



How to Choose a Virtualization Solution

VMware vForum

Q2 2009

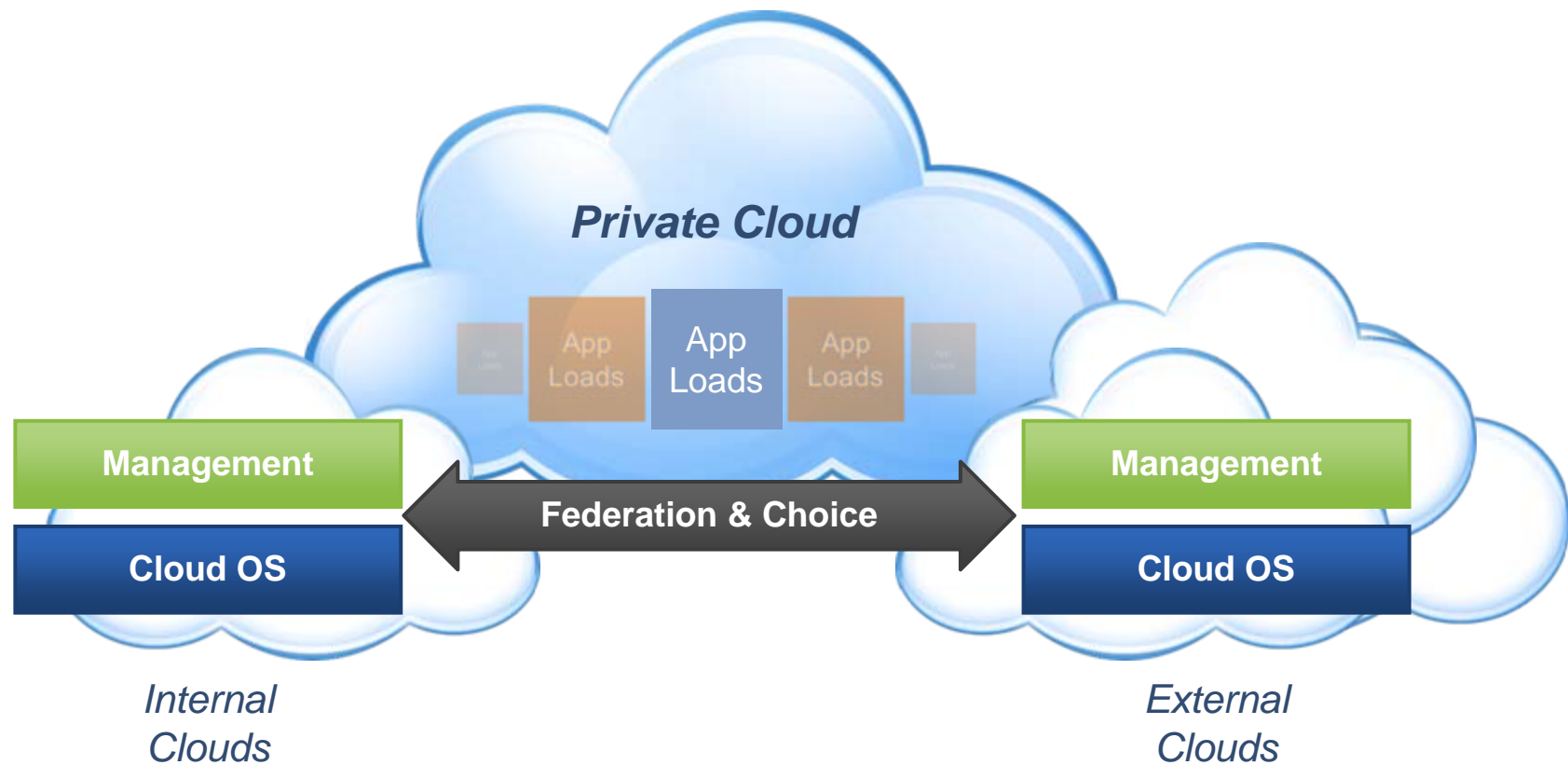
IT as a Service

Just like.....

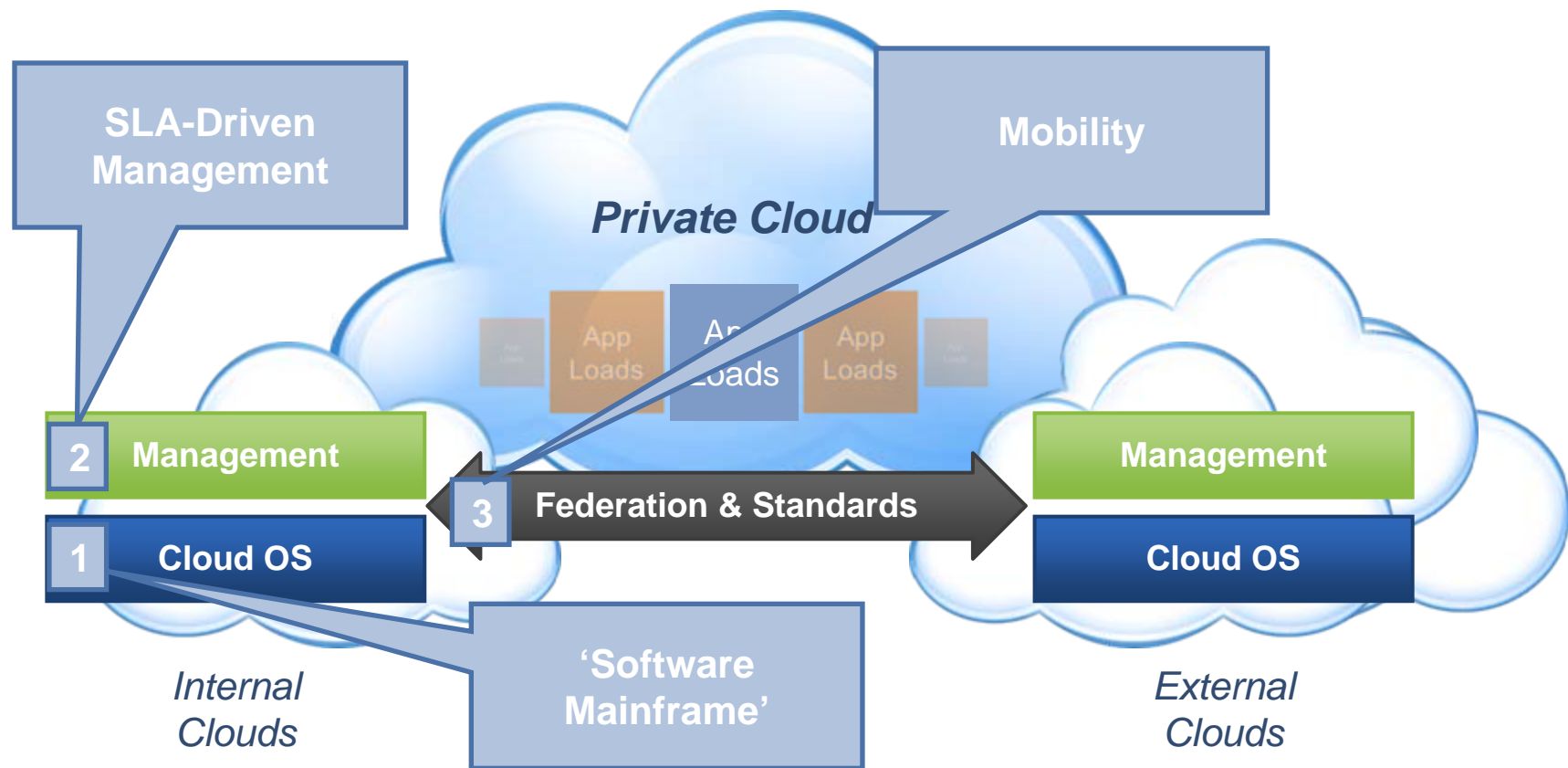


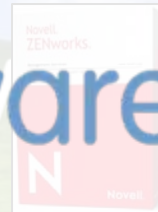
- Inexpensive, pay as you go, pay for what you use
- Ubiquitously available
- Reliable
- Choice of providers

The Vision: IT as a Service Delivered Through Private Cloud



There are Three Building Blocks for the Private Cloud





How do you make your decision from among all these vendors?



