
Microsoft®
tech·ed
India | 2009

LEARNING LIVES HERE

# Building Business Continuity Solutions With Hyper-V

Rohit Gulati | Partner Technical Consultant
Microsoft

msdn Microsoft® Developer Network

Microsoft TechNet

# Session Objectives & Agenda

- Virtualization and High Availability
- Types of high availability enabled by virtualization
- Enabling a highly available cluster with virtual machines
- Demo:  Windows Server 2008 Cluster Creation
- Demo:  Making a Virtual Machine highly available
- Stretch Clusters and Hyper V
- Guest Clustering Best Practices
- Hyper V and NLB
- Disaster Recovery and Virtualization
- What's new in R2

# Session Prerequisites

- Knowledge of Windows Server 2008
- Knowledge of Microsoft Hyper-V
- Cluster Experience NOT REQUIRED!

# Windows Server 2008 With Hyper-V Technology

**A role of Windows Server 2008 (Std, EE, DC)**

- Can be installed on both Windows Server 2008 Full and Core
- Production servers can be configured as a minimal footprint Server Core role

**Hypervisor based architecture**

**Flexible and dynamic virtualization solution**

**Managed by the Microsoft System Center family of products**

# Virtualization and High Availability

# Virtualization And High Availability

## Traditional Non-Virtualized Environment

- Downtime is bad, but affects only one workload

## Virtualized Environment

- Value of the physical server goes up
- Downtime is far worse because multiple workloads are affected

**Virtualization and High-Availability Go Hand in Hand**

# Microsoft Hyper-V Quick Migration

## Provides solutions for both planned and unplanned downtime

### Planned downtime

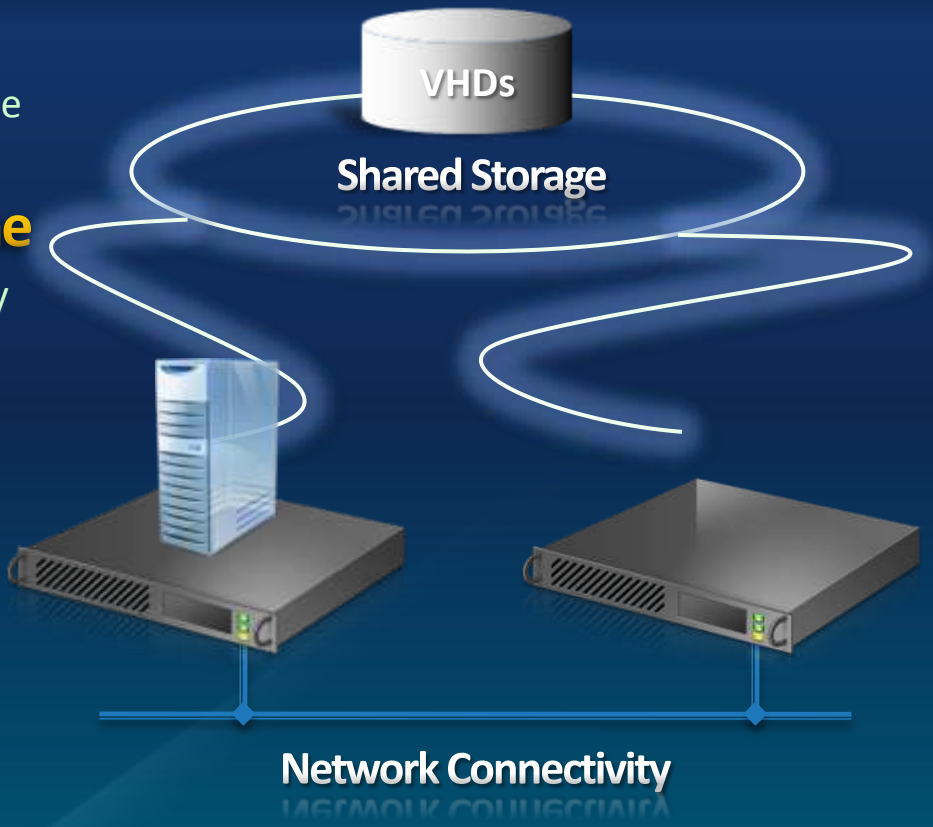
- Quickly move virtualized workloads to service underlying hardware
- More common than unplanned

### Unplanned downtime

- Automatic failover to other nodes (hardware or power failure)
- Not as common and more difficult

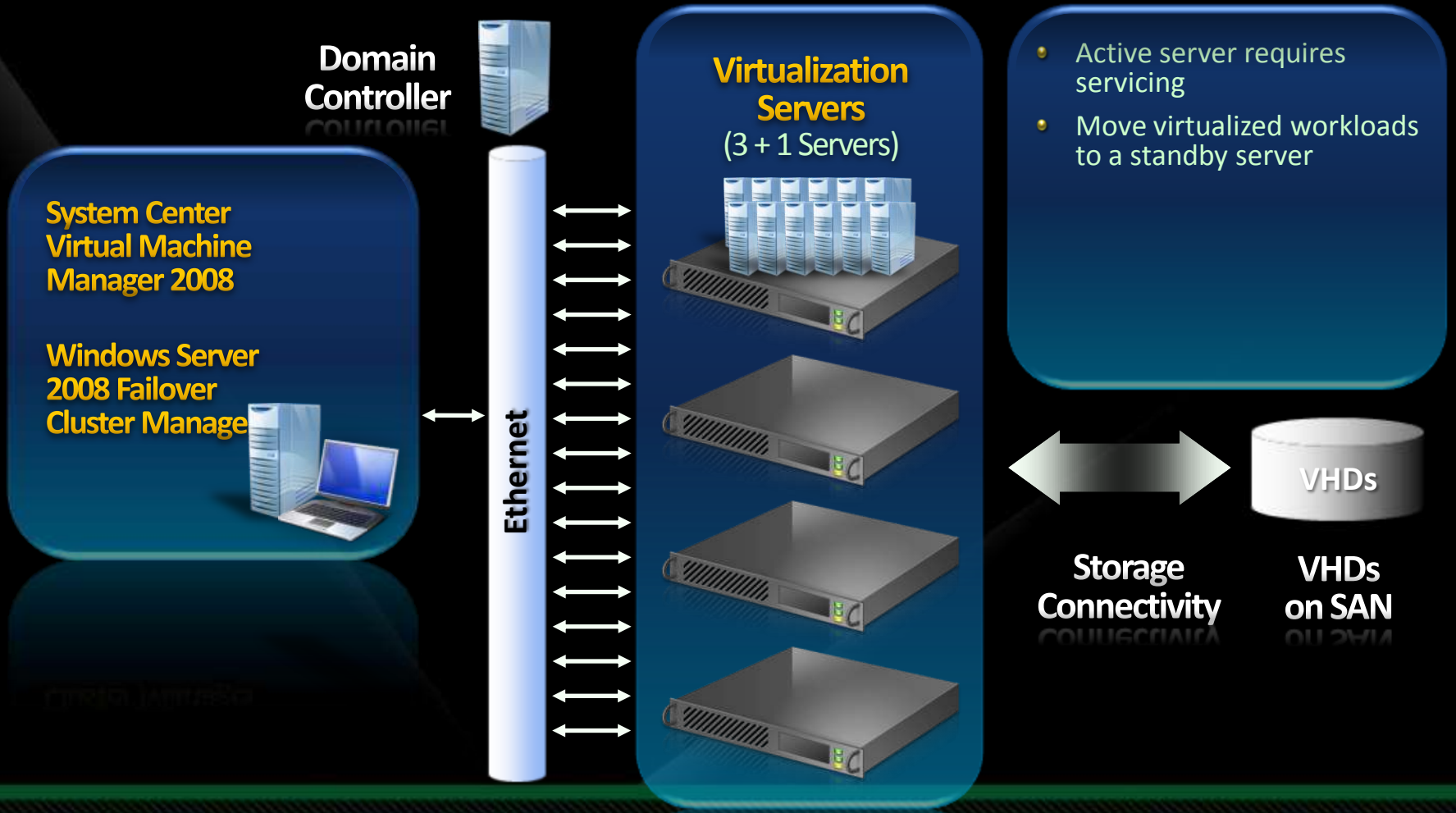
# Quick Migration Fundamentals – Planned Downtime

1. **Save state**
   - Save entire virtual machine state
2. **Move virtual machine**
   - Move storage connectivity from origin to destination host
3. **Restore state and Run**
   - Restore virtual machine and run



