

**BUILT FOR THE  
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# Microsoft Private Cloud

**A comparative look at  
Functionality, Benefits,  
and Economics**

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## Executive Summary

In this whitepaper, we compare private cloud solutions from Microsoft and VMware. We do this by defining private cloud using industry standard concepts, explain the Microsoft products needed to create a Microsoft private cloud solution and then define the technology benefits a Microsoft private cloud solution provides. We also examine how the licensing models differ between Microsoft and VMware and, in particular, how those licensing models will impact the ROI of investments you are making today and long into the future.

Microsoft private cloud solutions are licensed on a per processor basis, so customers get the cloud computing benefits of scale with unlimited virtualization and lower costs – consistently and predictably over time. VMware private cloud solutions are licensed by either the number of virtual machines or the virtual memory allocated to those virtual machines – charging you more as you grow. This difference in approach means that with Microsoft your private cloud ROI increases as your private cloud workload density increases. With VMware, your cost grows, as your workload density does.

**Our analysis shows that a VMware private cloud solution can cost from six to fifteen times more than a comparable Microsoft private cloud solution over a period of one to three years.**

**The reason for this significant cost difference is VMware’s per-VM licensing for private cloud products like VMware vCenter Operations Management Suite which charges \$34,250 for 25 VMs (Enterprise Plus edition, U.S. suggested license list price) and drives this cost differential.**

Economics has always been a powerful force in driving industry transformations and as more and more customers evaluate cloud computing investments that will significantly affect ROI, now is the time to provide the information they need to make informed decisions, for today and tomorrow.

## What is a Private Cloud?

Private cloud is a computing model that uses resources which are dedicated to your organization. A private cloud shares many of the characteristics of public cloud computing including resource pooling, self-service, elasticity and pay-by-use delivered in a standardized manner with the additional control and customization available from dedicated resources.

Fig. 1: Private Cloud Attributes



While virtualization is an important technological component of private cloud, the key differentiator is the continued abstraction of computing resources from infrastructure and the machines (virtual or otherwise) used to deliver those resources. Only by delivering this abstraction can customers achieve the benefits of private cloud – including improved agility and responsiveness, reduced TCO, and increased business alignment and focus. Most importantly, a private cloud promises to exceed the cost effectiveness of a virtualized infrastructure through higher workload density and greater resource utilization.

## Microsoft Private Cloud - No Virtualization, Memory, or Density Tax

Microsoft private cloud solutions are built using Windows Server with Hyper-V and System Center – the combination of which provides enterprise class virtualization, end-to-end service management and deep insight into applications so you can focus more attention on delivering business value. Both Windows Server 2012 and System Center 2012 are available in two editions, Standard for lightly virtualized environments and Datacenter for highly virtualized environments. They both have the same licensing model of a processor license that covers up to two physical processors on a server and both editions of the products have the same capabilities across the editions. The differentiator between the editions is the virtualization rights. Standard edition provides 2 virtual instances with each license and Datacenter continues to offer unlimited virtualization with each license. **As always, the best way to purchase Microsoft private cloud is through the Enrollment for Core Infrastructure<sup>1</sup> (ECI). ECI provides customers with an easy and cost efficient way to purchase the Microsoft private cloud.**

ECI Datacenter edition includes Windows Server 2012 Datacenter, which supports unlimited virtualization rights. This means that customers license on a per processor basis, with ability to have unlimited Windows Server 2012 based virtual machines on a particular physical processor. Additionally, ECI Datacenter also includes System Center 2012 Datacenter edition, which provides rights to manage an unlimited number of physical or virtual operating system environments. Microsoft Private Cloud licensing options are shown below.

Fig. 2: Microsoft Private Cloud Licensing Options

Editions Offered in two simple editions (Standard, Datacenter) differentiated only by virtualization rights	License type Each license covers up to 2 physical processors	Capabilities Provide all features to enable any private cloud workload	Virtual rights 2 OSEs	Virtual rights Unlimited
<b>Standard Low Density / No Virtualization</b>  Windows Server 2012 Standard System Center 2012 Standard ECI Standard	✓	✓	✓	
<b>Datacenter High Density Virtualization</b>  Windows Server 2012 Datacenter System Center 2012 Datacenter ECI Datacenter	✓	✓		✓

<sup>1</sup> Microsoft ECI licensing program details [here](#), more details in Appendix A

Our approach is focused on delivering the benefits of scale to you – through unlimited virtualization rights and significantly simplified licensing for Windows Server 2012 and System Center 2012. A deeper cost analysis is provided in the Private Cloud Economics section of this whitepaper.

## VMware Private Cloud – Combination of Virtualization, Memory, and Density Taxes

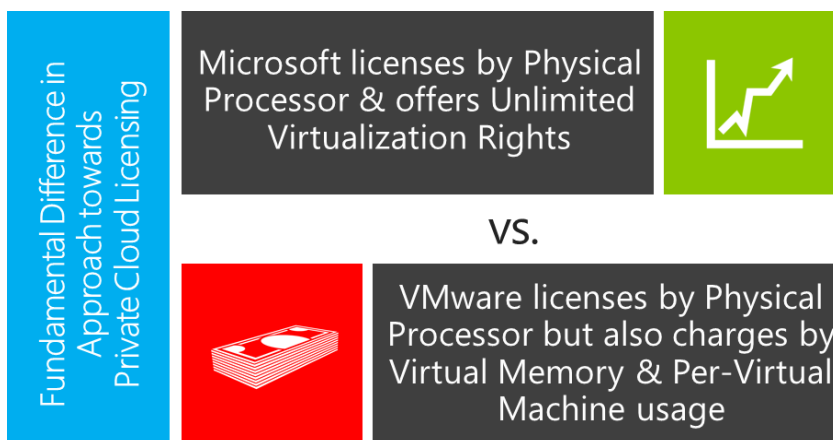
In 2011, VMware announced the latest version of its virtualization platform, vSphere 5, along with updated versions of surrounding technologies; vCenter Site Recovery Manager, vShield Security and vCloud Director. Since then VMware has also released several management products like vCenter Operations Management Suite and vFabric Application Performance Manager (APM) to provide capabilities like monitoring, application performance management, and configuration management. These products collectively are referred to as Cloud Infrastructure Suite. To build a comparable private cloud solution using VMware technologies, you'll require components from VMware Cloud Infrastructure suite as a private cloud solution requires capabilities like monitoring, configuration, automation, orchestration and security in addition to the virtualization platform. We explore the product comparisons later in the whitepaper.

**Unlike Microsoft ECI Datacenter, VMware Cloud Infrastructure Suite cannot be licensed as a single SKU, but has to be licensed separately for individual products. Moreover, VMware private cloud products follow a combination of three different licensing schemes-**

- **vSphere 5 is licensed on a per processor basis with virtual RAM entitlements<sup>2</sup>**
- **vCenter is licensed on a per-instance basis<sup>2</sup>**
- **Cloud Infrastructure products - vCloud Director, vCenter Site Recovery Manager, vShield, vCenter Operations Management Suite and vFabric APM are licensed on a per-VM basis<sup>3</sup>**

**This fundamental difference in private cloud licensing approach implies choosing VMware for your private cloud solution can cost you up to \$4,238 per-VM** (3 year license and support cost included). We'll provide an explanation later on how this cost is calculated.

