

Lab White Paper

Hitachi Unified Compute Platform (UCP) and Microsoft Fast Track Reference Architectures for Private Clouds

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Introduction

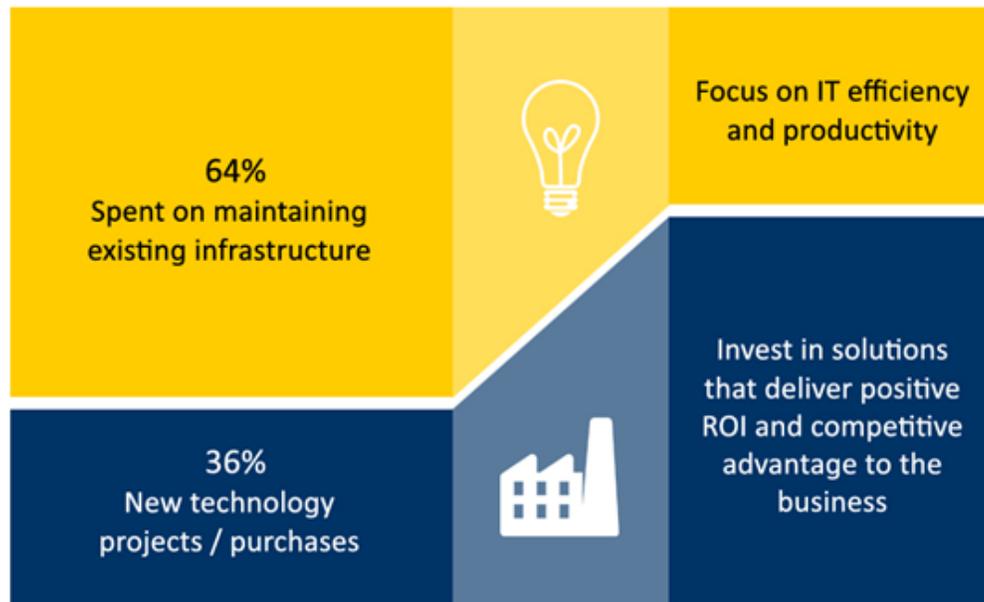
The value of virtualized and cloud computing infrastructures has come into clear focus. Business agility, more efficient operations, and costs savings top the list of benefits. Yet many organizations remain unsure of how to deploy a cloud, or how to leverage the physical resources they already have. In this paper, ESG will highlight key industry trends and customer challenges regarding virtualization and cloud computing, and discuss how converged infrastructure solutions like the Hitachi Unified Compute Platform (UCP) for Microsoft Private Cloud—delivering Microsoft-validated Fast Track Reference Architectures (RAs)—can help organizations deploy a private cloud in days instead of weeks or months. These solutions, tested for demanding workloads such as Microsoft Exchange and Microsoft SQL Server (among others), enable organizations to build cloud-based solutions for delivering IT-as-a-service and simplify the ongoing management of private cloud IT resources.

Background: Industry Trends and Customer Challenges

Tactics or Transformation?

For IT organizations, “keeping the lights on” will always take some effort and budget because they must maintain the existing infrastructure on which the business operates. According to ESG research, respondent organizations expected to spend nearly two-thirds (64%) of their 2013 IT budget on maintaining existing infrastructure, and only 36% on new technology projects (see Figure 1).¹ But as more of their budgets are consumed by basic maintenance, organizations have less for investing in new technologies that can transform how they do business. Manual operations, tedious interoperability challenges, and multiple administrative tools often keep IT mired in tactical efforts. Forward-thinking organizations search for ways to spend more of their budgets on innovative solutions that provide strategic value and free up IT resources to focus on driving business value rather than caretaking infrastructure.

Figure 1. Focus on Maintaining Infrastructure Hinders IT Agility



Source: Enterprise Strategy Group, 2014.

¹ Source: ESG Research Report, [2013 IT Spending Intentions Survey](#), January 2013.

