White
Paper

Building a Private Cloud

Cisco and Microsoft—Optimized Infrastructure Strategies

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Cisco and Microsoft: Complementary Strategies for the Private Cloud

When it comes to game-changing infrastructure technologies, private clouds are leading the way toward new IT efficiencies and a simplified means of consumption. Building on their roots as virtualized data centers, private clouds are rapidly moving up the list of must-have technologies to become an architectural standard for IT organizations around the world.

What are the requirements for a private cloud? It needs to provide high levels of availability at both an application and site level along with governance and automation. The private cloud is expected to provide business-aware IT control—driving the right levels of availability, security, and compliance for every application via automated business continuity, policy-based governance and provisioning, and virtualization-aware security and compliance. IT also wants the private cloud to scale to accommodate the rapid shift of workloads and management of data. In addition, it is important for them to manage the heterogeneous pools of infrastructure found in many IT environments today as well as provide workload mobility, easily porting applications from on-premises to off-premises. Private clouds must enable a wide variety of use cases. This includes not only automating the provisioning of infrastructure and eliminating infrastructure bottlenecks, but also automating application provisioning, providing disaster recovery, leveraging insights from structured and unstructured data, and having the ability to burst to a hybrid cloud when more capacity is required.

Management tools for private clouds are also critical as they enable automated, centralized management, better visibility into operations, higher levels of performance monitoring, and the flexibility to manage changing workloads and application demands. And all this should be done by giving IT visibility across infrastructures and applications through a unified management console—the single pane of glass. With a private cloud, IT can act like a true business partner, providing business-critical applications at the speed of business.

Cisco and Microsoft are taking advantage of the private cloud storm by joining forces to blaze a best-of-breed path for both current practitioners and future converts. Teaming up in this hot market is a pragmatic choice for these two companies; Cisco and Microsoft realize that in the realm of private cloud, there are distinct advantages to working together. So the two companies have created a plan that fully optimizes their complementary technologies, and can make it easier and more compelling for IT organizations to adopt the private cloud. Some key results of their partnership include:

- Cisco's Unified Data Center technology enables businesses to take full advantage of the Microsoft private cloud via three pillars: compute, manageability, and networking. Users can gain the benefit of an intelligent infrastructure, a virtual networking solution, and a single, unified way to manage it all.

- The Microsoft Private Cloud Fast Track program creates a comprehensive, turnkey solution that helps companies easily adopt the cloud. These pre-validated, pre-engineered offerings are a result of the joint efforts of Cisco, Microsoft, EMC, and NetApp.

- The combination of Cisco's infrastructure and Microsoft's private cloud technology can help automate everything from the application down to the operating system and hardware-level components.

- UCS Manager's integration with System Center 2012 R2 helps organizations achieve a true single-pane-of-glass that can manage both physical and virtual assets across the Microsoft Cloud Solution.

- When SQL Server is combined with the joint Cisco and Microsoft private cloud architecture, users gain access to a powerful tool for dealing with data management, analytics, big data, and data warehousing.