Fig. 3: Differences in approach towards private cloud licensing

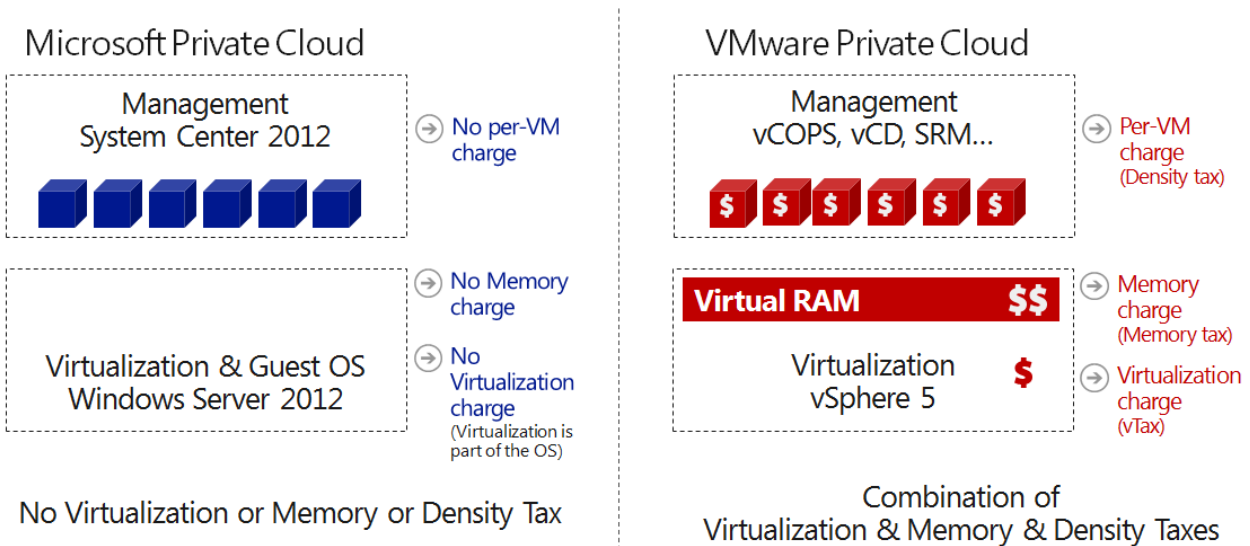


<sup>2</sup> vSphere 5 & vCenter 5 licensing information from VMware website as of July, 2012

<sup>3</sup> vCloud Director, vCenter SRM, vShield, vCenter Operations Management Suite, vFabric APM licensing information from VMware website as of July, 2012

With Microsoft you don't pay any virtualization, memory or density tax. With VMware, you pay separately for a virtualization platform (and also for a guest OS for running apps inside VMs). vSphere 5 follows a memory based pricing model (along with per-processor), with only 96GB of virtual RAM allowed for the highest edition of vSphere 5, and VMware's management products follow a per-VM licensing model, charging you for every single VM used.

Fig. 4: VMware Private Cloud Virtualization, Memory and Density Tax

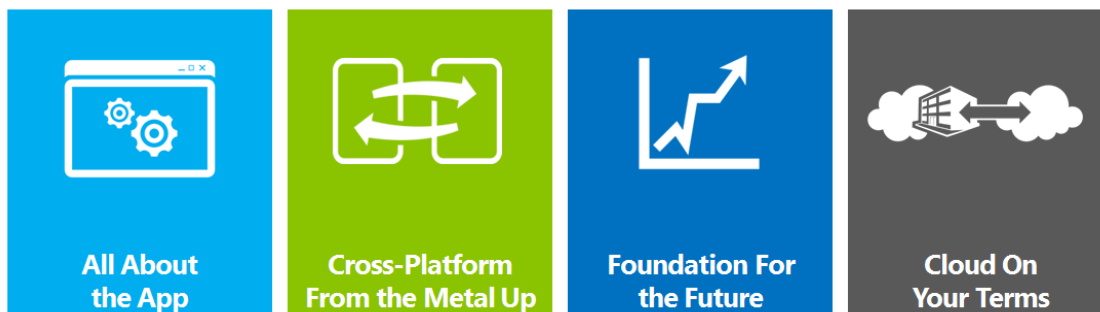


Before we get into a detailed immediate and long term cost analysis of each private cloud solution, we explore the Microsoft private cloud and the business value it delivers – in greater detail.

## Microsoft Private Cloud – Business Benefits

The Microsoft Private Cloud is a unique and comprehensive offering, built on four key “pillars”.

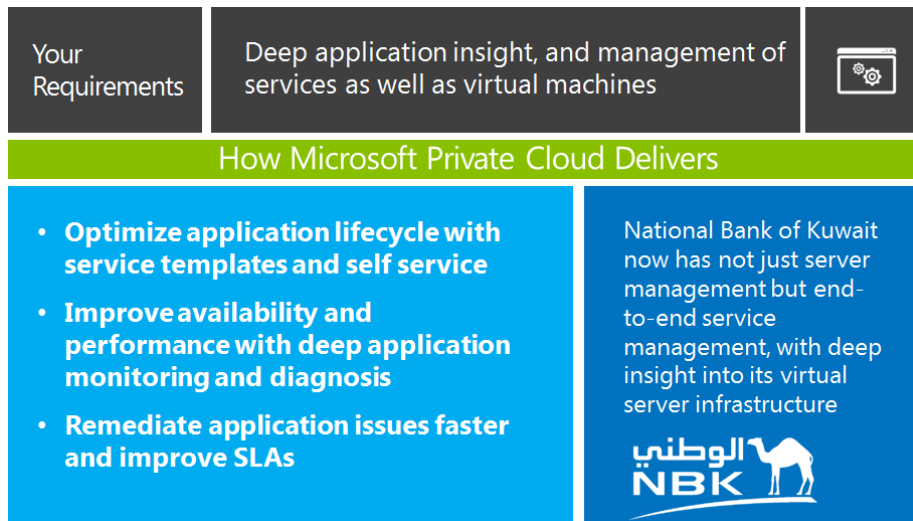
- **All About the App:** Application centric cloud platform that helps you focus on business value.
- **Cross-Platform From the Metal Up:** Cross-platform support for multi-hypervisor environments, operating systems, and application frameworks.
- **Foundation For the Future:** Microsoft Private Cloud lets you go beyond virtualization to a true cloud platform.
- **Cloud On Your Terms:** Ability to consume cloud on your terms, providing you the choice and flexibility of a hybrid cloud model through common management, virtualization, identity and developer tools.



Microsoft offers a private cloud that delivers real value today AND positions a business to take advantage of greater public cloud benefits in the future. Let's look at each of these pillars in depth.

## All about the App

Applications are the lifeblood of your business. The ability to deploy new applications faster and keep them up and running more reliably is the central mission of IT as a competitive differentiator. To gain a real edge, you need to go beyond just managing infrastructure.



[National Bank of Kuwait Case Study](#)

With the Microsoft Private Cloud, you can:

- Optimize the application lifecycle with service templates and self service
- Improve availability and performance with deep application monitoring and diagnosis
- Remediate application issues faster and improve SLAs



The Microsoft Private Cloud lets you deliver applications as a service. You can deploy both new and legacy applications on a self-service basis, and manage them across private cloud and public cloud environments. You can even virtualize server applications to simplify deployment and upgrading. And with a new way to see what's happening inside the performance of your applications, you can remediate issues faster – before they become show-stoppers. The result is better SLA's, better customer satisfaction, and a new level of agility across the board.

**Microsoft Private Cloud provides you deep application insight, and management of services as well as virtual machines.**

## Cross-Platform From the Metal Up

No datacenter is an island. Odds are, you run and manage an IT environment today that is deeply heterogeneous, with a wide range of OS, hypervisor, and development tools in the mix. You want to gain the advantages of private cloud computing, but not if it means walking away from your existing IT investments or adding new layers of complexity. Microsoft takes an open and comprehensive approach that puts customers' needs ahead of any particular technology.



Your Requirements	Comprehensive management of heterogeneous IT environments	
How Microsoft Private Cloud Delivers		
<ul style="list-style-type: none"> <li>• <b>Manage multiple hypervisors (Microsoft, VMware, &amp; Citrix)</b></li> <li>• <b>Run and monitor multiple operating systems</b></li> <li>• <b>Drive process automation and configuration across platforms and toolsets</b></li> <li>• <b>Develop applications using multiple application toolsets</b></li> </ul>		<p>By the end of 2012 the entire server environment, including Linux and older versions of Windows Server, will be virtualized on current Windows Server and Hyper-V technology.</p> 

[City of Milwaukee Case Study](#)

With the Microsoft Private Cloud, you can:


- Manage multiple hypervisors (Microsoft, VMware, & Citrix) & run and monitor multiple operating systems
- Drive process automation and configuration across platforms and toolsets
- Develop applications using multiple application toolsets

The Microsoft Private Cloud lets you keep what you've got and make the move now to a new kind of agility. That's because it's architected from the raw metal up to enable process automation and configuration across platforms and environments. Because the Microsoft Private Cloud provides comprehensive management of heterogeneous IT environments, you can put your business's needs ahead of the needs of any particular technology or vendor.