Virtualization: A Perennial Priority

So, which strategies are spending priorities for IT? According to ESG research, the increased use of server virtualization remains in the top three IT priorities most-cited by respondents, where it has been for the past few years.² Virtualization enables consolidation of applications, data, and infrastructure, resulting in lower spending on equipment, energy, floor space, and operations. And while VMware originally claimed the lion's share of the market, other hypervisors, including Microsoft Hyper-V, have gained significantly. In fact, according to ESG research, 65% of today's organizations are running multiple hypervisors, for both business and technical reasons.³ For example, because mission-critical Microsoft applications such as SQL Server and SharePoint have built-in synergies with Hyper-V, organizations already using VMware often add Hyper-V to gain those benefits.

Private Clouds Are Game Changers

As great as they are, the consolidation and cost efficiency benefits of basic server virtualization are just the beginning. The next level of benefit is to actually improve IT service delivery and optimize infrastructure with a private cloud.

The term "cloud" has been overused and misused, resulting in confusion, so it's important to clarify what the word means. *The essential components of cloud computing include self-service, on-demand provisioning using pools of centrally managed, virtualized resources that are highly scalable and elastic, and include usage-based tracking.*⁴ A **private cloud** is operated solely for the benefit of the organization that builds and operates it.

Private clouds streamline access to IT resources, enable self-service that enhances productivity, and offer better economic consumption models. For example, with a private cloud, organizations can add new users on the fly, quickly scale up to respond to new opportunities or competitive threats, and scale back down once a frenzy passes. You can't do that if you're waiting on application-specific servers linked to dedicated storage LUNs and built one piece at a time.

Converged Infrastructures Speed Cloud Implementation

The problem for many organizations is that they don't know how to build a private cloud. While they are enticed by the possibilities of a private cloud, most companies are unsure of how to proceed and many are simply not equipped to build what they want. Doing it yourself requires a lot of time and expense, from planning to procurement to testing, assembling, integrating, and then managing it. It's a hard job, and often results in inadequate resources for the workloads the homegrown private cloud supports.

What Is a Converged Infrastructure?

For these reasons, "converged infrastructures" or "integrated computing platforms" are gaining in popularity. ESG defines these as *infrastructures that integrate hardware and software components that are normally operated separately into single, consumable IT systems.* These infrastructures can mean the difference between success and failure for a private cloud, offering relief from the tasks of acquiring and integrating individual components. Two key types of converged infrastructure are:

- **Reference Architectures.** RAs are publicly available, pre-validated designs or blueprints that aggregate hardware and software from multiple vendors onto a jointly supported computing platform. They require some IT expertise to assemble, often from a reseller or systems integrator. RAs are often designed to scale based on specific workload sizes.
- **Pre-configured Solutions.** These bring together servers, storage, networking, virtualization, and software into prepackaged systems for streamlined consumption.

² Ibid.

³ Source: ESG Research Brief, [Multiple Hypervisor Usage Trends](#), December 2012.

⁴ Source: ESG Research Brief, [Private Cloud Attributes](#), May 2013.

