

私有云平台上优化SQL Server

Optimize SQL Server for Private Cloud

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课程目的及要点

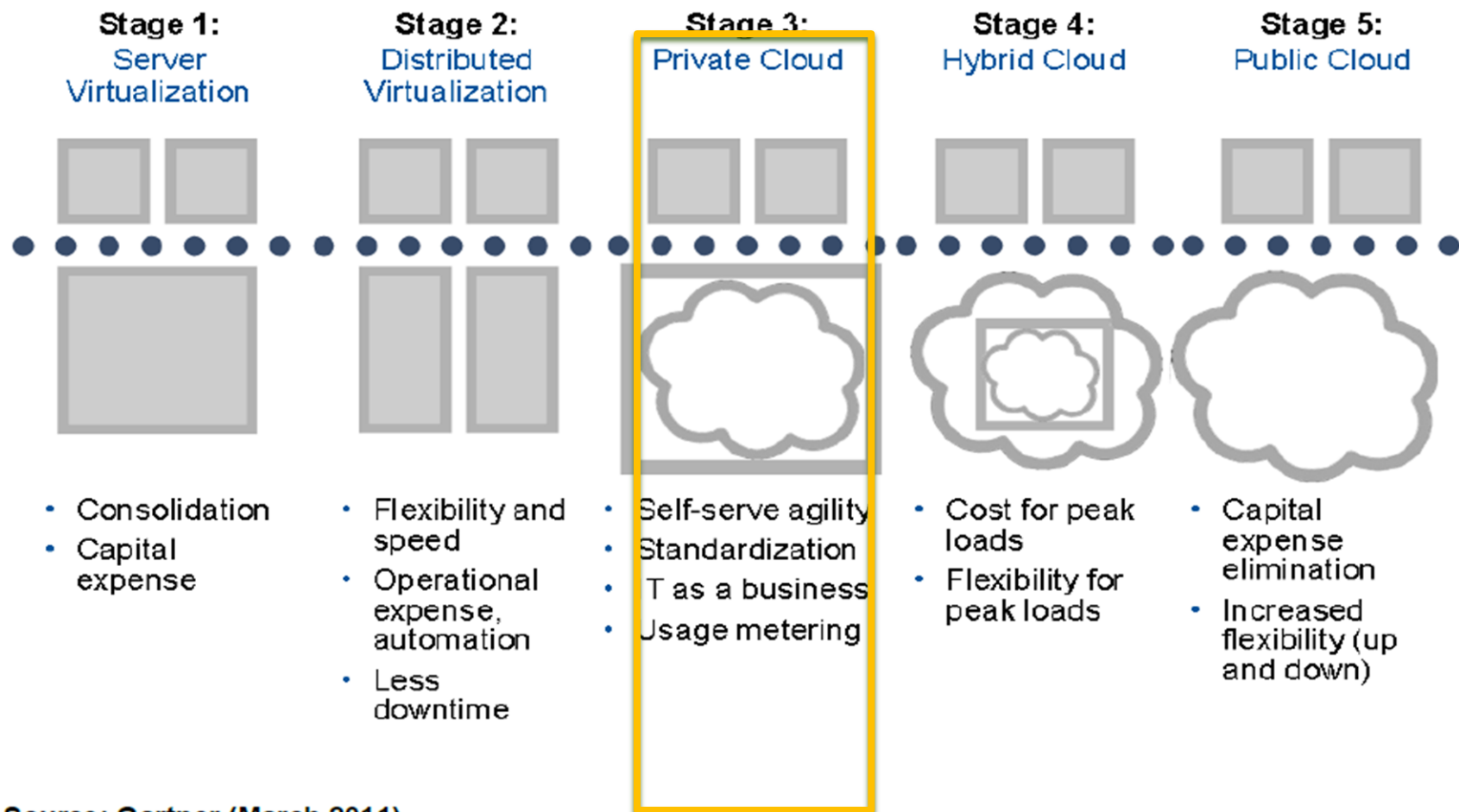
- 介绍SQL@私有云现状、路线图及关键技术
- 私有云的关键因素和优化SQL的最佳做法

- 什么是私有云？
- 怎样为私有云优化SQL Server？
- 怎样实现更高的密度？
- 真实案例

- 什么是私有云？

云征途中的五大阶段

Figure 1. Gartner Road Map: From Virtualization to Cloud Computing



Source: Gartner (March 2011)

Source: Gartner (March 2011)

私有云正在落地！

- 70% 的客户正在部署或计划私有云¹
- 美国一半以上的政府部门会在12月内部署私有云²
- 虚拟化和云计算的普及在未来12月内将会显著提升³
- 自助服务正在迅速赶上虚拟化⁴
- 超过50%的客户 (Forrester)

¹ [AFCOM 2011 study](#)

² [Information Week 2011 survey](#)

³ [Worldwide Executive Council 2011 survey on 100 CIOs](#)

