



Wonderware

ArchestrA System Platform in a Virtualized Environment Implementation Guide



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Welcome

This guide describes the implementation of ArchestrA System Platform in a virtualized environment, using Microsoft Hyper-V technology, failover clustering, and other strategies to create High Availability, Disaster Recovery, and High Availability with Disaster Recovery capabilities.

You can view this document online or you can print it, in part or whole, by using the print feature in Adobe Acrobat Reader.

Documentation Conventions

Convention	Used for
Initial Capitals	Paths and file names.
Bold	Menus, commands, dialog box names, and dialog box options.
Monospace	Code samples and display text.

This documentation uses the following conventions:

Technical Support

Wonderware Technical Support offers a variety of support options to answer any questions on Wonderware products and their implementation.

Before you contact Technical Support, refer to the relevant section(s) in this documentation for a possible solution to the problem. If you need to contact technical support for help, have the following information ready:

- The type and version of the operating system you are using.
- Details of how to recreate the problem.
- The exact wording of the error messages you saw.
- Any relevant output listing from the Log Viewer or any other diagnostic applications.
- Details of what you did to try to solve the problem(s) and your results.
- If known, the Wonderware Technical Support case number assigned to your problem, if this is an ongoing problem.

Chapter 1

Getting Started with Virtualization

Virtualization technologies are becoming high priority for IT administrators and managers, software and systems engineers, plant managers, software developers, and system integrators.

Mission-critical operations in both small- and large-scale organizations demand availability—defined as the ability of the user community to access the system—along with dependable recovery from natural or man-made disasters. Virtualization technologies provide a platform for High Availability and Disaster Recovery solutions.

Using this Guide

The purpose of this guide is to help you to implement ArchestrA System Platform in a virtualized environment, including:

- Implementing some of the new features in Microsoft Windows Server 2008 R2
- Implementing High Availability, Disaster Recovery, or High Availability with Disaster Recovery using Windows Server 2008 R2 virtualization technologies such as Hyper-V
- Implementing High Availability and Disaster Recovery using VMware technology

This chapter introduces and defines virtualization concepts in general, as well as in a System Platform context. This chapter also defines a basic workflow and planning framework for your virtualization implementation.

Subsequent chapters describe in detail the features of Windows Server 2008 R2 and how to use them, configuring High Availability, Disaster Recovery, High Availability with Disaster Recover, creating virtual images, and implementing a virtualized backup strategy.

Subsequent chapters also provide test and performance metrics for a wide variety of system configurations, including Recovery Time Objective (RTO) and Recovery Point Objective (RPO).

Understanding Virtualization

Virtualization is the creation of an abstracted or simulated—virtual, rather than actual—version of something, such as an operating system, server, network resource, or storage device. Virtualization technology abstracts the hardware from the software, extending the life cycle of a software platform.

In virtualization, a single piece of hardware, such as a server, hosts and coordinates multiple guest operating systems. No guest operating system is aware that it is sharing resources and running on a layer of virtualization software rather than directly on the host hardware. Each guest operating system appears as a complete, hardware-based OS to the applications running on it.

Definitions

This implementation guide assumes that you and your organization have done the necessary research and analysis and have made the decision to implement ArchestrA System Platform in a virtualized environment that will replace the need for physical computers and instead run them in a virtualized environment. Such an environment can take advantage of advanced virtualization features including High Availability and Disaster Recovery. In that context, we'll define the terms as follows:

- Virtualization can be defined as **creating a virtual, rather than** real, version of ArchestrA System Platform or one of its components, including servers, nodes, databases, storage devices, and network resources.
- High Availability (HA) can be defined as a primarily automated ArchestrA System Platform design and associated services implementation which ensures that a pre-defined level of operational performance will be met during a specified, limited time frame.

 Disaster Recovery (DR) can be defined as the organizational, hardware and software preparations for ArchestrA System Platform recovery or continuation of critical System Platform infrastructure after a natural or human-induced disaster.

While these definitions are general and allow for a variety of HA and DR designs, this implementation guide focuses on viritualization, an indispensible element in creating the redundancy necessary for HA and DR solutions.

The virtualized environment described in this guide is based on Microsoft Hyper-V technology incorporated in the Windows Server 2008 R2 operating system, and on VMware technology.

Types of Virtualization

There are eight types of virtualization:

A software execution environment separated from underlying hardware resources. Includes hardware-assisted virtualization, full and partial virtualization and paravirtualization.
An application operates as though it has sole access to memory resources, which have been virtualized and aggregated into one memory pool. Includes virtual memory and memory virtualization.
Complete abstraction of logical storage from physical storage
Multiple virtualized environments hosted within a single operating system instance. Related is a virtual machine (VM) which is a software implementation of a computer, possibly hardware-assisted, which behaves like a real computer.
Uses virtualization technology in mobile phones and other types of wireless devices.
Presentation of data as an abstract layer, independent of underlying databases, structures, and storage. Related is database virtualization, which is the decoupling of the database layer within the application stack.

Desktop	Remote display, hosting, or management of a graphical computer environment—a desktop.
Network	Implementation of a virtualized network address space within or across network subnets.

Virtualization Using a Hypervisor

Virtualization technology implements a type of hardware virtualization using a hypervisor, permitting a number of guest operating systems (virtual machines) to run concurrently on a host computer. The hypervisor is so named because it exists above the usual supervisory portion of the operating system.

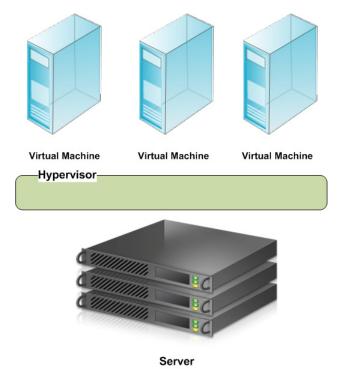
Hypervisor Classifications

There are two classifications of hypervisor:

- **Type 1**: Also known as a bare metal hypervisor, runs directly on the host hardware to control the hardware and to monitor the guest operating systems. Guest operating systems run as a second level above the hypervisor.
- **Type 2**: Also known as a hosted hypervisor, runs within a conventional operating system environment as a second software level. Guest operating systems run as a third level above the hypervisor.

Hypervisor Architecture

Hyper-V and VMware implement Type 1 hypervisor virtualization, in which the hypervisor primarily is responsible for managing the physical CPU and memory resources among the virtual machines. This basic architecture is illustrated in the following diagram.



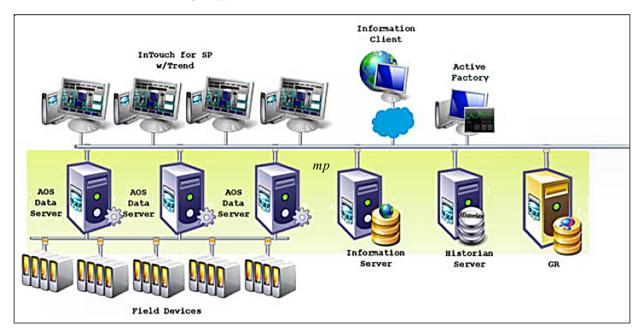
Virtualizing ArchestrA System Platform

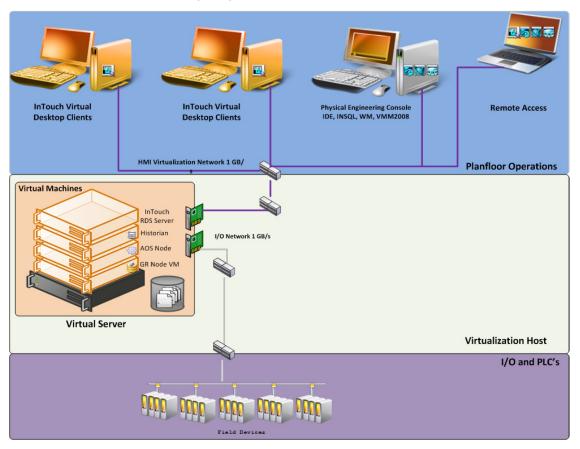
Abstraction Versus Isolation

With the release of InTouch 10.0, supporting the VMWare ESX platform, Wonderware became one of the first companies to support virtual machine operation of industrial software. VMware ESX is referred to as a "bare metal" virtualization system. The virtualization is run in an **abstraction layer**, rather than in a standard operating system.

Microsoft takes a different approach to virtualization. Microsoft Hyper-V is a hypervisor-based virtualization system. The hypervisor is essentially an **isolation layer** between the hardware and partitions which contain guest systems. This requires at least one parent partition, which runs Windows Server 2008. **Note:** An abstraction layer is a layer with drivers that make it possible for the virtual machine (VM) to communicate with hardware (VMware). In this scenario the drivers need to be present for proper communication with the hardware. With an isolation layer, the VM uses the operating system, its functionality, and its installed drivers. This scenario does not require special drivers. As a comparison, the abstraction layer in VMware is 32MB and in Hyper-V it is 256kb.

The following diagram shows a common ArchestrA System Platform topology, non-virtualized:





The following diagram shows the same environment virtualized:

Levels of Availability

When planning a virtualization implementation—for High Availability, Disaster Recovery, Fault Tolerance, and Redundancy—it is helpful to consider levels or degrees of redundancy and availability, described in the following table.

Level	Description	Comments
Level 0 Redundancy	No redundancy built into the architecture for safeguarding critical architectural components	Expected failover: None
Level 1 Cold Stand-by Redundancy	Redundancy at the Application Object level Safeguards single points of failure at the DAServer level or AOS redundancy.	Expected failover: 10 to 60 seconds Availability 99%: Annual uptime impact is approximtely four days down per year
Level 2 High Availability (HA)	 With provision to synchronize in real-time Uses virtualization techniques Can be 1-n levels of hot standby Can be geographically diverse (DR) Uses standard OS and nonproprietary hardware 	Expected failover: Uncontrolled 30 seconds to 2 minutes, DR 2 - 7 minutes Availability 99.9%: Annual uptime impact is approximately 8 hrs down per year

Level	Description	Comments
Level 3	Redundancy at the	Expected failover:
Hot Redundancy:	application level typically provided by Invensys controllers. For	Next cycle or single digit seconds
	example, hot backup of Invensys software such as Alarm System.	Availability 99.99%: Annual uptime impact is approximately 52 minutes down per year.
Level 4	Provides lock-step	Expected failover:
failover Fault Tolerance (FT)	failover	Next cycle or without loss of data.
		Availability 99.999%: Annual uptime impact is considered as "continuous availability" with downtime less than 5 minutes per year.
		A 99.999% availability is considered the "gold standard".
		For ArchestrA System Platform, this would be a Marathon-type solution, which also can be a virtualized system.

A typical system without virtualization, using a High Availability implementation, might attain Level 1 availability with a good server. With a good infrastructure, you can achieve Level 3 availability by using virtualized High Availability.

A typical system could also reach Level 4 availability by using virtualization with more than two possible hosts, RAID options on storage, dual power supplies, teamed NICs, and also implementing application monitoring so that when the application crashes it restarts on another host.

Performance of failover is dependent on quality and implementation of the HA architecture, and might vary depending on the architecture.

About RTO and RPO

The Recovery Time Objective (RTO) is the duration of time within which a business process must be restored to its service level after a disaster or other disruption in order to avoid a break in business continuity.

A Recovery Point Objective (RPO), is defined by business continuity planning. It is the maximum tolerable period in which data might be lost from an IT Service due to a major incident.

For ArchestrA System Platform in a normal, non-virtualized, implementation, depending on the system size, RTO could be hours or days on a complete loss of the system. The RPO would be 45 seconds or more for Wonderware Application Server redundancy, or more—in terms of hours— for non-redundant components such as Terminal Servers for InTouch HMI or Wonderware Information Server.

For System Platform in a virtualized High Availability implemention that uses double-host configuration, the measured recovery time is as follows:

- RTO is less than 2 minutes for the complete system. Controlled RTO is seconds, with un-controlled RTO less than 2 minutes.
- RPO is within 2 minutes.

High Availability

About HA

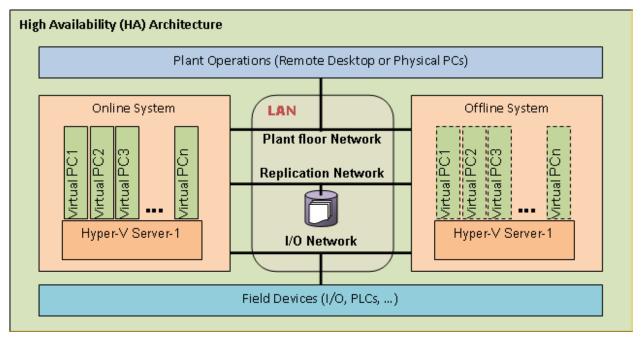
High Availability refers to the availability of resources in a computer system following the failure or shutdown of one or more components of that system.

At one end of the spectrum, traditional HA has been achieved through custom-designed and redundant hardware. This solution produces High Availability, but has proven to be very expensive.

At the other end of the spectrum are software solutions designed to function with off-the-shelf hardware. This type of solution typically results in significant cost reduction, and has proven to survive single points of failure in the system.

High Availability Scenarios

The basic HA architecture implementation described in this guide consists of an online system including a Hyper-V or VMware Server and a number of virtual PCs, linked by a LAN to an offline duplicate system. The LAN accommodates a number of networks including a plant floor network linked to plant operations, an I/O network linked to field devices, and a replication network linked to storage.



The following example shows Hyper-V implementation.

IT maintains a virtual server.	• A system engineer fails over all virtual nodes hosting ArchestrA System Platform software to back up the virtualization server over the LAN.
	• For a distributed system, the system engineer fails over all virtual nodes to back up the virtualization server over a WAN.
	• IT performs the required maintenance, requiring a restart of the primary virtualization server.
Virtualization server hardware fails.	• The primary virtualization server hardware fails with a backup virtualization server on the same LAN.
	• For a distributed system, the virtualization server hardware fails with a backup virtualization server over WAN.
	Note: This scenario is a hardware failure, not software. A program that crashes or hangs is a failure of software within a given OS.
A network fails on a virtual server.	• Any of the primary virtualization server network components fail with a backup virtualization server on the same LAN, triggering a backup of virtual nodes to the backup virtualization server.
	• Any of the primary virtualization server network components fail with a backup virtualization server connected via WAN, triggering a backup of virtual nodes to the backup virtualization server over WAN.

This basic architecture permits a number of common scenarios.

For these scenarios, the following expectations apply:

- For the maintenance scenario, all virtual images are up and running from the last state of execution prior to failover.
- For the hardware and network failure scenarios, the virtual images restart following failover.
- For LAN operations, you should see operational disruptions for approximately 2-15 seconds (LAN operations assumes recommended speeds and bandwidth. For more information refer to "Networks" on page 44).
- For WAN operations, you should see operational disruptions for approximately 2 minutes (WAN operations assumes recommended speeds and bandwidth. For more information refer to "Networks" on page 44).

Note: The disruption spans described here are general and approximate. For specific metrics under a variety of scenarios, see the relevant Recovery Time Objective (RTO) and Recovery Point Objective (RPO) sections in chapters 2, 3, and 4.

Disaster Recovery

About DR

Disaster Recovery planning typically involves policies, processes, and planning at the enterprise level, which is well outside the scope of this implementation guide.

DR, at its most basic, is all about data protection. The most common strategies for data protection include the following:

- Backups made to tape and sent off-site at regular intervals, typically daily.
- For the hardware and network failure scenarios, the virtual images restart following failover
- For the hardware and network failure scenarios, the virtual images restart following failover
- Backups made to disk on-site, automatically copied to an off-site disk, or made directly to an off-site disk.

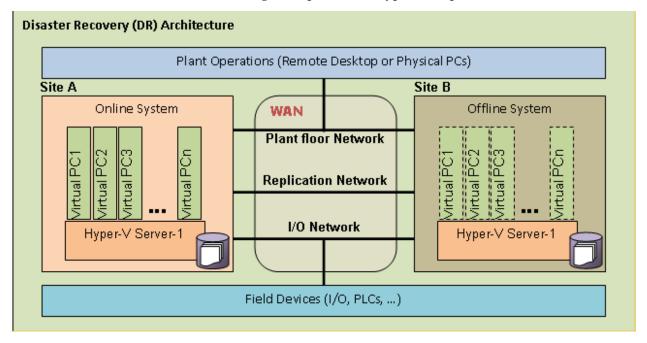
- Replication of data to an off-site location, making use of storage area network (SAN) technology. This strategy eliminates the need to restore the data. Only the systems need to be restored or synced.
- High availability systems which replicate both data and system off-site. This strategy enables continuous access to systems and data.

The ArchestrA System Platform virtualized environment implements the fourth strategy—building DR on an HA implementation.

Disaster Recovery Scenarios

The basic DR architecture implementation described in this guide builds on the HA architecture by moving storage to each Hyper-V or VMware server, and moving the offline system to an off-site location.

The following example shows Hyper-V implementation.