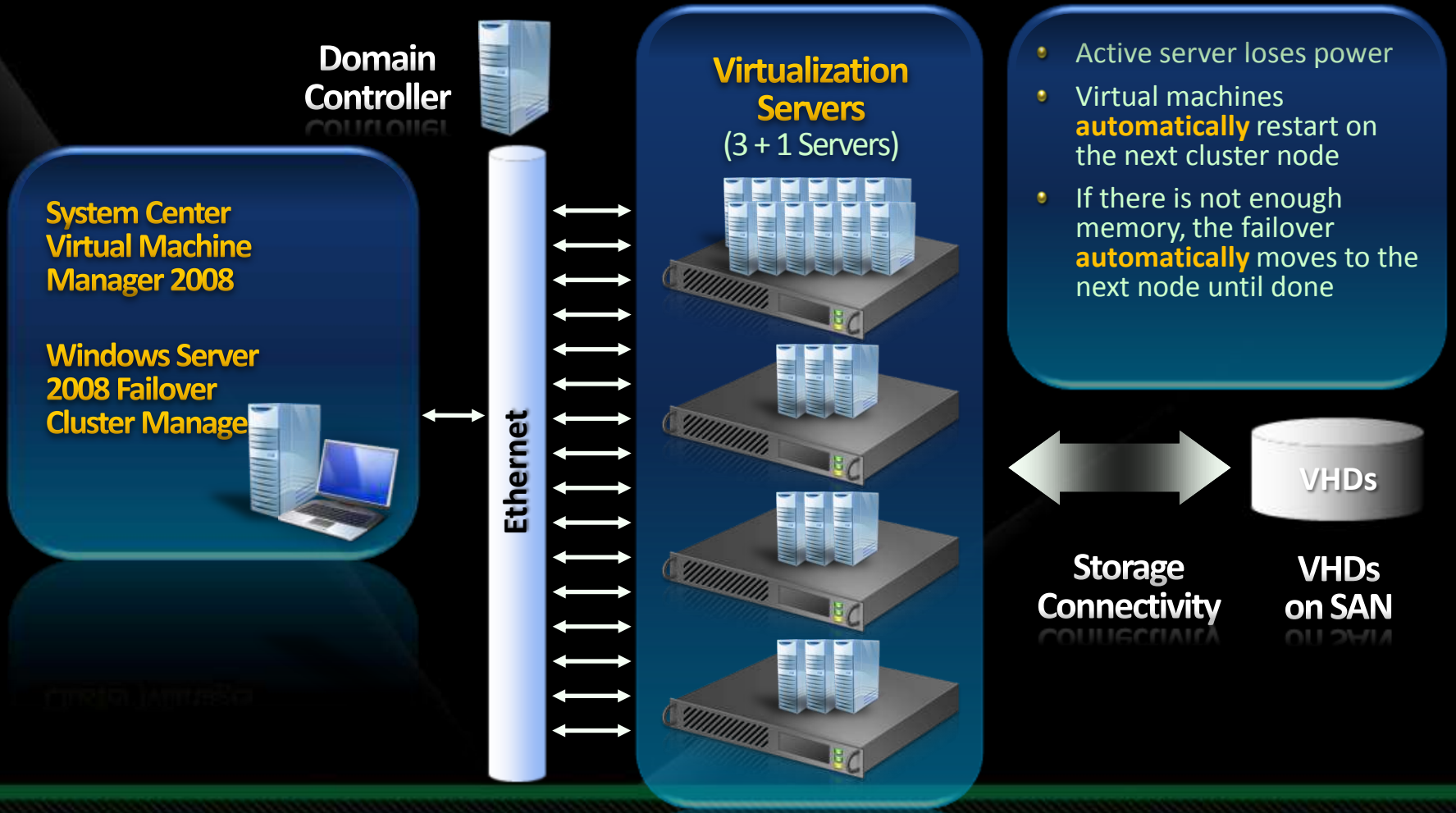
# Quick Migration

## Planned Downtime



# Quick Migration

## Unplanned Downtime



# Quick Migration

## Storage Considerations (1/2)

### Pass-through Disks in a cluster

- Provides enhanced I/O performance
- Requires VM configuration file to be stored separate from the virtual machine file
- Create file share on the cluster and store VM configuration files for virtual machines that use pass-thru

### VHD Based

- One LUN per VM best practice
- Ability to provision more then one VM per LUN but all failover as a unit

# Quick Migration

## Storage Considerations (2/2)

### SAN/ISCSI

- Leverage MPIO solutions for path availability and I/O throughput
- Leverage VM provisioning via GUID ID instead of drive letter
  - \\?\<GUID>\
  - Deploy KB951308 cluster update to support:
    - Support for MountPoints or Volumes with no Drive Letter
    - GUID Volume Path Copy
    - Allow more than one virtual machine in a "Services or Applications" group

# Other Types Of High Availability

## Virtual Machine Clustering

- Suited for stateful applications
- Application clusters
  - SQL
  - Exchange

## Network Load Balancing

- Stateless HA approach
- Enabled with Hyper-V's enhanced networking support

# Comparing High Availability To Fault Tolerance

- Continuous replication of VM memory contents
- Fail through concept vs. failover
- Hardware or component failure undetected by applications
- Requires redundant hardware configurations deployed in lock step
- Special interconnects
- Vendors with FT Hyper V solutions
  - Marathon
  - Stratus Technologies


# demo

## Cluster Creation and Quick Migration

# Cluster Management – VMM 2008

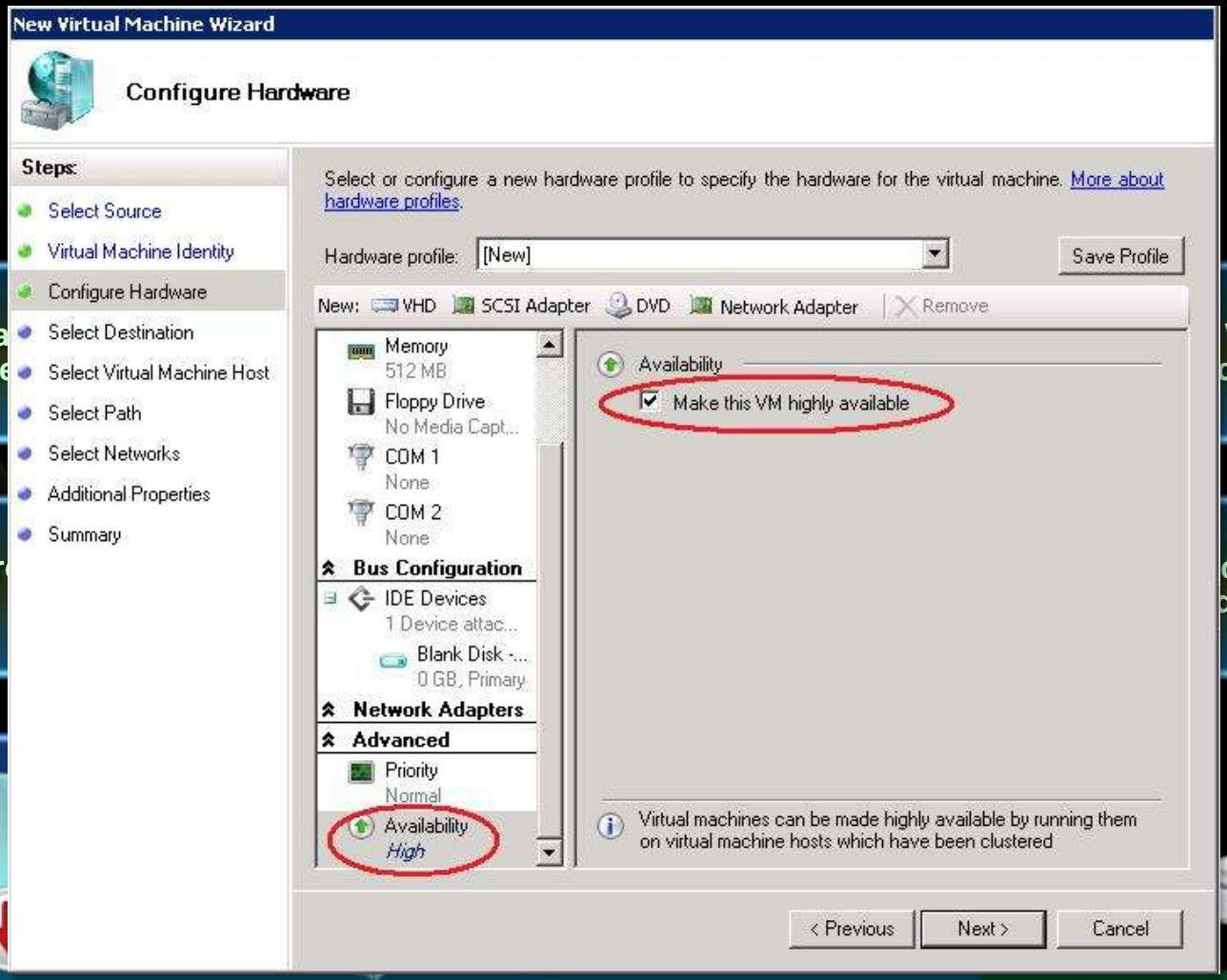
## Easy management of Hyper-V host clusters

- Add entire Hyper-V host cluster in a single step
- Automatic detection of node additions/removals

## Cluster reserve

- Specify the number of node failures to sustain while keeping all HA VMs running
- Intelligent Placement ensures that new HA VMs will not over commit the cluster
- Node failures automatically trigger over commit re-calculation