**Microsoft Private Cloud gives you comprehensive management of heterogeneous IT environments.**

## Foundation For the Future

A private cloud delivers fundamentally new capabilities that represent a fundamental shift in computing. The bet you make today will have long-term implications for the future of your business.

Your Requirements	Go beyond virtualization to a true cloud platform	
How Microsoft Private Cloud Delivers		
<ul style="list-style-type: none"> <li>• <b>Deliver best in class performance for your key Microsoft workloads</b></li> <li>• <b>Leverage the economics of the private cloud without the limitations of per-VM licensing</b></li> <li>• <b>Fully integrate management systems, from hardware resources to application services</b></li> </ul>		<p>No difference in performance with SQL Server running on high-performance physical hardware versus SQL Server running on a Hyper-V host.</p> <p><b>Voith IT Solutions</b></p>

[Voith IT Solutions Case Study](#)

With the Microsoft Private Cloud, you can:

- Deliver best-in-class performance for your key Microsoft workloads
- Leverage the economics of the private cloud without the limitations of per-VM licensing
- Fully integrate management systems, from hardware resources to application services



For more than 15 years, Microsoft has operated some of the world’s biggest and most advanced datacenters, and we’ve driven the evolution of major Internet services such as Windows Live, Hotmail, and Bing. Our experience is unmatched in the industry, and we’ve taken all that we’ve learned and put it into the DNA of our products.

Microsoft workloads (including SharePoint, Exchange, and SQL Server) work best on the Microsoft Private Cloud. But the story is much bigger than that. We’ve architected our platform and our management approach to be comprehensive and deeply integrated, spanning private and public cloud scenarios. Our goal is to take our customers beyond virtualization – and unnecessary per-VM licensing – and proceed with confidence in building a secure and manageable private cloud that delivers great performance and compelling economics.

**Microsoft Private Cloud lets you go beyond virtualization to a true cloud platform.**

**Cloud On Your Terms**

The move to cloud computing involves more than just building a private cloud. The undeniable benefits of public cloud computing – on-demand scalability, flexibility, and economics, as we’ve discussed – also promise significant competitive advantages. The challenge is to leverage your existing investments, infrastructure, and skill sets to build the right mix of private and public cloud solutions for your business – one that will work for you today and in the future.

Your Requirements	Distribute IT across public and private cloud computing models	
<b>How Microsoft Private Cloud Delivers</b>		
<ul style="list-style-type: none"> <li>• Use common management, identity, virtualization, and development tools that span private and public clouds</li> <li>• Construct and manage clouds across multiple datacenters, multiple infrastructures, and service providers</li> <li>• Provide delegated authority and tools to enable self-service across environments</li> <li>• Retain control across your private and public clouds for compliance and security</li> </ul>		<p>Customers can choose a pure cloud-based system or a hybrid solution that includes some on-premises hardware to meet their specific requirements.</p> 

[Fujitsu Case Study](#)

With the Microsoft Private Cloud, you can:

- Use common management, identity, virtualization, and development tools that span private and public clouds
- Construct and manage clouds across multiple datacenters, multiple infrastructures, and service providers
- Provide delegated authority and tools to enable self-service across environments
- Retain control across your private and public clouds for compliance and security

With Microsoft, you have the freedom to choose. Because Microsoft solutions share a common set of management, identity, virtualization, and development technologies, you can distribute IT across physical, virtual, and cloud computing models. Our solutions are built to give you the power to construct and manage clouds across multiple datacenters, infrastructures, and service providers – on terms that you control. That means you can keep a handle on compliance, security, and costs. And you can let your business needs drive your IT strategy, instead of having IT limit your options.

**Microsoft Private Cloud lets you distribute IT across public and private cloud computing models.**

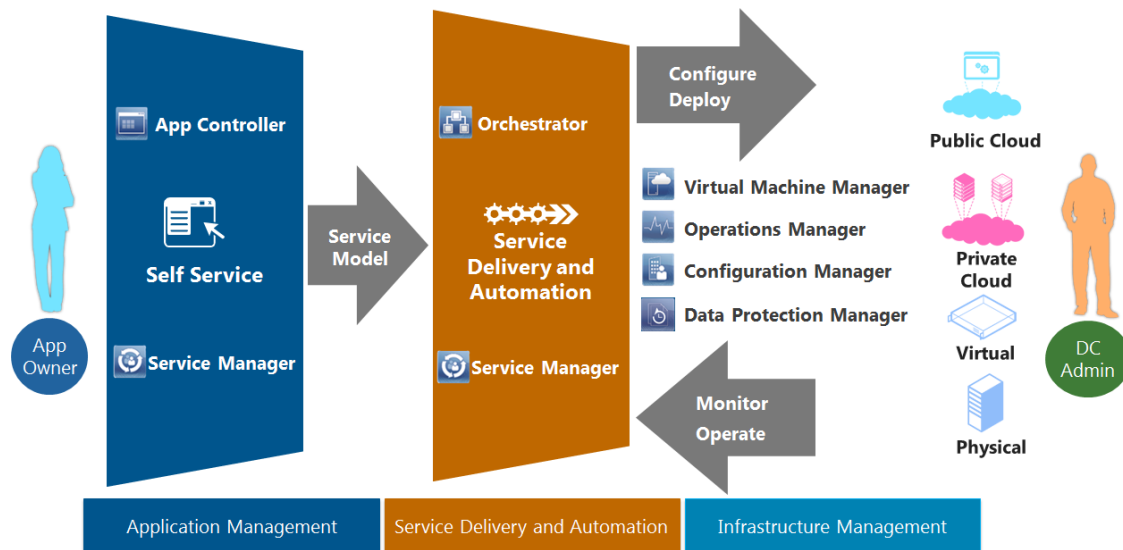
## Private Cloud Features Comparison

In this section we look at the features comparison between Microsoft and VMware private cloud products. As seen earlier, Microsoft private cloud solutions are built using Windows Server with Hyper-V and System Center. To build a comparable private cloud using VMware, you'd need components from its Cloud Infrastructure Suite.

Let's discuss the capabilities required to deliver IT as a service using a private cloud computing model.

- First, you need a "simple" **self-service experience** to enable your application owners to specify their requirements.
- Next, you need a way to understand the topology and architecture of the application service in question. An application deployed in on an abstracted, or cloud computing model is called a "service". This would necessitate a "**service model**" that accurately binds the application's architecture to the underlying resources where it will be hosted.
- You will need a set of **process automation capabilities** to break down this application provisioning request into the enterprise change requests that need to be implemented. This could include setting up the underlying infrastructure and then a set of app configuration/release requests that need to be tracked.
- Next, you need a set of provisioning tools that actually **configure and deploy** the infrastructure and application layers.
- Once the underlying infrastructure and application service are deployed, they would immediately need to be "**discovered**" and **monitored** for reporting and health tracking.

Fig. 5: System Center 2012 & Windows Server 2012 capabilities enabling you to deliver IT as Service



The table below shows the products required to deliver IT as service using a private cloud computing model. As you can see below, to build a comparable private cloud based on VMware, you'd need several components like vSphere, vCenter, vCloud Director, vCenter SRM, vCenter Operations Management Suite and others.