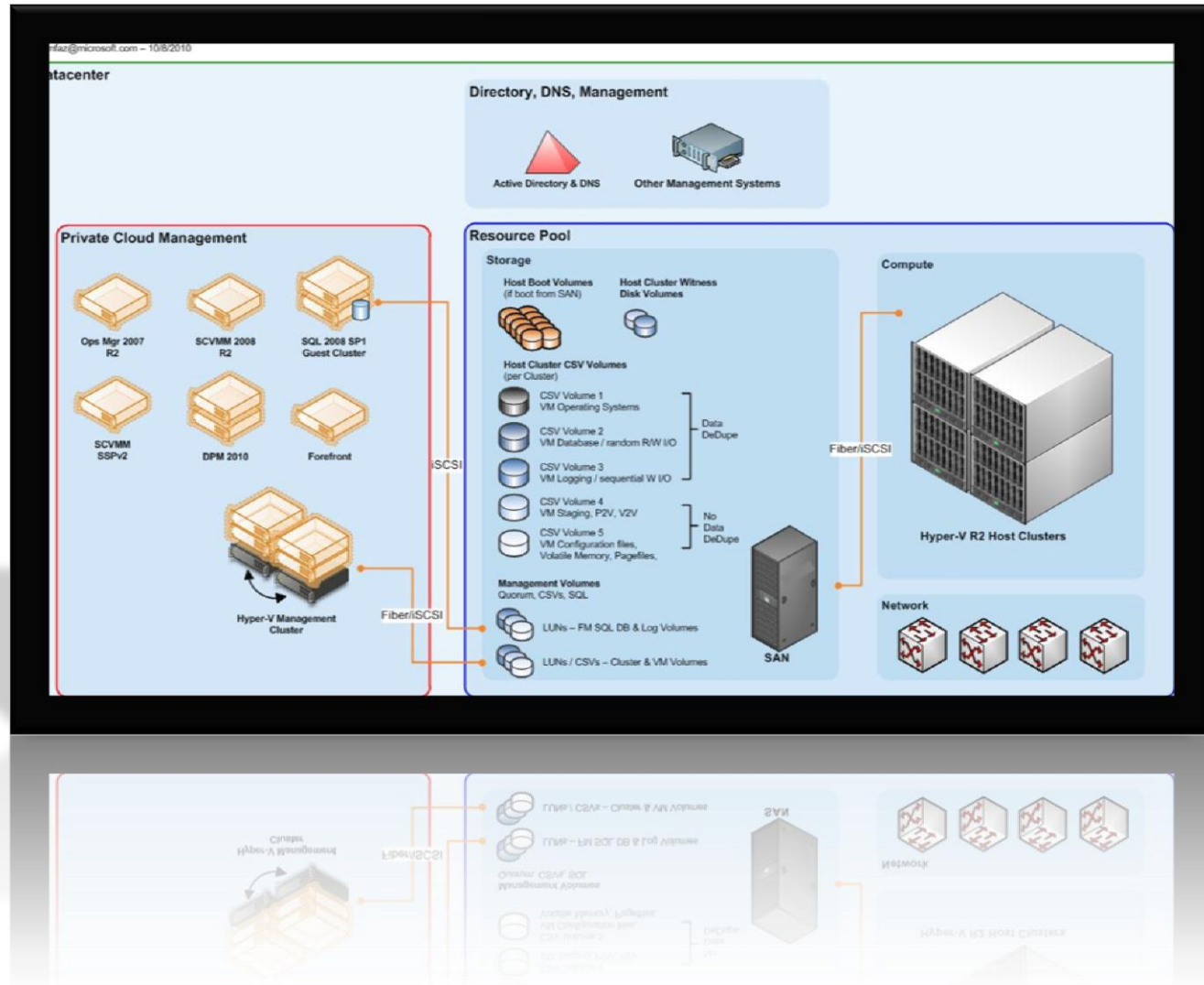
⁴ [CompTIA 2011 cloud computing survey](#)

Top 3 Database Initiatives	Currently doing or planning in next 12 months
Database Virtualization	58%
Database Standardization	56%
Database Consolidation	51%

Source: Forrester

逻辑性架构

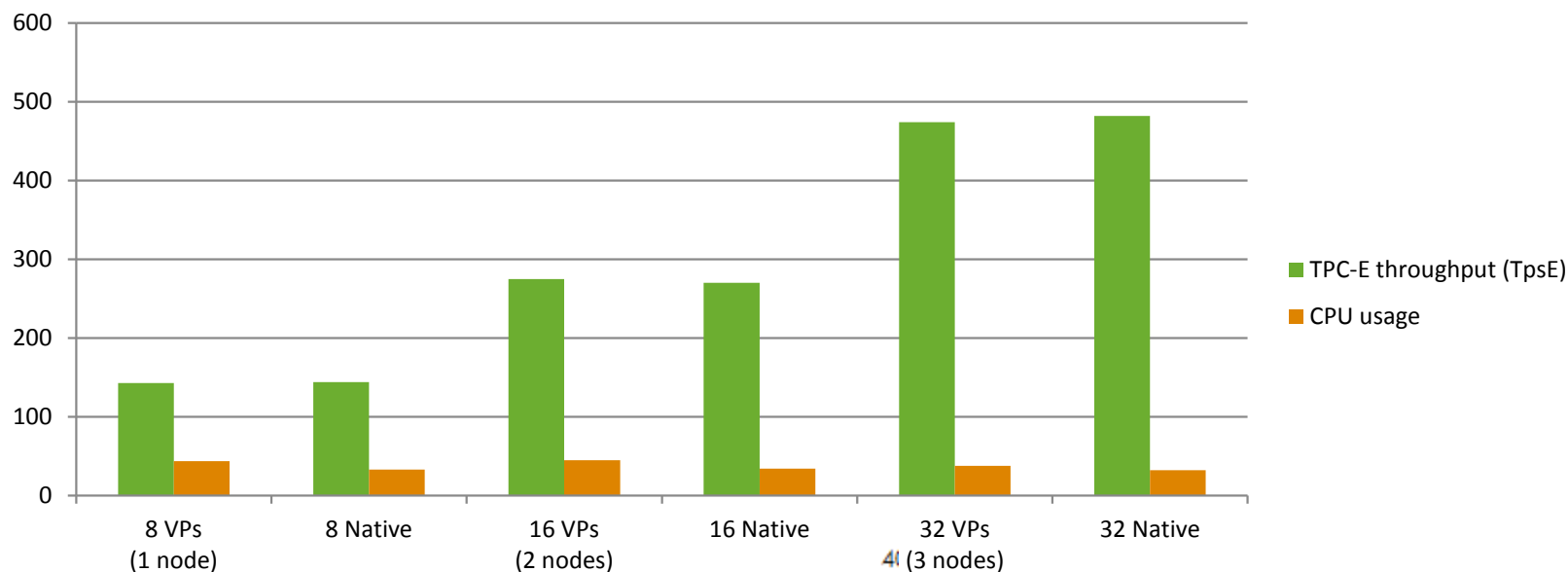
- 计算
Compute
- 网络 Network
- 存储 Storage
- 管理
Management



- 什么是私有云？
- 怎样为私有云优化SQL Server？

需要多大的服务器？

	Windows 2008 R2	Windows Server 8
CPU	4 CPUs	32 CPUs
Memory	64GB	512GB
VHD	2TB	>2TB
Host	64 LP	160 LPs



性能优化

	Win 2008 R1/R2	Windows Server 8
Enlightened VM	X	X
Better IO with Pass-through or Fixed VHDs	X	X
Minimize Roles in Host Partition	X	X
Virtualization Capability in New Processors	X	X
<u>Hyper-V on Server Core</u>	X	X
Guest Virtual Fiber Channel		X
Hyper-V over SMB2		X
VHDX		X
Guest networking (SR-IOV, VMQ)		X

Server Core Installation 益处及选项

- Benefits**

- Reduced maintenance.
- Reduced attack surface.
- Reduced management.
- Less disk space required.

- Roles Supported (by Edition):**

KEY: ○ = Not Available ● = Partial/Limited ✓ = Full

Server Role	Enterprise	Datacenter	Standard	Web	Itanium	Foundation
Active Directory Certificate Services	✓	✓	✓	○	○	○
Active Directory Domain Services	✓	✓	✓	○	○	○
Active Directory Lightweight Directory Services	✓	✓	✓	○	○	○
BranchCache Hosted Cache	✓	✓	○	○	○	○
DHCP Server	✓	✓	✓	○	○	○
DNS Server	✓	✓	✓	✓	○	○
File Services	✓	✓	● ¹	○	○	○
Hyper-V	✓	✓	✓	○	○	○
Media Services*	✓	✓	✓	✓	○	○
Print Services	✓	✓	✓	○	○	○
Web Services (IIS)	✓	✓	✓	✓	○	○

¹ Limited to one standalone DFS root.