# Configuring A VM To Be Highly Available




2. Find ava... resource... VM ...ce

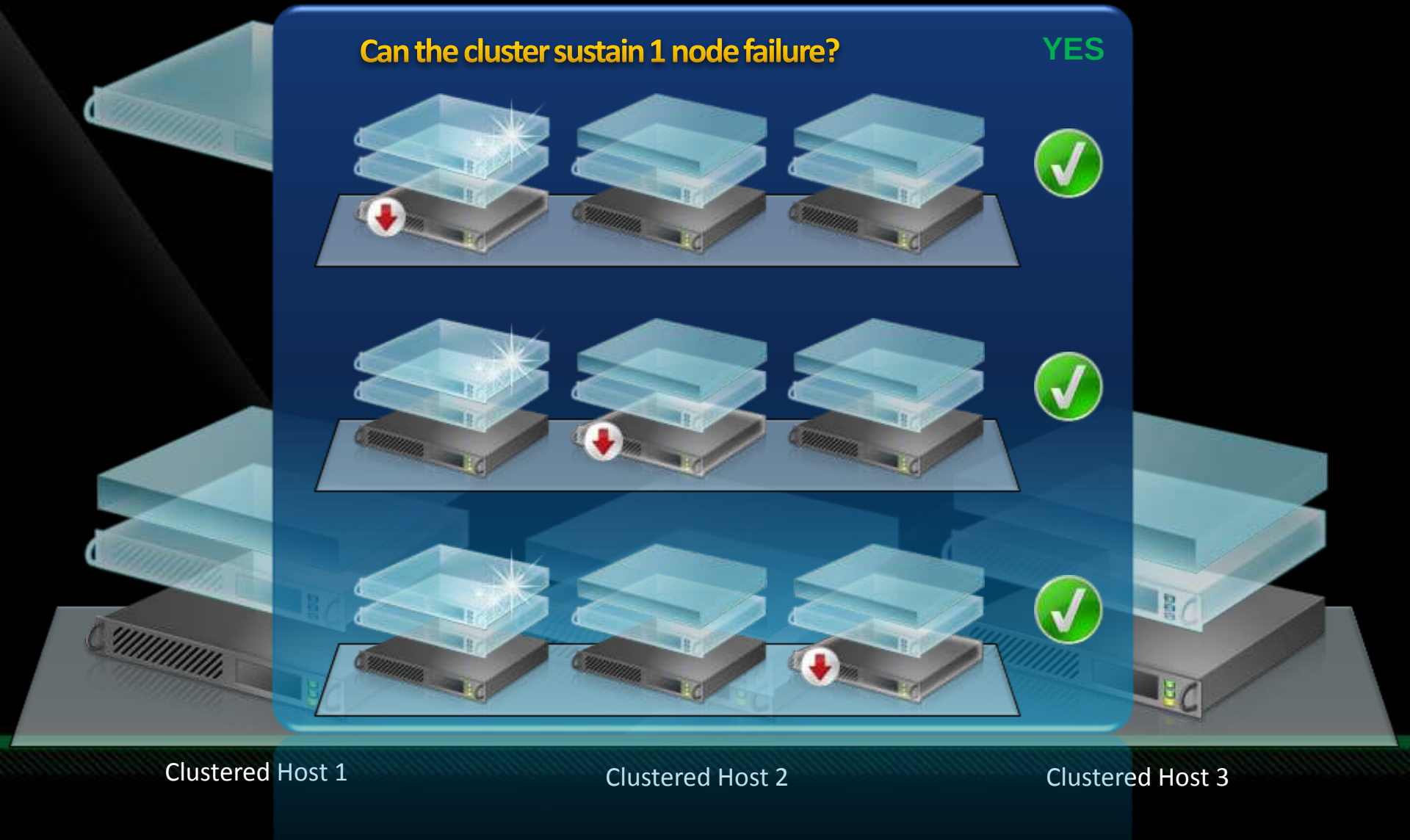
1. Create r... group ...ource ...dencies

VM Resource

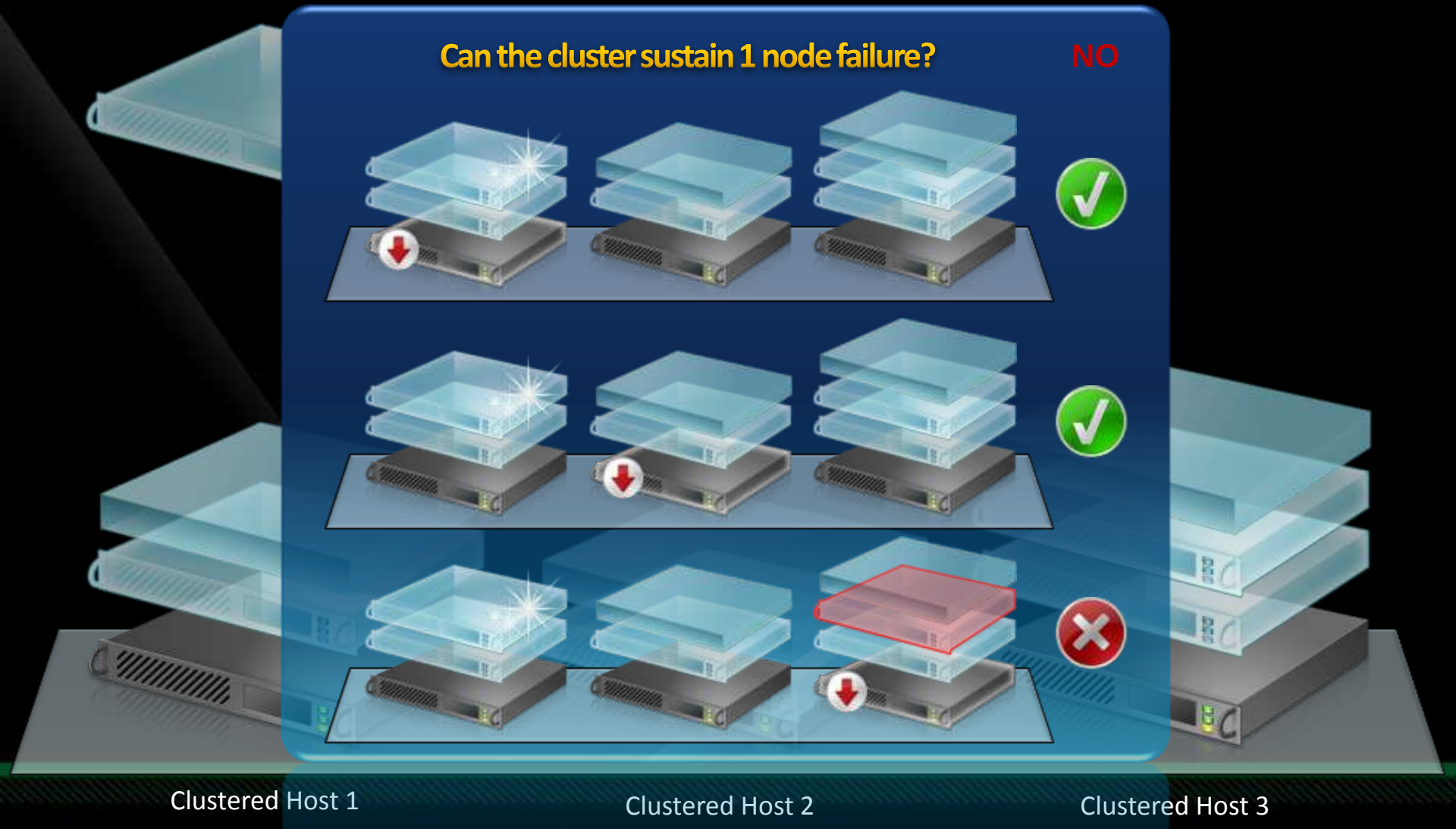
VM Config Resource

Disk Resource

# Placement And Cluster Reserve

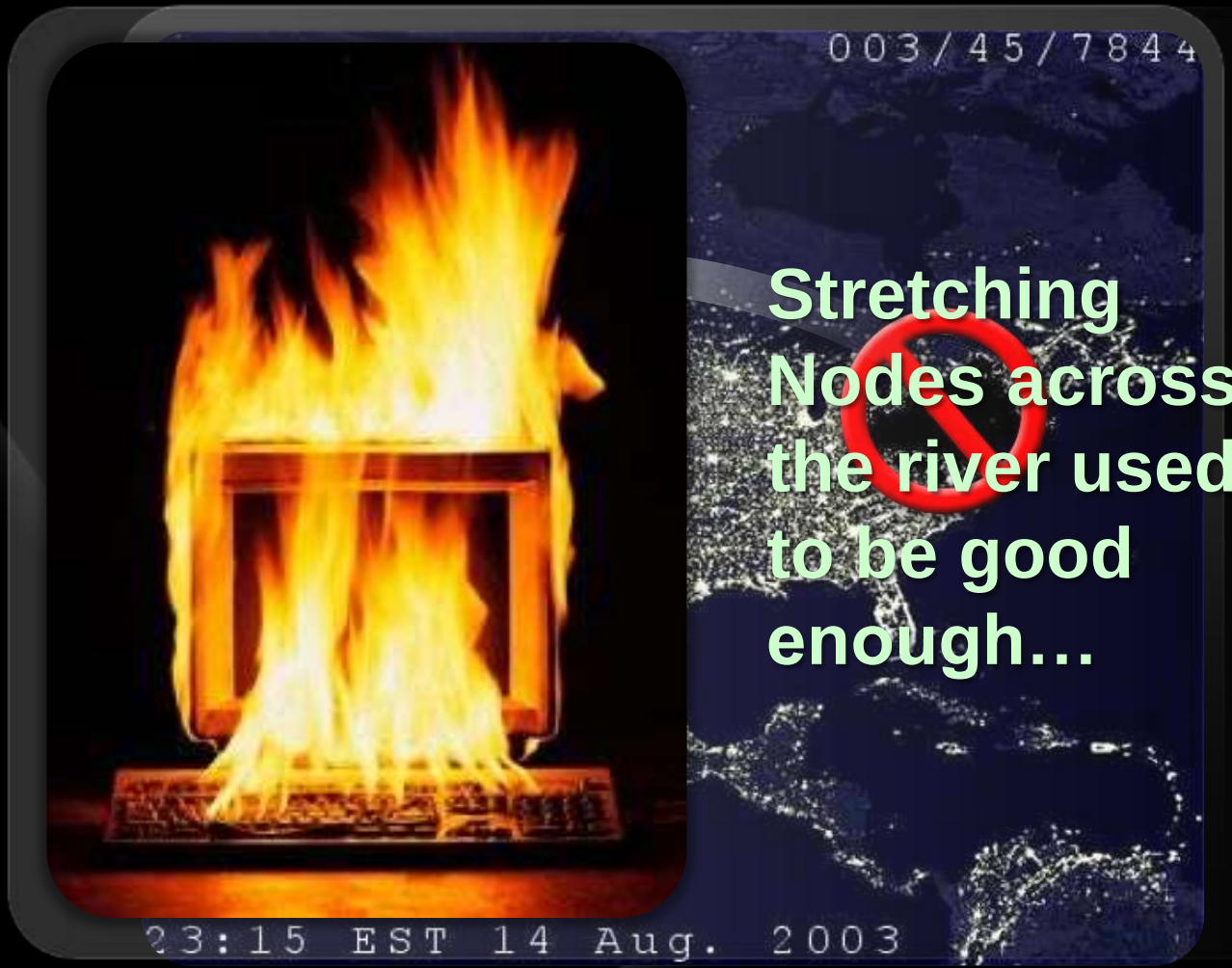


# Placement And Cluster Reserve



# Stretch Clusters

# Geographically Diverse Clusters




**But businesses are now demanding more!**

# Stretch Clusters (Long Distance)

## No More Single-Subnet Limitation

- Allow cluster nodes to communicate across network routers
- No more having to connect nodes with VLANs!