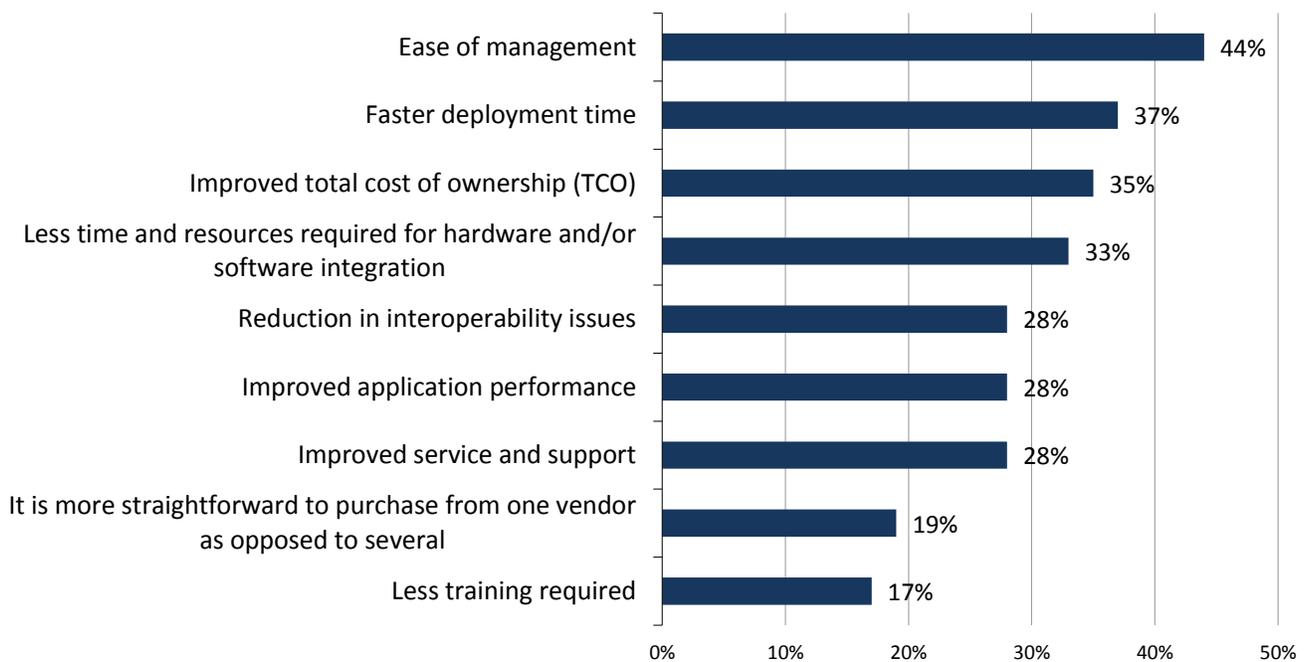
Selecting a vendor that provides configuration options and solution flexibility can ensure that your private cloud choice meets your business’s specific requirements. For example, the joint Hitachi/Microsoft solution described in this paper offers a reference architecture that is pre-validated by Microsoft and preconfigured by Hitachi.

Cloud Users Prefer Converged Infrastructures

Converged infrastructures can ease the burden of cloud deployments and ensure successful implementation, as ESG research demonstrates. Figure 2 shows the benefits that respondents to a recent survey reported experiencing with integrated platforms, including simplified management, faster deployment time, improved TCO, reduced integration time and cost, fewer interoperability issues, and better application performance.⁵ Taking all these benefits into consideration will help you properly assess your IT resources and confidently deploy a private cloud solution that meets your ongoing business requirements.

Figure 2. Benefits of Integrated Computing Platforms

**What benefits do you believe an integrated computing platform offers your organization?
(Percent of respondents, N=471, multiple responses accepted)**



Source: Enterprise Strategy Group, 2014.

User preferences further validate the benefits of these converged infrastructures. In a recent ESG survey, respondents were asked about their experience with virtualization/private cloud infrastructures. While 46% had built these environments on their own, 64% stated that they would prefer a converged strategy.⁶

With this background in mind, Hitachi and Microsoft have developed a set of private cloud RAs that are delivered as Hitachi converged infrastructures (including server, network, and storage components) designed for the Microsoft Private Cloud Fast Track Reference Architecture program. These solutions, the Hitachi Unified Compute Platform for Microsoft Private Cloud, are preconfigured before delivery, and provide turnkey converged infrastructures designed and optimized for Microsoft Hyper-V technology and System Center Management and orchestration.

⁵ Source: ESG Research Brief, [Integrated Computing Trends](#), March 2011.

⁶ Source: ESG Research Report, [2012 IT Spending Intentions Survey](#), January 2012.

Microsoft Private Cloud Fast Track

Microsoft Private Cloud Fast Track is a joint reference architecture effort between Microsoft and its hardware partners, such as Hitachi. The program's goal is to reduce the time, complexity, and risk for customers deploying private clouds.⁷ Dozens of Fast Track solutions are available for various customer needs, but the Hitachi solutions focus on delivering enterprise-class availability and protection.