* Must be downloaded separately.

- Install Hyper-V on Server Core
- `start /w ocsetup Microsoft-Hyper-V`
- Using Deployment Image Servicing and Management (DISM)
 - Discover available features:
 - `Dism /online /get-features /format:table`
 - To Install:
 - `Dism /online /enable-feature /featurename:<featurename>`
 - To Remove:
 - `Dism /online /enable-feature /featurename:<featurename>`
 - Beware, it is case sensitive
- Managing
 - Many options available, both locally and remotely
- Servicing

性能优化

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大型的虚拟机的网络附属存储(NAS)

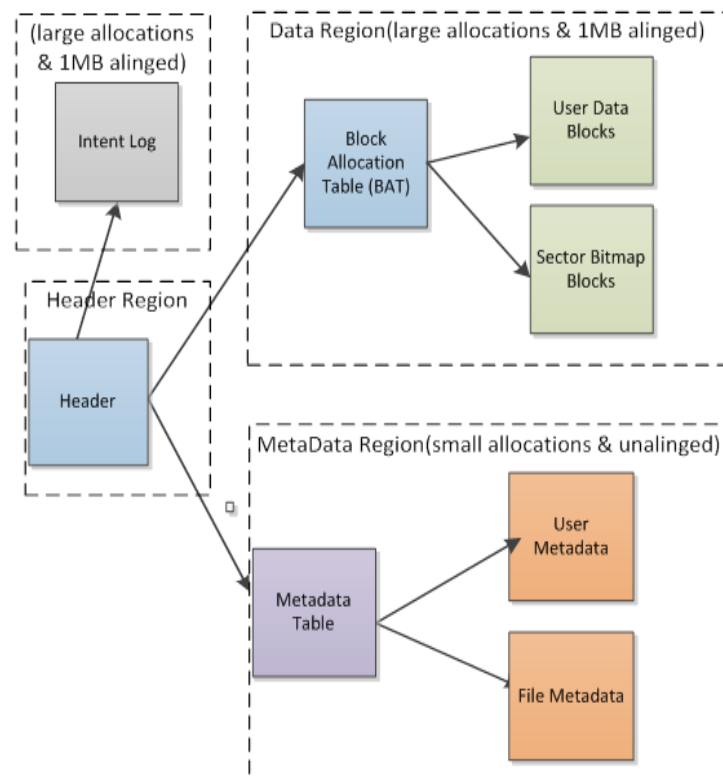
- Hyper-V Supported on SMB
- SMB comparable to FC
- Reliable (Transparent failover & multichannel)
- High performance & Low latency (RDMA)
- Works with existing infrastructure
 - Windows clustering (interchange CSV with SMB)
 - Support for remote VSS capabilities

最大限度提高性能

	Win 2008 R1/R2	Windows Server 8
Enlightened VM	X	X
Better IO with Pass-through or Fixed VHDs	X	X
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Virtualization Capability in New Processors	X	X
Hyper-V on Server Core	X	X
Guest Virtual Fiber Channel		X
Hyper-V over SMB2		X
<u>VHDX</u>		X
Guest networking (SR-IOV, VMQ)		X

VHDX

- >2TB disks
- **Better** performance (eliminate alignment issues)
- Resilient to corruption
- Embed user defined metadata
- Larger block sizes to adapt to workload requirements



Maximize Performance

	Win 2008 R1/R2	Windows Server 8
Enlightened VM	X	X
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Hyper-V over SMB2		X
VHDX		X
Guest networking (SR-IOV, VMQ)		X

SR-IOV (Single-Root I/O Virtualization)

PCI-SIG STANDARD

- Expands virtualization concepts to PCI Express Devices
- Is not specific to an I/O class
- Allows a device's hardware surface to be 'assigned' to a VM
- Requires device, firmware, chipset and driver support

FEATURE GOALS

- Reduce latency of network path
- Reduce CPU utilization for processing network traffic
- Increased throughput
- Support Live Migration

High Availability and Disaster Recovery

SQL 2005, 2008, 2008 R2, Denali	Windows 2008 R2	Windows Server8
Denali AlwaysOn	X	X
Database Mirroring	X	X
Guest Clustering	X	X
Database Replication	X	X
Log Shipping	X	X
Database Backup Restore	X	X
Hyper-V Live Migration	X	X
Hyper-V Replica		X
Hyper-V Live Storage Migration		X

SQL Server with Live Migration

- Scenario description
- Virtualization benefits
 - No loss of service during failover with Live Migration.
 - Improve availability with less complexity
 - Better server utilization due to consolidation
 - Easier setup and management through System Center Virtual Machine Manager

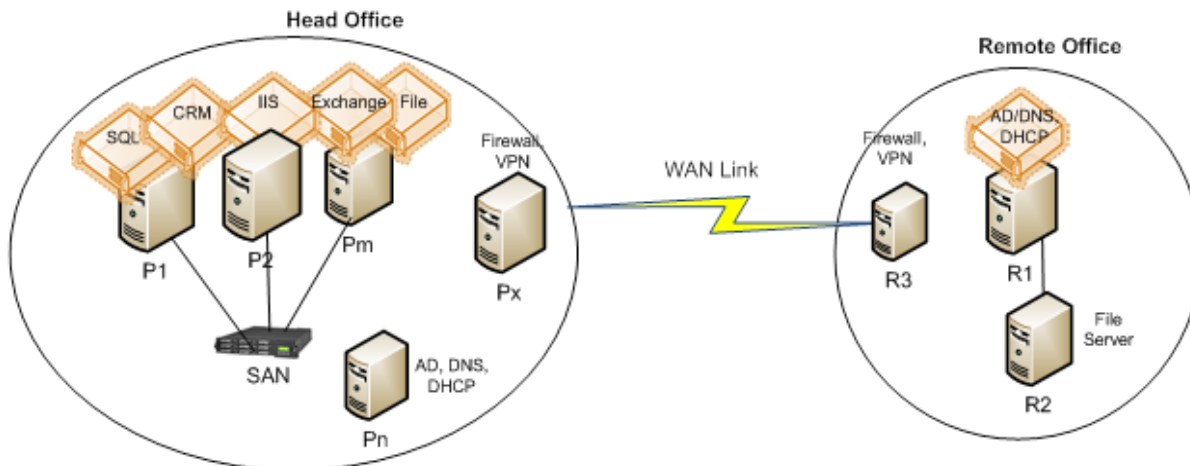


High Availability and Disaster Recovery

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Hyper-V Replica		X
Hyper-V Live Storage Migration		X