## Configurable Heartbeat Timeouts

- Increase to Extend Geographically Dispersed Clusters over greater distances
- Decrease to detect failures faster and take recovery actions for quicker failover

## Storage Vendor Based Solution

- Mirrored storage between stretched locations
- Hardware or Software based replication

# Guest Clustering

# Guest Clustering

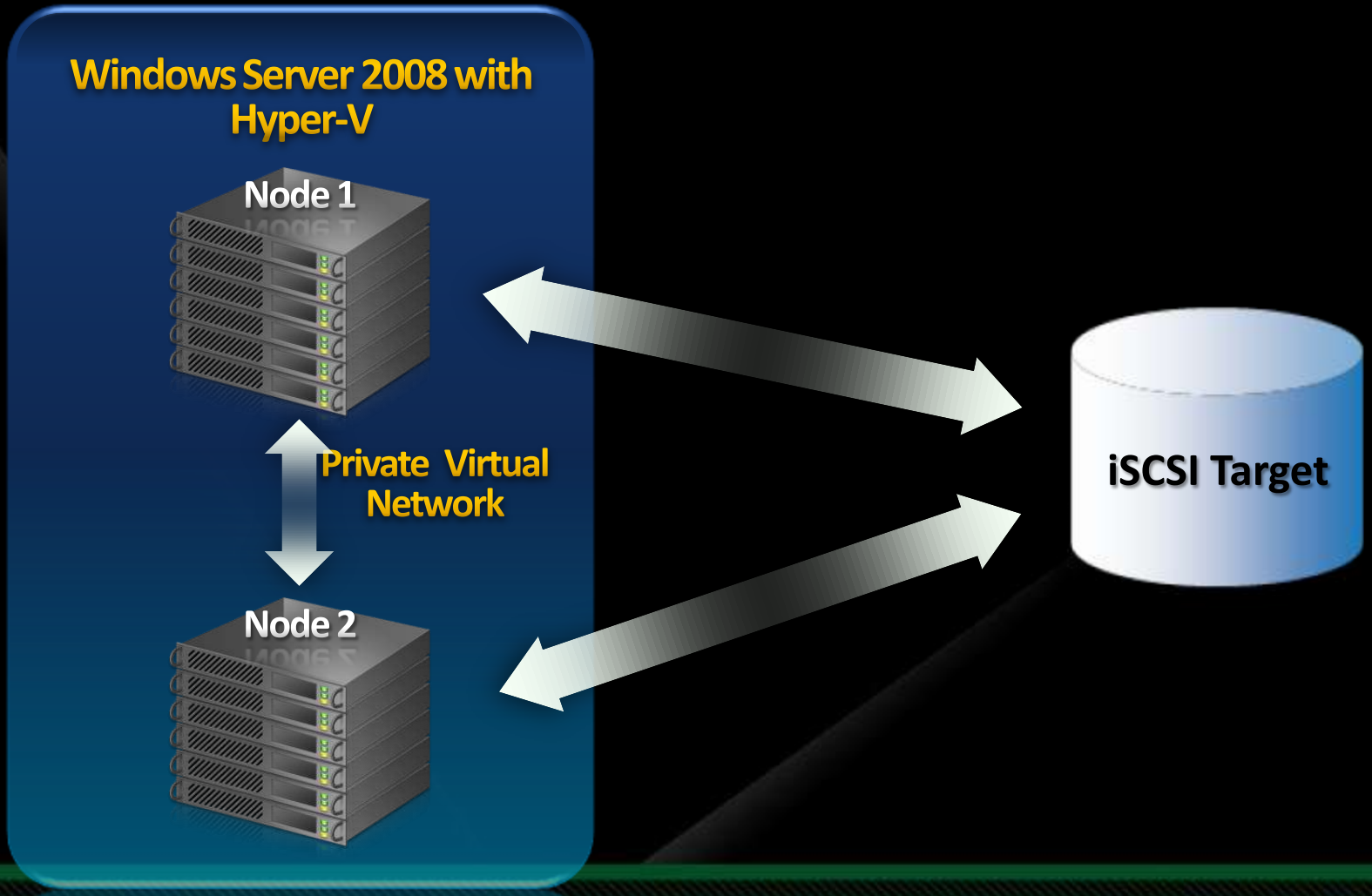
**Is the workload being run in the virtual machine cluster aware?**

- File, Print, DNS, DHCP, SQL, etc

**Virtual machines are clustered using SCSI**

**Guest clusters can co-exist with quick migration host clusters!**

# Guest Clustering



# Guest Clustering – Best Practices

## Multiple NICs in system

- Private virtual network for cluster communication
- Virtual network dedicated for ISCSI traffic

## Workload running in VM must be cluster aware

# Hyper-V and NLB

# Why Network Load Balancing?

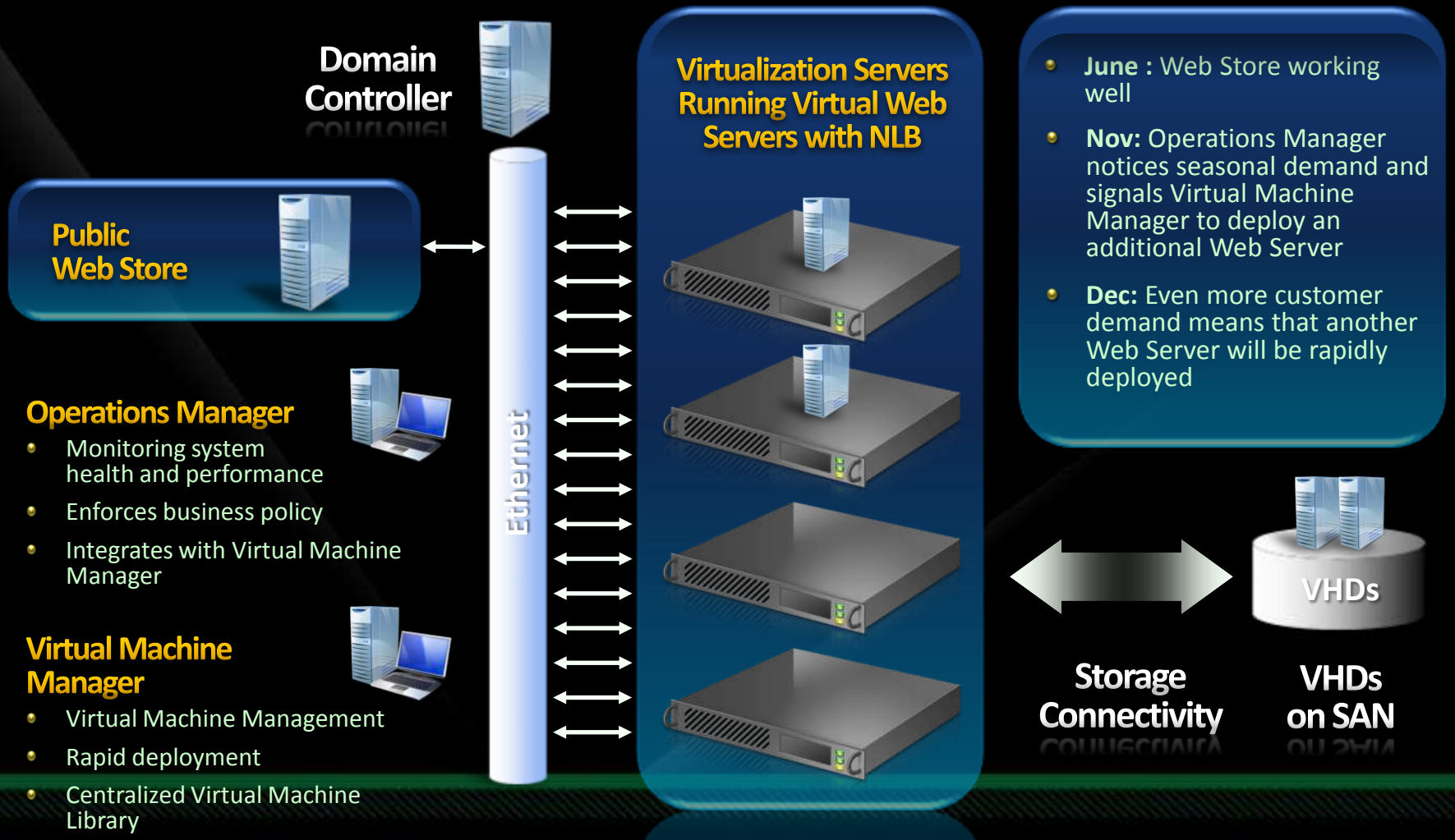
## Scalability

- Network Load Balancing can load balance requests for individual TCP/IP request across the cluster
- Can load balance multiple server requests, from the same client or from several clients across multiple hosts in the cluster