Microsoft has dedicated research and development resources to integrating its products with Cisco infrastructure technologies, with an acute focus on the application. These efforts are producing real-world solutions that can enable customers of both companies to enhance their IT environments and meet today's demands for business agility, with the added benefit of cost-efficiency and improved data center management.
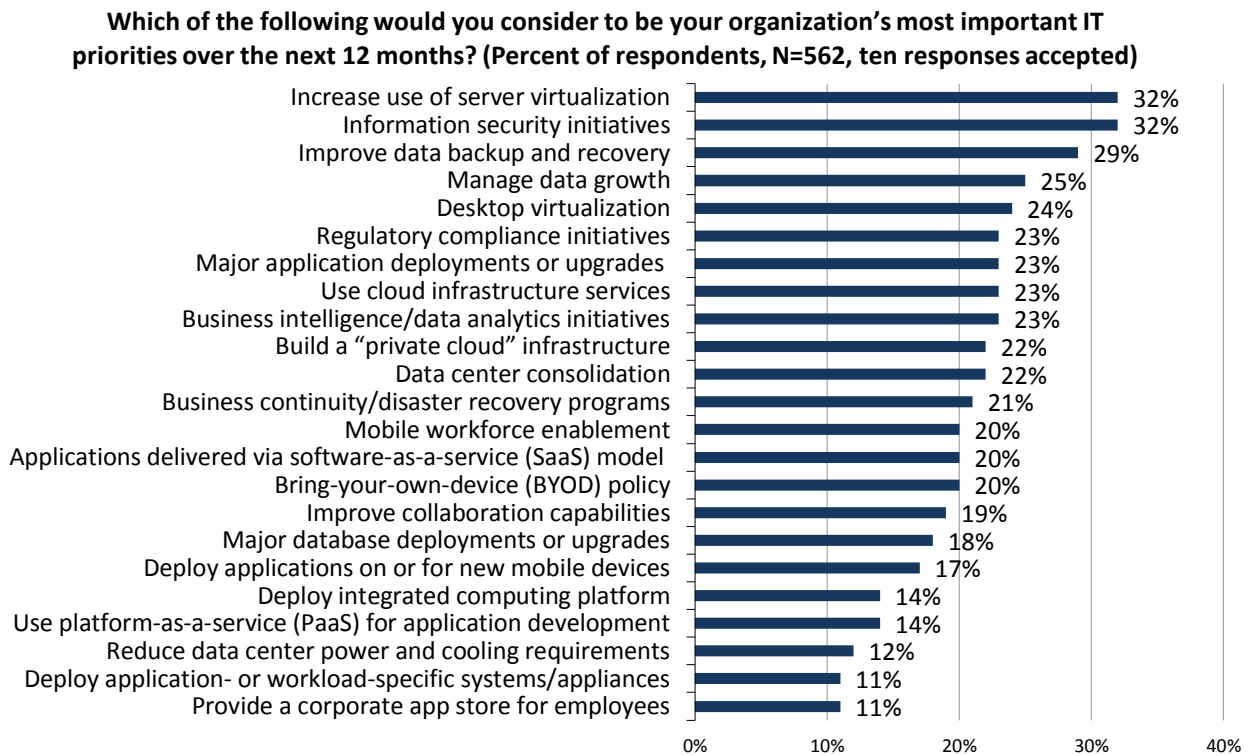
Cloud Trends and Market Priorities

In response to excessive spending, sluggish time to market, and a lack of business agility that plagues legacy IT infrastructures, private clouds are gaining in popularity as they emerge from their formative period (when they were characterized more by hype and contradictions than reality). This resurgence is substantiated by ESG research, which reveals that 50% of respondents say their organizations have private cloud infrastructures, 20% say they have plans to deploy one, and 16% say they are interested in implementing one. That's 70% of respondents who either have a private cloud infrastructure or have plans to deploy one in the near future.[1] Also, as is usually the case with emerging technologies, users are implementing purpose-built private clouds customized for their environment to meet their proprietary needs.

Private cloud initiatives can provide powerful cost and efficiency benefits to enterprises by enabling them to serve themselves and eliminate intermediaries. One of private cloud's greatest strengths is policy-based automation, which can free users from the tyranny of the expensive, unintelligent, and undependable hardware that has characterized so many legacy systems. Elasticity on demand—the ability to quickly scale up or down—is another major benefit, which also produces the additional result of freeing up IT personnel to perform other value-added tasks in their IT environments. Accelerating companies' time to market and allowing them to gain a competitive advantage are some of the natural outcomes of instituting a private cloud infrastructure.

Figure 1 provides further evidence that the most important priorities for IT revolve around virtualization and cloud computing.[2] Thirty two percent of respondents cited increased use of server virtualization as one of their most important priorities, and 25% indicated managing data growth—both of these were in the top five most-cited IT priorities overall. Building a private cloud infrastructure (22%), reducing data center power and cooling requirements (12%), and deploying an integrated computing platform (14%) were also cited as priorities. Microsoft and Cisco, with their private cloud strategy, can help IT organizations with all of these important initiatives.