Hyper-V Replica

- Part of Hyper-V install
- Hyper-V UI, PS and WMI support for all operations
- Integrated with Cluster Manager for all operations and status
- Asynchronous replication
- Support for asymmetric storage
- Works seamlessly across migrations
- Best Practices Analyzer (BPA) for getting set up correctly
- Status, perfmon counters and event logs for troubleshooting



High Availability and Disaster Recovery

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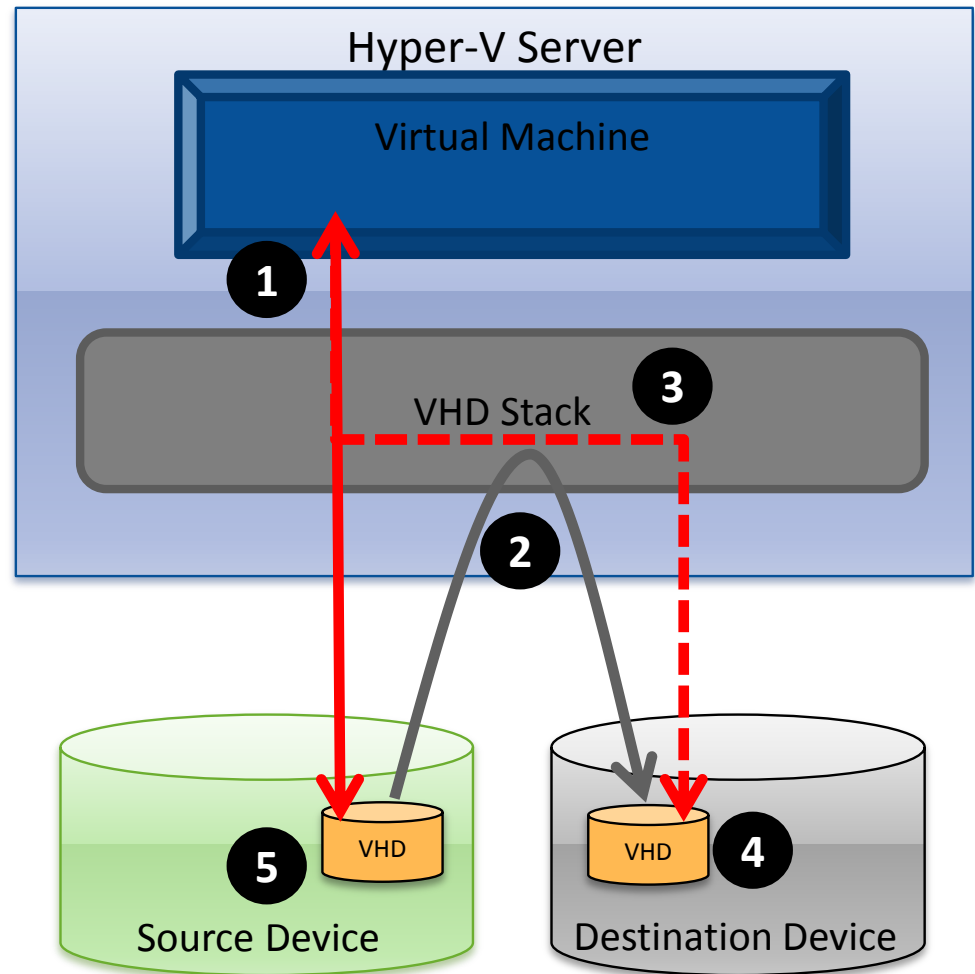
Storage Migration

- ▶ The ability to move all “on disk” components of a virtual machine – while it is running
 - ▶ Virtual Hard Disks
 - ▶ Configuration Files
 - ▶ .BIN / .VSV / .SLP Files

Storage Migration

How does this all work?

- The ability to move all “on disk” components of a virtual machine – while it is running
 - Virtual Hard Disks
 - Configuration Files
 - .BIN / .VSV / .SLP Files



Agenda

- What is Private Cloud?
- How to Optimize SQL for Private Cloud
- How to Achieve Higher Density?

CPU Overcommit

- Can deliver higher virtualization density

	Windows Server 2008 R2	Windows Server 8
Virtual Processor – Host	64	160
Virtual Processor – Guest	4	32

- May introduce noticeable performance overhead when all workloads are busy
- Hyper-V benefits from newer generation of processor architecture (SLAT)

CPU Over-commit

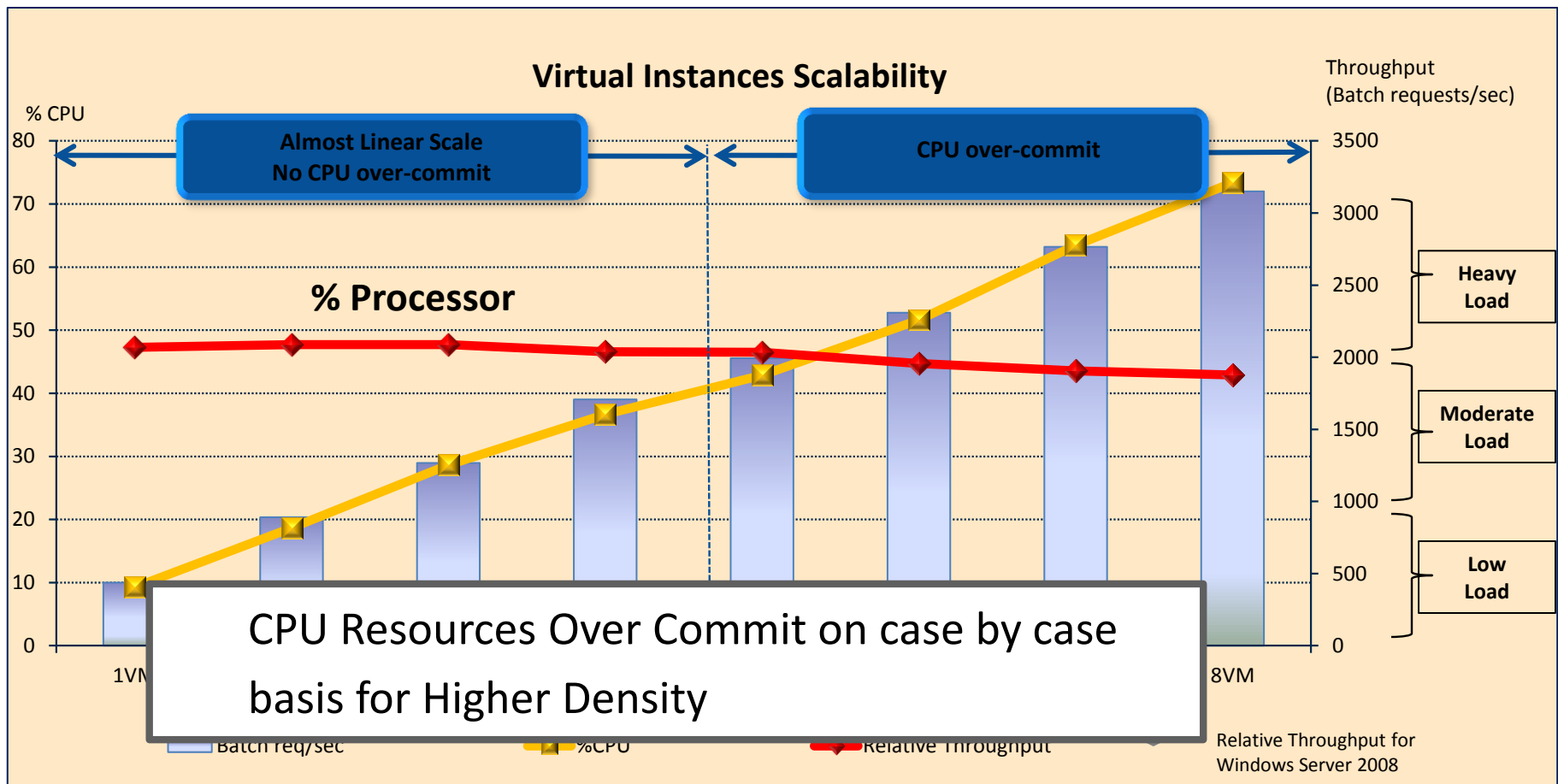
Configuration:

- **OS:** Microsoft® Windows Server® 2008 R2 Hyper-V™
- **Hardware:**
HP DL585 (16 core) with SLAT
HP EVA 8000 storage
- **Virtual Machines:** 4 virtual processors and 7 GB RAM per virtual machine; Fixed size VHD



Results:

- Increased throughput with consolidation
- Near linear scale in throughput with no CPU over-commit
- Improved performance with Windows Server 2008 R2 and SLAT processor architecture



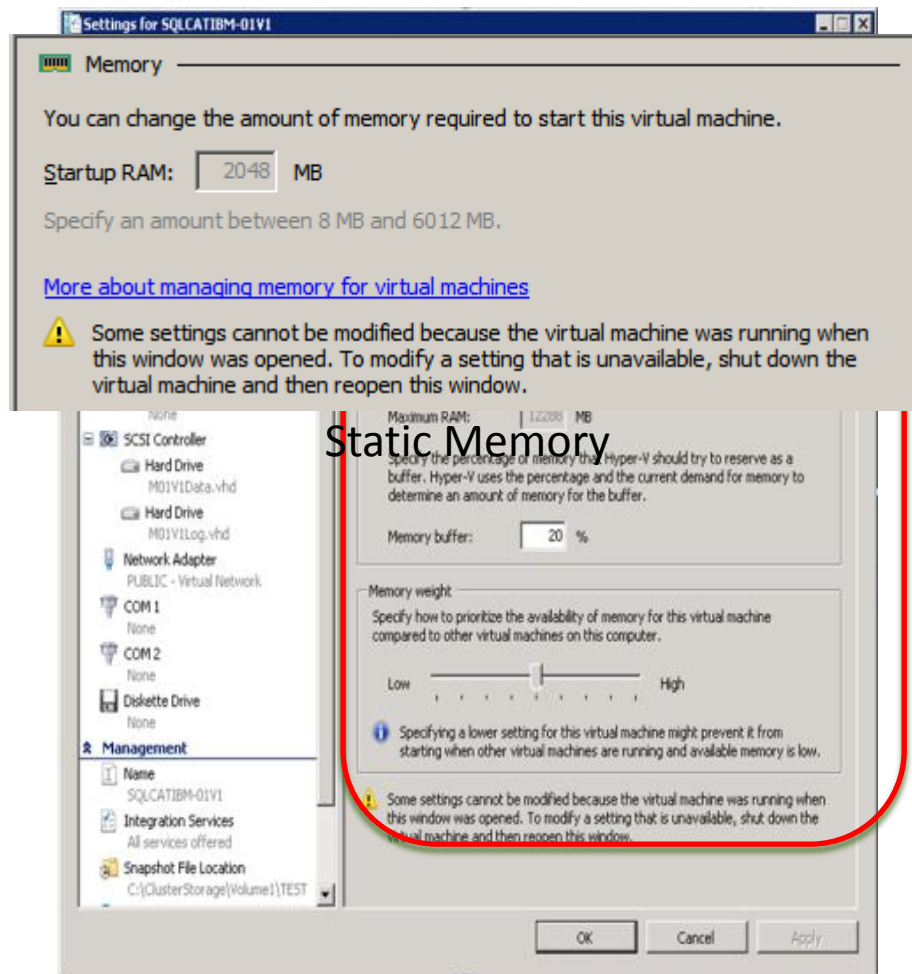
SQL Server and Dynamic Memory

- What is dynamic memory?
- Primary goals
 - Maximum density
 - Minimal perf impact
- Primary scenarios
 - Unplanned failover
 - Planned maintenance (Live migrations)