## High Availability

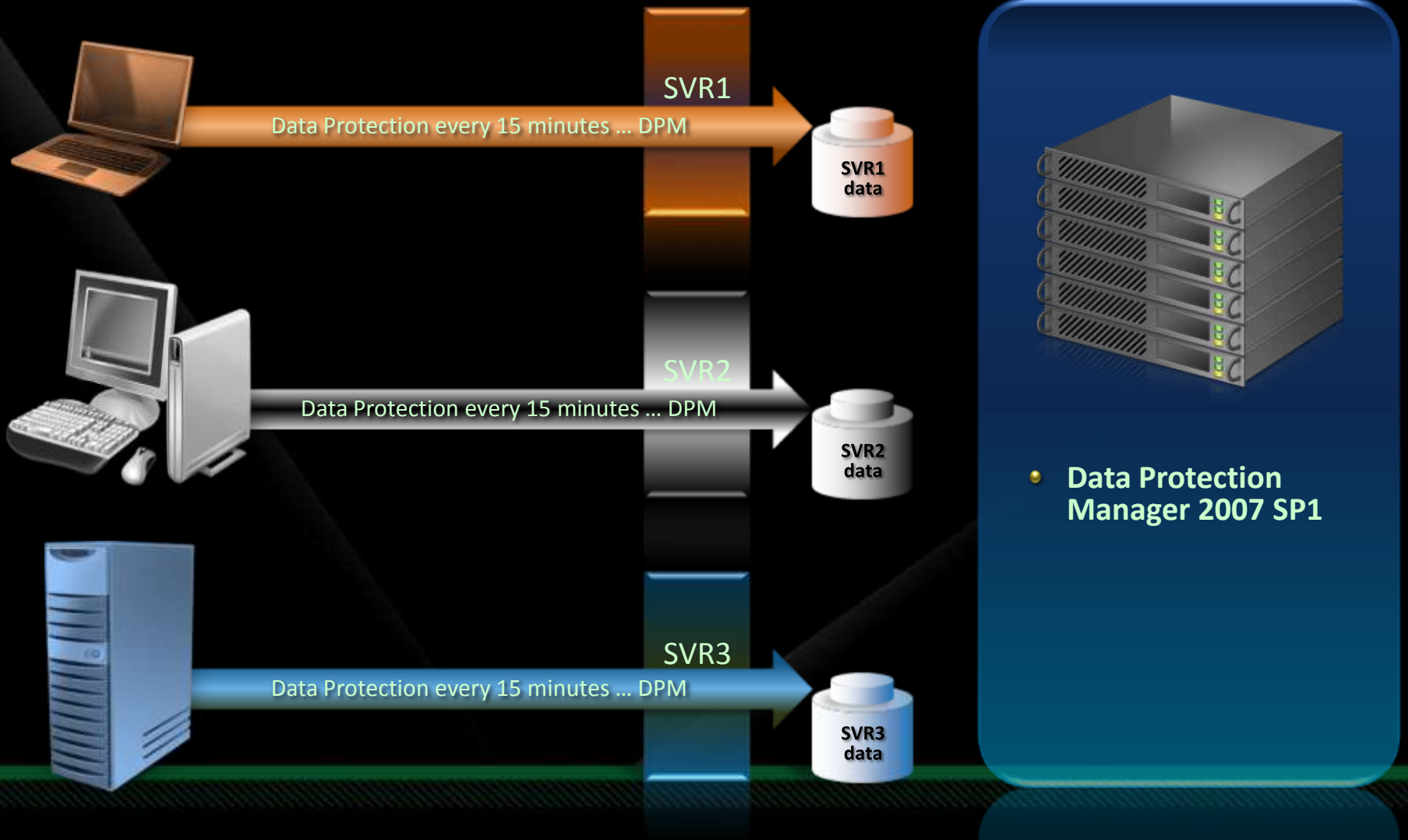
- Can automatically detect and recover from a failed or offline computer
- Can automatically rebalance the network load when servers are added or removed