Fig. 6: Microsoft and VMware Private Cloud products comparison

Private Cloud Tier	Private Cloud Capability	Microsoft Private Cloud Products	VMware Private Cloud Products
Application Management	Application Self-Service Application Performance Management Application Management across clouds	System Center 2012 SP1 Windows Server 2012	vCloud Director vFabric Application Performance Manager vCloud Director, vCloud Connector
Service Delivery & Automation	IT Service Management & Service Catalog Process Automation & Orchestration Capacity Management		VMware Service Manager vCenter Operations Management Suite vCenter Orchestrator
Infrastructure Management	Private Clouds Provisioning and Delegation Data Protection & Disaster Recovery Monitoring Configuration & Compliance Security		vCloud Director vCenter Site Recovery Manager vCenter Operations Management Suite vCenter Operations Management Suite vShield Endpoint
Virtualization	Hypervisor Platform		vSphere 5, vCenter 5

The VMware private cloud stack has several shortcomings as indicated below

- VMware vCloud Request Manager product, which was used to plug-in to vCloud Director, and act as a lightweight request portal to drive certain vCloud Director actions and responses has been discontinued and VMware recommends customers to use VMware Service Manager to personalize the service catalog<sup>4</sup>.
- Our analysis use vCenter Operations Management Suite (vCOPS) Enterprise Plus edition, as lower editions provide limited functionality. It is a bundle of 4 separate products and is priced at \$1370/VM (license only)
- vCenter Site Recovery Manager currently does not support protection of VMs managed by vCloud Director, implying no disaster recovery capability for VMware private clouds<sup>5</sup>.
- vShield Endpoint is an API – not an endpoint security solution and has several limitations (requires the purchase of a third-party anti-malware solution that integrates through the VMware EPSEC API, Security VM is required to enable anti-malware protection on VMs- this leads to a single point for failure and is a potential security threat, the solution is not truly agentless and requires stub code for each VM).

## Windows Server 2012 Hyper-V competitive advantages over vSphere 5 Enterprise Plus

Windows Server 2012 Hyper-V offers industry leading scalability and performance (largest clusters, largest virtual hard disks, largest number of virtual processors per VM), breakthrough advances like network and storage virtualization (Storage Spaces), in-the-box disaster recovery solution (Hyper-V Replica), complete VM mobility including ability to live migrate VMs without any shared storage or clusters (Shared Nothing Live Migration), and an open extensible virtual switch. These are some of the many features that customers require and VMware vSphere 5 Enterprise Plus (highest edition of vSphere) doesn't deliver today.

<sup>4</sup> End of Life of VMware vCloud Request Manager, details [here](#)

<sup>5</sup> vCenter SRM doesn't work with vCloud Director, details [here](#)

Fig. 7: Windows Server 2012 Hyper-V advantages over vSphere 5 Enterprise Plus

Capability	Feature	Windows Server 2012 Hyper-V	VMware vSphere 5.0 Enterprise Plus
<b>Scalability, Performance, Density</b>	Active Virtual Machines Per Host	1,024	512
	Memory Per Virtual Machine	1 TB	1 TB
	Virtual Processors Per Virtual Machine	64	32
	Maximum Nodes Per Hyper-V Cluster	64	32
	Maximum Virtual Machines per Hyper-V Cluster	4,000	3,000
	High Performance VM Networking with SR-IOV	Yes	No
<b>Storage</b>	Native 4KB Disk Support	Yes	No
	Maximum Virtual Disk Size	64 TB	2 TB
	Encrypted Cluster Storage	Yes	No
<b>Secure Multitenancy</b>	Open Extensible Switch	Yes	Closed
	Resource Metering	Yes	Chargeback Req.
<b>Flexible Infrastructure</b>	1GB Simultaneous Live Migrations	Unlimited	4
	10GB Simultaneous Live Migrations	Unlimited	8
	Live Storage Migration	Yes	Yes
	Shared Nothing Live Migration	Yes	No
	Network Virtualization	Yes	Cisco Req.
<b>High Availability</b>	Virtual Machine Replication	Yes	SRM Req.
	Guest OS Application Monitoring	Yes	API Only
	Guest Clustering with Live Migration & Dynamic Memory	Yes	No

**Other than Windows Server 2012 Hyper-V advantages over vSphere 5 Enterprise Plus, System Center 2012 also offers several competitive advantages over VMware Management products.**

System Center 2012	VMware Management Products
<p><b>Operations Manager</b></p> <ul style="list-style-type: none"> <li>Provides a single pane of glass to monitor infrastructure, network, applications, transactions, and code</li> <li>Provides a single pane of glass to monitor applications running on private and public cloud (Windows Azure)</li> <li>Provides a single pane of glass to monitor physical and virtual infrastructure</li> <li>Provides a single pane of glass to monitor Microsoft and non-Microsoft platforms, including Unix, Linux and VMware</li> </ul>	<p><b>vCenter Operations Manager Suite (vCOPs), vFabric APM</b></p> <ul style="list-style-type: none"> <li>vCOPs is needed for monitoring infrastructure and network. vFabric APM is needed for monitoring applications and code. These products are not completely integrated.</li> <li>vCOPs cannot monitor apps and vFabric APM cannot monitor apps running on VMware's PaaS platform, Cloud Foundry</li> <li>vCOPs cannot monitor physical infrastructure. VMware sells another product, Hyperic that is needed for monitoring apps running on physical infrastructure, but it can only monitor a limited set of apps. Unlike Operations Manager, it cannot monitor business critical apps like SQL, Exchange, and SharePoint.</li> <li>vCOPs Enterprise Plus edition can integrate with 3<sup>rd</sup> party products, but is priced at \$34,250 for 25 VMs</li> </ul>

<p style="text-align: center;"><b>Orchestrator</b></p> <ul style="list-style-type: none"> <li>• Mature product with best-in-class workflows and automation</li> <li>• Provides a true IT Pro authoring environment</li> <li>• Provides automation throughout the datacenter (Physical and Virtual)</li> <li>• 30+ integration packs, mostly focused on 3<sup>rd</sup> party tools</li> </ul>	<p style="text-align: center;"><b>vCenter Orchestrator</b></p> <ul style="list-style-type: none"> <li>• Rebranded from Lifecycle Manager</li> <li>• Complicated developer focused authoring environment</li> <li>• Automates only the virtual environment in the datacenter</li> <li>• Only 13 plug-ins, mostly focused on VMware products (5 plug-ins VMware centric)</li> </ul>
<p style="text-align: center;"><b>Configuration Manager</b></p> <ul style="list-style-type: none"> <li>• Configuration Manager is the most widely-used configuration life cycle management tool in the market &amp; has been available since 1996</li> <li>• Empowers users- enables device freedom and application self-service</li> <li>• Helps improve user satisfaction and free up helpdesk resources through service management integration</li> </ul>	<p style="text-align: center;"><b>vCenter Operations Manager Suite (vCOPs), vCenter Configuration Manager</b></p> <ul style="list-style-type: none"> <li>• New product, first released to market in 2011</li> <li>• No concept of application self-service</li> <li>• Limited integration with VMware Service Manager for service management tasks</li> </ul>
<p style="text-align: center;"><b>Virtual Machine Manager</b></p> <ul style="list-style-type: none"> <li>• Offers multi-hypervisor support (Microsoft, VMware, Citrix)</li> <li>• Server App-V integration, Service Templates</li> <li>• Provides built-in resiliency</li> </ul>	<p style="text-align: center;"><b>vCenter</b></p> <ul style="list-style-type: none"> <li>• Cannot manage hypervisors other than ESXi/ESX</li> <li>• Nothing comparable to Server App-V technology</li> <li>• Buy separately the expensive vCenter Heartbeat product for resiliency</li> </ul>

## Private Cloud Economics

In this section, we first compare the private cloud licensing differences between Microsoft and VMware. Next, we illustrate the cost differences through a simple example of a private cloud with 300 VMs. Finally, we analyze the impact of licensing differences on future growth scenarios and show that as your workload density increases, your costs on VMware increases significantly.

