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Heading for convergence

By Andy Rhodes, Benjamin A. Tao, and Marc Stitt

Modernizing data centers with a converged infrastructure can lead to convincing business agility gains. Widespread adoption of convergence heightens application and IT service delivery to drive emerging opportunities with exceptional cost-efficiency.

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Change agent

As technology and business strategies converge, Dell Global CIO Adriana Karaboutis is keenly focused on how her IT organization can be a catalyst of change. Here she takes a telling look at the role IT plays in supporting Dell's overall transformation.

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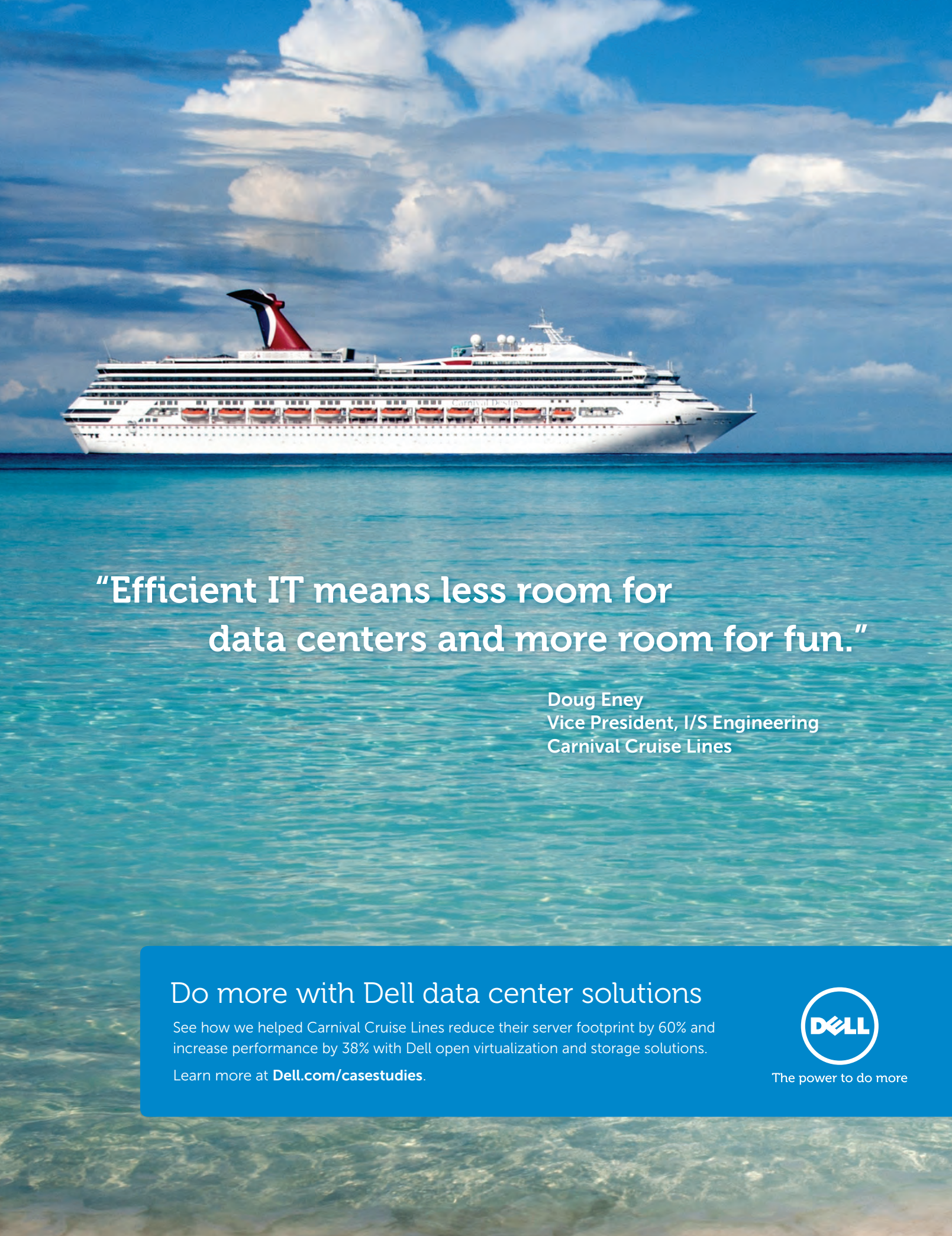

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Instrumental apps

A soft landing, after entering the Martian atmosphere at 13,000 mph and slowing to 0 in just 7 minutes. That was the minimum price of admission for NASA engineers as they prepared to land the Mars Science Laboratory mission's *Curiosity* rover on the foreign planet. On the ground in Pasadena, California, at NASA's Jet Propulsion Laboratory, a pair of high-performance computing (HPC) clusters outfitted with Dell™ PowerEdge™ servers and purpose-built computational analysis apps hammered through a massive amount of test data. The number crunching generated precise landing sequence parameters that would be downloaded to *Curiosity*'s on-board instrumentation. All of that rocket science paid off—NASA successfully brought *Curiosity* to rest on the floor of the Gale Crater a week before our press date for this issue. That's partially attributable to those instrumental apps and takes out-of-band remote management to new heights. (For more information, see dell.to/OB14au.)

During its two-year-plus mission to Mars, *Curiosity*'s payload of 10 instrument modules, and a corresponding array of complex apps, enables engineers and scientists to remotely manage and monitor exploration activities. For example, the Mast Camera (Mastcam) returns high-resolution images, while the Rover Environmental Monitoring Station (REMS) is a complex moniker for the weather-station instrumentation. More instruments, more apps, and more data to analyze—we suspect NASA's HPC clusters, dubbed Galaxy and Nebula, may be kept busy.

In the latest portfolio of Dell PowerEdge servers, robust out-of-band remote management and access to on-board hardware instrumentation were also fundamental design goals. This was taken to new heights in the form of the agent-free, embedded Integrated Dell Remote Access Controller 7 (iDRAC7) with Lifecycle Controller, plus corresponding console apps and APIs. Read what industry media and Dell customers are saying in this issue's Recent citings column, "Next-generation servers put to the test" (dell.to/Q3kgbj).

Are you aware of *Catalyst* magazine, Dell's online publication tailored to the IT needs of midsize businesses? As a new member of the *Power Solutions* publishing family, *Catalyst* will continue to evolve over the coming months. The latest issue, online at dell.com/catalyst, features a story on seismic imaging company Spectrum ASA. The company relies on its innovative IT infrastructure and apps for amassing and analyzing reams of data to scout locations for oil and natural gas exploration. Drop me an e-mail at the address below with feedback and ideas around what you would like to see in upcoming issues of *Catalyst*.

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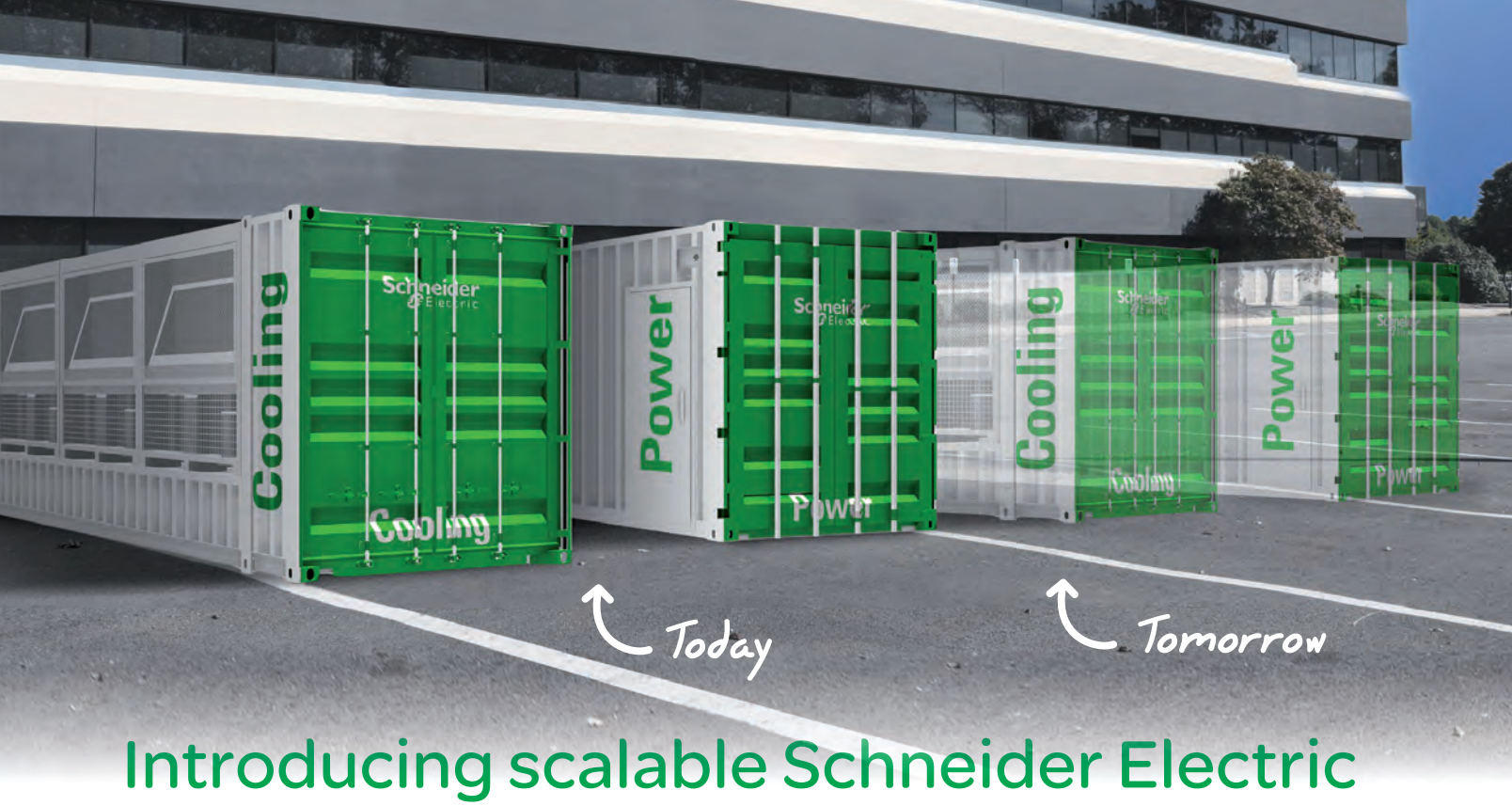

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Next-generation servers put to the test

Dell recently released 13 models as part of its 12th-generation Dell™ PowerEdge™ server portfolio. These next-generation servers introduced a number of innovative features that were inspired by input from IT professionals driven by specific organizational requirements to support a wide range of workloads. In addition, Dell engineered these features to help simplify the complexities of today's IT environments and manage converging resources efficiently—enabling organizations to achieve desired outcomes quickly and easily. (See the sidebar, "Inspired innovation at work.")

Because IT environments continue to grow in complexity—particularly as every level of the infrastructure becomes virtualized—12th-generation PowerEdge servers are designed to give organizations the power to do more with large memory footprints and flexible I/O options. They help bolster compute operations for a broad spectrum of high-performance, I/O-intensive applications, and they enable faster processing of surging data volumes and, when needed, scaling of more virtual machines than previous Dell server generations. Plus, they readily upgrade to next-level technologies such as 10 Gigabit Ethernet (10GbE), and the visionary engineering behind them is in step with continuous efforts by Dell to enhance energy efficiency.

Benchmark wins

In July 2012, the CRN Test Center, running Geekbench 2.3 cross-platform benchmark software from Primate Labs, tested the performance of a Dell PowerEdge R720 server and an HP ProLiant DL380p Gen8 server. Both servers were powered by two Intel® Xeon® E5-2690 processors and ran nearly identical configurations.

CRN ran five separate tests and reported the PowerEdge R720 server performance score at 40,250—nearly 11 percent higher than the ProLiant DL380p Gen8 server score of 36,295.[1]

The CRN Test Center result corroborates in-house testing of these same two servers at Dell. Using the standard SPECpower_ssj benchmark test at Dell Labs in June 2012, the Dell Solutions Performance Analysis team found that the PowerEdge R720 server is more energy efficient than the ProLiant DL380p server. Testing showed the PowerEdge R720 server to be 15 percent more efficient overall, 28 percent more efficient under load, and 10 percent more efficient at idle than the ProLiant DL380p server. For an IT organization, these results can translate to a significant reduction in energy costs.[2]

Editor's choice

In the short time following their launch, 12th-generation Dell PowerEdge servers have garnered considerable attention from industry media. The PowerEdge R715 server received an InfoWorld 2012 Technology of the Year award,[3] and innovative features in other PowerEdge servers in the portfolio have received the following accolades:

- In an *IT Pro* review, the PowerEdge R820 server received a five-stars-out-of-six rating for showcasing the latest Intel Xeon E5-4600 processor in a feature-packed system.[4]

Complex workload? No problem

Escalating demands of business applications and ever-growing volumes of data are pushing IT infrastructures to their capacity and manageability limits. View this video to learn more about how the flexibility of 12th-generation Dell PowerEdge servers supports challenging workloads in complex environments.

qrs.ly/go244t3

[1] "Battle of the titans: HP's ProLiant DL380p versus Dell's PowerEdge R720," by Edward J. Correia, *CRN*, July 12, 2012. Based on benchmark tests performed by the CRN Test Center in July 2012. Each rack server was configured with two Intel Xeon E5-2690 processors and 128 GB RAM. The ProLiant DL380p server was configured with eight 600 GB, 10,000 rpm Serial Attached SCSI (SAS) drives, and the PowerEdge R720 server was configured with six 300 GB SAS drives. For complete details, visit qrs.ly/xz24yk3.

[2] Based on SPECpower_ssj2008 benchmark tests performed by the Dell Solutions Performance Analysis team at Dell Labs in June 2012. Each rack server was configured with two Intel Xeon E5-2660 processors; four 8 GB dual-ranked Low Voltage Registered Dual In-line Memory Modules (LV RDIMMs) RAM; and two 73 GB, 15,000 rpm SAS drives. For complete details, visit qrs.ly/1324ykj.

[3] "InfoWorld's 2012 Technology of the Year award winners," *InfoWorld*, January 9, 2012, qrs.ly/xq24yk4.

[4] "Dell PowerEdge R820 review," by Dave Mitchell, *IT Pro*, Dennis Publishing, May 14, 2012, qrs.ly/9224yk8.

- A *V3.co.uk* review issued the PowerEdge R620 server a five-star rating along with the statement that this 1U rack server can be an excellent choice for organizations looking for a high-density server.[5]
- The *InfoWorld* data center site gave the PowerEdge C6220 server an 8.7 out of 10 score, and the server received an InfoWorld.com Editor's Choice designation.[6]

Outstanding management agility

Design principles inspired by IT professionals around the world have resulted in a next-generation server portfolio that features many innovative technologies. Among them, these next-generation servers utilize the embedded Integrated Dell Remote Access Controller 7 (iDRAC7) with Lifecycle Controller to manage the entire life cycle of servers without the need for software agents. They deploy energy-efficient, cost-saving Fresh Air–compliant configurations that enable data centers to run at high temperatures worry-free, and they upgrade the networking fabric with advanced I/O capabilities through deployment of Dell Select Network Adapter technology. These and other exceptional features, including integration of the Dell OpenManage™ systems management suite, enable enterprises to achieve unprecedented efficiency gains that can change the economics of their business and organizational success. PS

Learn more

Dell PowerEdge servers:
dell.com/poweredge

[5] "Dell PowerEdge R620 review," by Alan Stevens, *V3.co.uk*, Incisive Media, July 17, 2012, qrs.ly/z624ykd.

[6] "Review: Dell simplifies the blade server," by Brian Chee, *InfoWorld*, April 26, 2012, qrs.ly/ge24ykg.

The PowerEdge R715 server, winner of an InfoWorld 2012 Technology of the Year award

Inspired innovation at work

Positive reviews and impressive performance numbers tell a compelling story, as do advanced data center technologies that heighten data center IQ and efficiency. But first and foremost, invaluable insights derived from the wants and needs of IT professionals guided the design of 12th-generation Dell PowerEdge servers.

The following outlooks capture some of the many ways in which customer-inspired innovations enable these PowerEdge servers to increase performance, improve productivity, and optimize power and cooling efficiency in compute-intensive, high-performance business and scientific sectors.

"The agent-free monitoring capabilities available with the 12th-generation Dell PowerEdge servers will let us dedicate 100 percent of our CPU cycles to the scientific applications so we can maximize performance."

—**Tommy Minyard**
Director, advanced computing systems
at Texas Advanced Computing Center (TACC)
February 2012

"These servers can deliver outstanding performance for data processing while using very little power. This means we can accommodate company growth by running more servers in our data center while staying within our power envelope and controlling our energy costs."

—**Matthew Woodings**
CTO at HotSchedules
February 2012

"With these new server, processor, and networking technologies, we will be able to help researchers spend less time transporting data and more time testing scientific ideas."

—**Harvey Newman**
Professor of Physics at California Institute of Technology
February 2012

Heading for convergence

By Andy Rhodes, Benjamin A. Tao, and Marc Stitt

Modernizing data centers with a converged infrastructure can lead to convincing business agility gains. Widespread adoption of convergence heightens application and IT service delivery to drive emerging opportunities with exceptional cost-efficiency.

Business and IT visionaries are at a turning point. Having maximized the efficiency gains of simple virtualization, they must find fresh ways to continue elevating agility, innovation, and growth. This undertaking requires leaders to refocus their IT strategies, looking beyond the confines of the traditional data center model and leveraging open, flexible technology advances to best advantage.

Convergence enables outstanding agility and efficiency gains by bringing together key elements of the data center. As a strategy, it can drive down capital expenditures and operational expenses while also helping organizations respond to the mounting pressure for accelerated delivery of applications and IT services.

Virtualization is an important lever for convergence and has already achieved significant gains in operational efficiency while expediting the delivery of applications. However, over time virtual machine sprawl may erode the expected benefits of virtualization. In addition, virtualization alone does not remove the necessity to manage hardware and the hypervisor layer. In fact, some organizations find that virtualization may not reduce operational expenses at all—and may even increase them. To help realize the full cost-benefits of virtualization, IT organizations must reduce the complexity and expense of operating their virtual infrastructures.

Changing times

Given the pivotal role of technology in advancing business and organizational outcomes, many IT groups are keenly focused on finding cost-efficient ways to accelerate the delivery of applications and IT services. Achieving this important goal may involve overcoming some serious challenges.

First, building infrastructure can be time-intensive and require skills that are not a core competency of many IT teams. For example, it can take weeks or even months to work through the evaluation, procurement, installation, and configuration phases—taxing the patience of business leaders, end users, and IT administrators alike.

And second, some organizations are exploring cloud computing to gain agility and speed delivery. However, inflexible infrastructure and limited management tools already in place may create a barrier to effectively building and deploying a private cloud or utilizing public cloud options.

At the same time, IT groups must balance service quality while managing explosive growth. In many organizations and industries, end users are bringing their own devices to work. If they do not get what they need quickly, they may turn to alternative services that could potentially increase costs, create security vulnerabilities, and compromise compliance efforts.

This consumerization of endpoints, accompanied by the huge growth in data, places demands on IT that many legacy storage and networks are not equipped to meet. Despite serious IT challenges, in today's highly mobile and connected workplace it is essential that application delivery and IT service quality align with end-user expectations.

Convergence has led IT decision makers to rethink their approach to selecting and managing hardware, software, and operations. They are beginning to consider a highly integrated, singular unit as opposed to a collection of technologies. Because the data center infrastructure comprises servers, storage, networking, and management components, reexamining the way these four elements work together is a natural first step toward enabling IT to respond quickly and effectively to organization-wide demands. By proactively adopting a best-practices approach to IT convergence, enterprise decision makers can advance the business and organizational agenda through optimized delivery of applications and IT services.

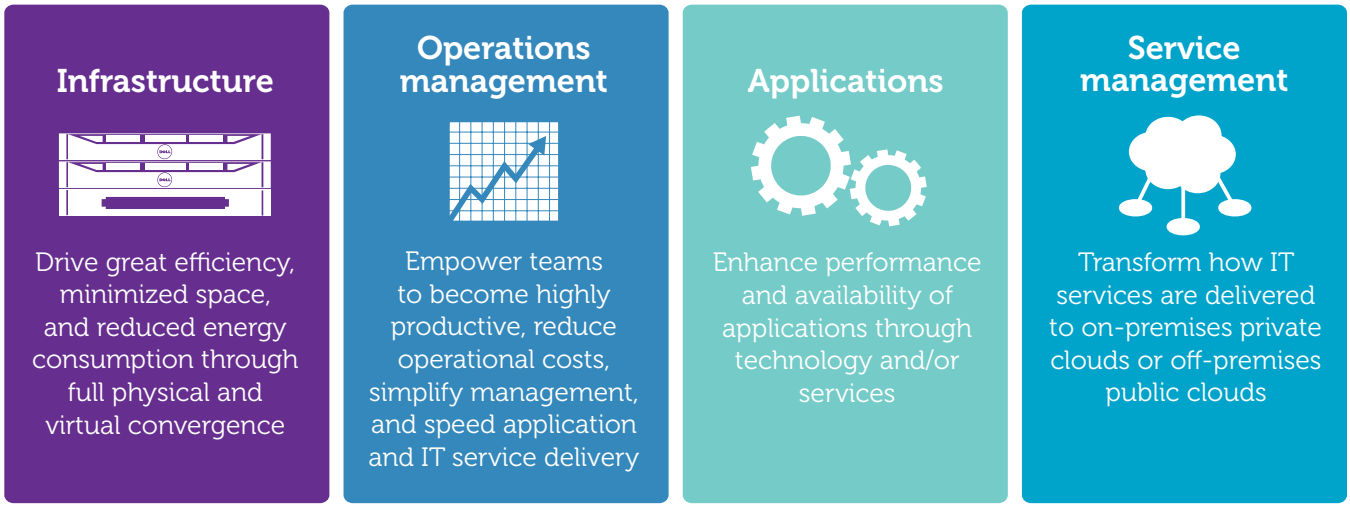

Figure 1. As a methodology that touches every part of IT, convergence is becoming pervasive

A unified approach

Over the years, many enterprise technologies—from computing and storage to networking and management resources—have evolved in parallel. They have also been managed separately by different administrators within the organization who may be specialists, may have their own agenda, and may not coordinate with administrators outside their domains. As a result, technological advances in each category have brought speed and efficiency advantages to the data center separately. Today, however, these technologies have reached a level of maturity that is leading to convergence. Through a converged infrastructure, enterprises can achieve new milestones in data center efficiency and agility.

Building and maintaining a competitive edge or efficiently achieving an organizational mission demands IT infrastructures that are flexible and streamlined. Such infrastructures help organizations reduce operational costs, not just capital expenditures. In particular, they are designed to boost computational density and increase asset utilization; improve responsiveness to end users; speed application and IT service delivery; and simplify management so fewer people with less-specialized experience can effectively manage more of the IT infrastructure.

An effective convergence strategy touches on every aspect of IT (see Figure 1):

- **Infrastructure:** The move from limited physical convergence to broad, full-spectrum physical and virtual convergence facilitates a unified data center that works together as a whole—across compute, storage, networking, and management resources. This approach enables IT organizations to greatly enhance efficiency while helping to reduce space and energy requirements.
- **Operations management:** Convergence enables IT teams to boost their productivity, helping reduce operational costs, ease management, and accelerate the delivery of applications and IT services. By integrating existing IT resources and systems management tools, a converged infrastructure helps support a unified view of an organization's overall operating framework.
- **Applications:** The convergence of hardware and software helps enterprises enhance the performance and availability of applications to support changing organizational needs.
- **Service management:** Convergence transforms how IT services are delivered to on-premises private clouds and off-premises public clouds, offering the flexibility to deploy and move workloads on demand. These capabilities enable organizations to meet end-user demands for applications and IT delivered as a service.

However, it is important to remind strategic business partners that convergence is not a silver bullet. Convergence is an enabler, not the goal. A converged infrastructure may not be designed to address fundamental organizational challenges that exist far beyond the infrastructure layer—such as to support the needs of applications and IT services.

Also, convergence is not a new concept. For example, mainframe computing is one application of converged infrastructure. However, monolithic infrastructures require highly specific administration knowledge, and their sheer size and cost often make them irrelevant for smaller applications or departments.

In addition, many convergence solutions involve trade-offs and may be incomplete. When systems are converged, one or more of the elements may fall short. For example, some converged infrastructure offerings may lack sufficient storage, while others may lack integration or fail to allow for the use of alternative, best-of-breed systems management offerings.

It is also important to note that no single approach to convergence is likely to deliver adequately across all desired outcomes. Many organizations seek rapid infrastructure deployment, while others want simple, low-cost administration. A converged infrastructure must be designed to support specific enterprise objectives.

Finally, convergence has historically been limited primarily to the network and infrastructure administration layers. Although some gains can be achieved through converging these two layers, the true value of convergence lies in embracing all aspects of the infrastructure.

The path to convergence

Dell is driving a path to convergence that is designed to unify hardware and software in a way that heightens agility, efficiency, and quality in the data center and beyond. Dell best practices recommend four key strategies to help achieve these goals while preserving existing IT infrastructure investments and operational processes.

1. Boost efficiency through simplified and integrated management that spans physical and virtual infrastructures. Virtualization has amplified the operational interactions across servers, storage, and networking. However, current IT processes and tools do not comprehend the changing IT roles. For many organizations, expensive and highly qualified network and storage administration resources are now focusing on mundane tasks, taking time away from strategic opportunities.

Dell Converged Blade Data Center

Simplifying data center deployment and management

Convergence can help minimize data center complexity by collapsing a highly virtualized infrastructure into a single chassis. The Dell Converged Blade Data Center is designed to provide an entire enterprise-class data center in a single 10U chassis. It delivers compute, storage, networking, and infrastructure management resources into one flexible, integrated offering.* The efficient footprint provides high computational density per rack unit, while standardized blade modules facilitate fast, easy deployment.

The shared infrastructure of the Converged Blade Data Center is designed to provide efficient hardware utilization. Shared power supplies and fans for the data center infrastructure help reduce the cost of power and cooling. In addition, the simplified infrastructure requires fewer cables and fewer rack units compared to traditional data center approaches, helping ease support and troubleshooting efforts.

The Converged Blade Data Center also helps simplify cross-hardware administration through common chassis management. Compute, storage, and networking components in the chassis share a common out-of-band interface to streamline the configuration and management process. The system's agent-free architecture helps ease management by avoiding software installation and OS dependencies. IT administrators can manage the infrastructure from their virtual machine console of choice. For example, storage area network (SAN) management is available to server administrators.

* For more information about the Dell Converged Blade Data Center, see "Deploying an agile infrastructure rapidly and efficiently," by Aaron Prince and Brent Collins, in *Dell Power Solutions*, 2012 Issue 3, qrs.ly/nf252pw.

Point of view

Join Andy Rhodes, executive director of converged infrastructure solutions at Dell, to learn more about how convergence helps achieve unprecedented gains in data center efficiency and agility.

qrs.ly/vy252pu

This increased management complexity can reduce capacity to effectively deliver applications and IT services.

Instead, organizations should unify management. This goal can be accomplished without compromising domain-level control, while increasing levels of automation to help improve efficiency and governance. By simplifying these processes and integrating with existing management tools such as the VMware® vCenter™ Server virtualization management platform and Microsoft® System Center management products, organizations can empower a single administrator to perform tasks that often require three or four administrators across both physical and virtual environments (see Figure 2).

2. Adopt infrastructure and architecture innovations. Convergence in the data center requires a rethinking of the architecture, and blade servers are a primary consideration. Blades are designed to deliver high computational density in a small data center footprint while optimizing efficiency through reduced power and cooling requirements. However, some convergence approaches leverage proprietary architectures that result in vendor lock-in, limiting system choices.

In contrast, Dell offers an open, flexible, end-to-end architecture that includes storage. This approach empowers organizations to leverage the Dell networking architecture or their own existing solutions. With a broad array of blade options and a comprehensive portfolio across servers, storage, networking, and management, Dell can support diverse organizational needs. (For more information, see the sidebar, "Simplifying data center deployment and management.")

3. Take a comprehensive approach to help ensure infrastructure performance, reliability, and quality. Bundled solutions are not necessarily comprehensive ones. Although grouping and packaging servers, storage, networking, and management can help ensure infrastructure performance, reliability, and quality, not all solutions are created or managed equally.

Dell offers integrated infrastructure management that leverages existing virtualization management tools, helping organizations deploy, update, monitor, and maintain their entire infrastructure. This approach is designed to be comprehensive because it also includes best-of-breed servers, storage, and network offerings that excel in their performance and reliability in support of tier 1 applications.

4. Choose the delivery option that optimally matches specific organizational needs. Convergence can bring together servers,

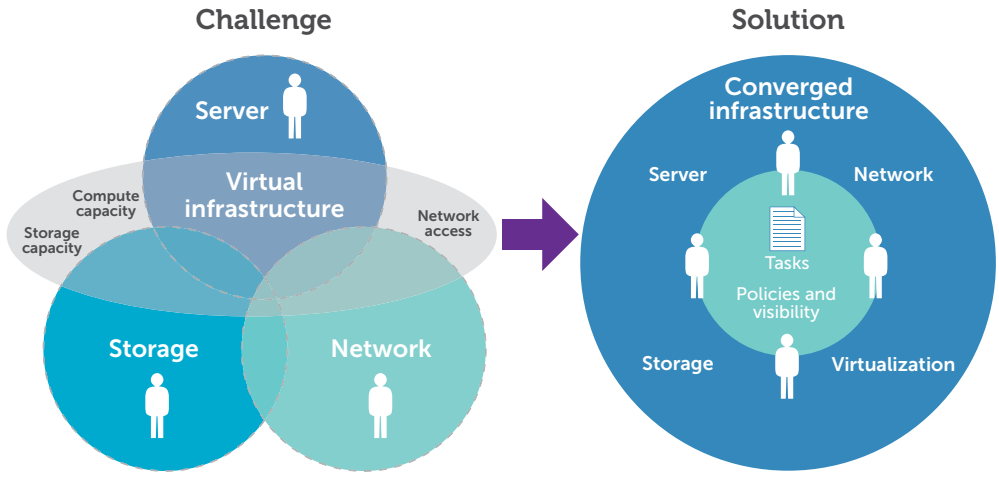

Figure 2. The Dell converged infrastructure strategy is designed to collapse and automate IT administration, expediting routine tasks to free experts for strategic initiatives

Accelerating virtual infrastructure delivery

An alternative approach to speeding deployment is through a fully preintegrated infrastructure. The Dell vStart 1000 provides an excellent example of converged infrastructure packaging.* Through a dependable and easy-to-scale virtualization framework, it delivers a private cloud infrastructure that enables IT to focus on delivering value-added business services. The Dell vStart 1000 is a mission-critical application platform that is designed to provide leading-edge scalability, resiliency, and performance. This approach helps organizations achieve several key goals, including the following:

- Accelerated time to value with a preintegrated infrastructure that is easy to implement and manage
- Heightened IT responsiveness through highly personalized private, public, and desktop cloud services that leverage existing systems and processes

This flexible, enterprise-class offering suits a wide range of use cases, such as expanding virtual environments, expediting application delivery, hosting specific mission-critical applications, and providing a platform for private clouds.

* For more information about Dell vStart, see "Building robust private cloud services infrastructures," by Brian Gautreau and Gong Wang, in *Dell Power Solutions*, 2012 Issue 3, qrs.ly/gi252q5.

Dell vStart 1000 virtualization platform

storage, networking, and management to drive agility and efficiency. However, many converged solutions may be fixed and rigid, with a one-size-fits-all approach.

Dell best practices recommend that organizations match their business needs with an approach that supports existing IT operational processes, to avoid disrupting architectural models already in place. To help achieve that goal, Dell offers a hardware compatibility list (HCL), a variety of reference architectures, and preintegrated infrastructures. (For more information, see the sidebar, "Accelerating virtual infrastructure delivery.") These options help organizations leverage a single provider with services and support designed to meet the needs of the entire solution.

Innovation in the fast lane

The pervasive drive toward convergence promises unprecedented gains in agility and cost-efficiency that reach far beyond the data center. Dell helps deliver the power to do more through dynamic, converged data center infrastructures that help maximize cost-efficiency and heighten application performance to meet specific enterprise requirements.

Built using field-tested, best-of-breed compute, storage, networking, and management components, Dell's converged infrastructure solutions are designed to provide innovative capabilities with built-in reliability and security. Based on decades of the company's firsthand experience, these highly scalable offerings enable interoperability with an organization's existing hardware and management investments, smoothing the way to a modernized data center and accelerating the time to value for emerging opportunities. In addition, Dell offers a variety of infrastructure consumption models, including do-it-yourself, reference architectures, and preintegrated infrastructure solutions—bridging boundless opportunities for innovation and growth. PS

Authors

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Learn more

Convergence from Dell:
marketing.dell.com/convergence

Targeting use cases for fast deployment of virtualized integrated infrastructure

Stepped-up demand to accelerate IT service delivery and extend virtualization benefits to vital applications is driving the move to integrate compute stacks. Dell™ vStart infrastructure consolidates virtualized resources for wide-ranging use cases.

