



How far will you take virtual?

Competitive Comparison Between Microsoft® and VMware Cloud Computing Solutions

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Introduction

As organizations evaluate how cloud computing can help them improve business agility, reduce management complexity and control costs, they are faced with numerous choices. However, simply moving towards a service-oriented cloud computing model will not automatically deliver benefits.

To deliver maximum benefit and Return on Investment (ROI), cloud computing needs to be considered as part of a larger move towards more effective management and integration. Cloud computing solutions that cannot be effectively managed, or that add complexity rather than reduce it, will not fully deliver on cloud's promises of greater efficiency and flexibility.

Microsoft's cloud computing solution helps customers meet their current and future IT challenges. The infrastructure of Microsoft® cloud computing provides more choice and flexibility through offerings such as a world-class public cloud option, comprehensive end-to-end management, and free cloud accelerator solutions with valuable out-of-box functionality. As result, Microsoft cloud computing helps companies increase how quickly they can respond to changes in their business environment and how effectively they can manage resources. At the same time, Microsoft cloud computing can help reduce management complexity and cost.

This document examines how VMware and Microsoft have approached their cloud solutions. When compared to the VMware cloud solution, the Microsoft solution is seen to have better management, greater integration with datacenter components, a better public cloud solution, and a simpler approach that translates to better results for the customer.

The Microsoft Cloud Solution

Microsoft's cloud solution is based on delivering services to the user through a flexible, easily managed infrastructure. There are two infrastructure models that Microsoft customers can use to implement cloud services: private cloud and public cloud. Customers can choose between these infrastructure models based on their application delivery needs, or they can combine the models to provide a flexible infrastructure of computing resources able to scale to changing service requirements.

Choice and Flexibility

Organizations that want to take advantage of a flexible, dynamic private cloud infrastructure can use Hyper-V™ and System Center to create cloud services within their datacenter. Alternatively, they can also lease VM-based cloud services from a Microsoft hosting partner to either dynamically augment their own datacenter capacity or outsource hardware acquisition and management costs. In either approach, the comprehensive management offered by System Center monitors hardware, operating systems, virtual machines, and both

How far will you take virtual?



physically-installed and VM-based applications. This allows System Center to monitor and manage the entire infrastructure, providing a holistic picture of datacenter operations that includes the causal relationships between system components. This eases troubleshooting and facilitates greater efficiency and availability in datacenter operations.

Organizations that want to take advantage of highly-scalable public cloud infrastructure can use Windows Azure™ services hosted in a Microsoft datacenter to create, scale, and manage .NET applications on a pay-as-you-go pricing model.

Across both infrastructure models, Microsoft's cloud computing solutions include:

- Virtualization and automation.
- Interchangeable resources such as servers, storage and network.
- Management of these resources as a single fabric.
- Elastic scale up or down capability to respond to business demands.
- Applications and development tools that can truly scale out.
- Focus on the service delivered to the business.

Infrastructure, Platform, and Software as a Service

Microsoft's cloud solution provides a comprehensive range of service-based components. Microsoft not only provides infrastructure services but also offers a range of platform and software services solutions as well. On the other hand, VMware primarily offers infrastructure services currently.

With Infrastructure as a Service (IaaS), customers get on-demand computing and storage to host, scale, and manage applications and services through Microsoft's worldwide datacenters. This allows customers to scale with ease and quickly meet the infrastructure needs of an entire organization or an individual department, either globally or locally.

Windows Azure provides a Platform as a Service (PaaS) consisting of an operating system, a fully relational database, and consumable Web-based services that provide security-enhanced connectivity and federated access control for applications. As a family of on-demand services, the Windows Azure platform offers organizations a familiar development experience, on-demand scalability, and reduced time to market for applications.

Microsoft Software as a Service (SaaS) Online Services are subscription-based, on-demand applications and hosted services, providing end users with a consistent experience across various client devices. Microsoft has a comprehensive set of online SaaS offerings, including:

How far will you take virtual?