### Private Cloud Licensing Comparison

As mentioned earlier, you can use Windows Server and System Center to build Microsoft based private cloud solutions. To build a comparable private cloud solution on VMware technologies, you'll require the components from VMware Cloud Infrastructure Suite. Unlike Microsoft ECI, these products cannot be licensed as a single SKU, but have to be licensed separately for individual products. Moreover, VMware private cloud products follow a combination of three different licensing schemes-

- **vSphere 5** is licensed on a **per processor** basis with virtual RAM entitlements
- **vCenter** is licensed on a **per-instance** basis
- **Cloud Infrastructure products** - vCenter Site Recovery Manager, vShield Security, vCloud Director, vCenter Operations Management Suite and vFabric APM are licensed on a **per-VM** basis

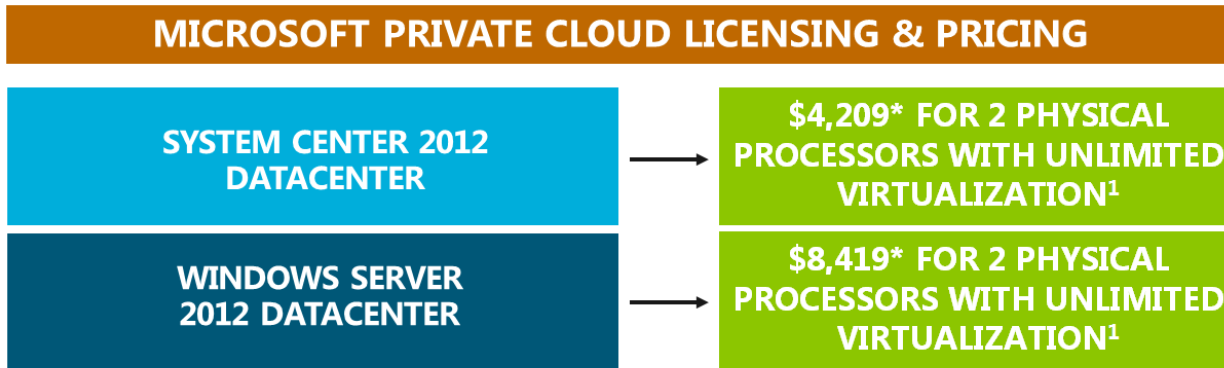
The licensing & pricing comparison between Microsoft and VMware private cloud solutions are shown below. These prices include licensing and support prices for 3 years based on published U.S. suggested list prices for both VMware and Microsoft. We include Microsoft Software Assurance<sup>6</sup> (SA) for Microsoft Windows Server 2012,

<sup>6</sup> Microsoft Software Assurance information [here](#)

System Center 2012, and ECI Datacenter<sup>7</sup> and VMware Production Support and Subscription<sup>8</sup> (SnS) for all VMware products. Appendix A provides details on Microsoft and VMware U.S. suggested list prices.

There are two options to license Microsoft Private Cloud. You can license Windows Server 2012 and System Center 2012 individually like shown below. The datacenter editions of both these products offer unlimited virtualization.

Fig. 8: Microsoft Private Cloud Licensing and Pricing (USD)

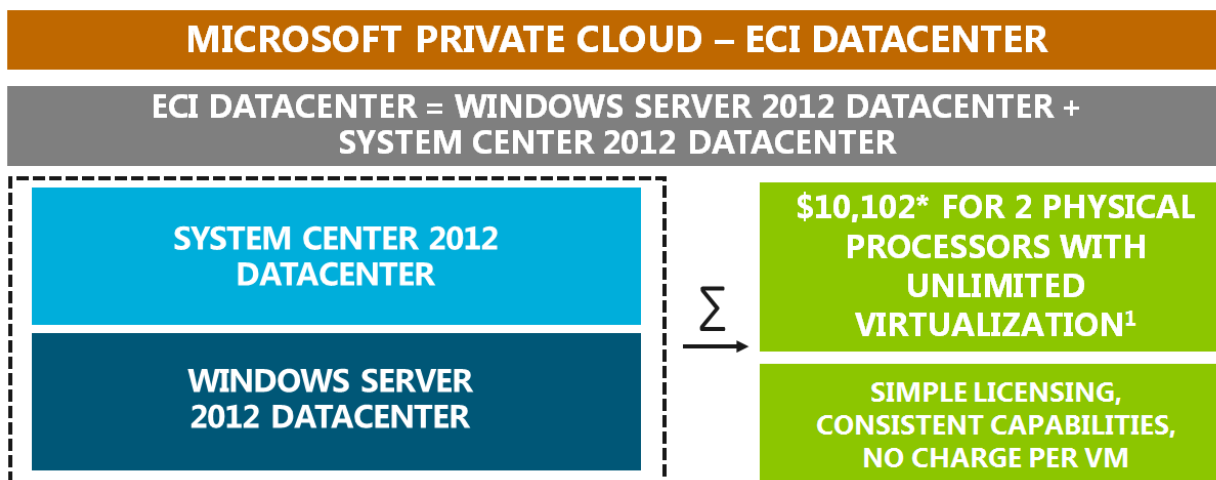


<sup>1</sup>EACH LICENSE OF WINDOWS SERVER 2012 AND SYSTEM CENTER 2012 COVERS UP TO 2 PHYSICAL PROCESSORS. WINDOWS SERVER 2012 DATACENTER AND SYSTEM CENTER 2012 DATACENTER ALLOW UNLIMITED VIRTUALIZATION RIGHTS.

\*PRICE SHOWN HERE INCLUDES 3 YEAR LICENSE AND SOFTWARE ASSURANCE COSTS UNDER MICROSOFT OPEN LICENSE PROGRAM, NO LEVEL PRICING USED, U.S. SUGGESTED LIST PRICES AS OF JULY 2012, RESLLER PRICING MAY VARY.

As always, the best way to purchase Microsoft private cloud is through the Enrollment for Core Infrastructure (ECI). ECI provides customers with an easy and cost efficient way to purchase the Microsoft private cloud. ECI helps reduce licensing costs with a 20 percent savings as compared to purchasing Windows Server and System Center licenses individually. The licensing and pricing of Microsoft Private Cloud with ECI is shown below.

Fig. 9: Microsoft Private Cloud Licensing and Pricing with ECI (USD)



<sup>1</sup>EACH LICENSE OF ECI DATACENTER COVERS UP TO 2 PHYSICAL PROCESSORS AND PROVIDE UNLIMITED VIRTUALIZATION RIGHTS. ECI REQUIRES A 25 LICENSE MINIMUM INITIAL PURCHASE

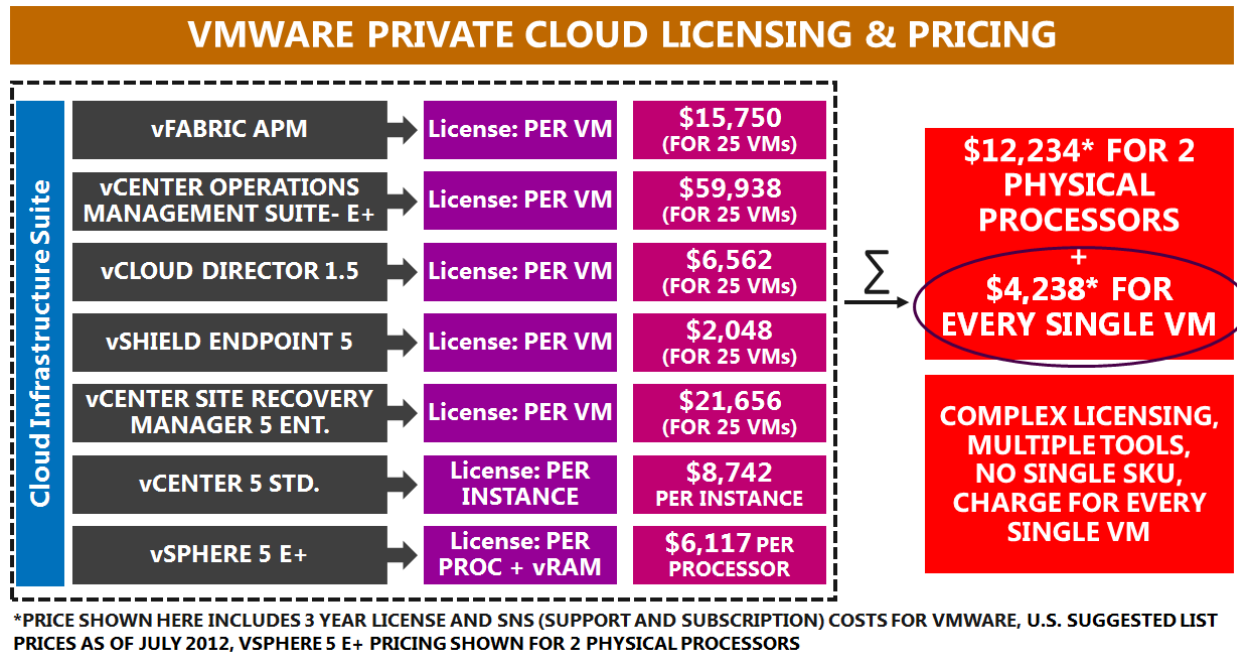
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<sup>7</sup> Pricing for ECI Datacenter available in Appendix A, Windows Server 2012 and System Center 2012 pricing available [here](#)

<sup>8</sup> Most of VMware products require at least 1 year of SnS. Production SnS is 25% of the then-current list price.