Making the transition to integrated infrastructure has become a business priority at organizations of virtually every size and description, and for good reason. Consolidating IT resources enables decision makers to speed implementation of cloud computing initiatives and to extend virtualization for cost-effective, streamlined operation in production environments. Moreover, many organizations are seeking ways to boost the performance of mission-critical applications and heighten the efficiency and flexibility of IT service delivery. Scalability is an equally important concern as resource-hungry applications and the proliferation of on-demand IT services strain current capacities.

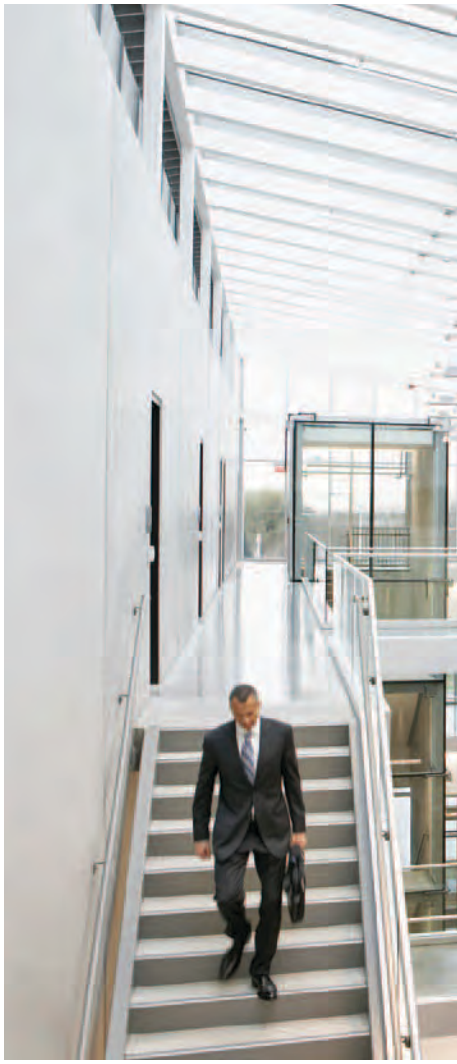
Many business leaders already understand why virtualization, resource consolidation, and simplified infrastructure management are instrumental in advancing successful business outcomes—all while helping to simplify operations and reduce total cost of ownership. Nevertheless, organizations are electing to adopt virtualized environments at extremely different rates. Some enterprises run all but mission-critical applications in a virtualized infrastructure; others have barely begun the journey to virtualization. For the latter group, time-consuming organizational demands, stretched resources, and constrained budgets may create obstacles. Or concern about risks and complexity may be a deterrence.

To help overcome these challenges, Dell has developed a preintegrated, prewired, and ready-to-deploy virtualized infrastructure that is designed to be up and running quickly. The Dell vStart infrastructure solution provides servers, networking, storage, management software, and deployment services. In addition, it preconfigures either VMware vSphere® or Microsoft® Hyper-V® virtualization to support organization-specific IT objectives. For example, vStart deployments may be designed to leverage resources already in place to avoid capital expenditures. They are also designed to preserve existing investment in management tool sets, utilize virtualization to enhance flexibility of application delivery, support vendor-agnostic component options, and implement an integrated infrastructure approach to expedite IT service delivery.

Capitalizing on rapid deployment

The Dell vStart infrastructure is designed to simplify the path to virtualization. It offers the following key advantages of a virtualized IT environment in a compact, cost-effective form factor: rapid deployment, enhanced management efficiency, and heightened scalability.

vStart enables organizations to avoid the time-consuming process of building an infrastructure from the ground up, including planning, design, implementation, configuration, testing, deployment, and even the removal of packing materials. Built-in Dell Management Plug-In for VMware vCenter



Inside enterprise IT

This Dell community blog offers strategic insights on using IT to achieve successful business outcomes. Visit the site and read a posted article about Dell vStart to learn more about its support of virtualization platforms.

qrs.ly/46252p9

and Microsoft Hyper-V software help simplify hardware management without requiring IT staff to learn or manage additional consoles or interfaces. Instead, management is efficiently centralized and streamlined through the familiar virtualization management console. Moreover, the vStart implementation includes three years of Dell support, providing organizations with a dependable single point of accountability.

The vStart infrastructure can be scaled by adding capacity to existing racks, and then scaled further by adding racks to the infrastructure. Out of the box, the vStart infrastructure provides a foundation for private cloud computing through either Dell VIS Creator, a component of the Dell Virtual Integrated System (VIS) portfolio, or the Microsoft Private Cloud Fast Track reference architecture.

Several use cases provide examples of how organizations of all sizes, each with a specific business goal or need, can implement a converged, virtualized environment based on the vStart infrastructure.

Putting integrated infrastructure into action

Organizations ranging from small and medium businesses (SMBs) to large enterprises have deployed Dell vStart to launch virtualization environments. These initiatives have been designed to accelerate specific business outcomes while realizing the cost-benefits of converged infrastructure. The following use cases indicate some of the ways organizations can leverage vStart infrastructure—for example, to consolidate servers, refresh or expand a virtualized environment, create a virtualized IT infrastructure for remote or branch offices, support application hosting platforms, and deploy private clouds.

Consolidate servers

Until a few years ago, IT departments had one infrastructure option, which was essentially hosting applications on physical servers. Typically, each requesting department owned its own set of hosted and managed applications. These servers usually were underutilized, and consequently afforded ample untapped capacity. As requesting departments added applications, IT administrators provisioned additional servers. Over time, data center space—as well as power and cooling costs—drove operational expense.

Today, organizations are looking toward dependable, virtualized environments to consolidate servers and help reduce their capital and operational costs. An SMB retailer provides a typical example. The retailer was experiencing server sprawl primarily as a result of running its applications on dedicated physical servers. To gain the benefits of virtualization, this retailer wanted to refresh its aging server population and move to a virtualized infrastructure. But it did not want to undergo a lengthy migration process.

By utilizing a vStart implementation, the retailer in this example use case realized a significantly faster deployment than it would have been able to achieve by updating its environment with physical servers. In addition, the vStart implementation enabled the retailer to substantially reduce the footprint for its storage and server rack space as well as for its power and cooling equipment. The retailer in this example scenario also can benefit by requiring significantly less staff time to manage the virtualized IT infrastructure, while at the same time maximizing availability for its applications and databases.

Refresh or expand a virtualized environment

A virtualization strategy is well suited for organizations such as online or Web-based service providers. These organizations need to maximize service-delivery performance in dynamic environments that must be reliable, highly available, and efficient. Yet implementing virtualization for these environments can present specific challenges such as identifying resource

contention problems, resolving data traffic bottlenecks, and scaling capacity to keep up with demand.

For example, an SMB-level online service provider may have an existing, mature IT environment that is already highly virtualized. It also may have in-house IT staff with the requisite skills to expand capacity. However, in this example use case the SMB service provider would face an untenable trade-off because its IT team is required to balance many other high-priority projects. In this case, diverting IT resources from daily—and in some cases, mission-critical—tasks to expand capacity would compromise business outcomes. The resulting inability to scale quickly, in this kind of scenario, may hamper the service provider's ability to deliver on strategic growth initiatives.

However, by implementing the vStart infrastructure, the service can keep its employees focused on meeting the service needs of its customers while adding capacity quickly and predictably on demand. Moreover, a vStart implementation offers the flexibility to allow the service provider in this example to execute on postponed but strategic endeavors.

Dell vStart: Ready-to-deploy virtualization for flexible application delivery and implementation of an integrated infrastructure for provisioning IT services

Create a virtualized IT infrastructure for remote or branch offices

Organizations such as medium to large enterprises with multiple offices often have an IT staff with diverse technical skills in their headquarters, but limited IT staffing in small branch or remote offices. Despite having rich skill sets and resources at their disposal, implementation of virtualization in branch or satellite offices can still be an expensive, time-consuming proposition that impacts more than one location and presents management and scalability challenges.

A very large domestic retailer having multiple outlets, for example, might need a versatile virtualization infrastructure located at its outlets to run particular applications locally. While the organization may be well staffed at the corporate office, the retailer in this example has little or no IT presence at the outlets. Consequently, deploying an infrastructure designed to be highly reliable—with a clear line of accountability should a problem arise—is imperative.

Deploying a vStart infrastructure in this use-case scenario enables the large retailer to deliver consistent infrastructure across all its locations. Built-in management software helps simplify managing the infrastructure, and centralized remote management helps avoid the complexity of regional deployments. It provides a flexible, scalable virtual infrastructure where it is needed without the burdens of hiring additional staff or retraining existing personnel. In addition, included Dell deployment and support services offer the accountability and accessibility an organization in this kind of scenario needs to scale its operations.

Support application hosting platforms

Sometimes an organization might have a service-level agreement that cannot be met with its existing infrastructure. Or it may need a disaster recovery plan that requires the configuration to be geographically separated from the core deployment. In either scenario—and many others like it—organizations need a way to introduce applications in a nondisruptive manner or to host mission-critical applications separately from the main IT infrastructure.

For example, a very large manufacturing concern may need a virtualization infrastructure that can run applications in support of a top-secret project. The organization may have all the necessary technical skills in-house. However, in this example scenario the internal IT department estimated it would need a three-month lead time to complete the virtualization infrastructure, and the company could not wait that long to launch the project.

By implementing a prebuilt vStart infrastructure, in-house engineers can remain focused on mission-critical projects instead of building infrastructure, and the manufacturer can get the project underway in short order. Furthermore, the preengineered infrastructure is designed to provide the reliability and capability an organization would need in this use-case example.

Deploy private clouds

In the past, IT managers or departments needing to access IT assets would submit a request and typically wait a week or longer to get the asset. This lag time creates a productivity drain. Now, as on-demand options became popular, decision makers expect to replicate the immediacy of that

experience in their own environments through private cloud computing.

By enabling near-instant access to IT assets for authorized personnel, private cloud platforms allow high levels of agility and efficiency throughout an organization. IT managers can increase or decrease capacity on an as-needed basis. The vStart infrastructure is designed to provide out-of-the-box audit capabilities and role-based asset provisioning to help decision makers identify asset consumers and their usage patterns, which can be invaluable for capacity planning use cases. In addition, built-in management software enables the organization to control virtual machine sprawl by identifying and shutting down virtual machines not in use, recovering their resources, and making those resources available for rapid, automated redeployment.

For example, a midsize agency for a large county in the United States wanted to create server-as-a-service capabilities quickly for multiple agencies. A vStart implementation enables the agency in this example scenario to deliver these capabilities, achieve detailed audit reporting, and realize a significant reduction in time-to-asset provisioning.

Advancing business priorities with integrated infrastructure

Organizations of virtually any size can benefit from virtualization, resource consolidation, and simplified infrastructure management to support successful business outcomes and help reduce total cost of ownership. Dell vStart offers a flexible, versatile infrastructure that can be rapidly deployed to support virtualization environments designed to meet specific business and organizational objectives. Preintegrated, wired, and ready to deploy quickly, vStart offers a highly scalable platform that expedites the delivery of applications and IT services in virtualized or private cloud computing environments. For organizations looking to enhance operational efficiencies, vStart allows IT professionals to stay focused on key business priorities and deploy solutions quickly—without being required to commit significant time and effort to build the infrastructure first. PS

Learn more

Fast path to virtualization:
dell.com/vstart

Dell vStart 1000:
qrs.ly/lz252p4

Deploying an agile infrastructure rapidly and efficiently

By Aaron Prince and Brent Collins

The Dell™ Converged Blade Data Center architecture integrates innovative Dell PowerEdge™ M420 blade servers, Dell Force10™ MXL switches, and Dell EqualLogic™ PS-M4110 blade arrays in a modular way for targeted use cases.

The importance of IT agility and efficiency in today's data centers now trumps traditional measures of performance and speed. IT organizations need the ability to quickly deliver infrastructure that supports changing business objectives, but inside the data center there are dynamics that can slow down operations. Providing required compute, network, and storage resources for an application is challenging and requires multiple disconnected groups to collaborate around infrastructure design, integration, and support. A modular approach helps minimize these complexities and other concerns such as use of power, cooling, and space inside the data center.

The Dell Converged Blade Data Center architecture offers organizations a preengineered platform that integrates recent Dell server, networking, and storage offerings, along with infrastructure management, in a single chassis. This architecture is designed to deliver a data center infrastructure with the agility, efficiency, and simplicity of a blade server environment. It combines blade form factor innovation with up-to-date protocols and enhanced manageability to deliver an enterprise-class data center in just 10U of rack space.

This architecture is targeted for specific use-case scenarios including small and medium businesses (SMBs) or branch offices requiring comprehensive, enterprise-class data center functionality, or hosted cloud organizations that can take advantage of its simplicity, scalability, and density. The platform offers enough flexibility and powerful capabilities to run both virtual and physical workloads, but its blade form factor is designed to be simple to deploy. Moreover, its converged storage and Ethernet fabric facilitate easy connectivity to the network. The architecture itself can be modified with different configurations of Dell servers, networking, or storage to meet particular needs for specific use cases.

Innovation for agile infrastructure

Speed, simplicity, and efficiency were guiding design principles for the Dell Converged Blade Data Center architecture. Each plays an important role in enhancing operations for converged environments:

- **Dell PowerEdge M420 blade server:** This one-quarter height, dual-socket blade server provides maximum compute density in the PowerEdge M1000e modular blade enclosure, occupying very little space and minimizing switch requirements to support compute resources. The blade server is managed agent free by the Chassis Management Controller (CMC). Up to 24 dual-socket PowerEdge M420 blade servers can be added to the chassis and provide up to 384 processor cores and 4.6 TB of memory. Each server has two on-board 10 Gigabit Ethernet (10GbE) converged network adapters for networking support.
- **Dell Force10 MXL switch:** This stackable, 40 Gbps–capable blade I/O module offers end-to-end, high-speed network capabilities. Support for the Data Center Bridging (DCB) protocol enables combining Ethernet LAN traffic and Internet SCSI (iSCSI) storage area network (SAN) traffic within a single fabric and cost-effectively helps simplify the topology. The switch delivers high I/O density with 32 internal 10GbE ports and up to six 40 Gigabit Ethernet (40GbE) external ports to support network bandwidth required by the converged fabric. Stacking two of these switches in the architecture can support a high-speed, low-latency, locally switched and redundant fabric.
- **Dell EqualLogic PS-M4110 blade array:** This enterprise-class storage blade array is designed to fit inside a PowerEdge M1000e blade chassis. It delivers storage to the servers on the same fabric, allowing high-speed, low-latency communication between servers within the chassis through local switching. Redundant arrays deliver more than 25 TB of storage inside the chassis and up to 2 PB of capacity in a single group when connected to external storage. The array offers enterprise-class redundancy and capabilities on a converged fabric with no cabling required. The storage can be configured from the CMC interface.

The preengineered Converged Blade Data Center architecture facilitates rapid deployment. Its modular, blade-based platform is designed to deploy quickly and easily, and the single-console management interface provides access to all components in up to nine chassis. Integrated management allows administrators to use a preexisting virtualization management console to manage the infrastructure and avoid the learning curve that is often associated with using another separate console. Maximum density, minimized cabling, and consolidated power and cooling in the Converged Blade Data Center architecture help organizations boost their data center efficiency.

Convergence for specific use cases

The Dell Converged Blade Data Center architecture delivers exceptional flexibility and versatility for organizations of varying sizes and for application in a range of use cases. In particular, its modular capability is well suited for hosting the IT infrastructure for SMBs, enterprise remote or branch offices, and other organizations. The density of compute, networking, and storage resources occupying 10 rack units allows the Converged Blade Data Center to be used in locations where space may be limited. Streamlined cabling and management helps simplify installation and allows the platform to be supported by on-site support staff that may have minimum technical skills.

Converged Blade Data Center modularity can also benefit large organizations with sizeable data centers that need to support new application, mid-tier virtualization, or disaster recovery initiatives. For these organizations, the Converged Blade Data Center can power multitier applications requiring both virtual and physical workloads from a physically separated platform and provide a modular building block for broad IT initiatives, mid-tier virtualization, and disaster recovery. In addition to helping simplify cabling, the Converged Blade Data Center enables organizations to consolidate physical workloads that are not ideal for virtualization. For example, physical workloads currently occupying 32 rack units using 1U servers could be collapsed into just 10 rack units.

An agile, flexible, and versatile Converged Blade Data Center architecture provides an innovative approach to data center infrastructure that is easy to deploy and manage. Its dense configuration of Dell servers, networking, and storage resources offers the modular scalability and efficiency for a wide range of use cases in many organizations. PS

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Learn more

Dell converged infrastructure:
dell.com/ci

Dell PowerEdge M420 blade server:
qrs.ly/wj23dmf

Dell Force10:
force10networks.com

Dell EqualLogic PS-M4110 blade array:
qrs.ly/b223dnx

Bringing virtualized storage intelligence to converged infrastructure

By Achmad Chadran and Shanky Chandra Gowri

Converging IT resources can minimize data center footprint, heighten scalability, and centralize management. Now, Dell™ EqualLogic™ PS-M4110 blade arrays enrich these consolidated environments with advanced, virtualized storage in a blade form factor.

Enterprise-class storage in a blade form factor

The Dell EqualLogic PS-M4110 blade array offers up to 56 TB of fully redundant storage and EqualLogic intelligence for enhanced performance, efficiency, and manageability.

Advanced integration of virtualization in IT environments and the redesign of hardware platforms that optimize virtualization provide a timely opportunity for many organizations to consolidate existing data center resources in a converged IT infrastructure. In some cases, converged infrastructure implementations offer modular computing environments that are scalable and easily managed by integrating server, network, and storage components. These consolidated data center building blocks are designed to be deployed and managed as compact units that help reduce complexity, simplify management, and facilitate scalability while minimizing use of physical space and enhancing power and cooling efficiency.

When consolidating IT resources in a converged data center, IT decision makers need to look beyond storage density and capacity requirements. They also need to avoid the limitations imposed by little or no automation or a lack of centralized management, which in some cases may render available storage options unsuitable for enterprise-class application deployments.

The Dell EqualLogic PS-M4110 Internet SCSI (iSCSI) blade array, a key component in the Dell Converged Blade Data Center architecture, offers virtualized, enterprise-class storage combined with intelligent EqualLogic capabilities in a consolidated blade form factor. The Converged Blade Data Center architecture integrates server, network switches, storage, and cabling within a compact Dell PowerEdge™ M1000e modular blade chassis, helping organizations to simplify management, enhance efficiency, and deploy and expand application clusters quickly. EqualLogic PS-M4110 blade arrays are designed to augment this architecture by offering the same self-optimization, automation, ease-of-use, and data protection features available with traditional, rack-mounted Dell EqualLogic PS Series iSCSI storage area network (SAN) arrays.

EqualLogic PS-M4110 blade arrays feature comprehensive, robust EqualLogic PS Series software to bring EqualLogic intelligence to the Converged Blade Data Center architecture. Comprehensive EqualLogic PS Series features and host integration software are available for every array that is under an active support contract. IT organizations with an up-to-date support contract can at any time download

Data center convergence

Converged infrastructures combine server, network, and storage components to help reduce costs, minimize data center footprint, and enhance efficiency. View this video to learn more about current technologies that enable data center convergence and its many benefits.

qrs.ly/8723dlr

system firmware, host integration tools, and storage monitoring software from the Dell EqualLogic support Web site. The intelligence available in these arrays enhances the efficiency of virtualized environments supporting application workloads such as Microsoft® Exchange Server messaging, Microsoft SQL Server® database, Microsoft SharePoint® Server collaboration software, and virtual desktop infrastructure (VDI) deployments.

Optimized modular data centers

In addition to the Dell EqualLogic PS-M4110 storage component, the Dell Converged Blade Data Center architecture combines Dell PowerEdge M-Series servers and Dell Force10™ MXL switches in a Dell PowerEdge M1000e blade chassis. This modular architecture is designed to deliver a comprehensive, end-to-end virtualized data center with 10 Gigabit Ethernet (10GbE) connectivity that enables IT organizations to do more while consuming less space, power, and cabling than traditional rack-mounted approaches.

Specifically, shared resources such as chassis-based power and cooling and backplane connectivity help reduce cabling and minimize space requirements cost-effectively. Additionally, unified management through the Dell Chassis Management Controller (CMC) enables rapid deployment and provisioning without requiring specialized expertise.

The double-wide, half-height blade form factor of the EqualLogic PS-M4110 blade array plugs neatly into the PowerEdge M1000e enclosure. It features dual, hot-pluggable 10GbE controllers, each with 4 GB of memory. The array is available in a variety of disk configurations. These configurations include 14 hot-pluggable 7,200 rpm, 10,000 rpm, and 15,000 rpm 2.5-inch Serial Attached SCSI (SAS) drives and—to suit highly demanding, multitiered workloads—a hybrid configuration consisting of nine SAS drives and five solid-state drives (SSDs). These drive configurations are designed to provide up to 14 TB of storage capacity per array, or 56 TB of storage capacity with four blade arrays within a single blade chassis. The array also includes one dedicated management port that is accessible through the CMC.

EqualLogic PS-M4110 blade arrays extend converged infrastructure storage capabilities by offering familiar, enterprise-class software and features available for EqualLogic PS Series iSCSI SAN arrays. In particular, EqualLogic PS-M4110 blade arrays offer thin provisioning, load balancing, and data tiering automation and optimization, all of which help significantly enhance storage performance, manageability, and efficiency.

Thin provisioning enables organizations to meet capacity requirements while optimizing resource utilization. Automated load balancing helps ensure application responsiveness even in high-demand transaction environments. Automated data tiering facilitates meeting performance requirements cost-effectively. Frequently accessed data can be automatically migrated to performance-optimized storage such as SSDs, while less-frequently accessed data can be migrated to cost-effective disk drives such as SAS drives.

These automation and optimization features help simplify scaling from a single array to multiple arrays within a single chassis or even beyond the chassis to external, rack-mounted EqualLogic PS Series arrays. For example, within a single chassis, IT organizations can deploy up to four blade arrays. Up to two blade arrays can be deployed in a single group inside the chassis. To expand beyond two arrays within the group, organizations can combine them with other EqualLogic PS6000 and/or EqualLogic PS6500 series arrays outside the chassis to scale storage up to 16 EqualLogic PS Series arrays.

The EqualLogic PS-M4110 blade array in combination with the PowerEdge M1000e chassis also features a modular design and unified management capabilities that allow storage to be provisioned, scaled, and managed efficiently. CMC enables setup, deployment, and monitoring from a centralized interface, helping avoid the need for specialized domain expertise. The hot-pluggable design of the EqualLogic PS-M4110 blade array enables administrators to upgrade drives and controllers without incurring downtime or disrupting applications. Redundancy of controllers, network, and switching layers provides enterprise-class availability.

Converged architecture for specific use cases

One advantage a converged infrastructure brings to organizations is the capability to rapidly deploy and maintain comprehensive, virtualized, highly manageable IT environments. Dell EqualLogic PS-M4110 blade arrays are well suited for specific use cases including virtualized, multiple-application workloads; VDI deployments; and remote or branch office (ROBO) and departmental workloads.

Virtualized, multiple-application workloads

For many organizations, the transition from application-dedicated servers to virtualized infrastructures has mitigated certain challenges while introducing others. One reason for this dilemma is that, for all its benefits, virtualization has not removed the need to manage hardware.

Virtualized storage blade

Dell EqualLogic PS-M4110 iSCSI blade arrays offer virtualized, enterprise-class storage combined with EqualLogic storage intelligence capabilities in a blade form factor. View this video to see how this blade array provides virtualized storage in the Dell Converged Blade Data Center.

qrs.ly/vd23dm4

Implementation of virtualized Dell EqualLogic PS-M4110 blade arrays offers a shared-storage approach that is well suited for virtualization-based consolidation inside a blade chassis. EqualLogic PS-M4110 blade arrays tightly integrate with VMware vSphere® and Microsoft Hyper-V® virtualization, enabling storage management from within virtual machine environments. Additionally, integration with VMware vSphere Storage APIs – Array Integration (VAAI) enables EqualLogic PS-M4110 arrays to offload storage-related tasks from servers to storage for enhanced application performance.

Maintaining business continuity through implementation of data protection and recovery capabilities in virtualized environments is an important consideration for IT decision makers planning to consolidate data center resources. Auto-Snapshot Manager/VMware Edition (ASM/VE), Auto-Snapshot Manager/Microsoft Edition (ASM/ME), and Auto-Snapshot Manager/Linux Edition (ASM/LE) support automatic creation of platform-aware clones, snapshots, and replicas for advanced data protection of virtualization environments.

Virtual desktop infrastructure

VDI deployments can be especially challenging for storage infrastructures. They often grow rapidly, starting off as small pilot projects but expanding quickly throughout an organization. VDI deployments are also subject to spikes in storage demand because of I/O storms that tend to occur during heavy activity periods, such as numerous concurrent boot-up, log-in, and log-out operations. To meet end-user performance demands, VDI deployments often utilize expensive, high-performance storage such as SSDs, which can increase costs significantly.

The EqualLogic PS-M4110 blade array is designed to meet the performance, scalability, and manageability demands of VDI deployments. The integrated compute, switching, and storage of the Dell Converged Blade Data Center architecture enables rapid, self-contained deployment and easy scalability. Integration with hypervisors such as vSphere and Hyper-V offers rapid provisioning of virtual machines and streamlined management. Additionally, hybrid arrays with a mix of SSD and SAS drives, combined with automated load balancing and tiering functionality, can be highly adaptive to spikes in demand. And thin clone capability allows space-efficient, cost-effective deployment of virtual machines in high-growth environments.

Remote or branch offices and departmental workloads

Organizations that encompass geographically dispersed centers of competence, regional centers, or other ROBO sites may often need IT infrastructures on location. Other organizations may require dedicated compute, networking, and storage infrastructures in close proximity to—or even coresident with—primary data centers.

The Dell Converged Blade Data Center offers numerous advantages to this approach because of its agile scalability, deployment flexibility, and streamlined manageability. Moreover, organizations using Dell EqualLogic storage in both primary and adjunct data centers can activate the Auto-Replication feature of the platform to automatically back up data across locations as part of a disaster avoidance strategy. EqualLogic pre-integration with leading-edge host and application platforms helps improve data protection within converged solutions and simplify management at the solution level.

Integrated enterprise-class blade storage

Organizations moving toward a converged infrastructure can reduce the physical footprint, ease management, and enhance the efficiency of their data centers. The Dell Converged Blade Data Center architecture enables organizations to put a converged infrastructure strategy into action by integrating blade server, networking resources, and blade storage in a Dell PowerEdge M1000e chassis.

In an era of tremendous data growth and complexity in virtualized environments, storage is a critical component for converged infrastructures. The Dell EqualLogic PS-M4110 blade array provides virtualized, enterprise-scale storage that fortifies consolidated environments with EqualLogic intelligence features for data protection and disaster recovery. This innovative EqualLogic storage alternative in a blade form factor enables organizations to enhance efficiency and business continuity, centralize management, and boost productivity in their IT environments to accelerate business outcomes. PS

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dell.com/equallogic

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The power to do more

Building robust private cloud services infrastructures

By Brian Gautreau and Gong Wang

Private clouds optimize utilization and management of IT resources to heighten availability. Microsoft® Private Cloud Fast Track reference architecture expands the Dell™ vStart 1000m infrastructure to offer enterprise-class private cloud computing.

Private cloud computing advances efficiency and helps reduce total cost of ownership (TCO) through a secure, virtualized environment for automated management, enhanced utilization of IT resources, and improved availability. By implementing cloud-based services on resources that are dedicated to a single organization, private cloud computing affords the same self-service, scalability, and elasticity benefits that can be derived from public cloud computing. At the same time, organizations gain additional control and customization over the infrastructure and data by either implementing private cloud computing on premises or hosting it off premises.

Private cloud service delivery is accomplished using one of two models. An infrastructure-as-a-service (IaaS) model provides on-demand access to resources—compute, network, and storage—that support operations. A platform-as-a-service (PaaS) model—such as the Windows Azure™ cloud platform—provides an OS, development tools, execution runtime, a database, and a Web server.

The Dell vStart 1000m enterprise-class private cloud infrastructure is an IaaS offering that is validated for the Microsoft Private Cloud Fast Track program, a reference architecture for building a preconfigured private cloud. The vStart 1000m infrastructure utilizes the Microsoft Windows Server® 2008 R2 Datacenter edition OS with Service Pack 1 (SP1), the Microsoft Hyper-V® hypervisor, and Microsoft System Center 2012 management tools. It integrates Dell PowerEdge™ blade servers, Dell Force10™ network switches, Dell Compellent™ Storage Center™ storage area network (SAN) arrays, and Dell systems management software such as the Dell OpenManage™ suite. Microsoft and Dell codeveloped the vStart 1000m infrastructure for Microsoft Private Cloud Fast Track, which is designed to help organizations of all sizes accelerate deployment and reduce TCO for a private cloud environment.

Rapid virtualization

The Dell vStart infrastructure offers comprehensive virtualization that can be implemented quickly and easily. View this video to learn more about getting started with a Dell vStart virtualized environment.

dell.to/lCca1x

The vStart private cloud architecture consists of two primary parts. The physical infrastructure called the *fabric*—comprising servers, networking, and storage—hosts and runs all tenant virtual machines. The *fabric management* is a set of virtual machines comprising Dell systems management software and Microsoft System Center 2012 components (see Figure 1).

Configuring the fabric of physical architectures

The Dell vStart 1000m infrastructure fabric consists of the following precabled and preconfigured components:

- Eight, 16, 24, or 32 Dell PowerEdge M620 blade servers residing in one or two Dell PowerEdge M1000e modular blade enclosures
- A Dell Compellent Storage Center array with the Compellent Series 40 controller, including a range of Serial Attached SCSI (SAS) enclosures
- Two Dell Force10 S4810 network switches and one Force10 S55 switch
- Two Brocade 5100 Fibre Channel switches
- Two Dell PowerEdge R620 servers

Server architecture

The Dell PowerEdge M620 blade server—powered by the Intel® Xeon® processor E5-2600 product family and the Dell Select Network Adapter flexible network interface card (NIC) technology—offers a hyperdense design for high-performance processing in a compact form factor. It is designed to provide up to 768 GB memory capacity and scalable I/O capabilities.

The PowerEdge M1000e blade enclosure supports up to 16 half-height blade servers such as the PowerEdge M620, enhancing data center efficiency through its shared power, cooling, networking, and management infrastructure. It also integrates enclosure management through a redundant Chassis Management Controller (CMC) module. The PowerEdge M1000e chassis supports Dell FlexAddress™ Plus technology to lock the World Wide Name (WWN) of the Fibre Channel controllers and Media Access Control (MAC) addresses of the Ethernet controllers to specific blade slots.

All servers in the vStart 1000m infrastructure run the Microsoft Windows Server 2008 R2 Datacenter edition OS with SP1 and with the Microsoft Hyper-V hypervisor role enabled. The Datacenter edition offers an unlimited number of virtual machine licenses.