The DR scenarios duplicate those described in "High Availability Scenarios" on page 22, with the variation that all failovers and backups occur over WAN.

High Availability with Disaster Recovery

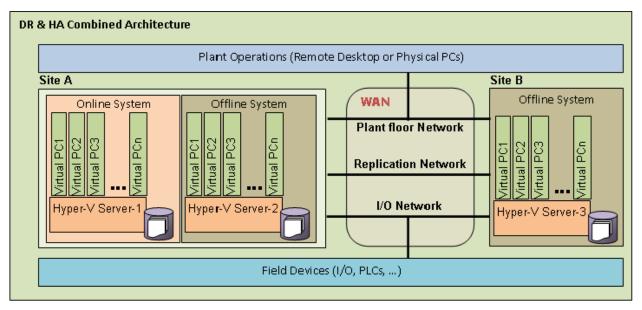
About HADR

The goal of a High Availability and Disaster Recovery (HADR) solution is to provide a means to shift data processing and retrieval to a standby system in the event of a primary system failure.

Typically, HA and DR are considered as individual architectures. HA and DR combined treat these concepts as a continuum. If your system is geographically distributed, for example, HA combined with DR can make it both highly available and quickly able to recover from a disaster.

HADR Scenarios

The basic HADR architecture implementation described in this guide builds on both the HA and DR architectures adding an offline system plus storage at "Site A". This creates a complete basic HA implementation at "Site A" plus a DR implementation at "Site B" when combined with distributed storage.



The scenarios and basic performance metrics described in "High Availability Scenarios" on page 22 also apply to HADR.

Planning the Virtualized System

Planning an ArchestrA System Platform virtualization implementation is a three-step process—based upon an understanding of the available technology:

- **1** Assess your existing System Platform installation
- 2 Assess virtualization requirements
- **3** Extend your assessment to define HA, DR, or HADR

For more information about configuring HA, DR, and HADR, see the following chapters:

Chapter 2, "Implementing High Availability Using Hyper-V."

Chapter 3, "Implementing High Availability Using vSphere."

Chapter 4, "Implementing Disaster Recovery Using Hyper-V."

Chapter 5, "Implementing Disaster Recovery Using vSphere."

Chapter 6, "Implementing High Availability and Disaster Recovery Using Virtualization."

Planning Information for a Hyper-V Implementation

About Hyper-V

The release of Service Pack 1 (SP1) for Windows Server 2008 R2 provides new virtualization technology in Hyper-V. Following is a summary of key Hyper-V features:

Dynamic Memory	In Windows Server 2008 R2 with SP1, Dynamic Memory enables better utilization of Hyper-V host memory resources by balancing how memory is distributed between running virtual machines. Memory can be dynamically reallocated between different virtual machines in response to the changing workloads of these machines.
Live Migration	Windows Server 2008 R2 with Hyper-V includes the live migration feature. Data-centers with multiple Hyper-V physical hosts can move running virtual machines to the best physical computer for performance, scaling, or optimal consolidation without affecting users.

Hardware Support for Hyper-V Virtual Machines	Windows Server 2008 R2 supports up to 64 logical processors in the host processor pool, allowing greater VM density per host, and more flexibility in assigning CPU resources to VMs, and enabling migration across a broader range of server host hardware.
Cluster Shared Volumes	Hyper-V uses Cluster Shared Volumes (CSV) storage to simplify and enhance shared storage usage. CSV enables multiple Windows Servers to access SAN storage using a single consistent namespace for all volumes on all hosts.
Cluster Node Connectivity Fault Tolerance	CSV architecture improves cluster node connectivity fault tolerance that directly affects VMs running on the cluster. The CSV architecture implements a mechanism, known as dynamic I/O redirection, where I/O can be rerouted within the failover cluster based on connection availability.
Enhanced Cluster Validation Tool	Windows Server 2008 R2 includes a Best Practices Analyzer (BPA) for all major server roles, including Failover Clustering. This analyzer examines the best practices configuration settings for a cluster and cluster nodes.
Management of Virtual Datacenters	The number of VMs tends to proliferate much faster than physical computers because machines typically do not require a hardware acquisition. This makes efficient management of virtual data centers more imperative than ever.
Virtual Networking Performance	Hyper-V leverages several new networking technologies contained in Windows Server 2008 R2 to improve overall VM networking performance.
Performance & Power Consumption	Hyper-V in Windows Server 2008 R2 adds enhancements that reduce virtual machine power consumption.
Networking Support	In Windows Server 2008 R2 supports Jumbo Frames, previously available in non-virtual environments, has been extended to work with VMs. The Virtual Machine Queue (VMQ) feature allows physical computer network interface cards (NICs) to use direct memory access (DMA) to place the contents of packets directly into VM memory, increasing I/O performance.
Dynamic VM storage	Windows Server 2008 R2 Hyper-V supports hot plug-in and hot removal of storage. This allows the addition and removal of both VHD files and pass-through disks to existing SCSI controllers for VMs.

Broad OS Support	Broad support for simultaneously running different types of operating systems, including 32-bit and 64-bit systems across different server platforms, such as Windows, Linux, and others.
Network Load Balancing	Hyper-V includes new virtual switch capabilities. This means virtual machines can be easily configured to run with Windows Network Load Balancing (NLB) Service to balance load across virtual machines on different servers.
Hardware Sharing Architecture	With the new virtual service provider/virtual service client (VSP/VSC) architecture, Hyper-V provides improved access and utilization of core resources, such as disk, networking, and video.
Virtual Machine Snapshot	Hyper-V provides the ability to take snapshots of a running virtual machine so you can easily revert to a previous state, and improve the overall backup and recoverability solution.
Extensibility	Standards-based Windows Management Instrumentation (WMI) interfaces and APIs in Hyper-V enable independent software vendors and developers to quickly build custom tools, utilities, and enhancements for the virtualization platform.

VM and Hyper-V Limits in Windows Server 2008 R2

The following tables show maximum values for VMs and for a server running Hyper-V in Windows Server 2008 R2 Standard and Enterprise editions, respectively. By understanding the limits of the hardware, software, and virtual machines, you can better plan your ArchestrA System Platform virtualized environment.

Virtual Machine Maximums - Windows Server 2008 R2 Standard Edition

Component	Maximum	Notes
Virtual processors	4	
Memory	64 GB	
Virtual IDE disks	4	The boot disk must be attached to one of the IDE devices. The boot disk can be either a virtual hard disk or a physical disk attached directly to a virtual machine.

Component	Maximum	Notes
Virtual SCSI controllers	4	Use of virtual SCSI devices requires integration services to be installed in the guest operating system.
Virtual SCSI disks	256	Each SCSI controller supports up to 64 SCSI disks.
Virtual hard disk capacity	2040 GB	Each virtual hard disk is stored as a .vhd file on physical media.
Size of physical disks attached to a VM	Varies	Maximum size is determined by the guest operating system.
Checkpoints (Snapshots)	50	The actual number depends on the available storage and may be lower.
		Each snapshot is stored as an .avhd file that consumes physical storage.
Virtual network adapters	12	8 can be the "network adapter" type. This type provides better performance and requires a virtual machine driver that is included in the integration services packages.
		4 can be the "legacy network adapter" type. This type emulates a specific physical network adapter and supports the Pre-execution Boot Environment (PXE) to perform network-based installation of an operating system.
Virtual floppy drives	1	
Serial (COM) ports	2	

Hyper-V Server Maximums - Windows 2008 R2 Enterprise Edition

Component	Maximum	Notes
Logical processors	64	
Virtual processors per logical processor	8	
Virtual machines per server	384 (running)	
Virtual processors per server	512	
Memory	1 TB	
Storage	Varies	Limited by what the
	No limits imposed by Hyper-V.	management operating system supports.
Physical network adapters	No limits imposed by Hyper-V.	
Virtual networks	Varies	Limited by available
(switches)	No limits imposed by Hyper-V.	computing resources.
Virtual network	Varies	Limited by available
switch ports per server	No limits imposed by Hyper-V.	computing resources.

Planning Information for a VMware Implementation

About vCenter Server and vSphere

VMware vCenter Server is a simple and efficient way to manage multiple VMware vSpheres. It provides unified management of all the hosts and VMs in your datacenter from a single console monitoring the performance of clusters, hosts, and VMs.One administrator can manage 100 or more workloads.

VMware vCenter Servers allow you to provide VMs and hosts using standardized templates. Use of templates helps to ensure compliance with vSphere host configurations and host and VM patch levels with automated remediation. With proactive management, VMware vCenter Server allows you to dynamically provide new services, allocate resources, and automate high availability.

VMware vCenter Server enables management of a large scale enterprise, more than 1,000 hosts and up to 10,000 VMs, from a single console.

Extensibility

VMware vCenter Server's open plug-in architecture supports a broad range of additional capabilities that can directly integrate with vCenter Server, allowing you to easily extend the platform for more advanced management capability in areas such as:

- Capacity management
- Compliance management
- Business continuity
- Storage monitoring
- Integratation of physical and virtual management tools

VMware vSphere 5.0 Editions

VMware vSphere 5 is available in three editions: Standard, Enterprise, and Enterprise Plus. One instance of VMware vCenter Server, sold separately, is required for all VMware vSphere deployments. The following table provides information about each edition's features and capabilities:

	Standard	Enterprise	Enterprise Plus
Overview	Server consolidation and no planned downtime	Powerful & efficient resource management	Policy-based datacenter automation
Product Components			
Processor Entitlement			
License is required per physical processor.	Per 1 CPU	Per 1 CPU	Per 1 CPU
vRAM Entitlement			
Amount of vRAM that each license adds to the available pool. vRAM is the amount of virtual memory configured to a virtual machine.	32GB	64GB	96GB
vCPU Entitlement			
The number of virtual CPUs that may be allocated to each VM when using virtual symmetric multiprocessing (vSMP)	8-way	8-way	32-way
SUSE Linux Enterprise Server for VMware			
Qualified purchases of VMware vSphere entitle free use of enterprise Linux (SUSE Linux Enterprise Server for VMware) as guest OS.	Yes	Yes	Yes
Centralized Management Compatibility			
vCenter Server (sold separately) - Provides management for vSphere deployments and is available in two editions:			
• vCenter Standard: Provides large scale management of VMware vSphere deployments for rapid provisioning, monitoring, orchestration, and control of virtual machines (up to 1000 vSphere hosts).	vCenter Server Foundation	vCenter Server Foundation	vCenter Server Foundation
• vCenter Foundation: Provides powerful management tools for smaller environments (up to 3 vSphere hosts) looking to rapidly provision, monitor, and control virtual machines.	vCenter Server Standard	vCenter Server Standard	vCenter Server Standard

	Standard	Enterprise	Enterprise Plus
Product Features			
Thin Provisioning	Yes	Yes	Yes
Reduce storage needs by utilizing dynamic storage that expands to meet the requirements of the virtual machine with no performance degradation.			
Update Manager	Yes	Yes	Yes
Reduce time spent on routine remediation by automating the tracking, patching, and updating of your vSphere hosts, as well as the VM's applications and operating systems.			
Data Recovery	Yes	Yes	Yes
Protect data through fast agent-less backups to disk, with de-duplication to minimize use of backup disk space.			
High Availability	Yes	Yes	Yes
Minimize downtime with automated restart of VMs following physical machine failure.			
vMotion	Yes	Yes	Yes
Eliminate application downtime from planned server maintenance by migrating running VMs between hosts.			
Storage APIs for Data Protection	Yes	Yes	Yes
Achieve scalable backup without disrupting applications or users by leveraging supported 3 rd party backup software that leverage these APIs.			
Virtual Serial Port Concentrator		Yes	Yes
Connect over the network via the serial port concentrator to the serial port console on any server.			
Hot Add		Yes	Yes
Increase capacity by adding CPU, memory, or devices to virtual machines when needed without disruption or downtime.			
vShield Zones		Yes	Yes
Simplify security management by configuring and maintaining your multiple zones of security within software among shared hosts rather than across separate siloed physical environments.			
Fault Tolerance		Yes	Yes
Provide continuous availability for applications with zero data loss in the event of server failures.			

	Standard	Enterprise	Enterprise Plus
Storage APIs for Array Integration		Yes	Yes
Improve performance and scalability by leveraging efficient array-based operations.			
Storage APIs for Multipathing		Yes	Yes
Improve performance and reliability of IO from vSphere to storage by leveraging third party storage vendor multi-path software capabilities.			
Storage vMotion		Yes	Yes
Avoid application downtime for planned storage maintenance by migrating live VM disk files across storage arrays.			
Distributed Resources Scheduler (DRS), Distributed Power Management (DPM)		Yes	Yes
Align resources usage with business priority by automatically load balancing across hosts and optimize power consumption by turning off hosts during lower load periods.			
Storage I/O Control			Yes
Prioritizes storage access by continuously monitoring I/O load of a storage volume and dynamically allocating available I/O resources to virtual machines according to business needs.			
Network I/O Control			Yes
Prioritizes network access by continuously monitoring I/O load over the network and dynamically allocating available I/O resources to specific flows according to business needs.			
Distributed Switch			Yes
Centralize provisioning, administration, and monitoring using cluster-level network aggregation.			
Host Profiles			Yes
Simplify host deployment and compliance by creating VMs from configuration templates.			
Auto Deploy			Yes
Deploy more vSphere hosts in minutes and "on the fly".			

	Standard	Enterprise	Enterprise Plus
Storage DRS			Yes
Automated load balancing now looks at storage characteristics to determine the best place for a given virtual machine's data to live when it is created and then used over time.			
Profile-Driven Storage			Yes
Reduce the steps in the selection of storage resources by grouping storage according to a user-defined policy.			

VM and Virtual Server Limits in VMware

The following tables show maximum values for VMs and for a server running VMware. By understanding the limits of the hardware, software, and virtual machines, you can better plan your ArchestrA System Platform virtualized environment.

VMware Virtual Machine Maximums

Component	Maximum	Notes
Virtual CPUs	32	
Memory	1 TB	
IDE controllers	1	Supports two channels (primary and secondary) each with a master and slave device.
SCSI adapters	4	Any combination of supported SCSI virtual storage controllers. Four Paravirtual SCSI adapters may be used only if the virtual machine boots from a device attached to an IDE controller, or from the network.
Virtual SCSI targets per virtual SCSI adapter	15	Any combination of disk, CD-ROM, or VMDirectPath SCSI target
Virtual hard disk capacity	2TB minus 512 bytes	

Component	Maximum	Notes
Size of physical disks attached to a VM	Varies	Maximum size is determined by the guest operating system.
Checkpoints (Snapshots)	32	The actual number depends on the available storage and may be lower.
		Each snapshot is stored as a file that consumes physical storage.
Virtual network adapters	10	Any combination of supported virtual NICs.
Virual floppy controllers	1	
Virtual floppy devices	2	BIOS is configured for 1 floppy device.
USB controllers	1	Supports USB 1.x and USB 2.x devices
USB devices connected to a virtual machine	20	
Parallel ports	3	
Serial (COM) ports	4	

Component	Maximum	Notes
Logical CPUs per host	160	
Virtual machines per host	512	
Virtual CPUs per host	2048	
Memory	2 TB	
Virtual disks per host	2048	
Physical network adapters	32	1Gb Ethernet ports (Intel PCI-x or Broadcom)
		Other ethernet ports have varying limits.
Maximum active ports per host	1016	
Virtual network switch ports per host	4096	vSphere Standard and Distributed Switch

VMware ESXi Host Maximums

VMware Requirements

VMware Installation Requirements

Following are the minimum requirements to install ESXi 5.0:

Component	Requirement
64-bit Processor	ESXi 5.0 installs and run only on servers with 64-bit x86 CPUs.
	ESXi 5.0 requires a host machine with at least two cores.
	ESXi 5.0 supports only LAHF and SAHF CPU instructions.
RAM	2GB RAM minimum

Component	Requirement
Network Adapters	One or more Gigabit or 10Gb Ethernet controllers.
SCSI Adapter, Fibre Channel Adapter or Internal RAID	Any combination of one or more of the following controllers:
Controller	 Basic SCSI controllers. Adaptec Ultra-160 or Ultra-320, LSI Logic Fusion-MPT, or most NCR/Symbios SCSI.
	 RAID controllers. Dell PERC (Adaptec RAID or LSI MegaRAID), HP Smart Array RAID, or IBM (Adaptec) ServeRAID controllers.
Installation and Storage	SCSI disk or a local, non-network, RAID LUN with unpartitioned space for the virtual machines.
	For Serial ATA (SATA), a disk connected through supported SAS controllers or supported on-board SATA controllers. SATA disks will be considered remote, not local. These disks will not be used as a scratch partition by default because they are seen as remote.

