

WHITE PAPER

HP BladeSystem Matrix: Delivering the Converged Infrastructure

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June 2010

EXECUTIVE SUMMARY

Today's IT organizations are under pressure to continually adapt IT resources to keep pace with changing business priorities, all the while seeking methods to lower costs and improve efficiency in the datacenter. The racked, stacked, and wired infrastructure common in today's environments creates obstacles in the ability to deliver and manage new applications critical to the business. IT managers are challenged by rising operational expenses, power and cooling limiting IT capacity, an IT staff overburdened by manual tasks, and the complicated integration between the server, network, and storage devices. A common situation is to find IT organizations spend the majority of their resources on maintenance rather than on value-add innovation tasks. To optimize the infrastructure, IT executives are rethinking the deployment, utilization, and management of their IT resources.

Since the datacenter has become more tightly integrated with day-to-day business operations, companies are placing greater emphasis on the operations of their IT environments. As virtualization gains mainstream adoption within the enterprise, customers are discovering that the new virtual environments will require new thinking, processes, infrastructure, and management. To deliver value in the dynamic business environment, with expected and unexpected changes in priorities, IT executives are required to have an infrastructure that is not only flexible but also scalable at minimal financial expense.

In the next evolution of its blade portfolio, HP has developed the BladeSystem Matrix solution that enables IT organizations to simplify the deployment of infrastructure and business services by delivering IT services through pools of readily deployed resources. Server, storage, networking, management, and even power and cooling are converged to produce a virtual infrastructure that can quickly configure and provision resources for the many distinct applications in operation by business.

HP BladeSystem Matrix optimizes IT capacity while ensuring predictable delivery and service levels for organizations. Consistent architectural standards and operational processes are utilized to remove risk related to application deployment and to deliver on-the-fly provisioning of resources. The application mobility for both physical and virtual infrastructure improves reliability and productivity, and centralized management provides a more granular view of IT operations to improve utilization and efficiency. BladeSystem Matrix is designed as a wire-once infrastructure yet easy-to-grow IT solution. The integrated platform of standard building blocks easily fits into a customer's existing IT environment and can scale effortlessly to match as a customer's IT requirements increase.

Converged systems and software, such as HP BladeSystem Matrix, are the building blocks for the private clouds that are being built in future enterprise datacenters. Enterprises are breaking down traditional IT silos in favor of internal clouds that deliver shared IT services of both infrastructure and applications. A bit unlike their public cloud counterparts, which utilize a large scale of standardized systems that deliver relatively simple workloads to large number of users, private clouds must deliver a spectrum of workloads to a variety of users and therefore require a flexible infrastructure that is able to be configured and consumed as business needs dictate — while still being cost-effective. Converged systems enhanced by virtualization and coupled with service management catalogs, automation, and self-service portals are enabling IT organizations to promote the dynamic resource sharing and the automated service delivery across a spectrum of business workloads.

SITUATION OVERVIEW

Customer Challenges

Today's IT managers face opposing priorities from multiple stakeholders within the enterprise. Business unit managers expect IT to respond quickly to business priorities, while financial managers are continuously seeking ways to lower costs and improve efficiency in the datacenter. The ability to control and reduce expenses has become an even higher priority in light of the recent economic downturn. While it may be uncertain what the lasting impact of this particular economic cycle will be on spending over time, it has become clear that IT organizations will continue to be pressured to provide higher levels of service while being asked to aggressively manage costs. As a means to reconcile these concerns, CIOs and IT managers are increasingly rethinking the deployment, utilization, and management of IT resources.

Over the past decade, IDC has observed that as the industry transitioned from Unix/mainframe to x86 environments, it has shifted from a scale-up to a scale-out infrastructure. While customers have benefited from the lower capital costs and the ability to "pay as you grow" that a distributed infrastructure delivers, there have also been some unfortunate consequences. The number of systems installed at customer sites has exploded, resulting in a "server sprawl" in which operational costs have risen as each of these disparate systems require additional management. Additionally, the nature of today's racked, stacked, and wired IT infrastructure has created a complex and inflexible environment that leads to obstacles in the deployment and management of new application services that are critical to the business. IDC has observed four key areas — cost, time, energy, and change — that are challenging IT organizations.