Network architecture

The vStart 1000m infrastructure uses 10 Gigabit Ethernet (10GbE) network connectivity. Each PowerEdge M620 blade server is configured for the fabric with two 10GbE ports and connected to two Force10 S4810 switches through the 10GbE Pass-Through Modules for PowerEdge M1000e enclosures. For fabric management, each PowerEdge R620 rack server is configured

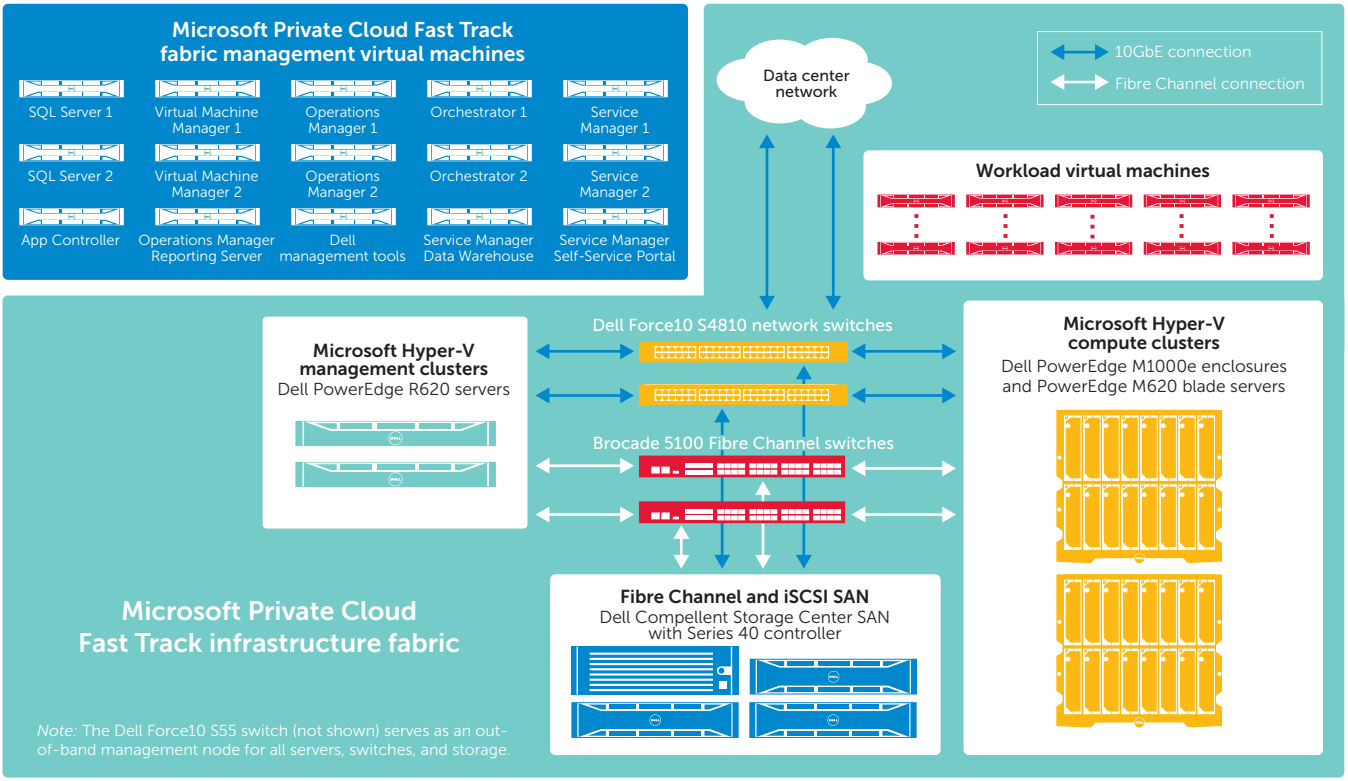
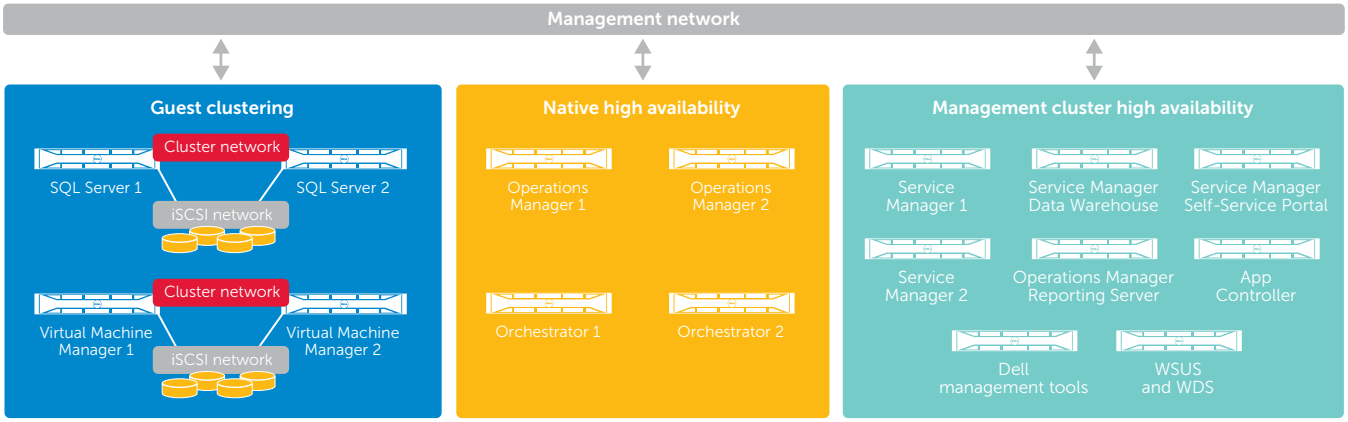


Figure 1. Dell vStart 1000m infrastructure fabric consisting of physical hardware and virtual machines hosting tools for fabric management



Note: The Microsoft Active Directory® Domain Services server role is required for deploying fabric management.

Figure 2. Dell vStart 1000m fabric management deployment

with two 10GbE ports and connected with the same Force10 S4810 switches. Link aggregation group is configured on the Inter-Switch Link between the two Force10 S4810 switches.

On both the PowerEdge M620 and PowerEdge R620 servers, each of their 10GbE ports is partitioned into four logical ports and allocated with appropriate bandwidth. Four NIC teams are created on each server, and different virtual LAN (VLAN) IDs are assigned to these teamed NICs to segregate traffic types such as cluster management, live migration, Cluster Shared Volumes (CSVs), virtual machine, and so on.

Storage architecture

Compellent storage arrays with the Compellent Series 40 controller are integrated into the vStart 1000m infrastructure for shared storage. The storage features high bandwidth and low latency for storage data flows with 8 Gbps Fibre Channel and 10GbE Internet SCSI (iSCSI) front-end storage I/O ports. This bandwidth is complemented in the attached SAS enclosure by a wide range of drive options in multiple speeds and sizes.

Fibre Channel is used for hypervisor connectivity and provides a dedicated SAN fabric for the storage traffic. This dedicated bandwidth enables hypervisors to provide the virtual machines a very low latency and high throughput option for storage connectivity. The Fibre Channel ports are connected to the Brocade 5100 switches, and the front-end iSCSI ports are connected to the Force10 S4810 switches. The iSCSI connectivity provides the virtual machines direct access to the SAN and enables guest failover clustering.

The Compellent storage array is configured with dual controllers and features virtual ports. All front-end I/O ports, including both Fibre Channel and iSCSI ports, are virtualized and used at the same time for load balancing and failover to another port. To maintain continuous availability of stored data from the server, the controller-level fault domains are established to create redundant I/O paths for both Fibre Channel and iSCSI connectivity.

On the fabric compute node, each PowerEdge M620 blade server is configured with a dual-port 8 Gbps Fibre Channel mezzanine card and connected to the two Brocade 5100 switches through two Dell 8/4 Gbps Fibre Channel SAN modules. On the fabric management node, each PowerEdge R620 server is also connected to the Compellent storage array through a QLogic dual-port 8 Gbps Fibre Channel adapter. To build the guest clusters, the PowerEdge R620 servers pass iSCSI traffic through the two Force10 S4810 switches to the Compellent array. Microsoft Multipath I/O is enabled to provide the redundant and independent paths for storage I/O. The iSCSI traffic is segregated from other types of LAN traffic by VLANs, jumbo frames are enabled on the iSCSI network, and quality of service is provided by the bandwidth settings in the NIC partitioning.

Understanding the fabric management architecture

Fabric management in the Dell vStart 1000m infrastructure is implemented on two dedicated Dell PowerEdge R620 servers in a failover cluster. It provides a high-availability platform for the management components, which include Microsoft System Center 2012—comprising App Controller, Operations Manager, Orchestrator, Service Manager, Microsoft SQL Server® database, and Virtual Machine Manager—together with Dell systems management tools including Dell OpenManage Essentials and Dell Compellent Enterprise Manager.

These components are deployed on a number of virtual machines configured with the effective high-availability option well suited to their capacity (see Figure 2). For instance, SQL Server and Virtual Machine Manager are deployed as guest clusters. Operations Manager and Orchestrator utilize their native high-availability features. And App Controller, Service Manager, Dell systems management tools, and the optional deployment server—Microsoft Windows Server Update Services (WSUS) and Windows Deployment Services (WDS)—are deployed as high-availability virtual machines on the management cluster.

A two-node guest cluster is implemented for Microsoft SQL Server to deploy System Center and maintain its high availability. The SQL Server cluster hosts the databases for each System Center component in discrete instances by product and function. For the Operations Manager Reporting Server instance, the required SQL Server Reporting Services (SSRS) is installed on the Operations Manager Reporting Server. The SSRS is configured with the remote database hosted on the component instance of the SQL Server cluster.

Fabric management

Virtual Machine Manager 2012 servers provide virtual machine management and services deployment with support for multiple-hypervisor environments that help build a flexible and cost-effective private cloud. Virtual Machine Manager in the vStart 1000m infrastructure is the primary management tool for the fabric. It can be used to provision and manage the virtualization host, networking, and storage resources to create and deploy virtual machines and services. Two virtual machines are deployed as a failover cluster for Virtual Machine Manager. Given the high-availability implementation, the Virtual Machine Manager library share resides on the SQL Server cluster.

Enabling large-scale rapid provisioning and de-provisioning of virtual machines requires tight integration with storage architecture and robust automation. Using the Storage Management Initiative Specification (SMI-S) protocol, Virtual Machine Manager can automate storage provisioning by discovering, classifying, and assigning Dell Compellent storage to a PowerEdge M620 blade server host or cluster.

Intelligent Platform Management Interface (IPMI) 2.0–compliant PowerEdge M620 blade servers support power optimization in Virtual Machine Manager to help save energy. For example, when the workload decreases in the vStart 1000m infrastructure, Virtual Machine Manager can automatically relocate virtual machines and power down the unused PowerEdge M620 blade servers in scheduled periods. Virtual Machine Manager can turn these blade servers back on when the workload increases and redistribute the workload among blade servers. In addition, the PowerEdge M620 blade server can be discovered and provisioned remotely by Virtual Machine Manager over the network.

Fabric health

Operations Manager 2012 provides a single management console to monitor services, devices, and operations across multiple systems. The vStart 1000m infrastructure deploys two Operations Manager management servers and one Operations Manager Reporting Server in a single management group.

The Microsoft Private Cloud Fast Track program is designed to monitor every major component in the cloud infrastructure and generate alerts based on performance, capacity, and availability metrics. Dell Server Management Pack Suite 5.0 is deployed in the vStart 1000m infrastructure to enable Operations Manager to monitor PowerEdge M620 and PowerEdge R620 servers, including the health of the individual server, Integrated Dell Remote Access Controller (iDRAC), and CMC. Dell Compellent Storage Center Management Pack for Microsoft System Center Operations Manager can be implemented to monitor storage.

Virtual Machine Manager and Operations Manager integration within the vStart 1000m infrastructure enables Virtual Machine Manager to use Operations Manager to monitor the health and availability of the virtual machines, their hosts, and other management servers. This integration enables Performance and Resource Optimization (PRO) in Virtual Machine Manager. The Dell Server PRO-enabled Management Pack for Microsoft System Center Virtual Machine Manager can be deployed to manage Dell servers and virtual machines using their available health information. Dell PRO Pack can recommend remedial actions in Virtual Machine Manager when the monitored objects transition to an unhealthy state in Operations Manager.

IT services

Service Manager 2012 provides an integrated platform for IT service management including change control, incident management, and resource allocation in private cloud computing environments. It maintains a configuration management database (CMDB) that, with the System Center Cloud Services Process Pack deployed, includes Virtual Machine Manager resources such as virtual machine templates and virtual machine service templates. The virtual machines and authorized users can be tied to Orchestrator run books for automated request fulfillment, metering, chargeback, and more. The vStart 1000m infrastructure deploys two Service Manager servers and one Service Manager Data Warehouse server.

Workflow orchestration

Orchestrator is implemented to automate the creation, monitoring, and deployment of resources in the private cloud and enable workflow management. Utilizing its Runbook Designer capability, Orchestrator ties together disparate tasks and procedures. Two Orchestrator Runbook servers are deployed in the vStart 1000m infrastructure, utilizing the built-in failover capability. When an Orchestrator Runbook server fails, any running workflows will start on another Orchestrator Runbook server. The two-node design also provides scalability because each Orchestrator Runbook server can run a maximum of 50 simultaneous workflows.

On-demand self-service

On-demand self-service is an essential characteristic of cloud computing. The vStart 1000m infrastructure offers this feature by implementing Service Manager Self-Service Portal, App Controller, and

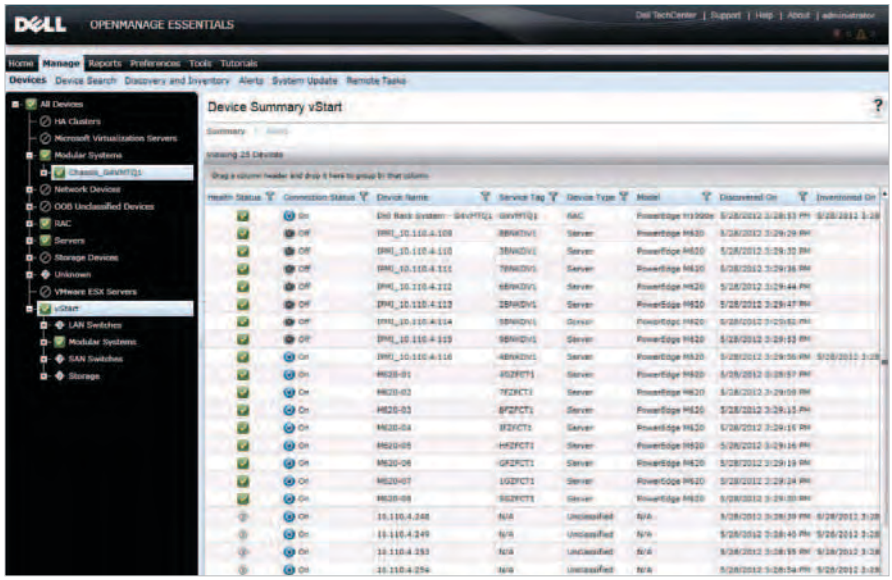


Figure 3. Dell OpenManage Essentials for comprehensive vStart 1000m infrastructure management

Cloud Services Process Pack. Using the CMDB, Service Manager can create a service catalog that shows the services available to a particular user. When a virtual machine request is made on the Self-Service Portal, Service Manager starts a workflow instead of passing it directly to Virtual Machine Manager. Once the request is approved by the appropriate manager, the workflow starts an Orchestrator run book to create the virtual machine. After the request is fulfilled, App Controller becomes the self-service portal for end users to access and manage their virtual machines and services. App Controller connects directly to Virtual Machine Manager to display the end user's virtual machines and services, and it provides a configurable set of actions.

Cloud Services Process Pack enhances the self-service experience for the private cloud environment. Implementing effective cloud services can be challenging and time-consuming for IT departments. Cloud Services Process Pack enables IaaS and incorporates domain expertise and best practices from enterprises that have successfully deployed IaaS. Cloud Services Process Pack is deployed in the vStart 1000m infrastructure on the Service Manager management server, and the associated Cloud Services run books are deployed on the Orchestrator server.

Fabric systems management

The Dell Server Management Pack Suite and Dell Compellent Storage Center Management Pack are deployed in the vStart 1000m infrastructure to enhance management capability for private cloud implementations. In addition, Dell OpenManage Essentials and Dell Compellent Enterprise Manager are both deployed on a single, dedicated virtual machine. Compellent Enterprise Manager provides a centralized management console to monitor, manage, and analyze Compellent storage. Dell OpenManage Essentials automates the systems management tasks on all server, networking, and storage devices from a single, easy-to-use, one-to-many console (see Figure 3).

Dell OpenManage Essentials can manage PowerEdge M620 and PowerEdge R620 servers with or without a systems management agent. When using agent-free remote management, Dell OpenManage Essentials communicates directly with the iDRAC to monitor server hardware components. Agent-free management helps reduce the computing and network overhead created by the agent and also enhances system security.

Deploying a rich private cloud experience

Private cloud computing is designed to simplify infrastructure management and automate routine tasks in a virtualized environment. The Dell vStart 1000m infrastructure provides a preengineered, prebuilt IaaS approach utilizing Microsoft Private Cloud Fast Track.

Microsoft System Center 2012 and Dell systems management software extend this cloud computing offering, which helps organizations to deploy a scalable, reliable, and flexible private cloud infrastructure. Dell Server Management Pack Suite, PRO-enabled Management Pack, and Dell Compellent Storage Center Management Pack work tightly with System Center tools to provide end-to-end management and task automation in a rich, robust IaaS private cloud solution. In addition, Dell OpenManage Essentials and Compellent Enterprise Manager help simplify systems management within the vStart 1000m infrastructure. PS

Authors

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Learn more

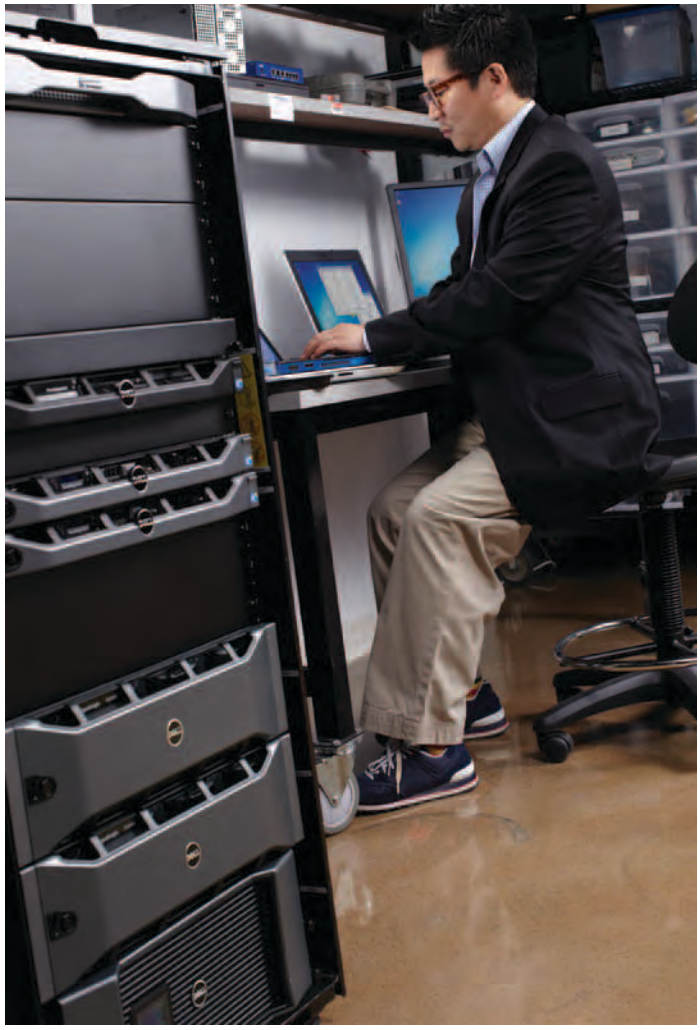
Fast path to virtualization with Dell vStart: dell.com/vstart

Microsoft server and cloud platform: microsoft.com/privatecloud

Essential power management for virtualized environments

By Andy McDonald and Jim Hutten

Virtualization is driving convergence to boost IT utilization and efficiency. Dell™ Multi-UPS Management Console software, integrated into the VMware® hypervisor, optimizes power management for virtual machines and host servers in a single interface.



Power management is essential to IT organizations for efficient and reliable operations. Matching power management tools with converging IT resources helps to achieve organizational outcomes without compromising performance and reliability. For those solid business reasons, updating power management tools is often the next logical step for organizations that have deployed virtualization to consolidate workloads on a reduced number of physical servers. And as virtualization has expanded from initial deployments—primarily for test and development—to production environments, it is driving many organizations to converge IT resources across multiple lines of business and help further reduce costs for hardware, operations, and management.

In addition to maximizing resource utilization, consolidating virtual machines on host servers can dramatically enhance power efficiency. Virtualization inherently delivers more computations or services per watt of energy, dollar of IT investment, unit of rack space, or almost any other measure of efficiency than traditional IT environments. While many organizations can align these advantages with business objectives, virtualization does nevertheless present challenges for the power infrastructure.

A host server, for example, may typically support several or many virtual machines, and an incoming power event for one host could bring down many important services. For virtualization deployments in production environments, avoiding physical server downtime is crucial. In addition, while the power infrastructure remains fixed, workloads in virtualized environments tend to shift dynamically. As a result, tracking server power requirements and power protection status for numerous virtual machines that are migrated across different physical hosts can be particularly challenging.

Virtualization can also add complexity because it often requires management at multiple levels—virtual machine, hypervisor, and host server. Utilizing advanced hypervisor functions for load balancing or dynamic resource allocation can further increase management complexity.

These challenges add a new dimension to managing and protecting virtual machines on physical servers (see the sidebar,

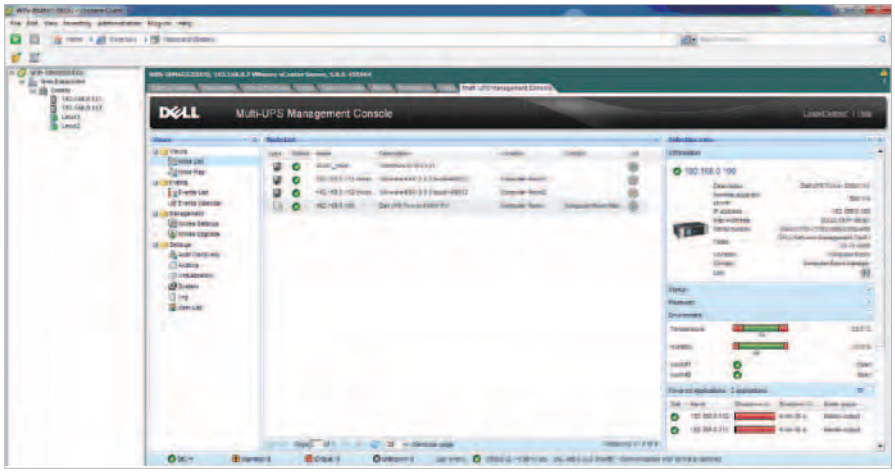


Figure 1. Seamless integration of UPS management into the vCenter Server dashboard

Dive deeper

Virtualization is reshaping the IT landscape, and the heightened utilization that results can dramatically enhance power efficiency. Download this white paper to learn more about how unified power management for virtualized environments helps overcome the power management challenges of traditional IT infrastructure.

qrs.ly/4q1zjgh

"Breaking with tradition"). IT organizations need to control and protect virtual machines during a power event, manage virtual machine power profiles, and monitor uninterruptible power supply (UPS) software agents and firmware. Traditionally, the approach to power management for the physical infrastructure was to shut down a server in the event of a loss of power. Although this approach worked well for a long time, advances in virtualization have separated the traditional concept of operating systems and applications from the server hardware. Interaction between the UPS management software and IT services has become increasingly challenging as a result.

IT organizations can help simplify power management using integrated, agentless software within a virtualization environment. The Dell Multi-UPS Management Console (MUMC) software integrates with the VMware hypervisor management layer—VMware vCenter™ Server management interface—enabling IT departments to monitor and manage power events for virtual machines.

Integrating power management and virtualization

The Dell MUMC software integrates with the hypervisor central controller to streamline power management of virtual machines. IT managers can use the Dell MUMC tab within the VMware vCenter Server virtualization management platform interface to monitor and manage the power infrastructure and hypervisor response to power events (see Figure 1).

Tight integration between the Dell UPS management software and vCenter Server offers IT organizations significant efficiency advantages. For example, administrators can install the UPS management software once on a Microsoft® Windows® OS–based client instead of performing multiple installations for each virtual machine or hypervisor. With the proper vCenter Server credentials, the UPS management software is designed to automatically recognize all VMware vSphere® hypervisors and install a plug-in within the vCenter Server console.

The plug-in enables administrators to manage the UPSs and hypervisors from a single control panel. For key elements, a simple right-click enables an administrator to determine—and change—configuration parameters such as shutdown profiles, VMware vSphere vMotion® technology support, and remote alarming. In addition, shutdown scripts can be defined, for example, to close a Microsoft SQL Server® database before shutting down a server.

Automatic migration of virtual machines in the event of a power failure avoids service disruptions and safeguards business continuity. When the battery level for a UPS reaches a defined value, the Dell UPS software automatically triggers a request to the virtualization platform's migration application—such as vMotion—to move virtual machines to a safe host before shutting down the hypervisor. In vSphere High Availability environments, the native startup and shutdown profile for virtual machines is disabled. In this case, Dell MUMC has an option to force virtual machine shutdown—preventing it from attempting to restart on another available host.

The Dell MUMC software also enables IT professionals to gracefully shut down host servers in addition to virtual machines. During an extended power outage or scheduled shutdown, the UPS management software instructs the hypervisor to migrate, shut down, or suspend each virtual machine before shutting down the host server. When power returns, the UPS, host server, and hypervisor power up in sequence, and then the hypervisor automatically restores virtual machines to their preferred host location.

Additional advantages include the ability to upgrade firmware for devices

Breaking with tradition

Leveraging extensive firsthand experience helping organizations address the challenges of using traditional power management software to manage uninterruptible power supply (UPS) agents and firmware, Dell now offers the Dell Multi-UPS Management Console (MUMC) software. This plug-in for the VMware vCenter Server interface enables IT professionals to manage power using an integral component of the virtualization management environment. Centralized power management helps organizations overcome the following challenges of UPS management in traditional IT environments:

- **Installing UPS software or agents on each virtual machine:** Deploying many virtual machines typically requires the installation and configuration of UPS management software or agents on each virtual machine; this task can be daunting—particularly for small and midsize organizations. In contrast, IT administrators can use Dell MUMC to install UPS management software once for any number of virtual machines.
- **Using complex interfaces for time-consuming installation:** In traditional infrastructures, UPS management software often requires using a command-line interface (CLI) for installation, configuration, and troubleshooting. Dell MUMC provides a Web browser–based graphical user interface that helps simplify installation.
- **Configuring shutdown profiles for each virtual machine:** Creating a shutdown profile for a specific virtual machine may take several minutes; after that, it may need to be repeated for each virtual machine. The Dell MUMC interface and capability for automatic synchronization of shutdown profiles provide straightforward configuration for management of all virtual machines by the hypervisor prior to physical server shutdown.
- **Maintaining virtual machine power profiles:** Whenever power conditions change, an administrator generally uses a time-consuming CLI to update individual virtual machine power profiles. The Dell MUMC Web interface enables an administrator to manage multiple hypervisors simultaneously without requiring the use of a CLI.
- **Losing services during a power failure:** Legacy UPS management software may potentially suspend services for end users by shutting down virtual machines that were not migrated to a backup server before a physical server's downtime. Dell MUMC proactively triggers VMware vSphere vMotion migration, transparently moving virtual machines in distress to a safe host.
- **Obtaining a new UPS management software license:** Any change to the power infrastructure may require either obtaining a new software license or a separate firmware upgrade for each device, which can be costly and time-consuming for IT staff. Dell offers complimentary MUMC software for any mix of up to 32 UPSs and power distribution units supporting an unlimited number of servers and virtual machines.

and the capability to unify management of diverse power infrastructures. IT administrators can upload a firmware package into the UPS management software and then deploy it through UPS network management cards. And because many organizations deploy UPSs and power distribution units (PDUs) from multiple manufacturers, the UPS management software supports industry-standard Simple Network Management Protocol (SNMP) traps. The SNMP traps provide unified monitoring from within the vCenter Server interface for UPSs and PDUs from many manufacturers.

The Dell MUMC software is available as a complimentary download for an unlimited number of servers and virtual machines and for any mix of up to 32 UPSs and PDUs. Monitoring and managing more than 32 UPSs and/or PDUs require a license upgrade.

Centralizing power management in the hypervisor

Today's requirements for computing efficiency, availability, and reliability can be well served with virtualization that provides a foundation for converging IT resources. However, if power management is not seamlessly integrated into a virtualized environment, the many potential benefits of virtualization may be compromised.

Dell UPS management software integrates tightly with VMware hypervisor software for managing virtual machines. Deep integration enables administrators to manage all virtual machines across a network from a single management interface—and use advanced virtualization technology such as VMware vSphere vMotion to move virtual machines to a safe host during a power event. The Dell MUMC plug-in for the VMware vCenter Server environment significantly enhances efficiency by helping to reduce the complexity, workload, and IT skill-set requirements typically associated with managing power in virtualized environments. PS

Authors

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Beyond consolidation: An application-driven approach to virtualization

By Doan Nguyen, Thomas Kopec, and Satheesh Iyer

By helping make enterprise applications easy to deploy, manage, and support, Oracle® VM server virtualization enables organizations to boost overall IT—and business—efficiency, speed, and agility.

At many enterprises, server virtualization has been a powerful and effective mechanism for reducing expenses and enhancing efficiency through data center consolidation. As virtualization technology matures, IT organizations are looking beyond the benefits of hardware consolidation and capital expenditure reduction to deliver advanced cloud-based services, such as infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS).

To support these services, an application-driven approach to virtualization helps simplify the deployment and management of the enterprise software and hardware stack. By offering excellent scalability, manageability, and ease of use, Oracle VM server virtualization enables administrators to rapidly deploy and manage enterprise application services. Oracle VM is designed to simplify and accelerate the deployment of business-critical enterprise application workloads—helping enhance the efficiency and agility of IT and business response while minimizing operational and support costs.[1]

Simplifying application deployment and management

Oracle VM server virtualization offers robust, scalable virtualization for servers utilizing x86-based processors, such as Dell™ PowerEdge™ servers. (See the sidebar, "Optimizing the virtualization infrastructure.") Included with Oracle VM is Oracle VM Manager, an easy-to-use, centralized management console that is tightly integrated with Oracle Enterprise Manager. Oracle VM Manager enables end-to-end configuration, management, and optimization of the entire application stack, including applications, virtual machines (VMs), servers, network, and storage.

Get the scoop on virtualization

The Oracle Virtualization Blog updates enterprises with the latest information on products, strategy, events, news, and more.

blogs.oracle.com/virtualization

[1] Oracle VM is available for download at no charge from edelivery.oracle.com/oraclevm. Pricing for Oracle VM support is calculated on a per-system basis.

Oracle VM also includes Oracle VM Server for x86, which is designed to handle mission-critical enterprise workloads with support for up to 160 physical CPUs and 2 TB of memory. For virtual machines, Oracle VM Server for x86 is designed to support up to 128 virtual CPUs and 1 TB of memory per VM.

Multiple Oracle VM Servers are grouped into server pools (see Figure 1). Each server in a given pool has access to shared storage through the Oracle Storage Connect framework. A VM is associated with a host server, which is assigned based on resource availability. If necessary, administrators can securely migrate the VM to any other server in the pool. Also, the VM can be load balanced across the pool based on a dynamic resource scheduling policy.

Tools such as Oracle VM Templates and Oracle Virtual Assembly Builder leverage Oracle VM to provide application-driven virtualization. These tools facilitate rapid, easy deployment of both Oracle and non-Oracle enterprise applications through prebuilt application templates and assemblies.

Accelerating software provisioning

Deploying enterprise applications in a virtualized environment often involves tasks beyond simple VM provisioning. Administrators may need to also deploy database, middleware, and application software and then perform a range of configuration and setup tasks. This manual effort can be complex and require significant administrator time, adding to overall operating costs.

To help simplify the deployment of enterprise applications, Oracle VM utilizes Oracle VM Templates, which are prebuilt, preconfigured, production-tested images of VMs. Oracle VM Templates can include the OS, Oracle or non-Oracle applications, and necessary patches. Oracle VM Templates enable organizations to reduce application deployment time from days to hours and minutes.

Administrators can download the ready-to-use templates from the Oracle E-Delivery Web site and import them directly into an Oracle VM instance. Oracle VM Templates are designed to automatically configure applications in the same manner as if the software had been installed and patched manually. Oracle VM Templates are available for a range of applications, including Oracle E-Business Suite, PeopleSoft Human Capital Management (HCM), and Siebel Customer Relationship Management (CRM). Administrators can also customize Oracle VM Templates post-installation and save them as a golden image template.

By customizing Oracle VM Templates, organizations can take multitier enterprise applications—for example, a Web server, an application server, and a database—and package them into self-contained, single-purpose VMs called *software appliances*.

For advanced customization and packaging of preconfigured VM deployments, administrators can use Oracle Virtual Assembly Builder. An *assembly* is a set of Oracle VM Templates that have additional configuration information and management policies packaged along with the set of VMs, their virtual disks, and the interconnectivity between them. Oracle Virtual Assembly Builder is a sophisticated development tool that is designed to inspect an existing application environment and automatically create VM assemblies—enabling organizations to quickly create and configure multitier application topologies and provision them onto virtualized resources. Assemblies are packaged using the industry-standard Open Virtualization Format (OVF).

Together, Oracle VM Templates and Oracle Virtual Assembly Builder help simplify and accelerate the provisioning and deployment of enterprise software. In addition, this approach makes it easy for administrators to accomplish these tasks in a highly efficient, repeatable manner by creating software gold images.

Enabling end-to-end management of the virtual stack

A multitiered, enterprise-class virtualization environment offers significant cost-benefits. At the same time, it presents some serious management challenges. Unlike traditional data centers operating on a "one physical server, one application" model, today's virtualized data center operates multiple VMs in each physical server. Moreover, multiple applications—such as database, middleware, and business software—run in each VM.

In addition, virtualized data centers are taking advantage of shared storage

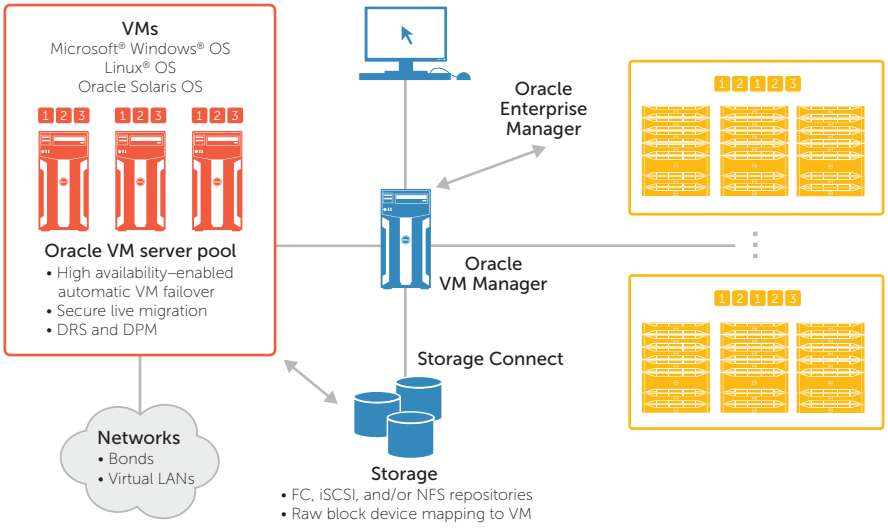

Figure 1. The Oracle VM architecture facilitates application-driven virtualization

Optimizing the virtualization infrastructure

Running on an advanced hardware platform such as Dell PowerEdge servers, Oracle VM provides significant advantages for deploying, managing, and scaling Oracle infrastructures within the data center. Based on x86 processor technology, PowerEdge servers provide robust expandability of server memory, internal storage, and connectivity, while maintaining a level of power efficiency that is critical to dense, virtualized environments. Engineered for virtualization, PowerEdge servers offer high-availability features—such as dual redundant hypervisors, on-board RAID controllers, and redundant fans and power supplies—that help ensure maximum uptime in a consolidated IT environment.

