Next Generation Virtualization

Robert Hu
IT Advisor
Developer & Platform Evangelism
Microsoft Taiwan

Agenda

- Virtualization
  - 如何降低機房管理成本
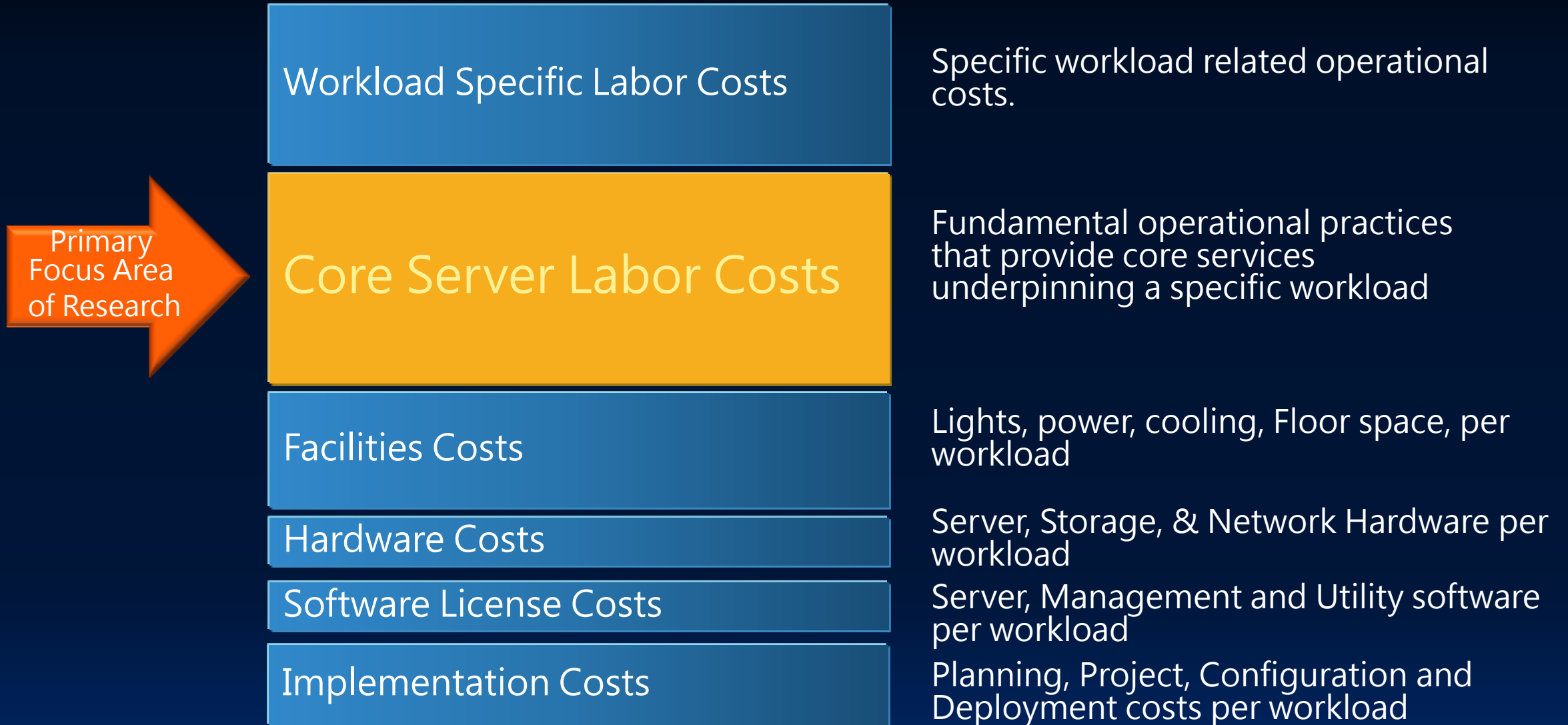- Private Cloud – Dynamic Datacenter Toolkit
  - 提供營運系統方便的動態管理方式

Microsoft Datacenter IO Research

- Study of cost impact of utilizing best practices
  - Double blind study of 162 customers
    - Size of organization: 1,000 to 300,000 PCs
  - Six "dial-tone" workloads
  - Measured IT labor costs
  - Evaluated impact of bests practices for each workload on IT labor savings and reduced downtime against Core IO maturity level

Collaboration

Email

Connectivity

Core Server Workloads

Identity and Access

Print

Data Management

Operational vs. Capital Expenditure

Workload Specific Labor Costs

Specific workload related operational costs.

Primary Focus Area of Research →

Core Server Labor Costs

Fundamental operational practices that provide core services underpinning a specific workload

Facilities Costs

Lights, power, cooling, Floor space, per workload

Hardware Costs

Server, Storage, & Network Hardware per workload

Software License Costs

Server, Management and Utility software per workload

Implementation Costs

Planning, Project, Configuration and Deployment costs per workload

What Does the Study Tell Us To Focus On?

Automation

- Automated Server Deploy
- Automated Patch Deployment and testing
- Automated Backup
- Automated Restore

Average Benefit: $2160 (Labor Per Server)

Opportunity:
- Configuration Management

Virtualization

Average Benefit: $3,800 (Labor Per Server)

Impactful across server workloads

Opportunity
- Physical and virtual management

Integration

- Automated integration with Systems Management
- Integration with Predictive Maintenance database
- Integration with Intrusion Detection

Average Benefit: $2,200 (Labor Per Server)

Opportunity:
- Suite integration
- Infrastructure integration

Data Protection & Recovery

Configuration Management (Physical & Virtual)

Server Compliance

End-To-End Monitoring

Microsoft Virtualization Strategy

The Platform You Know

- Key feature of platform
- Famliiar tools and processes
- Broad technology ecosystem

Data Center to Desktop

- Comprehensive portfolio
- Flexible choices
- Interoperable and Open

Integrated Management

- Integrated: Physical & Logical
- Tools you know
- Interoperability/X-Platform

Best TCO/ROI

- Integrated Platform
- ~1/6th the price up front
- Lower ongoing costs

Microsoft Virtualization Product Portfolio

What's new in Microsoft Virtualization

Momentum

- **IDC Virtualization Tracker says Microsoft now has 23% of virtualization market!**
- Over 400 servers certified for Hyper-V by over 40 OEMs
- Over 1M customers have downloaded RTM of Windows Server 2008
- Over 100,000 download of Microsoft Hyper-V Server 2008

Product Updates

- **Windows Server 2008 R2 RTM 7/22/09**
- **Microsoft Hyper-V Server 2008 R2 RTM 7/22/09**
- System Center Virtual Machine Manager 2008 R2 RTM (ETA mid Aug'09)
- App-V 4.5 and Configuration Manager 2007 R2 available

Recent News

- Microsoft submitted Hyper-V integration components to the Linux kernel under GPLv2
- Announced our free Hypervisor, Microsoft Hyper-V Server 2008 R2, will include Live Migration and Failover clustering at no cost
- Agreement with Red Hat to support Red Hat Enterprise Linux on Hyper-V
- Citrix releases Essentials for Hyper-V

What is Microsoft Hyper-V?