Fast Track architectures start with Microsoft lab-tested and validated guidelines for implementing multiple Microsoft products and technologies. These guidelines assist customers with hardware they already own or that they purchase. In addition, validated RA implementations are available directly from Microsoft hardware partners. While some customers deploy these RAs on their own, leveraging a hardware partner such as Hitachi offers the fastest time to value with the lowest risk. Program features include rigorous architectural principles, a design for resiliency, and stringent partner validation criteria.

Architectural Principles

Fast Track-validated RAs are designed for pooled resources with elastic scalability. RAs are designed to ensure continuous availability and predictable performance, with an assumption of multi-tenant consolidation and usage-based pricing. Security is built in, and options include self-service provisioning and extended capabilities delivered by partners.

A Design for Resiliency

Redundancy and resiliency are built into all Fast Track RAs. Technologies such as integrated replication, clustering, NIC teaming, I/O load-balancing and failover, multi-channel SMB, and live migration ensure high availability of applications and services.

Stringent Partner Validation Criteria

In order to be included in the Fast Track program, partners first formulate solutions based on the Fast Track Architecture and Management Guides and build physical systems using Microsoft software guidelines. Microsoft evaluates each solution's capabilities using functional and stress tests before validating it.

Mandatory criteria must be included before approval; checklists of recommended and optional criteria are also presented. Some examples include:

- **Mandatory criteria:** Windows hardware certification; failover-clustering validation; clustered RAID controller validation; redundant power supplies; and support for VM mobility, Hyper-V live migration, and storage migration. All solution features must operate with live migration.
- **Recommended criteria:** BitLocker encrypted clustered storage; network isolation; dedicated LAN for solutions with out-of-band management adapters; and use of System Center Virtual Machine Manager templates.
- **Optional best practices:** Hyper-V application monitoring; VM failover prioritization; third-party Hyper-V virtual switch extensions; resource metering; and Fibre Channel and SSD disk among others.

Key Microsoft Components

The core Microsoft technologies utilized in these current RAs include Windows Server 2012, including Hyper-V and System Center 2012 SP1. (Note that in the first half of 2014, the components will be refreshed to include Windows Server 2012 R2 and System Center 2012 R2 capabilities.)

⁷ For more information, visit <http://www.microsoft.com/en-us/server-cloud/fast-track.aspx#fbid=N1eJJ9jLVI>.

Windows Server 2012 with Hyper-V

Microsoft's Windows Server 2012 offers customers new functionality designed to optimize virtualization and cloud computing while capitalizing on existing investments. Understanding the opportunities and challenges that consolidation, virtualization, and cloud computing offer, Microsoft has built in numerous enterprise-level technologies such as Hyper-V server virtualization, Active Directory for controlled access, and network and storage virtualization to enable a more dynamic and efficient infrastructure.

Hyper-V provides organizations with massive scalability to transform data centers into complete cloud platforms, as well as expanded support for resource allocation. It now supports up to 64 virtual processors, a major improvement for certain virtualized workloads (such as Exchange 2013), and 1TB of memory for VMs.

Windows Server 2012 also delivers enterprise-class storage features that can be deployed on cost-effective, industry-standard hardware. Some or all of these features may be included in RAs that don't include traditional high-end storage. These features include:

- *Storage Spaces*—provides virtualized storage pools and virtual hard disks that are configured with specific provisioning and allocation attributes, and can leverage failover clustering for high availability and resiliency.
- *Enhanced SMB protocol*—enables file server support for applications needing high performance and availability.
- *Data deduplication*—offers state-of-the-art data chunking and compression for individual servers and branch office extension.
- *Thin provisioning and trim*—provides native support for thin provisioning of storage plus reclamation when storage is no longer needed.

Various design points for the Private Cloud Fast Track solutions provide choices for end-users on the type of hardware architecture they are familiar with.