Maintenance of the Oracle VM infrastructure is streamlined through innovative management features that come standard on enterprise-class PowerEdge servers, including rack-mount, blade, and stand-alone tower models. These features include the Integrated Dell Remote Access Controller (iDRAC) with Lifecycle Controller, an out-of-band network interface that enables hands-free deployment and maintenance of PowerEdge servers. The performance, scalability, and manageability of PowerEdge servers contribute to their excellent suitability as a platform for Oracle VM environments.

Dell storage also enables easy deployment of Oracle VM. Oracle VM Manager is designed to recognize Dell Compellent™ and Dell EqualLogic™ storage, helping accelerate the deployment of Oracle VM databases and boost operational efficiency.

technologies, such as Internet SCSI (iSCSI) or Fibre Channel (FC) storage area networks (SANs). Without effective management tools, multitier VM deployments have the potential to increase operating costs and administrative burden. Multiple tools for different layers of the infrastructure are often required, and many tasks require manual intervention and specialized expertise. This situation may also compromise an IT organization's ability to meet quality-of-service requirements.

Oracle VM Manager, included with Oracle VM, is integrated with Oracle Enterprise Manager to enable comprehensive, end-to-end management of the full computing stack—including storage, server, VM, OS, database, middleware, and cloud services. A dynamic, browser-based interface allows administrators to view and manage the application stack through an intuitive, interactive tree view. This interface is designed to show the real-time state of the physical and virtual environment, with automatic refresh to help ensure accuracy. Easy-to-use wizards streamline typical management tasks.

Automatic discovery of virtual and physical components provides an up-to-date, dynamic view of infrastructure components. In particular, automated discovery of VMs facilitates efficient and streamlined management operations of large-scale VM deployments. The Oracle Storage Connect framework enables Oracle VM Manager to automatically discover and leverage existing storage resources, such as SAN- or Network File System (NFS)–based storage.

Additionally, automated, policy-based resource management helps enhance quality of service and optimize operational efficiency. Distributed resource scheduling (DRS) allows real-time monitoring of Oracle VM Server utilization and automatic server rebalancing to optimize capacity management and application responsiveness. To help minimize power consumption, distributed power management (DPM) is designed to automatically reduce the number of powered-on servers during periods of low resource utilization.

Using Oracle VM Manager, administrators can provision and deploy VMs with ease. Multiple VMs can be created automatically from a single Oracle VM Template, and VM cloning support enables rapid deployment of VM clones. Entire multitier application assemblies can be rapidly deployed as well.

Taming the virtualization wave

As organizations move toward delivering advanced enterprise application services, efficient and effective management of virtual infrastructures has become crucial to help ensure quality of service and control operational costs. By using an application-driven approach to virtualization, organizations can speed deployment and ease management of virtualized environments. Oracle VM server virtualization provides an excellent foundation for organizations looking to expand into the cloud and beyond in a way that helps boost IT flexibility and business agility. PS

Authors

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Thomas Kopec is a senior technical account manager with Oracle. As a member of the Oracle–Dell Alliance team, he focuses on the technical aspects of the resale relationship.

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Learn more

Oracle VM:
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Dive deeper

See how application-driven virtualization is transforming the deployment of packaged applications, custom applications, databases, and middleware workloads—and why it is essential to enabling truly efficient cloud deployments.

qrs.ly/j2242zp

Consolidating virtualized IT resources for a robust infrastructure

By Judy Benson and Kim McMahon

Organizations of all sizes have an equal stake in meeting high-availability expectations cost-effectively. Dell designs virtualized architectures that integrate Dell™ PowerVault™ MD3 Series arrays with key features to enhance business continuity.

High-availability virtualization

Deploying a virtualized IT infrastructure helps organizations boost efficiency, enhance productivity, and minimize downtime. View step-by-step instructions and best practices in this guide for setting up and configuring the Dell virtualization solution to create a highly available, virtualized infrastructure.

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The quickening pace of business transactions and growing demand for bandwidth-intensive application support require organizations of all stripes to be vigilant in maintaining business continuity. Like large enterprises, small and medium businesses (SMBs), remote offices, and growing organizations can benefit from virtualization by consolidating physical servers, pooling storage resources, and managing those storage resources efficiently from a single console.

Meeting the performance, reliability, and uptime expectations of any organization can be challenging. As the demand for supporting bandwidth-hungry applications intensifies, infrastructure elements must work together as a comprehensive, integrated solution that is capable of utilizing optimized storage area network (SAN) virtualization.

Many existing server and storage deployments, however, are configured in a way that may not be capable of delivering trouble-free operation, particularly in a virtualized SAN environment. Such solutions may fall short in delivering the expected performance and capacity enhancements if their components do not integrate seamlessly. This situation can create a serious impediment for growing businesses or branch offices without the IT staff to integrate systems in-house.

Organizations moving to a virtualized environment have an opportunity to utilize recent Dell server, switch, and storage offerings designed to provide the necessary flexibility, performance, and reliability to support dynamic business and organizational requirements. Dell configures specific components into integrated solutions utilizing virtualization to suit these requirements along with business continuity needs of SMBs, remote or branch offices, and growing organizations.

Balancing computing needs and costs

Today, organizations expect their computing infrastructures to handle

enormous workloads. They strive to maximize employee productivity, make computing operations responsive for employees and customers, and maintain business continuity by avoiding downtime. Even as they try to meet these goals, decision makers must also carefully manage capital expenses and costs for IT support and maintenance.

An effective approach must meet current needs with the scalability and agility to accommodate future growth. When the accelerating pace of business transactions makes even minimal downtime costly, high availability becomes essential. Further, the robust 24/7 availability that many large enterprises deliver has raised expectations. SMBs are also experiencing pressure to keep their data and applications always available—especially if they lack the internal IT capabilities to quickly repair and recover systems when they are down. Remote offices of large enterprises often face similar challenges because of limited, on-site IT support.

Having a system go down can be particularly vexing for growing businesses or remote sales offices, given the potential for lost sales transactions or significantly reduced customer service response. However, an infrastructure that can deliver the requisite level of flexibility and reliability often exceeds IT budgets and presents complexity that is beyond the resources many organizations have available. SMBs need to streamline their IT environments without the consequence of impeding growth because of IT cost constraints.

Many growing businesses and remote offices also do not have the internal expertise or budgeting for outside consultants to integrate multiple infrastructure elements and create an optimized virtualization environment. Building a virtualized infrastructure from the ground up or integrating fresh elements into an existing IT environment can be particularly challenging.

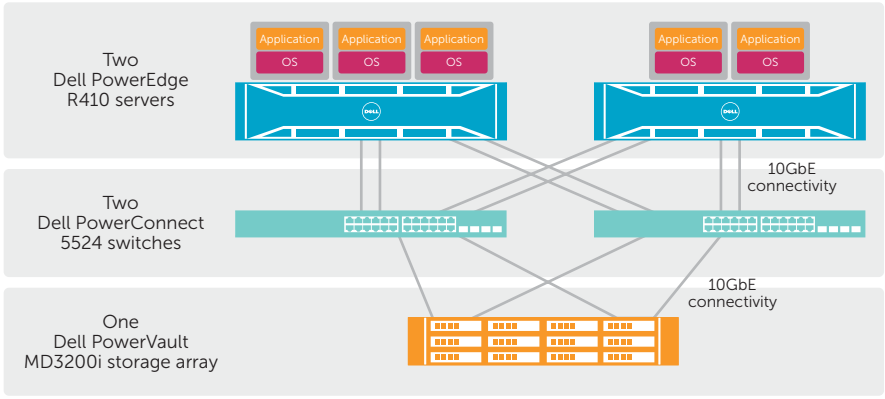

Figure 1. High availability in a configuration utilizing a virtualized Dell PowerVault MD3200i storage array

Achieving high availability in a virtualized infrastructure

To meet specific organizational needs, Dell offers highly integrated, virtualized architectures comprising 12th-generation Dell PowerEdge™ servers, Dell PowerConnect™ switches, and Dell PowerVault MD3 Series storage arrays. These server, switch, and storage configurations are designed to optimize performance and reliability. They also enhance manageability through a single console using the Dell OpenManage™ systems management suite.

Dell virtualization infrastructure supports Microsoft® Windows Server® 2008 R2 OS and Microsoft Hyper-V® and

Integrated storage at the core

The range of virtualization benefits that enhance business outcomes for many enterprises—compute workload, cost-efficiency, rapid deployment, consolidated hardware footprint, and consistent business continuity—are now within reach for small and medium businesses (SMBs) and growing organizations. A key element in Dell integrated virtualization solutions designed for SMBs and remote offices is the storage component. Dell PowerVault MD3 Series storage arrays offer the following capabilities:

- A storage area network (SAN) implementation utilizing cost-effective Ethernet networking
- Flexible scalability for unexpected business demands
- Optional data protection features for heightened security
- Capacity to meet escalating performance demands
- Enhanced throughput with two 10GBASE-T Internet SCSI (iSCSI) ports for each controller
- Support for up to 192 hard drives

PowerVault MD3 Series storage arrays are designed to provide the requisite performance and flexibility for server virtualization and storage consolidation in a cost-effective, scalable infrastructure.

VMware vSphere® virtualization software. The vSphere virtualization platform, in particular, can be well suited for building a cloud infrastructure.

In October 2011 Dell commissioned Principled Technologies to test a redundant configuration designed for high availability and reliable uptime that SMBs and remote offices require in a virtualized environment (see Figure 1).[1] This comprehensive, integrated Dell Virtualization solution included two PowerEdge R410 servers, two PowerConnect 5524 switches, and one PowerVault MD3200i storage array.

This configuration consolidated five legacy physical servers onto virtual machines and supported up to 125 concurrent e-commerce users. These servers were running application workloads that included Microsoft Exchange Server messaging, Microsoft SQL Server® database, and Microsoft SharePoint® Server collaboration software, as well as other applications. The configuration represented one of many possible approaches to a virtualization environment designed by Dell that utilizes PowerVault MD3 Series storage for supporting a variety of disparate applications (see the sidebar, "Integrated storage at the core"). Snapshot capability in the PowerVault MD3 Series array also helped protect data to increase operational resilience and enhance business continuity.

The tested configuration also implemented 10 Gigabit Ethernet (10GbE) connections between the servers, switches, and storage array, providing a significant performance boost over Gigabit Ethernet (GbE) connectivity for enhanced service throughput. Additionally, using 10GbE switches with virtual ports instead of GbE switches with physical ports helps reduce power consumption and costs (see Figure 2).

This example test study demonstrated that the two PowerEdge systems could run the heavy business application and management server workloads yet still provide ample processor and memory resources to facilitate high availability, accommodate growth, and handle sudden spikes in demand. The PowerVault MD3 Series storage arrays supported these workloads and also allowed significant capacity that could be allocated for additional application virtual machines and storage volumes.

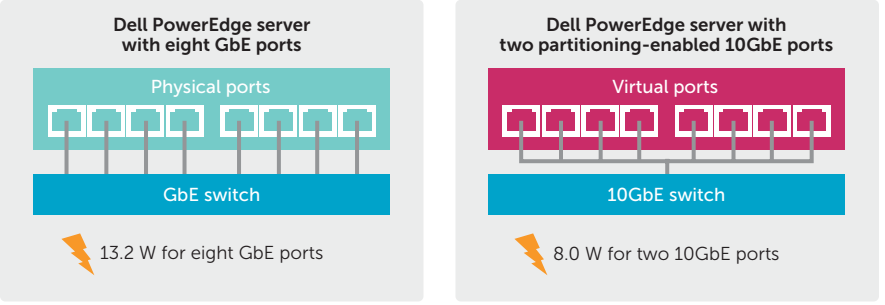

Figure 2. Enhanced, efficient performance through 10GbE connectivity utilizing virtual ports compared to GbE connectivity utilizing physical ports

Deploying a virtualized, easy-to-manage architecture

Although the scale of operations can vary widely among organizations of all sizes, the need to capitalize on the benefits of a virtualized infrastructure tends to be universal. SMBs and growing organizations can now deploy a Dell-designed virtualization infrastructure that integrates compatible servers, switches, and storage. The Dell virtualization configuration tested in this example use case integrated Dell PowerEdge servers, Dell PowerConnect switches, and a Dell PowerVault MD3200i storage array in a way that is designed to demonstrate a robust, highly available, and highly reliable virtualized architecture. In addition, this configuration utilized the Dell Lifecycle Controller and Dell OpenManage systems management tools for efficient, centralized deployment and management.

This approach to creating virtualized infrastructures can help many SMBs and remote offices cost-efficiently meet their computing needs for day-to-day operations while avoiding downtime to heighten employee productivity and business continuity.

SMBs, remote offices, and growing organizations have many of the same performance and reliability requirements that large enterprises have. Seamless integration in virtualized environments based on PowerEdge servers, 10GbE PowerConnect switches, and a PowerVault MD3 Series storage array offers organizations experiencing growth the same types of virtualization advantages that large enterprises enjoy. And at the same time, they can reduce energy use, support, and maintenance costs while offsetting capital investment. PS

Authors

Judy Benson is a global storage marketing manager at Dell and focuses on the Dell PowerVault MD3 Series and the PowerVault DL Backup to Disk Appliance.

Kim McMahon is the worldwide partner marketing manager for Dell original equipment manufacturer (OEM) products at Dell and works with the Dell PowerVault MD3 Series team to drive programs and growth for storage arrays.

Learn more

Dell virtualization:
qrs.ly/6t242zz

Dell PowerVault storage:
dell.com/powervault

[1] "Dell 2-2-1 solution plus virtualization: Replace all your old servers," a Principled Technologies test report, commissioned by Dell Inc., October 2011, qrs.ly/x923dk7.

Boosting I/O performance for virtualized servers

By Brian Johnson and Rahul Deshmukh

The Single Root I/O Virtualization and Sharing standard can virtualize throughput-sensitive applications and help reduce network latency in environments running the upcoming Microsoft® Windows Server® 2012 OS with Microsoft Hyper-V® virtualization.

As organizations expand virtualization across their infrastructures, converged solutions that integrate compute, networking, storage, and management heighten the efficiency and agility benefits that virtualization affords. In converged solutions, enhanced I/O performance is particularly important when maximizing server consolidation, optimizing application performance, and extending virtualization even to highly latency-sensitive applications, such as databases and virtual desktop applications. For these environments, organizations need to adopt networking approaches that help reduce I/O latency, minimize processor utilization for networking tasks, and deliver I/O throughput that is comparable to an application communicating directly with a physical network adapter.

The Single Root I/O Virtualization (SR-IOV) and Sharing specification introduced by the Peripheral Component Interconnect Special Interest Group (PCI-SIG) can play a key role in meeting those networking goals. Twelfth-generation Dell™ PowerEdge™ servers equipped with Dell Select Network Adapter technology based on Intel® Ethernet technology provide the hardware platform support required to deliver outstanding networking performance with the SR-IOV specification. And SR-IOV support in the expected Microsoft Windows Server 2012 OS enables organizations to easily deploy this networking approach in environments virtualized with the Microsoft Hyper-V hypervisor.

Understanding the challenges of I/O resource sharing

In a virtualized environment, I/O resources must be shared between the host server and multiple virtual machines. Technology vendors have introduced software-based, hardware-assisted, and full hardware offload approaches for sharing I/O resources. Software-based sharing often uses emulation techniques to provide the physical resources to the virtual machines (see Figure 1). With this approach, the hypervisor collects I/O requests, translates and assigns physical resources, and serializes requests for the physical hardware.

Although software-based sharing can provide a great deal of flexibility in how resources are distributed, this approach also may add latency and reduce bandwidth.

Standardized virtualization

The SR-IOV specification was developed by the PCI-SIG, and Intel was a significant contributor. View this video to learn more about how Intel Ethernet controllers support SR-IOV in virtualized environments.

qrs.ly/b623djt

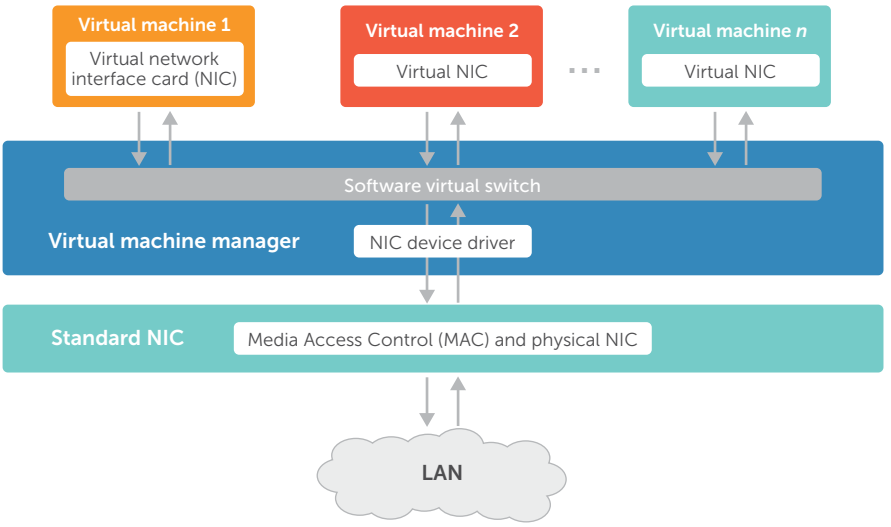

Figure 1. A virtualized switch between the virtual machines and hardware resources in software-based I/O resource sharing

Packets must be routed through an additional layer—the virtualized switch—before accessing the physical I/O resources. Inserting this layer between the virtual machines and physical I/O resources can produce significant latency.

Examining, processing, and routing packets to and from I/O hardware also require processor resources that would otherwise be used for running virtual machines. Virtual machine performance can be affected if processors are frequently interrupted for networking tasks. The additional software layer and use of processor resources for networking tasks often results in throughput that is below the maximum for the hardware device in a nonvirtualized environment.

To accelerate the software-based I/O sharing, some networking devices offer hardware assists to offload the parts of the process. Virtual Machine Device Queues (VMDq) technology, a component of Intel® Virtualization Technology for Connectivity (Intel® VT-c), helps software-based virtual switches significantly alleviate latency and increase throughput for many applications. The hypervisor takes advantage of VMDq by programming the Intel Ethernet controller hardware to presort and route network traffic before handing it off to the hypervisor. Because the hypervisor controls how VMDq is used on each virtual machine, this approach can provide performance improvements while maintaining quality of service (QoS) and policy management of the virtual machine traffic.

Nevertheless, because VMDq still involves the hypervisor and employs a software-based network path, there is still a small amount of latency. Organizations that need to further reduce latency and increase network bandwidth for particular applications may require a full hardware offload approach to share I/O resources in a virtualized environment.

Using industry standards in virtualization to share I/O resources

The PCI-SIG SR-IOV standard offers an advanced, nonproprietary approach to providing I/O resources to virtual machines that helps significantly reduce latency (see Figure 2). SR-IOV enables a single PCI Express (PCIe)–based I/O device to provide up to 64 virtual functions per 10 Gigabit Ethernet (10GbE) port. Virtual functions are basic, lightweight mechanisms for transferring data to and from the network adapter.

Each virtual function can be assigned directly to a virtual machine—for the virtual machine, a virtual function appears as a discrete physical resource. Using a virtual function, the virtual machine I/O talks directly to the physical network adapter, bypassing the hypervisor and software virtual switch. As a result, network traffic no longer needs to go through a virtualized switch or incur processor overhead for networking tasks. Data travels to and from the memory of a virtual machine without hypervisor software having to touch each packet.

Dive deeper

Learn more about the essentials of the SR-IOV specification, from its external dependencies to its setup to its resiliency. Visit this site for the eight-part Microsoft TechNet blog, "Everything you wanted to know about SR-IOV in Hyper-V."

qrs.ly/ur23djw

The result can be substantially enhanced I/O performance. Avoiding the need for an additional virtualized switch layer helps reduce latency and deliver increased throughput. In many cases, organizations can achieve near-native I/O performance at lower processor utilization than that of a pure software-based solution. By helping reduce processor utilization for networking tasks, SR-IOV returns processing resources to applications, which helps improve application performance.

Streamlining networking in virtualized environments

Many organizations are looking to simplify infrastructure by consolidating resources in converged infrastructure. Organizations deploying 12th-generation Dell PowerEdge servers equipped with Intel Ethernet–based Dell Select Network Adapter technology and running the expected Microsoft Windows Server 2012 OS can implement a converged approach that combines key hardware and software capabilities. These capabilities help reduce network latency in a virtualized environment. Convergence of these resources on a single platform helps simplify virtualization and enable organizations to achieve the performance they need while streamlining implementation and ongoing management (see the sidebar, "Converged infrastructure and SR-IOV–ready networking").

Support for network devices that are SR-IOV capable within the expected Windows Server 2012 OS enables organizations to increase network performance while taking advantage of the ease-of-management and cost-saving benefits that the Microsoft Hyper-V hypervisor provides. Windows Server 2012 is also expected to integrate SR-IOV support with key capabilities such as live migration to facilitate server maintenance, load balancing, increased server utilization, and application optimization. The SR-IOV specification enables administrators to switch between the direct virtual function connection and an emulated, software-routing path, which is required for the live migration capability, without having to make any changes to the virtual machine itself.

Twelfth-generation PowerEdge servers are designed to simplify implementation and configuration of host environments. For example, administrators can easily enable the BIOS configuration of devices that support SR-IOV. In addition, the Dell Select Network Adapter technology available with 12th-generation PowerEdge servers enables organizations to deploy Intel Ethernet adapters that are SR-IOV capable as part of the factory configuration.

Intel offers both Gigabit Ethernet and 10GbE server adapters that support the SR-IOV standard. These adapters use the memory translation capabilities from Intel® Virtualization Technology for Directed I/O (Intel® VT-d) to provide the hardware assistance required for direct memory access (DMA) transfers.

Optimizing I/O resource provisioning for specific use cases

SR-IOV is not the right solution for all applications and all environments. In many cases, the flexibility and policy control benefits offered by the software-based approach can outweigh the need for reduced latency. For example, Microsoft Exchange Server, traditional Web server applications, and other applications that do not require extremely low latency may not be the best candidates for this approach.

In addition, because the SR-IOV approach bypasses the hypervisor, environments that require port security policies, QoS policies, or network virtualization may not be the best match for this approach. In these cases, the hardware-assisted method using VMDq technology helps organizations reduce latency and increase throughput while maintaining flexibility and policy management.

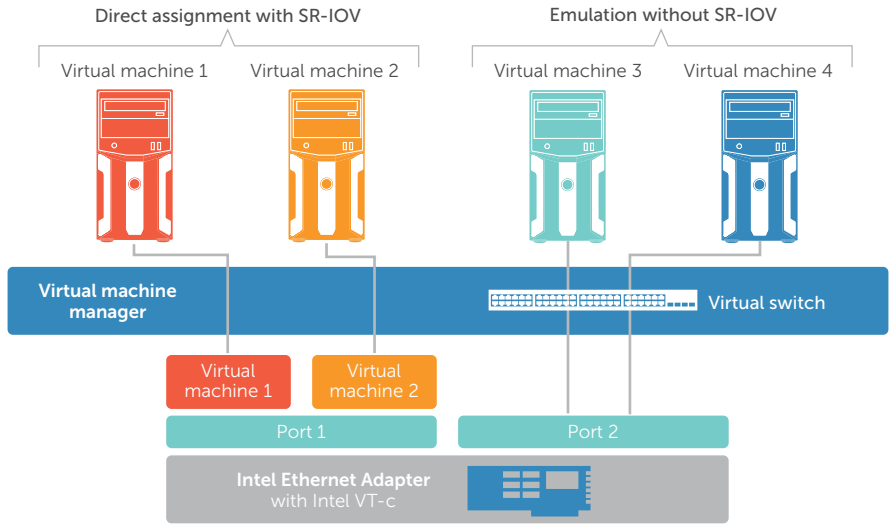

Figure 2. Direct assignment of physical I/O resources to a virtual machine enabled by the SR-IOV standard

Converged infrastructure and SR-IOV–ready networking

Reducing the cost of compute workloads, rapidly deploying IT infrastructure, and unifying management are key incentives driving organizations to adopt converged infrastructure initiatives. Dell supports open and flexible hardware and software approaches that help organizations overcome the complexities and challenges often associated with consolidating resources in a converged infrastructure. For example, legacy networks may be too rigid to support convergence requirements. Dell Select Network Adapter technology based on Intel Ethernet advances and available in 12th-generation Dell PowerEdge servers supports the Single Root I/O Virtualization (SR-IOV) and Sharing specification. This standards-based technology facilitates near-native I/O, minimized processor utilization, and reduced I/O latency to enhance I/O performance in converged infrastructure. SR-IOV networking requires the following components and technologies:

- A network adapter that supports the SR-IOV standard, such as the 10 Gigabit Ethernet (10GbE) Intel Ethernet Converged Network Adapter (CNA) X520 and Ethernet CNA X540 server adapters
- A host platform that enables BIOS configuration of devices that support the SR-IOV standard, such as 12th-generation PowerEdge servers
- A hypervisor that supports the SR-IOV standard, such as the virtualization capability in the expected Microsoft Windows Server 2012 platform
- Drivers for the management OS and each virtual machine

SR-IOV can be set up in 12th-generation PowerEdge servers equipped with Intel Ethernet server adapters that will run the expected Windows Server 2012 OS. As part of the setup operation, administrators are expected to be able to use Hyper-V Manager or the Microsoft Windows PowerShell™ command-line shell to create a virtual switch. That virtual switch supports SR-IOV, and administrators can enable SR-IOV in the guest virtual machine.

For more information on how to configure SR-IOV capability in the expected Windows Server 2012 OS, visit qrs.ly/tr23di4 for part 5 of the eight-part Microsoft TechNet blog, "Everything you wanted to know about SR-IOV in Hyper-V."

SR-IOV can be the right approach when low latency and maximum throughput are paramount. For example, Microsoft SQL Server® database and other database environments, financial applications, and interactive applications such as video streaming and virtual desktop applications can benefit from the low latency provided by SR-IOV. In addition, virtualized network appliances used for security, load balancing, and other functions are prime candidates for the SR-IOV approach.

Utilizing SR-IOV allows many organizations to virtualize these latency- and throughput-sensitive applications for the first time. Moreover, the performance gains that SR-IOV is designed to deliver help organizations further consolidate their environments. They can run increased numbers of virtual machines on each physical host while still achieving the low latency, high throughput, and outstanding application performance they require.

Extending virtualization to streamline throughput for applications

The need to enhance the efficiency and flexibility of virtualized IT infrastructures, particularly as many organizations are looking to implement infrastructure convergence, is driving many organizations to extend virtualization to new applications. By adopting solutions that support the SR-IOV standard, organizations can avoid some of the I/O bottlenecks that have prevented certain applications from being virtualized in the past.

Organizations can begin strategizing convergence initiatives by incorporating 12th-generation Dell PowerEdge servers with Intel Ethernet Converged Network Adapters and the expected Microsoft Windows Server 2012 OS. This approach can help them realize the performance gains of SR-IOV and the benefits of virtualization for enhancing business outcomes. PS

Authors

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Learn more

Intel SR-IOV primer:
qrs.ly/6u23dk0

Intel and Dell Ethernet:
intelethernet-dell.com

Dell and Intel technology collaboration:
dell.com/intel

Intel Ethernet adapters and controllers:
qrs.ly/ff23dk5

Brodart

Timing the move to virtualization with a server refresh

When refreshing legacy servers, Brodart took the opportunity to migrate to a virtualization environment. Dell™ vStart virtualization-ready infrastructure helps the company improve performance, simplify management, and reduce risk.

Messaging, database, collaboration, and other mission-critical applications are important tools of the trade for midsize retailer and wholesaler Brodart, a Pennsylvania-based library solutions merchant. Brodart provides a range of products from shelf-ready books to electronic ordering systems and furniture.

Running I/O-intensive applications on legacy gear was encumbering the company's operations. It also created concerns about the challenges of potential downtime during an upcoming server refresh. Brodart realized that migrating to a virtualized server infrastructure was inevitable. "Most of our servers were nearing end of life," says Brad Huyck, manager, IT operations at Brodart. "I knew we needed to virtualize as many servers as possible as part of the refresh."

Moving rapidly to virtualization

Brodart investigated options to accelerate the migration to virtualization while helping to reduce risk and complexity. After making an effort to thoroughly understand Brodart's needs, Dell referred the company to Interphase Systems, a third-party organization specifically qualified to assist Brodart with its virtualization project.

To help simplify the project and accelerate time to deployment, Brodart opted for the Dell vStart 100 infrastructure, which provides the servers, networking, storage, management tools, and services required for a successful virtualization deployment in one preassembled, validated solution. "To my knowledge, no other partner offers anything like vStart," says Huyck. "It turned out to be a perfect fit for our company. It made a lot of sense for us to deploy a prevalidated, virtualization-ready infrastructure in one fell swoop."

Interphase worked with the Brodart IT team to deploy vStart based on VMware vSphere® virtualization software, Dell PowerEdge™ servers, Dell PowerConnect™ switches, and a Dell EqualLogic™ Internet SCSI (iSCSI) storage area network (SAN). Huyck says he expected a six-month deployment. "I had been involved with a virtualization project in a previous job, and we shot ourselves in the foot because we

Consolidated deployment pays off

By providing servers, networking, storage, management tools, and services in one preassembled, prevalidated solution, Dell vStart accelerates the transition to a virtualization infrastructure.

6x

Brodart started to achieve business value just four weeks after procuring the virtualized vStart infrastructure—six times faster than expected.

50%

The capability to clone virtual machines without waiting for hardware helped reduce the time to stage, test, and deploy new applications by 50 percent.

10x

In the vStart environment, a virtualized server can be deployed at least 10 times faster than it takes to procure, rack, and configure a physical server.

used direct attach storage, and it turned out not to be enough."

The team had virtual servers up and running within the first week of delivery. The vStart infrastructure arrived completely racked and cabled, so all Brodart had to do was plug it in. "It even included the power distribution units and uninterruptible power supplies," Huyck says. "Just four weeks after we made the purchase, we were already achieving business value. That's about six times faster than I expected."

Brodart virtualized around 20 of its legacy servers immediately, including those running the Oracle® Application Express tool, domain controllers, Domain Name System (DNS) servers, terminal servers, FTP servers, databases, and security applications. All were running on the PowerEdge servers and EqualLogic SAN. "We're still moving things over, and we've already reduced the amount of rack space required to run our operations by 25 percent," says Huyck. "We also benefit from the energy efficiency of the Dell PowerEdge R710 servers. I'd estimate that our power and cooling requirements have been reduced by 30 to 40 percent thus far."

Optimizing virtualized server deployment

The ability to create and delete virtual machines at will streamlines testing and minimizes disruption to authorized users as Brodart moves its applications to advanced operating systems. "We still have some servers running Windows NT, if you can believe it," says Huyck. "We're upgrading as we move off the old servers. Virtualization gives us the opportunity to upgrade a system from one OS to another or to a new application version, and have our dev environment and our production environment side by side. That simplifies testing and also minimizes downtime during the transition."

Virtual machines can be deployed much faster than procuring, racking, and configuring a physical server. "We can deploy a new server at least 10 times faster now," says Huyck. Brodart can also recover data more rapidly and conveniently than before by restoring from point-in-time snapshots of virtual servers.

Brodart is in the final stages of testing virtual deployments of Microsoft® Exchange Server 2010 messaging and Microsoft SharePoint® Server 2010 collaboration applications. The IT team can clone virtual machines and does not have to wait for hardware, helping reduce the time it takes to stage, test, and introduce new applications by 50 percent. And the organization can provide high availability for applications and databases once they are virtualized because it can move workloads between physical host servers using VMware® vMotion® software.

Streamlining management and recovery

Easy administration of servers, networking, and storage is another benefit of deploying Dell vStart. Huyck and two associates manage the virtual infrastructure by performing most administration tasks directly from the VMware vCenter™ management console using the Dell Management Plug-In for VMware vCenter. The plug-in provides an additional Dell tab in the vCenter interface that displays health information for each server. Administrators can automatically perform Dell-recommended vCenter actions based on Dell hardware alerts.