Microsoft Hyper-V Server 2008 R2
(built with components and technologies from Server core

Hyper-V, feature of
Windows Server 2008 R2

Microsoft Hyper-V Server 2008 R2

| Parent Partition | Windows or Linux | Windows or Linux |

Windows hypervisor

Hardware

Hyper-V

| Windows (parent partition) | Windows or Linux | Windows or Linux |

Windows hypervisor

Hardware
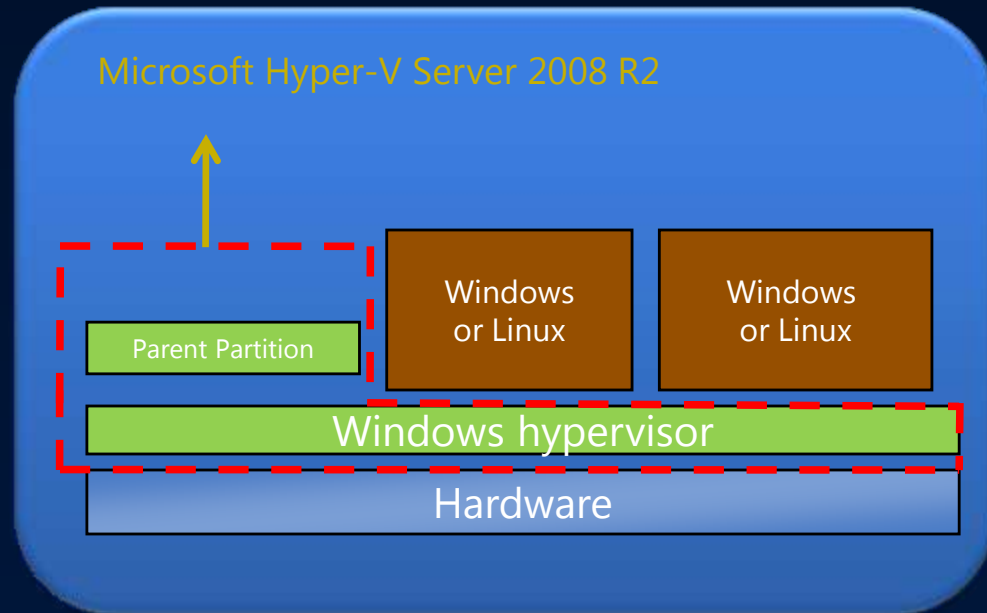
Contains Windows hypervisor and other components, including base kernel and driver technologies.
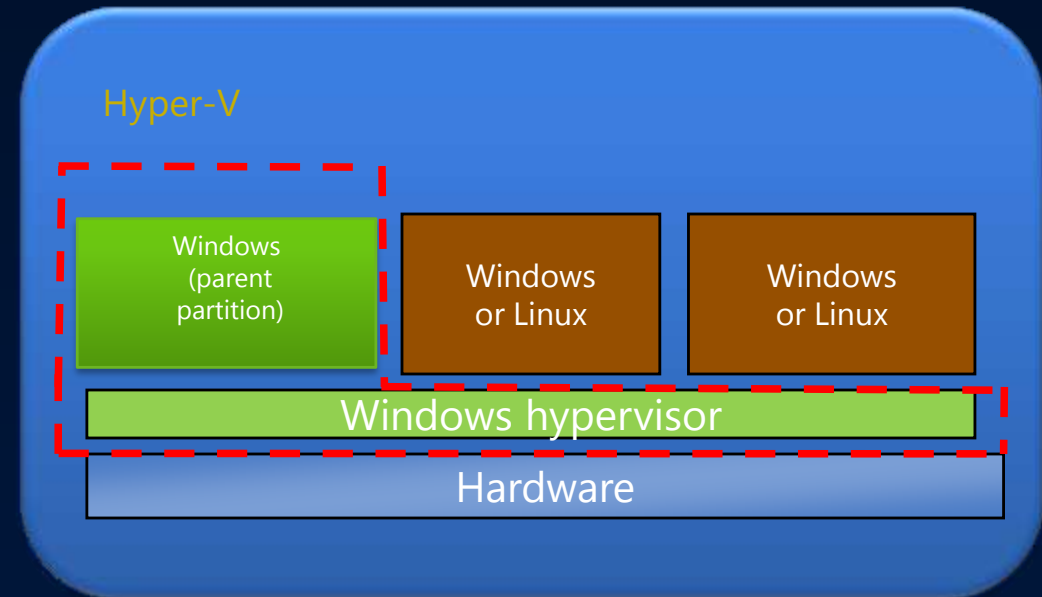
Available as a role in Server Core or full installation of Windows Server 2008 R2

Hyper-V Server 2008 R2 vs. Windows Server 2008 R2

Capabilities	Microsoft Hyper-V Server 2008	Microsoft Hyper-V Server 2008 R2	Windows Server 2008 R2 EE, DC (Hyper-V)
Number of Logical processors supported	24	64	64
Number of Sockets (Licensing)	Up to 4	Up to 8	Up to 8 = EE | Up to 64 = DC
Memory	Up to 32 GB	Up to 1 TB	Up to 1TB
VM Migration	None	Quick and Live migration	Quick and Live Migration
Number of VM's per node in a cluster	Not applicable	32 (server workloads) 64 (VDI workloads)	32 (server workloads) 64 (VDI workloads)
Virtualization Rights for Windows Server 2008 guests	0	0	EE = 4 VM DC = unlimited VM's
Number of running VM Guests	Up to 192, or as many as physical resources allow	Up to 384 or as many as physical resources allow	Up to 384, or as many as physical resources allow
Windows Server 2008 CALs Required for Guest Server OS	No	No	Yes
Guest OS support	Windows Server 2008 R2, Windows Server 2008 & SP2, Windows Server 2003 SP2, Windows 2000 Server, SLES 10, SLES 11, Red Hat Enterprise 5.2/5.3, Windows 7, Windows Vista SP1, SP2 & Windows XP SP3/SP2		

Virtualization Enhancements for Windows Server 2008 R2 and Virtual Machine Manager 2008 R2

Windows Server 2008 R2

- **Live Migration**
  - Clustered Shared Volumes (CSV)
  - Processor Compatibility Mode
- **Improved Scalability (64 Logical Procs)**
- **Remote Desktop Services (RDS)**
- **Performance Enhancements**
  - New Processor Feature Support
  - Core Parking - Power Efficiency
  - Hot Add/Remove of Storage
  - Networking Optimization

Foundation for the Business

\+

Microsoft® System Center Virtual Machine Manager 2008 R2

- X-platform Support (Hyper-V, VMware)
- Intelligent Placement of VMs
- Performance and Resource Optimization
- Live Migration Management
- Queuing/Maintenance Mode
- Rapid Provisioning via Templates
- Storage Migration, SAN Enhancements