Cost

IDC research shows that within the datacenter, operational expenses have grown to eclipse the capital expenditure of IT equipment. Fueled by a rapid increase in the installed base of servers, the personnel costs associated with managing and maintaining server systems as well as operational costs related to power and cooling and underutilized resources have significantly taxed datacenter budgets. In an effort to relieve some of this pressure, customers are focusing on solutions that effectively lower

costs by simplifying and standardizing their IT infrastructures and improving their management processes. Adding to the challenge are the current economic conditions; IT executives cannot risk large capital outlays and instead must focus on obtaining a relatively quick return on investment (ROI) without a significant up-front investment.

Time

As companies deployed scale-out environments, it was common to overbuild the infrastructure to ensure capacity was available to meet peak demand. The typical model in an organization was one application per server, resulting in high costs to manage the individual servers. While virtualization is making it possible to increase the utilization of the server hardware, systems administrators are finding new challenges in setting up and managing the vast number of virtual machines (VMs) and their connections. There is also a significant burden on staff time due to the multitude of manual processes, as well as dealing with the different server configurations that are necessary to handle the many different applications a business runs.

System administrators are also required to manage the complicated integration between the server, network, and storage devices. In addition, there is the drain on staff resources required to coordinate with people across different teams to complete both simple and complex tasks. Demand is increasing for solutions that enable staff to automate day-to-day tasks, streamline processes, and minimize errors so more of their time can be spent on innovation and value-added projects.

Energy

The energy expense necessary to operate a datacenter has risen sharply in recent years to a point today at which datacenter managers consider power and cooling their number 1 challenge. It is often the case that energy has become the primary limiting factor for financial budgets and the expansion of IT capacity within existing datacenter facilities. This surge in energy challenges is associated with the shift toward distributed environments; the energy required to power multiple smaller devices is exponentially greater than that required to power a single larger legacy system. In the past, the IT organization's objective was to maximize compute performance and expand IT availability and accessibility; the associated expense of power and cooling was largely an afterthought or simply viewed as a cost of doing business. The environment within the datacenter has changed, and datacenter customers are increasingly turning to solutions that can optimize server power and cooling.

Change

The pace at which business evolves continues to accelerate. Customer requirements and competitive forces in the market make it critical that a business be flexible and able to adapt to a dynamic environment. This in turn requires IT organizations to keep IT resources aligned with business requirements. The IT infrastructure is required to be increasingly flexible to address the changing business priorities. To realize the full value of the infrastructure, managers must utilize IT resources in multiple ways. In addition to being flexible, the infrastructure must be designed to be scalable. As new applications and users are added, the ability to easily scale the IT infrastructure at minimal cost becomes significant. Today's hardware-based server, storage, and network configurations that are hardwired are often static and relatively difficult to change.

FUTURE OUTLOOK

Moving Toward a Virtualized Environment

IDC has observed that businesses are increasingly leveraging IT as a tool for driving new products and business models. Several industries, including financial services and healthcare, have driven incremental revenue and are seeking to gain competitive advantages through IT. Since the datacenter has become more tightly integrated with day-to-day business operations, it is critical that the responsiveness and operational efficiency of IT become a focal point for the business. As customers shift their infrastructure to a virtual IT environment, it is becoming clear that this new virtual world will require new thinking, processes, infrastructure, and management:

- ☒ **Thinking and processes.** Within IT organizations, servers, storage, networks, and even power are often still thought of as separate entities. Even though these IT components are required to function together, they are purchased, deployed, and managed by different processes and staff. This can cause the provisioning of IT services to the business to be slow and inefficient, often taking weeks and even months to bring a new server into production. Also, the mainstream adoption of virtualization is leading to new challenges. IDC has observed that customers without policies in place to deal with the requisition of virtual servers can experience virtual server sprawl that can undermine the intended physical consolidation initiatives.
- ☒ **Infrastructure.** Customers report to IDC that it is common to have separate physical and virtual environments with distinct architectures for the two silos. The virtual environment includes a group of richly configured physical servers that are deployed only to host virtual servers. The physical environment comprises a group of servers with multiple configurations that have only one application per physical server deployed. Having two silos adds complexity to the datacenter and highlights the importance of management tools that can manage both environments through a single console.
- ☒ **Management.** As mentioned previously, IT is seeking to reduce expenses associated with IT organizations. While most of the focus is on lowering immediate costs and achieving a quick ROI or payback, IT managers must also focus on tools that collect and analyze data to enable the continuous optimization of IT resources. This includes gathering insights into network bandwidth, power usage, and storage capacity — in addition to traditional compute and memory utilization — to gain a better understanding of the infrastructure and improve utilization of resources.

HP BLADESYSTEM MATRIX

Solution Overview

HP developed BladeSystem Matrix as a converged infrastructure platform to deliver shared IT services. HP aims to deliver the benefits to customers by enabling IT to dynamically adjust to changing business demands and to allow IT to refocus budget and staff resources away from routine maintenance tasks to value-add initiatives.

HP BladeSystem Matrix is an integrated IT infrastructure platform designed to simplify the deployment of applications and business services by delivering IT capacity through pools of readily deployed resources (see Figure 1). The goal of Matrix is to optimize IT capacity across the customer's physical and virtual environments while ensuring predictable delivery and service levels. HP's next generation of BladeSystem Matrix expands capabilities to manage mission-critical workloads through Unix support and high-availability features.

HP BladeSystem Matrix integrates proven HP BladeSystem technologies, including:

- ☒ **BladeSystem c-Class infrastructure.** HP's enterprise blade chassis houses power supplies, cooling fans, and HP Onboard Administrator.
- ☒ **ProLiant and Integrity server blades.** HP's broad line of blade servers is based on industry-standard architectures from Intel Itanium, Xeon, and AMD Opteron.
 - ☐ **Operating system and hypervisor.** HP's next-generation BladeSystem Matrix supports HP-UX in addition to Linux and Windows-based applications, as well as multiple virtualization hypervisors, including VMware and Microsoft and HP Integrity Virtual Machines.
- ☒ **Virtual Connect.** HP's interconnect option dynamically connects blade servers to datacenter networks by creating pools of LAN and SAN connections. Virtual Connect virtualizes the connectivity that enables the rapid provisioning of servers in addition to the change-ready, dynamic movement of blade identities for maintenance or automated failover, without touching the actual blade hardware or reconfiguring connections.
- ☒ **Insight Dynamics.** HP's integrated infrastructure management software analyzes and automates the provisioning, recovery, and continuous consolidation of both physical and virtual resources. Insight Dynamics acts as the central console for architecting application and orchestrating infrastructure through the use of templates, and then the "self-service" provisioning/reprovisioning and management of those infrastructure resources.
- ☒ **Factory integration and onsite services.** These are included to deliver precabled, ready-to-go BladeSystem Matrix infrastructure for standardized implementation.
- ☒ **Application template library and tools.** In collaboration with its partners, HP also offers best practice templates for common applications from Microsoft, Oracle, SAP, Citrix, SAS, and others. HP has indicated that this list will continue to expand in the near future. Users can modify these templates and tools or use them as is to readily deploy application infrastructures.

Technologies can optionally include:

- ☒ **HP StorageWorks 4400 Enterprise Virtual Array (EVA4400).** This enterprise-class storage array offers built-in virtualization that is easy to manage and improves capacity utilization. The EVA4400 offers 99.999% availability and a dual redundant design; it is factory integrated with BladeSystem Matrix as part of a total solution. BladeSystem Matrix also supports any HP BladeSystem–certified Fibre Channel SAN array.
- ☒ **HP StorageWorks P4000 G2 SAN Solutions (P4300/P4500).** BladeSystem Matrix supports P4000 iSCSI storage for use as VM data stores. HP StorageWorks P4000 G2 SAN Solutions are designed to deliver enterprise functionality that enhances virtual environments, simplifies management, and reduces costs. HP P4000 SANs aim to ensure that crucial business data remains available and can be factory integrated with BladeSystem Matrix as part of a total solution.
- ☒ **HP Networking Switch Products.** The ProCurve 6600-24XG and ProCurve 8212 chassis switch are recommended to connect BladeSystem Matrix (Virtual Connect) to top-of-rack or end-of-row switches, respectively.