Moreover, Brodart and its IT team did not have to wait long before virtualization and vStart helped them avert days of downtime for critical business applications. "Just after we brought in vStart, we lost one of our legacy database servers," says Huyck. "Previously, we would have had to buy new equipment, wait for it to come in, and lose data each day while we waited. But with vStart, we were able to get back up and running in less than six hours. That's a great example of how virtualization is benefiting the business, and it was great timing." PS

ToonBox Entertainment

Quick draw

To captivate their audience, mischievous Surly Squirrel and his rat friend Buddy need to be rendered in eye-popping detail. ToonBox Entertainment deploys Dell™ PowerEdge™ servers in its render farm to help deliver world-class 3D animation.

Toronto-based ToonBox Entertainment hit the ground running—the company's first original TV production *Bolts & Blip* is one of the world's first 3D stereoscopic animated television series. But stereoscopic animation places extremely heavy demands on workstations and servers in the render farm. When ToonBox prepared to start stereoscopic animation for its film *The Nut Job*, the company sought new studio space and a hardware vendor to furnish it. "It was critical to select the right vendor up front, because we were looking for a long-term solution," says Ria Westaway, vice president of production." Dell treated us as their first priority. That commitment to our needs helped us make a decision relatively quickly."

For rendering, ToonBox selected Dell PowerEdge C6100 rack-mounted servers powered by Intel® Xeon® processor 5600 series. "For every animation we produce, we're rendering twice as many frames as we would in 2D," says computer graphics (CG) supervisor Andrew McPhillips. "Each shot in our rich and highly detailed film is comprised of dozens—sometimes even hundreds—of layers. Feature-length animated films typically have more than 1,000 shots. Because *The Nut Job* is 3D, we are rendering each of those shots twice, once for each eye. In this environment, the Dell PowerEdge C6100 servers have been fantastic. The PowerEdge C6100 makes a great render farm machine because it's fast, highly configurable, and incredibly robust."

Streamlining management

As the company grows, the hot-plug serviceability of each server node facilitates rapid expansion of the render farm. "These servers enable us to scale up and down very easily," says Aaron Pearce, systems administrator. "Adding a Dell PowerEdge C6100 server is basically plug-and-play. We receive a server, drop it into our infrastructure, install software, and that's it."

Furthermore, the servers' built-in management controllers help simplify administration. For example, instead of spending 50 hours each week manually installing various operating systems for testing on individual computers, IT staff hooks the open-source tool Extreme Cloud Administration Toolkit (xCAT) into the PowerEdge server's baseboard management controller (BMC) to automatically deploy preconfigured operating systems and software. "It deploys a new operating system across the entire server farm within minutes and takes almost no staff time," says Pearce.

Ten months after deployment, the ToonBox render farm achieved 100 percent availability. "Everything in the PowerEdge C6100 servers is redundant," Pearce explains. "If we have a failure, we're just going to remove the failed component, fix it in-house, or call Dell ProSupport for extended support. A motherboard in one of our servers had a small issue reading a piece of memory and because we have Dell ProSupport on the machine, the motherboard was received and replaced

Ready to render

ToonBox's server and render farms enjoy consistently high availability from Dell PowerEdge C6100 servers. Together with Dell Precision workstations, this state-of-the art technology helps the company produce innovative 3D animation, as well as recruit world-class artists.

50 hours

ToonBox reclaimed 50 hours each week of IT staff time by using the PowerEdge server's built-in baseboard management controller (BMC) to deploy operating systems to its server farm.

100%

The PowerEdge C6100 servers in the ToonBox render farm achieved 100 percent availability over 10 months.

1.5 hours

Thanks to Dell ProSupport, ToonBox experienced a 1.5-hour turnaround time for receiving and installing a new motherboard from Dell.

within an hour and a half of failure. That turnaround by Dell ProSupport was absolutely fantastic."

Creating stellar animation

ToonBox artists who work mostly with Autodesk SketchBook Pro, Adobe® Photoshop®, or Adobe Premiere® Pro software received Dell Precision™ T3500 workstations. For artists who work primarily in Autodesk Maya, eyeon Fusion, or Pixologic ZBrush, ToonBox provided Dell Precision T5500 workstations. "They are very powerful machines that facilitate the type of work our artists are doing," says Pearce.

Most of the company's back-office functions run in a virtual environment enabled by VMware® virtualization software. More than 30 virtual servers run on two Dell PowerEdge R710 hosts and one PowerEdge R510 host. "Intel Virtualization Technology for Directed I/O (Intel VT-d) enables the processor to split up resources for different virtual machines managed by the VMware layer," says Pearce. "It works fantastically. Our Dell and Intel hardware is enabling us to make excellent use of the resources we have without flooding our server room with excess equipment, power consumption, and heat."

To see that it selected the right hardware partner, ToonBox looked no further than its high-definition, stereoscopic animations. "In our teaser for *The Nut Job*, the image quality was so high that people couldn't believe we did it in the time frame we did with the resources we had," says McPhillips. "That validates our decisions, because a high image quality is the top of the pyramid. To get to that level, you need great people, great technology, and fantastic hardware. Dell computers give us one level of the pyramid."

Furthermore, ToonBox's state-of-the-art equipment has helped the company recruit animators. "When you're on the cutting edge of what can be done in animation, you need a solid backbone," says McPhillips. "Selecting Dell as our hardware partner was one of the best decisions ToonBox has made. It has been a fantastic relationship." PS

RMD Wasserstrassen

Breaking new ground for continued growth

German canal engineering company RMD Wasserstrassen consolidates its IT infrastructure, leading to quick data access, accelerated server and software deployment, and reduced maintenance time.

To help make the canal construction process efficient and environmentally friendly, today's builders use computers to simulate a canal's effect on its surroundings. For that reason, German engineering company RMD Wasserstrassen invests significant resources in its IT infrastructure, and its employees use cutting-edge software.

When many servers began approaching the end of their life cycles, the company decided it needed to take a long-term approach to developing its IT infrastructure. Its existing policy of adding system hardware to increase capacity had led to space and management complexity issues. RMD Wasserstrassen decided to find an approach that would create a streamlined and efficient data center.

The company turned to Dell Partner ACP IT Solutions, which has Dell accreditations in both servers and storage. "Because we are a public company, we always put our projects out to tender," says Richard Karmann, system administrator at RMD Wasserstrassen. "However, we've consistently chosen ACP IT Solutions and Dell due to their technical expertise and the performance of Dell solutions."

ACP IT Solutions proposed a virtualized environment centering on a

Channeling virtualization

To support growing amounts of data, RMD Wasserstrassen developed a long-term IT strategy to virtualize servers and storage. The move helped the company free up physical space and improve management efficiency.

75%

RMD Wasserstrassen consolidated its server environment by approximately 75 percent, moving from 12 to 2 physical servers.

33%

Virtualization enabled the IT team to cut routine management time by around 33 percent, freeing staff for strategic projects.

30%

Using Dell EqualLogic storage, employees are able to access stored data up to 30 percent faster than before, helping increase productivity.

small number of servers, using storage array technology to help protect data. "There is always the risk that projects will be held up because of the need to secure agreement from multiple stakeholders," says Karmann. "But thanks to the detailed work of ACP IT Solutions, we got the backing for our virtualization scheme without a problem." The two companies collaborated in the deployment phase, with ACP IT Solutions implementing storage and RMD Wasserstrassen installing servers and migrating data to the new virtual environment.

Designed for the long run

In its main environment, RMD Wasserstrassen replaced 12 physical servers with 2 Dell™ PowerEdge™ R710 servers using Intel® Xeon® processors running the VMware vSphere® 4 virtualization platform. These systems currently support 12 virtual servers. "We've consolidated our server environment by around 75 percent with the virtualized solution from Dell, giving us plenty of space in the data center," says Karmann.

In addition to a highly consolidated environment, the company also gained an easy-to-scale server infrastructure that can help meet its needs over the long term. The enhanced memory capacity and processing performance of the PowerEdge blade servers allows RMD Wasserstrassen to add virtual servers on the current platform as necessary.

Because the servers are virtualized, the IT team can roll out services quickly. Administrators deploying servers to run additional programs can complete the work in a matter of hours. And the VMware® vCenter™ Server virtualization management platform provides a centralized hub for rapidly provisioning virtual machines and load balancing. "We can deliver a more responsive IT service to our employees with our Dell virtualized environment and make sure the development of our infrastructure keeps pace with the needs of the company," says Karmann.

RMD Wasserstrassen boosted storage performance by deploying Internet SCSI (iSCSI)–based virtualization. "Personnel can reach stored data between 25 and 30 percent quicker using our EqualLogic arrays, helping them to increase productivity," says Karmann. The company implemented two Dell EqualLogic™ PS6000XV arrays to provide tier 1 storage, and an EqualLogic PS4000E array for data replication. The arrays help ensure high input/output capabilities, enhancing performance and delivering automated load balancing and tiering options. "We can reduce the costs of our storage by around 25 percent using the tiering options in our EqualLogic arrays," says Karmann. "In addition, people gain faster access to their most valuable data."

As a result of virtualization, Karmann and his colleagues have substantially cut the time they spend managing IT. They no longer must install physical servers whenever they add software. Likewise, the highly automated EqualLogic storage arrays offer features designed to automatically build RAID sets and perform health checks. "We have probably reduced administration by around 33 percent thanks to our Dell technology," says Karmann. "It's time that we can use on higher-value tasks to improve our overall IT service."

RMD Wasserstrassen expects its employees to see improved performance over the entire life cycle of the new environment, thanks to Dell ProSupport with the Mission-Critical option for four-hour, on-site service for servers and the Next Business Day On-Site Service for storage. "The great thing about Dell ProSupport is its flexibility," says Karmann. "You can select from a range of services to meet your exact requirements. Since we began working with Dell, system availability has been excellent, thanks to its support services." PS

Dell

Controlling data traffic and energy costs through consolidation

Developing the virtual platform optimized design (vPOD) architecture helps Dell consolidate its online infrastructure while improving agility and saving approximately 85 percent on energy costs each month.

The Dell e-commerce infrastructure is at the core of the Dell business, helping to generate billions of dollars in revenue each year and providing a wealth of valuable information and help to customers. In 2010, Dell decided it was time to upgrade the eDell infrastructure that powers dell.com, premier.dell.com, support.dell.com, and other online domains. "Operating such a large infrastructure was extremely inefficient and expensive," says Marc Castel, senior enterprise architect for the eDell team. "We needed to consolidate resources to reduce operating costs."

"Over the years, we installed new equipment wherever we could find the rack space," says Max Ekesi, eDell commerce services program manager. "But with servers and storage scattered across two data centers, administration was complicated and time-consuming."

To design and implement a fresh approach, the eDell team collaborated with Dell Global Infrastructure Consulting Services (GICS). Together, they defined the new infrastructure's requirements, including density, flexibility, and resilience. It also had to deliver outstanding performance during spikes in end-user traffic.

The project team decided on an all-Dell infrastructure. "To reduce to a minimum hardware interconnection complexity, we have the servers, storage, and networking products for building robust, resilient, high-performance environments—it was a natural choice to use only Dell components," says Michael Gierhart, global solutions architect for Dell GICS.

Designing for success from the ground up

The project team created the Dell™ virtual platform optimized design (vPOD), a fully integrated, preconfigured, consolidated collection of servers, storage, and switches customizable for precise performance and capacity needs.

The vPOD scales vertically and horizontally—organizations can begin with a half-rack, full-rack, or multi-rack vPOD and add servers or storage as needed. They also can integrate multiple vPODs to create a large-scale infrastructure that brings together distinct vPOD application or database environments.

The first Dell vPOD comprises Dell PowerEdge™ M710HD blade servers housed in a PowerEdge M1000e chassis, Dell EqualLogic™ PS6510X Internet SCSI (iSCSI) storage area networks (SANs), and Dell PowerConnect™ M8024 switches. It uses VMware vSphere® virtualization software and can accommodate alternate hypervisors if required. "Previously, each eDell application used its own server and had its own storage volume," explains Ekesi. "It was clear early on in this project that virtualization would provide the best way to consolidate hardware, reduce costs, and improve our responsiveness to new requests."

Testing during the proof-of-concept phase showed that the vPOD architecture could deliver outstanding performance and throughput. "Compared with the previous infrastructure, the vPOD can handle more than 75 times the number of users per second at more than five times the

Configured for success

The virtual platform optimized design (vPOD) architecture is designed to help Dell improve the customer experience and increase the profitability of Dell online operations. The vPOD consolidates server, storage, and networking resources to create a workload-optimized infrastructure that helps improve performance and efficiency while simplifying management.

US$150,000

The eDell team projects a monthly savings of US$150,000 in powering and cooling expenses as a result of implementing the vPOD architecture.

75x

During testing, Dell determined that the vPOD could handle more than 75 times the number of users per second using less than half the resources compared to the previous infrastructure.

80:8

Dell expects that the vPOD will enable the company to consolidate 80 racks of resources into 8.

data transfer rate, using less than half the resources," says Gierhart.

The eDell team projects that the use of vPODs for eDell can dramatically consolidate resources and cut operating expenses. The previous infrastructure of 1,500 servers cost US$175,000 per month to power and cool, but the eight-vPOD infrastructure of servers, storage, and networking is designed to cost only US$25,000 monthly. "We expect to consolidate almost 80 racks of resources into just 8," says Gierhart. "As a result, we project we will save approximately 85 percent of power and cooling costs per month with the vPOD architecture."

"Each vPOD has the capacity for numerous virtualized applications," says Gierhart. "Once the vPOD is deployed, there is no need to rack additional servers, do additional cabling, or set up vLANs. Application teams can simply install the software." The flexibility of the virtualized environment also enables application development teams to define accurate resource requirements before putting applications in production.

The Dell team conducted extensive survivability and performance testing during the vPOD proof-of-concept phase, removing servers, disconnecting cables, and shutting down storage to demonstrate the vPOD's readiness for real-world challenges. "If our eDell applications go down, we risk frustrating customers and losing sales," says Ekesi. "The vPOD is designed to survive multiple points of failure and still keep applications up and running without performance degradation."

Offering customization

Drawing on knowledge and experience gained through the eDell project, Dell GICS will offer vPOD solutions for a wide range of organizations. "Few organizations share the same extreme requirements as eDell," says Castel. "But the vPOD architecture can be easily configured and optimized for a variety of applications, including Web servers, mail servers, gateways, large-scale database environments, and more. No matter how organizations use it, the vPOD architecture provides an effective and efficient way to achieve the performance, reliability, flexibility, and scalability to address a full range of business needs." PS

Dell PowerEdge C6220 server

Powerful, streamlined, and efficient

Increasingly sophisticated animation requires top-flight hardware to handle the compute-intensive demands of video rendering. Created with the specific needs of animation and visual effects studios in mind, the Dell™ PowerEdge™ C6220 server is designed to deliver the highest possible performance in a dense, scale-out package. This shared-infrastructure server offers a mix of performance, flexibility, and efficiency that makes it an exceptional building block for render farms, as well as high-performance computing, data analytics, cloud computing, and Web 2.0 environments.

For more information, visit
dell.com/poweredgec
qrs.ly/e224cs1

Outstanding performance

The Intel® Xeon® processor E5-2600 product family powering the PowerEdge C6220 enables lightning-fast results—helping to boost performance up to 80 percent, reduce latency up to 30 percent, and increase memory bandwidth 2.3 times, compared to the Intel Xeon processor 5600 series used in previous-generation PowerEdge C6100 servers.

Ultradense design

The PowerEdge C6220 chassis supports up to four independent server nodes in a 2U form factor—allowing twice the density of four comparable 1U servers.

Efficiency at scale

The PowerEdge C6220 features smart chassis enhancements designed to save more than 100 watts per chassis compared to the previous-generation PowerEdge C6100. And the shared infrastructure—chassis, power, and cooling—can help reduce total cost of ownership by approximately 20 percent.

Executive Q&A

Change agent

As technology and business strategies converge, Dell Global CIO Adriana Karaboutis is keenly focused on how her IT organization can be a catalyst of change. Here she takes a telling look at the role IT plays in supporting Dell's overall transformation.

Across all industries, technology is a strategic differentiator with the influence to determine how effectively executives run their organizations and whether workers have the access they need to excel in their jobs. At Dell, Adriana "Andi" Karaboutis took the helm as global CIO in November 2011. Now, she is driving the evolution of Dell's IT organization—from developing an agile and efficient global information infrastructure to championing imaginative new ways to spark innovation across the company, its partners, and its customers. Join Karaboutis in conversation to learn more about how IT is accelerating Dell's transformation into an end-to-end technology solutions provider.

How is Dell IT supporting the company's evolving business model?

Dell IT has effectively supported the explosive growth of one of the largest companies in the world. In addition, Dell IT is now in a position to advance business transformation through a renewed focus on innovation, value delivery, people, and operational excellence.

A vital element in the plan is the implementation of our IT-as-a-service model, in which the Dell IT organization has successfully outsourced IT development and infrastructure support to Dell Services. The relationship is maturing as Dell IT and Dell Services work together to provide Dell with an efficient leveraged-services model.

Restructuring the IT budget is also an essential element of Dell IT's transformation. We must continue to become more efficient in running the business, which allows us to increase our investment in new capabilities while also helping to ensure that we keep meeting our compliance, security, and audit requirements.

How has Dell IT transformed?

Since I came into the role of global CIO, my team has worked hard to transform how we address strategy, process, and delivery. The first step of this critical transformation was defining and communicating a new mission statement as we announced our renewed presence and purpose in the company: *To be a world-class IT organization and partner of choice focusing on business transformation and operational excellence.*

As a global organization supporting a Fortune 50 business, Dell IT must strive to be the absolute best in what we deliver and support in serving our business partners. We must continually reinvent the organization to surpass those expectations externally and internally—specifically as an organization that provides foundational tools for selling solutions.

Collaborating on strategic business architecture

Karaboutis's organization establishes its IT road map through a highly integrated collaboration process with the Business Architecture Team (BAT), newly established in 2012 under the joint sponsorship of Jeffrey Clarke, vice chairman and president of Global Operations and End User Computing Solutions at Dell, and Brian Gladden, senior vice president and CFO at Dell.

The BAT works closely with IT to develop and maintain a living blueprint that maps out the processes and technology needed to help realize Dell's corporate strategy:

- Build foundational systems to enable the marketing, selling, building, and shipping of solutions—a necessary extension to support Dell's software, software-as-a-service, and services-rich portfolio.
- Create Dell-on-Dell implementations that leverage acquired technologies, drive efficiencies, and highlight the use of Dell products.
- Utilize cloud technologies internally to heighten efficiencies and provide a distinctive reference case for customers.
- Develop Dell's business intelligence capabilities to deliver exceptional insights into the company's own operations.
- Effectively support Dell's mobile workforce through a focus on consumerization and the connected workplace—which is expected to pay dividends in employee productivity and satisfaction while serving as a robust reference account for the company's mobile product offerings.

This blueprint sets the technology agenda to support the company's growth as an end-to-end solutions provider.

We're also establishing close, working relationships with our business partners and consistently introducing creative business ideas and strategies—not just IT innovations—that enhance differentiation in the marketplace and potentially expand revenue. This approach helps ensure strong partnerships and fuel our continuing transformation.

To address operational excellence, we strive to deliver high-quality services on time and on budget while constantly seeking innovative ways to derive the utmost value from our annual budget. Current plans include evaluating a shift to highly efficient solutions, such as cloud technologies, and leveraging the success of Dell-on-Dell implementations. We also continue to refine our metrics to help ensure constant improvements around system performance, reliability, speed to delivery, and product quality. And Dell IT remains focused on strengthening our financial controls and addressing any compliance and control gaps.

Tell us more about the IT-as-a-service model.

Dell IT has effectively outsourced its entire IT delivery operation to Dell Services. In return, Dell Services treats Dell IT as its largest, most-referenced account. This arrangement includes a fully realized customer contract between Dell IT and Dell Services that details each party's responsibilities and establishes service-level agreements, capacity and resource allocations, rate models, and so forth.

The overall Services–IT model aligns with industry trends and demonstrates a Dell-on-Dell story for our customers. It is unquestionably generating its fair share of external customer leads and engagements, and we are starting to realize leveraged service efficiencies as well.

Additionally, we are moving toward the ability to allocate and view all IT costs within four buckets: *fixed fee*, such as

management labor; *service fee*, such as variable expense allocated by server; *project and new investment*; and *pass-through*, such as depreciation, maintenance, and licenses. This consumption-based data can give Dell business leaders access to controls that link cause and effect more directly than before—decisions and behavior changes in areas such as application reduction, telecom, or hardware policies that can help manage overall IT costs.

What financial impact does this model have on the company?

Because of Dell's rapid growth through acquisitions, an overly complex IT environment emerged, with a plethora of diverse regional systems as well as complex global systems. In response to this complexity, Dell established its Rationalize the Core initiative to retire or consolidate thousands of applications and systems. This effort delivered nearly US$280 million in savings over five years. The initiative also enabled significant improvements in compliance and controls as we centralized and improved management of our IT landscape.

Going forward, we plan to continue with Rationalize the Core as a standard part of the IT fabric, not a stand-alone initiative. Our goal is to deliver maximum return to the organization and to explicitly link investments to business objectives. As part of delivering value to the business, we also intend to avoid creating regional or overly complex systems.

We use three levers to drive down costs and invest in new capabilities. The first, *simplification*, helps us ensure that we are investing in business initiatives aligned to business strategy and avoid shadow IT with hidden costs. Virtualization is a tool we use to pursue this goal.

Second, a focus on *standardization and automation* means that we invest in standards, open systems, reusable components, and a service-oriented architecture, with the goal of avoiding customization. Master data management helps solve significant data issues.

Finally, we strive for *operational excellence* by improving vendor sourcing and contracts and establishing service-level agreements that measure and reward uptime and quality. As well, we are pushing for on-time and on-budget delivery and implementing reliability-engineering teams in services to drive performance and stability.

How has IT's relationship with the business changed to enable transformation?

The easiest way for me to say it is that the lines between IT and the business are blurring. In the past three years, Dell has progressed from bottoms-up, business unit–centric IT funding to an integrated and aligned delivery process for meeting strategic priorities. Dell IT is working closely with the business to design and deliver capabilities required to support Dell's transformational strategy. At the core is a blueprint for the future-state business architecture. The Business Architecture Team, or BAT, creates the blueprint for aligning processes, systems, and people to enable and support Dell's transformation while addressing current-state pain points along the way. The future-state blueprint is a living document that evolves with Dell's strategy. (See the sidebar, "Collaborating on strategic business architecture.")

> "Dell IT is now in a position to advance business transformation through a renewed focus on innovation, value delivery, people, and operational excellence."

The blueprint is designed through the lens of Dell's process capabilities: develop, market, sell, fulfill, and support corporate functions. The Dell Enterprise Architecture team and other IT leaders are part of the blueprint team charged with creating an end-to-end capability assessment and defining the target future state within and across these process capabilities. Inputs include outside-in research, external benchmarking, emerging trends, Dell's future business plans, and internal discussion with leaders. At the same time, IT is creating its first strategic plan both to support Dell's business and to establish IT as a business. Using these inputs, the Dell Enterprise Architecture team has defined the future-state reference architecture, which incorporates our strategic objectives and technology best practices.

While this work is still in process, the progress to date has revealed that our sales systems require expansion to support distinct product offerings in addition to our core hardware business. In particular, we must better enable transactions that require highly configurable sales systems including software, recurring *X*-as-a-service products or subscription offerings, digital licensing, and service sales. In addition to the expansion required in our sales systems, we plan to enhance back-office general ledger capabilities to support new businesses and acquired companies.

The partnership of the BAT and IT created, for the first time, a rolling six-quarter

program portfolio, which we plan to implement in fiscal year 2013. This portfolio allows us to add important programs and redirect funding after the annual plan is initially locked—accelerating our response to changing business needs.

What does the future hold?

Dell IT is focusing on five key areas that are central to helping the company achieve its objectives.

Foundational systems. As we move from primarily being a stock-keeping unit (SKU)–based, hardware company to a comprehensive solutions provider, we must address the underlying foundation. This foundation needs to enable the marketing, selling, building, and shipping of solutions, which include hardware, software, software-as-a-service, and project-based services. Also, back-office systems must correctly recognize these transactions through automated processes. Having foundational systems helps us extract the full potential of the 25-plus acquisitions Dell has made in the past few years.

Dell-on-Dell examples. A key pillar of Dell's transformation is our aggressive merger and acquisition strategy, which is adding capabilities to our hardware, software, and services portfolios. Recent acquisitions such as Wyse Technology, SonicWALL, and AppAssure provide Dell IT with excellent opportunities to become an industry-leading innovator and to create a compelling go-to-market strategy for the transformed company. Dell IT is charged with building a Dell-on-Dell story that is palatable to integration stakeholders. Dell™ Boomi™, SonicWALL™, Compellent™, and EqualLogic™ products already are being used internally by Dell IT to help reduce integration complexities, improve performance, and drive down costs. We fully expect to continually add such examples, unambiguously affirming to our business partners, executive leadership team, and customers that acquired assets have a valuable place in our environment because they are designed to offer better, more secure, and more cost-effective solutions than current standards.

Cloud technologies. Elastic computing and cloud infrastructure offer significant opportunities for boosting speed to market while deriving operational efficiencies and significant cost savings. Our experience with acquisition integrations, the Dell-on-Dell story, and industry analyst insights all suggest that cloud technology provides a good fit and opportunity for Dell internal use. Innovation to support application delivery, data backup, and storage and mobile connectivity better positions us to meet the growing demands of our users and their high expectations for technology. For example, we are building sales systems on the salesforce.com platform to support software and acquired companies. Additional incubations on private clouds are also in development.

Business intelligence. The technology and practice of business intelligence is evolving rapidly with the continued influx of big data. Dell's internal appetite for market, customer, and business information and insight affords us a unique opportunity to grow an internal practice and contribute to the development of a high-margin, highly in-demand service. Pervasive analytics, self-service for users to answer their own questions, and development of analytic competencies help mature our business intelligence processes and capabilities. As well, they allow us to build the platform and the talent necessary to deliver credible, real-time decision support for our internal use, and they give us the competitive insights required to continue to drive our business forward.

Mobile workforce. Dell's acquisitions strengthen our mobility offerings and provide us with a solid platform on which to build and support a secure mobile workforce for connectivity, application, and data services. Our growing mobile capabilities place us at the forefront of brand-independent mobility solutions to meet our needs—and our customers' needs—for consumerization in an increasingly mobile global workforce. We are building an end-to-end mobility solution that addresses security, device, and user-rights management while supporting the breadth of devices used in the enterprise environment. This solution, combined with a solid private cloud implementation, allows us to lead the industry in providing comprehensive and effective mobile workforce solutions. PS

Brocade switches for Dell Compellent storage

Flexible networking for cloud storage

Highly virtualized environments call for storage and network solutions that work together to deliver outstanding performance, reliability, and flexibility while streamlining management. Dell™ Compellent™ storage area network (SAN) arrays and Brocade® 6510 16 Gbps Fibre Channel switches offer an end-to-end approach optimized for cloud storage—with the agility to meet changing business and organizational requirements quickly and easily.

For more information, visit dell.com/brocade

High performance

Together, Compellent arrays and Brocade switches provide excellent throughput for bandwidth-hungry virtualized infrastructures.

Exceptional reliability

Brocade switches and Compellent arrays are designed to deliver 99.999 percent availability for demanding data center environments.

On-demand flexibility

Complementing highly scalable Compellent arrays, Brocade switches offer flexible Ports on Demand options to address immediate and evolving storage needs.

Simplified management

Centralized end-to-end storage and network administration through a single interface helps streamline the management of cloud storage environments.

BROCADE

DELL

Agile data protection for virtualized environments

By Sheryl Koenigsberg, Ted Curtin, Marc Mombourquette, and Jay Woodruff

Virtualization enables data center efficiency and the shift toward private clouds. But it also calls for innovative ways to protect rising volumes of data. Dell™ AppAssure™ software offers ongoing data protection and fast, flexible data recovery.

Decision makers continue to extend virtualization throughout the data center, not only to boost IT efficiency and flexibility but also to enhance strategic business and organizational outcomes. The pace of data and application migrations to virtualized environments is intensifying as organizations move beyond virtualizing second-tier applications and begin to commit business-critical applications to virtual machines in production environments.

Virtualized environments can create formidable challenges for data protection. Differing virtual machine, server, network, and storage topologies often complicate implementation and management of data backup and recovery processes, particularly for organizations with hybrid deployments of both physical and virtual machines. Server sprawl—caused not only by the ease with which virtual machines can be created, but also by the neglect to retire them and their data when they are no longer needed—creates an efficiency drain and impedes data protection.

As a result, data protection in virtualized environments may often be inefficient and unreliable. IT organizations frequently use separate tools to protect virtual and physical servers, which can be costly and time-consuming and can potentially slow recoveries after a disaster. Additionally, although many backup tools may verify the integrity of the backup set or recoverability of the test machine, they may not carry out application recoverability testing that can detect corrupted data. Such tools can leave administrators unaware that the application will fail to recover when end users need it most. Many backup tools, especially those using legacy agent technology or first-generation agentless technology, can place a significant burden on host processors, eroding application performance and slowing recovery times.

To help simplify data protection in virtualized environments, Dell AppAssure software offers an innovative, unified approach to enterprise-level backup and recovery. It protects across hybrid physical, virtual, and cloud computing environments ranging in size from several servers to thousands. AppAssure is designed to provide continuous, image-based data protection using snapshots as frequently as every five minutes. Just as important, it delivers near-instantaneous recovery of both physical and virtualized Microsoft® Windows® OS–based servers. (For an example of how AppAssure protects a virtualized environment in an industry-specific setting, see the sidebar, "Dependable backup, efficient recovery.")

AppAssure supports virtual machines running in Microsoft Hyper-V®, VMware®, and Citrix® hypervisor environments, and it is hardware-agnostic, allowing the flexibility to carry out cross-platform recoveries in minutes with any underlying server, storage, and network hardware. In addition, storage optimization features such as global deduplication

Easy data protection

Setting up, using, and managing Dell AppAssure for data backup, replication, and recovery can be a snap. Visit this page for a comprehensive video series that provides on-demand demonstrations of utilizing AppAssure for efficient data protection.

qrs.ly/lb242yn

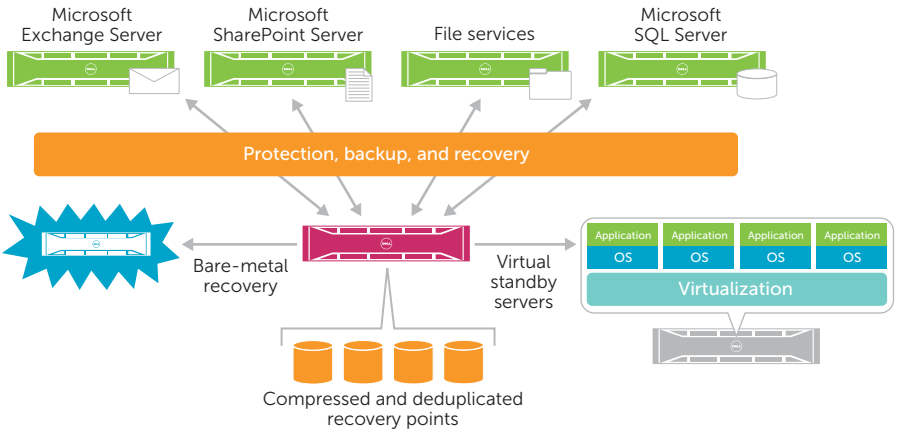

Figure 1. Dell AppAssure: Continuous protection of physical and virtual environments

and compression help reduce storage requirements by up to 80 percent over legacy backup applications. AppAssure streamlines backup and recovery, enhances availability and recoverability, and helps improve the efficiency with which administrators can protect their virtualized environments.

Increasing the frequency of captured data

Many IT organizations depend on legacy data protection applications that run file-and-folder backups requiring dedicated backup windows—often of long duration. Backups occur at regular intervals, such as once a day after routine business hours when network traffic and access are generally light. Traditional batch backup methodologies, however, run a significant risk of data loss. An afternoon failure in an infrastructure that follows a nightly backup protocol, for example, may result in the loss of almost an entire day's worth of data.

Virtual environments, which tend to accumulate more data than the physical environments they replace, may need to be backed up more frequently than physical environments. Frequent backups may be especially necessary for business-critical functions such as those in fast-moving Microsoft SQL Server® database transaction–based applications. Heavily used Microsoft Exchange Server messaging environments may also require frequent backups. For I/O-intensive applications such as these, backup protection every 15 minutes may be needed to avoid significant potential for data loss.

Image-level backup technology in Dell AppAssure can protect each virtual machine every five minutes, significantly minimizing the potential for lost data. This frequency allows up to 288 recovery points a day—offering a significantly more comprehensive and time-granular option than traditional backup methods provide. This technology avoids the need for a dedicated backup window. AppAssure provides continuous, image-level snapshots of Windows-based servers and applications such as Microsoft Exchange Server messaging, Microsoft SQL Server database, and Microsoft SharePoint® Server collaboration and documentation software. Moreover, Dell AppAssure True Scale™ architecture is designed to deliver multicore backup scalability that can automatically turn on as many backup core processors as needed to run backups at line speed, whether that speed is 1 Gbps or 10 Gbps.