Figure 1. Most Important IT Priorities for 2014

Which of the following would you consider to be your organization's most important IT priorities over the next 12 months? (Percent of respondents, N=562, ten responses accepted)

Priority	Percent
Increase use of server virtualization	32%
Information security initiatives	32%
Improve data backup and recovery	29%
Manage data growth	25%
Desktop virtualization	24%
Regulatory compliance initiatives	23%
Major application deployments or upgrades	23%
Use cloud infrastructure services	23%
Business intelligence/data analytics initiatives	23%
Build a "private cloud" infrastructure	22%
Data center consolidation	22%
Business continuity/disaster recovery programs	21%
Mobile workforce enablement	20%
Applications delivered via software-as-a-service (SaaS) model	20%
Bring-your-own-device (BYOD) policy	20%
Improve collaboration capabilities	19%
Major database deployments or upgrades	18%
Deploy applications on or for new mobile devices	17%
Deploy integrated computing platform	14%
Use platform-as-a-service (PaaS) for application development	14%
Reduce data center power and cooling requirements	12%
Deploy application- or workload-specific systems/appliances	11%
Provide a corporate app store for employees	11%

Source: Enterprise Strategy Group, 2014.

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[1] Source: ESG Research Report, *Trends in Private Cloud Infrastructure*, April 2014.
[2] Source: ESG Research Report, *2014 IT Spending Intentions Survey*, February 2014.

Microsoft: Comprehensive Simplicity

Microsoft's Cloud OS vision features Windows Server 2012 R2 as a hub with a single operating system that serves three environments, which users can seamlessly manage. The first environment enables Azure to host virtual machines (VMs), the second provides on-premises private cloud resources, and the third shares on-premises resources with off-premises service providers. This entire ecosystem operates within a Microsoft System Center 2012 R2 environment that enables users to monitor and manage their data center components, including VMs, applications, and monitoring and report generation. Microsoft recognizes that there is no need for a private cloud to require a complex infrastructure with multiple pieces. For example, live migration with no downtime is a difficult conversion challenge for users wanting to move their VMs from Amazon Web Services to their on-premises locations. Amazon is, in effect, saying that it can only be run in one specific place, while Microsoft wants IT to embrace running VMs in multiple locations that users can manage and maintain seamlessly across these different environments. Windows Server 2012 R2 also offers enterprise storage capabilities such as storage pools, which can be created by IT admins based on deployment needs, and multi-tenancy, in which storage pools are controlled through Access Control Lists and delegated on a per-pool basis.

Cisco Unified Data Center

Cisco infrastructure enables businesses to take full advantage of the Microsoft private cloud via three pillars: compute, manageability, and networking. The compute capability—Cisco Unified Computing System (UCS)—employs intelligent infrastructure with compatible Cisco and Microsoft tools, enabling customers to gain more of the benefits that server virtualization has brought to the cloud. On the management side, organizations can gain a single, unified way to manage all aspects of the Microsoft and Cisco solution. This is accomplished by integrating physical and virtual management for hardware components and hardware stacks. In addition, the company's virtual networking solutions can reduce operational complexities associated with VM-to-VM connectivity.

Cisco innovations and UCS technology can complement the capabilities of Windows Server 2012 R2. The UCS platform, combined with the Nexus 1000V switch and UCS Virtual Machine Fabric Extender (VM-FEX), provides the ideal match of the compute and networking worlds for Windows 2012 Hyper-V by enabling organizations to optimize Hyper-V virtualization capabilities and extend them through Cisco innovations. By leveraging network virtualization and an extensible Hyper-V switch, the Microsoft-with-Cisco infrastructure can help geographically diverse organizations break the bond that existed between VMs and the physical network fabric. Additionally, organizations can gain a single, unified way to manage all aspects of the Microsoft-with-Cisco solution when PowerShell and System Center 2012 R2 are combined with UCS Manager and its Cisco PowerTool utility.