Dynamic Memory is supported for SQL Server

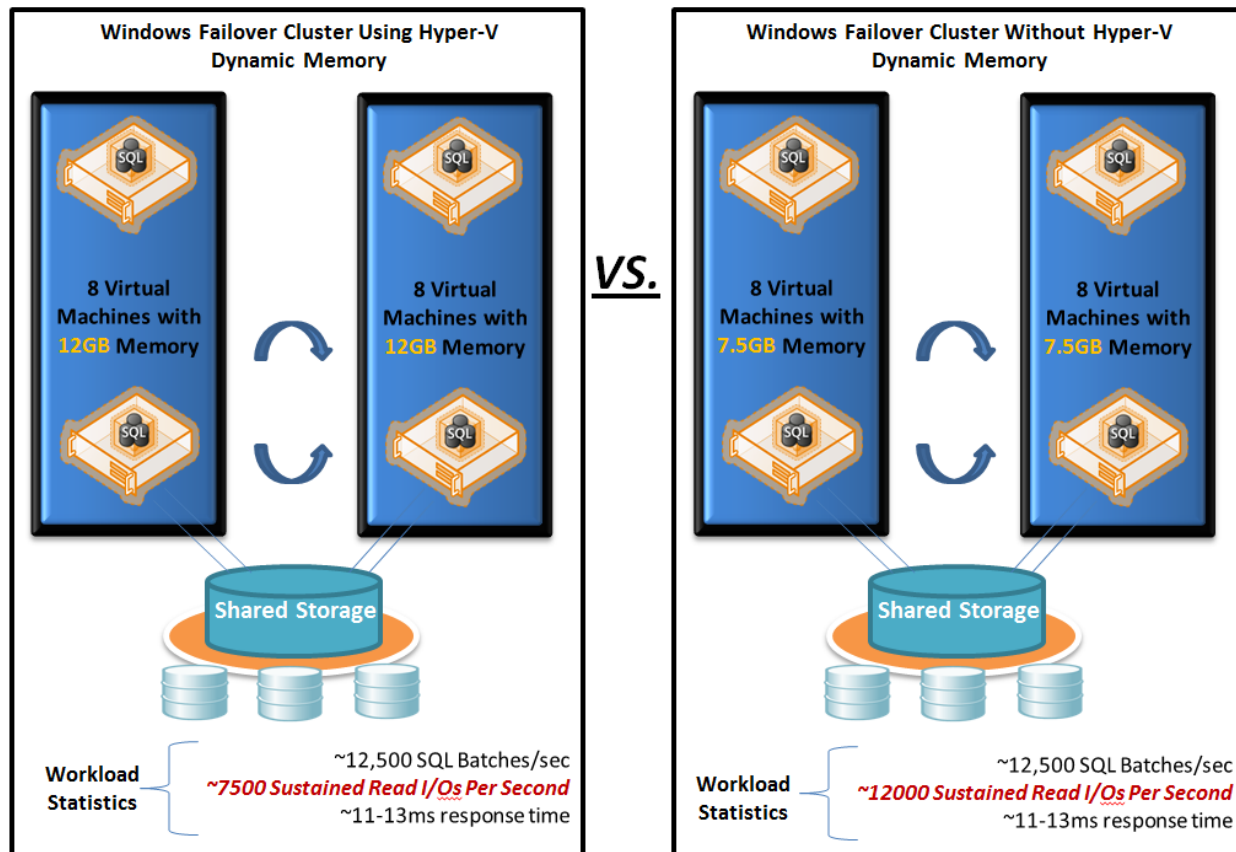
(<http://support.microsoft.com/?id=956893>)

Best practice guidance is [published](#)



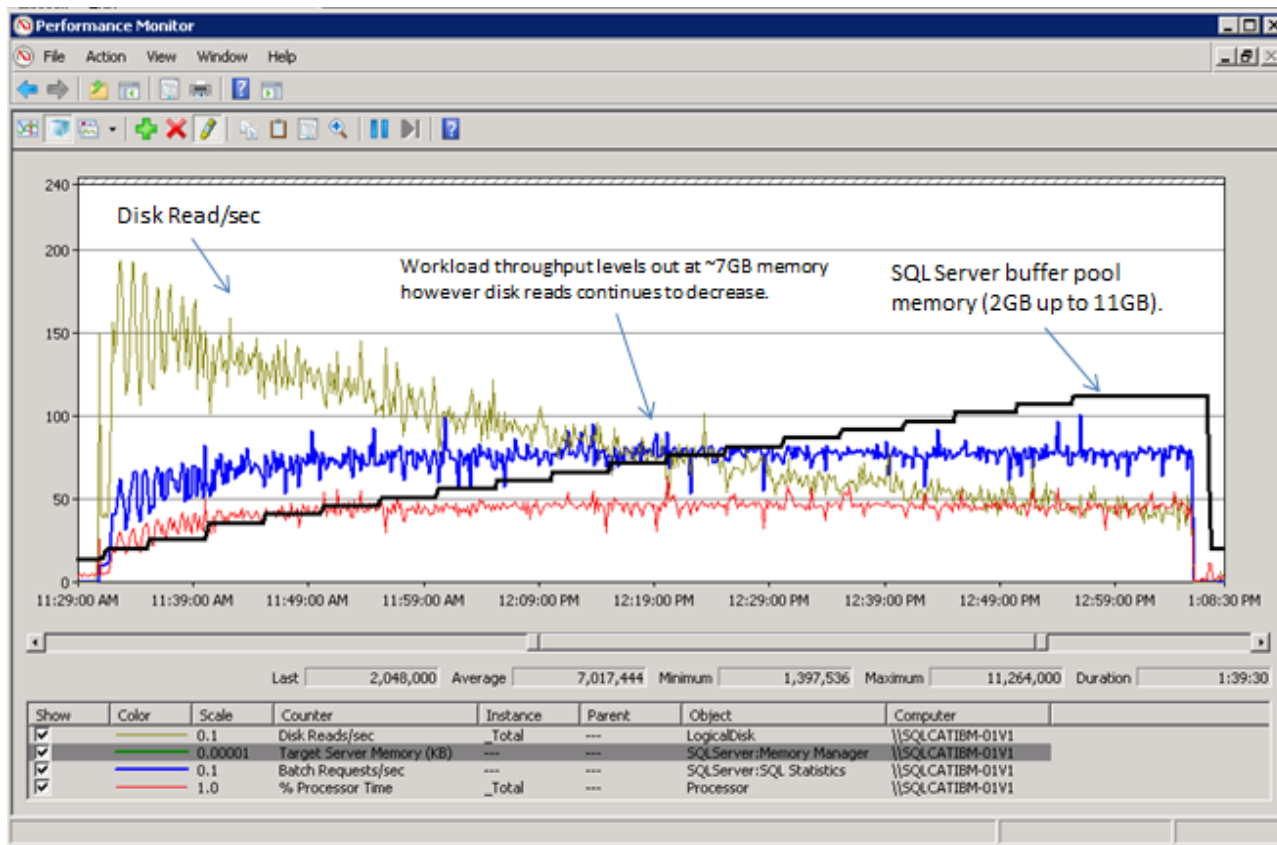
Dynamic Memory

How does Dynamic Memory Benefit SQL Server?



* Each cluster node has 128GB RAM

How does Dynamic Memory Benefit SQL Server?



Dynamic Memory Findings and Best Practices

- Reduce SQL Server memory using 'max server memory' sp_configure setting prior to Live Migration
- Adjusting memory weight of VMs for Live Migration to an overcommitted server
- Grant SQL Server service accounts 'Lock Pages in Memory'

These settings combined avoid performance drop offs for SQL Server

Agenda

- What is Private Cloud?
- How to Optimize SQL for Private Cloud
- How to Achieve Higher Density?
- A Real World Story

Case Study: Commerce Platform

Virtualization and High Availability

Commerce Platform

- ▶ Online payment and subscription processing service.
- ▶ Supporting 13 payment methods, 56 currencies , 74 markets
- ▶ 50 million active Microsoft customers and 2.5 billion dollars in transactions for FY11.
- ▶ Part of Server and Tools Business (STB).