Unified Management with System Center 2012

System Center 2012 provides unified management of enterprise Windows environments across data centers to ensure that customers gain the maximum benefit of cloud computing. Its hallmarks are simplicity, cost-efficiency, and application focus. Key System Center components for cloud solutions include Virtual Machine Manager for configuration and management of virtual resources, and Orchestrator for automation and provisioning. Other components handle host configurations, data protection, health/performance monitoring, and incident management.

Fast Deployment, Less Risk, Lower Cost

Private Cloud Fast Track RAs are designed to help customers deploy their cloud environments faster, with less risk and lower TCO.

- *Faster deployment*—predefined capacity helps to streamline planning, and end-to-end architectural and implementation guidance helps to speed deployment. Advanced functionality, automation, and integrated VM management add to the ease and speed of deployment.
- *Reduced risk*—solutions purchased from hardware partners are fully tested for interoperability of compute, storage, and network components, which not only minimizes the chance of problems but also adds to the ease and speed of deployment.
- *Lower TCO*—fault tolerance and built-in features ensure high availability and greater productivity. In addition, dynamic pooling makes optimal use of server, network, and storage resources, and commodity storage devices can be endowed with enterprise-class features using Windows Server 2012.

Hitachi Unified Compute Platform for Microsoft Private Cloud

What do enterprise organizations require for their private clouds? First, reliability and uptime—in some industries, to comply with regulations, and, in all industries, to maximize profitability. Enterprises need confidence that their data and applications are protected, and that they can resume productivity in minutes, not hours or days. They need flexibility—shifting workloads, adding users, and launching new applications cannot stall operations. Enterprise private clouds must be able to scale easily, often to great heights—growing from hundreds of VMs to tens of thousands smoothly could be the difference between success and failure. In short, enterprise organizations demand a lot from a cloud infrastructure, so it has to be rock solid.

The Hitachi UCP for Microsoft Private Cloud solution was designed to provide that peace of mind. Each solution enables organizations to deploy cloud-based solutions for infrastructure-as-a-service (IaaS) and platform-as-a-service (PaaS). Hitachi UCP solutions are designed for the enterprise with guaranteed service level agreements (SLAs) and recovery time objectives (RTOs), and are tested and validated for the most demanding IT applications and workloads such as Microsoft Exchange and SQL Server. The promise of Hitachi is delivered with every solution:

- **Mission-critical Architecture** – the Hitachi Unified Compute Platform is designed for 99.999% availability.
- **Guaranteed SLAs and RTOs** – Service guarantees are written in your purchase agreement to provide peace of mind.
- **Deployment in Days** – Simple deployment speeds implementation by weeks or months.
- **IT Agility** – Flexible infrastructure easily supports disparate applications and workloads.
- **Disaster Recovery** – Solution supports two- and three-site disaster recovery for true enterprise failover and recovery.⁸