Cisco customers can benefit from the company's Application Centric Infrastructure (ACI) architecture, which delivers centralized, application-driven policy automation, management, and visibility of physical and virtual networks. In January of this year, Cisco expanded the scope of ACI with its Cisco Application Policy Infrastructure Controller (APIC), which brings software-defined networking to users by enabling IT organizations to have complete visibility into their networks, automating network and policy configuration, and managing applications across the WAN and access networks.

Cisco and Microsoft are understandably bullish on the "better together" advantages they offer to the data center. They have the technology, the knowledge, and the experience to make private cloud appealing and accessible to the wide and growing base of Microsoft and Cisco users.

Intelligent Infrastructure Optimized for the Cloud

The details of how this Microsoft-with-Cisco infrastructure is designed and optimized for the cloud are important. The infrastructure can provide enhanced visibility into operations, management, and IT control.

Data Center Platform

Cisco Computing (UCS): Cisco UCS is an intelligent, fabric-based computing platform that simplifies operations and speeds applications in cloud computing environments. UCS's fabric-based infrastructure dramatically simplifies

server deployment and increases performance, security, and manageability by treating physical and virtual machines in the same way. The UCS platform delivers "stateless" servers, which are pools of compute resources dynamically assigned as needed, delivering a dynamic, flexible server environment. Server definitions are stored in software templates – "Service Profiles", enabling on-demand provisioning from shared pools of infrastructure resources across both physical and virtual environments.

Cisco UCS Manager: This capability provides unified, embedded management of all UCS software and hardware components across multiple chassis, rack-mount servers, and thousands of VMs. Advantages include decreased complexity, expedited deployment and alterations of applications, increased business agility, and reduced TCO.

Takeaway: This is policy-driven compute. The infrastructure is able to respond based on application requirements, making it possible to:

- Determine computing conditions in response to application requirements.

- Provision infrastructure based on current demands.

- Remove or add bandwidth as needed.

Management

Cisco manageability is optimized for use with cloud computing. Toward that end, Cisco and Microsoft provide an integrated management experience for both physical and virtual workloads. Cisco UCS Manager provides unified and embedded management of UCS infrastructure through an open XML API that works with and extends the System Center 2012 R2 suite of tools. Free Cisco integration and management packs along with Microsoft tools can enable IT to:

- Proactively manage and monitor UCS hardware with System Center 2012 R2 Operations Manager.

- Automate, standardize, and extend UCS deployment and management with Microsoft System Center 2012 R2 Orchestrator.

- View and manage UCS infrastructure directly from System Center Virtual Machine Manager with its UI extension with its Add-in.

UCS Central extends the UCS Manager feature across multiple UCS domains, simplifying operations at scale while ensuring global policy compliance.

Single Microsoft Interface: Tight integration allows users to utilize a single interface—monitoring, measuring, and automating at every layer in the stack.

Cisco PowerTool: This PowerShell oriented capability reduces administrative and operational overhead while decreasing automation time.

Utilizing UCS PowerTool for PowerShell (Management with Hyper-V integration): This enables users to manage a unified system center that delivers Microsoft Cloud solutions from a single pane of glass. In this environment, Cisco virtual networking solutions for Hyper-V and Windows Server 2012 R2 provide the integration points between System Center 2012 R2 and the UCS Manager.

Takeaway: Automation and manageability are critical to cloud computing, and tight integration between Cisco and Microsoft provides increased physical and virtual management for hardware components and software stacks.

Enterprise-class Virtual Networking

Cisco virtual networking solutions can reduce the complexities associated with VM-to-VM networking, thereby helping users gain the benefits of server virtualization and the cloud. Cisco Nexus 1000V is a virtual switch that supports Microsoft private cloud and hybrid cloud deployments. This consists of an operating model across both physical and virtual environments, including tight integration with System Center Virtual Machine and PowerShell. It also features a scale-out architecture design with a strong network services ecosystem.