VMware Resource – Why Choose VMware

“Why Choose VMware” on www.vmware.com



www.vmware.com/go/whyvmware

Checklist of Core Requirements

Based on VMware's 11-years of Experience and Customer Feedback

Most Robust, Reliable Foundation

If the hypervisor
doesn't work well,
nothing else does

Secured IT Services

Enterprise Virtualization Management

Support for Your Entire Infrastructure

Customer Proven Solution

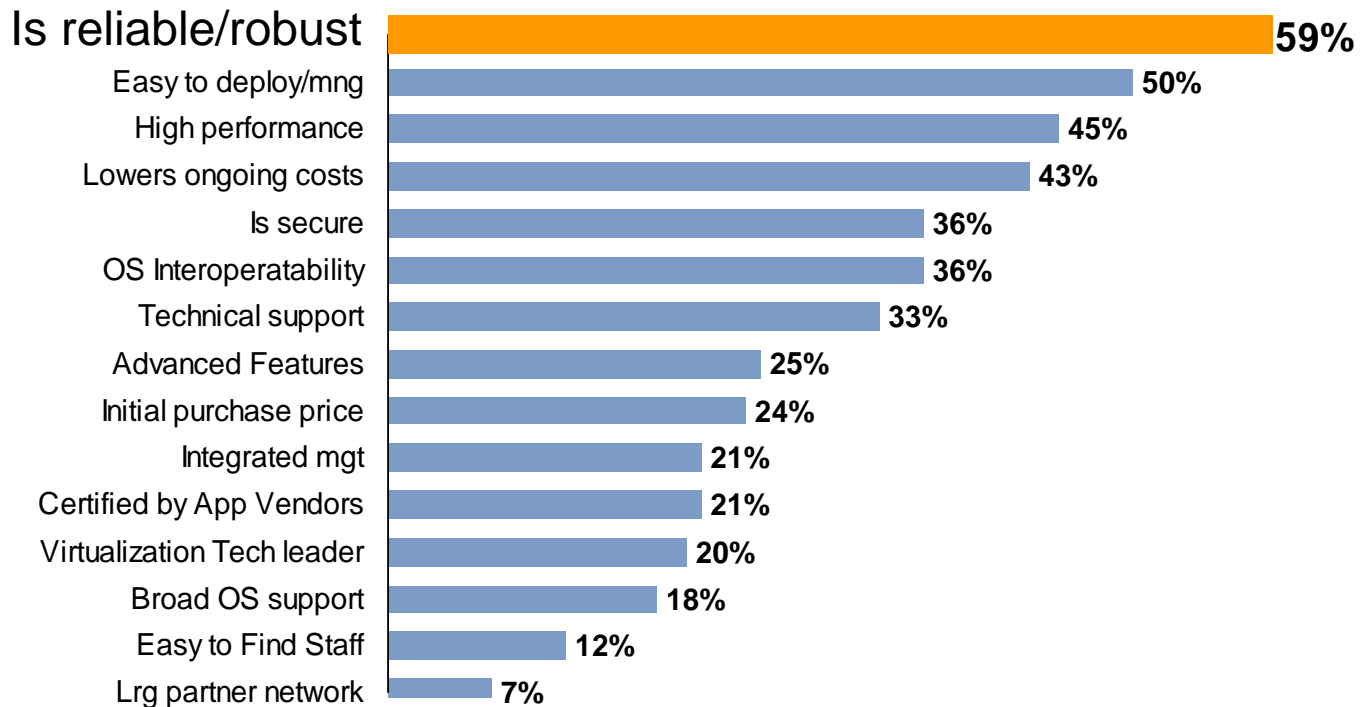
...and it should be the lowest cost solution!!!

Customers Said Reliability is the Top Criterion

When Selecting a Virtualization Solution

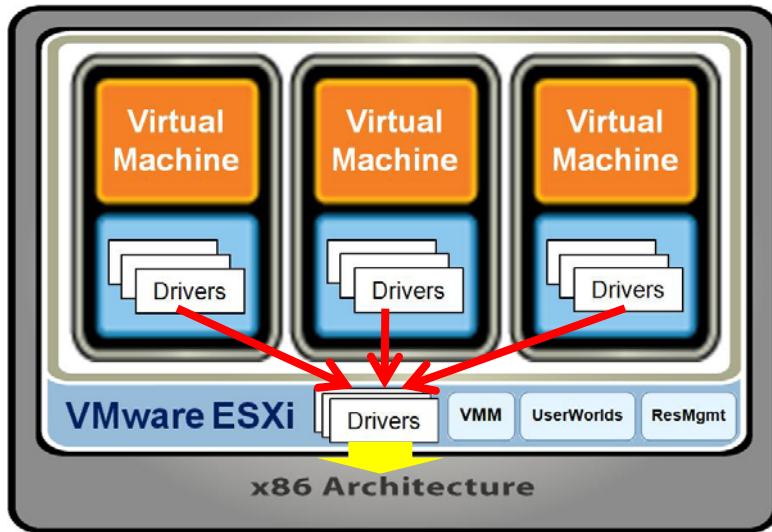
Virtualization Software Attributes

59% of those surveyed Worldwide rated Reliability #1



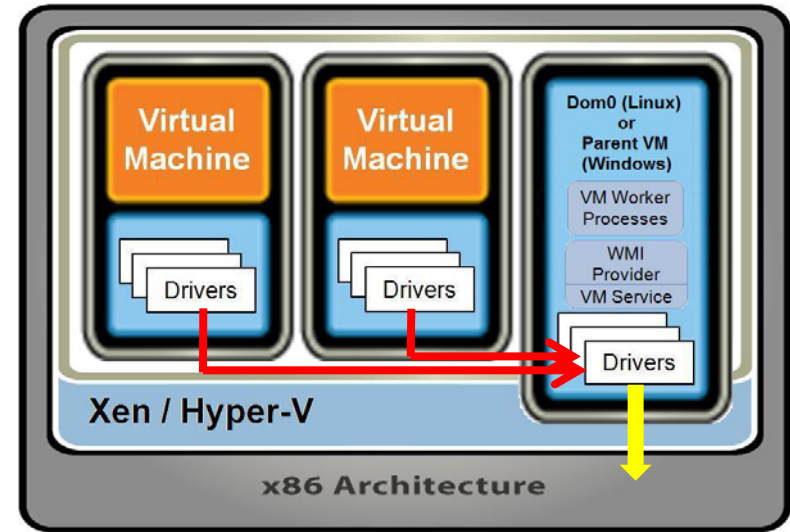
Source: VMware Customer/Prospects Study, 2007; n = 1520

Hypervisor Architectures Do Matter



VMware Architecture

- True thin hypervisor
- No general-purpose OS
- Direct driver model = I/O scaling
- Drivers optimized for VMs
- Page Sharing = Greater Density
- Hypervisor owns the resources

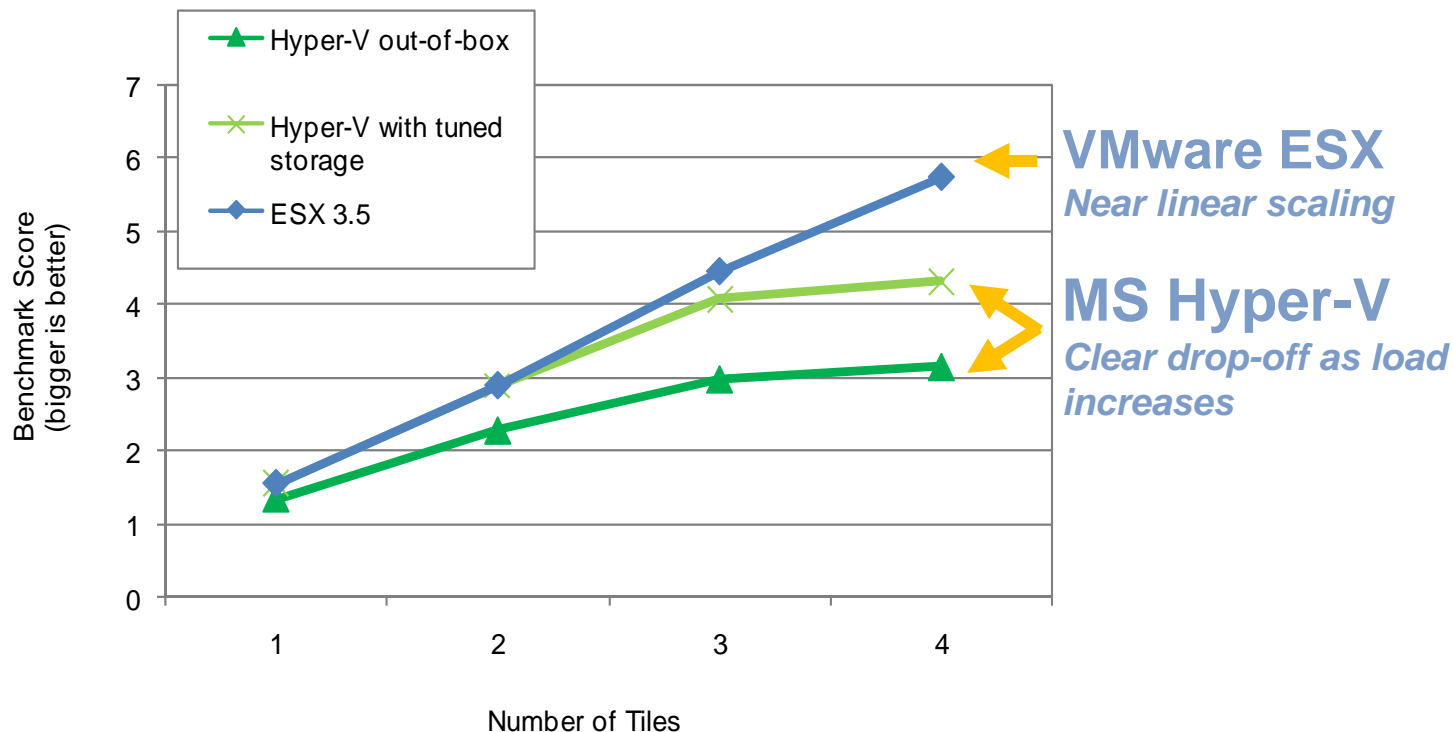


Other Architectures

- Large gen. purpose OS in mgmt partition
- Indirect driver model
- Generic drivers in mgmt partition
- I/O bottlenecks under load
- Mgmt OS & drivers are single point of failure

Architectural Impact on Scalability

Heterogeneous Workload: VMmark Comparison



ESX 3.5 outperforms Hyper-V on VMmark (heterogeneous workloads) by up to 93%
ESX 4.0 performance and scalability is even better!