To perform backups efficiently and with minimal impact on performance, AppAssure leverages nondisruptive snapshot technology. Unlike traditional backup software that can significantly impact host processor performance, the Dell AppAssure Smart Agent

Dependable backup, efficient recovery

American HealthTech in Ridgeland, Mississippi, provides clinical, residential accounting, financial, and enterprise software suites that help more than 5,000 post-acute care providers meet their business goals. The organization depends on an environment comprising 50 virtual machines in a Citrix XenServer® hypervisor layer to keep its operations running smoothly. However, until recently American HealthTech was unable to quickly back up or recover the virtual machines that are so vital to its business.

Danny Welch, corporate systems manager at American HealthTech, evaluated many backup solutions, and after serious consideration opted for Dell AppAssure backup and recovery software. His decision was based on two important capabilities. First, AppAssure offers dependable, image-level backups and application recoveries for virtual machines. Second, AppAssure provides a time-saving, intuitive user interface.

"I've had to do some restores, and Dell AppAssure has come through every time," Welch says. "I just treat the virtual machines like physical machines. The winning feature was the ability to click on a server, choose a recovery point, and mount it instantly."

Because he pays for a host license only, rather than paying for each client virtual machine, Welch appreciates the cost-effective protection for virtual machines that AppAssure provides. "I'm very happy with the results," Welch adds.

Data protection in action

AppAssure helps protect data and applications in virtual, physical, and cloud environments. Read three case studies to learn how a retailer optimized utilization of backup resources, a manufacturer enhanced efficiency for critical messaging backup, and a distributor achieved off-site replication for its warehouses.

qrs.ly/ga242yt

technology is designed to significantly reduce host processor utilization. In addition, this technology enables a considerably higher frequency of backups than traditional backup software.

AppAssure snapshots can protect the entire application stack including the OS, Windows-based applications, settings, and data in one backup operation (see Figure 1). Applications can be recovered to a specific point in time, enabling organizations to reduce recovery point objective (RPO) intervals from hours to minutes without resorting to complex scheduling and downtime. Data can be tracked at the disk level, enabling highly granular recovery options compared to traditional approaches to data protection. And to facilitate off-site backup and recovery options, AppAssure also includes robust replication capabilities.

Because many legacy backup and recovery applications do not verify the integrity of backups, some IT organizations manually test backups to ensure recoverability. However, limitations in resources usually mean that only a very small fraction of backups are actually tested. As a result, attempts to restore data after a disaster may fail, leaving administrators no recourse but to recover back to the last good backup, which may be from days or even weeks earlier.

Dell AppAssure Recovery Assure™ technology is designed to automatically test and verify the recoverability of applications on the same day the backup is taken; if a specific backup is ever needed, it has already been verified for recoverability. Specifically, every evening each backup is checked for data corruption, and any potential problem triggers a notification so the problem may be identified and corrected before the backup is actually needed. Recovery Assure is designed to deliver highly reliable recovery and the option to recover to nearly any point in time previous to a system outage or data-loss event.

In addition to providing ongoing, reliable backups, AppAssure helps simplify management of the data protection infrastructure. The AppAssure enterprise console can be used to manage and automate data protection functions for many servers at once, and includes built-in wizards to guide administrators through key operations. Once a configuration has been set up, backup processes are automated. If a backup is unsuccessful for any reason, such as a machine being disconnected from the network, an administrator will be notified automatically. Additionally, administrators can configure multiple physical or virtual hosts at once, which is particularly helpful in virtualized environments containing many virtual machines for which the alternative would be an arduous manual provisioning process.

AppAssure also utilizes advanced storage efficiency techniques that enable space-efficient, frequent backups of extremely large sets of data—even up to exabytes in size. Specifically, AppAssure integrates global deduplication and compression to

help reduce the amount of stored data to a minimum. These technologies work at the block level to minimize storage requirements for backup and recovery and deliver a highly significant overall reduction of disk storage space. Its capability to efficiently protect large amounts of data is particularly useful for virtual environments, which are known for having significant amounts of duplicate data.

Enabling flexible, near-instantaneous recovery

IT organizations in today's virtualized IT environments are exploring aggressive business continuity methodologies to advance RPO and recovery time objective (RTO) goals and help ensure rapid recoveries of critical data and applications. Many legacy backup and recovery solutions, however, require unacceptably long application downtime to perform restores.

Dell AppAssure is designed to deliver fast, agile, and nearly instantaneous data recovery that may be measured in seconds or minutes rather than hours or days. Specifically, if an application needs to be recovered, Dell AppAssure Live Recovery™ technology initiates a restore that can bring up the application on any available machine in just minutes while application data is simultaneously being recovered to its original location. By enabling applications to be back online within seconds of a failure, Live Recovery is designed to deliver a near-zero RTO and help ensure continuity of business-critical applications. This level of data protection is a critical enabler for virtualizing tier 1 applications.

Recoverability can also be hampered by inflexible backup and recovery configurations. For example, legacy data protection applications often require that backups be restored to the same physical or virtual configuration. However, if that configuration has changed or is unavailable, the data is essentially unrecoverable, or recovery can take an unacceptably long time while an IT administrator builds a target recovery platform.

Dell AppAssure Universal Recovery™ technology provides the flexibility for administrators to restore data to virtually any platform in minutes, regardless of the original configuration. Data can be restored to either physical or virtual servers, whether or not the originating server was physical or virtual. For example, an administrator might restore a virtual server to a physical server so that the restore has access to dedicated physical resources or to test a software update before it is introduced into a production environment. Alternatively, a physical server may be restored to a virtual server because of a limitation in the availability of physical resources. Physical servers also can be recovered on a bare-metal server or dissimilar hardware.

Universal Recovery also provides a wide range of granular restore options. Whole virtual machines and servers may be restored, or individual application elements such as Microsoft Exchange e-mails or Microsoft SharePoint files may be restored instead.

For advanced application availability and recoverability, AppAssure also enables IT organizations to have a cost-effective live standby of a host server as a virtual machine that can resume operation in the event of a failure. Administrators can use the AppAssure Create Virtual Machine Wizard to create full virtual clones of physical and virtual machines for standby purposes. If the primary host goes down, the virtual host—with the same name and IP address—can be switched on, and end users can continue to access data. While the standby host is running, ongoing backup snapshots continue to protect changing data; when the primary host is repaired, just a few mouse clicks are required to fail back with no noticeable loss of access to applications or end users.

Streamlining data protection in virtual environments

For many organizations, legacy data protection applications cannot keep up with the ongoing growth of virtualization environments. Instead, they require innovative approaches to data backup and recovery to meet heightened RPO and RTO goals that are required to maintain end-user productivity.

By providing a holistic approach to backup and recovery well suited for virtualized environments, Dell AppAssure helps organizations avoid backup windows, ensure recoverability and availability, and enhance backup efficiency. By offering an innovative, unified approach to enterprise-level backup and recovery, it can protect expansive and complex hybrid physical, virtual, and cloud computing environments. AppAssure also provides continuous, image-based data protection, enabling organizations to move tier 1 applications to virtual environments. Utilizing near-continuous data protection and fast, flexible data recovery, AppAssure helps organizations meet aggressive business continuity strategies cost-effectively. PS

Authors

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Learn more

Dell AppAssure:
dellstorage.com/appassure

Simplified data retention on a massive scale speeds access to big data

By Dave Jaffe, Craig Warthen, and Ramon Chen

Big data delivers substantial competitive advantages when it can be leveraged cost-effectively. The Dell™ Big Data Retention Solution from Dell and RainStor helps shrink storage requirements and simplify data accessibility for fast, low-cost analysis.

Many enterprises derive valuable insights from structured and unstructured data that help improve their understanding of business objectives, customer relationships, and operating environments. Big data refers to data sets that have become too large for organizations to collect, store, manage, and analyze using traditional software, systems, and methods. Machine-generated data systems today produce extremely large quantities of data from many sources, ranging from logs, sensors, and radio frequency identification (RFID) tags to trading systems.

The volume, velocity, and variety of this data far exceed that of traditional data and may overwhelm existing structured systems. In many cases, machine-generated data sets are being stored on file systems as a way to avoid or relieve the scaling pressure they put on traditional databases. In the near future, as the data volumes from these same sources accelerate exponentially, machine-generated data sets are likely to break all conventional systems and management processes, as well as many of the upcoming and seemingly more scalable systems and technologies. This characteristic of big data can make it especially challenging for organizations to extract meaningful insight of sufficient value to justify the costs of managing the data.

Many of the technologies supporting the use of big data sets for analysis and strategy are still emerging. Understandably, organizations may not be ready to invest heavily in early adoption of these new areas. Instead, they require a present-day strategy to store and manage the data as efficiently as possible and access it using anything from simple standard SQL queries to complex analytics tools. The Dell Big Data Retention Solution reference architecture has been developed to demonstrate an effective way to meet this need.

Making highly compressed data easy to access

The Dell Big Data Retention Solution combines Dell storage platforms and services with RainStor® software, a specialized data repository developed for online data retention at a massive scale (see Figure 1). RainStor is designed to significantly reduce retention cost through extreme data compression, simplified data management, and outstanding scalability. The solution can be readily installed, managed, and expanded. RainStor is designed to ingest and retain machine-generated data at compression ratios of more than 40:1[1] while keeping data directly accessible online and available for analysis using standard SQL queries and business intelligence tools.

Database designed for big data

The RainStor enterprise-grade database is designed to handle big data efficiently and cost-effectively. It features deduplication algorithms that can result in extremely high compression ratios and is deployed in hundreds of organizations worldwide.

RainStor combines the efficiency of massive parallel processing with a logical, shared-everything architecture to provide a database that is designed to ingest and manage tens of billions of records per day with nearly limitless retention capability, while offering a choice of data access and analysis methods (see Figure 2). RainStor can be deployed on a range of storage environments including content-addressable storage (CAS), such as the Dell DX Object Storage Platform; storage area network (SAN); network attached storage (NAS); direct attach storage (DAS); cloud-based storage; and even the Apache™ Hadoop™ Distributed File System (HDFS) framework.

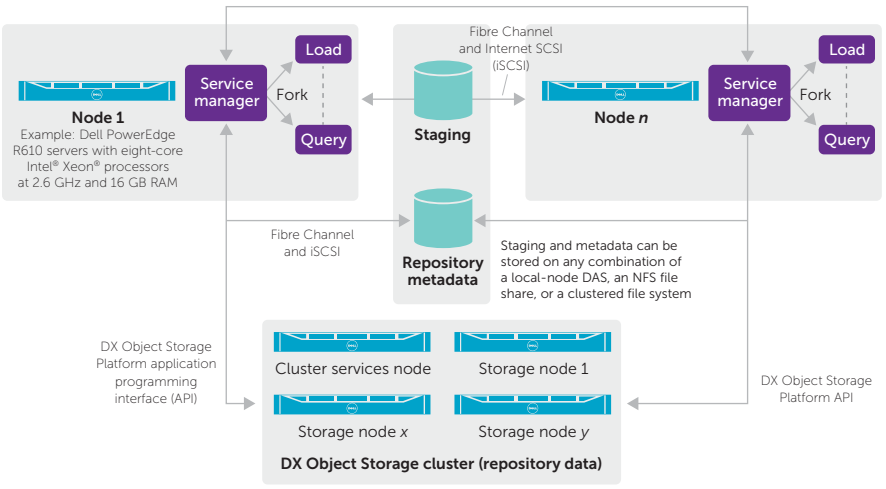

Figure 1. Dell DX Object Storage cluster and RainStor in the Dell Big Data Retention Solution

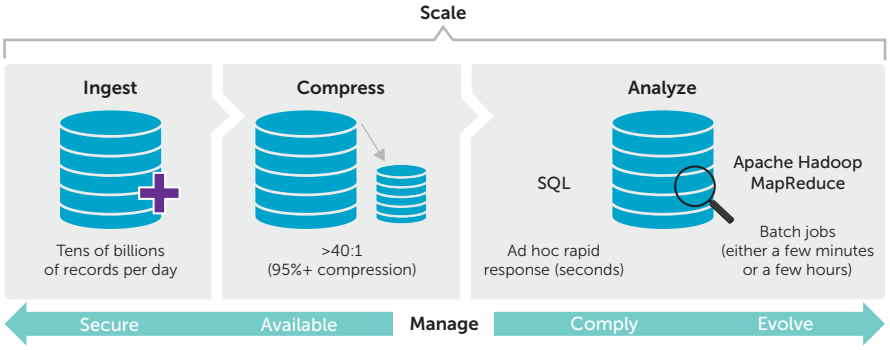

Figure 2. RainStor core capabilities for cost-effective retention of huge data volumes and rapid information retrieval

RainStor offers many benefits over traditional database storage. It helps reduce the cost of infrastructure for organizations by cutting demand for physical storage through extreme compression. It helps organizations retain huge volumes of records while managing record life cycles with configurable retention policies, to help preserve a secure data model. RainStor also supports rapid information retrieval using enterprise-standard SQL-92 over Open Database Connectivity/Java Database Connectivity (ODBC/JDBC), so organizations can leverage existing

[1] "Dell big data retention solution with RainStor," by Dave Jaffe, Craig Warthen, and Ramon Chen, a Dell | RainStor technical white paper, May 2012, qrs.ly/op242z3.

business information, reporting, and analytics investments. The Apache Hadoop framework and its MapReduce distribution can be used when RainStor is deployed on the Hadoop framework.

Reference architecture for advanced storage

The Dell Big Data Retention Solution reference architecture has three major components. The first component comprises the RainStor service managers. The service managers are deployed on two dual-socket Dell PowerEdge™ R610 servers in a multiple-server manager configuration. Through shared metadata, the two service managers work together to provide the RainStor import and query functions.

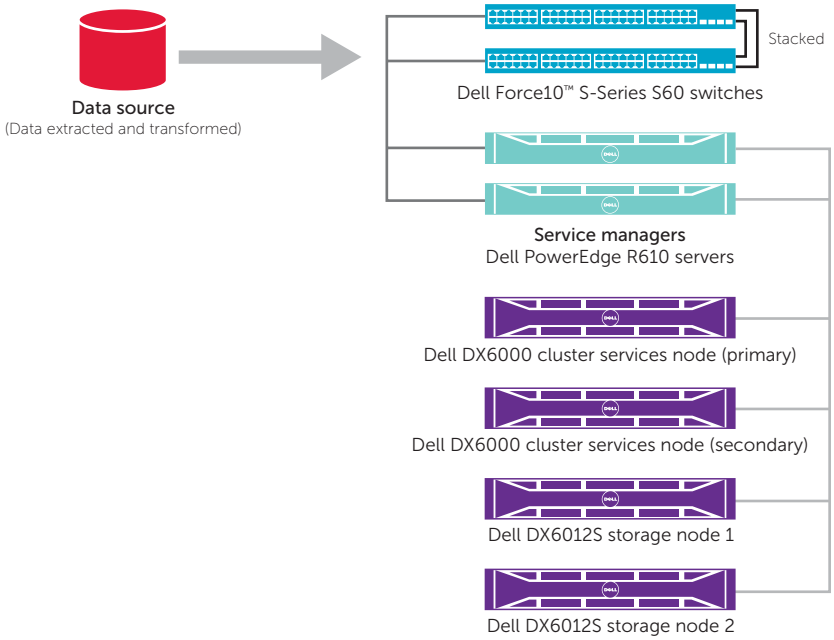

Figure 3. Dell Big Data Retention Solution reference architecture

Service manager hostnames	ambrosm1 and ambrosm2
NParchive home path	/home/rainstor/NParchive-dist
Number of cores in NParchive configuration	23 (of 24 cores total)
Memory per active process—queries	2,103 MB (of 48 GB total)
Memory per active process—build	2,103 MB (of 48 GB total)
Data staging path	/shared1/rainstor/t3000
Archive data path	/shared2/rdata
Archive metadata path	/home/rainstor/rmetadata
Archive queue path	/dev/shm/rqueue
Queue priority	Import

Figure 4. RainStor parameters for configuring the service managers

The second component is the data archive. In this particular reference architecture the archive is the Dell DX Object Storage Platform, which consists of the Dell DX6000 cluster services node and two or more Dell DX6012S or Dell DX6004S storage nodes. The DX Object Storage Platform is an integrated hardware and software solution designed to handle the storage of files and accompanying metadata on disk-based storage nodes. The platform is designed with the scalability to handle billions of objects through the use of unique file identifiers created from one enormous, flat, nonhierarchical address space. In the tests described in the "Testing import and query performance" section, two DX6000 cluster services node devices were deployed in a primary and secondary configuration for high availability, along with two DX6012S storage nodes (see Figure 3). Two copies of every object were created, with one located on each storage node for availability.

The third component is shared storage. RainStor can use local DAS storage, a Network File System (NFS) file share, or a comprehensive clustered file system to hold staging and metadata. The test configuration deployed the Dell EqualLogic™ FS7500 scale-out NAS appliance, consisting of clustered EqualLogic FS7500 front ends and a Dell EqualLogic PS6010E storage array back end. The source data is extracted, transformed, and staged on this shared storage. Two 4 TB shares are created on the NAS and mounted on each service manager under the directories /shared1 and /shared2 for the shared data and metadata.

Multiple-server configuration for the service managers

RainStor was installed on each service manager, and each was running the Red Hat® Linux® 6.1 OS. The parameters used are shown in Figure 4.

Testing import and query performance

The Dell Big Data Retention Solution reference architecture was tested in February 2012 by Dell engineers at Dell Solution Center labs. To facilitate testing on a very large data set, a custom program was written in the C programming language to generate 508 GB of fictitious financial data modeled after a NASDAQ stock tick data set. Each of the 13.6 billion rows represented a stock trade for a single symbol. The modeled NASDAQ data in this example test study was given an exponential distribution of stock trades per day (see Figure 5).

Data import performance

The data import load was spread over the two service managers. The loads took 1 hour and 10 minutes. There were 11.6 billion records imported per hour. The 508 GB of imported data was reduced to 31.9 GB of archive data on the Dell DX Object Storage Platform, representing a compression of 15.9:1.[2]

The processor and network performance during the import is shown in Figure 6. The average processor usage of the two service managers is represented by the red line—using the scale on the left. Each service manager runs in the mid-80 percent processor performance range during most of the import, showing excellent utilization. The blue line shows the total amount of data being transmitted from the NAS to the two service managers—using the scale on the right. The data flow peaks at about 160 MB/sec during the import. Significantly reduced transmission of compressed data from the service managers to the DX Object Storage Platform is represented by the purple line, which follows the same scale on the right as the NAS data.

Size	508 GB
Rows	13,587,527,545 (13.6 billion)
Stocks	3,000
Years	4
Days per year	250
Range of trades/day/stock	1 to 4,400,000
Sample row	S,US.ZVI,20111110,0,0840,321,T,N,N,110
Data Definition Language (DDL)	`create table transactions ( contract_name varchar(20), trade_date date, session_indicator varchar(1), transaction_time time, transaction_price int, transaction_type varchar(1), market_indicator varchar(1), trans_corr_ind varchar(1), transaction_volume int ) ;`

Figure 5. Financial stock tick data set metrics for testing a large example data set

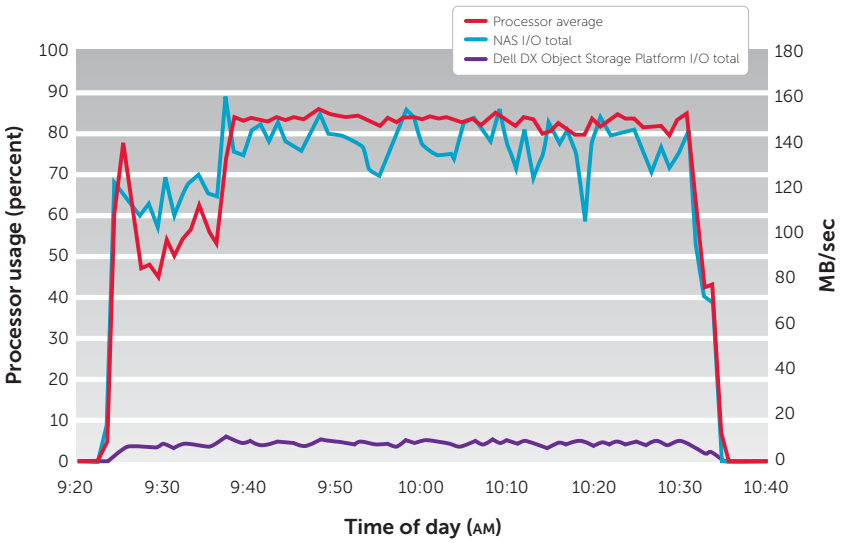

Figure 6. Import performance for a large financial stock tick data set example

[2] "Dell big data retention solution with RainStor," by Dave Jaffe, Craig Warthen, and Ramon Chen, a Dell | RainStor technical white paper, May 2012, qrs.ly/op242z3.

"The Dell Big Data Retention Solution offers a compelling response to the demands on organizations to ingest and manage huge volumes of data and extract business insights efficiently and cost-effectively."

Solution query performance

To test solution query performance, weighted intraday average stock prices were computed on each service manager for several of the largest volume stocks. The following query was used:

```
select sum(transaction_price*transaction_
volume/100.0)/sum(transaction_volume/100.0)
from transactions where trade_date=20101101
and contract_name='S.US.AFYX';
```

Both the numerator and denominator were divided by 100.0 to prevent the large integer sums in the numerator from overflowing the allowed size of an integer. The queries were run against the three largest-volume stocks—with approximately 4,400,000 trades per day. This query took an average of 5.5 seconds and 5.4 seconds on ambrosm1 and ambrosm2, respectively.

Prior to running the query, each service manager was directed to replicate its import metadata to the other. This replication enabled both service managers to query data imported by either of them.

Optimizing a massive-volume repository for big data

The Dell Big Data Retention Solution offers a compelling response to the demands on organizations to ingest and manage huge volumes of data and extract business insights efficiently and cost-effectively. This reference architecture comprised two dual-socket Dell PowerEdge R610 servers for import and query functions, a Dell EqualLogic FS7500 scale-out NAS and an EqualLogic PS6010E array for the shared storage, and imported data records stored on the Dell DX Object Storage Platform. A fictitious 508 GB financial stock tick data set modeled on existing NASDAQ data was imported into this configuration. The solution described in this test study enabled rapid import and query results, ingesting a healthy 11.6 billion records per hour. The 508 GB of financial data was compressed to 31.9 GB of archive data on the DX Object Storage Platform; upon completion of the import, large queries involving millions of records ran in under six seconds.

Organizations can deploy the Big Data Retention Solution to add capacity while avoiding the setup and management complexity or the costs of traditional storage. Together, the DX Object Storage Platform and RainStor can provide a highly advanced repository for big data that can be optimized for online retention, accessed for business agility, and implemented for enhancing total cost of ownership. PS

Authors

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Learn more

Dell big data retention:
qrs.ly/i3252oy

Optimizing data warehouse configurations for peak efficiency

By Satheesh Iyer

Reference architectures and best practices enable enterprises to capitalize on their information resources. Building on Microsoft guidelines, Dell has engineered end-to-end data warehousing solutions utilizing Microsoft® SQL Server® database software.

The proliferation of data from diverse sources has a significant impact on data center operations. An efficient, highly scalable data warehousing strategy helps enterprises manage the volume, velocity, and variety of data running into and across the organization, enabling them to tap the immense potential of big data for a distinct competitive advantage.

Adopting an effective data warehousing strategy enables enterprises to mine vast collections of data and historical information quickly and efficiently, allowing workers to derive meaningful insights that advance business and organizational outcomes. For this reason, data warehouses are rapidly becoming essential elements in the IT infrastructure, as organizations harness data to identify trends, provide business intelligence reporting, and perform predictive analyses (see Figure 1).

To deliver on this vision, organizations need to strike the optimal balance of capacity and performance within their data warehouse systems. And none too soon. Counterproductive increases in response time are resulting from a convergence of factors such as escalating data volumes and their related loading demands, mounting complexity of online analytical processing (OLAP) queries, and a rising number of end users.

Best practices and guidelines jointly developed by Dell and Microsoft can assist IT staff in designing and implementing a

balanced configuration for Microsoft SQL Server 2012 data warehouse workloads. These recommendations enable organizations to quickly and cost-effectively achieve scalable performance while helping to reduce management complexity.

Overcoming obstacles to data optimization

Despite the high business value of accurate and timely information, obstacles may hinder organizations from gathering data and making sense of it in a cost-effective way. Data continues to grow, both internally and externally. Disparate data sources with diverse formats and duplicate information add complexity. And OLAP is heightening pressure on data management systems as online business initiatives continue to gain momentum.

Many IT groups lack the internal resources to design and implement a data warehouse approach that can effectively address these challenges, primarily because of IT staff size and budget constraints. Ensuring an optimal balance of I/O, storage, memory, and processing power is essential in designing a database configuration so that no single element becomes a bottleneck. Without the requisite expertise in database architecture and administration, organizations may overprovision and experience costly inefficiencies during the design and implementation process.

Using external resources to piece together software, servers, and storage also has its drawbacks, often resulting in complex systems that offer no single point of accountability. Other alternatives, such as traditional warehouse systems based on proprietary technology, are often costly to acquire and may require expensive, ongoing contracts to optimize and maintain these systems.

Implementing advanced data warehouse capabilities

To help overcome these challenges, Microsoft has developed a framework designed to balance the hardware and software capabilities of the data warehouse system. The Microsoft SQL Server Fast Track Data Warehouse (FTDW) reference architecture implements data warehousing that is optimized for the large sequential scans and reads characteristic of many OLAP systems today. This methodology is designed to yield outstanding performance compared with traditional data warehousing implementations.

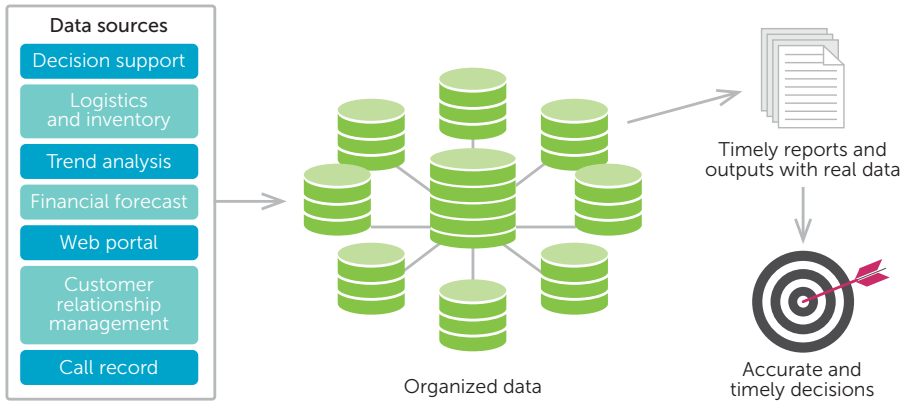

Figure 1. Deriving valuable insights from vast data resources

Dell has built on SQL Server FTDW to develop best practices and reference guidelines that help organizations implement SQL Server FTDW on Dell™ hardware. The reference configurations integrate next-generation Dell PowerEdge™ servers and Dell PowerVault™ storage arrays with the data warehouse capabilities of Microsoft SQL Server. The result is an optimized, balanced, end-to-end data warehouse solution.

Utilizing this Dell approach helps IT organizations reverse the conventional notion that a data warehouse solution often requires a complex, proprietary, and one-size-fits-all approach that can be costly. Dell helps organizations avoid the intricacies and learning curves required to architect a complex data warehouse solution, which often results in overprovisioning of hardware, cost overruns, and time delays. Several configuration alternatives are available, enabling organizations to start at the size and stage of infrastructure they currently have and scale their database system using standards-based, off-the-shelf hardware. The reference configurations are applicable to a range of industries, segments in public and private sectors, and organization sizes.

Moreover, Dell and Microsoft continually refresh SQL Server FTDW reference architecture offerings with technology advancements. For example, Microsoft SQL Server 2012 and 12th-generation PowerEdge servers powered by the Intel® Xeon® processor E5 product family have recently been added. Dell is committed to continuously refreshing data warehousing solutions as technology evolves. (See the sidebar, "Take the fast track to data warehousing.")

Based on SQL Server FTDW 4.0, the refreshed configurations are built on small, 5 TB; medium, 10 TB; and large, 20 TB platforms (see Figure 2). The 5 TB platform is based on the PowerEdge R720xd server with internal storage for small and medium businesses (SMBs). The 10 TB platform is based on the PowerEdge R720 server and a PowerVault MD3620i Internet SCSI (iSCSI) storage array for medium data warehouse requirements. The 20 TB platform is based on the PowerEdge R720 server and a PowerVault MD3620f Fibre Channel storage array for large data warehouse requirements. For high availability, Dell provides tested and validated solutions for configuring database clustering using multiple PowerEdge R720 servers.

Delivering solutions, not just a set of instructions

Organizations utilizing the combination of next-generation Dell hardware, Dell Services offerings, optional integration of Dell Boomi™ AtomSphere™ Integration Cloud™ software, and the reference configurations based on Microsoft SQL Server FTDW can capitalize on a tested, certified, production-ready approach for their environments. The data warehouse system can be up and running quickly, with minimal impact on an organization's operational systems.

Dell Data Warehouse solutions are based on Dell PowerEdge servers that provide robust expandability of server memory, connectivity, and internal storage, while maintaining a level of power efficiency that is critical for dense environments. PowerEdge servers offer high-availability features such as on-board RAID controllers and redundant fans and power supplies that help ensure maximum uptime for the consolidated environment. Maintaining the data warehouse infrastructure can be even easier using innovative management features that PowerEdge servers provide. These features include the Integrated Dell Remote Access Controller 7 (iDRAC7) with Lifecycle Controller and an integrated out-of-band network interface to provide hands-free deployment and maintenance of PowerEdge servers.

Integrated Dell PowerVault storage helps improve operational efficiencies, performance, and utilization; minimizes cost and complexity; supports backup and recovery; and can scale to meet capacity needs. These arrays also offer nondisruptive firmware upgrades and automated I/O path protection with host-based, multipath failover drivers. Other features include dual-active controllers that incorporate mirrored cache to protect data in the event of controller failure while the I/O continues processing without interruption. Data protection features such as snapshots, virtual disk copy, and remote replication help protect data effectively.

In addition, Dell Services supports data warehouse solutions with comprehensive knowledge and end-to-end services offerings. In particular, Dell Services can assist with assessment and implementation of a comprehensive data warehouse solution based on the SQL Server FTDW framework to help simplify the procurement, configuration, and deployment experience for organizations. AtomSphere Integration Cloud is also easily integrated into SQL Server FTDW deployments to streamline data integration by facilitating the connection of cloud computing and on-premises data sources more rapidly and cost-effectively than conventional integration solutions.

From April through June 2012, testing was conducted by Dell engineers at Dell Labs and validated and certified by Microsoft engineers. The testing validated SQL Server FTDW performance by measuring the maximum consumption rate (MCR) of the processor and the benchmark consumption rate (BCR).[1] Testing of the entire database stack was also performed for robustness and availability, as well as to determine the best practices for building a solid and balanced SQL Server FTDW system. Dell engineers worked closely with Microsoft, and the tremendous amount of information they shared helps strengthen the foundation for these Dell Data Warehouse solutions and ongoing development of the SQL Server FTDW framework.

Each layer of hardware and software is comprehensively tuned to help optimize performance of the data warehouse stack. Dell began by taking query response time

[1] For more information on the test configurations, results, and best practices, see "Dell SMB reference configuration for Microsoft SQL Server 2012 Fast Track Data Warehouse on PowerEdge R720xd," by Anthony Fernandez and Mayura Deshmukh, Dell Database Solutions Engineering, May 2012, qrs.ly/nt23dko; "Microsoft SQL Server 2012 Fast Track reference configuration using PowerEdge R720 and PowerVault MD3620i," by Jisha J, Dell Database Solutions Engineering, July 2012, qrs.ly/ml242yi; and "Microsoft SQL Server 2012 Fast Track reference configuration using PowerEdge R720 and PowerVault MD3620f," by Narasimha Reddy Gopu and Jisha J, Dell Database Solutions Engineering, May 2012, qrs.ly/tw23dl9.

	Small solution*	Medium solution*	Large solution*
Rated capacity	5 TB	10 TB	20 TB
Processors	One: quad-core Intel Xeon processor E5 product family	Two: quad-core Intel Xeon processor E5 product family	Two: eight-core Intel Xeon processor E5 product family
RAM	96 GB	128 GB	160 GB
Storage	300 GB and 600 GB Serial Attached SCSI (SAS) drives	Dell PowerVault MD3620i	Dell PowerVault MD3620f
Switching	None	One iSCSI switch	One Fibre Channel switch
Single-server configuration ID**	2209618	2405036	2319046
Highly available configuration ID**	None	2405110	2316699

*All platforms take advantage of the columnstore index capability available with SQL Server 2012. In the SQL Server database engine, a *columnstore index* stores data in a specified table one column at a time and, combined with query optimization features, helps facilitate fast query performance for data warehouses. For more information, visit msdn.microsoft.com/en-us/library/gg492088.aspx.

**For more information on a specific platform, provide the appropriate configuration ID when contacting a Dell representative.

Figure 2. Configuring data warehouse platforms based on SQL Server FTDW 4.0

requirements and calculating the number of processor cores necessary to achieve that throughput. The I/O channel and storage arrays were then matched to maximize the processor throughput. The goal was to take advantage of all the hardware components in equilibrium, without underutilizing or overburdening any one component.