Nexus 1000V Feature Set: The Nexus 1000V offers advanced networking features to Hyper-V environments, including:

- Advanced switching features, which enable private virtual LANs (PVLANs), QoS, access control lists, port security, and Cisco vPath.
- Security features such as Dynamic Host Configuration Protocol (DHCP) snooping, Dynamic Address Resolution Protocol (ARP) Inspection, and IP source guard, which ensure that the Nexus 1000V is fully aware of all server virtualization.
- Network services using Cisco vPath such as Cisco Virtual Security Gateway (VSG).
- Visibility features for VMs participating in traffic monitoring activities such as Cisco NetFlow or ERSPAN.

The Nexus 1000V architecture on Hyper-V with UCS Virtual Machine Fabric Extender (VM-FEX): This configuration:

- Extends the physical switch's interfaces all the way to the VMs.
- Collapses virtual and physical infrastructures into one infrastructure.

Accelerated Server Virtualization: Windows Server 2012 R2 Hyper-V introduces extensibility to the Hyper-V network switch, allowing third parties to plug into it and extend their server virtualization functionality.

Nexus 1000V Management: Cisco has integrated the new Hyper-V switch with the Cisco Nexus 1000V, providing the Nexus 1000V with full management of the new virtual access layer that virtualization introduces. Utilizing the Nexus 1000V in this manner brings the management and experience of the network for the Hyper-V VMs back to network operators. This management is enabled in a consistent manner using the same methods used for the physical network infrastructure through the UCS management tools.

Takeaway: Network operators can regain:

- Control of policies for VMs as they move between hosts.
- Visibility into traffic between VMs.
- Management of the network for Hyper-V VMs.

Benefits of Integrated Computing Platforms

ESG defines integrated computing platforms (ICPs) as virtual computing infrastructure (VCI) solutions that integrate hardware and software components into a single, consumable IT system. ICPs enable rapid time to market, automate IT processes, and expand and contract based on demand. At a time when multiple forms of virtualization are becoming increasingly popular, ICPs add value by acting as conduits that connect on-premises VCIs with off-premises cloud solutions. They also provide safe, secure, and centralized command and control of their information assets.
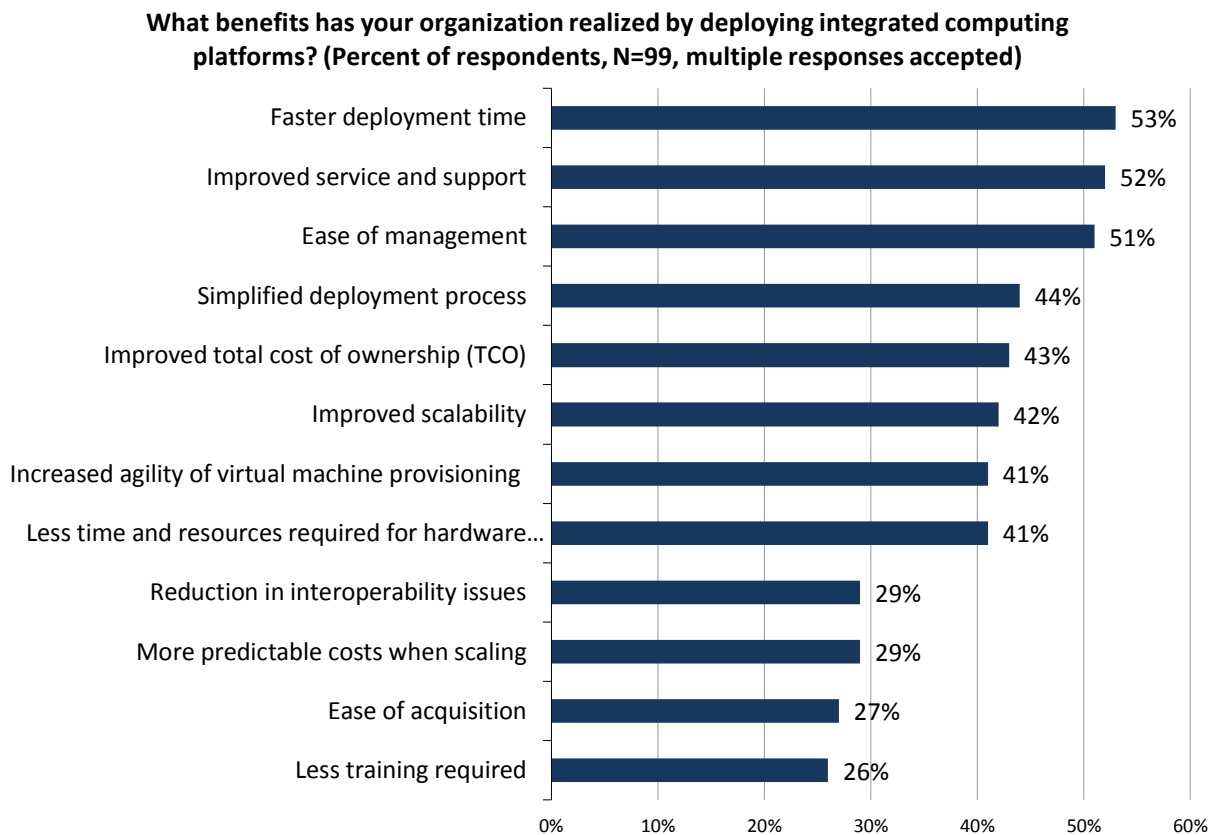
For all of the joint Cisco and Microsoft automation and orchestration pieces to work, it is necessary to have the virtualization capabilities and the infrastructure respond to these private cloud environments. Indeed, ESG research reveals that the most commonly identified benefits among current ICP users include faster and simplified deployment, easier ongoing management, and improved total cost of ownership (see Figure 2).[3]