Most of the VMware private cloud products are licensed on a per-VM basis and these products are sold in packs of 25 virtual machine licenses<sup>9</sup>. The licensing and pricing of a VMware private cloud is shown below.

Fig. 10: VMware Private Cloud Licensing & Pricing (USD)



The VMware private cloud licensing cost for a single VM is calculated as below

$$\text{VMware Private Cloud Licensing Cost Per-VM} = \sum \text{List License Prices (Cloud Infrastructure Suite)}/25$$

$$\text{VMware Private Cloud Licensing Cost Per-VM} = \sum \text{List License Prices (vCenter SRM + vShield Endpoint + vCloud Director + vCenter Operations Management Suite + vFabric APM)}/25$$

$$\text{VMware Private Cloud Licensing Cost Per-VM} = \sum (\$21,656 + \$2,048 + \$6,562 + \$59,938 + \$15,750)/25 = \$4,238 \text{ USD}$$

$$\text{VMware Private Cloud Licensing Cost Per-VM} = \$4,238 \text{ USD}$$

**With VMware, you might need to pay \$4,238 USD for every VM running in your private cloud.** On the other hand, with Microsoft Windows Server 2012, System Center 2012, and ECI Datacenter, you benefit from unlimited virtualization rights for Windows Server VMs along with management (monitoring, configuration, automation, orchestration, backup, virtual management, service management) for an unlimited number of VMs. Our licensing model delivers cost benefits up front and as you scale – helping you achieve the economic benefits of cloud computing. We illustrate this below through a simple example.

<sup>9</sup> VMware Private Cloud products such as vCloud Director, vCenter SRM, vShield, vCenter Operations Management Suite are sold in packs of 25 virtual machine licenses.



## Private Cloud Cost Comparisons

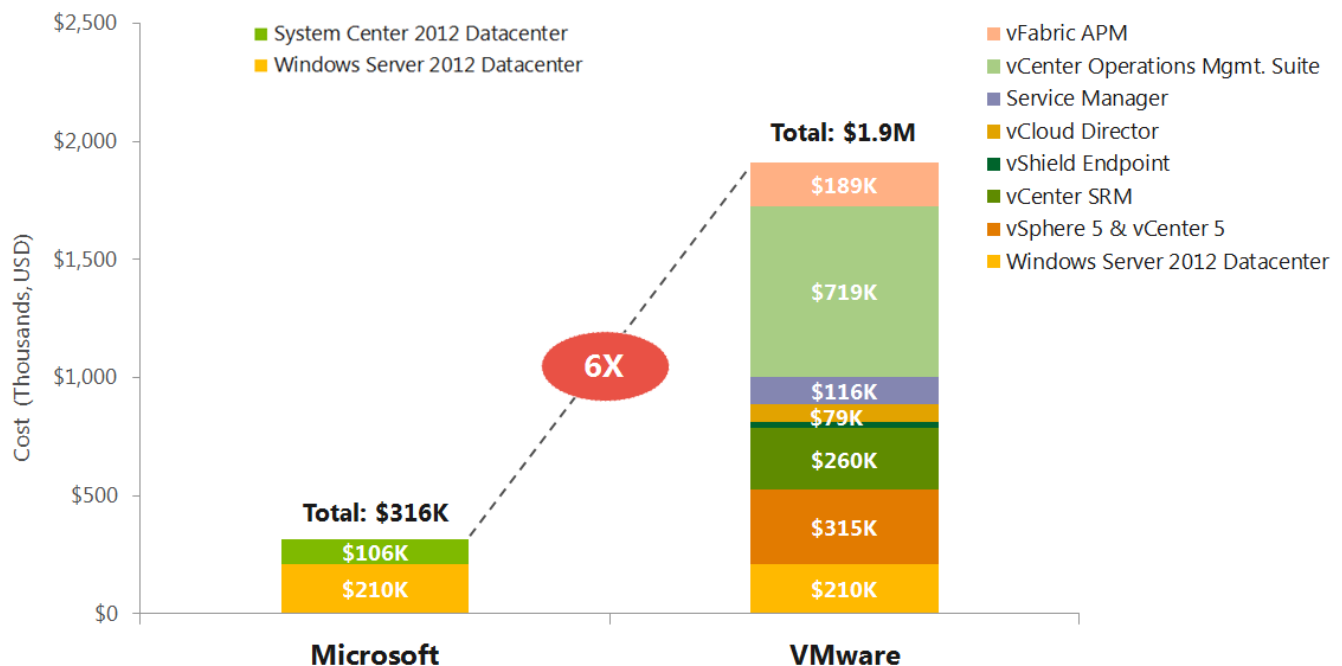
In our analysis of private cloud costs between Microsoft and VMware, we only consider the software acquisition and support costs, including software licenses for virtualization, private cloud, management, and guest operating systems. We are not providing a complete datacenter or private cloud TCO (Total Cost of Ownership) analysis, as calculating operational costs, capital costs, and other datacenter related costs require complex calculations and are beyond the scope of this whitepaper. Additionally, complete datacenter TCO cost comparisons can get misleading because of different assumptions around operational and capital costs.

### Set up your Private Cloud (let's say with 300 VMs)

Let's say you want to set up a new private cloud with a fixed number of VMs. In our example, we consider an initial private cloud set up with 300 VMs. The costs below don't include hardware, storage, or operational costs.

**As shown below, with a fairly conservative consolidation ratio of 6 VMs per physical processor, a VMware private cloud solution can cost six times more than a comparable Microsoft private cloud solution over a period of one to three years.** In this example, we use Windows Server 2012 and System Center 2012 licenses for a Microsoft private cloud solution. As you factor in the hardware costs, the cost difference is bound to go up because of the limitation imposed by vSphere 5 memory based licensing, which makes scale-up scenarios and memory overcommitment expensive to implement for VMware based private clouds.

Fig. 11: Private Cloud Cost Comparison- Microsoft & VMware for 300 VMs



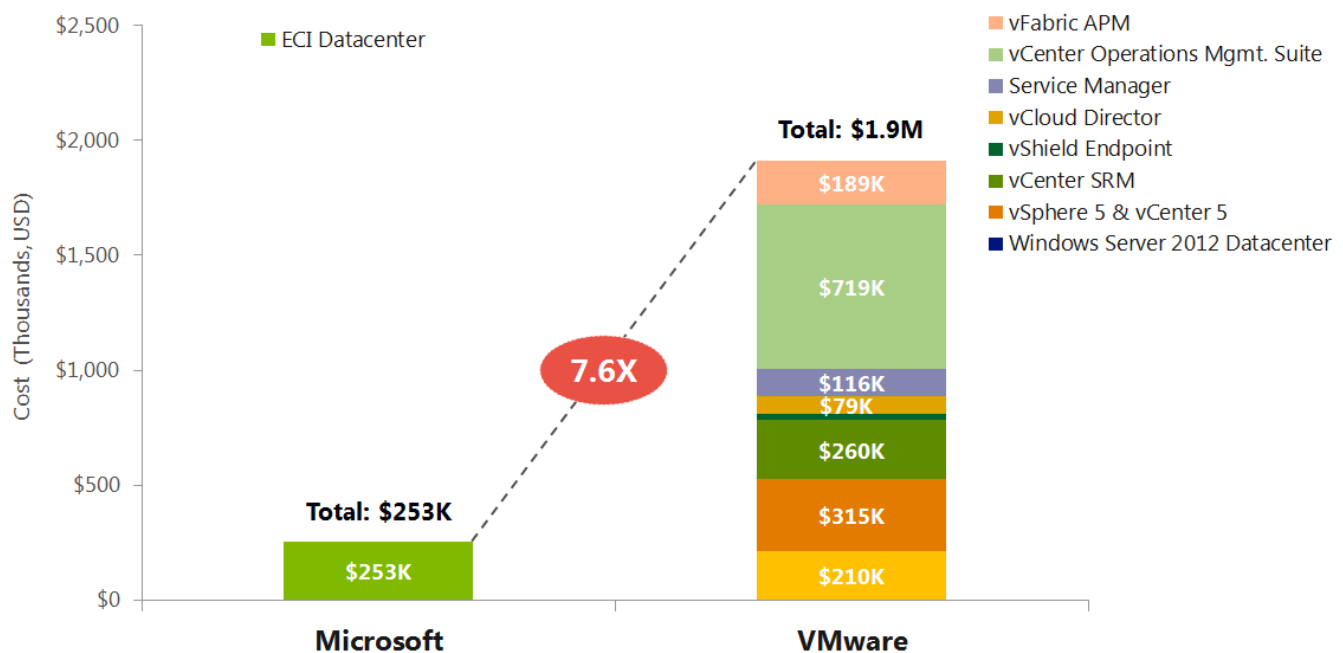
Appendix B provides detailed cost breakdowns. Assumptions