Engineering data warehousing for specific needs

Dell offers a variety of data warehouse solutions to meet specific organizational requirements. In addition to the Microsoft SQL Server FTDW reference architecture for Dell hardware, Dell also provides engineered departmental and midsized data warehouses on Dell hardware, the Dell Quickstart Data Warehouse Appliance 1000, and enterprise-wide parallel data warehouses on Dell hardware. The Quickstart Data Warehouse Appliance 1000, which is validated on SQL Server FTDW reference architecture guidelines, offers a comprehensive approach that includes the hardware, software, and implementation services necessary to quickly deploy a powerful, robust data warehouse.

Other technologies that help organizations achieve their data warehouse objectives include Dell Boomi AtomSphere Integration Cloud software for integrating cloud computing. Placing an organization's data into the data warehouse is vital to the success of a data analysis system. But in many cases, integrating multiple data sources efficiently, easily, and accurately can be a challenging and time-intensive task. Dell helps simplify this critical step by offering the AtomSphere Integration Cloud software.

Organizations can also take advantage of Dell Services offerings available at each stage of the data life cycle. These services range from assessment and design to operation and maintenance. Additionally, global software and hardware support is available for Dell-based data warehouse environments. Organizations can opt for the level of service and support that best suits their needs, from do-it-yourself approaches, to build-and-transfer approaches, to data warehousing as a service.

Take the fast track to data warehousing

Building a data warehouse using the Microsoft SQL Server Fast Track Data Warehouse (FTDW) 4.0 architecture and 12th-generation Dell PowerEdge servers is designed to provide several key benefits for organizations:

- A comprehensive solution pre-engineered at Dell Labs and certified by Microsoft
- High availability using multiple servers for redundancy
- A balanced and optimized system at all levels of the hardware and software stack
- Predictable, out-of-the-box performance to maximize SQL Server database capabilities
- Avoidance of design pitfalls such as overprovisioning hardware resources
- Rapid deployment and accelerated data warehouse projects that help reduce costs for planning and enhance productivity quickly

Organizations can also potentially reduce future support costs because the SQL Server FTDW reference architecture is designed to limit the need for changes resulting from scalability challenges as the data warehouse grows. It is designed to simplify the procurement, configuration, and deployment process.

Harnessing vital information in a data-driven world

Escalating growth in data from myriad, disparate sources provides many organizations with a compelling opportunity to implement data warehousing. Data organized into useful information helps organizations gain a competitive advantage in an increasingly data-driven world. Dell Data Warehouse solutions running on 12th-generation Dell PowerEdge servers and Dell PowerVault storage arrays enable organizations to leverage their own data to greatly enhance their understanding of their business operations and adapt to ever-changing demands.

The Dell and Microsoft-certified reference architecture provides server and storage deployment best practices and guidance for various data warehouse workloads, helping organizations identify highly efficient hardware for their needs. It also helps them save time and avoid the potential ramp-up and overprovisioning costs associated with their own technology procurement processes. PS

Author

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Dell-supported configurations for Microsoft SQL Server:
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Dell SQL Server Advisor tool:
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Dell high availability cluster servers:
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Microsoft SQL Server data warehousing:
microsoft.com/fasttrack

Enhancing data protection and recovery for SharePoint environments

By Maggie Smith, Geoff Hickey, and Parind Shah

Rapidly growing Microsoft® SharePoint® farms require scalable, application-aware data protection and cost-effective storage. Tools integrated with Dell™ EqualLogic™ SAN arrays enable fast, efficient data recovery wherever and whenever needed.

Organizations are rapidly stepping up deployments of Microsoft SharePoint Server collaboration software to manage—and heighten the value of—enterprise content. SharePoint makes it easy for people to collaborate by enabling file and information sharing across an organization. It also provides centralized document storage and versioning management as well as built-in workflows that allow organizations to develop content workflow systems. Moreover, SharePoint enables nontechnical users to create sophisticated Web pages. As a mission-critical enterprise content management system, SharePoint requires fast and reliable backups, granular data recovery capabilities, and highly scalable storage.

At the same time, decision makers are challenged to establish governance policies that consolidate data protection procedures for distributed and multitiered SharePoint Server deployments. Given the rapid growth of SharePoint within enterprises, IT groups need to build an efficient, cost-effective storage infrastructure that can resiliently safeguard SharePoint user data and manage the data growth that SharePoint farms generate.

To help meet the specific needs of SharePoint data protection, Dell EqualLogic PS Series Internet SCSI (iSCSI) storage area network (SAN) arrays are shipped with EqualLogic Host Integration Tools for Microsoft. This comprehensive toolkit facilitates the deployment, ongoing management, and protection of EqualLogic SANs in Microsoft Windows®–based

environments. The toolkit includes Auto-Snapshot Manager/Microsoft Edition (ASM/ME), which provides advanced data protection and quick restore capabilities for Microsoft Exchange, Microsoft SQL Server®, and Microsoft Hyper-V® software. Version 4.5 of the toolkit adds ASM/ME support for SharePoint 2007 and SharePoint 2010.[1]

Understanding SharePoint environments

By nature, SharePoint environments have a distributed architecture, which adds complexity to data storage. The storage must support a broad range of use cases, from a single-purpose repository for a small organization to an Internet-facing Web site for a large enterprise.

Moreover, implementations may quickly grow from a single physical server to clustered pairs and on to multiserver farms (see Figure 1)—requiring a highly scalable solution for managing server volumes. In addition, large server farms often comprise a mix of physical and virtual machines, which requires an approach designed to manage virtual environments.

Each SharePoint farm encompasses multiple components with data that must be protected. These components include front-end servers responsible for the state of the farm and servers for SQL Server databases that store content and search data for the farm. A separate server may be used to host index files that enable the SharePoint search function. Optionally, Web interactions may be hosted by one or more servers. This highly distributed environment makes it crucial for administrators to manage multiple SharePoint servers and their data volumes efficiently from a single console.

Organizations can help optimize efficiency and performance by using a SAN as the primary storage for the entire

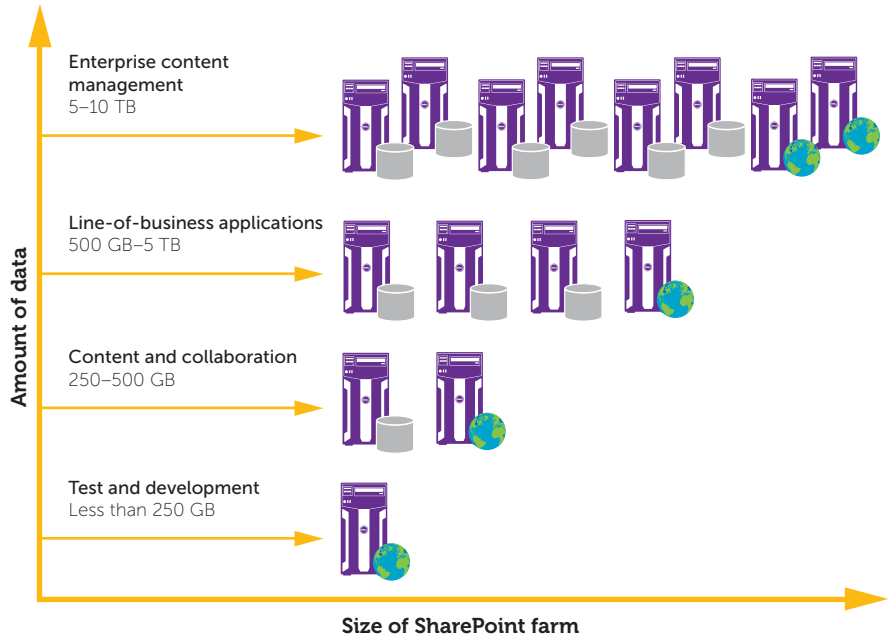

Figure 1. Growth of data typically stored in SharePoint farms

SharePoint farm. The SAN should allow administrators to manage servers and volumes centrally, provide easy scalability as SharePoint servers and farms proliferate, and enable fast backup-and-restore operations for SharePoint farm and database components. (For more information, see the sidebar, "Leveraging SAN benefits across a virtualized SharePoint environment.")

SharePoint also requires application-consistent data protection. Data must remain consistent even as SharePoint is running when a snapshot of a database is captured for backup and recovery. If a snapshot is taken of a disk, for example, the SharePoint instances that are using it must have a chance to flush all their data to that disk. Otherwise, when SharePoint is presented with the volume after a restore, the data may not be usable and the database may not start. Microsoft Volume Shadow Copy Service (VSS) helps maintain data consistency, but as a stand-alone solution, VSS is not designed to work across servers.

Providing application-aware data protection and recovery

Dell EqualLogic PS Series SAN arrays support online data protection and recovery of SharePoint farms through the included EqualLogic Host Integration Tools for Microsoft.[2] Shipped at no additional charge with the Host Integration Tools, ASM/ME is an application-aware data management tool that is designed to create consistent, point-in-time Smart Copy snapshots of the SharePoint infrastructure—including content databases, search databases and indexes, and single databases. The space-efficient Smart Copy snapshots help eliminate data duplication on the EqualLogic SAN. Smart Copies can be stored without creating a complete database copy for each point-in-time copy, helping significantly reduce storage requirements. These snapshots provide the basis for fast and efficient backup-and-restore operations of the SharePoint farm.

Built-in EqualLogic tools help SharePoint administrators discover, install, and manage

[1] At press time, version 4.5 of Dell EqualLogic Host Integration Tools for Microsoft is in beta; general availability (GA) is planned for 2H 2012.

[2] Administrators can download the latest version of EqualLogic Host Integration Tools for Microsoft from the EqualLogic support site at support.dell.com/equallogic.

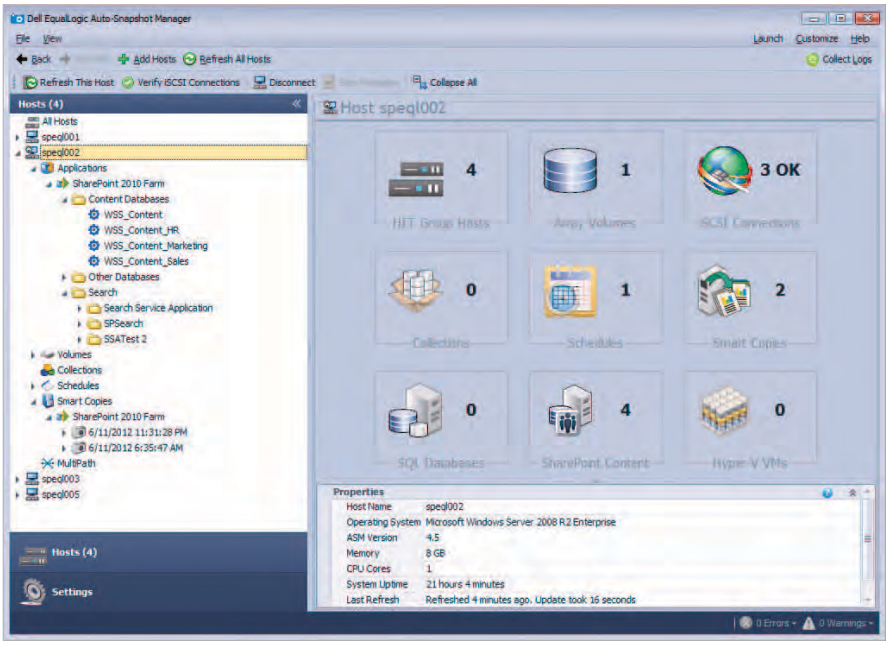

Figure 2. Centralized management interface for Dell EqualLogic Auto-Snapshot Manager/Microsoft Edition

Safeguarding SharePoint data

Dell EqualLogic storage ships with software that is designed to protect mission-critical data. View a whiteboard presentation that demonstrates how Auto-Snapshot Manager/Microsoft Edition (ASM/ME) software can help create an effective data protection strategy for growing Microsoft SharePoint environments.

qrs.ly/2823dms

ASM/ME for supported Microsoft application hosts from a single ASM/ME installation. Once ASM/ME is installed on a server in the SharePoint farm, it is designed to identify other servers in the farm and install itself remotely on those servers.

To create application-consistent snapshots, ASM/ME uses VSS and the hardware snapshot features of EqualLogic SANs. VSS provides the application awareness needed to help ensure data remains consistent, even if SharePoint is running when a snapshot is captured. During the snapshot process, SharePoint can remain online because ASM/ME requests VSS to quiesce I/O between the database and the SAN while the snapshot is taken. This momentary pausing of I/O across the farm enables point-in-time accuracy without skipping any data files, avoiding the need to shut down SharePoint prior to backup. After the snapshot is taken, the SharePoint application continues normal operation, without disrupting end-user access to enterprise data.

After identified databases are categorized and displayed by ASM/ME, SharePoint administrators can use ASM/ME to create and automate snapshot schedules so that data can be backed up at the desired times without manual intervention. ASM/ME is designed to automatically detect changes to the farm and include them in the next scheduled snapshot. The task of copying data from a snapshot to backup media of any type can be done from a server within the SharePoint farm or from one that is not part of the farm.

Using ASM/ME, administrators have multiple restore options. Administrators can restore one or more content databases to fix corrupt or lost content, or restore SharePoint Service Search Applications (SSAs) to fix corrupt or broken index files. They can also rapidly mount a previous version of a database side by side with an existing one, which enables them to inspect or retrieve data from an earlier point in time without rolling back the entire database. These capabilities help organizations shorten recovery times and simplify disaster recovery planning while providing mission-critical business continuity.

Centralizing and simplifying management

ASM/ME provides a centralized graphical user interface (GUI) for efficient management of SharePoint volumes and Smart Copies (see Figure 2). The unified graphical view enhances productivity for SharePoint administrators who manage multiple SharePoint data repositories residing on Dell EqualLogic arrays.

Within this single console, SharePoint administrators can view and manage SharePoint host volumes, collections, Smart Copy schedules, and restore options. This centralized management capability also boosts cost-efficiencies by helping to reduce the administration time and expense required to manage a SharePoint farm.

While ASM/ME provides SharePoint management capabilities, EqualLogic Host Integration Tools for Microsoft also facilitate SAN management. For example, Dell EqualLogic PowerShell Tools include a comprehensive set of cmdlets used in the Microsoft Windows PowerShell™ scripting environment for managing one or many EqualLogic PS Series groups deployed in a SharePoint farm. Creating Smart Copy

schedules is one of several management tasks administrators can perform using the Windows PowerShell tools.

Boosting scalability for SharePoint growth

ASM/ME makes it easy to protect the large amounts of data generated as a SharePoint farm grows. Administrators are automatically notified when hosts, databases, SQL Server instances, and search components are added or changed. For example, if a host is added to a SharePoint farm, ASM not only notifies the administrator, but also can start a wizard that will add the new host to an ASM-managed group.

As an organization's SharePoint farm expands, ASM/ME operations are designed to run in parallel so the number of servers in the farm does not increase total operation time. Dell EqualLogic SAN arrays contribute to smooth, nondisruptive expansion of a SharePoint farm as well, with performance designed to scale linearly as administrators add disks and arrays. Automatic load balancing across arrays enables administrators to add storage capacity transparently to SharePoint servers at any time, avoiding downtime for end users.

Consolidating behind a single data protection strategy

A dynamic and responsive content management repository, Microsoft SharePoint has rapidly emerged as a mission-critical application. As a result, protecting SharePoint data has become crucial to business continuity. ASM/ME works with Dell EqualLogic PS Series iSCSI SANs to enable simple, integrated, and automated end-to-end data protection for SharePoint environments. ASM/ME and other tools included with EqualLogic Host Integration Tools for Microsoft help streamline SharePoint data management, consolidate data protection, and reduce administration overhead—making EqualLogic SANs an exceptional match for SharePoint storage. PS

Leveraging SAN benefits across a virtualized SharePoint environment

To gain control of Microsoft SharePoint data—and to extract its full business value—organizations need data management solutions that help reduce SharePoint storage costs, ease management overhead, and scale seamlessly. Dell EqualLogic Internet SCSI (iSCSI) storage offers powerful features that help organizations streamline operations, maximize system uptime, and adapt to the changing needs and conditions of their SharePoint farms:

- A modular, scale-out, Ethernet-based storage architecture that allows for simple deployment
- Tight integration with virtualized SharePoint environments
- Storage thin provisioning that helps eliminate overprovisioning of SharePoint storage
- Automated data tiering that efficiently uses solid-state drive (SSD) resources for frequently accessed SharePoint data repositories
- Efficient and consolidated storage that is designed to scale with SharePoint data growth simply and cost-effectively

Moreover, EqualLogic storage includes a comprehensive set of software with no additional software licensing fees. With its innovative peer storage architecture and highly automated operation, EqualLogic storage offers an efficient and agile approach to managing and consolidating the growing torrent of SharePoint data.

Authors

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Learn more

Dell EqualLogic data management software:
dellstorage.com/equallogic/software

Dell storage:
dellstorage.com

Cost-efficient data management across multiple storage tiers

By Sarah Doherty, Kris Piepho, Juan Garcia, and Camillo Vitale

Handled effectively, data is key to driving organizational growth. A reference architecture designed to integrate Dell™ hardware and CommVault® Simpana® software helps organizations automate intelligent data management across multiple storage tiers.

The tremendous amount of data accumulated and processed by organizations in the course of business has led to a high demand for storage. All too often, the complexity of managing and protecting data assets can strain staff time and budgets and slow operations.

To help reduce the cost and complexity of data protection, Dell and CommVault have defined a tiered storage reference architecture called Solving Forward by Design. This reference architecture combines the storage optimization of the Dell Fluid Data™ architecture with the data protection of CommVault Simpana software to offer comprehensive life-cycle management and retention of data. Essentially, Solving Forward by Design extends the Dell Fluid by Design approach beyond the Dell Compellent™ storage tier into protection and archiving tiers that leverage complementary Dell storage platforms.

Working across multiple tiers

Solving Forward by Design provides a unified strategy that brings together physical and virtual server protection with backup and archiving. It is designed to scale, adapt, and react to the changing IT environment. The reference architecture incorporates key elements of the Dell and CommVault modern data protection strategy:

- **Application awareness:** CommVault and Dell use their in-depth knowledge of applications and file systems based on the Microsoft® Windows® OS and

Dive deeper

Learn how Dell Compellent storage virtualization and CommVault Simpana SnapProtect technology provide integrated, unified, and robust end-to-end data management that is designed to seamlessly enable data protection policies in physical as well as virtual environments.

qrs.ly/c125pft

VMware® virtualization software to help provide fine granularity of the data being protected and enable consistent, rapid copying of that data.

- **Snapshot management:** CommVault Simpana SnapProtect® technology is designed to create instant, application-aware recovery copies from Dell Compellent Data Instant Replay™ snapshots. By offloading production resources for backup operations, this snapshot integration helps minimize recovery time and improve execution on stringent data service-level agreements while enabling a dramatic reduction in backup windows.
- **Dynamic tiering:** Organizations have the flexibility to maintain copies of data on different tiers to meet specific retention and recovery needs, enhancing efficiency and helping to ensure appropriate levels of protection over time.
- **Automation:** To minimize storage and storage management costs, this modern data protection strategy is designed to eliminate manual activities through policy-based approaches and centralized administration that automate the movement of data to cost-effective storage tiers.
- **Global reporting:** Intuitive reporting helps optimize management of storage and backup-and-recovery resources, enhancing the organization's understanding of the storage environment and its ability to plan appropriately as needs evolve.
- **Recovery management:** Simpana software enables granular recovery of files and application data from any Dell storage tier to help improve recovery time objectives (RTOs) and recovery point objectives (RPOs).

As shown in Figure 1, Solving Forward by Design uses Simpana software to intelligently and automatically manage data across Dell storage platforms that are configured in three primary tiers: storage, protection, and archive. The integration of Simpana software with Dell Fluid Data architecture is designed to move data from the high-performance storage tier to cost-efficient protection and archiving tiers (see Figure 2).

The storage tier

To manage rapid data growth, many organizations are turning to automated sub-logical unit (LUN) tiering approaches, such as Dell Compellent Storage Center™ storage area network (SAN) arrays. Compellent storage facilitates hands-free data management through policy-based automation. The Dell Compellent Data Progression™ feature provides automated tiered storage functionality that is built into the virtualized storage platform. Data Progression helps organizations manage the large amounts of enterprise data in the storage tier that become inactive a few months after creation. This functionality enables granular real-time awareness of how data is used, contributing to accurate data placement.

The Dell Compellent Dynamic Capacity™ thin provisioning feature is designed to optimize enterprise storage utilization by avoiding pre-allocated, unused capacity. Thin provisioning separates allocation from utilization, enabling administrators to provision any size volume up front; disk space is consumed only when data is written.

The protection tier

The Dell PowerVault™ DL Backup to Disk Appliance – Powered by CommVault helps

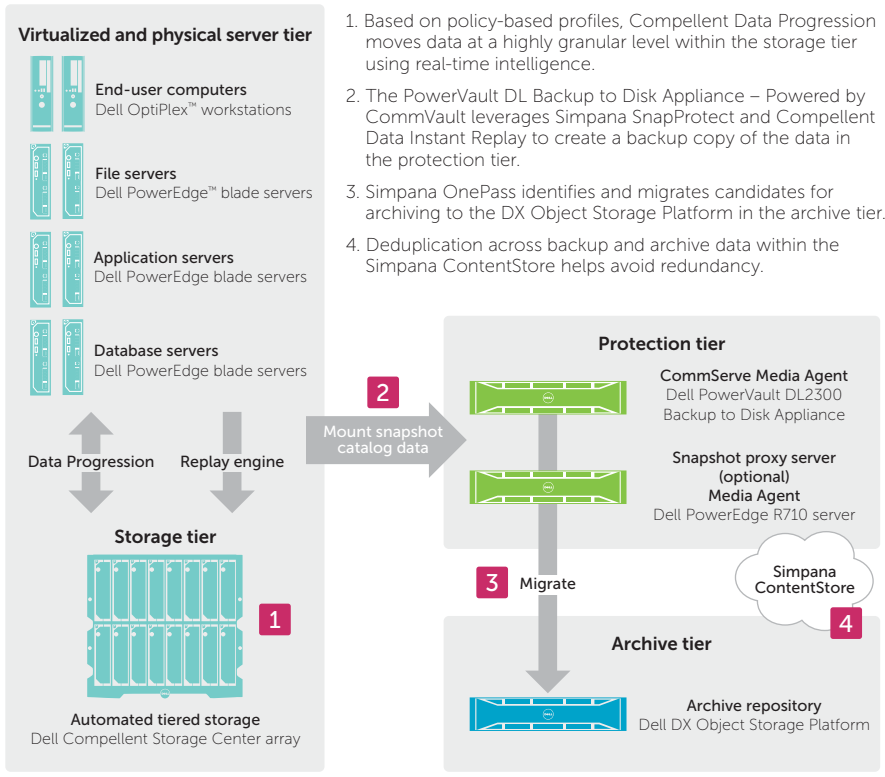

Figure 1. The reference architecture for Solving Forward by Design enables organizations to automatically move data across multiple tiers

streamline data protection by automating tasks that discover, deploy, and protect data within the IT environment. The appliance is designed to be up and running in less than 30 minutes using a single interface for the setup, management, monitoring, and reporting of the protection and archiving tiers. Built into the appliance is a source and target–based deduplication capability that avoids redundant data across consolidated backup and archive sets. The appliance is designed to deliver deduplication throughput rates up to 4.5 TB per hour, helping meet stringent protection windows.

The PowerVault DL appliance supports Simpana SnapProtect technology and its Virtual Server Agent (VSA). Through integration with Compellent and VMware application programming interfaces (APIs), SnapProtect for VSA enables administrators to create point-in-time snapshots, or replays, that can be used for various data protection operations. VSA is designed to protect unlimited virtual machines without requiring agents on each virtual machine.

Compellent and Simpana software offer a converged process for backup, archive, and reporting from a single collection of data. The PowerVault DL appliance combines the three workflows into one operation, the Simpana OnePass feature, to help reduce time for backup, archive, and reporting by up to 50 percent over isolated methods that each run as a separate cycle, such as traditional tape or remote backups. The resulting Simpana ContentStore is a virtual repository that facilitates automated tiering across the protection and archive tiers. Enabling cost-effective, long-term retention, it offers a single index that can be searched for backup or archive data.

The archive tier

Together, CommVault Simpana software and the Dell DX Object Storage Platform help improve the economics of long-term data archiving while enhancing corporate, legal, or regulatory governance.

Figure 2. Solving Forward by Design helps reduce storage costs by moving data to cost-efficient protection and archiving tiers

The Solving Forward by Design reference architecture enables organizations to reclaim valuable primary storage space by automatically moving infrequently accessed data to the cost-effective DX platform. By freeing physical storage space in the production environment, Solving Forward by Design helps cut the capacity and time requirements for backup and recovery operations, while boosting the performance of production applications.

Streamlining data management

The Solving Forward by Design reference architecture leverages Dell Fluid Data architecture and CommVault Simpana software to provide a flexible, persistent data management platform that scales up and out for virtualized data centers and cloud environments. Administrators can manage data protection, recovery, and archiving using Simpana software, which is designed to deliver application-aware, global cataloging across the Dell storage tiers for instant recovery from any tier. Simpana software also provides automated alerts, security, and search options, as well as easy-to-use storage resource management reporting to heighten an organization's understanding of the dynamic environment and to ease data and information management.

Solving Forward by Design tightly integrates Dell storage hardware and a single Simpana software platform, enabling administrators to manage, tier, analyze, replicate, protect, archive, and search data efficiently and cost-effectively. This integration also helps ensure data is protected and managed to meet corporate, regulatory, and governance requirements. The fine data granularity enabled by the reference architecture leads to the intelligence and clarity that is critical for effective management of today's chaotic data flow—contributing to low storage costs, reduced risk of data loss, and operational simplicity. PS

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Dell UPS

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The right power management tools are critical for maintaining high availability and reliable operations. This is particularly true in virtualized environments, where an incoming power event affecting one physical server host may bring down numerous virtual machines running mission-critical services. Dell™ uninterruptible power supply (UPS) products condition incoming power and provide ride-through power to cover short outages. Available in online and line-interactive technologies, Dell UPSs enable robust protection of physical and virtual infrastructures.

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Multiple options, easy sizing

Offered in tower (500 W to 2700 W) and rack-mounted (1000 W to 5600 W) models, Dell UPSs are designed to protect desktops to server racks. Plus, Dell UPSs are sized in watts, making it easy to match the model to the load.

Outstanding efficiency

Dell UPSs are designed to run at up to 97 percent efficiency—helping cut energy usage and costs.

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Included at no additional cost, power management software provides control and visibility over multiple local and remote Dell UPSs. It integrates with leading virtualization software to manage multihost virtualized environments—all from a single interface.

Sparking collaboration across socially dynamic online communities

By Bob Kelly

IT professionals have vital information at their fingertips to help solve problems and enhance business outcomes. Now, ITNinja and other communities integrate social network environments for peer interaction and access to rich content repositories.

Treasure trove

ITNinja is a robust online community where IT professionals discuss a wide range of topics. Visit the community to discover its vast repository of information and experience its integrated social networking environment for access to product summaries, reviews, downloads, answers to questions, feature articles, and more.

itninja.com/about

Even seasoned IT professionals may encounter unexpected obstacles when performing certain operations—for example, migrating an organization's PCs to the latest version of the Microsoft® Windows® OS. Traditionally, when a process-hindering problem occurred, finding the answer meant sifting through myriad search results, phoning or sending an e-mail or instant message to a colleague, or digging through any support resources the organization had available.

Today, an evolving channel of communication helps administrators and decision makers quickly hone in on specific answers to specific questions. Mushrooming participation in online peer-to-peer communities and social networks provides easy access to rich stores of actionable information that IT organizations can tap to help solve problems or advance efficiency and innovation for successful business outcomes.

Expediting information exchange in a fast-changing technology landscape

Although communities, user groups, and industry associations have served key supporting roles in organizations for a long time, their migration online and development through social networking is opening fresh avenues to engage and swap ideas with like-minded professionals. Increasing numbers of participants are utilizing these communities to network with peers and access critical information ranging from resource procurement recommendations to successful problem resolution and best-practices implementations.

According to Forrester Research, 86 percent of business technology buyers engage in some kind of social activity for business purposes.[1] Further, these technologists tend to rely on their network of peers and colleagues for critical business information such as procurement recommendations and resolutions for common problems.

[1] "2011 Social Technographics® for business technology buyers," Forrester Research, Inc., July 2011.

The following results from a Dell KACE™–sponsored online survey of 674 IT professionals[2] offers insight into the high level of participation in online communities, its significant benefits, and its resulting business value:

- **Professional engagement:** 80 percent of respondents engage in online communities, and 70 percent of them visit several times a week.
- **Active participation:** 53 percent of those surveyed actively participate in the communities they visit.
- **Skill building:** 98 percent of respondents claim they benefit professionally from online communities.
- **Productivity boost:** 95 percent of frontline IT professionals with hands-on systems management responsibility report saving time and increasing the efficiency of doing their jobs.
- **Time management:** 82 percent of respondents report typically saving more than one hour per week.

Despite the many benefits from using online communities, the survey also revealed that many respondents are compelled to visit multiple communities to find satisfactory answers because online communities often are either too product specific or are not technical enough for their needs. The impact of this extended research can include lost time, reduced productivity, and cost-inefficiency.

Zeroing in on relevant coverage quickly and easily

Today, hundreds of online communities are devoted to countless topics, but few communities have a suitable mix of actionable content that focuses specifically on the information needs of IT professionals (see the sidebar, "5 criteria for screening online communities"). ITNinja—previously known as AppDeploy.com—is a product-agnostic, online community that is sponsored by Dell KACE. It leverages an engaging, game-like experience with complimentary access to a central information repository that helps system administrators easily find answers to a wide range of complex problems and learn best practices for specific operations.

System administrators can benefit from this information through the ITNinja community regardless of which systems management solution they may use. However, organizations that utilize the Dell KACE K1000 Management Appliance can access community content directly within the appliance's administrator console by providing easy-to-use contextual help for addressing complex problems.

Advancing organizational efficiency and success

Online IT communities are multiplying quickly. By extending their connections through social media networks and systems management tools, these communities enable IT decision makers to participate in timely, relevant discussions with peers and access rich collections of helpful information. Five key selection criteria help IT professionals identify online communities that suit their specific information needs. A product-agnostic community such as ITNinja can help IT organizations enhance efficiency and productivity to accelerate successful business outcomes. PS

Author

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Learn more

ITNinja:
itninja.com

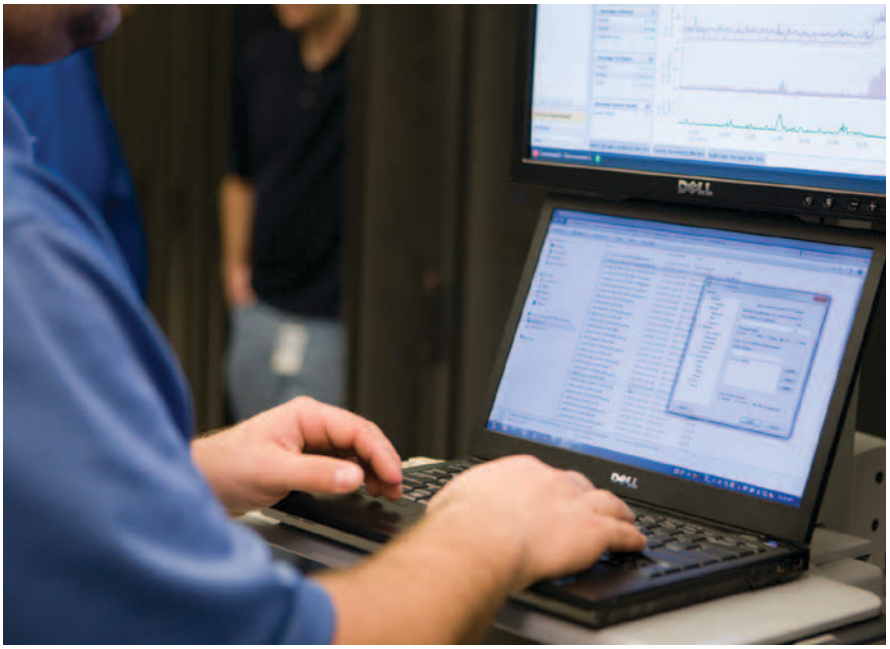
Dell KACE:
dell.com/kace

5 criteria for screening online communities

Finding the right online community takes thoughtful consideration. The following five criteria help system administrators determine which online community best meets their needs:

- **Content:** Practical information differs widely. Determining the type of information—white papers, discussions, multimedia—that effectively addresses specific needs helps narrow the search for a suitable community.
- **Focus:** Facebook, LinkedIn, and Twitter cater to large memberships and cover a broad topic range. Offering concentrated coverage that zeroes in on the information needs of the member community is essential.
- **Quality:** A community offering hands-on tips, complimentary tools, scripts, and how-to documents and videos can be substantially more actionable for system administrators than one providing well-presented information on abstract technology trends or buzzwords du jour.
- **Agility:** Technology is fluid, and an online resource must be up-to-date on emerging technologies. In addition, it should be in the vanguard for early adopters, dedicating resources to develop and enhance the user community.
- **Customization:** Instead of offering an exhaustive topic list to all comers, a useful community resource should provide the means for following selected topics, including e-mail or RSS feed notifications when fresh information is available.