Clearly, IT organizations are eager to embrace these integrated infrastructures to make private cloud environments harbingers of positive change for their companies. Through private cloud environments and ICPs, IT has an opportunity to work productively with line of business managers to help improve market share, revenue, and competitive advantage.

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[3] Source: ESG Research Report, *Trends in Private Cloud Infrastructure*, April 2014.

Figure 2. Benefits Attributed to Integrated Computing Platforms Deployments

What benefits has your organization realized by deploying integrated computing platforms? (Percent of respondents, N=99, multiple responses accepted)

Benefit	Percent
Faster deployment time	53%
Improved service and support	52%
Ease of management	51%
Simplified deployment process	44%
Improved total cost of ownership (TCO)	43%
Improved scalability	42%
Increased agility of virtual machine provisioning	41%
Less time and resources required for hardware…	41%
Reduction in interoperability issues	29%
More predictable costs when scaling	29%
Ease of acquisition	27%
Less training required	26%

Source: Enterprise Strategy Group, 2014.

FlexPod and VSPEX: Cisco Validated Reference Architectures

Cisco, Microsoft, EMC, and NetApp are poised to help companies jump onboard the ICP/private cloud bandwagon with the Microsoft Private Cloud Fast Track program, a pre-validated, pre-engineered, turnkey offering with design guides and installation support based on the virtualization capabilities of FlexPod from NetApp, and VSPEX from EMC. As partners in this program, Microsoft supplies Windows Server 2012 R2 and System Center 2012 R2, while Cisco offers its UCS. Delivered through Cisco Validated Designs (CVDs), these solution sets are well-tested and documented so that a customer (or partner) can build out the solution.

FlexPod

FlexPod is a joint solution between Cisco and NetApp. This solution, which has been designed for use with open, public APIs, reduces infrastructure and application deployment time from days to hours by combining hardware and software to provide a complete turnkey solution for Hyper-V provisioning. The FlexPod software toolkit utilizes PowerShell and System Center Orchestrator to fully automate the provisioning process. FlexPod solution configurations and workloads are published as Cisco Validated Designs.