Component	Requirement		
Installing and Booting from Storage	ESXi 5.0 supports installing on and booting from the listed storage systems:		
	SATA disk drives: SATA disk drives connected behind supported SAS controllers or supported on-board		
	SATA controllers: Supported SAS controllers include:		
	• LSI1068E (LSISAS3442E)		
	• LSI1068 (SAS 5)		
	• IBM ServeRAID 8K SAS controller		
	• Smart Array P400/256 controller		
	• Dell PERC 5.0.1 controller		
	Supported on-board SATA include:		
	• Intel ICH9		
	 NVIDIA MCP55 		
	 ServerWorks HT1000 		
	Serial Attached SCSI (SAS) disk drives: Supported for installing ESXi 5.0 and for storing virtual machines on VMFS partitions.		
	Dedicated SAN disk on Fibre Channel or iSCSI		
	USB devices. Supported for installing ESXi 5.0.		

VMware Disaster Recovery Requirements

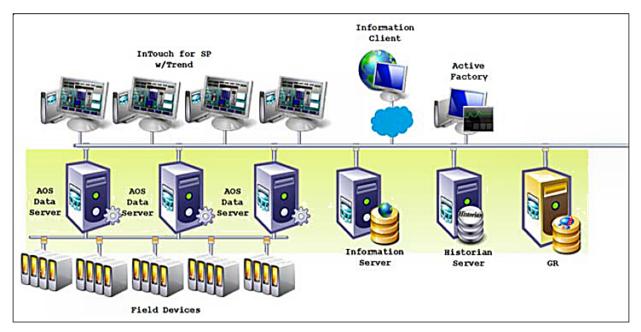
VMware Disaster Recovery (DR) implementations require installation of vCenter Site Recovery Manager 5, Standard or Enterprise edition.

Scalability limits of the vCenter Recovery Manager editions are:

- Standard Edition: 75 virtual machines
- Enterprise Edition: Unlimited, subject to the product's technical scalability limits.

Assessing Your System Platform Installation

In most cases, a System Platform installation already exists. You will need to create an assessment of the current architecture. You can start with a basic topology diagram, similar to the following:



Once you have diagramed your topology, you can build a detailed inventory of the system hardware and software.

Microsoft Planning Tools

Microsoft tools to assist with virtualization assessment and planning:

• Microsoft Assessment and Planning Toolkit (MAP)

The MAP toolkit is useful for a variety of migration projects, including virtualization. The component package for this automated tool is available for download from Microsoft at the following address:

 $\label{eq:http://www.microsoft.com/downloads/en/details.aspx?FamilyID=67 240b76-3148-4e49-943d-4d9ea7f77730\&displaylang=en$

• Infrastructure Planning and Design Guides for Virtualization (IPD)

The IPD Guides from Microsoft provide a series of guides specifically geared to assist with virtualization planning. They are available for download from Microsoft at the following address:

http://technet.microsoft.com/en-us/solutionaccelerators/ee395429

VMware Planning Tools

VMware tools to assist with virtualization assessment and planning:

• VMware Capacity Planner

The VMware Capacity Planner is a business and IT tool for datacenter and desktop capacity planning.

http://www.vmware.com/files/pdf/VMware-Capacity-Planner-DS-E N.pdf

• VMware SAN System Design and Deployment Guide

This guide describes how to design and deploy virtual infrastructures using VMware technology.

http://www.vmware.com/pdf/vi3_san_design_deploy.pdf

• VMware Infrastructure 3 Planning

This guide is specific to planning virtualization using Hewlett-Packard computer equipment. It offers considerable insight into planning, architecture, and deployment.

http://www.vmware.com/files/pdf/partners/hp/vmware_infrastruct ure_3_planning.pdf

Sizing Recommendations for Virtualization

This section provides sizing guidelines and recommended minimums for ArchestrA System Platform installations.

For a virtualization-only implementation, you can use these minimums and guidelines to size the virtualization server or servers that will host your System Platform configuration.

Cores and Memory

Spare Resources

The host server should always have spare resources of 25% above what the guest machines require.

For example, if a configuration with five nodes requires 20GB of RAM and 10 CPUs, the host system should have 25GB of RAM and 13 CPUs. If this is not feasible, choose the alternative closest to the 25% figure, but round up so the host server has 32GB of RAM and 16 cores.

Hyper-Threading

Hyper-Threading Technology can be used to extend the amount of cores, but it does impact performance. An 8-core CPU will perform better than a 4-core CPU that is Hyper-Threading.

Storage

It is always important to plan for proper Storage. A best practice is to dedicate a local drive or virtual drive on a Logical Unit Number (LUN) to each of the VMs being hosted. We recommend SATA or higher interfaces.

Recommended Storage Topology

To gain maximum performance, the host OS also should have a dedicated storage drive. A basic storage topology would include:

- Host storage
- VM storage for each VM
- A general disk

This disk should be large enough to hold snapshots, backups, and other content. It should not be used by the host or by a VM.

Recommended Storage Speed

Boot times and VM performance are impacted both by storage bandwidth and storage speed. Faster is always better. Drives rated at 7200 rpm perform better than those rated at 5400 rpm. Solid-state drives (SSDs) perform better than 7200-rpm drives.

Keep in mind that multiple VMs attempting to boot from one hard drive will be slow, and your performance will experience a significant degrade. Attempting to save on storage could well become more costly in the end.

Networks

Networking is as important as any other component for the overall performance of the system.

Recommended Networking for Virtualization

If virtualization is your only requirement, your network topology could include the following elements:

- Plant network
- Storage network
- Virtualization network.

A best practice is to establish, on every node, an internal-only Static Virtual Network. In the event that the host and the guest VMs become disconnected from the outside world, you will still be able to communicate through an RDP session independent of external network connectivity.

Recommended Networking for HA

If HA is your requirement, then we recommend using fast, dedicated drives for local use. In the case of a Storage Area Network (SAN), we recommend using iSCI 1GB/s as a minimum configuration.

A higher-performance configuration would be an FO connection to the storage at 10GB/s. For HA, we recommend a dedicated network for virtualization at 1GB/s. This will ensure fast transfers under different migration scenarios.

Recommended Minimums for System Platform

Following are approximate numbers of nodes to define small, medium, and large systems.

- Small: 1–3 nodes
- Medium: 4–8 nodes
- Large: More than 8 nodes

The following table provides recommended minimums for System Platform configurations.

	Cores	RAM	Storage
Small Systems	5		
GR Node	2	2	100
Historian	2	2	250
Application Server	2	2	100
RDS Servers	2	2	100
Information Servers	2	2	100
Historian Clients	2	2	100
Medium and I	arge Systems		
GR Node	4	4	250
Historian	4	4	500
Application Server	2-4	4	100
RDS Servers	4-8	4-8	100

	Cores	RAM	Storage
Information Server	4	4	100
Historian Clients	2	4	100

After installation of the server, you will start from scratch, or you can use the existing installation. A free tool on Microsoft TechNet called Disk2vhd supports extracting a physical machine to a VHD file. The Disk2vhd tool is available for download from Microsoft at the following address:

http://technet.microsoft.com/en-us/sysinternals/ee656415

Another tool you can use to migrate physical machines into to a virtual environment is VMM2008. This tool is available for purchase from Microsoft. For more information, see the following Microsoft address:

http://www.microsoft.com/systemcenter/en/us/virtual-machine-manag er.aspx

A VMware tool for disk conversion is the vCenter Converter Standalone for P2V Conversion, available from VMware as a free download at the following address:

https://www.vmware.com/tryvmware/?p=converter&rct=j&q=vmware %20converter&source=web&cd=6&sqi=2&ved=0CEoQFjAF&url=http: //www.vmware.com/go/getconverter&ei=4XIPT7ePB7CPigLR0OzSDQ &usg=AFQjCNH3Et0H1SZPzkw2VZxLVZoNZ_yY5g

Defining High Availability

To define a High Availability implementation, you need to plan for the following requirements:

• Server specification doubles

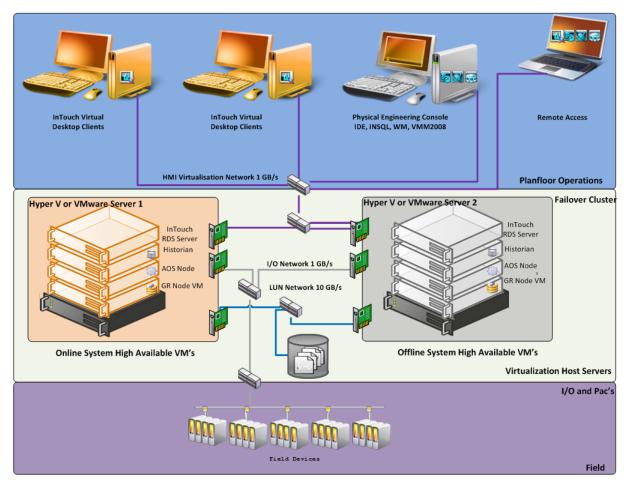
Double the baseline configuration is required for shadow nodes in the Failover Cluster.

• Minimum OS requirements increase

Hyper-V failover is supported only on Windows Server 2008 R2 Enterprise and higher operating system editions.

Also, Hyper-V live migration, remote applications, and other features are available only if the host machines are Windows Server 2008 R2 editions.

The following shows a System Platform HA implementation:



To implement HA, we strongly recommend the use of a SAN configured with the sizing guidelines and recommendations outlined in the preceding section.

Defining Disaster Recovery

To define a Disaster Recovery implementation, you need to plan for the following requirements:

• Adding a second server set with the same specifications as the first

The second server set moves to the off-site location and connects over LAN or (more likely) WAN.

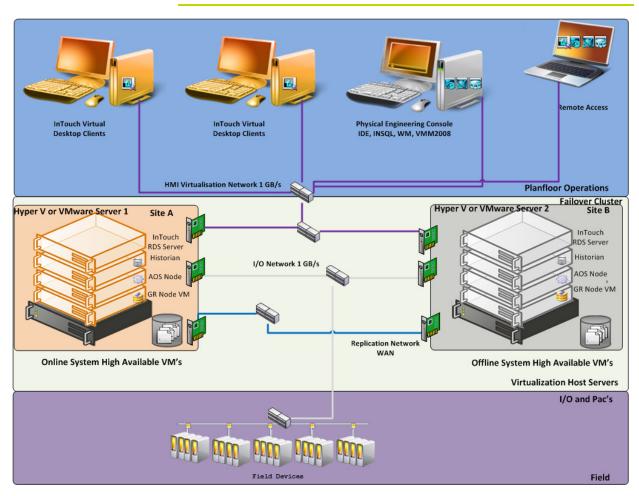
• Configuring minimum bandwidth

The minimum network bandwidth is 100MB/sec. Recovery times improve with higher network speeds.

• Installing and configuring third-party software with Hyper-V virtualization

Third party software from SIOS (SteelEye) mirrors the drives from site A to site B. The replication can be done on a SAN system or as shown in the illustration, with regular local hard drives.

Important: Mirrored partitions must have identical drive letters and sizes.



Defining High Availability and Disaster Recovery Combined

An important advantage from implementing HA and DR in the same scenario is that a local HA set can quickly resume functionality upon failure. In the event that site A is offline, the system can resume at site B without intervention from site A.

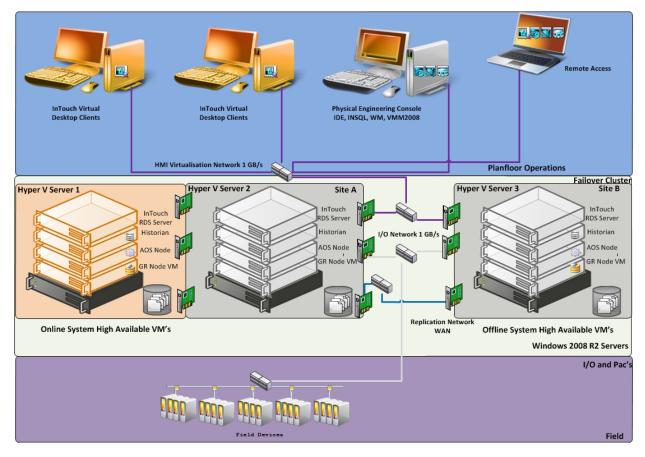
To define a HADR implementation, you need to plan for the following requirements:

Sizing

You'll need to triple the size of the estimated baseline server.

SANs

Two SANs are required—one local and one remote—to host the storage. In HADR implementation, the local configuration uses the failover cluster configuration and the set of VMs are replicated to a remote site.



Recommendations and Best Practices

Following are recommendations and best practices for HA, DR, and HADR implementations, with guidelines specific to ArchestrA System Platform products.

High Availability

- Ensure that auto log on is set up for all virtual machines running the System Platform products. This is to ensure that these virtual machines start automatically after the failover.
- Ensure the time on all the host servers, the virtual machines, and all other nodes which are part of the High Availability Environment are continuously synchronized. Otherwise, the virtual machines running on the host experience time drifts and results in discarding of data. You can add the time synchronization utility in the Start Up programs so that this utility starts automatically whenever the machine reboots.
- On the host servers disable all the network cards which are not utilized by the System Platform Environment. This is to avoid any confusion during the network selections while setting up the cluster.
- Ensure the Virtual Networks have the same name across all the nodes which are participating in the Cluster. Otherwise, migration/failover of virtual machines will fail.

ArchestrA System Platform Product-specific Recommendations and Observations

• During the preparation for Live and Quick migrations it is observed that the network freezes intermittently and then at the time of actual migration connectivity to the VM is lost. As a result, the System Platform node under migration experiences intermittent data loss during the preparation for Live and Quick migrations, and then has a data gap for the duration of actual migration.

The Historian

- In case of Live and Quick migration of the Historian, you may notice that the Historian logs values with quality detail 448 and there may be values logged twice with same timestamps. This is because the suspended Historian VM starts on the other cluster node with the system time it was suspended at before the migration. As a result, some of the data points it is receiving with the current time seem to be in the future to the Historian. This results in the Historian modifying the timestamps to its system time and updating the QD to 448. This happens until the system time of the Historian node catches up with the real current time using the TimeSync utility, after which the problem goes away. So, it is recommended to stop the historian before the migration and restart it after the VM is migrated and its system time is synced up with the current time.
- Live and Quick migration of the Historian should not be done when the block change over is in progress on the Historian node.
- If a failover happens (for example, due to a network disconnect on the source Host Virtualization Server) while the Historian status is still "Starting", the Historian node fails over to the target Host Virtualization Server. In the target host, the Historian fails to start. To recover from this state, kill the Historian services that failed to start and then start the Historian by launching the SMC.

InTouch HMI

• Ensure that InTouch Window Viewer is added to the Start Up programs so that the view is started automatically when the virtual machine reboots.

Application Server

- If a failover happens (for example, due to a network disconnect on the source Host Virtualization Server) while the Galaxy Migration is in progress, the GR node fails over to the target Host Virtualization Server. In the target host, on opening the IDE for the galaxy, the templates do not appear in the Template toolbox and in Graphic toolbox. To recover from this state, delete the Galaxy and create a new Galaxy. Initiate the migration process once again.
- If a failover happens (for example, due to an abrupt power-off on the source Host Virtualization Server) while a platform deploy is in progress, the Platform node fails over to the target Host Virtualization Server. In the target host, some objects will be in deployed state and the rest will be in undeployed state. To recover from this state, redeploy the whole Platform once again.
- If a failover happens (for example, due to an abrupt power-off on the source Host Virtualization Server) while a platform undeploy is in progress, the Platform node fails over to the target Host Virtualization Server. In the target host, some objects will be in undeployed state and the rest will be in deployed state. To recover from this state, undeploy the whole Platform once again.

Data Access Server

In case of Live and Quick migration of an I/O Server node (for example, DASSIDirect), InTouch I/O Tags acquiring data from that I/O server need to be reinitialized after the I/O server node is migrated. To automatically acquire the data for these tags from the I/O server after migration, it is recommended to have an InTouch script which monitors the quality status of any of those tags and triggers reinitialize I/O once the quality goes to bad. Execute this script every 3 to 5 seconds until the tag quality becomes good.

Disaster Recovery

- Ensure that auto log on is set up for all virtual machines running the System Platform products. This is to ensure that these virtual machines start up automatically after the failover.
- Ensure the time on all the Host Servers, the virtual machines and all other nodes which are part of the Disaster Recovery Environment are continuously synchronized. Otherwise, the virtual machines running on the host experience time drifts and results in discarding of data. You can add the time synchronization utility in the Start Up programs so that this utility starts automatically whenever the machine reboots.

- On the host servers disable all the network cards which are not utilized by the System Platform Environment. This is to avoid any confusion during the network selections while setting up the cluster.
- As per the topology described earlier for the Disaster Recovery environment, only one network is used for all communications. If multiple networks are being used, then make sure only the primary network which is used for the communication between the Nodes is enabled for the Failover Cluster Communication. Disable the remaining cluster networks in Failover Cluster Manager.
- Ensure the virtual networks have the same name across all the nodes which are participating in the Cluster. Otherwise, migration/failover of virtual machines will fail.

