

## I D C   E X E C U T I V E   B R I E F

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# Converged Infrastructure: The Future for Servers, Storage, and Networking in the Agile Datacenter and the Cloud

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### Introduction

As the economic recovery remains uncertain, dramatic changes in many industry dynamics are profoundly affecting the IT investment and operations priorities of many organizations. In response to changing conditions, senior executives want to "operationally" transform IT so that their organizations can react quickly to major changes in the business environment and also have the ability to more reliably assess revenue gains and cost savings from proposed investments in new services (e.g., mobile applications, use of cloud services, Big Data analytics).

On the IT side, one of the key strategies that IT teams are pursuing to reduce capital costs while boosting asset utilization is the transition to highly virtualized datacenters. However, IDC finds that expected boosts in IT asset use and operational efficiency often fail to materialize due to overloaded storage and data network facilities, overprovisioning of storage capacity, and a quantum leap in storage/network administration workloads. In combination, these problems can quickly overwhelm any anticipated benefits as the scope of virtual server deployment expands.

Faced with a future in which organizations need to deploy and effectively use hundreds, thousands, and even tens of thousands of server (and/or desktop) application instances in a virtual environment, companies should consider deploying optimally (e.g., densest, greenest, simplest) configured converged systems (integrated server, storage, network elements) that are managed as unified IT assets.

This Executive Brief explores the changes affecting datacenters and discusses how the move to converged infrastructure is critical for the development and adoption of private clouds.

### Market Situation

One significant consequence of the 2008 economic slowdown was a growing tendency among large and medium-sized enterprises to leverage server virtualization as part of efforts to boost datacenter efficiency, responsiveness, and reliability. As a result, now a majority of new server applications are deployed as virtual machines rather than on individual physical servers.

With this transition, IT organizations are also faced with the challenge of taking a more systemic approach to server virtualization deployment and ongoing operations. One consequence of this development is a dramatic increase in the demand for 10GbE and storage virtualization solutions that address the data management challenges associated with deploying hundreds or thousands of

virtual machine images. Of even more long-term significance is the growing desire of IT organizations to adopt a more converged approach to IT infrastructure design and deployment.

Translating the operational mandate from senior management into IT infrastructure investment decisions has been a high priority. Three key goals shaped IT transformation efforts:

- Aggressive consolidation of server, storage, and network assets through the use of technologies such as server and storage virtualization
- Faster, automated provisioning of IT assets and more reliable/timely recovery of data and applications
- Reduced administrative costs associated with system, data, and application maintenance and migration

Within many datacenters around the world, the most visible consequence of these new priorities was the rapid expansion in the use of server virtualization technology. This rapid virtualization of server assets was and remains (especially for small and midsize organizations) a key element in aggressive consolidation efforts to significantly boost asset utilization. The shift to virtualized servers often leads to significant disruptions in a number of areas:

- An explosion in virtual machine images (often called virtual server sprawl), which increases server/storage administrative burdens and threatened application performance
- Overloading/overprovisioning of storage and data network facilities, which forces time-consuming, costly, and often unnecessary upgrades
- Unpredictable application performance and recovery behaviors, which stall plans to migrate more business-critical applications to virtual environments

These problems can quickly overwhelm any hoped-for benefits as the scope of virtual server use expands beyond a few hundred virtual machines. Early adopters of widespread server virtualization quickly recognized the perils associated with rapid virtual server growth and developed a standard strategy for avoiding problems related to the following:

- **Virtualized storage.** The use of virtual volumes and thin provisioning allowed adopters to avoid both storage administration overload and the massive overprovisioning of storage for virtualized servers. Today, more companies are leveraging scale-out storage systems based on a new generation of x86 processors that embed storage virtualization into the core system. These systems enable the more effective use of automated data movement to lower storage hardware costs, further boost asset utilization, and enable more rapid application recovery across multiple datacenters.
- **Upgraded and converged datacenter networks.** This most recent step unifies the network (10GbE based) for both storage and data network traffic. This reduces cabling and reconfiguration costs while providing greater network capacity for future growth.

## Definitions

Converged infrastructure is the development of a datacenter (or closet) based on a set of standard elements (e.g., x86 processors for compute, PCI for the system bus, and 10GbE for internode and storage connections). By leveraging hypervisor and storage virtualization software, these "chunks" can then be dynamically partitioned and automatically rebalanced to support a pool of different business applications.

For IT, the goal is no longer to deploy each element (server, storage, network) individually but to build the optimal (e.g., densest, greenest, simplest) datacenter on a set of modular converged systems that make full use of industry-standard processors across the entire environment. Companies can then manage the unified IT assets in these systems (e.g., a rack, an aisle, or an entire datacenter built and deployed as a single pool of converged IT infrastructure) for different service-oriented applications (e.g., virtual desktops, data analytics warehouses, or large content repositories).

## Benefits

For many organizations, the most immediate hoped-for benefit from adopting a converged datacenter infrastructure approach to IT asset acquisition is an up-front reduction in spending on hardware assets. In part, this is because IT can avoid wasteful overprovisioning and the continual rebalancing of server, storage, and network resources as applications evolve and business requirements change. Equally important is that IT can get rid of much of the cable cluttering the datacenters, and this can be a surprisingly large savings.

The savings in hardware spend associated with PODs shouldn't be the sole justification for a shift to a converged datacenter infrastructure. Without advanced, unified, cross-tier management capabilities, organizations have a bunch of hardwired hardware that can't do much dynamically. Simply providing an integrated set of existing systems, storage, and network management solutions does not effectively address this requirement, however. For example, what good is converged infrastructure if storage administrators still have to provision and reconfigure every LUN and volume manually?