Size Does Matter



*Windows 2008
Server Core with
Hyper-V*

2.6 GB

*Hyper-V Server 2008
isn't much better at...*

2.5 GB

Windows Updates Impact Hyper-V

Datacenter downtime due to Microsoft Patch Tuesdays

In most Patch Tuesdays since MS Hyper-V was released, patches consisted of “Important” updates to Server Core that were:

1. UNRELATED to a Hyper-V install,
2. Required a REBOOT of the host,
3. Caused VM DOWNTIME since Hyper-V doesn't support live migration.

	7/8/08	8/12/08	9/10/08	10/21/08	11/18/08	12/9/08	1/13/09	Misc
Number of Patches for Server Core	2	3	4	5	2	1	1	5
% Patches Related to Hyper-V	0%	0%	25%	40%	0%	0%	0%	20%
Reboot Required	YES	YES	YES	YES	YES	YES	YES	YES

Clear example of the negative impact of virtualization as part of a general purpose operating system

Risk from Generic Windows Drivers



[Back to article](#) [Print this](#)

Hyper-V's Achilles' heel

By Randall Kennedy

May 13, 2008

A house of cards -- that's how I'd describe the current state of the Windows device driver ecosystem. And now, with the introduction of Hyper-V, we have a whole new failure vector to think about.

In a nutshell, one of Hyper-V's advertised strengths -- the host partition's ability to work with generic Windows device drivers -- is also its greatest weakness. That's because the quality level of Windows device drivers, especially those from third-party developers, is notoriously inconsistent.

I found this out the hard way while experimenting with the Hyper-V Release Candidate 1 (RC1) system. After enabling the Hyper-V role in Server Manager, I installed the latest ATI Catalyst (8.4) software for the system's X1300 display adapter. The installation was successful (I hadn't seen one of these in months) and puzzling: I had successfully installed the driver without incident. The only difference this time around was Hyper-V (unlike VMware, which requires a hypervisor OS layer).

Even more disturbing was the fact that I had just finished watching an old (December 2007) video with Mark Russinovich, a Technical Fellow at Microsoft and one of the smartest people I know about Hyper-V and how its ability to leverage existing Windows drivers in the host partition is a major advantage over certain unnamed competitors (read: VMware), which require a hypervisor OS layer.

“A house of cards -- that's how I'd describe the current state of the Windows device driver ecosystem... And now, **with the introduction of Hyper-V, we have a whole new failure vector to think about.**”

“In a nutshell, **one of Hyper-V's advertised strengths -- the host partition's ability to work with generic Windows device drivers -- is also its greatest weakness.**

That's because the quality level of Windows device drivers, especially those from third-party developers, is notoriously inconsistent.”

VMware Receives Reliability Awards

...external validation of VMware product reliability

Redmondmag.com

► Home ► Features ► Print Feature Article

Feature

The 2008 Editors' Choice Awards

Here are our selections for

by Lafe Low
January 2008



Crafts
They
reflec
doma
our co
produ

that's delivered on time. Th
streamline operations, sav
opportunities.

For this Editors' Choice, w
feature or function. There a
management tool. Instead
mean to our expert editors

Let us know how our expe
you use in your everyday li

Most Reliable

This is the "accidentally built a wall around it and forgot it was there" kind of reliable:

1. **VMware ESX:** The least stable part of ESX is usually the administrator. The code is virtually bomb-proof.
2. **IBM mainframes:** They've been running for more than 50 years, and probably will for another 50.
3. **DOS 6.2:** One company had a DOS machine with a terminal emulator connected to a remote customer. It downloaded thousands of invoices per month and delivered them to a file share. The box was never rebooted and was found behind a filing cabinet when the company moved.

Customers Count on VMware ESX Reliability

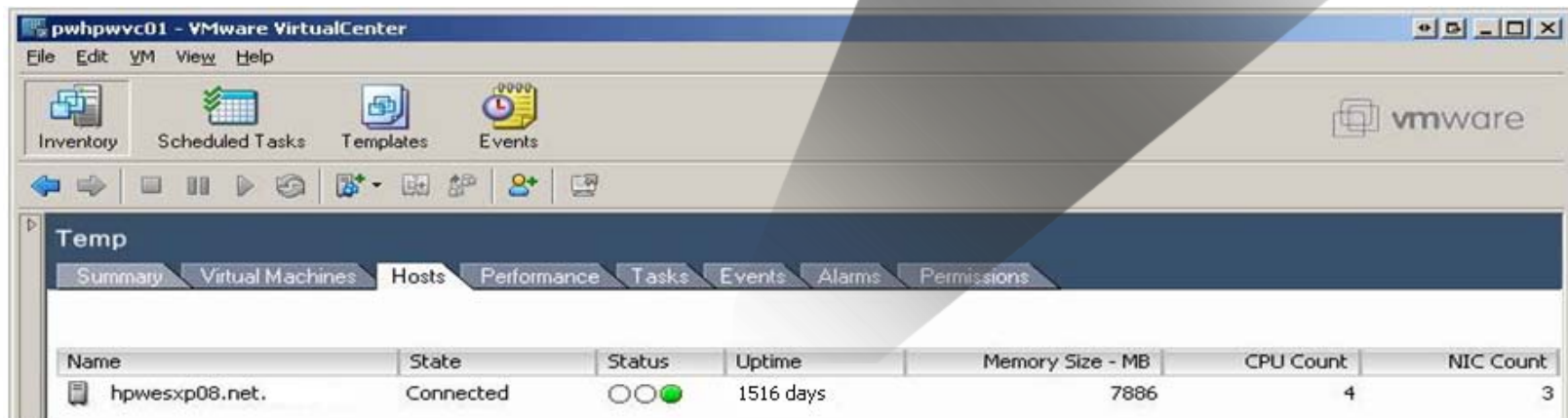
...customer validation of VMware product reliability

VMware ESX: #1 in Reliability

Large pharmaceutical customer: Over four years of VMware ESX uptime!

Uptime

1516 days



Companies Trust Their Production Servers to Run on VMware

Most Robust and Reliable Foundation

Most Robust, Reliable Foundation

VMware

Others



Thin, purpose built architecture



Near-linear scaling under load



Hardened, optimized drivers for virt.



Broad third-party, customer validation

Checklist of Core Requirements

Functionality needed in any virtualization solution



Most Robust, Reliable Foundation



Platform for Shared IT Services



IT services that enable you to management
realize the full potential
of virtualization



Support for Your Entire Infrastructure

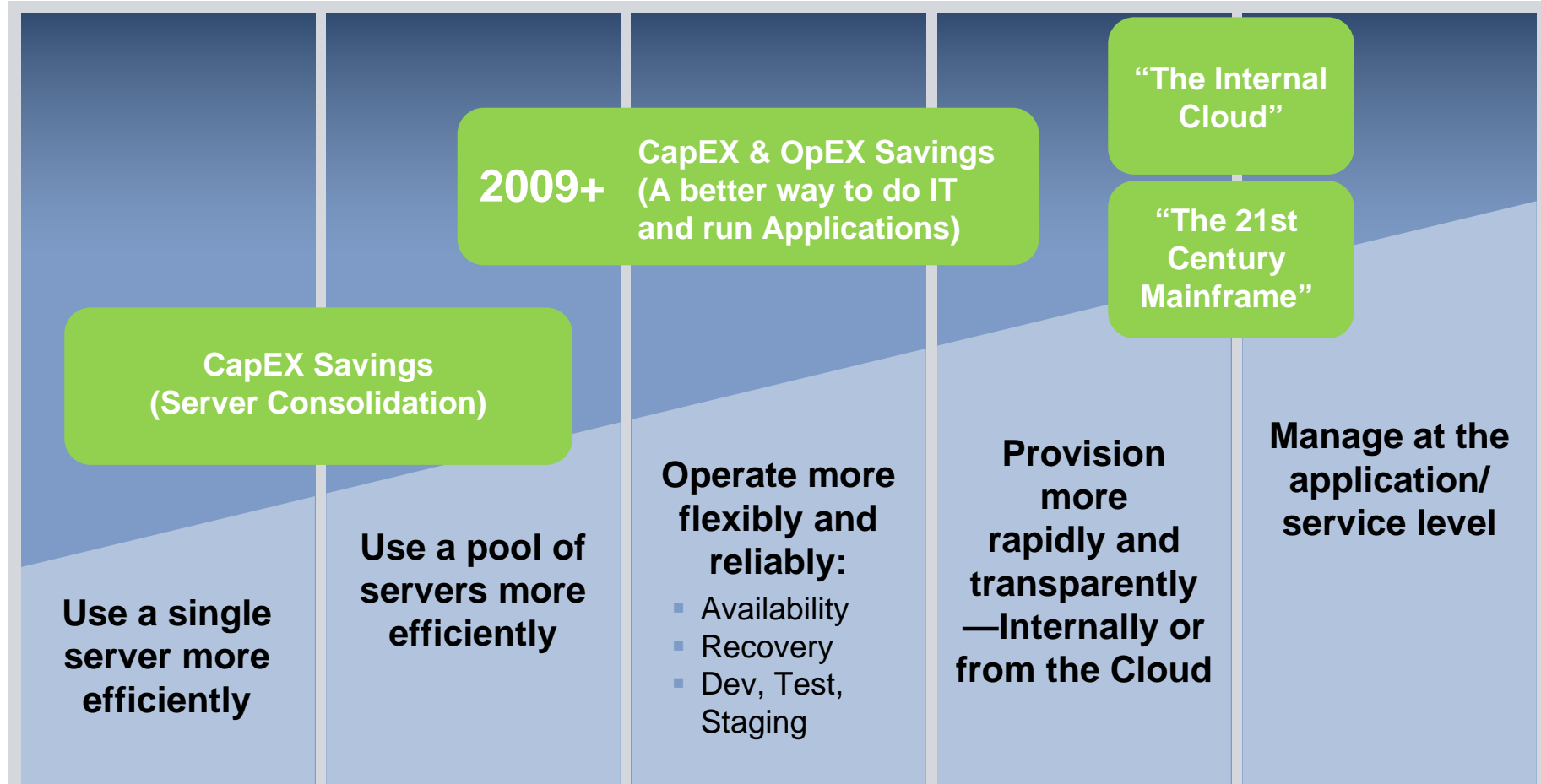


Customer Proven Solution

...and it has to be the Lowest TCO Solution!!!