What is Commerce Platform



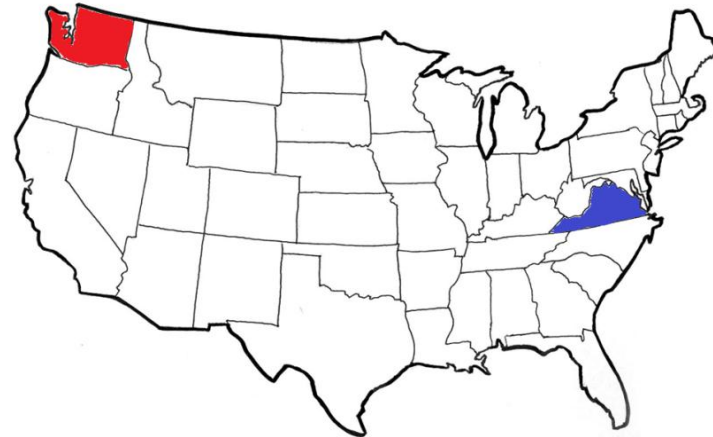
- ✓ Subscription Billing
- ✓ Payments
- ✓ Risk Management
- ✓ Mobile Operator Billing
- ✓ Point of Sale Activation
- ✓ Payouts



SQL Infrastructure

PROD & BCP

2	Datacenters
210	SQL 2008 SP2 physical user databases
980	TB active datafiles
121	TB storage
420	TB monthly growth
12	DB Mirror Pairs
110	Log Shipping pairs
98	Replication streams
400	Replicas / Subscribers

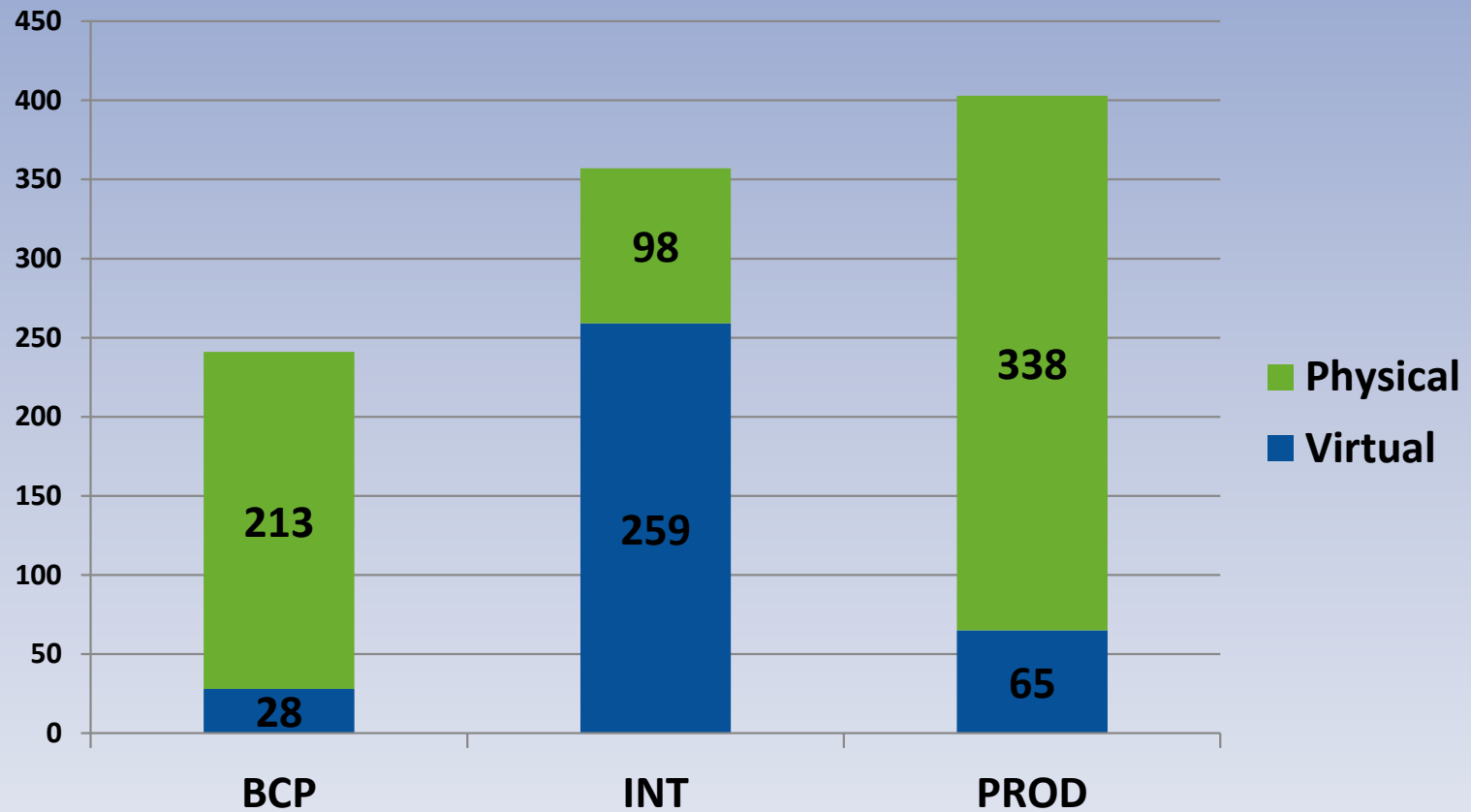


INT

1	Datacenter
132	SQL 2008 SP2 Virtual Machines
980	user databases
10	TB active datafiles
100	TB storage
110	DB Mirror Pairs
400	Replication streams
15	Replicas / Subscribers