# Hyper-V and Network Load Balancing

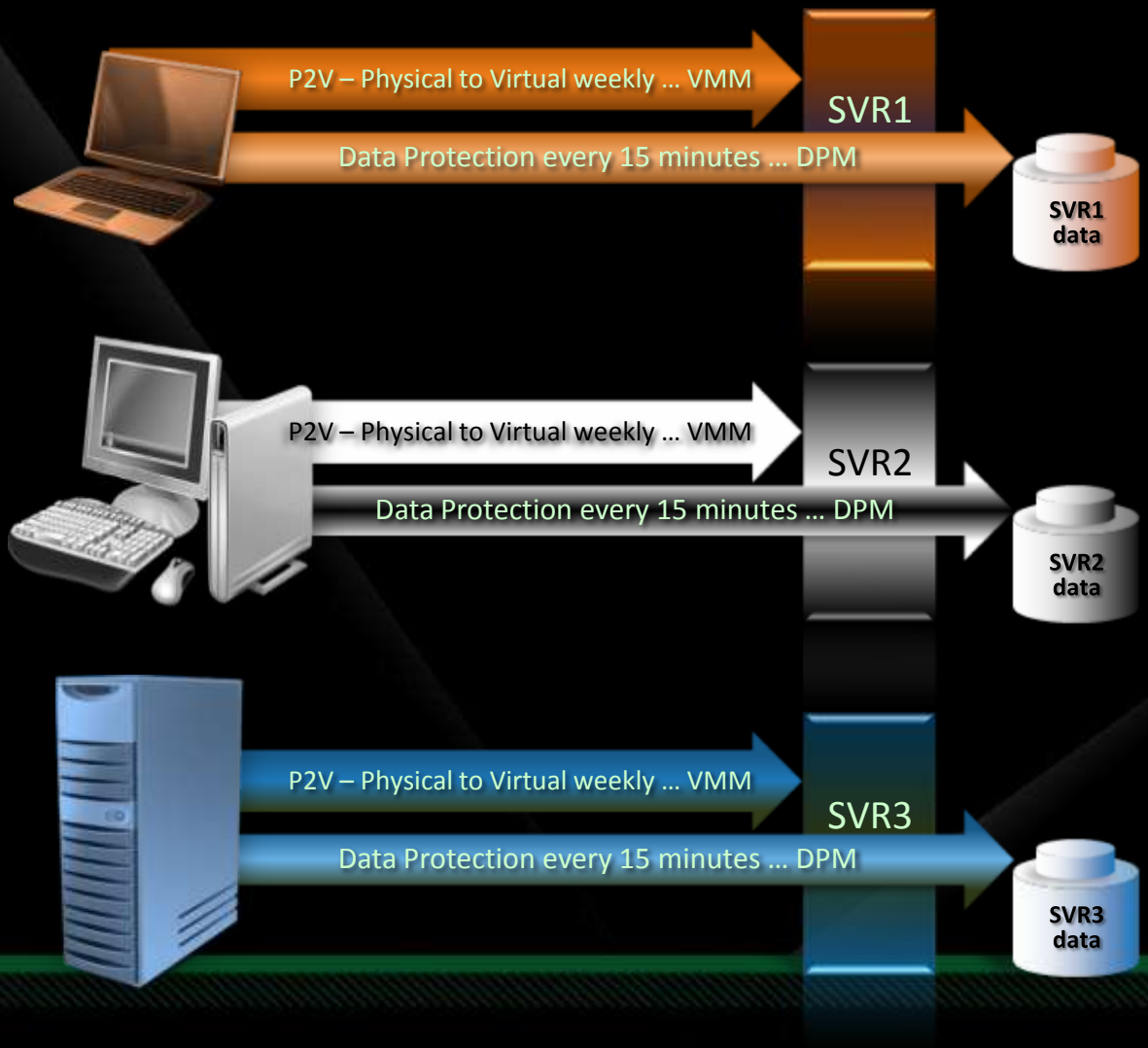


# Virtualization and Disaster Recovery

# Disaster Recovery Staging

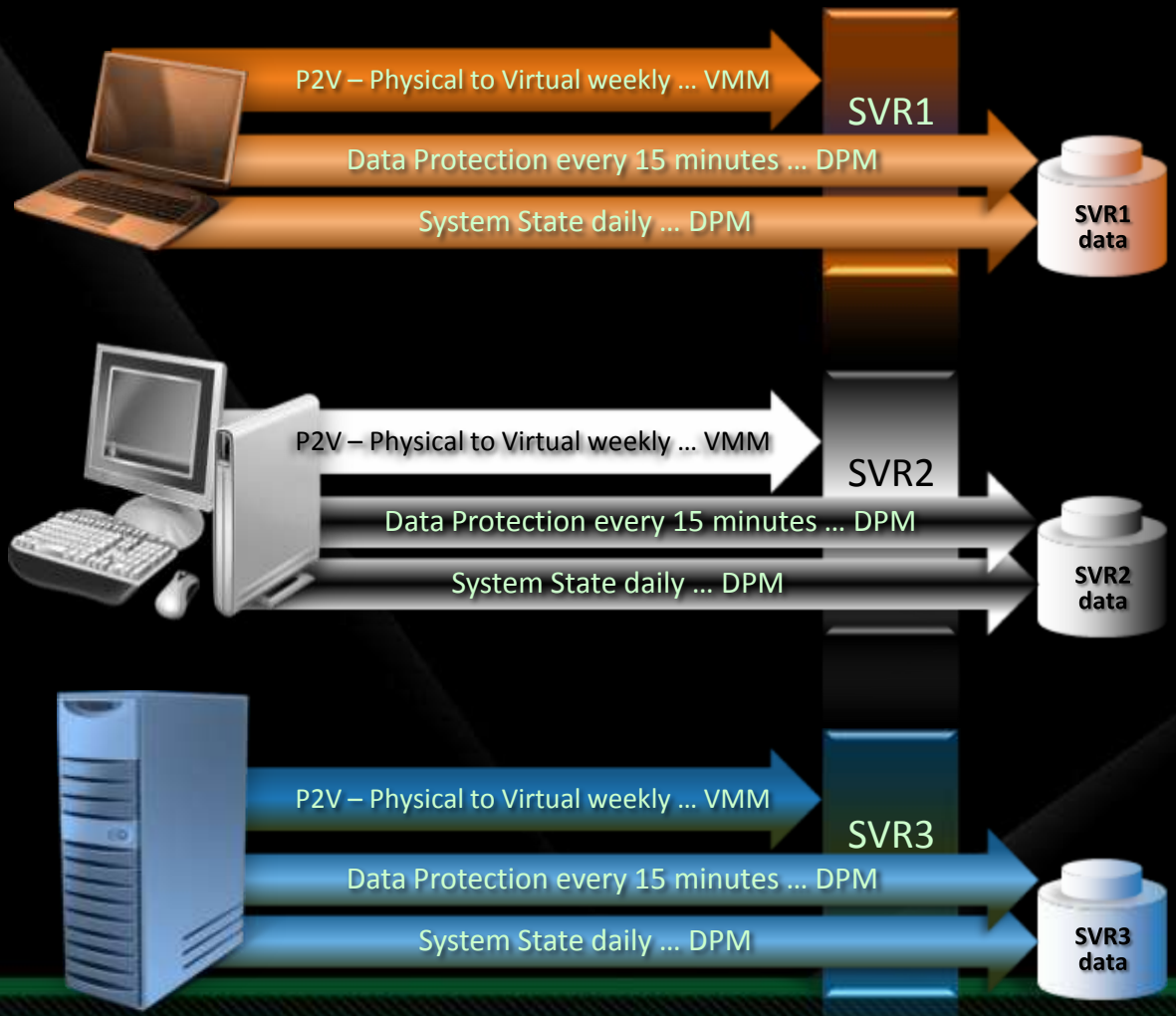


# Disaster Recovery Staging




- Data Protection Manager 2007 SP1
- Virtual Machine Manager 2008

# Disaster Recovery Staging

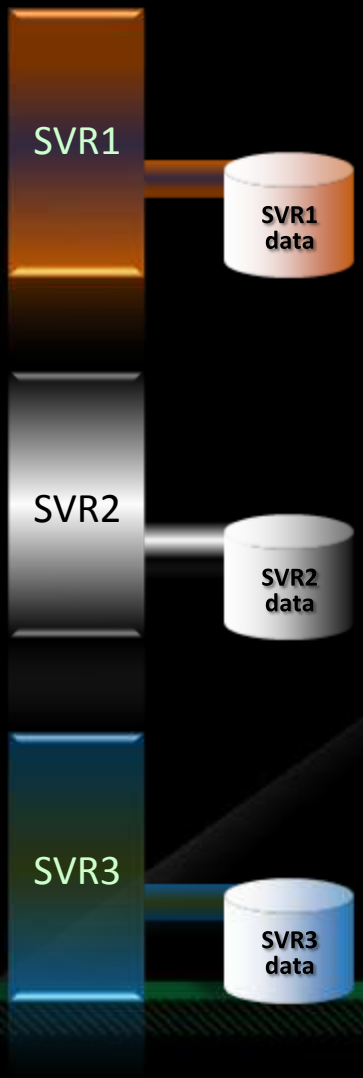



- Data Protection Manager 2007 SP1
- Virtual Machine Manager 2008

# Disaster Recovery Staging

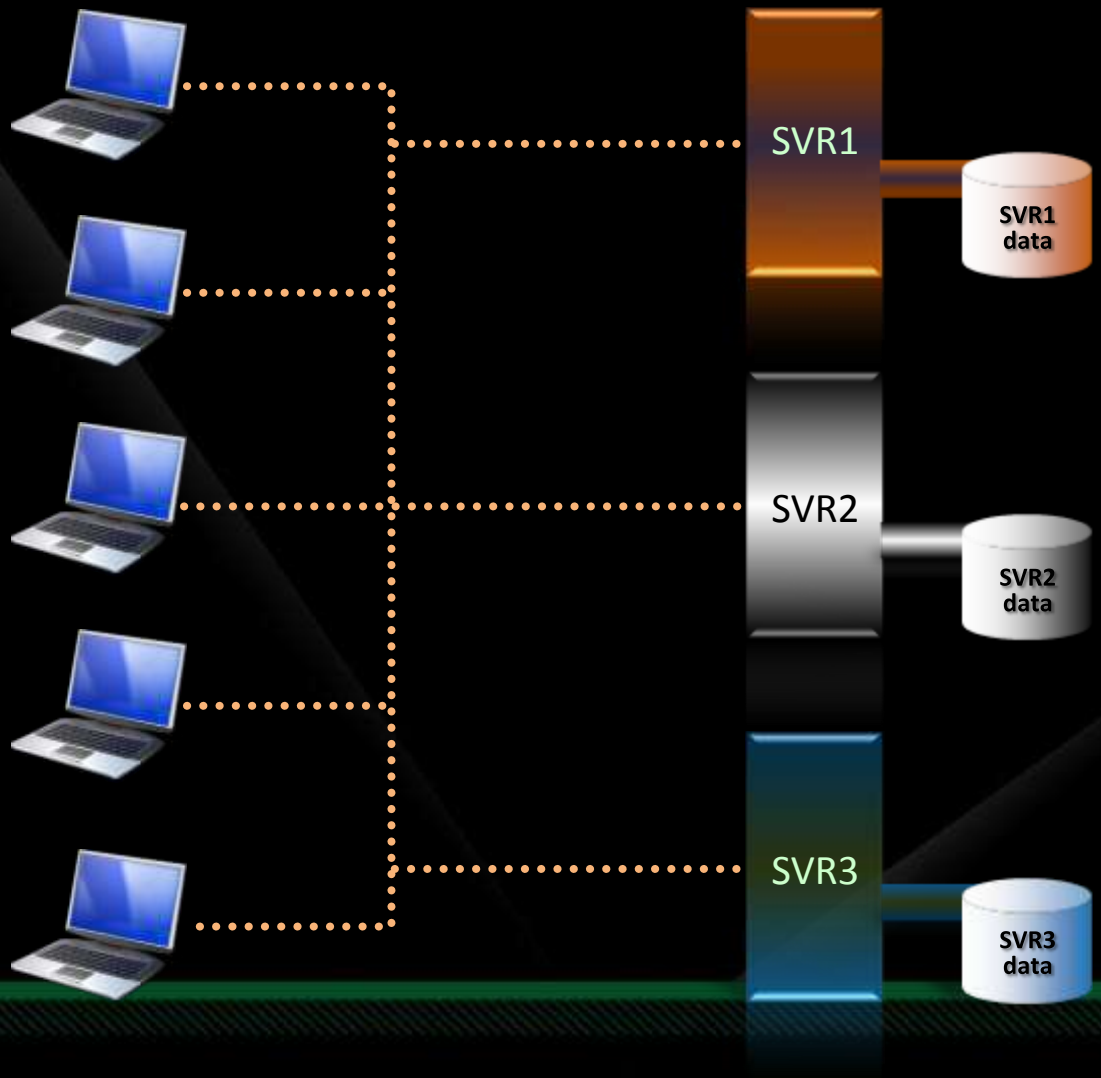

- Data Protection Manager 2007 SP1
- Virtual Machine Manager 2008
- Windows Server 2008 Hyper V

# Disaster Recovery Staging




- Data Protection Manager 2007 SP1
- Virtual Machine Manager 2008
- Windows Server 2008 Hyper V

# Disaster Recovery Staging

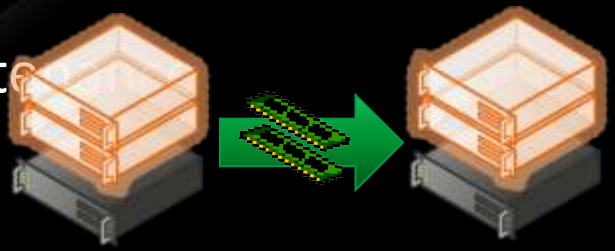



- Data Protection Manager 2007 SP1
- Virtual Machine Manager 2008
- Windows Server 2008 Hyper V

# Live Migration in Hyper-V R2

# Live Migration

- Overview
  - Moving a virtual machine from one server to another without loss of service
- Benefits
  - Enables new scenarios
  - Load balancing VMs for power
  - Load balancing VMs for CPU
  - Upgrade of host hardware and maint

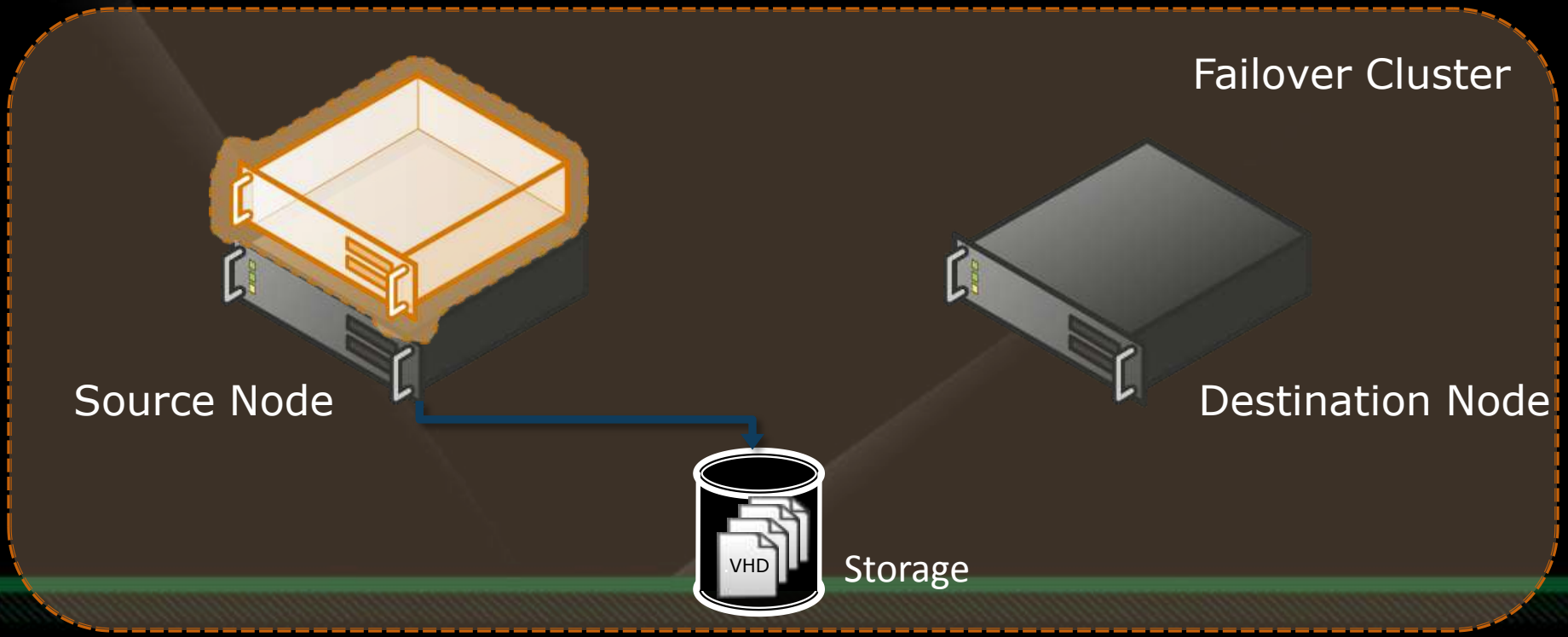


# Live Migration

- Live Migration via Cluster Manager
  - In box UI
- Live Migration via Virtual Machine Manager
  - Orchestrate migrations via policy
- Moving from Quick to Live Migration:
  - Guest OS limitations?: No
  - Changes to VMs needed?: No
  - Changes to Storage infrastructure: No
  - Changes to Network Infrastructure: No
  - Update to WS 2008 R2 Hyper-V: Yes