Best Practices for SteelEye DataKeeper Mirroring:

- While creating the SteelEye DataKeeper mirroring job, ensure the drive letters of the source and target drives to be mirrored are the same.
- We suggest that you have zero latency in the network when SteelEye DataKeeper mirroring, failover/migration of virtual machines between host servers take place. In the case of networks with latency, refer to the SteelEye documentation on network requirements.
- While designing the network architecture, particularly with regard to bandwidth between the hosts in the Disaster Recovery environment, make sure to select the bandwidth based on the rate of data change captured from Disk Write Bytes/Sec on the host server for all the mirrored volumes. To verify that you have sufficient network bandwidth to successfully replicate your volume, use the Windows Performance Monitoring and Alerts tool to collect Write Bytes/sec on the replicated volumes to calculate the rate of data change. Collect this counter every 10 seconds and use your own data analysis program to estimate your rate of data change. For more details, refer to SteelEye documentation on network requirements.

Network Bandwith	Rate of Change
1.5 Mbps(T1)	182,000 Bytes/sec (1.45 Mbps)
10 Mbps	1,175,000 Bytes/sec (9.4 Mbps)
45 Mbps (T3)	5,250,000 Bytes/sec (41.75 Mbps)
100 Mbps	12,000,000 Bytes/sec (96 Mbps)
1000 Mbps (Gigabit)	65,000,000 Bytes/sec (520 Mbps)

SteelEye DataKeeper can handle the following approximate average rates of change:

The following table lists the impact on CPU utilization and bandwidth with various compression levels.

- Medium Configuration Load: Approx. 50000 IO Points with Approx. 20000 attributes being historized
- Network: Bandwidth controller with bandwidth: 45Mbps and No Latency

These readings are when the mirroring is continuously happening between the source and destination storage SANs when all the VM are running on the source host server. The data captured shows that the % CPU utilization of the SteelEye mirroring process increases with increasing compression levels. Based on these findings we recommend Compression Level 2 in the Medium scale virtualization environment.

	Impact on CPU of Source Host Server		Impact on Bandwidth
	% Processor Time (ExtMirrSvc)- SteelEye Mirroring process	% Processor Time (CPU) - Overall CPU	Total Bytes / Sec
Compression 0	Min: 0	Min: 0	Min: 0
	Max:4.679	Max:28.333	Max: 11,042,788
	Avg: 0.157	Avg: 1.882	Avg: 2,686,598

Compression 1	Min: 0	Min: 0	Min: 0
	Max: 4.680	Max: 31.900	Max: 10,157,373
	Avg: 0.254	Avg: 1.895	Avg: 1,871,426
Compression 2	Min: 0	Min: 0	Min: 791.970
	Max:6.239	Max:37.861	Max: 10,327,221
	Avg: 0.402	Avg: 2.622	Avg: 1,199,242
Compression 9	Min: 0	Min: 0	Min: 0
	Max:13.525	Max:42.094	Max: 7,066,439
	Avg: 0.308	Avg: 3.244	Avg: 649,822

ArchestrA System Platform Product-specific Recommendations and Observations

• During the preparation for Live and Quick migrations it is observed that the network freezes intermittently and then at the time of actual migration connectivity to the VM is lost. As a result, the System Platform node under migration experiences intermittent data loss during the preparation for Live and Quick migrations, and then has a data gap for the duration of actual migration.

The Historian

- In case of Live and Quick migration of the Historian, you may notice that the Historian logs values with quality detail 448 and there may be values logged twice with same timestamps. This is because the suspended Historian VM starts on the other cluster node with the system time it was suspended at before the migration. As a result, some of the data points it is receiving with the current time seem to be in the future to the Historian. This results in Historian modifying the timestamps to its system time and updating the QD to 448. This happens until the system time of the Historian node catches up with the real current time using the TimeSync utility, after which the problem goes away. So, it is recommended to stop the historian before the migration and restart it after the VM is migrated and its system time is synced up with the current time.
- Live and Quick migration of Historian should not be done when the block change over is in progress on the Historian node.

• If a failover happens (for example, due to a network disconnect on the source Host Virtualization Server) while the Historian status is still "Starting", the Historian node fails over to the target Host Virtualization Server. In the target host, Historian fails to start. To recover from this state, kill the Historian services that failed to start and then start the Historian by launching the SMC.

InTouch

• Ensure that InTouch Window Viewer is added to the Start Up programs so that the view is started automatically when the virtual machine reboots.

Application Server

- If a failover happens (for example, due to a network disconnect on the source Host Virtualization Server) while the Galaxy Migration is in progress, the GR node fails over to the target Host Virtualization Server. In the target host, on opening the IDE for the galaxy, the templates do not appear in the Template toolbox and in Graphic toolbox. To recover from this state, delete the Galaxy and create new Galaxy. Initiate the migration process once again.
- If a failover happens (for example, due to an abrupt power-off on the source Host Virtualization Server) while a platform deploy is in progress, the Platform node fails over to the target Host Virtualization Server. In the target host, some objects will be in deployed state and the rest will be in undeployed state. To recover from this state, redeploy the whole Platform once again.
- If a failover happens (for example, due to an abrupt power-off on the source Host Virtualization Server) while a platform undeploy is in progress, the Platform node fails over to the target Host Virtualization Server. In the target host, some objects will be in undeployed state and the rest will be in deployed state. To recover from this state, undeploy the whole Platform once again.

Data Access Server

In case of Live and Quick migration of I/O Server node (for example, DASSIDirect), InTouch I/O tags acquiring data from that I/O server need to be reinitialized after the I/O server node is migrated. To automatically acquire the data for these tags from the I/O server after migration, it is recommended to have an InTouch script which monitors the quality status of any of those tags and triggers reinitialize I/O once the quality goes to bad. Execute this script every 3 to 5 seconds until the tag quality becomes good.

High Availability and Disaster Recovery

- Ensure that auto logon is set up for all virtual machines running the System Platform products. This is to ensure that these virtual machines start up automatically after the failover.
- Ensure the time on all the host servers, the virtual machines, and all other nodes, which are part of the Disaster Recovery environment are continuously synchronized. Otherwise, the virtual machines running on the host experience time drifts and discards data. You can add the time synchronization utility in the Start Up programs so that this utility starts automatically whenever the machine reboots.
- On the host servers, disable all the network cards that are not utilized by the System Platform environment. This is to avoid any confusion during the network selections while setting up the cluster.
- As per the topology described earlier for the High Availability and Disaster Recovery environment, only one network is used for all communications. If multiple networks are used, then make sure only the primary network used for communication between the nodes is enabled for the Failover Cluster Communication. Disable the remaining cluster networks in Failover Cluster Manager.
- Ensure the virtual networks have the same name across all the nodes, which are participating in the cluster. Otherwise, migration/failover of virtual machines will fail.
- Though this is a three-node failover topology, to achieve the required failover order, a fourth node is required for setting up the Node Majority in the failover cluster. The three nodes are used for virtual machine services and the fourth node is used for Quorum witness. The fourth node is not meant for failover of virtual machines running on the cluster. This fourth node should not be marked as the preferred owner while setting up the preferred owners for the virtual machines running on the cluster.

The following scenario is a description of the failover order.

Node 1 and Node 2 are in High Available site and Node 3 is in Disaster site. The failover sequence is Node 1 > Node 2 > Node 3.

- When all VMs are running on Node 1:
 - All three nodes are up. Now Node 1 goes down. The VMs running on Node 1 move to Node 2.
 - Node 1 and Node 3 are up and Node 2 is down. Now Node 1 goes down. The VMs running on Node 1 move to Node 3.
- When all VMs are running on Node 2:
 - Node 2 and Node 3 are up and Node 1 is down. Now Node 2 goes down. The VMs running on Node 2 move to Node 3.
 - All three nodes are up. Now Node 2 goes down. The VMs running on Node 2 move to Node 3.

Best Practices for SteelEye DataKeeper Mirroring:

- While creating the SteelEye DataKeeper mirroring job, ensure the drive letters of the source and target drives to be mirrored are same.
- We recommend that you have zero latency in the network when SteelEye DataKeeper mirroring, failover/migration of virtual machines between host servers takes place. In the case of networks with latency, refer to the SteelEye DataKeeper documentation on network requirements.
- While designing the network architecture, particularly regarding bandwidth between the hosts in the Disaster Recovery Environment, make sure to select the bandwidth based on the rate of data change captured from the Disk Write Bytes/Sec on the host server for all the mirrored volumes. To verify that you have sufficient network bandwidth to successfully replicate your volume, use the Windows Performance Monitoring and Alerts tool to collect Write Bytes/sec on the replicated volumes to calculate the rate of data change. Collect this counter every 10 seconds and use your own data analysis program to estimate your rate of data change. For more details, refer to SteelEye DataKeeper documentation on network requirements.

SteelEye DataKeeper can handle the following approximate average rates of change:

Network Bandwith	Rate of Change
1.5 Mbps (T1)	182,000 Bytes/sec (1.45 Mbps)
10 Mbps	1,175,000 Bytes/sec (9.4 Mbps)
45 Mbps (T3)	5,250,000 Bytes/sec (41.75 Mbps)
100 Mbps	12,000,000 Bytes/sec (96 Mbps)
1000 Mbps (Gigabit)	65,000,000 Bytes/sec (520 Mbps)

The following table lists the impact on CPU utilization and bandwidth at various compression levels.

- Medium Configuration Load: Approximately 50000 IO Points with approximately 20000 attributes being historized.
- Network: Bandwidth controller with bandwidth is 45Mbps and no latency.

These are readings when mirroring is continuously occurring between the source and the destination storage SANs, when all the VMs are running on the source host server. The data captured shows that the % CPU utilization of the SteelEye DataKeeper mirroring process increases with increasing compression levels. Based on these findings, you are recommended to use Compression Level 2 in the Medium Scale Virtualization environment.

	Impact on CPU of Source Host Server		Impact on Bandwidth
	% Processor Time (ExtMirrSvc)- SteelEye DataKeeper Mirroring process	% Processor Time (CPU) - Overall CPU	Total Bytes/Sec
Compression 0	Min: 0	Min: 0	Min: 0
	Max: 4.679	Max: 28.333	Max: 11,042,788
	Avg: 0.157	Avg: 1.882	Avg: 2,686,598
Compression 1	Min: 0	Min: 0	Min: 0
	Max: 4.680	Max: 31.900	Max: 10,157,373
	Avg: 0.254	Avg: 1.895	Avg: 1,871,426
Compression 2	Min: 0	Min: 0	Min: 791.970
	Max: 6.239	Max: 37.861	Max: 10,327,221
	Avg: 0.402	Avg: 2.622	Avg: 1,199,242
Compression 9	Min: 0	Min: 0	Min: 0
	Max: 13.525	Max: 42.094	Max: 7,066,439
	Avg: 0.308	Avg: 3.244	Avg: 649,822

ArchestrA System Platform Product-specific Recommendations and Observations

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- Live and Quick migration of the Historian should not be done when the block change over is in progress on the Historian node.
- If a failover happens (for example, due to a network disconnect on the source host Virtualization Server) while the Historian status is still "Starting", the Historian node fails over to the target host Virtualization Server. In the target host, Historian fails to start. To recover from this state, kill the Historian services that failed to start and then start the Historian by launching the SMC.

InTouch

• Ensure that InTouch Window Viewer is added to the Start Up programs so that the view is started automatically when the virtual machine reboots.

Application Server

- If a failover happens (for example, due to a network disconnect on the source host Virtualization Server) while the Galaxy Migration is in progress, the GR node fails over to the target host Virtualization Server. In the target host, on opening the IDE for the galaxy, the templates do not appear in the Template toolbox and in Graphic toolbox. To recover from this state, delete the Galaxy and create new Galaxy. Initiate the migration process once again.
- If a failover happens (for example, due to an abrupt power-off on the source host Virtualization Server) while a platform deploy is in progress, the Platform node fails over to the target host Virtualization Server. In the target host, some objects will be in deployed state and the rest will be in undeployed state. To recover from this state, redeploy the whole Platform once again.
- If a failover happens (for example, due to an abrupt power-off on the source host Virtualization Server) while a platform undeploy is in progress, the Platform node fails over to the target host Virtualization Server. In the target host, some objects will be in undeployed state and the rest will be in deployed state. To recover from this state, undeploy the whole Platform once again.

Data Access Server

In case of Live and Quick migration of I/O Server node (for example, DASSIDirect), InTouch I/O Tags acquiring data from that I/O server need to be reinitialized after the I/O server node is migrated. To automatically acquire the data for these tags from the I/O server after migration, it is recommended to have an InTouch script which monitors the quality status of any of those tags and triggers reinitialize I/O once the quality goes to bad. Execute this script every 3 to 5 seconds until the tag quality becomes good.

Chapter 2

Implementing High Availability Using Hyper-V

This section introduces virtualization high-availability solutions that improve the availability of System Platform Products. A high-availability solution masks the effects of a hardware or software failure, and maintains the availability of applications so that the perceived downtime for users is minimized.

The set-up and configuration procedures, expected Recovery Time Objective (RTO) observations, Recovery Point Objective (RPO) observations, and data trend snapshots are presented first for small-scale virtualization environment, and are then repeated for medium-scale virtualization environment.

Working with a Small Scale Virtualization Environment

This section contains the following topics:

- Setting Up Small Scale Virtualization Environment
- Configuration of System Platform Products in a Typical Small Scale Virtualization
- Expected Recovery Time Objective and Recovery Point Objective
- Working with a Medium Scale Virtualization Environment

Setting Up Small Scale Virtualization Environment

The following procedures help you to set up and implement a small scale virtualization environment.

Note: In the event that the private network becomes disabled, you may need to add a script to enable a failover. For more information, see "Failover of the Virtual Machine if the Domain/ Private Network is disabled" on page 102

Planning for Small Scale Virtualization Environment

The following table lists the minimum and recommended hardware and software requirements for the machines used for a small scale virtualization environment:

Hyper-V Hosts

Processor:	Two - 2.66 GHz Intel Xeon with - 8 Cores
Operating System	Windows Server 2008 R2 Enterprise with Hyper-V Enabled
Memory	12GB
Storage	Local Volume with Capacity of 500 GB

Note: For the Hyper-V Host to function optimally, the server should have the same processor, RAM, storage and service pack level. Preferably the servers should be purchased in pairs to avoid hardware discrepancies. Though the differences are supported, it will impact the performance during failovers.

Virtual Machines

Using the above Specified Hyper-V Host, three virtual machines can be created with the following Configuration.

Virtual Machine 1: DAS SI, Historian, and Application Server (GR) node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Historian, ArchestrA, DAS SI

Virtual Machine 2: Application Server Runtime node 1

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	2 GB
Storage	40 GB
System Platform Products Installed	Application Server Runtime only, and InTouch

Virtual Machine 3: Information Server node, InTouch, and Historian Client

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 Standard
Memory	4 GB
Storage	40 GB
System Platform Products Installed	Information Server, InTouch, Historian Client

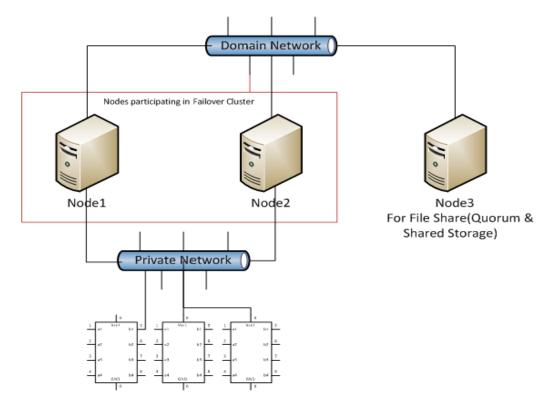
Note: There should be a minimum of two Hyper-V hosts to configure the failover cluster.

Network Requirements

For this high availability architecture, you can use two physical network cards that need to be installed on a host computer and configured, to separate the domain network and the process network.

Configuring Failover Cluster

The following is the recommended topology of the failover cluster for a small scale virtualization environment.



This setup requires a minimum of two host servers. Another independent node is used for configuring the quorum. For more information on configuring the quorum, refer to "Configuring Cluster Quorum Settings" on page 82. In this setup, the same or a different node can be used for the storage of virtual machines.

The following procedures help you to install and configure a failover cluster, that has two nodes, to set up on a small scale virtualization environment.

Installing Failover Cluster

To install the failover cluster feature, you need to run Windows Server 2008 R2 Enterprise Edition on your server.

To install the failover cluster feature on a server

1 On the Initial Configuration Tasks window, under Customize This Server, click Add features. The Add Features Wizard window appears.

Note: The **Initial Configuration Tasks** window appears if you have already installed Windows Server 2008 R2. If it does not appear, open the **Server Manager** window, right-click **Features** and click **Add Features**. For information on accessing the **Server Manager** window, refer to step 1 of "To validate failover cluster configuration" on page 125.