Managing the Fabric

Cluster Shared Volumes Overview

Data over any network

Coordinator Node

SAN

1 LUN, Many VMs

Distributed File Access for Hyper-V

VHD   VHD   VHD
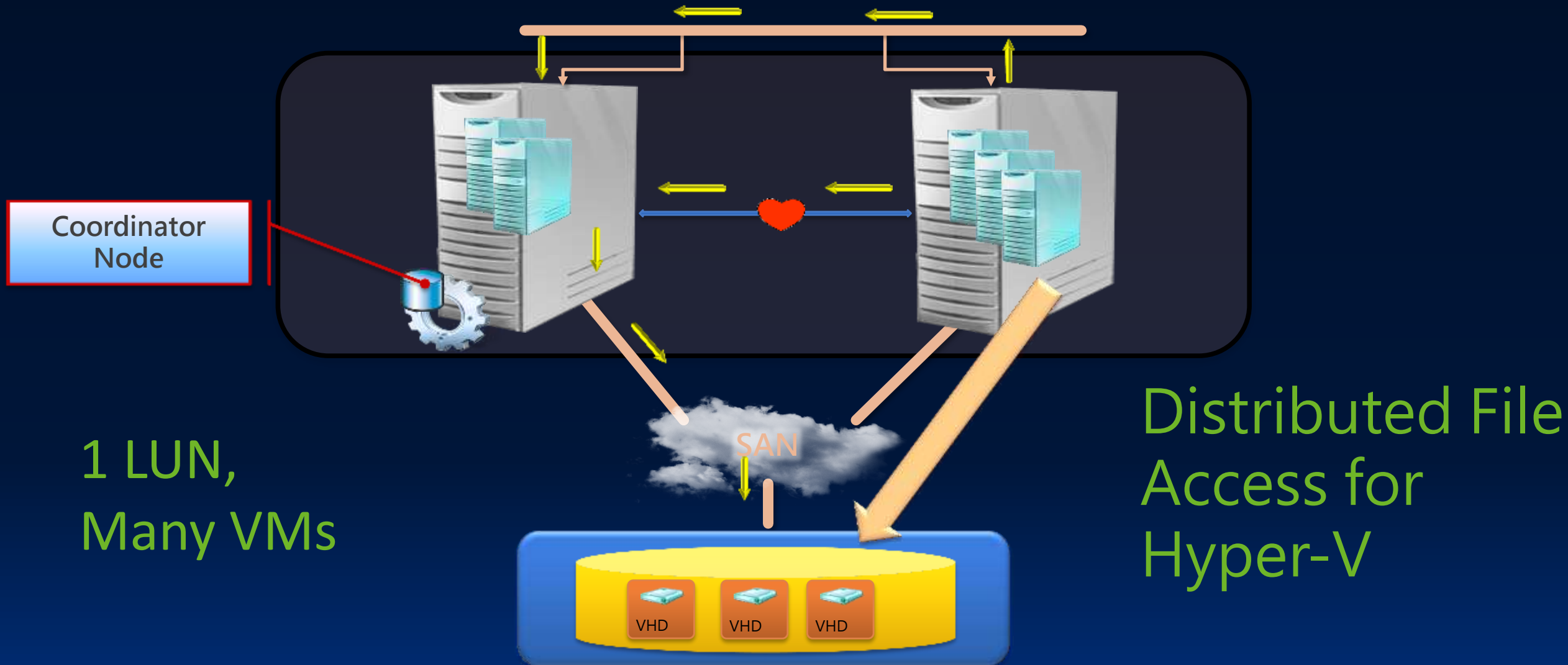
Live Migration Overview

- Prerequisites:
  - Source and destination hosts must be part of a Failover Cluster
    - Hyper-V Server R2 nodes can be clustered with Windows Server 2008 R2 server core nodes
  - Files used by the VM must be located on network storage
    (SAN volumes managed by the cluster)

Failover Cluster

Source Host

Destination Host

.VHD

Network Storage
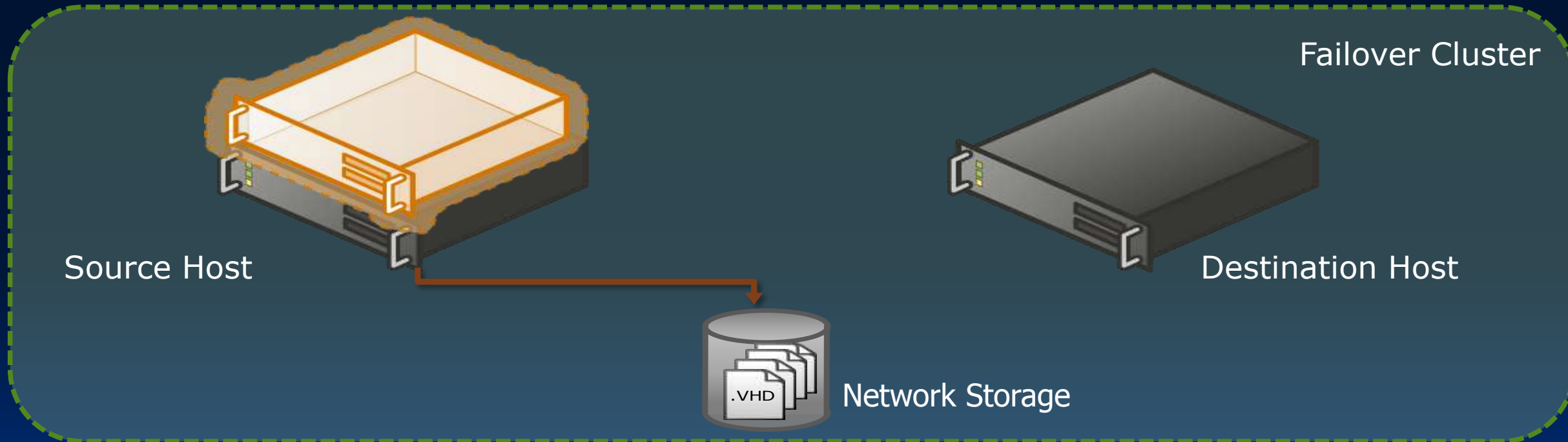
Live Migration

1. Create Paused Virtual Machine On Target server

2. Copy Memory Pages From The Source To The Target Via Ethernet

3. Final State Transfer
   a) Pause Virtual Machine On Source
   b) Migrate Remaining Virtual Machine State
   c) Move Storage Connectivity From Source Host To Target Host