- Assumes 25 physical hosts with 2 CPU & six cores each, 300 VMs at 6:1 consolidation ratio, meaning 6 VMs are run per physical processor
- Costs shown for 3 years for license and support for both Microsoft and VMware, no discount applied on either sides

- Cost doesn't include hardware, storage or IT labor costs
- VMware cost includes Windows Server 2012 Datacenter edition for running guests
- Calculation uses licensing and support prices based on published U.S. suggested list prices for VMware and Microsoft as of July 2012

If you require buying more than 25 licenses of Windows Server 2012 Datacenter and System Center 2012 Datacenter, the best way to purchase these products is through ECI Datacenter. ECI helps reduce licensing costs with a 20 percent savings as compared to purchasing Windows Server and System Center licenses individually. **In this case, a VMware private cloud solution can cost eight times more than a comparable Microsoft private cloud solution over a period of one to three years.**

Fig. 12: Private Cloud Cost Comparison- Microsoft & VMware for 300 VMs when using Microsoft ECI Datacenter



Same assumptions as the scenario above

In the calculations above, we allow for 6 VMs per physical processor, a very typical and conservative consolidation ratio used by majority of customers today. But, we are already witnessing several customers that are running much higher VM densities of 12 or 15 VMs per physical processor or higher. The cost efficiency of private cloud computing depends on economies of scale, higher workload density, and dynamic management of resources that ensure service levels. Optimal costs are achieved when all resources in a pool can be allocated to specific workloads, so it is likely that you're considering higher VM densities.

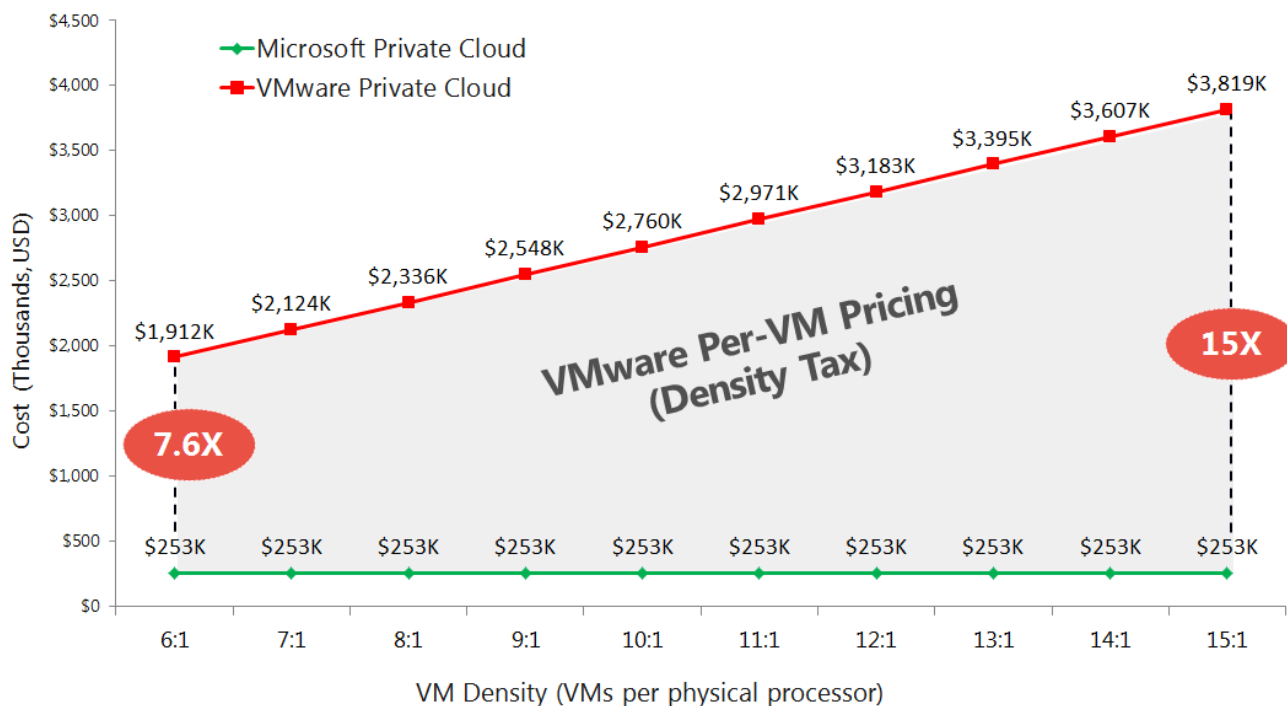
### Six Months Later: Get Aggressive about Efficiency (& Pay VMware Density tax)

Once you have set up your private cloud, within the next 6-12 months you want to get aggressive about efficiency to reduce your IT costs. You achieve this efficiency by maximizing hardware utilization and driving up workload density through increased virtualization. As a result, your costs should decrease as your VM density increases.

We model this situation below where we start with 6 VMs per physical processor (the configuration with which you set up your private cloud) and go to 15 VMs per physical processor, increasing your VM density by adding 1 more VM per physical processor at a time. As you can see from the chart below, Microsoft costs remain predictable- in this case flat, as we are increasing the VM density on the physical hosts from 6 VMs to 15 VMs per physical processor and not adding additional physical hosts or processors.

**Microsoft Windows Server 2012, System center 2012, and ECI Datacenter provide unlimited virtualization rights, which mean that as VM densities increase, your licensing costs remain predictable. With VMware, as your VM densities increase, your costs increase significantly, as you end up paying a separate licensing fee for every VM. As shown below, with 15 VMs per physical processor, a VMware private cloud solution can cost fifteen times more than a comparable Microsoft private cloud solution over a period of one to three years.** This cost difference is driven mainly by VMware per VM licensing (Density Tax).

Fig. 13: Private Cloud Cost Comparison- Microsoft & VMware for increasing VM densities



**Assumptions**

- Assumes 25 physical hosts with 2 CPU & six cores each, VM density increased from 6:1 to 15:1
- Costs shown for 3 years for license and support for both Microsoft and VMware, no discount applied on either sides
- Cost doesn't include hardware, storage or IT labor costs
- VMware cost includes Windows Server 2012 Datacenter edition for running guests
- Licensing and support prices based on published U.S. suggested list prices for VMware and Microsoft as of July 2012

**As you saw in the example above, as you doubled your efficiency (from 6 VMs to 15 VMs per physical processor), your costs on VMware doubled, while costs on Microsoft remained the same. With Microsoft, your private cloud ROI increases as your VM density increases. With VMware, your private cloud costs grow, as your VM density increases. Basically, VMware "taxes" you when you do a good job of increasing your private cloud efficiency.**

## Conclusion

Our analysis clearly demonstrates that with Microsoft the ROI of your private cloud increases as you scale. VMware approach to private cloud ensures you are “taxed” as you virtualize more workloads, grow your private cloud and scale your business critical tier-1 apps.

Cloud computing, both private and public, is fundamentally shifting the IT industry and a primary driver of that trend is economics. Customers that implement Microsoft private cloud solutions are well poised to realize many benefits. They will be able to leverage a hybrid cloud model and choose either a private or public cloud model depending on what best suits their requirements. For any private cloud model (on-premise or hosted) that they choose, they will have access to Windows Server 2012 Hyper-V groundbreaking capabilities and System Center 2012 complete, integrated management capabilities and will get a single pane of glass to manage physical, virtual, private, and public cloud environments. This will enable them to manage their infrastructure more effectively than with VMware’s private cloud solutions.