Add Features Wizard	X
Select Features	
Features Confirmation Progress Results	Select one or more features to install on this server. Peatures: Image: Select one or more features to install on this server. Image: Select one or more features to install on this server. Image: Select one or more features to install on this server. Image: Select one or more features to install on this server. Image: Select one or more features to install on this server. Image: Select one or more features to install on this server. Image: Select one or more features to install on this service. Image: Select one or more features to install on this service. Image: Select one or more features to install on this service. Image: Select one one of the install on this service. Image: Select one one of the install on this service. Image: Select one one one of the install on this service. Image: Select one
	< Previous Next > Install Cancel

2 In the Add Features Wizard window, select the Failover Clustering check box and click Next. The Confirm Installation Selections area appears.

Add Features Wizard		×
Confirm Installat	ion Selections	
Features Confirmation Progress Results	To install the following roles, role services, or features, click Install. 1 informational message below ① This server might need to be restarted after the installation completes. Failover Clustering Print, e-mail, or save this information	
	<previous next=""> Install Cancel</previous>	

3 To complete the installation, view the instructions on the wizard and click **Install**. The **Installation Results** area appears with the installation confirmation message.

Add Features Wizard	is
Features Confirmation Progress Results	The following roles, role services, or features were installed successfully: ▲ 1 warning message below ▲ Windows automatic updating is not enabled. To ensure that your newly-installed role or feature is automatically updated, turn on Windows Update in Control Panel. Failover Clustering
	Print, e-mail, or save the installation report
	< Previous Next > Close Gancel

4 Click Close to close the Add Features Wizard window.

Note: Repeat the above procedure to include all the other nodes that are part of the Cluster configuration process.

Validating Failover Cluster Configuration

You must validate your configuration before you create a cluster. Validation helps you to confirm the configuration of your servers, network, and to storage meets the specific requirements for failover clusters.

To validate failover cluster configuration

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

Server Manager			_ 0
File Action View Help			
Server Manager (CAPRICORN)	Server Manager (CAPRICORN) Get an overview of the state	us of this server, perform top management tasks, and add or remov	ve server roles and features.
	Server Summary		Server Summary Help
	Computer Information		Change System Properties Wiew Network Connections
	Full Computer Name: Domain:	CAPRICORN.space.com space.com	Configure Remote Desktop
	vDomain: vPlant:	Assigned by DHCP 192.168.0.165, IPv6 enabled	- Managemone
	Remote Desktop: Server Manager Remote Management:	Enabled Enabled	
	Product ID:	00486-001-0001076-84653 (Activated)	
	Do not show me this console a Security Information	t logon. This setting is controlled by Group Policy.	🍘 Go to Windows Firewall
	Windows Firewall: Windows Updates:	Domain: Off, Public: Off Install updates automatically using Windows Update	Configure Updates
	Last checked for updates:	Never	Run Security Configuration Wizard Configure IE ESC
	Con Con Con Con Con	figure refresh	

2 Expand Features and click Failover Cluster Manager. The Failover Cluster Manager area appears.

Note: If the **User Account Control** dialog box appears, confirm the action you want to perform and click **Yes**.

Server Manager			
File Action View Help			
🗢 🔿 🔰 🖬 🚺 🖬			
Server Manager (CAPRICORN)	Failover Cluster Manager		
Roles Features	Failover Cluster Manager		
Failover Cluster Manager Togonostics Configuration Storage	Create failover clusters, validate hardware for potential failover clusters, and perform configuration changes to your failover clusters.		
	* Overview		
	A failover cluster is a set of independent computers that work together to increase the availability of services and applications. The clustered servers (called nodes) are connected by physical cables and by software. If one of the nodes fails, another node begins to provide services (a process known as failover).		
	* Clusters		
	Chusters		
	* Management		
		ster can include migrating se	onfiguration, then create a cluster. After these steps are complete, you can rvices and applications to it from a cluster running Windows Server 2003,
	Validate a Configuration	? Under	rstanding cluster validation tests
	Create a Cluster	? Creati	ng a failover cluster or adding a cluster node
	Manage a Cluster	? Mana	ging a failover cluster
		? Migrat	ing services and applications from a cluster
	More Information		
	 More Information 		
	Eailover cluster topics on the V	eb	
	Failover cluster communities or	the Web	
	Microsoft support page on the	/eb	

3 Under Management, click Validate a Configuration. The Validate a Configuration Wizard window appears. Click Next.

👹 ¥alidate a Configu	ration Wizard	×
Before Y	ou Begin	
Before You Begin Select Servers or a Cluster Testing Options Confirmation Validating Summary	This wizard runs validation tests to determine whether this configuration of servers and attached storage is set up correctly to support failover. A cluster solution is supported by Microsoft only if the complete configuration (servers, network, and storage) passes all tests in this wizard. In addition, all hardware components in the cluster solution must be "Certified for Windows Server 2008 R2". If you want to validate a set of unclustered servers, you need to know the names of the servers. Important: the storage connected to the selected servers will be unavailable during validation tests. If you want to validate an existing failover cluster, you need to know the name of the cluster or one of its nodes. You must be a local administrator on each of the servers you want to validate. To continue, click Next. More about preparing your hardware for validation More about preparing your hardware for validation More about cluster validation tests	
	Next > Cancel	

- **4** In the **Select Servers or a Cluster** area, do the following:
 - **a** Click **Browse** or enter next to the **Enter name** box and select the relevant server name.

Note: You can either enter the server name or click **Browse** and select the relevant server name.

- **b** In the **Selected Servers** list, click the required servers, and then click **Add**.
- **c** Click **Next**. The **Testing Options** area appears.

Note: You can add one or more server names. To remove a server from the **Selected servers** list, select the server and click **Remove**.

Before You Begin Select Servers or a Cluster		rvers, add the names of all the servers. ster, add the name of the cluster or one of its n	odes.
Festing Options Confirmation /alidating Summary	Enter name: Selected servers:	Capricom space.com gemini.space.com	Browse Add Remove
		1	

d Click **Next**. The **Testing Options** area appears.

Note: You can add one or more server names. To remove a server from the **Selected servers** list, select the server and click **Remove**.

Before You Begin	Choose between running all tests or running selected tests.
Select Servers or a Cluster	The tests include Inventory tasks, Network tests, Storage tests, and System Configuration tests.
Testing Options	Microsoft supports a cluster solution only if the complete configuration (servers, network, and storage) can pass all tests in this wizard. In addition, all hardware components in the cluster solution must be "Certified for Windows Server 2008 R2".
Confirmation	
/alidating	
Summary	Run all tests (recommended) Bun only tests I select
	More about cluster validation tests

5 Click the **Run only tests I select** option to skip storage validation process, and then click **Next**. The **Test Selection** area appears.

Note: Click the **Run all tests (recommended)** option to validate the default selection of tests.

Before You Begin	dependent test, the test that it depends on will	sts are dependent on other tests. If you choose a
Select Servers or a Cluster Testing Options Test Selection Confirmation Validating Summary		Description These tests gather and display information about the nodes.
	More about cluster validation tests	< Previous Next > Cancel

6 Clear the **Storage** check box, and then click **Next**. The **Summary** screen appears.



7 Click View Report to view the test results or click Finish to close the Validate a Configuration Wizard window.

A warning message appears indicating that all tests have not been run. This usually happens in a multi site cluster where storage tests are skipped. You can proceed if there is no other error message. If the report indicates any other error, you need to fix the problem and rerun the tests before you continue. You can view the results of the tests after you close the wizard in *SystemRoot\Cluster\Reports\Validation Report date and time.html* where SystemRoot is the folder in which the operating system is installed (for example, C:\Windows).

To know more about cluster validation tests, click **More about cluster** validation tests on Validate a Configuration Wizard window.

Creating a Cluster

To create a cluster, you need to run the Create Cluster wizard.

To create a cluster

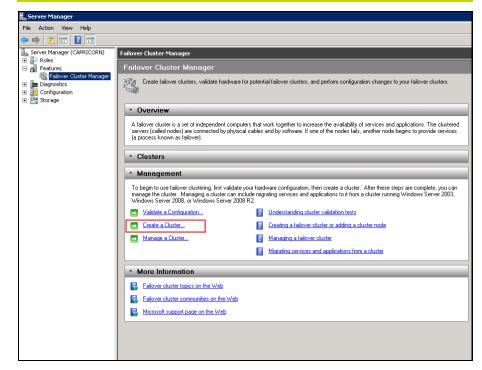
1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

📕 Server Manager		_ 8
File Action View Help		
🗇 🔿 🗾 🖬		
Server Manager (UNIVERSE)	Roles	
Server Manager (UNIVERSE)	View the health of the roles installed on your server and add or remove roles and features.	
		Roles Summary Help
	Roles: 3 of 17 installed	Add Roles
	Active Directory Domain Services	-
	DNS Server File Services	
	me services	
	Active Directory Domain Services	AD DS Help
	Stores directory data and manages communication between users and domains, including user logon processes, authentication, and directory searches.	
	🛞 Role Status	Go to Active Directory Domain Services
	Messages: 1	
	System Services: 8 Running, 2 Stopped	
	(i) Events: 4 informational in the last 24 hours Best Practices Analyzer: To start a Best Practices Analyzer scan, go to the Best Practices Analyzer tile on this role's homepage and dick Scan this Role	
	dest Practices Analyzer: To start a dest Practices Analyzer start, you one best Practices Analyzer die on this role's nomepage and dick scan this Kole	

2 Expand Features and click Failover Cluster Manager. The Failover Cluster Manager pane appears.

Note: If the **User Account Control** dialog box appears, confirm the action you want to perform and click **Yes**.



3 Under Management, click Create a cluster. The Create Cluster Wizard window appears.

🏶 Create Cluster Wi	zard	×
Before Y	ou Begin	
Before You Begin Select Servers Validation Warning Access Point for Administering the Cluster Confirmation Creating New Cluster Summary	This wizard creates a cluster, which is a set of servers that work together to increase the availability of clustered services and applications. If one of the servers fails, another server begins hosting the clustered services and applications (a process known as failover). Before you run this wizard, we strongly recommend that you run the Validate a Configuration wizard to ensure that your hardware and hardware settings are compatible with failover clustering. Microsoft supports a cluster solution only if the complete configuration (servers, network, and storage) can pass all tests in the Validate a Configuration wizard. In addition, all hardware components in the cluster solution must be "Certified for Windows Server 2008 R2". You must be a local administrator on each of the servers you want to include in the cluster. To continue, click Next. More about Microsoft support of cluster solutions that have passed validation tests More about the name and IP address information needed for a new cluster Do not show this page again	
	Next > Cancel]

4 View the instructions and click **Next**. The **Validation Warning** area appears.

Create Cluster Wi	zard 🛛 🕅
Before You Begin Select Servers Validation Warning Access Point for	For the servers you selected for this cluster, the reports from cluster configuration validation tests appear to be missing or incomplete. Microsoft supports a cluster solution only if the complete configuration (servers, network and storage) can pass all the tests in the Validate a Configuration wizard.
Administering the Cluster Confirmation Creating New Cluster	View Report
Summary	 Yes. When I click Next, run configuration validation tests, and then return to the process of creating the cluster. No. I do not require support from Microsoft for this cluster, and therefore do not want to run the validation tests. When I click Next, continue creating the cluster.
	More about Microsoft support of cluster solutions that have passed validation tests
	< Previous Next > Cancel

5 Click No. I do not require support from Microsoft for this cluster, and therefore do not want to run the validation tests.
 When I click Next, continue creating the cluster option and click Next. The Select Servers area appears.

Note: Click Yes. When I click Next, run configuration validation tests, and then return to the process of creating the cluster option if you want to run the configuration validation tests. Click **View Report** to view the cluster operation report.

🏺 Create Cluster Wi	zard			X
Select Se	ervers			
Before You Begin Select Servers Validation Warning	Add the names of all the	e servers that you want to have	in the cluster. You must add at leas	t one server.
Access Point for Administering the Cluster Confirmation Creating New Cluster Summary	Enter server name: Selected servers:	mercury.space.com venus.space.com		Browse Add Remove
			< Previous Next >	Cancel

- **6** In the **Select Servers** screen, do the following:
 - a In the Enter server name field, enter the relevant server name and click Add. The server name gets added in the Selected servers box.

Note: You can either enter the server name or click **Browse** to select the relevant server name.

b Click Next. The Access Point for Administering the Cluster area appears.

🚏 Create Cluster Wiz	zard				
Access Point for Administering the Cluster					
Before You Begin Select Servers	Type the name you want to use when administering the cluster.				
Validation Warning Access Point for Administering the Cluster	One or more DHCP IPv4 addresses were configured automatically. All networks were configured automatically.				
Confirmation					
Creating New Cluster					
Summary					
	More about the administrative Access Point for a cluster				
	< Previous Next> Cancel				

7 In the Cluster Name field, enter the name of the cluster and click Next. The Confirmation area appears.

Note: Enter a valid IP address for the cluster to be created if the IP address is not configured through Dynamic Host Configuration Protocol (DHCP).

Create Cluster Wi			X
Before You Begin Select Servers	You are ready to create The wizard will create yo	a cluster. ur cluster with the following settings:	
Validation Warning Access Point for Administering the Cluster Confirmation Creating New Cluster Summary	Cluster: Node: Node: IP Address:	Stars1 capricorn.space.com gemini.space.com DHCP address on 10.91.60.0/23	×
	To continue, click Next.	< Previous N	lext > Cancel

8 Click Next. The cluster is created and the Summary area appears.

韂 Create Cluster Wi	zard		×
Summary	,		
Before You Begin Select Servers Validation Warning	You have suc	ccessfully completed the Create Cluster Wizard.	
Access Point for Administering the Cluster		Create Cluster	
Confirmation Creating New Cluster Summary	Cluster: Node: Node: Quorum:	Planet mercury.space.com venus.space.com Node Majority	•
	, To view the report cre To close this wizard, c	ated by the wizard, click View Report. Jick Finish.	View Report
			Finish

9 Click **View Report** to view the cluster report created by the wizard or click **Finish** to close the **Create Cluster Wizard** window.

Disabling the Plant Network for the Cluster Communication

After creating the failover cluster using two or more enabled network cards, make sure only the primary network card which is used for the communication between the Hyper-V nodes is enabled for the Failover Communication. You must disable the remaining cluster networks.

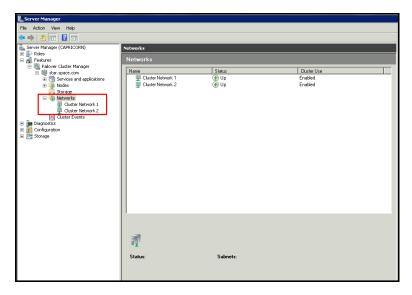
To disable the plant network for the Cluster Communication

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

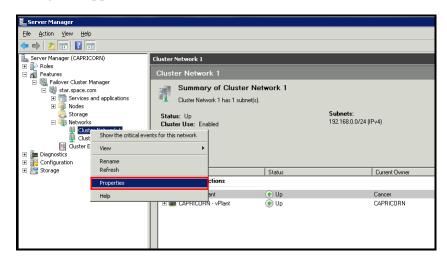
Note: You can also access the **Server Manager** window from the Administrative Tools window or the Start menu.

1			
Manager (CAPRICORN)	Server Manager (CAPRICORN)		
cures mostics figuration	Get an overview of the stat	us of this server, perform top management tasks, and add or remov	re server roles and features.
age	Server Summary		Server Summary Help
	Computer Information		🙀 Change System Properties
	Full Computer Name:	CAPRICORN.space.com	View Network Connections
	Domain:	space.com	S. Configure Server Manager Remote
	vDomain:	Assigned by DHCP	Management
	vPlant:	192.168.0.165, IPv6 enabled	
	Remote Desktop:	Enabled	
	Server Manager Remote Management:	Enabled	
	Product ID:	00486-001-0001076-84653 (Activated)	
	Do not show me this console a	t logon. This setting is controlled by Group Policy.	
	Security Information		😭 Go to Windows Firewal
	Windows Firewall:	Domain: Off, Public: Off	Configure Updates
	Windows Updates:	Install updates automatically using Windows Update	✤ Check for New Roles Run Security Configuration Wizard
	Last checked for updates:	Never	% Configure IE ESC

2 Expand the **Failover Cluster Manager** and select **Networks** to check how many networks are participating in the cluster.



3 Select the network that is not required to be part of the Cluster Communication (for example, Private Network), and right-click and then select **Properties.** The **Cluster Network Properties** dialog box appears.



4 Select the **Do not Allow cluster communication on this network** option from the **Properties** dialog box and click **OK** to apply the changes.

Cluster Nei	twork 1 Properties 🛛 🗙				
General	,				
	Cluster Network 1				
Name:					
Cluster	Network 1				
	C Allow cluster network communication on this network				
	Allow clients to connect through this network				
	Do not allow cluster network communication on this network				
Status:	Up				
Subnets	192.168.0.0/24				
	OK Cancel Apply				

5 Check the summary pane of the networks and ensure **Cluster Use** is disabled for the network which is not required for cluster communication.