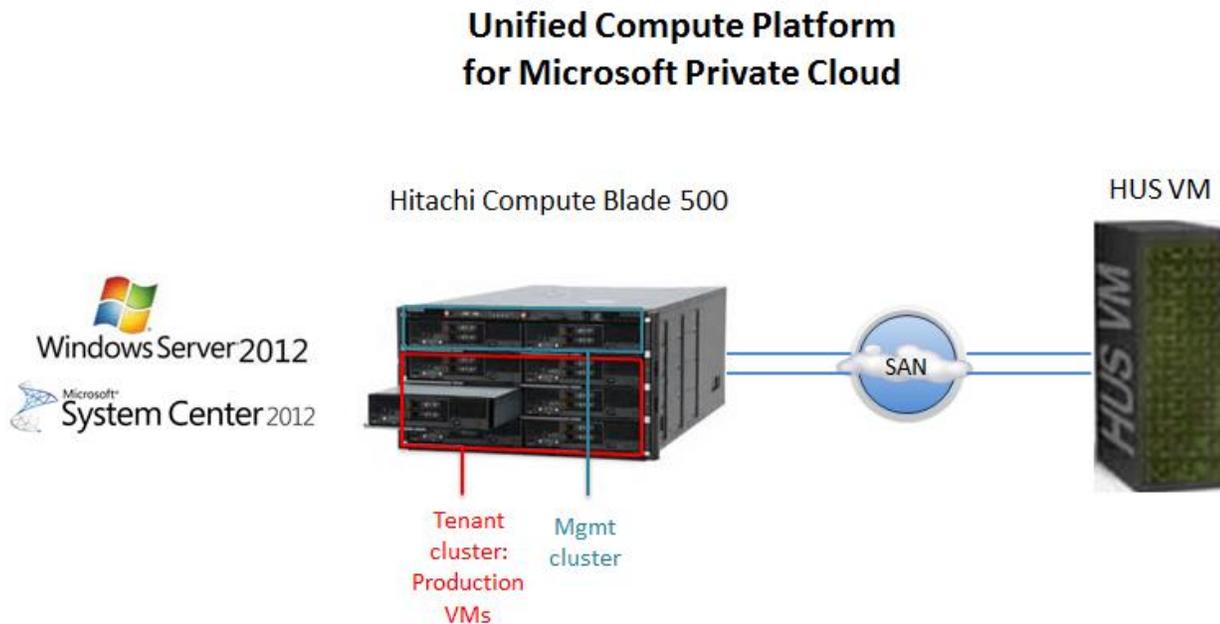
Pre-configured Solutions

Each Hitachi UCP is an enterprise-class, converged platform that leverages Hitachi mission-critical compute and storage components, preconfigured for easy ordering and rapid deployment according to Microsoft Fast Track requirements. The configuration was designed for the performance, high availability, and protection that enterprise customers need. The architecture includes:

- **Two Hyper-V failover clusters**
 1. A six-node cluster for production or tenant VMs
 2. A two-node management cluster including VM deployment software and tools to manage infrastructure components
- **Hitachi Compute Blade 500**, an eight-blade chassis built for mission-critical applications.
 1. Each blade offers 384GB RAM standard; Intel Xeon E-5 series processors with 16 cores per blade; symmetric multi-processor interconnects for bidirectional scaling; and internal 8GB Fibre Channel and 10GbE switching that meets the Microsoft Fast Track high availability standards.
- **Hitachi Unified Storage VM (HUS VM)**, a storage solution designed for large deployments that combines storage virtualization with unified block and file management.
 1. Storage virtualization adds key storage services to existing storage resources, with unified management of all virtualized internal and external storage.
 2. HUS VM includes 128GB cache and 8 x 8Gb/sec Fibre Channel ports. Integrated front-to-back I/O load balancing and high-performance SAS and SATA drives deliver mission-critical performance.
- **HDS software** including Hitachi Dynamic Provisioning, which enables wide striping and thin provisioning for enhanced storage performance; Hitachi Command Suite for storage management; and Hitachi Compute System Manager for managing HDS servers.

⁸ For more information, visit http://www.hds.com/solutions/infrastructure/microsoft-cloud-deployments/?WT.ac=us_mg_sol_hvcft.

Figure 3. Solution Overview



Hitachi and Microsoft: Better Together for Cloud Delivery

The key benefits of this Microsoft-validated solution with HDS components are the truly enterprise-class features for high availability and disaster recovery. Various capabilities designed into the solution ensure customers of five 9s availability, so they can maintain operations and maximize profitability. In industries such as finance, healthcare, and retail, disruption of IT services can result in loss of revenue and regulatory fines, so these capabilities are essential.

High availability. In addition to there being no single point of failure in the UCP for Microsoft Private Cloud framework, the solution offers virtual machine high availability with Microsoft Hyper-V failover clustering. If a blade in the cluster fails, the virtual machines residing on that blade automatically fail over to another blade in the cluster. VM Live Migration ensures that running VMs can be moved from one blade in the cluster to another to balance workloads for performance or to move VMs before doing server maintenance. Symmetric active-active storage controllers also enhance availability and protection.