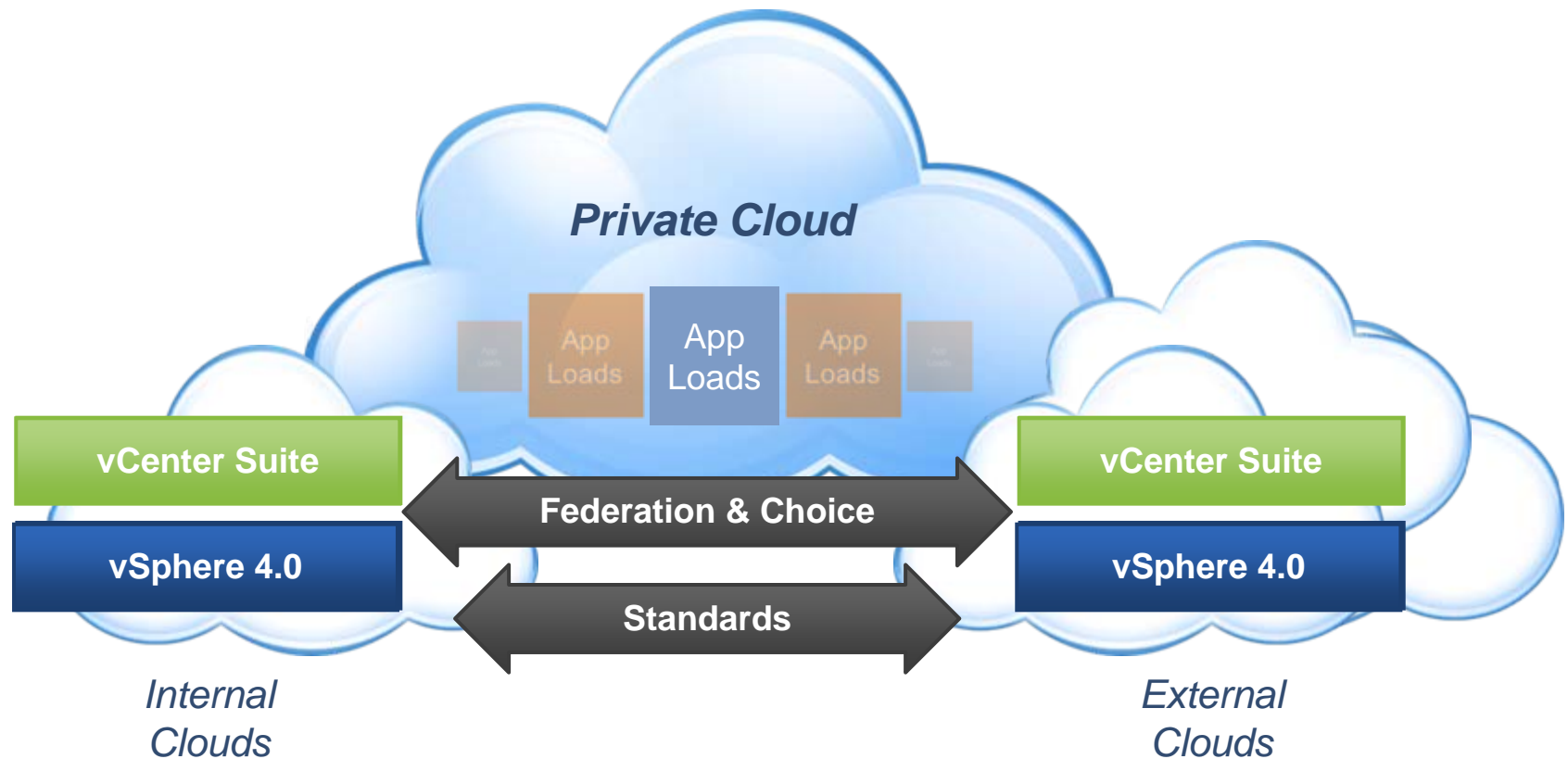
The VMware Journey

Beyond the Hypervisor to the Cloud-OS



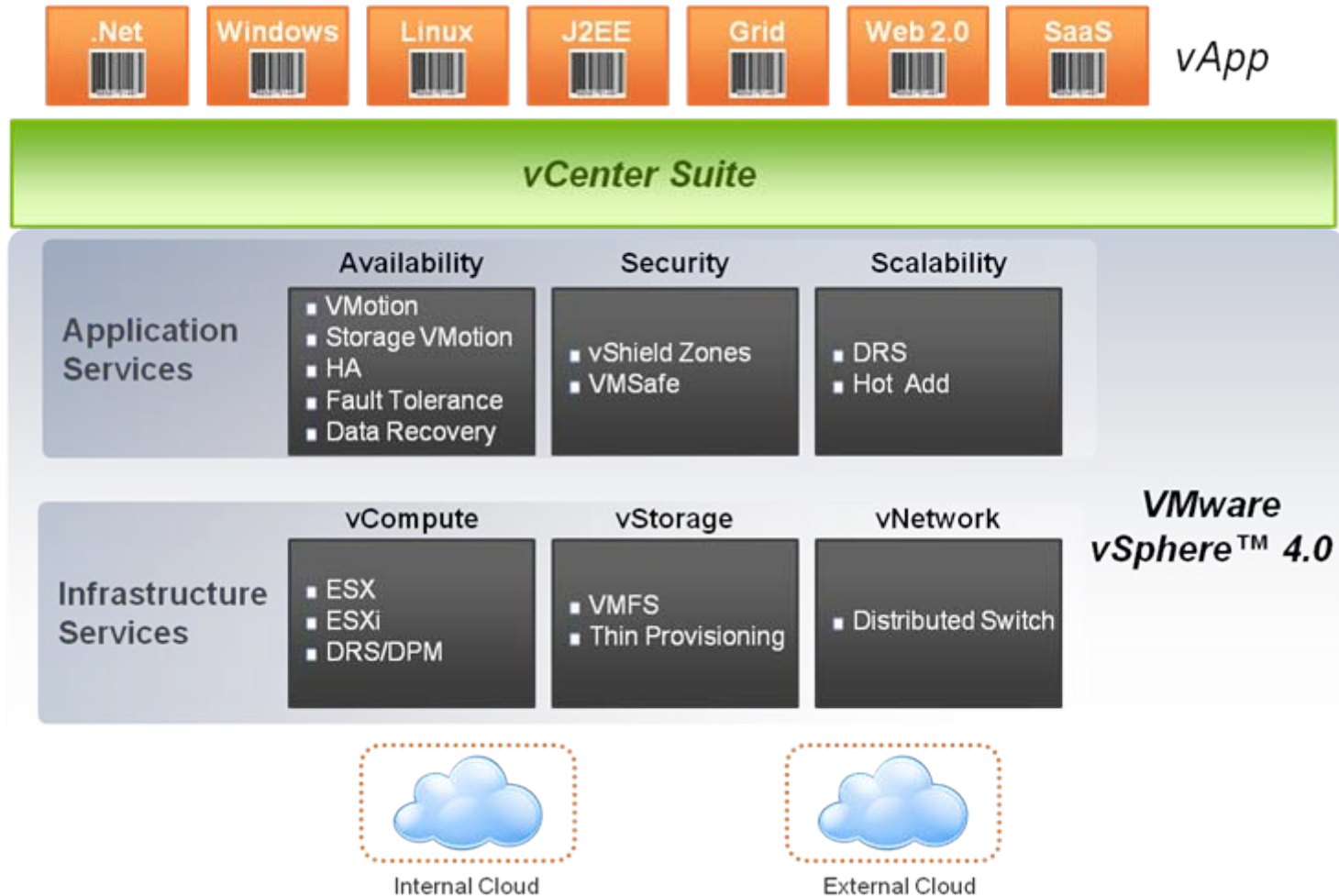
VMware vSphere 4.0

The Underpinning For Cloud Infrastructures



Summary of VMware vSphere™

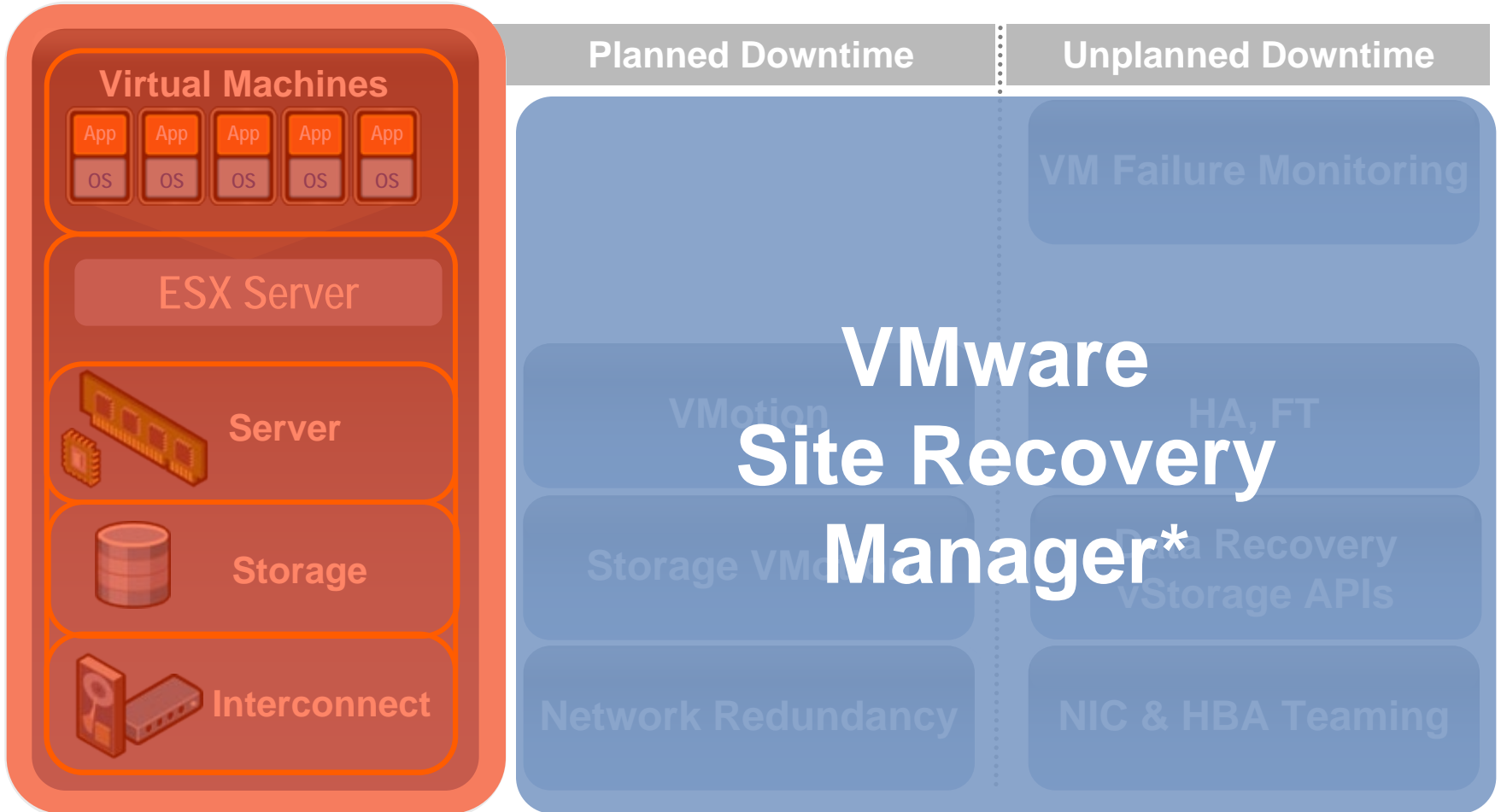
Broadest set of Cost-saving Services in the Industry



**Note vCenter Server and its components are a separate purchase*

Services & Solutions to Maximize Uptime

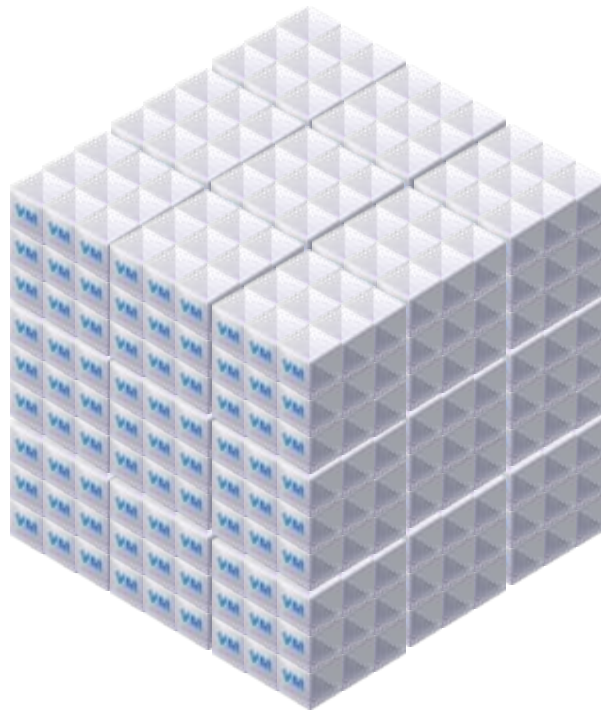
Planned/Unplanned Downtime, and Disaster Recovery



* VMware Site Recovery Manager is a separate purchase from VMware Infrastructure / vSphere

Services to Get the Benefits of Cloud Computing

Transform Your Existing Datacenter into an Internal Cloud

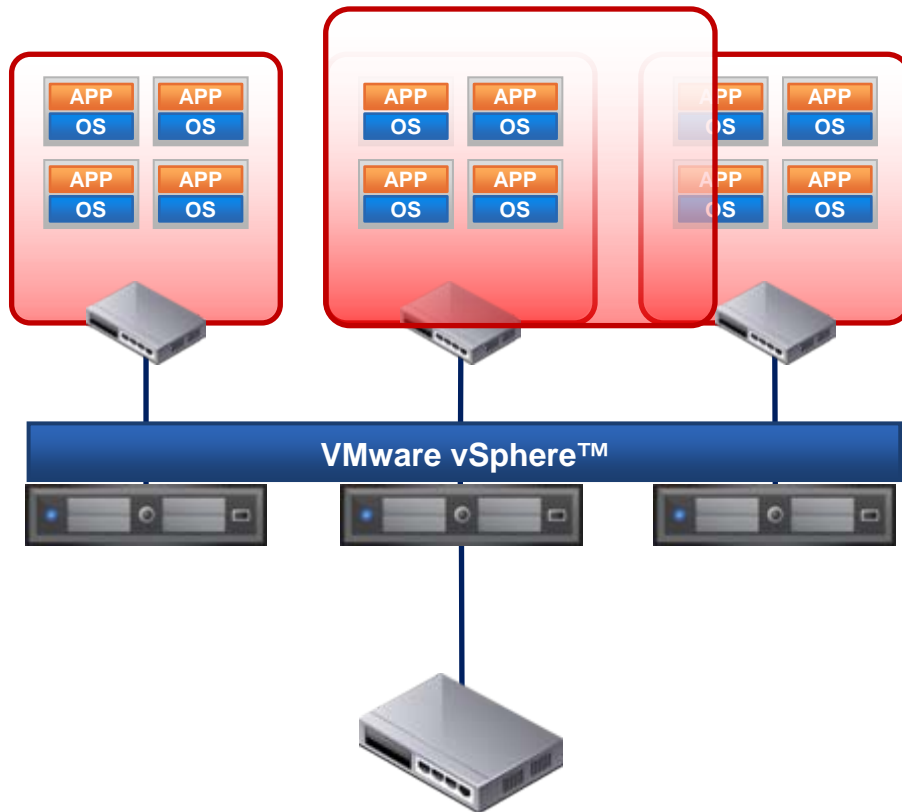


***It's not just about
virtualizing
individual hosts!***

VMware Datacenter Volumes

VMware vShield Zones

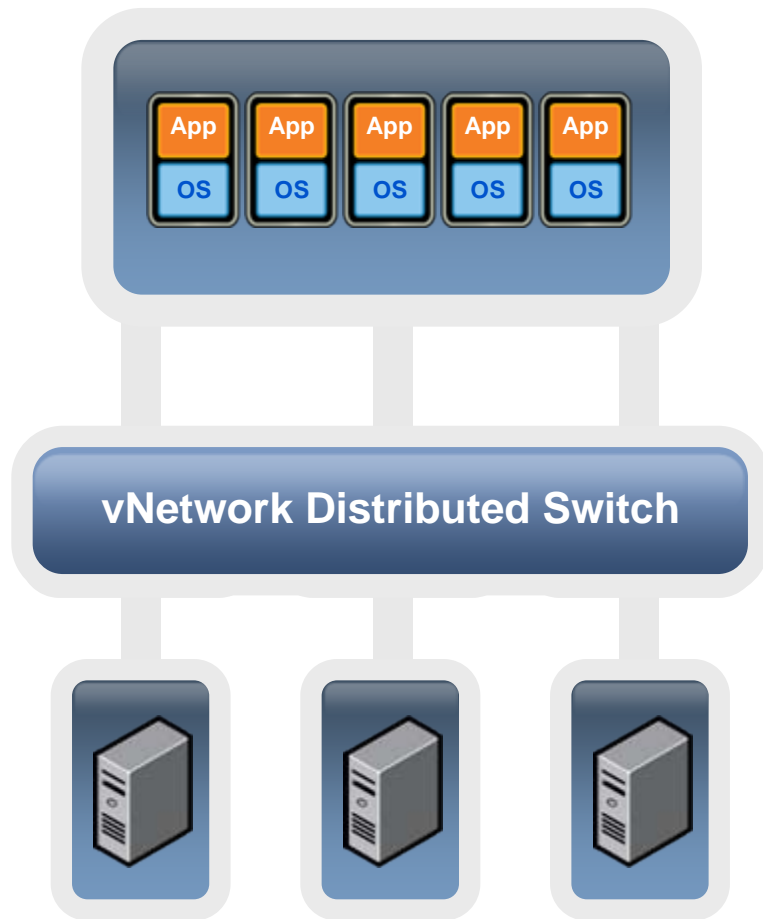
Security for Your Internal Cloud



- ❑ Self-learning, self-configuring firewall Service
- ❑ VMotion and network-configuration aware trust zones
- ❑ Dynamic firewall policy using application protocol awareness
- ❑ Dynamic security capacity using infrastructure vServices
- ❑ Security policies auto-adapt to network reconfiguration or upgrades

vNetwork Distributed Switch

Cluster-level Virtual Networking for Your Internal Cloud



- > Aggregated view of virtual networking
 - Datacenter level networking (versus host level)
 - Historical statistics follow the VM
 - A unified infrastructure for networking services (monitoring, filtering, mgmt via PVLANS)
- > Simplified setup and change; seamless addition of capacity
- > Easy troubleshooting, monitoring and debugging
- > Enables new security services

VMware Distributed Power Management

Cluster-level Power Optimization for Your Internal Cloud



DPM brings servers back online when requirements are lower

- ❑ DPM consolidates workloads onto fewer servers when the cluster needs fewer resources
 - ❑ Places unneeded servers in standby mode
 - ❑ Brings servers back online as workload needs increase
- ❑ ESX supports Intel Speed Step/AMD Power now for individual host power optimization
- ❑ Minimizes power consumption while guaranteeing service levels
- ❑ No disruption or downtime to virtual machines

Platform for Shared IT Services

Platform for Shared IT Services

VMware

Others



Broadest set of cost-saving services



Services to solve today's problems



Transform DCs into internal clouds



Virtual security, network, power saving

Checklist of Core Requirements

Functionality needed in any virtualization solution



Most Robust, Reliable Foundation



Platform for Shared IT Services



Complete Virtualization Management



Centrally manage
virtual machines – over the lifecycle
of the application



Customer Self-Service

...and it has to be the Lowest TCO Solution!!!