Eserver Manager						
File Action View Help						
🗢 🔿 🗾 🖬 🗾 🖬						
Server Manager (CAPRICORN)	Networks					
Roles Ales Ales	Networks					
 Features Raiover Cluster Manager 						
E Star.space.com	Name	Status	Cluster Use			
E Services and applications	Cluster Network 1	🕥 Up	Disabled			
🗉 🏺 Nodes	Cluster Network 2	💽 Up	Enabled			
Storage						
Wetworks Wetworks Gluster Network 1						
Cluster Network 2						
Cluster Events						
🗉 🏣 Diagnostics						
🗉 🏬 Configuration						
🗄 📇 Storage						

Note: Repeat the above process if more than two networks, which are not required for cluster communication, are involved in the Cluster Setup.

Configuring Cluster Quorum Settings

After both nodes have been added to the cluster, and the cluster networking components have been configured, you must configure the failover cluster quorum.

The File Share to be used for the node and File Share Majority quorum must be created and secured before configuring the failover cluster quorum. If the file share has not been created or correctly secured, the following procedure to configure a cluster quorum will fail. The file share can be hosted on any computer running a Windows operating system.

To configure the cluster quorum, you need to perform the following procedures:

- Create and secure a file share for the node, and file share majority quorum
- Use the failover cluster management tool to configure a node, and file share majority quorum

To create and secure a file share for the node and file share majority quorum

- **1** Create a new folder on the system that will host the share directory.
- 2 Right-click the folder that you created and click **Properties**. The **Quorum Properties** window for the folder that you created appears.

Note: In the following procedure, Quorum is the name of the folder.

📙 Quorum Properties 🛛 🗙
General Sharing Security Previous Versions Customize
Network File and Folder Sharing Quorum Not Shared Network Path: Not Shared Share
Advanced Sharing Set custom permissions, create multiple shares, and set other advanced sharing options.
OK Cancel Apply

3 Click the Sharing tab, and then click Advanced Sharing. The Advanced Sharing window appears.

Advanced Sharing	×
Share this folder	
Settings	
Share name:	
Quorum	
Add Remove	
Limit the number of simultaneous users to:	
Comments:	
Permissions Caching	
OK Cancel Apply	

4 Select the **Share this folder** check box and click **Permissions**. The **Permissions for Quorum** window appears.

🖡 Permissions for Quorum		×
Share Permissions		
Group or user names:		
A Everyone		
	Add	Remove
Permissions for Everyone	Allow	Deny
Full Control	8	
Change Read		
Learn about access control and permissions		
ОК	Cancel	Apply

5 Click Add. The Select Users, Computers, Service Accounts, or Groups window appears.

Select Users, Computers, Service Accounts, or Groups	? ×
Select this object type:	
Users, Groups, or Built-in security principals	Object Types
From this location:	
	Locations
Enter the object names to select (<u>examples</u>):	
<node1>,<node2>,<cluster name=""></cluster></node2></node1>	Check Names
Advanced OK	Cancel

6 In the Enter the object name to select box, enter the two node names used for the cluster in the small node configuration and click OK. The node names are added and the Permissions for Quorum window appears.

🔋 Permissions for Quorum		×
Share Permissions		
Group or user names:		
Serveryone		
	Add	Remove
Permissions for Everyone	Allow	Deny
Full Control		
Change Read		
Learn about access control and permissions		
ОК	Cancel	Apply

7 Select the Full Control, Change, and Read check boxes and click OK. The Properties window appears.

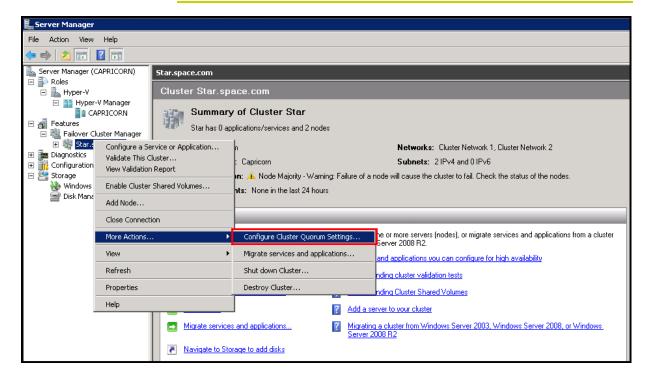
📙 Quorum Properties 🛛 🛛 🔀		
General Sharing Security Previous Versions Customize		
Network File and Folder Sharing Quorum Not Shared Network Path: Not Shared Share		
Advanced Sharing Set custom permissions, create multiple shares, and set other advanced sharing options.		
OK Cancel Apply		

8 Click **Ok**. The folder is shared and can be used to create virtual machines.

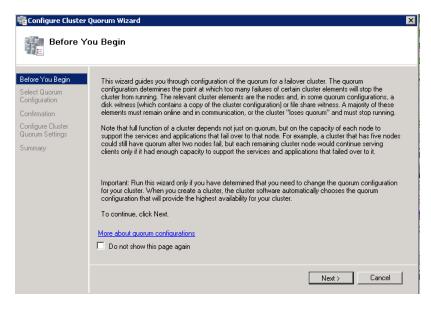
To configure a node and file share majority quorum using the failover cluster management tool

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.



2 Right-click the name of the cluster you created and click More Actions. Click Configure Cluster Quorum Settings. The Configure Cluster Quorum Wizard window appears.



3 View the instructions on the wizard and click **Next**. The **Select Quorum Configuration** area appears.

Note: The **Before you Begin** screen appears the first time you run the wizard. You can hide this screen on subsequent uses of the wizard.

📲 Configure Cluster (Quorum Wizard	×
Select Qu	uorum Configuration	
Before You Begin Select Quorum Configure File Share Witness Confirmation Configure Cluster Quorum Settings Summary	Read the descriptions and then select a quorum configuration for your cluster. The recommendations are based on providing the highest availability for your cluster. Node Majority (not recommended for your current number of nodes) Can sustain failures of 0 node(s). Node and Disk Majority Can sustain failures of 1 node(s) with the disk witness online. Can sustain failures of 0 node(s) if the disk witness goes offline or fails. Node and File Share Majority (for clusters with special configurations) Can sustain failures of 1 node(s) if the file share witness remains available. Can sustain failures of 0 node(s) if the file share witness becomes unavailable. No Majority: Disk Only (not recommended) Can sustain failures of all nodes except 1. Cannot sustain a failure of the quorum disk. This configuration is not recommended because the disk is a single point of failure.	
	More about quorum configurations < Previous Next > Cancel]

4 You need to select the relevant quorum node. For special configuration, click the **Node and File Share Majority** option and click **Next**. The **Configure File Share Witness** area appears.

Note: Click the **Node Majority** option if the cluster is configured for node majority or a single quorum resource. Click the **Node and Disk Majority** option if the number of nodes is even and not part of a multi site cluster. Click the **No Majority: Disk Only** option if the disk being used is only for the quorum.

Configure Cluster	Quorum Wizard 🛛 🔀
Before You Begin Select Quorum Configure File Share Witness Confirmation Configure Cluster Quorum Settings Summary	Please select a shared folder that will be used by the file share witness resource. This shared folder must not be hosted by this cluster. It can be made more available by hosting it on another cluster. Shared Folder Path: Shared Folder Path: \\universe\Shared Browse
	< <u>Previous</u> Cancel

5 In the **Shared Folder Path** box, enter the Universal Naming Convention (UNC) path to the file share that you created in the Shared Folder Path field, and then click **Next**. Permissions to the share are verified. If there are no problems with the access to the share, the **Confirmation** screen appears.

Note: You can either enter the server name or click **Browse** to select the relevant shared path.

Configure Cluster	
Before You Begin	You are ready to configure the quorum settings of the cluster.
Select Quorum Configuration	
Configure File Share Witness	Share: \\universe\Shared Quorum Configuration: Node and File Share Majority
Confirmation Configure Cluster Quorum Settings Summary	Your cluster quorum configuration will be changed to the configuration shown above.
	To continue, click Next. < Previous Next > Cancel

6 The details you have selected are displayed. To confirm the details click **Next**. The **Summary** area appears and the configuration details of the quorum settings are displayed.

輩Configure Cluster	Quorum Wizard	×
Summary		
Before You Begin Select Quorum Configuration	You have successfully configured the quorum settings for the cluster.	
Configure File Share Witness	Configure Cluster Quorum Settings 🖹	
Confirmation	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	
Configure Cluster Quorum Settings Summary	Share: \\universe\Shared Quorum Configuration: Node and File Share Majority	
	To view the report created by the wizard, click View Report. View Report View Report	
	Finish	

7 Click View Report to view a report of the tasks performed, or clickFinish to close the window.

After you configure the cluster quorum, you must validate the cluster. For more information, refer to http://technet.microsoft.com/en-us/library/bb676379(EXCHG.80).aspx.

Configuring Storage

For a smaller virtualization environment, storage is one of the central barriers to implementing a good virtualization strategy. But with Hyper-V, VM storage is kept on a Windows file system. Users can put VMs on any file system that a Hyper-V server can access. As a result, HA can be built into the virtualization platform and storage for the virtual machines. This configuration can accommodate a host failure by making storage accessible to all Hyper-V hosts so that any host can run VMs from the same path on the shared folder. The back-end part of this storage can be a local or storage area network, iSCSI or whatever is available to fit the implementation.

For this architecture, the Shared Folder is used. The process of how to use the Shared Folder in the Failover Cluster for the High Availability is described in the section "Configuring Virtual Machines" on page 150.

The following table lists the minimum storage recommendations to configure storage for each VM:

System	Processor
Historian and Application Server (GR node) Virtual Machine	80 GB
Application Engine (Runtime node) Virtual Machine	40 GB
InTouch and Information Server Virtual Machine	40 GB

The recommended total storage capacity should be minimum 1TB.

Configuring Hyper-V

Microsoft Hyper-V Server 2008 R2 helps in creating a virtual environment that improves server utilization. It enhances patching, provisioning, management, support tools, processes, and skills. Microsoft Hyper-V Server 2008 R2 provides live migration, cluster shared volume support, expanded processor, and memory support for host systems.

Hyper-V is available in x64-based versions of Windows Server 2008 R2 operating system, specifically the x64-based versions of Windows Server 2008 R2 Standard, Windows Server 2008 R2 Enterprise, and Windows Server 2008 Datacenter.

The following are the prerequisites to set up Hyper-V:

- x64-based processor
- Hardware-assisted virtualization
- Hardware Data Execution Prevention (DEP)

To configure Hyper-V on Windows Server 2008 R2

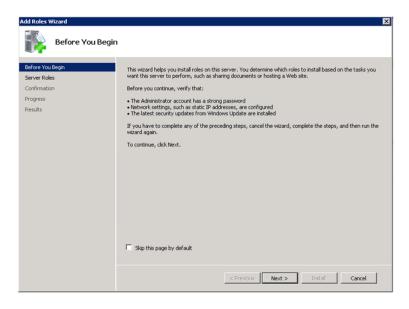
1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

📕 Server Manager		_ 8
File Action View Help		
🗇 🔿 🞽 🖬 👔		
Server Manager (UNIVERSE)	Roles	
Diagnostics Configuration Storage	View the health of the roles installed on your server and add or remove roles and features.	
	⊙ Roles Summary	Roles Summary Help
	Roles: 3 of 17 installed	Add Roles
	Active Directory Domain Services	Remove Roles
	DN5 Server	
	File Services	
	Active Directory Domain Services	AD DS Help
	Stores directory data and manages communication between users and domains, including user logon processes, authentication, and directory searches.	
	⊘ Role Status	Go to Active Directory Domain Services
	Messages: 1	
	System Services: 8 Running, 2 Stopped	
	(i) Events: 4 informational in the last 24 hours	
	Best Practices Analyzer: To start a Best Practices Analyzer scan, go to the Best Practices Analyzer tile on this role's homepage and click Scan this Role	

2 In the Roles pane, under Roles Summary area, click Add Roles. The Add Roles Wizard window appears.

Note: You can also right-click **Roles**, and then click **Add Roles Wizard** to open the **Add Roles Wizard** window.



3 View the instructions on the wizard and click **Next**. The **Select Server Roles** area appears.

Add Roles Wizard	oles	X
Before You Begin Server Roles Hyper-V Virtual Networks Confirmation Progress Results	Select one or more roles to install on this server. Roles: Active Directory Certificate Services Active Directory Federation Services Active Directory Lightweight Directory Services Active Directory Lightweight Directory Services Active Directory Rights Management Services Active Directory Rights Management Services Application Server DHCP Server Fax Server Fax Server Fax Server Fax Server Fat Services (Installed) Metwork Policy and Access Services (Installed) Print and Document Services Renote Desktop Services (Installed) Windows Deployment Services Windows Server Lipdate Services More about server roles	Description: <u>Hypervity</u> provides the services that you can use to create and manage witual machines and their resources. Each vitual machine is a vitualized computer system that operates in an isolated execution environment. This allows you to run multiple operating systems simultaneously.

4 Select the **Hyper-V** check box and click **Next**. The **Create Virtual Networks** area appears.

Add Roles Wizard			×
Create Virtual Ne	etworks		
Before You Begin Server Roles Hyper-V Virtual Networks Confirmation	can create virtual machines and at One virtual network will be created	d for each network adapter you select. We recomme use with virtual machines. You can add, remove, an	nd that you create at
Progress	Name	Network Adapter	
Results	Local Area Connection Local Area Connection 2	Realisk RTB139/B10x Family Fast Ethernet NIC Broadcom NetXtreme 57xx Gigabit Controller ve one network adapter for remote access to this s t it for use with a virtual network.	erver. To reserve a
	More about virtual networks		
		< Previous Next > Insta	Cancel

5 Select the check box next to the required network adapter to make the connection available to virtual machines. Click Next. The Confirm Installation Selections area appears.

Note: You can select one or more network adapters.

Add Roles Wizard	X
Confirm Installat	ion Selections
Before You Begin Server Roles Hyper-V Virtual Networks Confirmation	To install the following roles, role services, or features, click Install.
Progress Results	Virtual Networks : Local Area Connection
	Print, e-mail, or save this information
	<previous next=""> Install Cancel</previous>

6 Click **Install**. The **Installation Results** area appears.

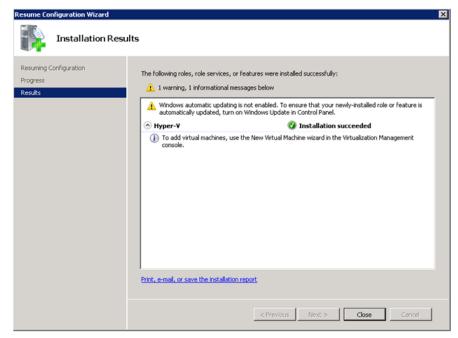
Add Roles Wizard	Σ
Installation	lesults
Before You Begin Server Roles Hyper-V	One or more of the following roles, role services, or features require you to restart:
Virtual Networks	A Hyper-V A Restart Pending
Confirmation	⚠️ You must restart this server to finish the installation process.
Progress	
Results	
	Print, e-mail, or save the installation report
	< Previous Next > Close Cancel

7 A message appears prompting you to restart the computer. ClickClose. The Add Roles Wizard pop-up window appears.

Add Roles Wizard			×
Installation Res	ults		
Before You Begin Server Roles Hyper-V	One or more of the following roles, role 1 warning message below	services, or features require you to restart:	
Virtual Networks		A Restart Pending	
Confirmation	Add Roles Wizard		
Progress Results	Do you want to restart now		
	This server must be restarted to process. You cannot add or remo or features until the server is res	ve other roles, role services,	
	Print, e-mail, or save the installation re	<u>1011</u>	
		< Previous Next > Close C	iancel

8 Click **Yes** to restart the computer.

9 After you restart the computer, log on with the same ID and password you used to install the Hyper V role. The installation is completed and the **Resume Configuration Wizard** window appears with the installation results.



10 Click Close to close the Resume Configuration Wizard window.

Configuring Virtual Machines

After installing Hyper-V, you need to create a virtual machine.

To configure a virtual machine

1 In the Server Manager window, right-click Features, and then click Failover Cluster Manager. The Failover Cluster Manager tree expands.

🏭 Server Manager		
File Action View Help		
🗢 🔿 🔰 🖬 🚺 🖬		
Server Manager (VENUS)	Failover Cluster Manager	Actions
Roles Byper-V	Failover Cluster Manager	Failover Cluster Manager 🔷 🔺
🖃 📑 Hyper-V Manager	Create failover clusters, validate hardware for potential failover cluste	Validate a Configuration
Features	configuration changes to your failover clusters.	🙀 Create a Cluster
🖃 🍓 Failover Cluster Manager		Manage a Cluster
⊟ Nanet.space.com I Image Services and application	* Overview	View 🕨
🗉 🍯 Nodes	A failover cluster is a set of independent computers that work together to	Properties
C Storage	availability of services and applications. The clustered servers (called nod physical cables and by software. If one of the nodes fails, another node b	👔 Help
Cluster Events	services (a process known as failover).	
Diagnostics Configuration		
E Storage	* Clusters	
	Planet space.com	
	Management	
	To begin to use failover clustering, first validate your hardware configurati- cluster. After these steps are complete, you can manage the cluster. Ma	
	include migrating services and applications to it from a cluster running Wir Windows Server 2008, or Windows Server 2008 R2.	
	Validate a Configuration Understanding	
	tests	
· ·		

2 Right-click Services and applications, click Virtual Machines, and then click New Virtual Machine. The New Virtual Machine Wizard window appears.