VSPEX

Cisco Solutions for EMC VSPEX, also a Cisco Validated Design, offers a turnkey private cloud platform built on a defined set of hardware and software for infrastructure-as-a-service (IaaS) environments based on Microsoft platforms. VSPEX features management, automation, and orchestration capabilities integrated with Microsoft System Center 2012 R2 and PowerShell for the efficient and accelerated deployment of services and applications. It

also features support for networking standards across traditional, virtualized, unified, and high-performance computing environments. Like FlexPod, VSPEX is also a member of the Microsoft Private Cloud Fast Track program.

Applications and SQL

Cisco and Microsoft together create an infrastructure that provides support for a diverse set of applications and use cases. One of the biggest needs arises out of such important issues as data management, analytics, big data, and data warehousing. The private cloud infrastructure discussed in this white paper along with SQL Server can allow companies to manage their exploding data needs.

How can SQL Server help with a company's exponentially-increasing data needs? SQL Server provides customers with large-scale data warehousing and analytics solutions backed by IT management and insights. This allows users to crunch through data sets quickly to make complex, real-time decisions. It also provides the capability to deploy and alter applications quickly.

SQL Server can serve as the foundation of the Cisco and Microsoft cloud-ready platform, providing data access, analysis, and reporting across on-premises and off-premises clouds. Organizations can gain near-real-time insights by analyzing not only static data, but also data in-motion or dynamic data. The possibilities are vast for mining large amounts of data to create models that demonstrate actionable insights and add value to the business.

Data warehousing, with high availability and performance as well as data quality services and data integration, round out the features of this important piece of the cloud platform.

Typical IT approaches to infrastructure often do not play out well for big data challenges. However, the Cisco and Microsoft approach can provide what enterprises need, including:

- Fluidity for customers—Companies have to decide which data management environment is best—on-prem private cloud, off-prem cloud service, or hosted. With Cisco and Microsoft, customers can move easily among those three infrastructures because Windows Server 2012 R2's OS can support them all. Additionally, UCS Service Profiles can simplify and standardize server deployments.

- Scalability—IT needs to be able to implement and manage environments that will grow larger as company data and use cases expand. Since this is software-defined, organizations can scale and cost effectively add hardware as needed because there are no disparate systems - all are connected through System Center and the UCS Data Center Platform.

- Infrastructure management for expanding data volumes—Cisco UCS can decrease database and virtualization sprawl. System Center 2012 R2 monitors, manages, and maintains SQL Server implementations with flexible, standards-based management tools, and interfaces through a comprehensive, open XML API that works with and extends the Microsoft System Center 2012 R2 suite of tools. Nexus 1000V provides high-bandwidth network connectivity.

- Flexibility—The Microsoft-with-Cisco platform can make it easy to integrate analytics capabilities and big data applications development as needed. The software-defined nature allows server workloads to change on demand, a key for large data projects.

Three Questions to Ask Private Cloud Vendors

1. Can you refer me to one of your customers whose needs were closest to mine?

   Everybody knows how important it is to ask prospective private cloud vendors to provide you with reference customers, but in order to gain the most value, you should ask for customers who had needs similar to yours before they committed to a vendor. Also, don't be afraid to ask tough questions about vendor performance.

2. What are the true—and hidden—costs of a private cloud?

Enterprises that purchase on-premises private clouds can expect to incur capital expenditures for hardware and software, but what other expenses are poised to pounce? After initial layouts for software—almost always a big-ticket item—users need to add performance checks and maintenance fees to the tab, along with upgrades to other pricey hardware items such as load balancers or routers. CapEx costs can rapidly race out of control if you haven't planned ahead for them. Users should catalog key technologies and processes already in use and make sure they will fit with their new cloud infrastructures. Bottom line: Find out about future costs sooner rather than later, and ferret out the unique infrastructure designs that may help reduce these costs.