4. Run New VM On Target; Delete VM On Source

Host 1

Shared storage

Host 2

VHD
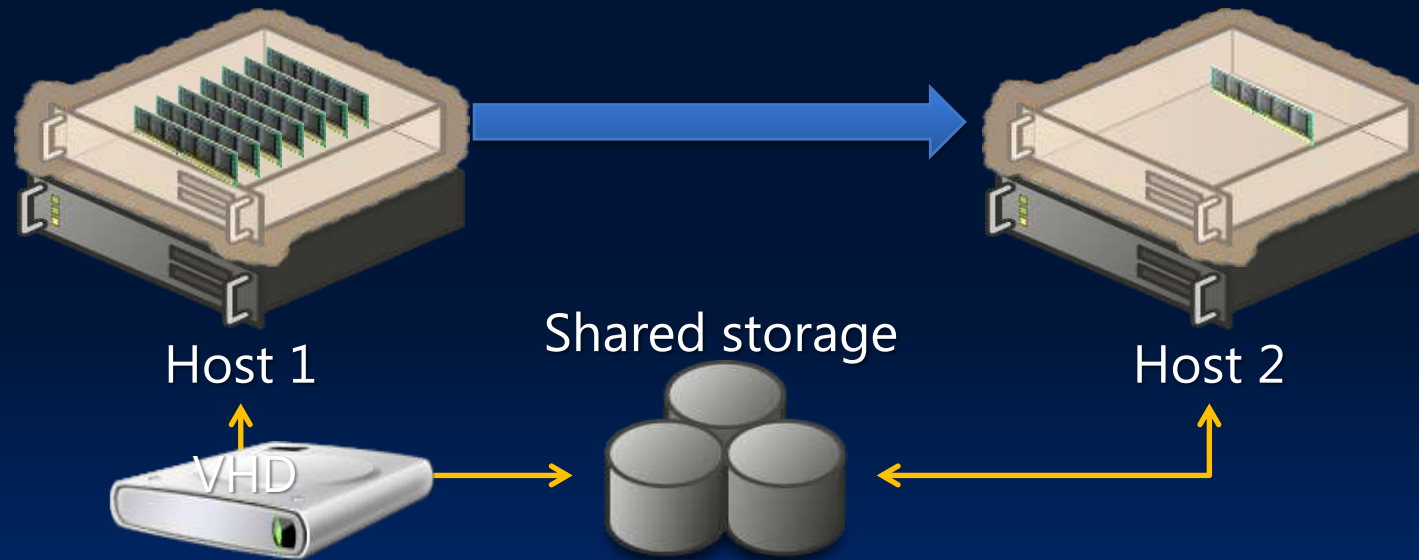
Live Migration usage scenarios
Live migration for planned downtime

Host is now offline for servicing (hardware, software)

Shared Storage
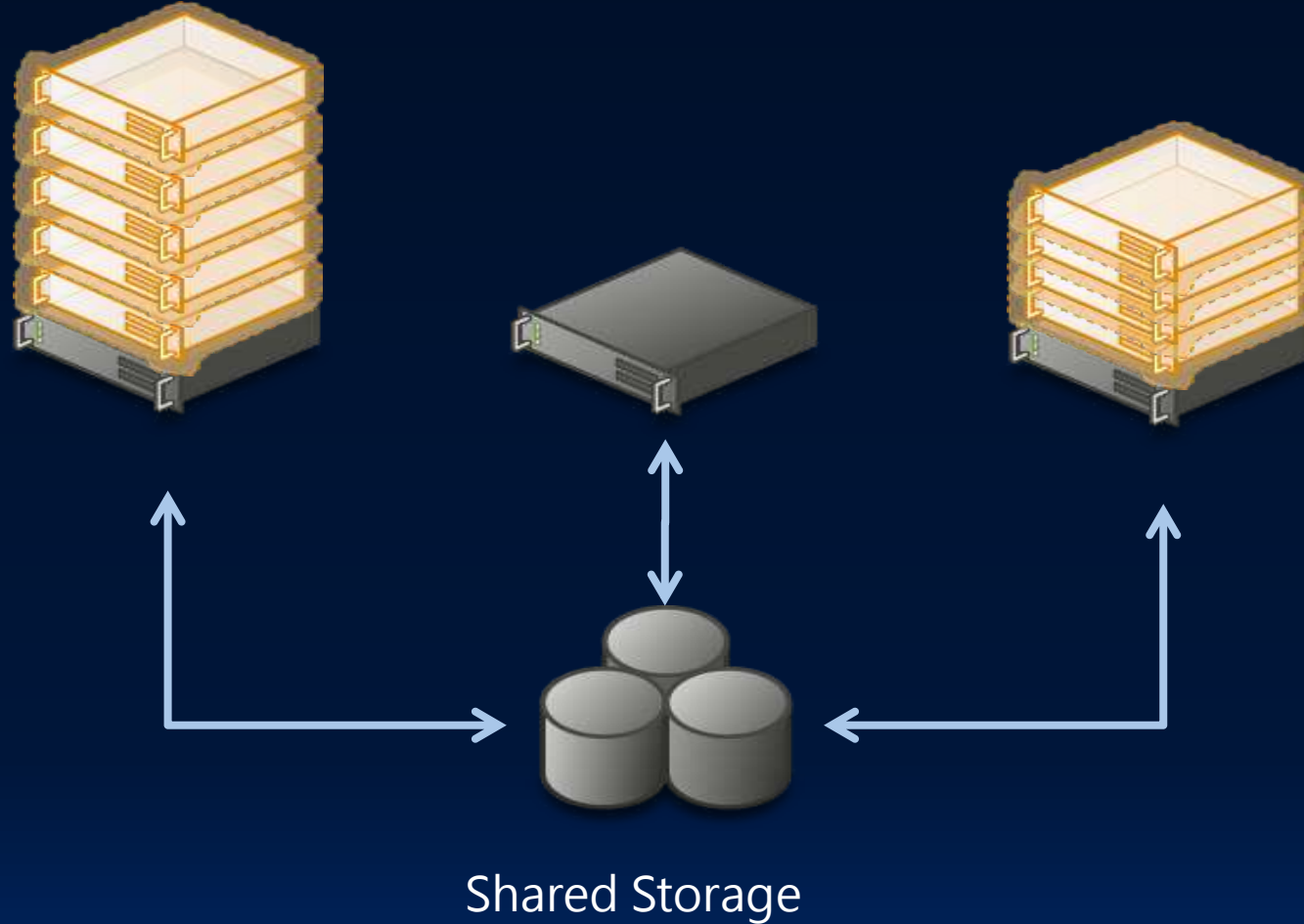
Live Migration usage scenarios
VM load balancing with SCVMM/PRO