🏚 New Virtual Machine Wizard 🛛 🛛 🔀	
Before You E	Begin
Before You Begin Specify Name and Location Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	This wizard helps you create a virtual machine. You can use virtual machines in place of physical gou can change the configuration later using Hyper-V Manager. To create a virtual machine, do one of the following: • Click Finish to create a virtual machine that is configured with default values. • Click Next to create a virtual machine with a custom configuration. © Do not show this page again More about creating virtual machines
	< Previous Next > Finish Cancel

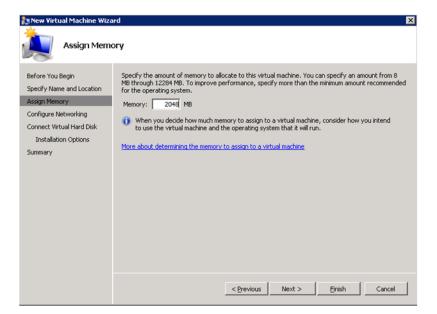
3 View the instructions in the **Before You Begin** area and click **Next**. The **Specify Name and Location** area appears.

Specify Nam	e and Location
Before You Begin Specify Name and Location Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	Choose a name and location for this virtual machine. The name is displayed in Hyper-Y Manager. We recommend that you use a name that helps you easily identify this virtual machine, such as the name of the guest operating system or workload. Name: HistorianVM You can create a folder or use an existing folder to store the virtual machine. If you don't select a folder, the virtual machine is stored in the default folder configured for this server. ✓ Store the virtual machine in a different location Location: 5:1 M If you plan to take snapshots of this virtual machine, select a location that has enough free space. Snapshots include virtual machine data and may require a large amount of space.
	< Previous Next > Finish Cancel

- **4** In the **Specify Name and Location** area, do the following:
 - **a** In the Name box, enter a name for the virtual machine.
 - **b** Select the **Store the virtual machine is a different location** check box to be able to indicate the location of the virtual machine.
 - **c** In the **Location** box, enter the location where you want to store the virtual machine.

Note: You can either enter the path to the filename or click **Browse** to select the relevant server name.

d Click Next. The Assign Memory area appears.



5 Enter the recommended amount of memory in the **Memory** box and click **Next**. The **Configure Networking** area appears.

Configure No	
Before You Begin Specify Name and Location Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	Each new virtual machine includes a network adapter. You can configure the network adapter to use a virtual network, or it can remain disconnected. Connection: Domain - Virtual Network More about configuring network adapters
	< Previous Next > Finish Cancel

6 Select the network to be used for the virtual machine and click **Next**. The **Connect Virtual Hard Disk** area appears.

捷 New Virtual Machine Wiza	rd	×
Connect Virt	tual Hard Disk	
Before You Begin Specify Name and Location Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	A virtual machine requires storage so that you can install an operating system. You can specify the storage now or configure it later by modifying the virtual machine's properties. C Create a virtual hard disk Name: HistorianVM, vhd Location: G:(HistorianVM) Browse Size: 40 GB (Maximum: 2040 GB) C Use an existing virtual hard disk Location: [!\venus\Appserver\ Browse C Attach a virtual hard disk later	
	< Previous Next > Finish Cancel	

- 7 Click the **Create a virtual hard disk** option and then do the following:
 - **a** In the Name box, enter the name of the virtual machine.
 - **b** In the **Location** box, enter the location of the virtual machine.

Note: You can either enter the location or click **Browse** to select the location of the virtual machine and click Next.

c In the **Size** box, enter the size of the virtual machine and then click **Next**. The **Installation Options** area appears.

Note: You need to click either the **Use an existing virtual hard disk** or the **Attach a virtual hard disk later** option, only if you are using an existing virtual hard disk, or you want to attach a virtual disk later.

Installation	Options
Before You Begin	You can install an operating system now if you have access to the setup media, or you can install it later.
Specify Name and Location	Install an operating system later
Assign Memory Configure Networking	C Install an operating system from a boot CD/DVD-ROM
Connect Virtual Hard Disk	Media
Installation Options	Physical CD/DVD drive: B:
Summary	C Image file (.iso): Browse
	C Install an operating system from a boot floppy disk
	Media -
	Virtual floppy disk (.vfd): Browse
	C Install an operating system from a network-based installation server

8 Click the Install an operating system later option and click Next. The Completing the New Virtual Machine Window area appears.

Note: If you want to install an operating system from a boot CD/DVD-ROM or a boot floppy disk or a network-based installation server, click the relevant option.

Completing	ard 🛛 🗙
Before You Begin Specify Name and Location Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	You have successfully completed the New Virtual Machine Wizard. You are about to create the following virtual machine. Description: Name: HistorianVM Memory: 2048 MB Network: Domain - Virtual Network. Hard Disk: G:VHistorianVM/HistorianVM.vhd Operating System: Will be installed at a later time
	To create the virtual machine and close the wizard, click Finish. < Previous

9 Click **Finish**. The virtual machine is created with the details you provided. As we have started this process from the Failover Cluster Manager, after completing the process of creating a virtual machine, the **High Availability Wizard** window appears.

🧱 High Availability W	fizard			×
Summary				
Configure High Availability Summary	High availability was successfu	lly configured for the serv	vice or application.	
	Virtual Machin	ne		^
	Name		Result	Description
	HistorianVM			Warning
	To view the report created by the wizard To close this wizard, click Finish.	d, click View Report.		View Report
				Finish

10 Click **View Report** to view the report or click **Finish** to close the **High Availability Wizard** window.

Note: You can use the above procedure to create multiple virtual machines with appropriate names and configuration.

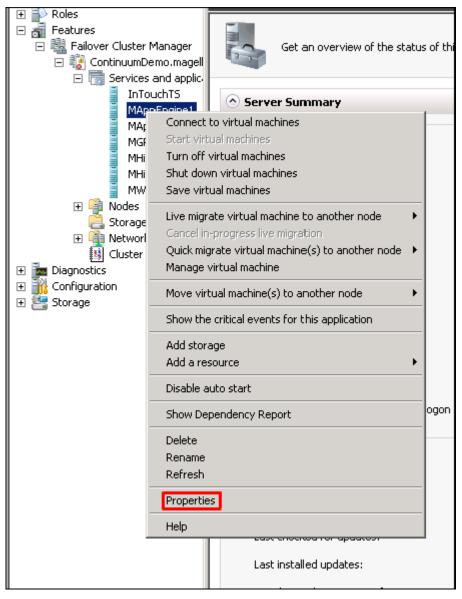
Failover of the Virtual Machine if the Domain/ Private Network is disabled

Whenever public network is disconnected on the node where the virtual machines are running, Failover Cluster Manager force failover of all the Virtual Machine Services and application to the other host node in the cluster. If the private network which is not participating in the cluster communication fails, Failover Cluster Manager does not failover any Cluster Service or Application.

To overcome this, we need to add a script which detects the private network failure as a dependency to the Virtual Machine. This results in failover of the Virtual Machine when the script fails.

To add a script which enables the failover of the virtual machine if the private network is disabled

- Add a script to the virtual machine. Follow the process mentioned in the following URL to add the script: http://gallery.technet.microsoft.com/ScriptCenter/5f7b4df3-af02-47 bf-b275-154e5edf17e6/
- **2** After the script is added, select the virtual machine and right-click. Click **Properties**. The **Properties** dialog box appears.



3 Navigate to the Failover tab and change Maximum failures in the specified period to 15 and Period (hours) to 1 and Click OK.

MAppEngine1 Properties				
General Failover				
Failover				
Specify the number of times the Cluster service will attempt to restart or fail over the service or application in the specified period.				
If the service or application fails more than the maximum in the specified period, it will be left in the failed state.				
Maximum failures in the specified 15				
Period (hours):				
Failback Specify whether the service or application will automatically fail back to the most preferred owner (which is set on the General tab).				
Prevent failback				
C Allow failback				
C Immediately				
C Failback between: 0 📑 and				
0 - hours				
More about failover and failback				
OK Cancel Apply				

Note: If the Script fails when Domain/Private network is disabled, Virtual machine also fails and moves to the backup node.

Configuration of System Platform Products in a Typical Small Scale Virtualization

To record the expected Recovery Time Objective (RTO) and Recovery Point Objective (RPO) trends and various observations in a small scale virtualization environment, tests are performed with System Platform Product configuration shown below.

The virtualization host server used for small scale configuration consists of three virtual machines listed below.

Node 1: GR, Historian and DAS SI Direct - Windows 2008 R2 Standard edition (64bit) OS with SQL Server 2008 SP1 32 bit

Node 2 (AppEngine): Bootstrap, IDE and InTouch (Managed App) -Windows 2008 R2 Standard edition (64bit) OS

Node 3: Information Server, Bootstrap and IDE, InTouch Terminal Service and Historian Client - Windows Server 2008 SP2 (32bit) with SQL Server 2008 SP1 and Office 2007

Virtual Node	IO tags (Approx.)	Historized tags (Approx.)
GR	10000	2500
AppEngine	10000	5000

Historized tags and their Update Rates for this Configuration

The following table shows historized tags and their update rates for this configuration:

Update Rate	Device Items	Active Items
1000	480	144
10000	1	1
10000	1880	796
30000	1880	796
60000	1880	796
3600000	1880	796
600000	40	16
10000	1480	596
30000	520	352
1800000	1480	676
1000	4	4
1800000	1000	350
	1000 10000 10000 30000 60000 3600000 60000 30000 30000 10000 10000 10000 10000 10000 10000	Items 1000 480 10000 1 10000 1880 30000 1880 60000 1880 3600000 1880 10000 1880 3600000 1880 10000 1480 10000 1480 10000 4

Real Time data from DAS SI Direct

Late tags and buffered tags from DAS test Server

Topic Name	Update Rate	Device Items	Active Items
Late Data (1 hour)	1000	246	112
Buffered Data	1000	132	79

Application Server Configuration Details

Total No of Engines: 14

Number of objects under each Engine

- Engine 1 : 9
- Engine 2 : 13
- Engine 3 : 13
- Engine 4 : 225
- Engine 5 : 118
- Engine 6 : 118
- Engine 7 : 195
- Engine 8 : 225
- Engine 9 : 102
- Engine 10: 2
- Engine 11: 3
- Engine 12: 21
- Engine 13: 1
- Engine 14: 1

The total number of DI objects is 6.

Expected Recovery Time Objective and Recovery Point Objective

This section provides the indicative Recovery Time Objectives (RTO) and Recovery Point Objective (RPO) for the load of IO and Attributes historized shown above and with the configuration of Host Virtualization Servers and Hyper-V virtual machines explained in the Setup instructions of Small Scale Virtualization. In addition to these factors, the exact RTO and RPO depend on factors like storage I/O performance, CPU utilization, memory usage, and network usage at the time of failover/migration activity.

RTO and RPO Observations—HA Small Configuration

Scenarios and observations in this section:

Scenario	Observation
Scenario 1: IT provides maintenance on Virtualization Server	"Live Migration" on page 109
	"" on page 109
	"Quick Migration of all nodes simultaneously" on page 111
	"Shut down" on page 112
Scenario 2: Virtualization Server hardware fails	"Scenario 2: Virtualization Server hardware fails" on page 113
Scenario 3: Network fails on Virtualization Server	"Failover due to network disconnect (private)" on page 117
Scenario 4: Virtualization Server becomes unresponsive	"Scenario 4: Virtualization Server becomes unresponsive" on page 118

The following tables display RTO and RPO observations with approximately 20000 IO points with approximately 7500 attributes being historized:

Scenario 1: IT provides maintenance on Virtualization Server

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Primary Node	Products	RTO	RPO	
			Tags	Data Loss Duration
GR	IAS	2 sec	IAS tag (Script)	8 sec
			IAS IO Tag (DASSiDirect)	13 sec
	Historian Client	2 sec	Historian Local tag	0 sec
			InTouch Tag \$Second	4 sec
			IAS IO Tag (DASSiDirect)	20 sec
			IAS tag (Script)	0 sec
	DAServer	5 sec	N/A	N/A

Live Migration

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Primary node	Products	RTO	RPO	
			Tags	Data Loss Duration
WIS Node	InTouch	5 sec		5 sec
	Wonderware Information Server	5 sec	N/A	N/A
	Historian Client	5 sec	N/A	N/A
AppEngine	AppEngine	1 sec	IAS IO tag (DASSiDirect)	3 sec
			IAS tag (Script)	6 sec

Quick Migration

Primary node	Products	RTO	RPO	
			Tags	Data Loss Duration
GR	IAS	134 sec	IAS Tag (Script)	183 sec
			IAS IO Tag (DASSiDirect)	184 sec
	Historian Client	145 sec	Historian Local tag	148 sec
			InTouch tag \$Second	152 sec
			IAS IO Tag (DASSiDirect)	165 sec
			IAS tag (Script)	0 sec
	DAServer	146 sec	N/A	N/A
WIS Node	InTouch HMI	79 sec		89 sec
	Wonderware Information Server	79 sec	N/A	N/A
	Historian Client	79 sec	N/A	N/A
AppEngine	AppEngine	59 sec	IAS IO tag (DASSiDirect)	105 sec
			IAS Tag (Script)	104 sec

Primary node	Products	RTO	RPO	
			Tags	Data Loss Duration
GR	IAS	188 sec	IAS tag (Script)	222 sec
			IAS IO tag (DASSiDirect)	227 sec
	Historian Client	220 sec	Historian Local tag	221 sec
			InTouch tag \$Second	228 sec
			IAS IO tag (DASSiDirect)	238 sec
			IAS tag (Script)	135 sec
	DAServer	221 sec	N/A	
WIS Node	InTouch HMI	183 sec		228 sec
	Wonderware Information Server	183 sec	N/A	N/A
	Historian Client	183 sec	N/A	N/A
AppEngine	AppEngine	100 sec	IAS IO tag (DASSiDirect)	238 sec
			IAS tag (Script)	135 sec

Quick Migration of all nodes simultaneously

Primary node	Products	RTO	RPO	
			Tags	Data Loss Duration
GR	IAS	160 sec	IAS tag (Script)	3 min 36 sec
			IAS IO tag (DASSiDirect)	3 min 43 sec
	Historian Client	211 sec	Historian Local tag	3 min 25 sec
			InTouch tag \$Second	3 min 32 sec
			IAS IO tag (DASSiDirect)	3 min 50 sec
			IAS tag (Script)	2 min 46 sec
	DAServer	212 sec	N/A	N/A
WIS Node	InTouch HMI	202 sec		212 sec
	Wonderware Information Server	202 sec	N/A	N/A
	Historian Client	202 sec	N/A	N/A
AppEngine	AppEngine	114 sec	IAS IO tag (DASSiDirect)	3 min 50 sec
			IAS tag (Script)	$2 \min 46 \sec$

Scenario 2: Virtualization Server hardware fails

The failover occurs due to hardware failure, and it is simulated with power-off on the host server.

Primary node	Products	RTO	R	PO
			Tags	Data Loss Duration
GR	IAS	497 sec	IAS Tag (Script)	9min
			IAS IO tag (DASSiDirect)	9 min
	Historian Client	532 sec	Historian local tag	9 min 23 sec
			InTouch tag \$Second	10 min + time taken to start viewer
			time taken by t InTouchView o and the RTO of	s dependent on the he user to start the n the InTouch node the Historian node, historizes this tag.
			IAS IO tag (DASSiDirect)	8 min 23 sec
			IAS tag (Script)	7 min 1 sec

Primary node	Products	RTO	R	PO
			Tags	Data Loss Duration
	DAServer	269 sec	N/A	N/A
WIS Node	InTouch HMI	601 sec + time taken by the user to start the InTouchView		611 sec
			time taken by t InTouchView o and the RTO of	s dependent on the he user to start the n the InTouch node the Historian node, historizes this tag.
	Wonderware Information Server	601 sec + time taken by the user to start the Information Server	N/A	N/A
	Historian Client	601 sec+ time taken by the user to start the Hist Client	N/A	N/A
AppEngine	AppEngine	366 sec	IAS IO Tag (DASSiDirect)	8 min 23 sec
			IAS tag (Script)	7 min 1 sec

Scenario 3: Network fails on Virtualization Server

The failover occurs due to network disconnect (public). In this case, the VMs restart, after moving to the other host server.