More savings result when IT can significantly improve the utilization rates for all of the IT assets in the datacenter. The next stage of converged datacenter infrastructure maturation is the addition of unified orchestration functions that automate provisioning and enable policy-based resource management for the PODs and the applications running on them.

Ultimately, a converged datacenter infrastructure has to extend beyond individual PODs. IT needs to leverage advanced solutions that extend efficient operations and automated resource management across multiple PODs in the datacenter — and across multiple datacenters. Without this extension, IT will just be creating new stovepipes, albeit at a different scale. In addition, IT will be unable to deliver effective and efficient DR/business continuity.

By deploying a converged infrastructure of unified storage, servers, and networks, an IT department can:

- Boost operational efficiency
- Continue aggressive consolidation of server, storage, and network assets through the use of technologies such as virtualization (server and storage) and unified networks (10GbE)
- Improve utilization of installed IT assets with technologies such as thin provisioning and data deduplication
- Reduce costs associated with system, data, and application maintenance and migration through use of live migration and automated data movement
- Improve responsiveness to business needs and requirements
- Achieve faster, automated provisioning of IT assets
- Enable more reliable and timely recovery of data and applications
- Reduce corporate risk from data loss or misuse

## Trends

Navigating the phases of converged IT infrastructure maturity will also be at the core of the efforts of many organizations to implement a private cloud for their business applications.

The motivations firms have in deploying private cloud are varied. However, they fall into two broad categories:

- Some organizations see private cloud as a way to increase asset utilization and operational efficiency.
- Many others (often the most aggressive adopters) see private cloud as the key to boosting business agility as they seek to gain competitive advantage through new developments such as mobility and Big Data analytics.

Suppliers must boost the efficiency gains and operational savings while enabling further-reaching benefits such as improved provisioning times and running IT as a service.

Firms tend to view the critical technologies to the deployment of private cloud first at the physical infrastructure level and then at the logical management level, which is indicative of the nascent stage of private cloud adoption and technology integration. The majority of respondents to an IDC survey indicated that server virtualization and storage virtualization are key technologies enabling private cloud; however, service catalogs and orchestration management software, which are viewed as less critical to deploying a private cloud, will play a critical role in meeting the agility goals.

Storage network infrastructure is one of the areas that is most affected by the development of converged IT. The desire to simplify the IT platform includes the desire to simplify the underlying network environment. Most converged IT solutions are based on a standard 10GbE foundation (with a few leveraging InfiniBand instead). At the same time, most of the mission-critical applications and critical data sets in these organizations currently leverage Fibre Channel-based storage systems.

This combination would appear to bode well for Fibre Channel over Ethernet (FCoE) as the obvious option for storage connectivity in large enterprises and many midsize enterprises. Conversely, many smaller organizations that are also looking at converged IT are opting for iSCSI and see the move to 10GbE as a significant performance boost. Finally, a number of the largest hosting and cloud service providers that are already dealing with tens of thousands of virtual machines are opting for file-based (NFS) solutions that also run on 10GbE.

## Considerations

A big challenge for organizations that want to migrate to a converged infrastructure is finding the right partner to help. IT departments should look for an IT solutions supplier with a broad product and service portfolio (server, storage, and network management). In addition, many organizations may not clearly understand the business value of adopting a converged datacenter approach when it comes to IT infrastructure investment decisions.

A shift to a converged IT infrastructure is also likely to mean a complete rethinking of IT budgeting and cost allocation. As a result, many IT organizations must adjust existing product selection and management practices to fully take advantage of converged IT infrastructure. When speaking with IT executives considering broader use of this approach, IDC has three major recommendations:

- Embrace standardization of hardware and software components as much as possible to simplify management and interoperability challenges. However, it is important to be sure that the approach also provides an interoperability and transition path for mission-critical applications on installed systems and SANs.

- Implement a mature, standardized, and centralized approach to management operations with added investment in performance monitoring and analytics and install a chargeback system.
- Revamp the IT organization structure to move away from device-specific (e.g., server, storage, and network) administration and move toward an IT resource-oriented (e.g., database, collaboration, and archiving) structure.

## Conclusion

Early adopters of widespread server virtualization quickly recognized the perils associated with rapid virtual server growth and developed a standard strategy for avoiding problems. Many of these early adopters moved rapidly to networked storage if they hadn't already done so, which enabled them to better take advantage of live migration technologies to reduce planned downtime. The next desired step in this area is to move to a unified network (10GbE based) for both storage and data network traffic to reduce cabling and reconfiguration costs while providing greater network capacity for future growth.

Once the move to a unified network was made, organizations virtualized their storage. The use of virtual volumes and thin provisioning allowed these companies to avoid both storage administration overload and the massive overprovisioning of storage for virtualized servers.

Ultimately, a long-term strategy for the virtualized datacenter needs to be developed. To achieve this, IT needs to develop a more systematic approach to deploying and managing IT assets in the highly virtualized datacenter of the future. The underlying goals of these efforts include:

- Enable more cost-effective and predictable spending on servers, storage, and network equipment
- Ensure that all purchased IT assets are used to their maximum level
- Reduce the operational and management burdens associated with new application deployment, application/data migration, and business continuity

The key foundation underlying the strategy that many organizations adopt to meet these goals is to leverage emerging converged IT infrastructure solutions. The transition to converged IT infrastructure will play a vital role in helping IT departments meet the rapidly evolving business needs of their organizations. It will also be critical in efforts to reduce both the capital costs and the operational costs of running datacenters and the applications/information residing in them. To meet these objectives, organizations need IT solutions that more tightly integrate the hardware elements, provide an open operating environment, and support full orchestration of resources across the entire datacenter.

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