Shared Storage
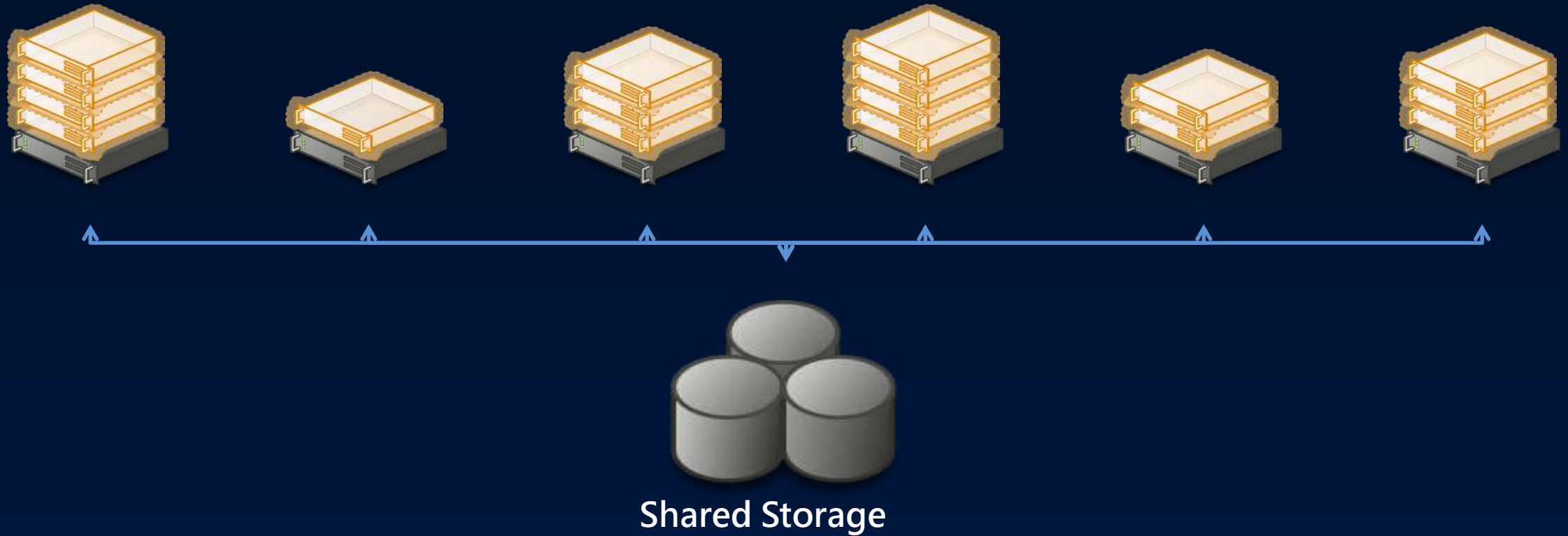
Managing the Server Lifecycle

Microsoft® **System Center** Data Protection Manager 2007

Microsoft® **System Center** Configuration Manager 2007 R2

- Live host level virtual machine backup
- In guest consistency
- Rapid recovery

- Patch management and deployment
- OS and application configuration management
- Software upgrades

- End to end service management
- Server and application health monitoring & management
- Performance reporting and analysis

- Virtual machine management
- Server consolidation and resource utilization optimization
- Conversions: P2V and V2V

Backup

Hardware

Enterprise

OS

Microsoft® **System Center** Operations Manager 2007 R2

Microsoft® **System Center** Virtual Machine Manager 2008 R2
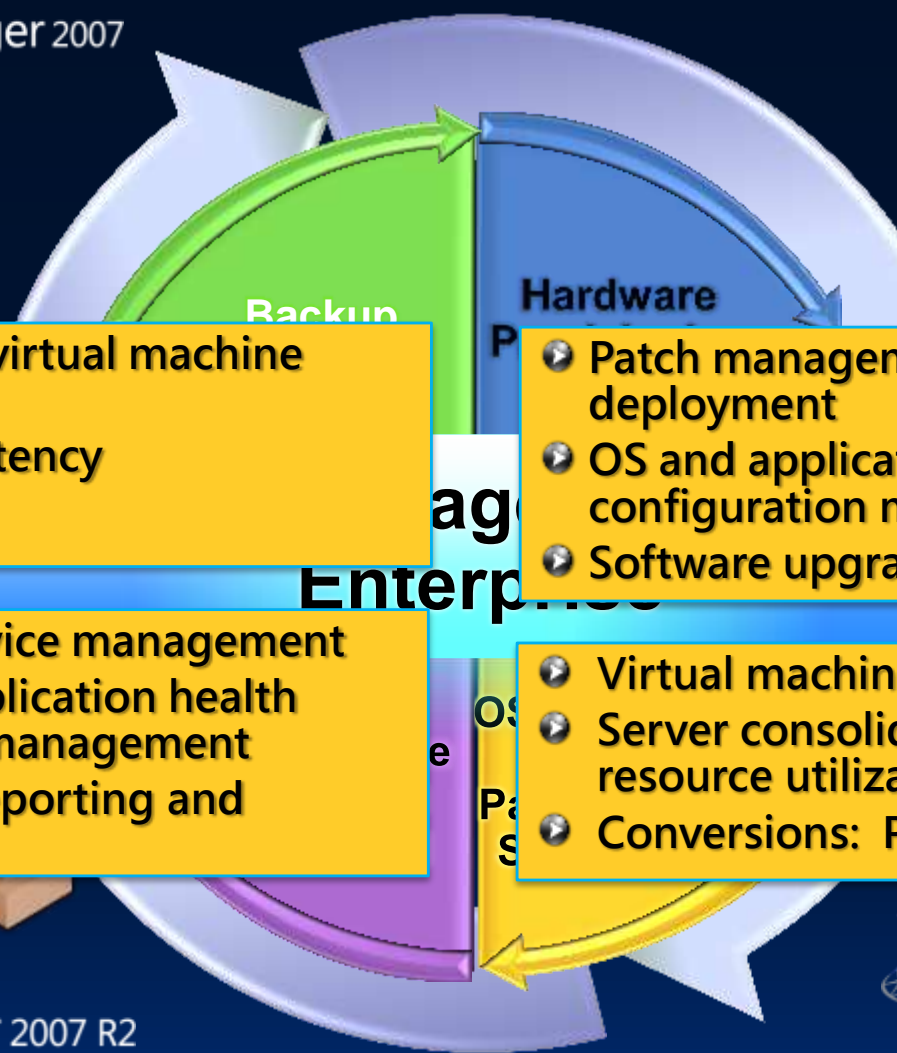
Virtualization Built Into Management Platform

Microsoft® System Center

Microsoft® System Center Data Protection Manager 2007

Microsoft® System Center Configuration Manager 2007

Microsoft® System Center Virtual Machine Manager

Microsoft® System Center Operations Manager 2007

Virtual, Physical & Cross-Hypervisor Management

"...if my central console can manage both my Microsoft virtual machines and my VMware virtual machines with an interface that is familiar and easy for my Microsoft certified staff, that's a big plus."

Brent Register, The Atlanta Journal-Constitution

Disaster Recovery part of System Center

"Doing this on physical hardware takes a couple of hours; with virtual machines, it takes minutes,"

Robert McShinsky Senior Systems Administrator, Dartmouth-Hitchcock Medical Center.

App Virtualization deployment part of System Center

"Now we can deploy both virtualized and installed applications using the same procedure,"

Arne Bertgen, IT administrator for Tuv Nord.