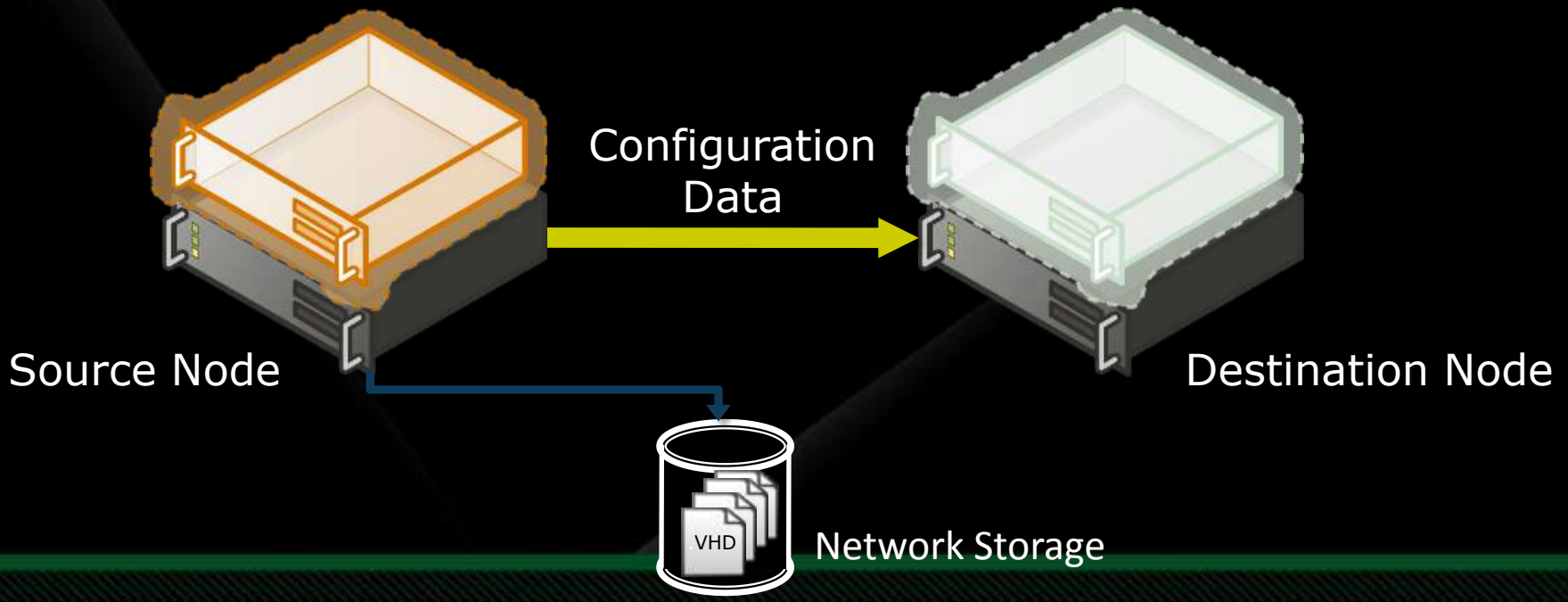
# How does Live Migration work?

- Prerequisites:
  - Source and Destination computers running WS08 R2
  - Source and destination nodes must be part of a Failover Cluster
  - Files used by the VM must be located on shared storage



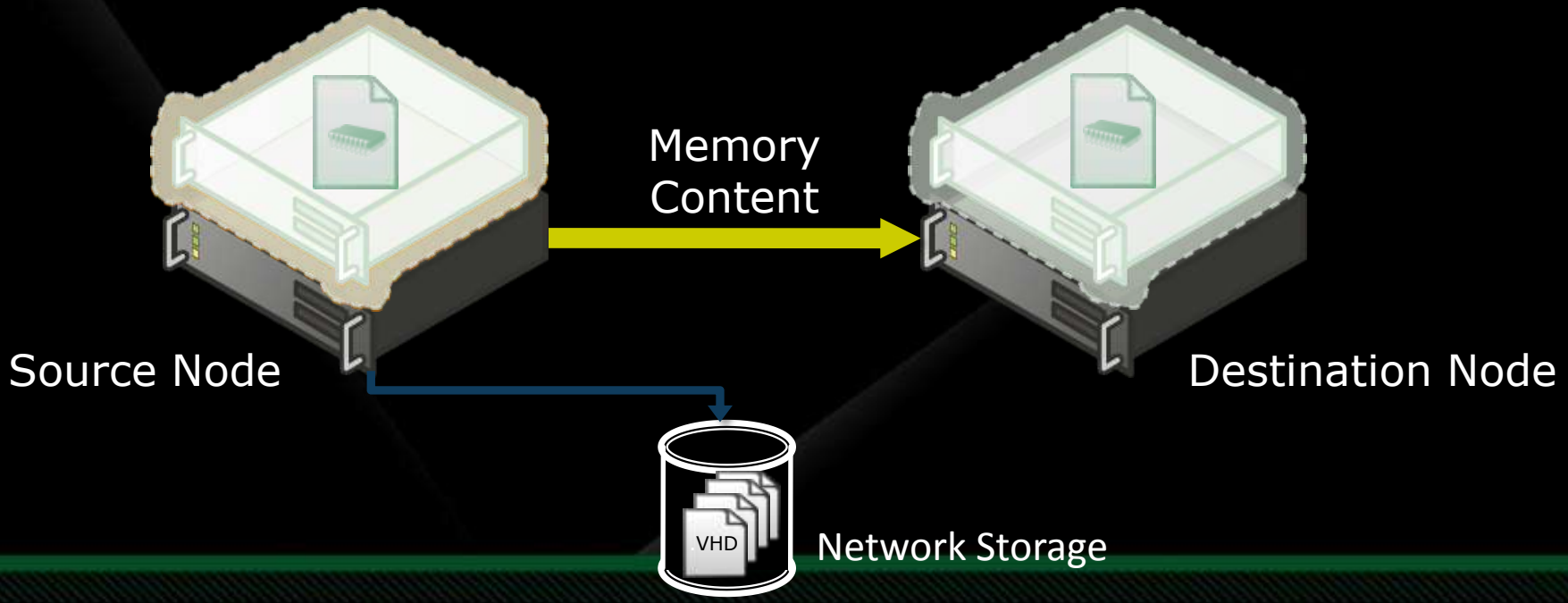
# How does Live Migration work?

- Phase 1: Setup
  - Create TCP connection between source and destination nodes
  - Transfer VM configuration data to destination node
  - Setup a skeleton for the VM on the destination node



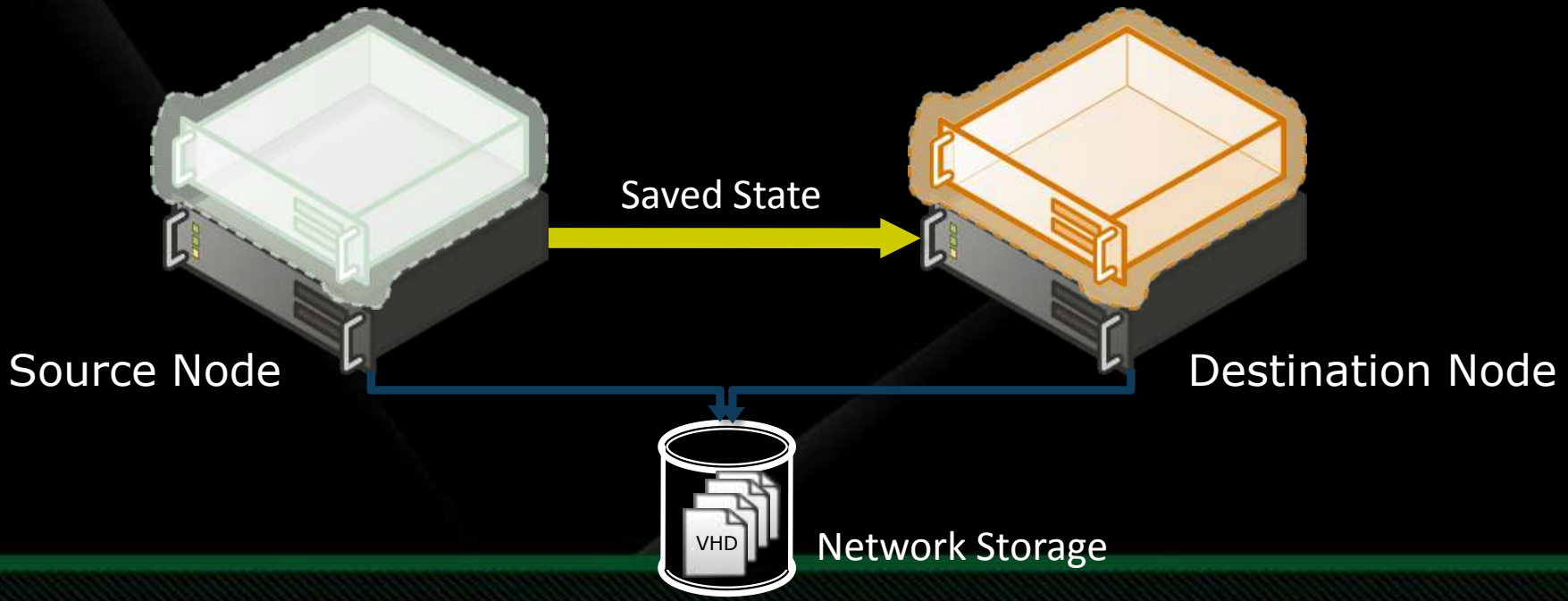
# How does Live Migration work?