- The Business Productivity Online Suite (BPOS) delivering security-enhanced, hosted communications and collaboration tools including Microsoft Exchange Online, Microsoft SharePoint Online, Microsoft Office Live Meeting, and Microsoft Office Communications Online.
- Exchange Hosted Services is a set of tools to help organizations manage electronic communications including:
 - Protecting against spam and malware
 - Helping satisfy retention requirements for e-discovery and compliance
 - Encrypting data to preserve confidentiality
 - Maintaining access to e-mail during and after emergency situations
- Microsoft Dynamics® CRM Online provides marketing, sales, and customer service solutions deployed through Microsoft Office Outlook or an Internet browser to help end users efficiently automate workflows and centralize customer information.
- Office Web Apps provides on-demand access to the Web-based version of Microsoft Office suite of applications, including Microsoft Word, Microsoft Excel, and Microsoft PowerPoint.

With Microsoft cloud services, customers maintain choice and control over how and where services are utilized. These choices include, for instance, determining the ratio of on-premises to off-premises solutions, whether to host within a Microsoft datacenter or at Microsoft partner, and how to change the mix as needs grow, and so forth. Customers also choose which Microsoft services to deploy -- IaaS, SaaS, PaaS, or any combination of the three.

Public Cloud

The promise of a “public cloud” is to enable customers to deploy, scale, and consume application services from an off premise resource. Microsoft’s public cloud offerings powered by Microsoft’s Azure is a highly scalable services platform providing pay-as-you-go flexibility delivered from Microsoft’s datacenters.

As a cloud services operating system, Windows Azure serves as the development, service hosting and service management environment for the Azure Services Platform.

Customers can use Windows Azure to:

- Add Web service capabilities to existing packaged applications.
- Build, modify, and distribute applications to the Web with minimal on-premises resources.
- Perform services like large-volume storage, batch processing, and intense or large-volume computations off premises.
- Create, test, debug, and distribute Web services quickly and inexpensively.
- Reduce costs of building and extending on-premises resources.
- Reduce the effort and costs of IT management.

How far will you take virtual?



For developers, Windows Azure provides on-demand computing and storage resources to host, scale, and manage Web applications on the Internet through Microsoft datacenters. Windows Azure reduces obstacles to creating reliable and scalable web applications because it is based on, and works with familiar Microsoft technology including ASP.NET, IIS, FastCGI, .NET Full Trust, P/Invoke, and Visual Studio® 2008. Industry web standards and protocols such SOAP, REST, XML, and PHP are also supported by Windows Azure. With Windows Azure, developers can focus on the business logic of an application, without worrying about operational constraints.

The Fabric Controller technology in Windows Azure enables organizations to scale applications seamlessly, as demand rises and falls. The built-in management services provide monitoring and tracing capabilities, and allow developers to stay focused on creating and delivering services and applications online.

Private Cloud

With Microsoft's cloud strategy, organizations can now move towards cloud computing models with the confidence that their existing investments in their datacenter are safe, and can be leveraged in this new paradigm. Existing applications and services will be able to move to the private cloud without the need to learn unproven technologies, or introduce unnecessary complexity.

The Microsoft private cloud enables:

- Management of the datacenter fabric as a single pool of resources.
- Delivery of scalable applications and workloads.
- Focus on the management of the datacenter service and its dependencies.

End-to-end management

Customers can use Microsoft System Center to manage both public and private Microsoft cloud implementations. System Center's comprehensive management capabilities enable it to monitor and manage the entire IT infrastructure stack from traditional physical servers, virtualized servers, virtual machines, running workloads and all the way up to service-based cloud components. Microsoft System Center works closely with Microsoft's cloud solutions to help customers create and manage a flexible, reliable computing environment that allows internal customers to easily consume infrastructure, software, and platform services.

Without monitoring software that has visibility into the entire IT infrastructure from the hardware to the application level, organizations are lacking a crucial tool for infrastructure management. In environments that use virtualization, this shortcoming is exacerbated. Because virtual machines can be so easily modified or migrated to new hosts, server virtualization requires effective management tools that provide timely system compliance and tracking capabilities. Furthermore, because of the multiple interrelated layers between the physical hosts up through the running virtualized applications, IT administrators need a single tool that can show the cause-effect relationships between all the components and layers of the stack. Microsoft System

How far will you take virtual?