VMware Support

- VMware vCenter Server
  - VMware vCenter Server 2.5

- VMware ESX Hosts
  - VMware ESX 3.5
  - VMware ESX 3.0.2
  - VMware ESX Server 3i

- What about vSphere 4?
  - SUPPORTED – tested after RC
  - API Close enough to VI3 that we were able to complete our tests and it is supported

Operation Manager Products Releases

MOM 2005 → **OpsMgr 2007** → **OpsMgr R2**

2004 — MOM 2005 RTM
2005 — MOM 2005 SP1
2006
2007 — SCOM 2007 RTM
2008 — SCOM 2007 SP1
2009 — SCOM 2007 R2
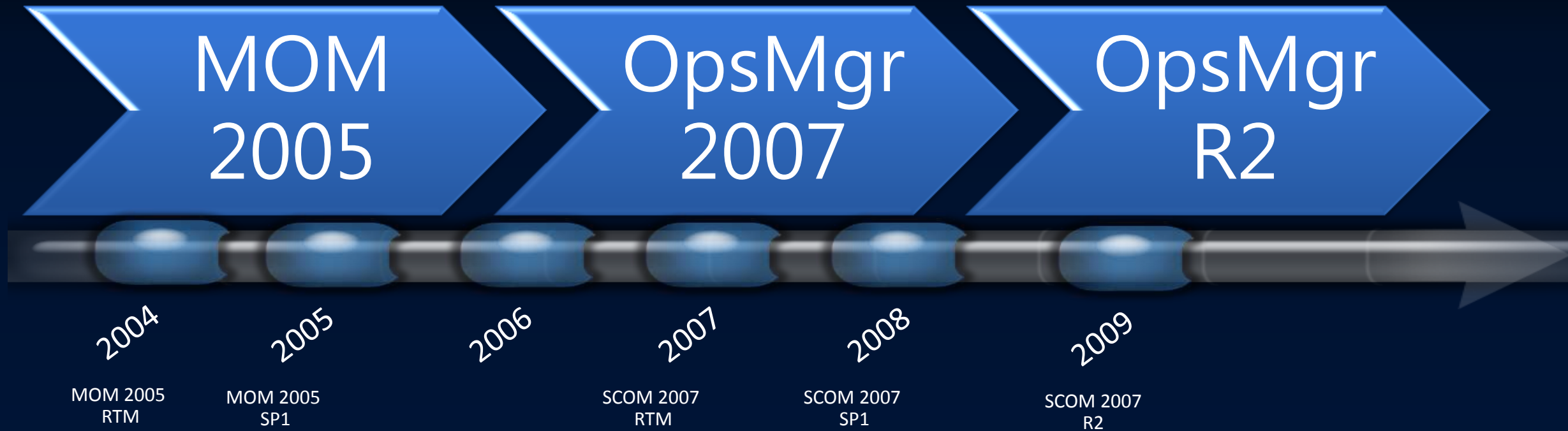
	MOM 2005	OpsMgr 2007	OpsMgr 2007 R2
Managed Environments	Server Roles	Services, LOB Apps, Transactions, Clients	Extends to Heterogeneous Environments'
Detect	State	Health Model	Synthetic Transactions + Health Model
Architecture	WS based Tiering and Integration	Model based Management	Model based Management
Actions	Tasks	Active Knowledge	Service Level Reporting

Unix Monitoring Module

- New component for Cross Platform
- Existing v3 or SP1 component
- Outside dependency
- Built-in Unix/Linux functionality

OpsMgr

WS-Man

WS-Man

CIMOM

OpsMgr Providers

OS Resources

Health Service

WS-Man Modules

SSH Modules

SFTP Modules

WinRM

Putty Library

Enumerate

Get

Invoke

Execute Cmd

Session

Transfer File

CIMOM
OpenPegasus 2.9 with WS-Management Support

SSH Daemon

OpsMgr Providers

OS Resources
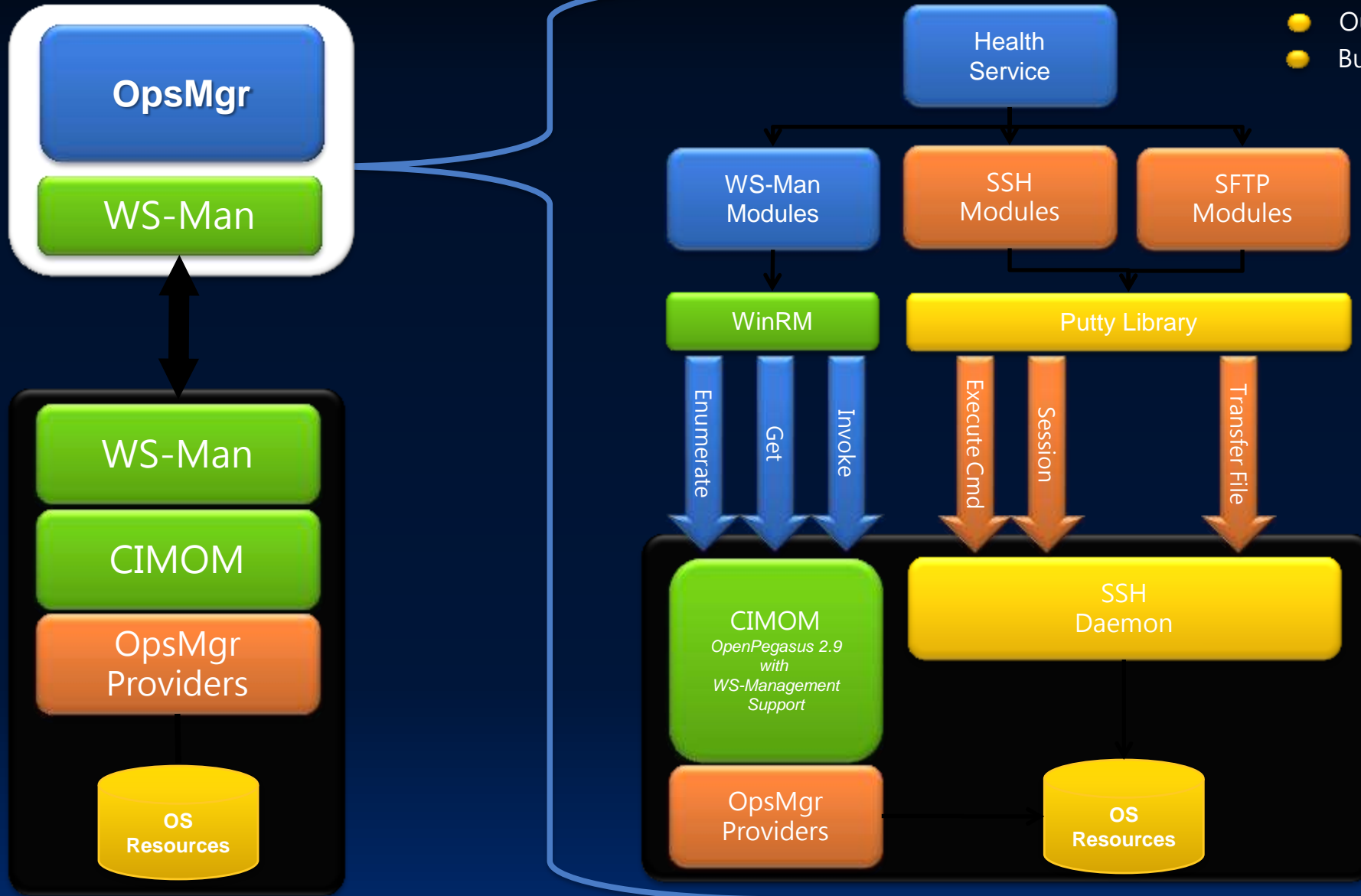
Hyper-V Mission Critical App Performance