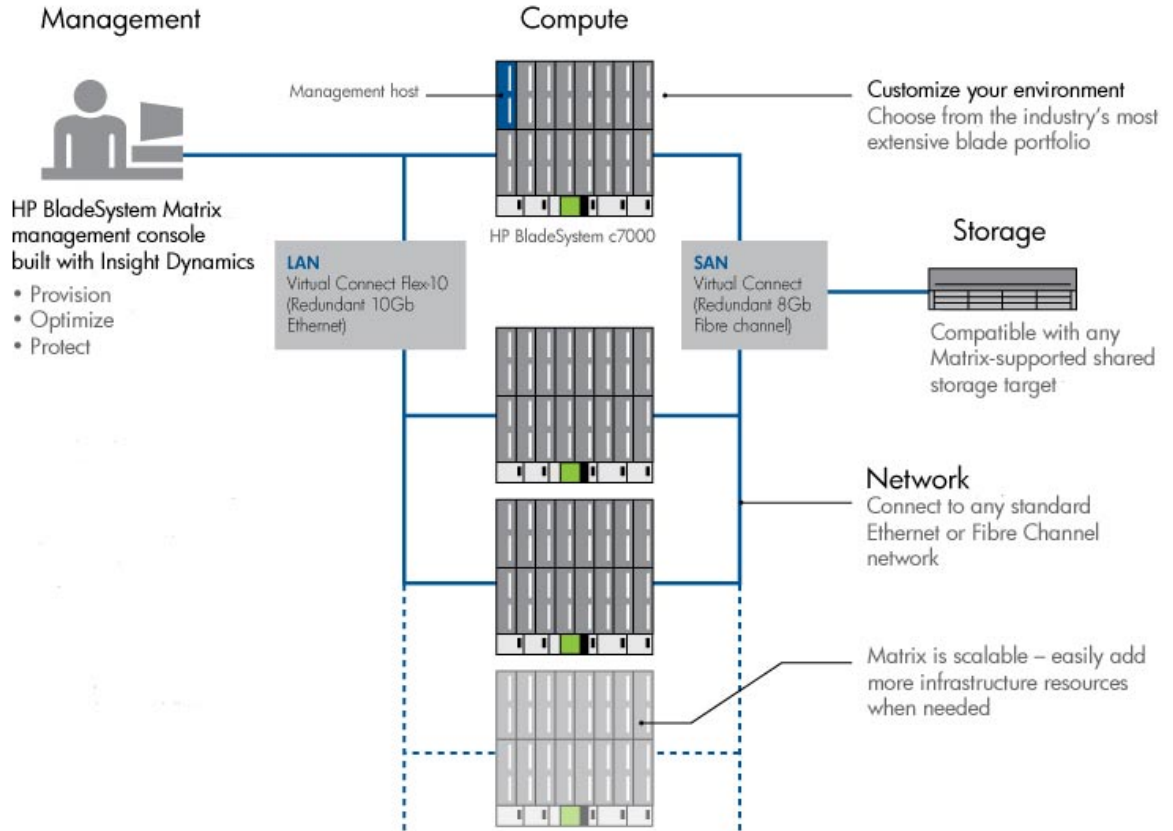
Through expansion kits, HP BladeSystem Matrix can scale to 1,500 blades or virtual machines, managed as a single central management server. Furthermore, Virtual Connect Flex-10 enables the consolidation of the network equipment from 4 to 1, as well as allocating and fine-tuning the 10GbE bandwidth to the needs of individual applications and virtual machines. Finally, with built-in power capping control, customers can significantly lower their power and cooling costs to the point of even extending the life of datacenter facilities.