Center is the only monitoring tool that can provide this level of comprehensive monitoring including both physical and virtualized infrastructure.

While IT staff are often focused on the availability and performance of supporting infrastructure like server hardware, networking, and storage, corporate users are only concerned with application availability and performance. For this reason, effective monitoring of the IT services infrastructure must include application-level monitoring and Microsoft System Center does just that. It provides deep visibility through comprehensive in-guest monitoring of running applications or services thus keeping administrators aware of application issues that may cause poor performance or worse.

Competing management and monitoring solutions like VMware vCenter do not provide deep visibility into the applications running within VMs. Without this in-guest monitoring capability, IT staff will receive notification of application outages or performance problems from users rather than from their monitoring software. This forces IT staff into a reactive stance and may result in poor service levels. In addition, precursor conditions that can lead to an application outage can easily be missed by monitoring tools that only view host memory and CPU utilization or a simplistic VM heartbeat. Only comprehensive in-guest monitoring will provide information about these precursor conditions and allow administrators to take remedial action before performance is impacted.

Toolkits to Enable Cloud Infrastructure

Dynamic Infrastructure Toolkit for System Center

A Microsoft private cloud combines Hyper-V's enterprise-class capabilities and System Center's comprehensive integrated management with the workflow automation capabilities of the Dynamic Infrastructure Toolkit for System Center. The Dynamic Infrastructure Toolkit for System Center is a freely available, partner-extensible toolkit that will enable datacenters to dynamically pool, allocate, and manage resources to enable IT as a service.

The Dynamic Infrastructure Toolkit for System Center includes these operational components:

- **On-boarding:** Allows IT admins to capture the service requirements from the service consumer.
- **Self Service/ Admin Portal:** Allows IT service manager to interact with his/her service from deployment to decommissioning. Service managers also have the option to access VM and charge-back reports.
- **Provisioning:** This is foundational to the creation of an IT service. Batch creation of VMs enables the simultaneous or sequenced deployment of multiple VMs into a service environment.
- **Operation:** The Dynamic Infrastructure Toolkit for System Center utilizes the Microsoft System Center family of products (SCVMM) to provide virtual machine management capabilities.
- **Guidance around Infrastructure:** Installing, configuration, deployment guidance with system center products.

How far will you take virtual?



- **Toolkit guidance:** Getting started and online user help guide.

Dynamic Data Center Toolkit for Hosters

To make it easier for hosting providers to create Dynamic Data Centers, the Dynamic Data Center Toolkit for Hosters is freely available. This resource provides documentation and sample code to help hosters create automated, self-managing, and self-service provisioning systems in their environment. The documentation in the toolkit describes:

- Bare-metal provisioning of Windows Server 2008 R2 to host virtual environments.
- Provisioning a virtual environment (using Hyper-V). This document outlines:
 - Configurations to deploy a virtual infrastructure based on Windows Server 2008 Hyper-V.
 - Configuring the Active Directory® service to make it easier to create a multi-tenant environment.
 - Securing the environment.
 - Managing the virtual environment using System Center Virtual Machine Manager.
 - Best practices to configure and use Virtual Machine Manager.
 - Capacity planning.
- Installing and configuring System Center to manage a virtualized environment.
- Leveraging System Center Data Protection Manager to backup and restore the virtual environments in a delegated administration model.
- Configure System Center Configuration Manager to:
 - Perform updates on demand.
 - Track inventory.
 - Push out standard configurations and software.
- Configure System Center Operations Manager to monitor and alert individual end customers based on policies.

In addition to these documents, the Dynamic Datacenter Toolkit for Hosters includes a Microsoft Silverlight™-based test portal for ContosoHosting.com. This portal includes a control panel that enables end customers to:

- Provision and manage Hyper-V-based clients.
- Perform file/folder-level backups and restores.
- Monitor important counters and receive alerts.
- Install updates during a configurable time window.
- Monitor events.

Along with the sample application, the toolkit provides the source code for scripts that provision and manage the System Center Server Management Suite Enterprise and Windows Server 2008 R2.

How far will you take virtual?