- Oracle 10gR2 on Windows Server 2008 (Physical & VM)
  - Average TPM difference less than 1% difference (16916 vs 17071)

	HyperV01 (Hyper-V virtual machine)	Physical01 (physical machine)
Physical Memory	14.0 GB	14.0 GB
CPUs	4	4
Operating System	Windows Server 2008 Enterprise Edition x64 SP1	Windows Server 2008 Enterprise Editions x64 SP1
Oracle Database Name	DBVM01	DBPHYS
Oracle Version	10.2.0.4.0	10.2.0.4.0
Database SGA size	4.0 GB	4.0 GB
Database PGA size	1.0 GB	1.0 GB
Windows Large Page Support Configured?	Yes	Yes

Table 1 – Server Configuration for HyperV01 and Physical01

Application:	SwingBench Order Entry - Full OLTP Transaction Mix (4 CPUs)								
Benchmark Scenario	Total Concurrent Users	Avg. CPU Utilization	Storage Utilization	Memory Utilization (4GB SGA)	Swap Utilization	Average TPMs Achieved	Max TPMs Achieved	Average TPSs Achieved	Max TPSs Achieved
HyperV01	50	95%	64% / 74%	46%	0%	16,916	18,634	294	407
Physical01	50	92%	66% / 75%	44%	0%	17,071	19,637	299	445

Table 2 - SwingBench Full OLTP Test Results on HyperV01

Native VHD Performance

Physical Drive vs. Fixed VHD vs. Dynamic VHD vs. Passthru (VM Mode)

Legend:
- Physical Drive in Host
- Fixed VHD in Win7
- Dynamic VHD in Win7
- Passthru in Win7

Y-axis: Througput(MBps) — 1.00, 10.00, 100.00, 1000.00

X-axis categories: 64K Sequential Read, 64K Sequential Write, 4K Random Read, 4K Random Write

(Log Scaled by 10)
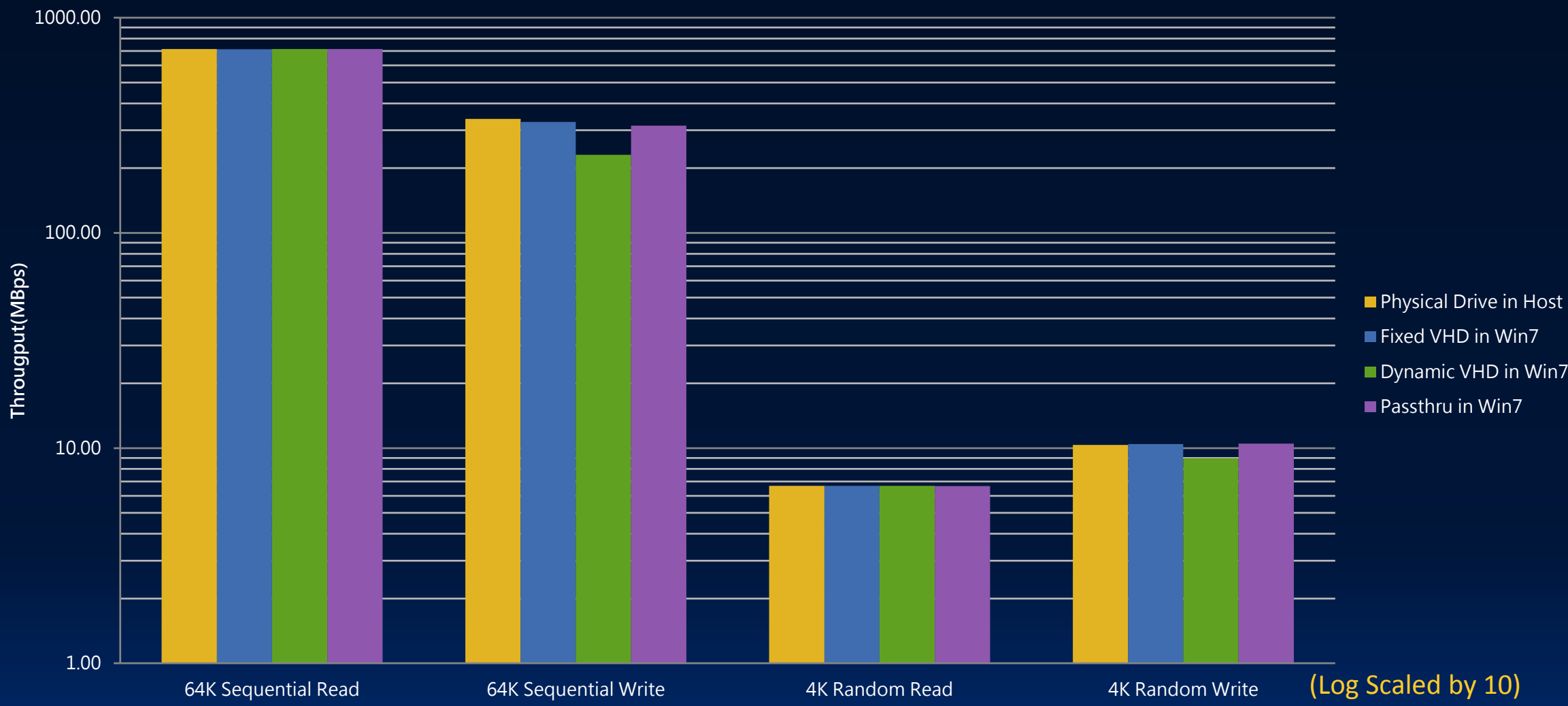
微軟資料中心
全球最大的虛擬化案例

微軟全球資料中心有**450,000**台伺服器,目前已經有**50%**在Hyper-V上執行

TechNet: 100% Hyper-V
http://technet.microsoft.com
~1 million hits a DAY

Microsoft *TechNet*

MSDN®: 100% Hyper-V
http://msdn.microsoft.com
~3 million hits a DAY

msdn

Microsoft.com: ~50% Hyper-V and growing
http://www.microsoft.com
>1 billion hits a month

Microsoft

We got what customers need without the VMware TAX

	vSphere Enterprise Plus	Windows Server 2008 SMSE	Windows Server 2008 R2 Server Management Suite Datacenter
Price	**$58,525**	**$9,698**	**$9,698**
VMotion/Live Migration	✅	❌	✅
HA/Clustering	✅	✅	✅
Offline VM/OS Updates	✅	✅	✅
Fault Tolerance	➖ Limited Capability	❌	❌
Storage Migration	✅	❌	➖ QUICK
Auto. VM Optimization	✅ DRS	✅ PRO	✅ PRO
Hot Add (CPU/Mem/Disk)	✅ CPU/Mem/Disk (Limited OSes)	❌	➖ Disk
Physical Mgmt	❌	✅	✅
In-Guest Monitoring	❌	✅	✅
Cross Hypervisor	❌	✅	✅