Finally our history, and ongoing, commitment to helping customers benefit from technology – at scale – will continue.

Our approach is focused on you – your apps, your heterogeneous environments, your need for a solution that scales with a public cloud that’s real today. Our approach to cloud – is on your terms – and it will grow with you – not against you.

Visit this site – <http://www.microsoft.com/privatecloud/> – to learn more about our private cloud offerings.

## Appendix A: VMware & Microsoft U.S. Suggested Price List

VMware Private Cloud Products Price List (U.S. Suggested List Prices) All per-VM prices calculated for packs of 25 VMs.						
Product	Components	License Type	Base License Price	Production SnS for 1 Year*	Production SnS for 3 Years	Total Cost (License + 3 year SnS)
Cloud Infrastructure Suite	vSphere 5 Enterprise Plus	Per-Processor with vRAM	\$3,495 <sup>10</sup>	\$874	\$2,621	<b>\$6,117</b>
	vCenter 5 Standard	Per-Instance	\$4,995 <sup>11</sup>	\$1,249	\$3,747	<b>\$8,742</b>
	vCenter Site Recovery Manager 5 Enterprise	Per-VM	\$12,375 <sup>12</sup>	\$3,094	\$9,281	<b>\$21,656</b>
	vShield Endpoint 5	Per-VM	Endpoint License+ 3 Yr. SnS			<b>\$2,048<sup>13</sup></b>
	vCloud Director 1.5	Per-VM	\$3,750 <sup>14</sup>	\$937	\$2,812	<b>\$6,562</b>
	vCenter Operations Management Suite – Enterprise Plus	Per-VM	\$34,250 <sup>15</sup>	\$8,562	\$25,688	<b>\$59,938</b>
	vFabric Application Performance Manager (APM)	Per-VM	\$360 <sup>16</sup> per VM or \$9,000 per 25 VMs	\$2,250	\$6,750	<b>\$15,750</b>

\* Production SnS fee is 25% of base license price per year

All VMware private cloud products, except vFabric APM, licensed on a per-VM basis are sold in packs of 25 virtual machine licenses.

<sup>10</sup> vSphere 5 U.S. suggested list price from VMware website as of July, 2012

<sup>11</sup> vCenter 5 U.S. suggested list price from VMware website as of July, 2012

<sup>12</sup> vCenter SRM Enterprise U.S. suggested list price from VMware website as of July, 2012

<sup>13</sup> vShield Endpoint U.S. suggested list price from VMware website as of July, 2012

<sup>14</sup> vCloud Director U.S. suggested list price from VMware website as of July, 2012

<sup>15</sup> vCenter Operations Management Suite – Enterprise Plus U.S. suggested list price from VMware presentation as of July 2012

<sup>16</sup> vFabric APM U.S. suggested list price list price from VMware website as of July, 2012

Microsoft Private Cloud Products Price List (Microsoft Open License Estimated Retail Price List <sup>17</sup> in USD, reseller pricing may vary)						
Product	Components	License Type	Base License Price (2 physical processors)	SA for 2 Years (2 physical processors)	SA for 3 Years (2 physical processors)	Total Cost (License + 3 year SA) (2 physical processors)
System Center 2012	Operations Manager	Per 2 physical Processors	\$2,404	\$1203	\$1,805	<b>\$4,209</b>
	Configuration Manager					
	Orchestrator					
	Data Protection Manager					
	App Controller					
	Virtual Machine Manager					
	Service Manager					
Endpoint Protection						
Windows Server 2012	Windows Server 2012 Datacenter	Per 2 Physical Processors	\$4,810	\$2406	\$3,609	<b>\$8,419</b>
ECI Datacenter	System Center 2012 Datacenter Windows Server 2012 Datacenter	Per 2 Physical Processors				<b>\$10,102</b>

Each Windows Server 2012, System Center 2012, and ECI license covers up to 2 physical processors. ECI requires a 25 license minimum initial purchase.

ECI helps reduce licensing costs with a 20 percent savings as compared to purchasing Windows Server and System Center licenses individually.

ECI Datacenter = (Windows Server 2012 Datacenter + System Center 2012 Datacenter) \*.80

ECI Datacenter = (\$8419 + \$4209) \*.80 = \$10102

System Center 2012 introduces the following licensing improvements

- Standalone 'products' become components of integrated product Management Licenses
- Software Assurance is included with all licenses
- Server Management Licenses align to 'processor-based' model, each license covers 2 processors
- The right to run Management Server software and supporting SQL Runtime are now included with every Management License. Management Server Licenses are discontinued.

<sup>17</sup> [Microsoft License Advisor](#), July 2012

## Appendix B: Private Cloud Cost Comparison- Microsoft & VMware for 300 VMs

Private Cloud Environment	
Number of Physical hosts	25
Number of Physical Processors (2 per host)	$(25 \times 2) = 50$
Number of VMs per physical processor	6
Total Number of VMs (VMs per physical processor* number of physical processors)	300

Product	Components	License Type	Total Cost (License + 3 year SnS)	Calculation	Final Cost
Cloud Infrastructure Suite	vSphere 5 (Enterprise Plus)	Per-Processor with vRAM	<b>\$6,117</b>	$= \$6,117 \times 50$	<b>\$305,850</b>
	vCenter 5 (Standard)	Per-Instance	<b>\$8,742</b>	$= \$8,742 \times 1$	<b>\$8,742</b>
	vCenter Site Recovery Manager 5 (Enterprise)	Per-VM	<b>\$21,656</b>	$= \$(21,656 \times 300) / 25$	<b>\$259,884</b>
	vShield 5 Endpoint	Per-VM	<b>\$2,048</b>	$= \$(2,048 \times 300) / 25$	<b>\$24,576</b>
	vCloud Director 1.5	Per-VM	<b>\$6,562</b>	$= \$(6,562 \times 300) / 25$	<b>\$78,744</b>
	vCenter Operations Management Suite – Enterprise Plus	Per-VM	<b>\$ 59,938</b>	$= \$(59,938 \times 300) / 25$	<b>\$719,256</b>
	vFabric Application Performance Manager	Per-VM	<b>\$15,750</b>	$= \$(15,750 \times 300) / 25$	<b>\$ 189,000</b>
	Service Manager	Per-Instance	<b>\$115,500</b>	$= \$115,500 \times 1$	<b>\$115,500</b>
Windows Server 2012	Windows Server 2012 Datacenter	Per 2 Physical Processors	<b>\$8,416</b>	$= \$8,416 \times 25$	<b>\$210,400</b>
Total VMware Private Cloud cost for 300 VMs					<b>\$1,911,952</b>

### Microsoft Private Cloud costs without using ECI Datacenter

Product	Components	License Type	Total Cost (License + 3 year SA)	Calculation	Final Cost
Not using ECI Datacenter	Windows Server 2012 Datacenter	Per 2 Physical Processors	<b>\$8,419</b>	$= \$8,419 \times 25$	<b>\$210,475</b>
	System Center 2012 Datacenter	Per 2 Physical Processors	<b>\$4,209</b>	$= \$4,209 \times 25$	<b>\$105,225</b>
Total Microsoft Private Cloud cost for 300 VMs					<b>\$315,700</b>

**Microsoft Private Cloud costs using ECI Datacenter**

Product	Components	License Type	Total Cost (License + 3 year SA)	Calculation	Final Cost
ECI Datacenter	System Center 2012 Datacenter Windows Server 2012 Datacenter	Per 2 Physical Processors	<b>\$10,102</b>	=\$10,102*25	<b>\$252,800</b>
Total Microsoft Private Cloud cost for 300 VMs					<b>\$252,550</b>

**A VMware Private Cloud with 300 VMs is 6X more expensive than a Microsoft Private Cloud without using Microsoft ECI licensing option.**

**A VMware Private Cloud with 300 VMs is 7.6X more expensive than a Microsoft Private Cloud when using Microsoft ECI licensing option.**