VM/Physical

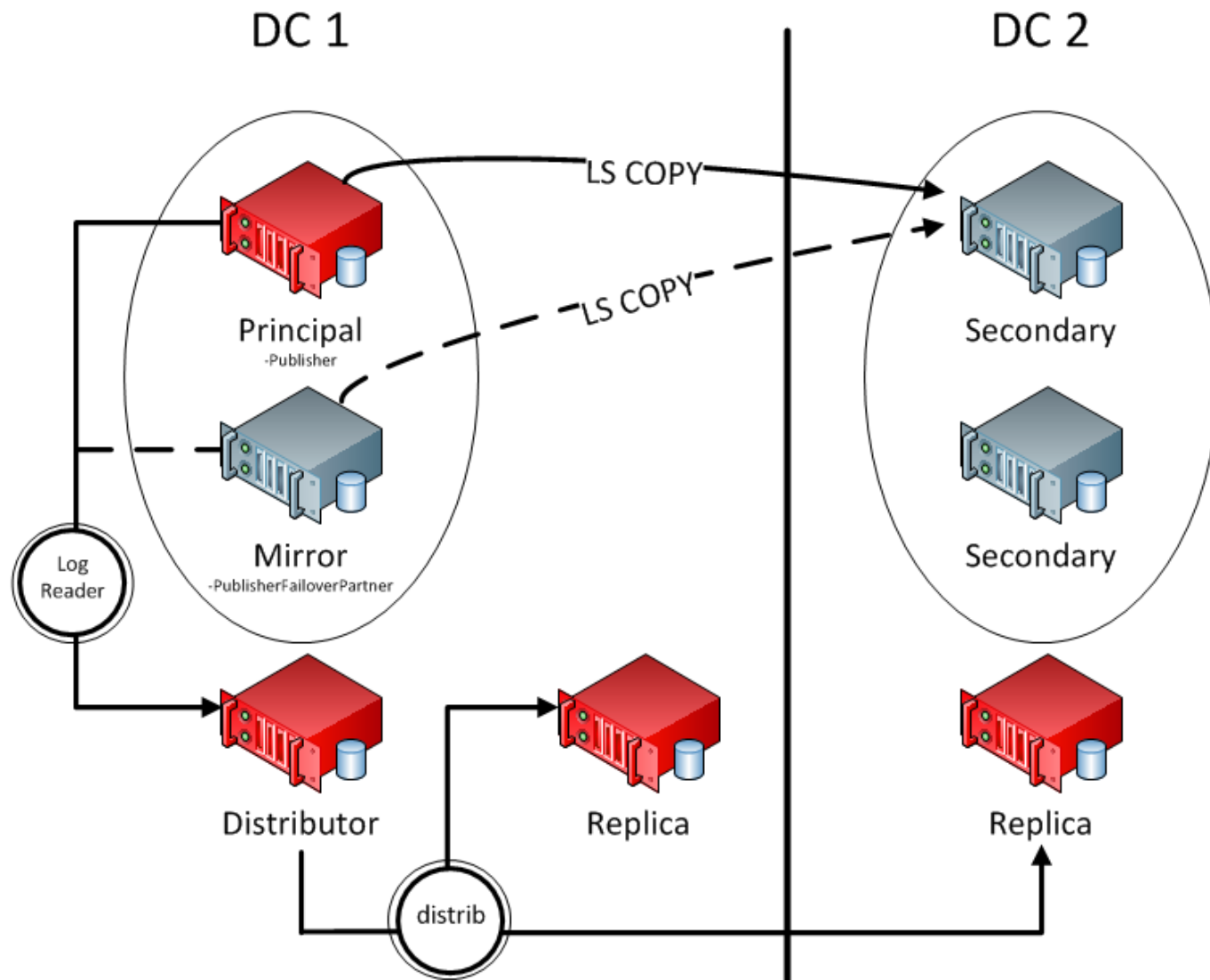
Virtualization by Environment



Virtualized Environment

- 100% VM in INT for over 2 years
- Elasticity allows 1:1 server mapping with INT & PROD
- Density of 4 – 12 VMs per host.
- Dynamic Disks, fixed 4GB memory, 4 processors.
- Standard organizational base image and template
- Scripted PowerShell VM creation
- 30 minutes to build VM, 1 hour to patch and fully deployed in 24 hours
- Utilizing VM Host Clusters for elasticity, HA and fast/live migration

High Availability Architecture



```
C:\>TowerAdmin.exe mirroring plannedFailover /prisvr:TK2PRINCIPAL /pridb:MyDatabase
```

```
(07:10:39) *****
(07:10:39) PLANNEDFAILOVER [PRINCIPAL: TK2PRINCIPAL:MyDatabase; MIRROR: TK2MIRROR]
(07:10:39) *****
(07:10:39) Disable log shipping backup jobs
(07:10:50) Set mirroring partner safety to full
(07:10:50) Sync mirroring
(07:10:51) Mirroring state for database MyDatabase on server TK2PRINCIPAL is SYNCHRONIZED.
(07:10:51) Mirroring state for database MyDatabase on server TK2MIRROR is SYNCHRONIZED.
(07:10:52) Mirroring Failover LSN for database MyDatabase on server TK2PRINCIPAL is xxx.
(07:10:52) Last Log Backup LSN for database MyDatabase on server TK2PRINCIPAL is xxx.
(07:10:52) Sync mirroring Succeeded (Elapse: 00:00:02.0508200)
(07:10:54) Sync mirroring again Succeeded (Elapse: 00:00:02.0168064)
(07:10:54) *****
(07:10:54) DOWNTIME BEGINS
(07:10:54) *****
(07:10:55) Set partner to failover on principal Succeeded (Elapse: 00:00:01.1014404)
(07:10:55) *****
(07:10:55) DOWNTIME ENDS
(07:10:55) *****
(07:10:55) Set mirroring partner safety to off
(07:10:55) Setup partner safety to off for database MyDatabase on server TK2MIRROR.
(07:10:56) Set mirroring partner safety to off Succeeded (Elapse: 00:00:01.3495396)
(07:10:56) Enable Log Shipping Primary Agent Jobs TK2PRINCIPAL:MyDatabase
(07:10:56) Enable Job LSBak_MyDatabase@TK2PRINCIPAL
(07:10:56) Enable log shipping backup jobs Succeeded (Elapse: 00:00:00.0800320)
(07:10:56) Planned Failover ends successfully! (Elapse: 00:00:17.1408536)
```

Future

- To the Cloud
- More Compression and Encryption
- More Tracing and Auditing
- SQL Server “Denali”

Takeaways

- Best practices to maximize performance in virtualized environment
- Achieve higher density with CPU overcommit and dynamic memory
- Win8 is the ultimate private cloud OS
 - Better performance, scalability
 - Better availability and DR

Virtualization - Strategy

- Start from smallest workload
- Continue to larger workload over time with experience
- Microsoft supports SQL Server virtualization:
<http://support.microsoft.com/?id=956893>

Start small, learn, and continue to virtualize as you test and learn how to manage

Virtualization - Platform

– SQL Server & Hyper-V

- Integration with Windows clustering: a key high availability (HA) technology
- Retain all Hyper-V features in failover clustering

	Windows Server 2008 R2	Windows Server 8
CPU	<=4 CPU	<=32 CPUs
Memory	<=64GB	<=512GB
Disk	<=2TB	<=16TB

Question & Answer

问题和解答

键入请求演示者解答的问题。

提问

如需提出问题，请在此区域输入文字，并单击“问题和解答”右上方的“提问”按钮即可。

尚未解答任何问题。

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