Integrated HP BladeSystem Matrix Services. The Matrix solution is bundled with integrated services and the option for upgrades of HP Care Pack Services. Core to the Matrix offering are services packages that include addressing the implementation of new converged technologies as well as organizational processes required in an internal cloud:

- ☒ **HP Cloud and Converged Infrastructure Discovery Workshop** focuses on helping customers speed through the learning curve of concepts of shared services, cloud, service portfolio, governance, and security. Proper planning and execution of a private cloud can avoid the potential organizational, process, and decision-making pitfalls.
- ☒ **HP Converged Infrastructure Pilot Service for HP BladeSystem Matrix** showcases the capabilities of HP BladeSystem Matrix in a specific customer environment, testing the most common business scenarios via hands-on experience with HP consulting through observations and best practices.
- ☒ **HP Converged Infrastructure Planning and Design Services** outline a comprehensive transition plan with defined phases and business case analysis for the transition to HP BladeSystem Matrix in a customer environment to enabled cloud-based infrastructure.
- ☒ **HP Converged Infrastructure Education and Support Services** provide courses on datacenter setup, networking, system management, and storage utilization to ensure that mission-critical workloads are effectively supported by a converged infrastructure.

FIGURE 1

HP BladeSystem Matrix



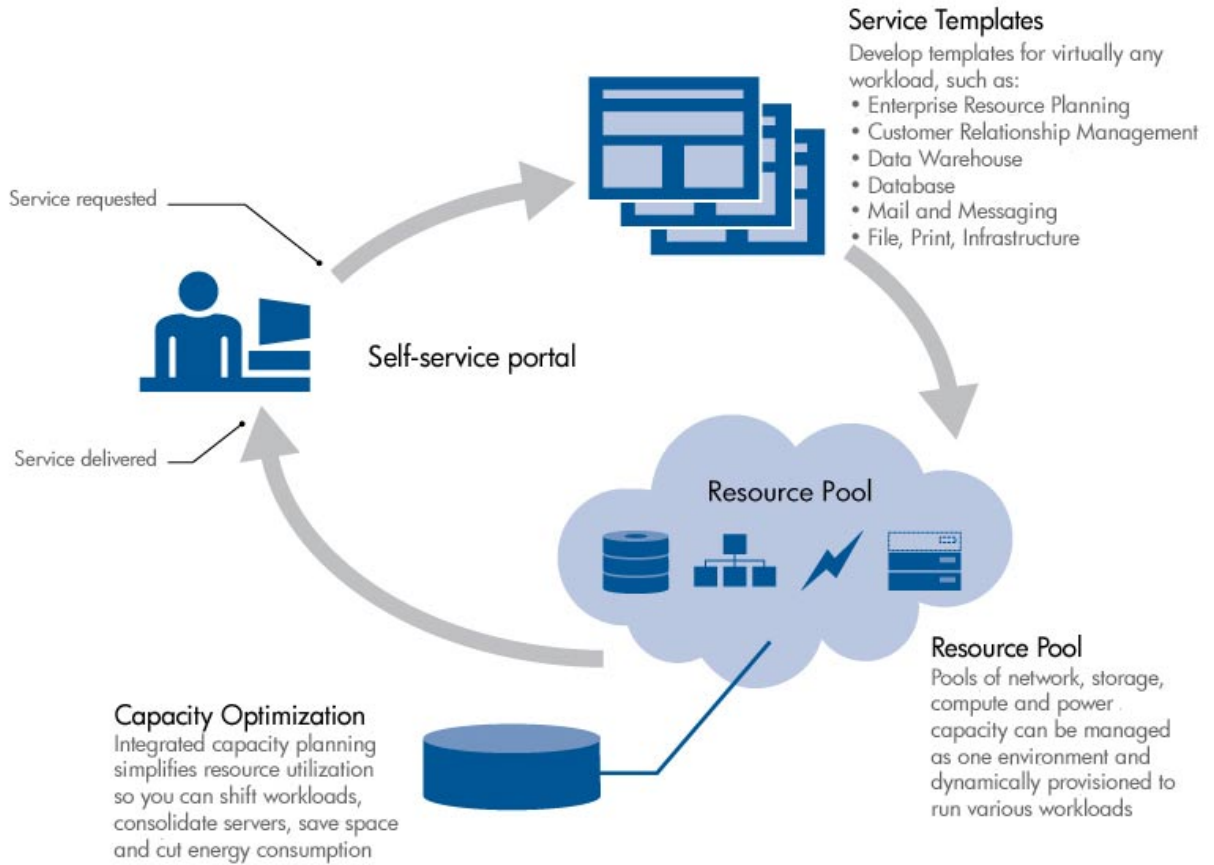
Source: HP, 2010

Virtualized Infrastructure

HP BladeSystem Matrix utilizes integrated server, storage, and network components to produce a converged infrastructure that can be quickly divided and provisioned for distinct applications, yet all managed as a single environment. Customers are able to draw from the pool of resources that can be configured and deployed to meet the requirements of a large number of enterprise applications within the organization (see Figure 2).

FIGURE 2

Business-Ready Infrastructure



Source: HP, 2010

Establishes Best Practices

IT managers are able to establish (and enforce) consistent architectural standards and operational processes for their organization via an application template library. By creating a catalog of best practice templates for their specific applications, they are able to remove risk and guesswork related to future application deployment and resource provisioning. The standardized infrastructure "building blocks" that HP BladeSystem Matrix delivers also drive consistency in methods and processes for deploying new resources and greatly reduce training and servicing variance.

Accelerates Service Delivery

HP BladeSystem Matrix provides customers with on-the-fly provisioning of infrastructure for their applications. The self-service portal for push-button provisioning intelligently deploys resources based on the established architectural standards. IT is now able to deliver IT services to business units in a matter of hours or days rather than weeks or months.