3. What are the important features to look for in a private cloud infrastructure?

Start by making sure vendors have a true integrated computing platform for flexibility and scalability. The next order of business is a secure, single operating system optimized for the cloud. Unified management is required for reporting, monitoring, BI, and analytics. As always, a network infrastructure is essential, and a virtualized network is the right way to go as intelligent, automated, software-defined data centers increasingly come to the fore. Turnkey platforms such as FlexPod and VSPEX are best for some customers because they are built on a defined set of hardware and software for IaaS environments based on Microsoft platforms.

The Bigger Truth

Individually, Cisco and Microsoft are among the most powerful and sophisticated vendors in the IT industry. Their brands are pervasive, and their products are running in large and small companies around the world. As successful as they have become on their own, Cisco and Microsoft realize that collaboration on their joint private cloud infrastructure can expand the scope of capabilities and value to customers.

That is why these two companies have come together and developed a best-of-breed private cloud ecosystem that combines Cisco's compute and network expertise with Microsoft's single operating system, data management, and virtualization capabilities. The following list of potential benefits underscores the value of better-together approach:

Accelerated time to market: Enter markets quickly with easy access across multiple consumption models driven by Cisco infrastructure and Microsoft software.

CapEx and OpEx savings: Savings on CapEx and OpEx costs can be achieved by virtualizing the server environment with no additional CapEx when moving to the cloud, minimizing implementation complexity, enabling virtual management with increased control, and gaining the ability to scale as required.

Rapid ROI: Because this environment is software-defined, and its infrastructure is efficient, it can quickly pay for itself by simplifying provisioning, efficient time to value, and operational efficiencies.

High availability: Because the Cisco Unified Data Center fabric has no single point of failure, it unifies compute, storage, networking, and management resources into a single, fabric-based platform that can increase operating efficiency and availability, simplify the data center, and provide business agility. Microsoft solutions compound this value with data protection solutions for on- and off-premises protection.

Increased IT organizational efficiencies: Due to the ease of implementation and management, IT pros can be shifted to positions where they are most productive and leverage their current Microsoft and Cisco certifications.

Accelerated business agility: Turnkey platforms such as FlexPod and VSPEX offer simple and secure private cloud solutions that can speed companies' deployment, can be scaled up or down in response to changing workloads, and can allow companies to drive revenue opportunities more quickly.

Flexibility to use alternative cloud consumption models: Because Windows Server 2012 R2 enables companies to work in three different cloud environments, they can readily change their consumption models without additional OpEx costs and take advantage of multiple consumption models.

Ease of management with System Center, UCS Manager, PowerTool and Application Centric Infrastructure (ACI): Cisco, through UCS Manager, PowerTool ACI, and Microsoft, through System Center 2012 R2 enable companies to have unified management across all their cloud components—managing, monitoring, measuring, and automating every layer in the stack.

A new competitive advantage: The combination of close coordination and product integration that Cisco and Microsoft have put into this joint private cloud project is both innovative and forward-thinking. "Better together" is an apt description of the positive effect on customer value when these two business partners optimize the private cloud infrastructure

Here's what Brad Anderson, Corporate Vice President in Microsoft's Windows Server and System Center Group, had to say about ACI: "The integration with Microsoft cloud OS and UCS is really remarkable. Literally, you have a common way to automate everything from the application down to the operating system and the hardware-level components. That's the kind of value we are going to be able to deliver together."

Cisco and Microsoft together make a giant leap forward in enabling organizations to embrace virtualization and the private cloud. Microsoft Windows Server 2012 R2 continues to target customer value opportunities in server virtualization, and as a cloud platform, with operating system and Hyper-V role enhancements. Combining the UCS platform with the Nexus 1000V and VM-FEX provides a comprehensive platform for Windows Server 2012 R2

Hyper-V. This package enables organizations to take full advantage of the Windows Server 2012 R2 Hyper-V capabilities and extend them through Cisco innovations. In addition, when PowerShell and System Center 2012 R2 integration is leveraged with UCS Manager, enterprises end up with a single, unified way to manage all aspects of the Microsoft and Cisco solutions.