The VMware Cloud Solution

VMware's cloud solution is based on VMware's vSphere hypervisor platform. With VMware's cloud model, customers create VMware virtual machines, which contain an operating system and one or more applications. These VMs run on VMware vCenter servers which are either hosted privately within a company's datacenter or publicly by one of VMware's hosting partners. In addition, VMware provides an application marketplace where pre-configured VMs can be downloaded for use in a VMware-based compute cloud.

VMware uses a large number of components to create their cloud solution. Some of these components are only available in VMware's most expensive license tier, and some are separately licensed, extra cost components:

- VMware vCompute uses the ESX hypervisor to virtualize server resources and aggregate those resources into logical pools.
- VMware vStorage abstracts storage resources from the underlying hardware.
- VMware vNetwork provides networking services for cloud VMs.
- VMware VMotion is used to provide real-time VM migration from one ESX host to another.
- VMware High Availability is used to monitor virtual machines and restart them on another host when a failure is detected.
- VMware vCenter Chargeback is used for chargeback tracking of cloud computing services.

(A full list of VMware's components can be found on their public website: <http://www.vmware.com/products/>)

A VMware compute cloud can be constructed either as an on-premise private cloud or as a hosted public cloud. An on-premise private cloud will use hardware located in an organization's datacenter to provide cloud computing services. A hosted public cloud will use hardware provided by a VMware partner and located at the partner's datacenter. In either case, VMware's cloud solution does not include comprehensive monitoring and management for applications. Instead, vCenter monitors only CPU and memory utilization for VMs, leaving non-cloud operating systems and applications to be managed using separate tools.

Microsoft Cloud Solution Business Value

As customers continue to use server virtualization to cut cost and increase datacenter efficiency, they can leverage the benefits of cloud computing to realize additional gains in efficiency and uptime. Microsoft's cloud computing solution combines simplicity and flexibility to offer substantial value and choice to customers.

How far will you take virtual?



By choosing Microsoft's cloud computing platform, customers will have cost-effective and easily used tools to address their IT pain points. The Windows-based infrastructure of Microsoft's cloud computing solution is familiar, which lowers barriers in the evolution to cloud computing through lower training and staffing costs.

With System Center, customers will also have a comprehensive and efficiently managed solution. In contrast to VMware's cloud solution, the Microsoft solution provides management and monitoring that extends from the hardware to the applications. This comprehensive monitoring is mandatory for realizing maximum efficiency and uptime, and VMware does not offer it with their solution. Microsoft's comprehensive monitoring allows organizations to reduce expense through greater staff efficiency and easier troubleshooting. By presenting a comprehensive picture of the datacenter that shows causal relationships between both physical and virtualized system components, System Center gives organizations the information they need to fully utilize their cloud compute resources.

The range of choice in Microsoft's cloud computing solutions, from private VM-based services to public application-based services, allows customers to choose the best infrastructure for their needs, with no compromise. Rather than re-engineering datacenters from the ground up around cloud computing, customers can immediately realize benefits by progressively integrate cloud computing into existing procedures and skill sets.

The free Dynamic Datacenter and Dynamic Infrastructure toolkits help customers with the transition towards cloud computing. The sample code and documentation in these toolkits helps customers spend more time implementing an effective cloud solution that addresses their specific requirements and pain points.

Conclusion

Organizations that implement Microsoft's cloud computing solutions will realize several benefits. They will be able to choose between or blend a private or public cloud model depending on what best suits their requirements. For any infrastructure model that they choose, they will have access to System Center's complete, integrated monitoring and management. This will enable them to manage their infrastructure more effectively than with VMware's cloud solution.

To get customers started, the freely downloadable Dynamic Datacenter and Dynamic Infrastructure toolkits provide code samples and prescriptive guidance about implementing cloud services. And because of inhouse expertise managing Windows and other Microsoft products, customers who also choose Microsoft for their cloud solutions will be able to leverage their existing platform knowledge to more easily create a cloud infrastructure that better suits and integrates into their environment.

By implementing the Microsoft cloud computing solutions, customers will realize increases in efficiency and flexibility. The Microsoft solution offers more choice, more simplicity, and greater manageability. These

How far will you take virtual?



qualities translate into better cloud deployments that help Microsoft customers realize their business goals with less cost and greater ease.