VMware vCenter Suite - 2009

Virtualization management over the lifecycle of a VM

Accelerated
Development

Reliable
Deployment

Predictable
Performance

Application Management

VMware vCenter Suite

Infrastructure Management

Automated
Provisioning

Transparent
Chargeback



Intelligent
Capacity

Simplified
Configuration


Unified
Operations

VMware vCenter Suite


Best solution for virtualization management

	 vmware vCenter Suite	Microsoft Systems Center
Basic VM Management	✓	✓
Basic Patch Management	✓	✓
Performance Monitoring	✓	✓
Backup	✓	✓
Manage Physical Servers		✓
Zero App Downtime Maintenance	✓	✗
Dynamic Load Balancing	✓	✗
Zero-app downtime + offline VM patching	✓	✗
Multi-tier self-service provisioning, library mgmt	✓	✗
VM lifecycle mgmt with track-and-control	✓	✗
Staging multi-tier environments for production	✓	✗
BC / DR workflow & automation	✓	✗


Complete Virtualization Management

	 VMware Infrastructure 3.5 with VMware vCenter Server	Microsoft Hyper-V with SCVMM	CITRIX Xen Server 5.0 with XenCenter
Integrated P2V tool	✓	X	No live P2V
Customizable Reports	✓	Requires SCOM	X
Hot Virtual Machine Cloning	✓	X	X
Provisioning from Virtual Machine Templates	✓	✓	✓
Automated guest customization	✓	Windows only	X
Virtual appliance marketplace	✓	X	X
Centralized server configuration	✓	✓	✓
Centralized license management	✓	X	X
SQL management database	✓	✓	X

Complete Virtualization Management (cont.)

	 VMware Infrastructure 3.5 with VMware vCenter Server	Microsoft Hyper-V with SCVMM	CITRIX Xen Server 5.0 with XenCenter
Web management client	✓	X	X
Advanced CPU resource controls	✓	✓	X
Network bandwidth resource controls	✓	X	✓
Customizable alarms	✓	Requires SCOM	✓
Customizable tasks	✓	Requires SCOM	X
Event logging	✓	✓	✓
Performance monitoring	✓	✓	Basic
Resource topology maps	✓	X	X
Continuously monitors utilization across resource pools	✓	X	X

Complete Virtualization Management (cont.)

	 VMware Infrastructure 3.5 with VMware vCenter Server	Microsoft Hyper-V with SCVMM	CITRIX Xen Server 5.0 with XenCenter
Utilizes live migration for zero downtimes, automated load balancing	✓	✗	✗
Hierarchical resource pools	✓	✗	✗
Isolation between resource pools	✓	✗	✗
Affinity rules	✓	✗	✗
Maintenance mode for servers	✓	✗	✓
Recommends host for initial virtual machine placement	✓	✓	✓
Maintenance mode for servers	✓	✗	✓

Limitations: Managing ESX with Microsoft SCVMM

Reality Falls Far Short of Microsoft's Claims

“Microsoft hopes that its customers, already implementing the competing hypervisor [ESX], stop using VirtualCenter and turn to SCVMM 2008 for any task. Unfortunately this goal seems hard to achieve considering some limitations that plague this first attempt.”

Virtualization.info, 2008

- No VirtualCenter (VC) Network Labels seen
- No VM CPU reservations or limits can be set
- No VM memory resource allocations
- No disk resource allocations
- No processor affinity settings
- Can't install or upgrade VMware tools
- No VMware tools power control settings
- No where to see the location of a VM's .vmx file
- No host maintenance mode
- Can't configure HA, DRS, DPM, Update Manager
- Can't set swapfile locations
- No visibility into Guided Consolidation
- No performance monitoring\reporting for ESX hosts & VMs
- No VC tasks, events, and alarms seen
- No configuration settings for VC permissions\roles
- Can't clone to template
- Can't create resource pools. Only can view them.
- No storage admin tasks, ex. add\remove storage, rescanning HBAs
- Can't view or configure licensing
- Can't configure security settings
- No traffic shaping for ESX NICs
- No topology maps
- No access to VMware Converter
- No adv. network configs, ex. NIC team, security settings, load balance
- ...

End-to-End Integrated Management



Enterprise System Management

vCenter

Non-Virtual Management Tools

Physical-Only Environments/
Non-x86/Non-VMware

Non-Virtualized

Rich Ecosystem of VMware Partners



Solutions

- Remedy ITSM
- Atrium Orchestrator (RBA)



Solutions

- CA Advanced Systems Management
- CA Data Center Automation



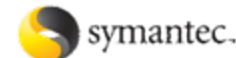
Solutions

- HP Operations Manager
- HP Server Automation



Solutions

- IBM Tivoli Monitoring
- IBM Tivoli Usage and Accounting Manager



Solutions

- Altiris Deployment Solution
- Server Management Suite



Solutions

- EMC Application Discovery Manager
- IT Compliance Analyzer



Solutions

- NetIQ AppManager
- NetIQ Aegis



Solutions

- MP for Systems Center Operations Manager
- SPI for HP Operations



Solutions

- Quest vFoglight
- Quest vConverter



Solutions

- Tripwire Enterprise
- Tripwire ConfigCheck

Complete Virtualization Management

Complete Virtualization Management

VMware

Others



Virtual mgmt across VM lifecycle



Addresses key virtual mgmt needs



Integration w/ existing physical mgmt



Rich ecosystem of mgmt partners

Checklist of Core Requirements

Functionality needed in any virtualization solution



Most Robust, Reliable Foundation



Platform for Shared IT Services



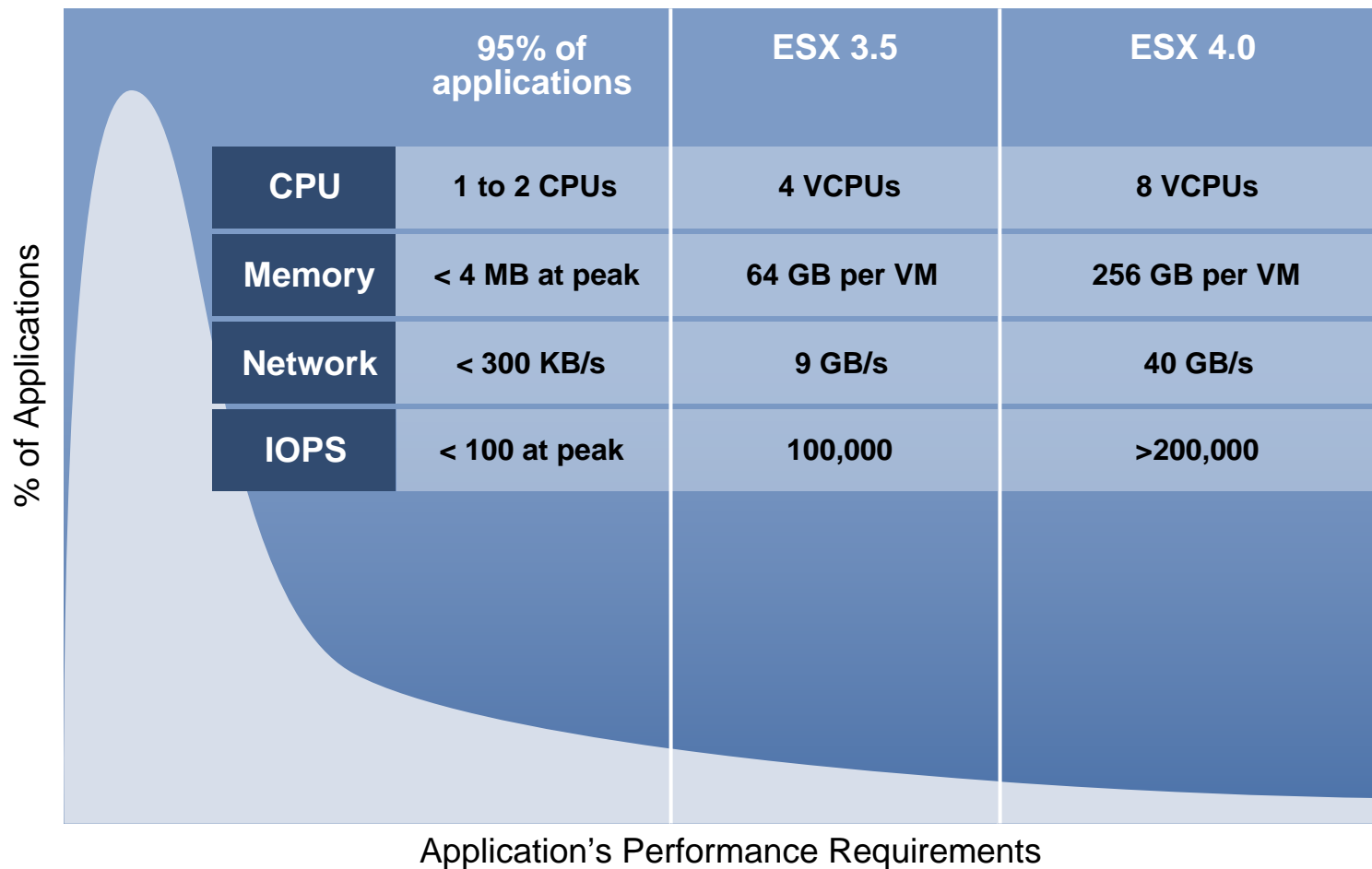
Standardize on one
virtualization solution for all ement
your workloads

Support for Your Entire Infrastructure

Customer Proven Solution

...and it has to be the Lowest TCO Solution!!!