[2] "The value of online communities: A survey of technology professionals," Dimensional Research, February 2012, qrs.ly/id20v67.



Fast, efficient management of expanding network environments

By Odie Cavazos, Scott McIntyre, and Terry Myers

Running growing networks efficiently can become a difficult and time-consuming challenge. Dell™ OpenManage™ Network Manager makes it easy to automate labor-intensive tasks while monitoring and managing Dell network switches—all from a single console.

Get control of the network

Digital information and communication are critical to the daily operation of organizations today—and the enterprise network is what keeps them flowing. Learn how Dell OpenManage Network Manager helps simplify the configuration, monitoring, and management of Dell networking products.

qrs.ly/am23dn7

The usage demands of mobile devices, cloud computing, virtualization, and other bandwidth-intensive environments have spurred the rapid growth of enterprise networks. IT organizations are looking for efficient ways to manage their expanding networks in what can be a very complex environment. Keeping track of the health of network devices and ensuring that device configurations comply with regulations and internal policies can be difficult and time-consuming. Network administrators are also tasked with keeping costs under control while meeting the performance requirements of end users.

A key strategy for easing the load on busy network administrators is the automation of important day-to-day tasks, such as switch firmware updates, configuration backup, and performance reporting. In addition, enterprise-wide network monitoring and proactive balancing of bandwidth utilization can help administrators optimize performance as well as operational efficiency.

To help simplify the management of Dell-based network environments, Dell OpenManage Network Manager offers a unified console that integrates a comprehensive set of network management tools into a Web-based interface. (For more information, see the sidebar, "Bird's-eye view.") It offers a centralized view for configuring, managing, monitoring, and automating critical network requirements.

Keeping pace with evolving network challenges

To manage their networks effectively, administrators must first be confident that they have a correct view of the network topology: what devices they have, how they are connected, and how the network is configured. They also need to make sure that any configuration changes made to switches and controllers comply

with regulations and internal policies. Administrators must find and remediate any unauthorized, unsupervised, or nonstandard changes and provide proof that switches are configured in a compliant fashion.

Optimizing network performance and operation is another key responsibility. The ability to generate regular reports on network performance and other key metrics enables the administrator to understand how the network is performing over time and correlate network changes to their effects on network operation. If administrators spot degraded performance and bottlenecks in the network, they must be able to track down and correct the causes.

Because network downtime is unacceptable in today's busy enterprise environments, administrators must also be prepared to quickly handle problems such as switch or port failures and excessive memory or processor utilization. Monitoring and alarm capabilities are essential for rapid response.

Automation of updates, firmware upgrades, and common maintenance tasks help increase administrator productivity and reduce support costs. For example, maintenance and backups can be scheduled in advance to take place automatically after regular business hours or over the weekend. These operations could also be executed or scheduled against a group of devices at one time, simplifying these tasks and maximizing use of the administrator's time.

Bird's-eye view

Dell OpenManage Network Manager 5, a major platform update, heightens operational efficiency and organizational agility with the introduction of several powerful features:

- Comprehensive support for Dell networking products, including Dell Force10™ data center networking devices, Dell PowerConnect™ switches, and Dell PowerConnect W-Series wireless controllers, access points, and instant access points
- Web-based graphical user interface (GUI) that is easy to use and customizable
- Ability to manage the network from any place with a Web connection to the OpenManage Network Manager server
- Enhanced tools for traffic flow analysis, deployment, monitoring, and management
- No charge for up to 10 managed Dell switches, switch stacks, or controllers*

A fully configured OpenManage Network Manager server is designed to handle up to approximately 2,000 devices, depending on the size and configuration of the server and the OpenManage Network Manager features in use.

For installations requiring management of more than 2,000 devices—or of non-Dell networking switches—organizations can upgrade to the Dorado Software Redcell product suite. Redcell is designed to provide the same set of enterprise network management features as OpenManage Network Manager, together with support for third-party network devices and optionally for management of other parts of the IT infrastructure, including servers and storage devices.

* Download a copy of OpenManage Network Manager at dell.com/networkmanager.

Providing centralized, Web-based management

Centralized management helps organizations unify network device management in the face of rising costs and declining resources. Techniques that make it easy for administrators to gain control of the enterprise network include simplifying device configuration, tracking the health and performance of network devices, and managing change in the network infrastructure.

These capabilities are delivered through the Web-based graphical user interface (GUI) of Dell OpenManage Network Manager. The management console enables organizations to efficiently troubleshoot network problems and simplify the configuration of Dell-based network environments. Administrators can customize scripts, change report formats, and create dashboards to display trends over time.

Automating a wide range of tasks

Dell OpenManage Network Manager is designed to take the complexity out of many administrative activities. First, a resource discovery wizard helps simplify discovery of IP-based network elements. The wizard automates discovery of network devices, providing detailed device information that administrators can use to create network topology maps.

After device discovery, administrators can view the managed resources and alarms at a glance from the OpenManage Network Manager console, with quick access to a menu of management actions. By clicking on a network switch, administrators can easily view details such as performance alarms, processor and memory utilization, learned Media Access Control (MAC) addresses, and an audit trail of configuration changes. Details specific to each Dell PowerEdge™ server in the network can also be viewed, such as information about the server's memory, processor, BIOS, and on-board network interface cards.

Active performance monitors enable network administrators to keep tabs on the

Figure 1. Customized dashboards displayed in the Dell OpenManage Network Manager console for network device monitoring

health and performance of their Dell-based network with customizable dashboards for fault, availability, and performance monitoring (see Figure 1). A traffic flow analysis feature enables administrators to get detailed information on the bandwidth consumption of key users, applications, and devices.

ProScan configuration auditing enables administrators to track down and correct configuration problems. Using ProScan, administrators can define configuration rules and periodically scan network devices to help ensure that device configurations are compliant with those rules. Administrators can also compare current configurations to a known good-configuration baseline. To help ensure security compliance, administrators can configure role-based user access to various OpenManage Network Manager capabilities.

Many network operations can be scheduled for single Dell switches or groups of switches. Advanced scheduling capability allows administrators to automate and schedule key tasks such as backup operations and firmware updates.

Proactive alerting helps administrators respond rapidly to network problems (see Figure 2). Administrators can set thresholds for a variety of issues ranging from dropped packets to spikes in bandwidth or processor utilization. Alarms can be sent through an e-mail or a page if a threshold is exceeded.

Enabling a strategic focus

Dell OpenManage Network Manager helps free up time for administrators to work on strategic, forward-looking activities rather than routine management. Tools such as OpenManage Network Manager help organizations lower total cost of ownership (TCO) by proactively monitoring for network problems, automating common configuration actions, and enabling easy firmware deployment. Moreover, these tools help improve network compliance and performance. As a result, network administrators can focus on value-added initiatives that advance business and organizational objectives. PS

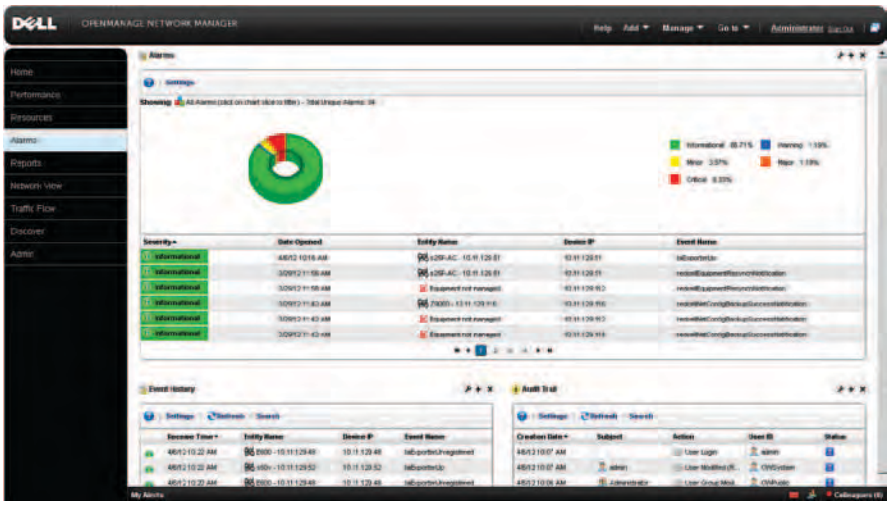


Figure 2. A signal alerting the administrator to an error or fault

Authors

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Learn more

Dell OpenManage Network Manager:
dell.com/networkmanager

Dell network devices:
dell.com/networking

Rock-solid protection for Web application delivery

By Fred Johnson, Allen Vance, and Andrew Walker

Comprehensive Web application security is vital for organizations today. Flexible, cost-effective application delivery networks built using F5® BIG-IP® platforms and Dell™ hardware and services help keep Web applications secure and available.

Ongoing, rapid growth of Web applications puts increasing amounts of sensitive enterprise data at risk of potential theft, security vulnerabilities, and multilayer attacks. Protecting an organization and its reputation by maintaining the confidentiality, availability, and performance of its applications is critical to successful business outcomes.

Today's threats are far more sophisticated than those of just a few years ago. Gone are the days of simply exhausting networking bandwidth or crashing the hard drive in a victim's desktop computer. Some of the most serious security threats now come from multilayer cyberattacks by Internet bot programs, such as distributed denial-of-service (DDoS) and SQL injection attacks that target vulnerabilities in Internet and enterprise applications. Business-critical applications and data are primary targets. Recently there have been many widely publicized incidents involving advanced attacks against both public and private organizations.

Modern attacks can be highly coordinated, distributed, and diverse in nature, sometimes rolling many different types of attacks into one. Applications and network services may be simultaneously attacked across many layers of the technology stack, from many different sources. Attackers often focus on more sinister goals, such as exposing sensitive data, cleverly redirecting users to malicious sites seeking access to financial information, or exhausting connection resources to cause a denial-of-service (DoS) attack. Stealth methods and increased complexity make these threats significantly more difficult to detect and block compared to their predecessors. Additionally, interactive Web 2.0 applications have paved the way for new threats that render traditional security solutions ineffective and blind to the attacks.

Security breaches and site outages can lead to major losses in revenue and brand reputation damage. At the same

F5 DevCentral community

The F5 DevCentral portal provides comprehensive technical documentation, discussion forums, blogs, media, and more for information on application delivery networking. Visit this community site to get tips, learn best practices, and discuss topics with peers.

bit.ly/Ods5Qr

time, today's economic challenges have many organizations facing tight budget constraints and diminishing resources—they are being asked to do more with less even as their overall security risks are increasing. The stakes are high for Web application security, and eliminating threats is impossible. Organizations must therefore seek out cost-effective solutions to improve responsiveness to vulnerabilities.

Security designed for essential Web applications

The F5 BIG-IP Application Security Manager™ (ASM™) application delivery controller is a high-performance, flexible Web application firewall (WAF) that helps secure Web applications in traditional, virtual, and cloud computing environments. BIG-IP ASM provides powerful Web application and Web site protection and helps secure deployed applications against unknown vulnerabilities. It also enables compliance for key regulatory mandates such as the Payment Card Industry Data Security Standard (PCI DSS) and an array of security standards (see the sidebar, "Integrated platform protection").

Employing specific technologies, BIG-IP ASM detects when applications are being attacked and protects them from vulnerabilities such as Layer 7 DoS and DDoS, SQL injection, command injection, cross-site scripting, Web-scraping, cookie poisoning, worms, and JavaScript Object Notation (JSON) payload attacks in Asynchronous JavaScript and XML (AJAX) widgets. Blocking attacks on the network before they reach the Web servers is often referred to as virtual patching. Integration with vulnerability scanners provides advanced application assessment and threat protections, helping secure deployed applications from unknown vulnerabilities (see the sidebar, "Security highlights for enterprise Web infrastructure").

Multilayer defense strategies can yield enhanced results. Leveraging combined solutions, BIG-IP ASM integrates application attack protection along with the Layer 2 through Layer 4 network security features provided in the F5 Traffic Management Operating System® (TMOS®) platform and the BIG-IP Local Traffic Manager™ (LTM®) application delivery controller. This approach helps dramatically reduce the risk of application and network vulnerabilities in deployments, and it can deliver cost-savings on vulnerability repairs.

Comprehensive Web application firewall management

Meeting security and compliance requirements can be daunting even for the most technically savvy IT organizations. The critical nature of protecting applications against attacks means these activities receive extremely high levels of visibility and scrutiny, especially if something goes wrong that negatively impacts the business. Managing and monitoring security devices can be complex. In an ideal world, using devices such as next-generation firewalls, intrusion prevention systems, DoS protection systems, and WAFs would be an easy matter of taking a set-it-and-forget-it approach. Unfortunately, utilizing such an ideal approach is not the case today.

To help organizations manage Web application security, BIG-IP ASM offers features that make WAF configurations easy to perform through an intuitive, Web browser–based graphical user interface (GUI). Organizations can choose between automated learning or manual methods of policy configuration for enhanced deployment flexibility and control. Monitoring, reporting, and further tuning or tightening of the policies is also possible through the BIG-IP ASM Web management interface. The configuration wizard for BIG-IP LTM settings streamlines the tasks of creating HTTP classes and assigning them to existing load-balancing virtual servers. An easy-to-use attack signature update process helps keep BIG-IP ASM current and servers protected from new attacks and threats.

For organizations that need security expertise and wish to avoid staff augmentation, a managed security service provider (MSSP) with certified security experts may be a

Integrated platform protection

The BIG-IP platform has earned ICSA Labs network firewall and Web application firewall (WAF) certifications* and supports the following among numerous security standards and mandates:

Hardware security modules

- Federal Information Processing Standards (FIPS) 140-2 Level 2 Certified F Series, including BIG-IP models 6900F, 8900F, 11000F, and 11050F
- Key third-party management solutions for many certificates
- Third-party Public-Key Cryptography Standards (PKCS) #11 certificate format and network-based hardware security modules
- Secure Vault key protection on local storage

Vertical mandates for hardware security modules

- Financial and insurance: Payment Card Industry (PCI)
- Government: FIPS 140-2
- Health care: Health Insurance Portability and Accountability Act (HIPAA)

* For more information on ICSA Labs, visit icsalabs.com.

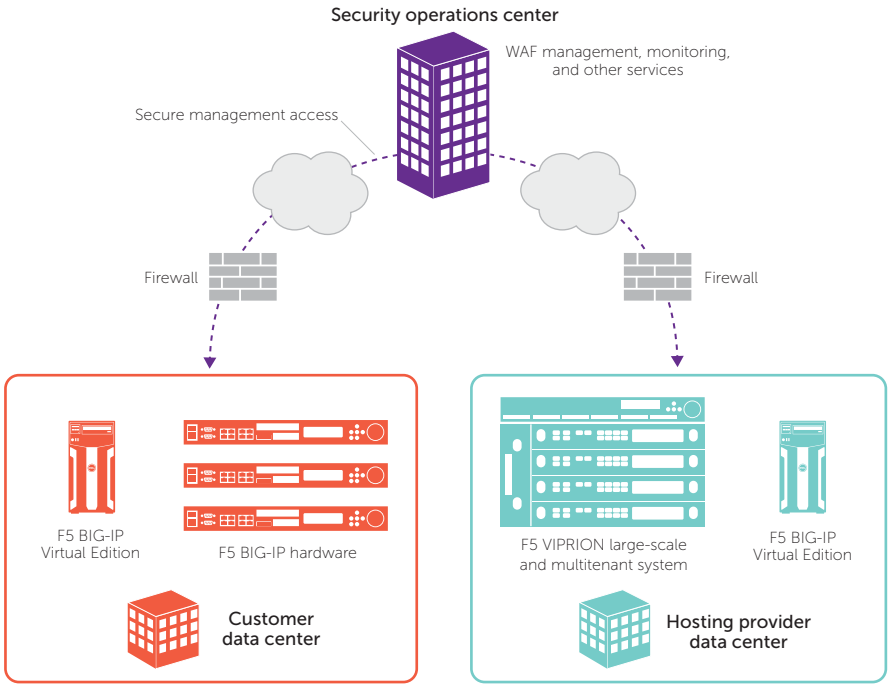

Figure 1. MSSP management and monitoring services for BIG-IP ASM deployments across different types of data centers

well-suited, cost-effective alternative (see Figure 1). An MSSP can be a single point of contact for security services such as device management and monitoring, unified threat management, application penetration testing, compliance and reporting, security consulting, and application security tuning, among other services. In addition to daily WAF management and monitoring activities, an MSSP helps organizations achieve PCI compliance for specific applications and provides an application security posture, trending, statistics, and other information through a secure self-service Web portal. (For more information on WAF management, see the sidebar, "End-to-end Web presence defense.")

Flexible and adaptable configurations

The BIG-IP platform is rooted in advanced traffic management with deep feature sets to support many specific application,

Security highlights for enterprise Web infrastructure

BIG-IP Application Security Manager (ASM) is designed to support secure, mission-critical enterprise Web infrastructure with a wide range of features.

- Network traffic security through an ICSA Labs–certified network firewall
- Protection against threats listed on the Open Web Application Security Project (OWASP) Top 10 Web Application Security Risks
- Integration with WhiteHat Sentinel, Cenzic Hailstorm technology, Qualys QualysGuard Web Application Scanning, IBM® Security AppScan, Splunk, and other security solutions
- Easy-to-update attack signatures that protect against generalized and known application attacks
- IP version 6 (IPv6) support, IP geolocation enforcement, and analytics
- File upload detection to block end users from uploading binary executables
- Support for session tracking, event correlation, and response checking and logging
- System-generated learning suggestions from the BIG-IP ASM Learning Manager resource for tuning policies
- Help simplifying and standardizing setup of BIG-IP using the F5 iApps™ configuration wizard
- Self-service configuration analysis and support using the F5 BIG-IP iHealth® Web portal tool
- Management access provided by the Web browser–based graphical user interface (GUI), Traffic Management Shell, and Linux® OS–style command-line interfaces
- Secure, out-of-band Ethernet management and serial console interfaces
- Lights-out management of the system over Secure Shell (SSH) or the serial console provided by Always-On Management whenever power has been applied—that is, when the device is plugged in—even if the host subsystem is turned off

networking, and security configurations. BIG-IP is often referred to as the Swiss Army knife of application delivery and security. This flexibility can help to significantly reduce costs to deploy and manage WAF technology. Integrated and consolidated, resilient scale-out, and pooled fail-open deployment models (see Figures 2, 3, and 4, respectively) supporting Web applications running on Dell PowerEdge™ servers, for example, demonstrate easy adaptation to supporting networks. These deployment models also provide a range of capabilities that help organizations realize enormous benefits from BIG-IP ASM.

An important benefit of BIG-IP is the capability to consolidate multiple functions into a single appliance. Software add-on modules can be layered together through licensing. All BIG-IP units, regardless of provisioned licensed software modules, contain a core set of platform features and functionality. BIG-IP ASM is a modular component of the TMOS architecture and leverages the dynamic features that are part of that architecture. These common features include a comprehensive reverse proxy, the F5 BIG-IP SSL Acceleration™ module, digital certificates management, Federal Information Processing Standards (FIPS) compliance, virtual LAN (VLAN) segmentation, remote authentication and authorization, enhanced logging, and TCP/IP optimization. In addition, they include connection pooling, IP and port filtering, rate shaping, and F5 iRules® scripts.

BIG-IP ASM is available as a stand-alone appliance, as a virtual edition (BIG-IP ASM VE), and as a product module in the BIG-IP system—for example, BIG-IP ASM and BIG-IP LTM. The stand-alone appliance includes comprehensive BIG-IP ASM functionality with Secure Sockets Layer (SSL) acceleration, Web caching, essential Layer 4 load balancing, and other beneficial features to optimize WAF deployments. BIG-IP ASM VE and the F5 VIPRION® system with the F5 virtual

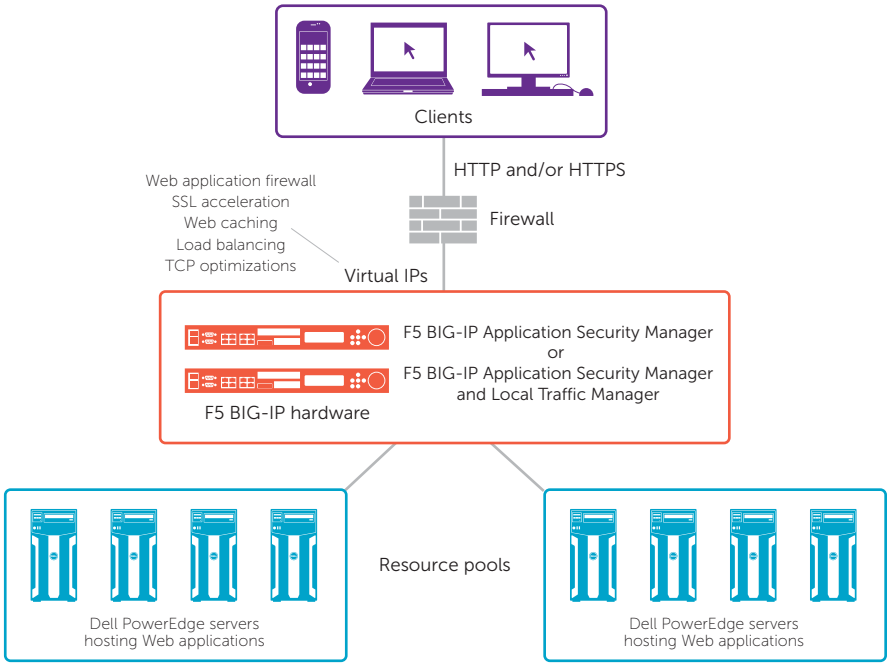

Figure 2. High-availability deployment utilizing BIG-IP ASM or integrated BIG-IP ASM and BIG-IP LTM for protecting Web application infrastructure

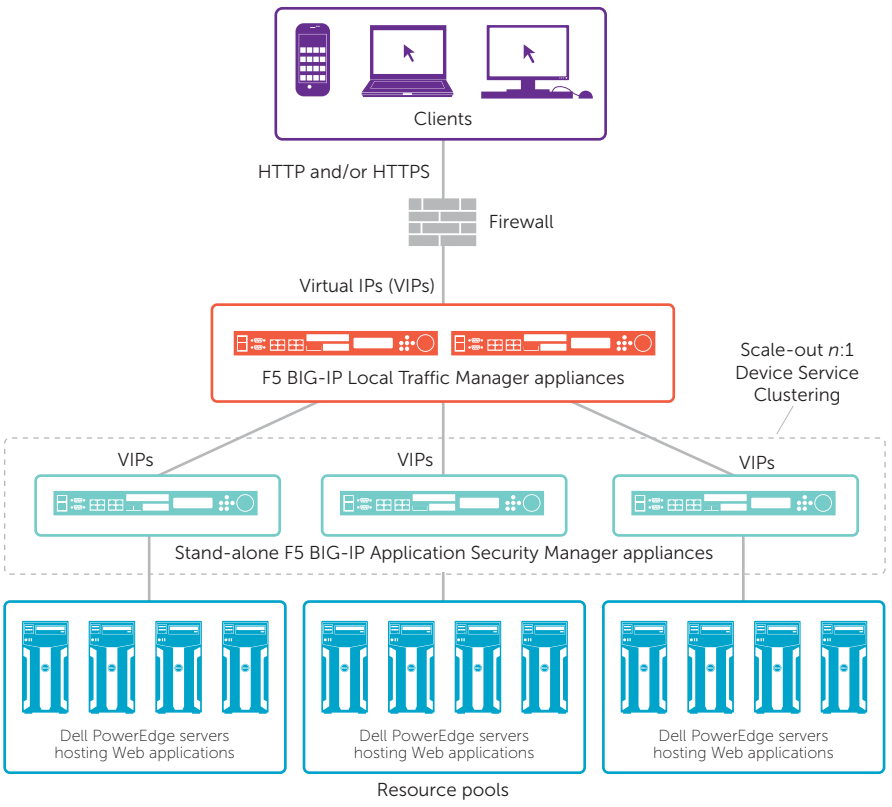

Figure 3. Scale-out deployment for resilient failure protection using *n*:1 Device Service Clustering

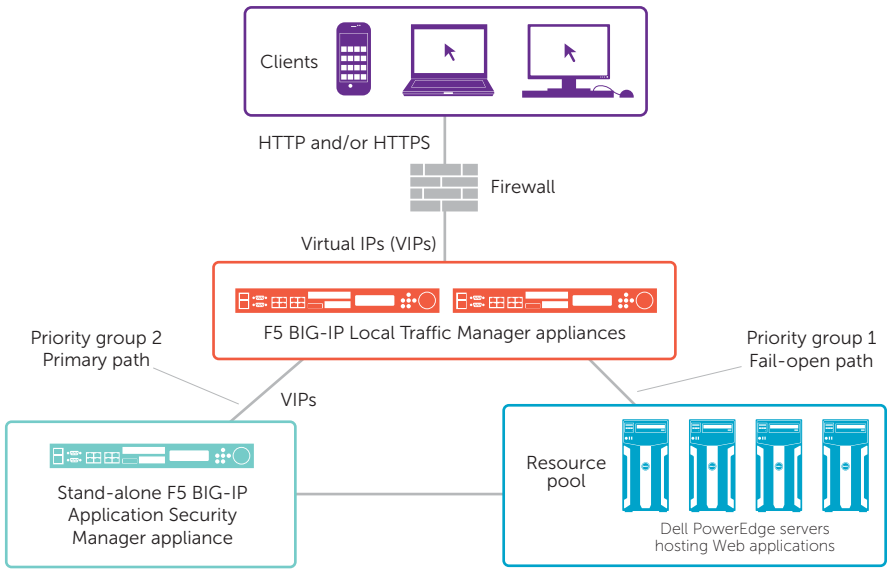

Figure 4. Pooled deployment for fail-open capability using Priority Group Activation

clustered multiprocessing (vCMP®) feature support multitenancy as separate BIG-IP instances, while all systems support internal security boundaries through administrative partitions, route domains, and rate shaping.

Fast, increasingly efficient processing of application traffic helps reduce latency because data flows through the BIG-IP stack only once; yet all the features—such as WAF, SSL acceleration, Web caching, TCP optimizations, and load balancing—are applied to the traffic. As a result, performance and end-user experience may actually improve when BIG-IP ASM is added in front of applications. Enhanced performance and reduced cost are major advantages, particularly when compared to the additional latency and management complexity that can be created by stringing together many single-purpose appliances from different vendors.

Taking advantage of the platform flexibility, some organizations can add BIG-IP ASM to their existing BIG-IP LTM units by simply purchasing add-on software module licenses. This approach helps avoid the need to purchase additional hardware. These products and their functionality require minimum platform specifications and F5 TMOS version 11.1 Hotfix 2 or higher.

Advanced approaches for protecting Web applications

With the rising number and sophistication of attacks on Web applications, implementing strong cyberdefense strategies is more important than ever before. Configuration flexibility, advanced multilayer security protections, and straightforward management options are key factors to successfully managing costs and maintaining maximum security throughout application life cycles. Together, Dell and F5 provide a high-quality and cost-effective array of solutions to help solve today's Web application security challenges. PS

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End-to-end Web presence defense

To help organizations defend their Web presence, the Dell SecureWorks Web application firewall (WAF) management service provides 24/7 management and real-time monitoring for WAF devices. By supporting the entire WAF life cycle, this service helps ensure that security appliances provide a high degree of protection without interrupting legitimate business traffic to and from applications, such as Web applications running on Dell PowerEdge servers. Certified security experts help build comprehensive, end-to-end systems from solution design, deployment, continuous tuning, configuration management, and monitoring and analysis to ongoing maintenance, backup and recovery, performance and availability management, and security and compliance reporting. Dell SecureWorks can collaborate with organizations as an extension to their security staff, working closely together to enable fast, accurate detection and response to security incidents.

Learn more

Dell SecureWorks managed security services:
bit.ly/MZvWf8

F5 BIG-IP ASM:
bit.ly/KrMSLK

Dell SecureWorks:
bit.ly/LRxxbn

OWASP Top 10 project:
bit.ly/ioBuA3

Advancing network security and performance

By Patrick Sweeney

Protection and performance can go hand-in-hand for next-generation firewalls. Real-time deep packet inspection helps Dell™ SonicWALL™ SuperMassive™ firewalls meet security demands in a fast-paced world of constant Web access and cloud-based computing.

Enterprises today rely on an ever-expanding array of advanced technology options to heighten productivity, taking advantage of Web 2.0, real-time collaboration, instant messaging, voice over IP (VoIP), streaming media, teleconferencing, and mission-critical cloud-based applications. These technologies play a significant role in advancing business and organizational outcomes, but employees may also run unknown and untrusted applications during the course of the workday. As a result, IT leaders must continue to find ways to increase productivity, security, and compliance while containing costs.

Mission-critical applications need bandwidth prioritization while other applications must be throttled or completely blocked. Moreover, enterprises cannot rely on the low level of security provided by legacy stateful packet inspection (SPI) firewalls, nor can they tolerate the network bottlenecks associated with some next-generation firewalls

(NGFWs). Performance is an essential consideration when determining how to address security challenges.

Securing the network

Technology analyst firm Gartner defines an NGFW as "a wire-speed integrated network platform that performs deep inspection of traffic and blocking of attacks."[1] In basic terms, an NGFW integrates deep packet inspection (DPI) firewall technology with intrusion prevention service (IPS) and application intelligence and control.

Outdated NGFWs pose a serious security risk to organizations because they may fail to fully inspect the data payload of network packets. In addition, some firewalls buffer downloaded files and then inspect them for malware. This *proxy* or *assembly* method may introduce significant latency. With this type of approach, memory is consumed until it runs out, resulting in the firewall either passing traffic through unscanned—which can compromise security—or blocking all traffic until memory is freed.

One alternative is real-time inspection over an NGFW. By effectively combining real-time DPI technology with high-performance multicore architecture, NGFWs are now capable of delivering exceptional application intelligence and control, intrusion prevention, malware protection, and Secure Sockets Layer (SSL) inspection at multigigabit speeds.

Achieving effective protection

By combining a multicore architecture with Dell SonicWALL Reassembly-Free Deep Packet Inspection™ (RFDPI) technology, the SonicWALL SuperMassive E10000 Series NGFW enables effective security and control with tightly integrated intrusion prevention, malware protection, and application intelligence. RFDPI is designed to scan any number of simultaneous files of unlimited size in real time across any port, without security or performance degradation—as a result, minimizing the chance that infected files will slip through undetected when the firewall is under heavy load. In addition, it can apply security and application-control technologies to SSL-encrypted traffic to help ensure that it does not become a malware vector in the network.

RFDPI is designed to match within files, attachments, and certain compressed archives, regardless of size, and to transform as needed to perform normalized pattern matching. RFDPI also helps identify malicious code within parts of files and emerging variant mutations, as well as block compressed files that have been password protected or contain embedded macros. Moreover, RFDPI is designed to scan all ports and protocols to detect and block known viruses and malware, regardless of the transmitting protocol.

Validating firewall performance

To select a suitable NGFW, best practices suggest obtaining verification of its protection and performance from independent security product testing or certification sources, such as NSS Labs. Recent NSS Labs tests on NGFWs provided detailed performance and security effectiveness data across a broad spectrum of devices. According to the lab's 2012 Next Generation Firewall Security Value Map, the Dell SonicWALL SuperMassive E10800 appliance was one of three NGFWs—out of seven evaluated—to earn NSS Labs' highest rating of "Recommend."

NSS Labs rated the SuperMassive E10800 appliance's stability and reliability to be excellent, with 100 percent scores in firewall enforcement, application control, and identity awareness. The SuperMassive E10800 successfully passed 18.9 Gbps of inspected traffic. Findings stated that the firewall "offers some highly evolved features suitable for large enterprise and multitenant service providers."[2]

Network World magazine also evaluated NGFWs in a Clear Choice Test. Out of four tested, the SuperMassive E10800 topped the performance test; it "moved traffic the fastest, even when forwarding SSL traffic. In multiple cases, it maxed out the capabilities of our test bed. For example, when doing application of clear text traffic, it moved traffic at or near 20 Gbps."[3]

Defending against threats

Critical Web- and cloud-based applications help boost productivity but can also introduce security challenges. Organizations can defend their networks against emerging threats while optimizing network performance by using NGFWs. As verified by independent testing, Dell SonicWALL SuperMassive NGFWs provide in-depth protection and enterprise performance levels that help overcome the limitations of traditional firewall solutions. PS

Author

Patrick Sweeney is executive director at Dell, where he oversees the Dell SonicWALL network security, content security, business continuity, and policy and management product lines.

Learn more

NSS Labs Next Generation Firewall Security Value Map:
sonicwall.com/nss

Dell SonicWALL SuperMassive E10000 Series:
sonicwall.com/supermassive

[1] "Defining the next-generation firewall," by John Pescatore and Greg Young, Gartner RAS Core Research Note G00171540, R3210 04102010, Gartner, Inc., October 12, 2009.
[2] "2012 SonicWALL SuperMassive E10800 Next-Generation Firewall Product Analysis Report" provided by NSS Labs—a third-party, global leader in independent security product testing and certification (nsslabs.com).
[3] "Fast-forwarding firewall faceoff," by David Newman, *Network World*, April 23, 2012, qrs.ly/an242zm.

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