5 x 2 Socket Servers with 2 Years Maintenance - OS Cost the same for both solutions so omitted

Dynamic Datacenter

Extending into the Cloud

Traditional Datacenter

- Well-known, stable and secure
- Utilization <15%

Virtualized Datacenter

- Utilization Increases to >50%
- Management Costs Decrease

Extending into the Cloud

Traditional Datacenter

Virtualized Datacenter

Private Cloud

Public Cloud

- Management Costs Decrease Significantly
- Scale-out Development Expense
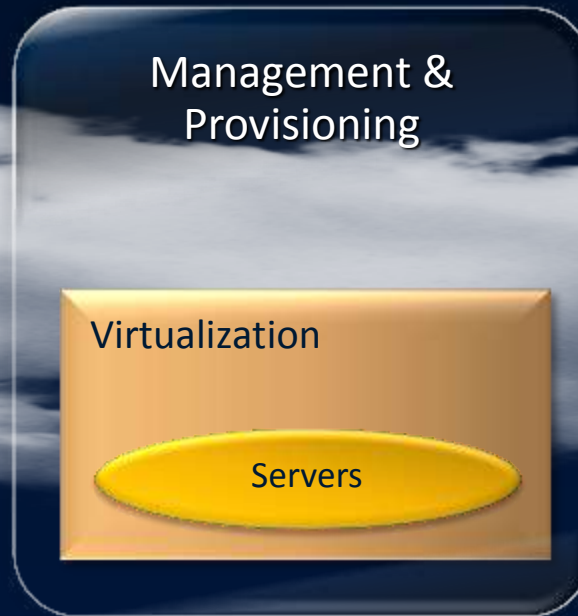
- Capacity on Demand
- Global Reach

At this moment ...

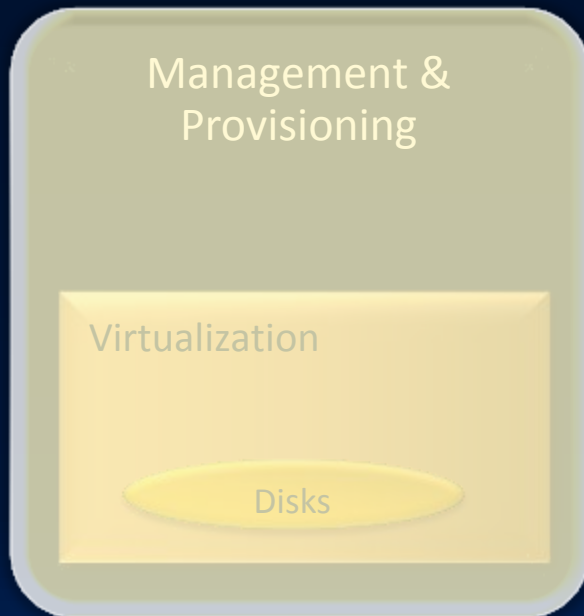○ "Windows Azure obviously runs in our own data center, It is very much restricted. It only needs to run the hardware that we are trying to run on. It's not really appropriate for us to deliver it to customers in that form."

Bob Muglia
President, Server and Tools Business
Microsoft Corporation

Source : http://news.cnet.com/8301-13860_3-10286612-56.html?tag=mncol

Microsoft Private Cloud Offering
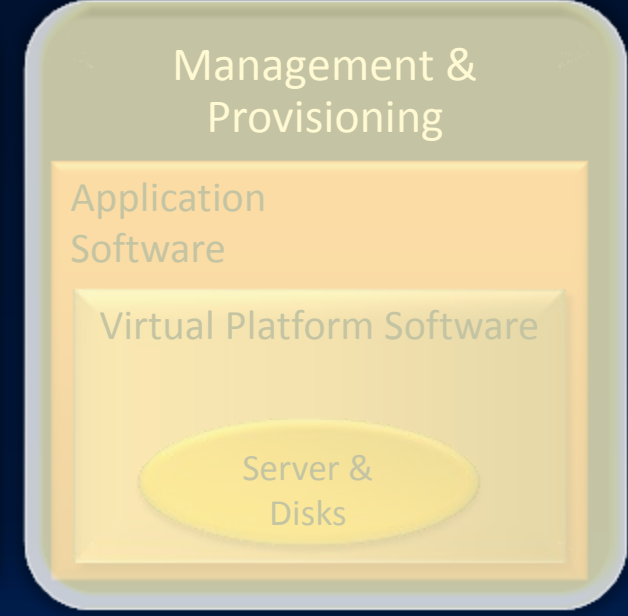
Storage as a Service	Infrastructure as a Service Software	Platform as a Service	Software as a Service
Management & Provisioning	Management & Provisioning	Management & Provisioning	Management & Provisioning
Virtualization	Virtualization	Configurators / APIs	Application Software
Disks	Servers	Virtual Platform Software	Virtual Platform Software
		Server & Disks	Server & Disks

Microsoft Private Cloud Solution

- **Dynamic Data Center Toolkit for Hosters (DDTK-H): Available now and free of charge!**
  - Step-by-step instructions that you can use to build an instantly scalable virtualized infrastructure guidance.
  - Sample code and best practices.

- **Dynamic Data Center Toolkit for Enterprises (DDTK-E): Available free of charge in first half of 2010!**
  - An architectural roadmap, deployment guidance and best practices.
  - Familiar tools that are compatible with existing applications.

Dynamic Datacenter Toolkit for Hoster

- Built for hosters to create a hosted cloud service and integrate into their existing environments.
  - Documentation
    - Technical best practices, FAQs, white papers
    - Installation guides specific to hosting scenarios
    - www.windowshda.com
  - Managed Services
    - On-demand VM provisioning
    - WCF based services for all Servers and server roles that are supported by DDC
    - Source code is available on http://code.msdn.microsoft.com/ddc
  - Portal
    - Sample Silverlight or ASP.net portal helps provide hosters' customers an integrated view of services
    - Source code is available on http://code.msdn.microsoft.com/ddc

WHO IS USING IT?

- 10 Hosters deploying services by using the Dynamic Data Center Toolkit since launch at Microsoft Hosting Summit in March 2009.

Microsoft Complete Cloud Offering

Traditional Datacenter

Virtualized Datacenter

Private Cloud

Public Cloud

POWER OF CHOICE

Summary

- Virtualization, Automation, Integration are the key to reduce datacenter cost

- Microsoft offers complete virtualization solution for datacenter and entire IT environment

- Cloud computing will be the future of IT computing environment

- Microsoft is the only vendor that provides Virtualization, Private Cloud and Public Cloud solutions and provides choice to fulfill customer's need

Microsoft®

Your potential. Our passion.™