Very Large VMs, Powerful Performance



Record Capacity for Exchange 2007

VMware Sets Capacity Record Running Microsoft Exchange on IBM System x3850 M2 Servers

Microsoft Exchange Virtualized by VMware More than Doubles Native Capacity of Mailboxes Running on 16-core Physical Servers

CANNES, France, February 26, 2008 — VMware, Inc. (NYSE: VMW), the global leader in virtualization solutions from

Native



8K Mailboxes

VMware ESX



16K Mailboxes

VMware vSphere™: Extensive Enterprise Apps Support

Over 300 enterprise software applications have explicit support statements for VMware vSphere today.

- See complete list at <http://www.vmware.com/partners/alliances/vendors/>
- List includes: BMC, Cisco, CA , Dell, HP, IBM, McAfee, Microsoft, Research in Motion, SAP, Symantec

More software vendors adding support for VMware vSphere every month.

- Submit requests to VMware for help to get an application supported:
[Click here](#)

VMware + Software Vendors
Working together to ensure customers are supported

VMware vSphere™: Most Comprehensive OS Support

VMware vSphere™




- Windows NT 4.0
- Windows 2000
- Windows Server 2003
- Windows Server 2008
- Windows Vista
- Windows XP
- RHEL5
- RHEL4
- RHEL3
- RHEL2.1
- SLES10
- SLES9
- SLES8
- Ubuntu 7.04
- Solaris 10 for x86
- NetWare 6.5
- NetWare 6.0
- NetWare 6.1
- Debian
- CentOS
- FreeBSD
- Asianux
- SCO OpenServer
- SCO Unixware
- ..

MS Hyper-V

- Win Server 2008 (up to 4P vSMP)
- Win Server 2003 SP2 (up to 2P vSMP)
- Win Server 2000 SP4 (1P only)
- SLES10 (1P only)
- Windows Vista SP1
- Windows XP Pro SP2/SP3

Integrate with Your Infrastructure

Benefit from Broad Hardware Support

	 VMware Infrastructure 3	 XenServer 5.0	 Virtual Iron v4.4
Supported servers	>450 certified	104 certified	54 certified
Supported HBAs	>450 certified	66 certified	26 certified
Supported Network I/O cards	>160 certified	51 certified	11 certified

Note: Data collected on December 5, 2008

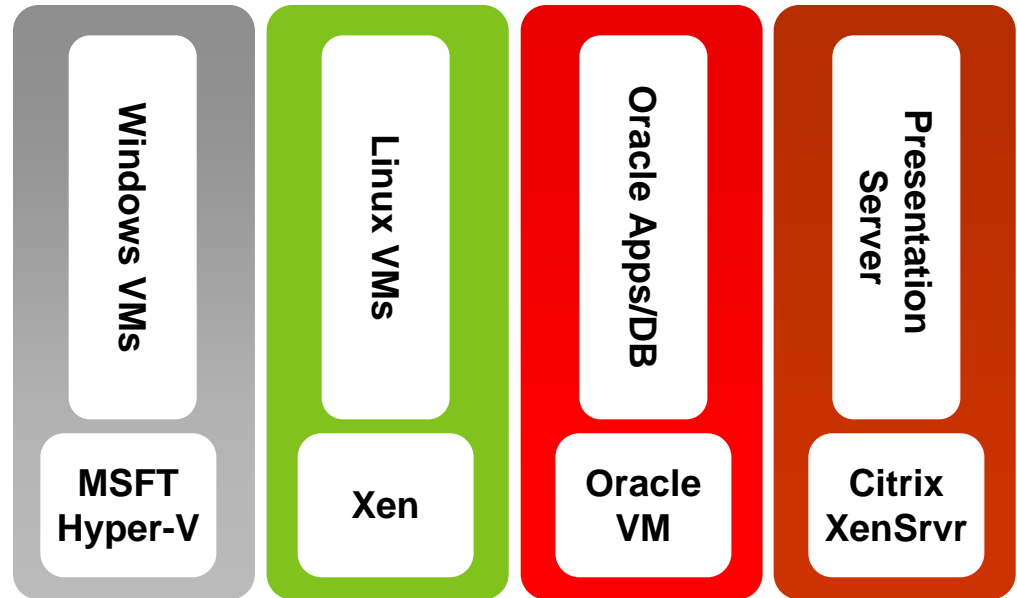
Microsoft Hyper-V trades off driver reliability and performance scalability for broad hardware support (See Criteria 1)

Single Platform to Support Entire IT Infrastructure

VMware Infrastructure



Multiple Silos



Standardize on one virtualization infrastructure for all your applications
View your datacenter as a seamless pool of resources

Support for Your Entire Infrastructure

Support for Your Entire Infrastructure

VMware

Others



Performance to virtualize all apps



Extensive apps support from ISVs



Most comprehensive OS support



Very broad hardware support

Checklist of Core Requirements

Functionality needed in any virtualization solution



Most Robust, Reliable Foundation



Platform for Shared IT Services



Complete Virtualization Management



You can't afford to risk your
datacenter on an unproven offering

Customer Proven Solution

...and it has to be the Lowest TCO Solution!!!

VMware: Proven Solution, Unrivaled Customer Success

140,000+ VMware customers

- 100% of Fortune 100
- 96% of Fortune 1000

94% use VMware in production

70% use VMotion in production

**65% VMware as the default /
most new production servers**



**The World's Most Successful
Companies Run VMware**

(hundreds of customer stories on www.vmware.com)

Customer Proven Solution

Customer Proven Solution

VMware

Others



Many peer references (industry, size)



Used by businesses of all sizes, sectors




High %age production deployments



Well-established user community

Checklist of Core Requirements

Functionality needed in any virtualization solution

-  Most Robust, Reliable Foundation
-  Platform for Shared IT Services
-  Complete Virtualization Management
-  Support for Your Entire Infrastructure
-  Customer Proven Solution

...and it has to be the Lowest TCO Solution!!!

But what about cost?

VMware solutions are a lower cost per application than other so-called “free” virtualization offerings.

What is Cost per Application

VM density is critical in a virtual environment

Physical World



- 1:1 relationship between applications and hardware
- Relevant cost metric = cost/server

Virtual World



- **Many:1** relationship between applications and hardware
- Relevant cost metric = cost/application

VMware Density Advantage

Why VMware's superior technology makes it a less expensive solution

Memory Oversubscription

More efficient use of physical RAM by reclaiming unused physical memory and consolidating identical memory pages among VMs on a host.

Direct Driver Model

VMware ESX can achieve very high I/O throughput and can handle the I/O requirements for more VMs simultaneously requesting hardware resources.

Support for Large Memory Pages and Nested Page Tables

Optimize memory access and can provide substantial performance benefits for mission critical, memory-intensive applications, can reduce CPU resource consumption by up to 15%.