HP BladeSystem Matrix integrates with HP Server Automation software to deliver one-touch, self-service provisioning of infrastructure and applications for physical and virtual servers and provide ongoing life-cycle management of operating system and application software such as patching and compliance assurance.

Improves Reliability and Productivity

HP BladeSystem Matrix is able to provide application mobility for both physical and virtual infrastructure, which delivers a level of protection in terms of disaster recovery and high availability for customer applications. Additionally, IT can experience increases in productivity through the automated workflow engine, which removes manual steps and coordination among multiple teams to provision resources to applications.

Centralizes Management

Through a common set of tools, HP BladeSystem Matrix aims to improve IT utilization and provide a better view of IT operations and expenses. Customers are able to simplify planning for future capacity needs through a better understanding of their IT resources, including server compute, power usage, network bandwidth, and storage capacity.

Packaged Infrastructure

HP designed BladeSystem Matrix as a wire-once and easy-to-grow infrastructure solution — from the purchase order to deployment and even through expansion. Focal points were its ease of integration into a customer's existing IT environment and its ability to eliminate the need for piece-part ordering among IT organizations. A pay-as-you-grow and special lease financing strategy enables organizations to greatly reduce their up-front investment costs. Moreover, automated instant capacity programs (available in the United States) enable customers to have ProLiant server capacity available and pay for resources only as they are provisioned. The BladeSystem Matrix packages include the BladeSystem Matrix Starter Kit, which enables IT organizations to quickly get their initial BladeSystem Matrix environment up and running. The Starter Kit is delivered with the necessary management, networking, factory integration, implementation services, and hardware infrastructure for a whole enclosure at a time. At this point, customers have the option of utilizing their existing storage area network or integrating available storage options such as HP StorageWorks P4300 G2 or EVA4400 SAN optimized for BladeSystem Matrix implementation. HP accelerates customer deployment via HP Factory Express and end-to-end implementation services, which offer customers the benefits of project-managed configuration, implementation, and orientation.

As customers find IT requirements increasing initially or at any point in the future, they are able to add expansion kits to keep pace with business demands, even as instant capacity standby resources. The expansion kit enables easy purchase of additional infrastructure to instantly scale an existing Matrix environment.