- Phase 2: Memory transfer
  - Transfer the content of the VM's memory to the destination node
  - Track pages modified by the VM, retransfer these pages
  - Pause the VM before the final transfer pass



# How does Live Migration work

- Phase 3: State transfer and VM restore
  - Save register and device state of VM on source node
  - Transfer saved state and storage ownership to destination node
  - Restore VM from saved state on destination node
  - Cleanup VM on source node



# Quick Migration vs. Live Migration

## Quick Migration

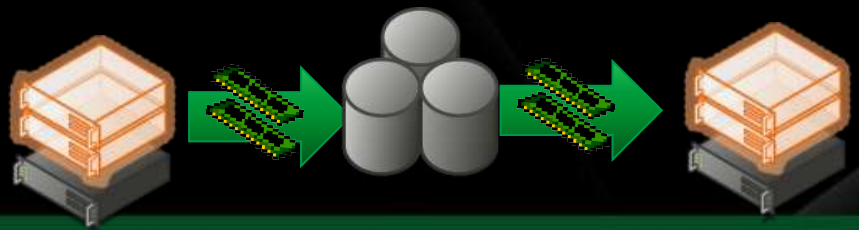
(Windows Server 2008 Hyper-V)

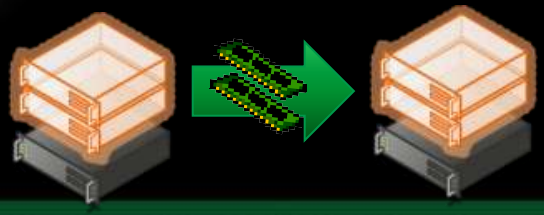
1. Save state
   a) Create VM on the target
   b) Write VM memory to shared storage
2. Move virtual machine
   a) Move storage connectivity from source host to target host via Ethernet
3. Restore state & Run
   a) Take VM memory from shared storage and restore on Target
   b) Run

## Live Migration

(Windows Server 2008 R2  Server Hyper-V)

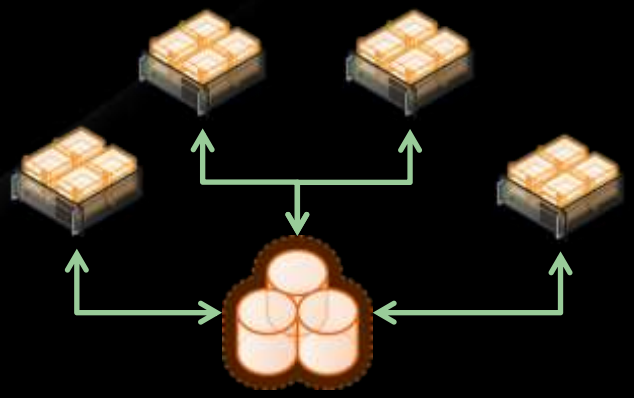
1. VM State/Memory Transfer
   a) Create VM on the target
   b) Move memory pages from the source to the target via Ethernet
2. Final state transfer and virtual machine restore
   a) Pause virtual machine
   b) Move storage connectivity from source host to target host via Ethernet
3. Un-pause & Run



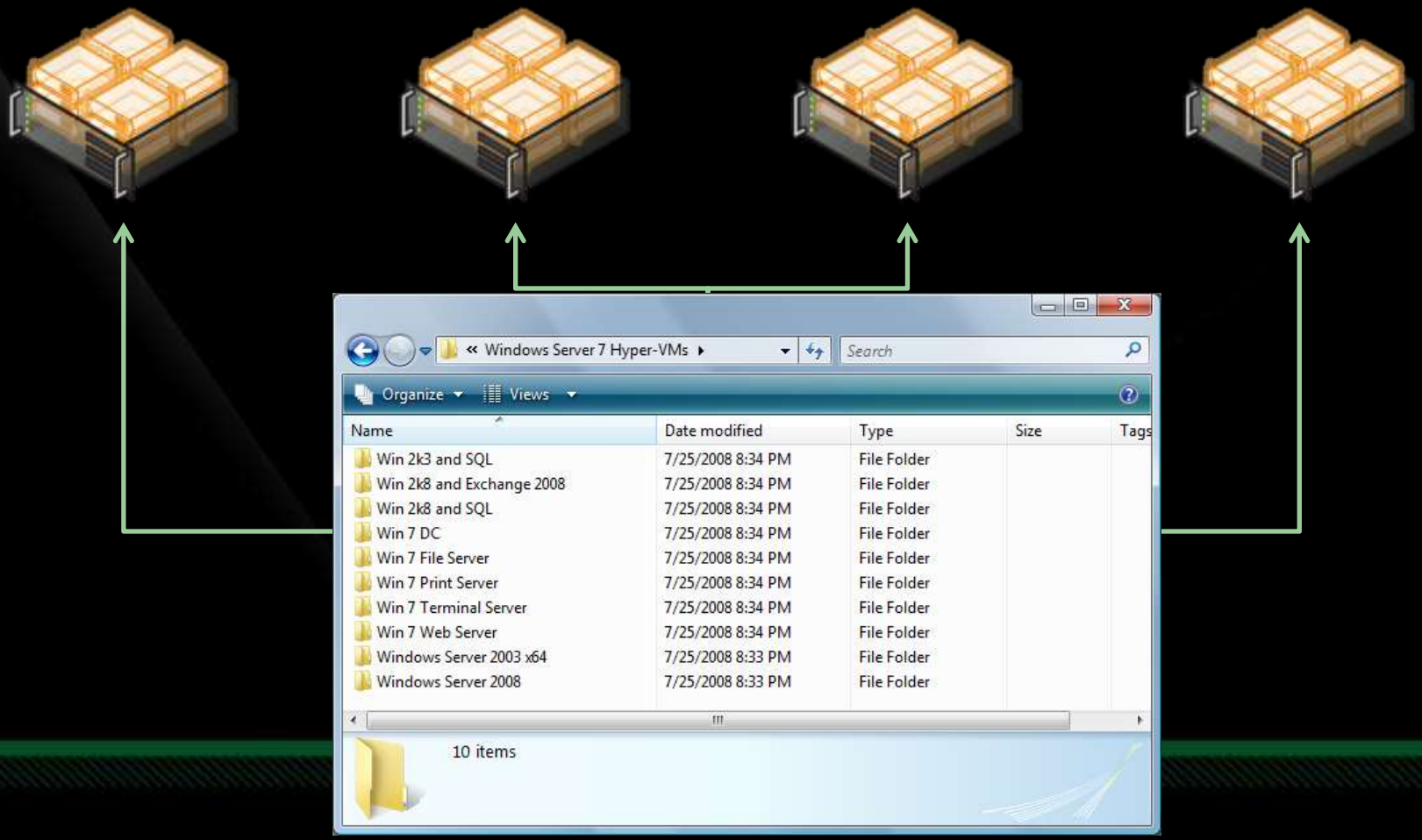
# Cluster Share Volumes: Migration & Storage

- NEW Cluster Shared Volumes (CSV) in Windows Server 2008 R2
- Overview
  - CSV provides a single consistent file name space; All Windows Server 2008 R2  Server servers see the same storage
- Benefits
  - Easy setup; Uses NTFS
  - No reformatting SANs
  - Create one big data store
  - No more drive letter problems
  - Existing tools just work
  - Highly recommended for live migration scenarios



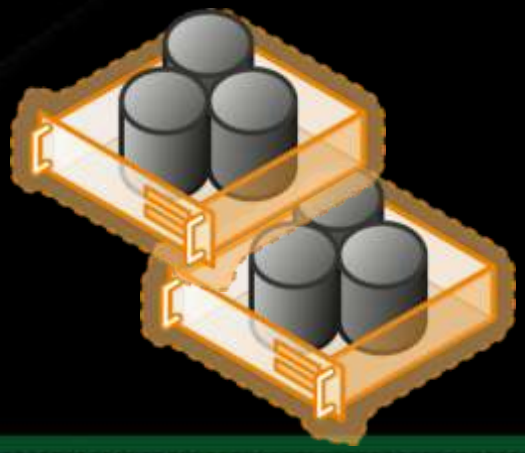
# Cluster Shared Volumes

- All servers “see” the same storage



# Hot Add/Remove Storage

- Overview
  - Add and remove VHD and pass-through disks to a running VM without requiring a reboot.
    - Hot-add/remove disk applies to VHDs and pass-through disks attached to the virtual SCSI controller
- Benefits
  - Enables storage growth in VMs without downtime
  - Enables additional datacenter backup scenarios
  - Enables new SQL/Exchange scenarios



# DEMO

## Live Migration of Virtual Machines


# question & answer

msdn Microsoft® Developer Network

Microsoft TechNet

# Resources

Virtualization Home Page: www.microsoft.com/virtualization

Virtualization Solution Accelerators: www.microsoft.com/vsa

MAP tool : http://microsoft.com/map

Hyper-V Green Tool : http://hyper-green.com

આભાર

ধন্যবাদ

நன்றி

धन्यवाद

Thank You!

ధన్యవాదాలు

ಧನ್ಯವಾದಗಳು

ধন্যবাদ

ਧੰਨਵਾਦ

നിങ്ങൾക്ക് നന്ദി

Microsoft®

*Your potential. Our passion.™*