Advanced features. Storage virtualization delivered by HUS VM saves money by extending the useful life of storage resources that customers already own. Built-in thin provisioning makes efficient and cost-effective use of storage, and automated workload balancing ensures optimal performance.

Ease of ordering, deployment, and management. Because they are pre-validated, these solutions are simple to order, so IT doesn't have to research components and test interoperability. Pre-configuration by HDS speeds implementation. HDS integration with Microsoft System Center ensures consolidated management, including automation and orchestration. HUS VM meets the Common Information Model standards that enable the storage automation features of Microsoft System Center 2012; in addition, Hitachi has a Microsoft VSS provider integration with HUS VM for storage-based snapshots. Alerts and notifications for HUS VM and Hitachi Compute Blades are delivered to the System Center console using Microsoft Operations Manager Management Packs. This makes it easy to manage the complete cloud infrastructure from one location. Also, VMs are managed through System Center Virtual Machine Manager, while System Center Orchestrator facilitates automation in the data center by creating workflows to provision, deploy, and manage VMs on the HDS components.

Scalability and self-service. Customers using this solution have saved weeks and even months in deployment time, and they are able to scale quickly and easily. Technologies such as template-based virtual machine provisioning

make it possible for administrators to quickly and easily deploy virtual machines. Organizations using this solution have been able to scale to tens of thousands of VMs and have supported more than a million users in a single deployment. In addition, the solution enables self-service VM provisioning. IT administrators can delegate authority to certain users, allowing them to create VMs using a web interface and leveraging predetermined templates. These capabilities can keep organizations productive instead of waiting for IT.

The Bigger Truth

IT's job has traditionally been to operate various hardware and software components to deliver a platform on which to run business processes. Identifying, evaluating, purchasing, deploying, and integrating infrastructure components is a large part of the job. For most organizations, IT defines which services—and service levels—are available to the business. At the same time, managing requests from various business departments often results in IT having to deal with complex environments, point solutions, and silos of infrastructure. Ultimately, maintaining system interdependencies and application interoperability on a daily basis is not only difficult, but also a grossly inefficient use of IT administrators' time.

Virtualization and cloud computing can change that. Resources no longer must be dedicated to individual applications or workloads, and can now be shared and even self-provisioned by users. Pools of resources can scale up in crunch times, and back down when urgent needs diminish. IT systems today must be cross-functional, deliver intelligent infrastructure components that execute in harmony, and utilize virtualization-aware management tools and automation. The days of IT operating machines are on the way out; instead, IT is charged with delivering services when and where needed.

Providing these services will remain difficult without tight integration among compute, storage, networking, and virtualization components. Having IT build that kind of environment with individual components is likely to be a difficult, time-consuming, and costly effort. Joint efforts in converged infrastructure, such as the Hitachi Unified Compute Platform for Microsoft Private Cloud, can deliver faster deployment and time to value with high availability and performance for any workload.

The market is certainly ready for a Microsoft private cloud, and this joint reference architecture is a proof point. ESG Lab has years of experience testing both Microsoft and HDS products, and recently put Windows Server 2012 with Hyper-V through its paces; it definitely proved itself as an enterprise-class virtualization platform. ESG Lab believes that any organization looking to build a private cloud will find these solutions to be rock-solid platforms that can be quickly and easily deployed, with all the necessary enterprise-features.

HDS was not the first to market with a converged infrastructure, and Microsoft Hyper-V came after VMware had launched the server virtualization market. But HDS has a reputation for delivering high-quality, enterprise-class data center components, and Microsoft has become—to the surprise of some—a true enterprise virtualization player with Windows Server 2012 and Hyper-V.

The combination is a strong one. Your IT department can be your hero in many ways, but how much value is there in having IT build a cloud infrastructure on its own? ESG recommends that you look carefully at solutions like the HDS/Microsoft private cloud RAs. They can get you where you want to go faster, more efficiently, and with less cost, while relieving IT of some of the blocking and tackling so they can focus on service delivery.



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