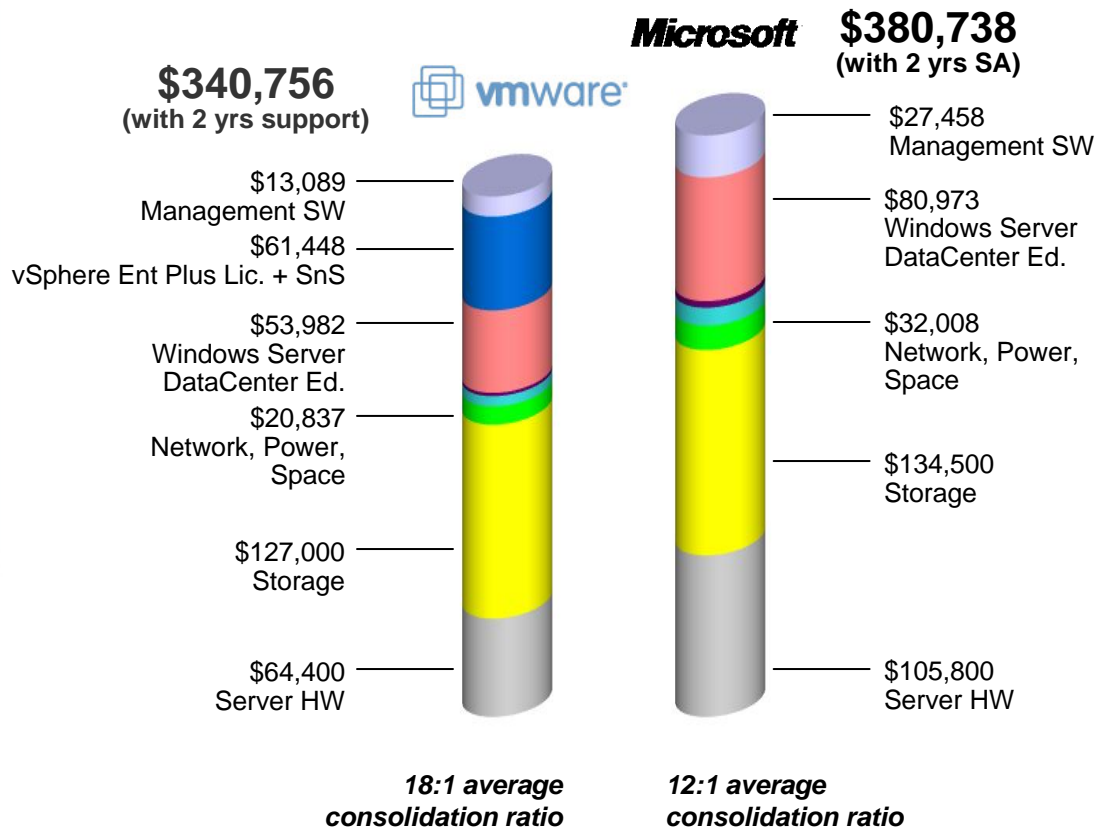
DRS with Resource Pools

Dynamically load balance VMs across a cluster so applications get required resources when they need them -a "safety net" that lets administrators run individual servers at higher utilization levels while meeting service level agreements.

High Performance "Gang" Scheduler

Can account for CPU and I/O needs of virtual machines by dynamically allocating more resources and larger processor timeslices to VMs.

VMware vSphere™ = Lowest Cost Per Application



Cost to deploy 100 VMs

**VMware vSphere 4
Enterprise Plus**

\$3,408 per App

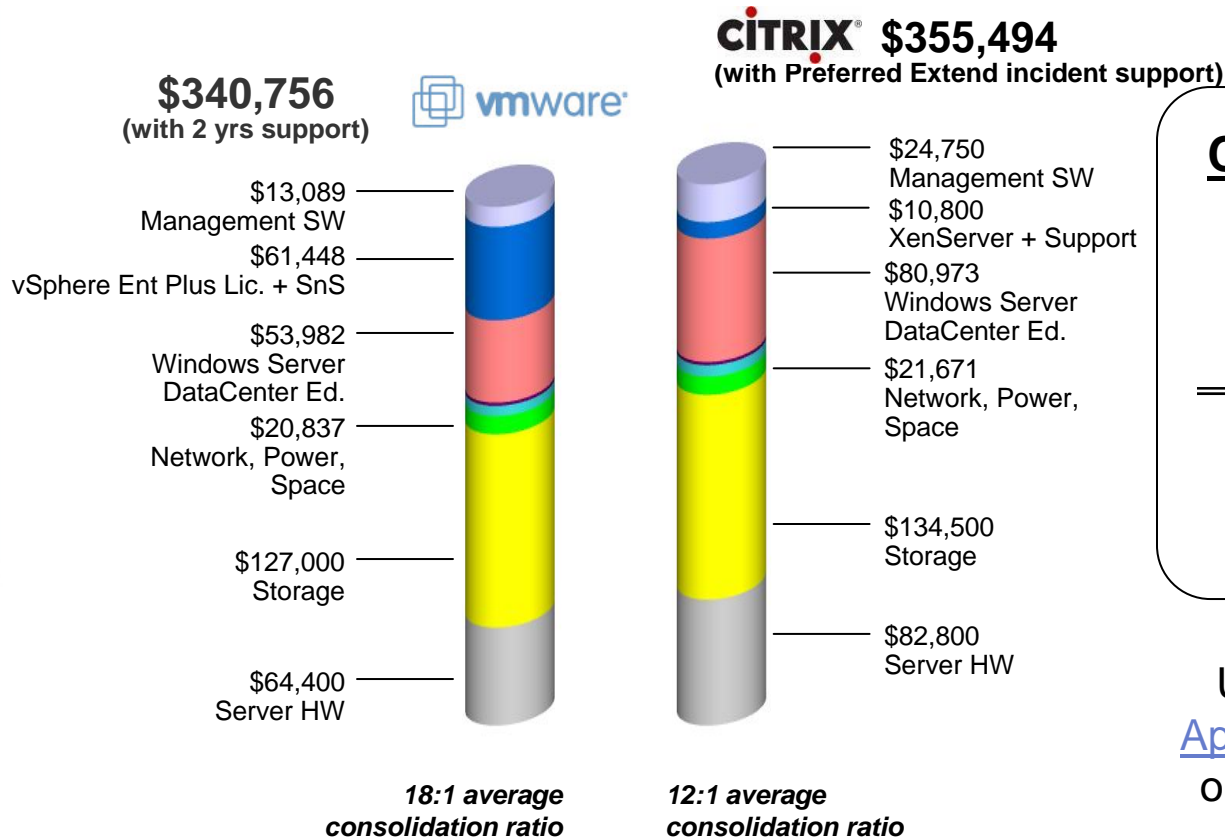
**Windows Server 2008
with Hyper-V**

\$3807 per App

Use the [VMware Cost-per-Application Calculator](#) to figure out your cost-per-application

Enterprise Plus costs 11% less AND has more functionality!

VMware vSphere™ = Lowest Cost Per Application



Cost to deploy 100 VMs

**VMware vSphere 4
Enterprise Plus**

\$3,408 per App

**Citrix XenServer with
Essentials Enterprise**

\$3,555 per App

Use the [VMware Cost-per-Application Calculator](#) to figure out your cost-per-application

Enterprise Plus costs 4% less AND has more functionality!

CAPEX Tool: Cost-per-App Calculator

- > Customers enter inputs according to their IT environment
- > Factors in costs of virtualization SW, hardware, storage, networking, management SW, guest OSs
- > Shows VMware cost (vs. others) at a realistic and conservative VM density levels

The screenshot shows the VMware Cost-Per-Application Calculator web interface. The header includes the VMware logo and navigation links: Communities, Virtual Appliances, Store, Support, Downloads, Account, and Contact Us. The main title is "VMware Cost-Per-Application Calculator" with a subtitle "VMware Infrastructure 3 vs. Microsoft Hyper-V plus Systems Center - Representative Cost Comparison".

The calculator is divided into two main sections: "Calculate the cost per application" and "1. Number of applications".

Calculate the cost per application:

- 1. Number of applications:** Specify the number of applications that you plan to virtualize. (min:10 - max:1000 VMs)
- 2. Virtualization host type:** Select a price and configuration for the virtualization hosts.
 - ☐ Server A (2 socket, dual-core CPU, 16 GB RAM, 3 NICs - \$5,000)
 - ☐ Server B (2 socket, quad-core CPU, 32 GB RAM, 4 NICs - \$8,000)
- 3. Software Licensing:** Select the product edition that best meets your business goals.
 - ☐ Foundation
 - ☐ Standard
 - ☐ Enterprise
- 4. Management deployment:** Select how the virtualization management software should be deployed.
 - ☐ Virtual
 - ☐ Physical
- 5. Cost of electric power:** Select the electricity cost for this analysis.
 - ☐ Low
 - ☐ Average
 - ☐ High
- 6. Cost of real estate:** Select the datacenter space cost for the analysis.
 - ☐ Low
 - ☐ Average
 - ☐ High

A "Submit Calculations" button is located at the bottom of the form.

1. Number of applications:

The number of applications to be virtualized can be approximated by the number of virtual machines (VMs) you plan to deploy.

VMware Cost Per Application Calculator:
<http://www.vmware.com/go/costperappcalc>

Lowest Cost per Application

Lowest Cost per Application

VMware

Others



Advanced performance for scalability



Dynamic balancing for 'safety net'



Direct driver model for scaling



Very efficient use of hardware

Checklist of Core Requirements

Functionality needed in any virtualization solution



Most Robust, Reliable Foundation



Platform for Shared IT Services



Complete Virtualization Management



Support for Your Entire Infrastructure



Customer Proven Solution



..and it has to be the Lowest TCO Solution!!!

Virtualization Solution Checklist

☐ Most Robust, Reliable Foundation

- ☐ Thin, purpose built architecture
- ☐ Near-linear scaling under load
- ☐ Hardened, optimized drivers for virt.
- ☐ Broad third-party, customer validation

☐ Platform for Shared IT Services

- ☐ Broadest set of cost-saving services
- ☐ Services to solve today's problems
- ☐ Transform datacenters into internal clouds
- ☐ Virtual security, network, power saving

☐ Complete Virtualization Mgmt

- ☐ Virtual mgmt of across VM lifecycle
- ☐ Addresses key virtual mgmt needs
- ☐ Integration w/ existing physical mgmt
- ☐ Rich ecosystem of mgmt partners

☐ Support for Your Infrastructure

- ☐ Performance to virtualize all app
- ☐ Extensive apps support from ISVs
- ☐ Most comprehensive OS support
- ☐ Very broad hardware support

☐ Customer Proven Solution

- ☐ Many peer references (industry, size)
- ☐ Used by businesses of all sizes, sectors
- ☐ High %age production deployments
- ☐ Well-established user community

☐ Lowest Cost per Application

- ☐ Advanced performance for scalability
- ☐ Dynamic balancing for 'safety net'
- ☐ Direct driver model for scaling
- ☐ Very efficient use of hardware