Future Evolution of HP BladeSystem Matrix

Converge Everything

Since the development and launch of the HP BladeSystem c-Class and Virtual Connect in 2006, HP has seen the blade platform as a natural area for innovation due to the integrated technologies in the blade infrastructure. The HP BladeSystem addresses some of the key issues facing today's datacenter through three key product features: Insight Software for infrastructure management, Virtual Connect for virtual I/O networking, and Thermal Logic for power and cooling. Driven by the success of the BladeSystem c-Class, HP has maintained the number 1 spot in the blade server market since the middle of 2006.

HP's strategy is to think about blades less as a form factor and more as a point of integration to deliver value to its customers with datacenter infrastructure built on well-managed servers, network, storage, and power and cooling. The next phase of HP's strategy is to "converge everything," which includes not only the technologies but also the tools, processes, and architectures. BladeSystem Matrix is a continued step forward for the HP blade portfolio and a step in the next evolution that enables the HP Converged Infrastructure — a strategy to deliver customers an infrastructure that is preintegrated, scalable, and ready for quick deployment.

IDC ANALYSIS

IDC has been tracking the server industry for the past 40 years, yet it has been only in the past decade that we have observed almost linear growth in the installed server base. Recent IT trends, including more powerful x86 systems and the mainstream adoption of virtualization, have enabled IT organizations to reduce capital expenditures. However, there has been simultaneous growth in the operational costs of IT, specifically the spending on the staff to manage and the cost to power and cool the growing server installed base. Customers cannot continue under these conditions if they are expected to provide increased IT capacity and higher service levels within tighter budgetary constraints.

The mainstream adoption of server virtualization has brought customers new benefits as well as new challenges. IT organizations have been able to reduce hardware costs and create a flexible infrastructure by leveraging mobility tools; however, the virtual server sprawl within customer environments places pressure on IT in terms of the resources and staff time necessary to manage the growing number of virtual machines and network connections. The continued success of this market is dependent on not only enhanced management and automation tools but also improved practices and processes within the IT organization.

IDC's research reveals that many customers are hesitant to move to a cloud infrastructure in part from internal resistance and over reservations of security and data privacy. HP BladeSystem Matrix represents a different approach to delivering IT resources and services to the business, and as with most new things, companies are likely to be cautious. To alleviate this concern, HP will need to clearly illustrate the value of the solution and demonstrate how converged systems address both security

and data privacy concerns by allowing the customers to maintain control of access to their critical data. To run an internal cloud, IT organizations will require a shift from the traditional decision making and ROI methodology used in the legacy technology silos to a mindset that focuses on end-to-end shared service delivery. HP consulting services can benefit customers by accelerating the learning curve and provide best practices in planning and deployment leveraged from experience with real-world customer case studies.

Working in favor of BladeSystem Matrix is that HP is not introducing any brand-new technologies. Rather, HP is delivering a new value proposition by integrating proven technologies that have already been tested in customer environments, most notably its BladeSystem, Virtual Connect, EVA storage, and Insight software. HP will need to focus its efforts on the Matrix value proposition that centers on new thinking, processes, and management.

CONCLUSION

Private clouds delivered through converged systems will be commonplace in the datacenter of the future due to reductions in both capital and operation expenses, as well as the business agility achieved through the dynamic sharing of IT resources in an automated, service-centric method. A converged infrastructure will create a flexible IT environment that IT managers will be able to dynamically adapt to changing business demands and to run more cost-effectively.

HP BladeSystem Matrix is the next generation of HP's blade portfolio, designed to provide higher value through converged infrastructure, and represents another step toward delivering HP's Converged Infrastructure. BladeSystem Matrix leverages established HP enterprise technologies integrated with the tools and processes to speed and simplify the delivery of IT services. The new offering is best suited for customers that are currently focused on optimizing datacenter operations and undertaking consolidation initiatives. The centralized management tools enable IT organizations to achieve maximum efficiency through migrating and balancing workloads across their physical and virtual environments. Customers are able to accelerate the provisioning of IT to the business units via built-in capacity planning. BladeSystem Matrix also serves a role as a high-availability solution. The automated failover provides a level of disaster recovery protection for applications critical to the business.

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