Primary node	Products	RTO		RPO
			Tags	Data Loss Duration
GR	IAS	535 sec	IAS Tag (Script)	9 min 8 sec
			IAS IO Tag (DASSiDirect)	8 min 53 sec
	Historian Client	544 sec	Historian Local Tag	9 min 35 sec
			InTouch Tag \$Second	9 min 16 sec
			taken by the use on the InTouc) is dependent on the time er to start the InTouchView h node and the RTO of the e, which historizes this tag.
			IAS IO Tag (DASSiDirect)	8 min 57 sec
			IAS Tag (Script)	7 min 52 sec
	DAServer	457sec	N/A	N/A
WIS Node	InTouch HMI	415 sec + time taken by the user to start the InTouchView	N/A	556 sec + Time taken to run viewer)
			taken by the use on the InTouc) is dependent on the time er to start the InTouchView h node and the RTO of the e, which historizes this tag.

Primary node	Products	RTO		RPO
			Tags	Data Loss Duration
	Wonderware Information Server	415 sec + time taken by the user to start the Information Server	N/A	N/A
	Historian Client	415 sec + time taken by the user to start the Hist Client	N/A	N/A
AppEngine	AppEngine	463 sec	N/A	8 min 57 sec
			N/A	7 min 52 sec

Failover due to network disconnect (private)

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In this case, the private network disconnects on GR, VM will be moved to the other host server.

Primary node	Products	RTO	RPO	
			Tags	Data Loss Duration
GR	IAS	118 sec	IAS Tag (Script)	132 sec
			IAS IO Tag (DASSiDirect)	140 sec
	Historian Client	128 sec	Historian Local Tag	132 sec
			InTouch Tag \$Second	147 sec
			taken by t InTouchView o and the RTO of	endent on the time he user to start the n the InTouch node the Historian node, historizes this tag.
			IAS IO Tag (DASSiDirect)	145 sec
			IAS Tag (Script)	0 (Sfed)
	DAServer	134 sec		
WIS Node	InTouch HMI	N/A		N/A
	Wonderware Information Server	N/A		N/A
	Historian Client	N/A	N/A	N/A

Primary node	Products	RTO (sec)	R	РО
			Tags	Data Loss Duration
AppEngine	AppEngine	N/A	IAS IO Tag (DASSiDirect)	
			IAS Tag (Script)	

Scenario 4: Virtualization Server becomes unresponsive

There is no failover of VMs to the other host server when the CPU utilization on the host server is 100%.

Primary node	Products	RTO (sec)	RPO	
			Tags	Data Loss Duration
GR	IAS	N/A	I	N/A
	Historian Client	N/A		N/A
WIS Node	InTouch HMI	N/A		N/A
	WWonderware Information ServerIS	N/A		N/A
	Historian Client	N/A	N/A	N/A
AppEngine	AppEngine	N/A	N/A	
	InTouch HMI	N/A		N/A
WIS Node	InTouch HMI	N/A		N/A

Working with a Medium Scale Virtualization Environment

This section contains the following topics:

- Setting Up Medium Scale Virtualization Environment
- Configuration of System Platform Products in a Typical Medium Scale Virtualization
- Expected Recovery Time Objective and Recovery Point Objective

Setting Up Medium Scale Virtualization Environment

The following procedures help you to set up and implement the medium scale virtualization high availability environment.

Note: In the event that the private network becomes disabled, you may need to add a script to enable a failover. For more information, see "Failover of the Virtual Machine if the Domain/ Private Network is disabled" on page 102

Planning for Medium Scale Virtualization Environment

The minimum recommended hardware and software requirements for the Host and Virtual machines used for medium virtualization environment are provided in the table below:

Hyper-V Host

Processor	Two 2.79 GHz Intel Xeon with 24 Cores
Operating System	Windows Server 2008 R2 Enterprise with Hyper-V enabled
Memory	48 GB
Storage	SAN with 1TB storage disk

Note: For the Hyper-V Host to function optimally, the server should have the same processor, RAM, storage and service pack level. Preferably the servers should be purchased in pairs to avoid hardware discrepancies. Though the differences are supported, it will impact the performance during failovers.

Virtual Machines

Using the Hyper-V host specified above, seven virtual machines can be created in the environment with the configuration given below.

Virtual Machine 1: Historian node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	8 GB
Storage	200 GB
System Platform Products Installed	Historian

Virtual Machine 2: Application Server node, DAS SI

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	8 GB
Storage	100 GB
System Platform Products Installed	ArchestrA-Runtime, DAS SI

Virtual Machine 3: InTouch TS node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	InTouch with TS enabled

noue I	
Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Application Server Runtime only and InTouch

Virtual Machine 4: Application Server Runtime node 1

Virtual Machine 5: Application Server Runtime node 2

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Application Server Runtime only

Virtual Machine 6: Information Server node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Information Server

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows 7 Enterprise
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Historian Client

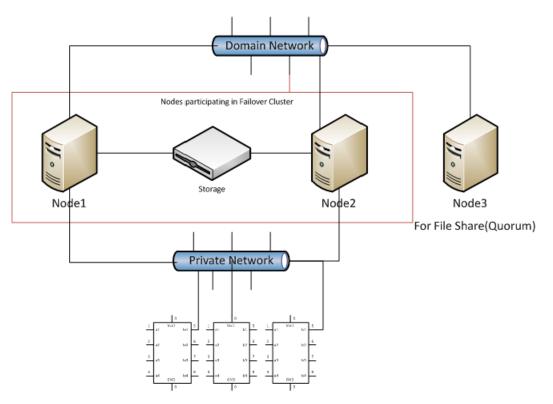
Note: There should be a minimum of two Hyper-V hosts to configure the failover cluster.

Network Requirements

For this high availability architecture, you can use two physical network cards that need to be installed on a host computer and configured to separate the domain network and the process network.

Configuring Failover Cluster

The following is the recommended topology of the failover cluster for a medium scale virtualization high availability environment.



This setup requires a minimum of two host servers and one storage server shared across two hosts. Another independent node is used for configuring the quorum. For more information on configuring the quorum, refer to "Configure Cluster Quorum Settings" on page 136.

The following procedures help you install and configure a failover cluster that has two nodes to set up on a medium scale virtualization high availability environment.

Installing Failover Cluster

To install the failover cluster feature, you need to run Windows Server 2008 R2 Enterprise Edition on your server.

To install the failover cluster feature on a server

1 On the Initial Configuration Tasks window, under Customize This Server, click Add features. The Add Features Wizard window appears.

Note: The **Initial Configuration Tasks** window appears if you have already installed Windows Server 2008 R2. If it does not appear, open the **Server Manager** window, right-click **Features** and click **Add Features**. For information on accessing the **Server Manager** window, refer to step 1 of "To validate failover cluster configuration" on page 125.

Add Features Wizard Select Features	×
Features Confirmation Progress Results	Select one or more features to install on this server. Patures
	< Provious Next > Install Cancel

2 In the Add Features Wizard window, select the Failover Clustering check box and click Next. The Confirm Installation Selections area appears.

Add Features Wizard		×
Confirm Installat	ion Selections	
Features Confirmation Progress Results	To install the following roles, role services, or features, click Install.	_

3 To complete the installation, view the instructions on the wizard and click **Install**. The **Installation Results** area appears with the installation confirmation message.

Add Features Wizard		×
Installation Resu	lts	
Features Confirmation Progress	The following roles, role services, or fea	
Results	Windows automatic updating is no automatically updated, turn on W	it enabled. To ensure that your newly-installed role or feature is indows Update in Control Panel.
	Failover Clustering	🥑 Installation succeeded
	Print, e-mail, or save the installation rep	ort
		< Previous Next > Close Cancel

4 Click Close to close the Add Features Wizard window.

Note: Repeat the above procedure to include all the other nodes that will be part of the Cluster configuration process.

Validating Failover Cluster Configuration

You must validate your configuration before you create a cluster. Validation helps you confirm the configuration of your servers, network, and storage meets the specific requirements for failover clusters.

To validate failover cluster configuration

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

Action View Help			
⇒ π 2			
erver Manager (CAPRICORN)	Server Manager (CAPRICORN)		
Features Diagnostics Configuration Storage	Get an overview of the state	us of this server, perform top management tasks, and add or remov	ve server roles and features.
	Server Summary		Server Summary Help
	Computer Information		📳 Change System Properties
	Full Computer Name:	CAPRICORN.space.com	View Network Connections
	Domain:	space.com	Configure Remote Desktop Configure Server Manager Remote
	vDomain:	Assigned by DHCP	Management
	vPlant:	192.168.0.165, IPv6 enabled	
	Remote Desktop:	Enabled	
	Server Manager Remote Management:	Enabled	
	Product ID:	00486-001-0001076-84653 (Activated)	
	Do not show me this console a	at logon. This setting is controlled by Group Policy.	
	Security Information		🔐 Go to Windows Firewall
	Windows Firewall:	Domain: Off, Public: Off	Configure Updates
	Windows Updates:	Install updates automatically using Windows Update	← Check for New Roles ■ Run Security Configuration Wizard
	Last checked for updates:	Never	Configure IE ESC
		ifigure refresh	

2 Expand Features and click Failover Cluster Manager. The Failover Cluster Manager area appears.

Note: If the **User Account Control** dialog box appears, confirm the action you want to perform and click **Yes**.

🏪 Server Manager				
File Action View Help				
🗢 🔿 🙋 🖬 🚺 🖬				
Server Manager (CAPRICORN)	Failover Cluster Manager			
🖃 🚠 Features	Failover Cluster Manager			
 Failover Cluster Manager ■ Diagnostics ■ Configuration ■ Storage 	Create failover clusters, validate hardware for potential failover clusters, and perform configuration changes to your failover clusters.			
_	* Overview			
	A failover cluster is a set of independent computers that work together to increase the availability of services and applications. The clustered servers (called nodes) are connected by physical cables and by software. If one of the nodes fails, another node begins to provide services (a process known as failover).			
	Clusters			
	* Management			
		: validate your hardware configuration, then create a cluster. After these steps are complete, you can er can include migrating services and applications to it from a cluster running Windows Server 2003, river 2008 R2.		
	Validate a Configuration	Understanding cluster validation tests		
	Create a Cluster	Creating a failover cluster or adding a cluster node		
	Manage a Cluster	Managing a failover cluster		
		Migrating services and applications from a cluster		
	More Information			
	Failover cluster topics on the We			
	Failover cluster communities on th	ne Web		
	Microsoft support page on the We	<u>əb</u>		

3 Under Management, click Validate a Configuration. The Validate a Configuration Wizard window appears.

👹 Validate a Configu	ration Wizard	×
Before Yo	ou Begin	
Before You Begin Select Servers or a Cluster Testing Options Confirmation Validating Summary	This wizard runs validation tests to determine whether this configuration of servers and attached storage is set up correctly to support failover. A cluster solution is supported by Microsoft only if the complete configuration (servers, network, and storage) passes all tests in this wizard. In addition, all hardware components in the cluster solution must be "Certified for Windows Server 2008 R2". If you want to validate a set of unclustered servers, you need to know the names of the servers. Important: the storage connected to the selected servers will be unavailable during validation tests. If you want to validate an existing failover cluster, you need to know the name of the cluster or one of its nodes. You must be a local administrator on each of the servers you want to validate. To continue, click Next. More about preparing your hardware for validation More about cluster validation tests Do not show this page again	
	Next > Cancel	

4 View the instructions on the wizard and click **Next**. The **Select Servers or a Cluster** area appears.

Validate a Config	uration Wizard ervers or a Cluste	er.		×
Before You Begin Select Servers or a Cluster		ervers, add the names of all the ister, add the name of the cluste		
Testing Options Confirmation Validating Summary	Enter name: Selected servers:	capricorn.space.com gemini.space.com		Browse Add Remove
			< Previous Next >	Cancel

- **5** In the **Select Servers or a Cluster** area, do the following:
 - **a** In the **Enter name** list, enter the relevant server name.

Note: You can either enter the server name or click **Browse** to select the relevant server name.

- **b** In the **Selected servers** list, click the required servers, and then click **Add**.
- **c** Click **Next**. The **Testing Options** area appears.

Note: You can add one or more server names. To remove a server from the **Selected servers** list, select the server and click **Remove**.

Before You Begin	Choose between running all tests or running selected tests.
Select Servers or a Cluster	The tests include Inventory tasks, Network tests, Storage tests, and System Configuration tests.
Testing Options	Microsoft supports a cluster solution only if the complete configuration (servers, network, and storage) can
Test Selection	pass all tests in this wizard. In addition, all hardware components in the cluster solution must be "Certified for Windows Server 2008 R2".
Confirmation	
Validating	
Summary	C Run all tests (recommended)
	Fruit an easis (recommended) Run only tests I select
	More about cluster validation tests

6 Click the **Run only tests I select** option to skip storage validation process, and then click **Next**. The **Test Selection** screen appears.

Note: Click the **Run all tests (recommended)** option to validate the default selection of tests.

Before You Begin Select Servers or a Cluster	Select the tests that you want to run. A few tests are o dependent test, the test that it depends on will also run	dependent on other tests. If you choose a L
Testing Options	Inventory Network	Description
Test Selection	① ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ●	These tests gather and display information about the
Confirmation	System Configuration	nodes.
/alidating		
Summary		
	1	

7 Clear the **Storage** check box, and then click **Next**. The **Summary** screen appears.



8 Click View Report to view the test results or click Finish to close the Validate a Configuration Wizard window.

A warning message appears indicating that all tests have not been run. This usually happens in a multi site cluster where storage tests are skipped. You can proceed if there is no other error message. If the report indicates any other error, you need to fix the problem and rerun the tests before you continue. You can view the results of the tests after you close the wizard in SystemRoot\Cluster\Reports\Validation Report date and time.html where SystemRoot is the folder in which the operating system is installed (for example, C:\Windows).

To know more about cluster validation tests, click **More about cluster** validation tests on Validate a Configuration Wizard window.

Creating a Cluster

To create a cluster, you need to run the Create Cluster wizard.

To create a cluster

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

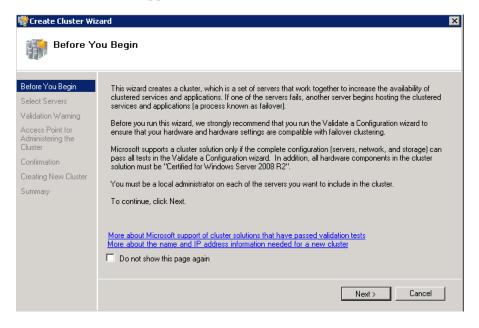
Server Manager		_ 5
File Action View Help		
🗇 🔿 🗾 🖬 🔢		
Server Manager (UNIVERSE)	Roles	
Kours Features Diagnostics Configuration Storage	Vow the health of the roles installed on your server and add or remove roles and features.	
<u> </u>		Roles Summary Help
	Roles: 3 of 17 installed Declaration Services	Add Roles
	CNS Server	
	File Services	
	Active Directory Domain Services	AD DS Help
	Stores directory data and manages communication between users and domains, including user logon processes, authentication, and directory searches.	
	© Role Status	Go to Active Directory Domain Services
	Messages: 1	
	System Services: 8 Running, 2 Stopped (i) Events: 4 informational in the last 24 hours	
	W Events: + informational in the last 2+ nours Best Practices Analyzer: To start a Best Practices Analyzer scan, go to the Best Practices Analyzer tile on this role's homepage and click Scan this Role	

2 Expand Features and click Failover Cluster Manager. The Failover Cluster Manager pane appears.

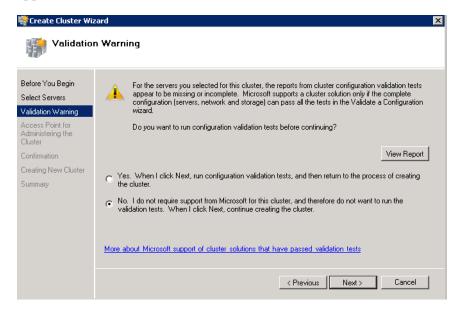
Note: If the **User Account Control** dialog box appears, confirm the action you want to perform and click **Yes**.

🛼 Server Manager			
File Action View Help			
🗢 🔿 🔰 🖬 🚺 🖬			
Server Manager (CAPRICORN)	Failover Cluster Manager		
E 🚮 Features	Failover Cluster Manager		
Falover Cluster Manager	Create failover clusters, validate hardware for potential failover clusters, and perform configuration changes to your failover clusters.		
Diagnostics Configuration	Create failover clusters, validate hardware for potential failover clusters, and perform configuration changes to your failover clusters.		
🕀 🚰 Storage			
	* Overview		
	A failover cluster is a set of independent computers that work together to increase the availability of services and applications. The clustered servers (called nodes) are connected by physical cables and by software. If one of the nodes faits, another node begins to provide services (a process known as failower).		
	* Clusters		
	* Management		
	To begin to use failover clustering, first validate your hardware configuration, then create a cluster. After these steps are complete, you can manage the cluster. Managing a cluster can include migrafing services and applications to it from a cluster running Windows Server 2003, Windows Server 2008, or Windows Server 2008 R2.		
	S Validate a Configuration		
	Create a Cluster		
	Manage a Cluster Managing a failover cluster		
	Migrating services and applications from a cluster		
	* More Information		
	Eailover cluster topics on the Web		
	Eailover cluster communities on the Web		
	Kicrosoft support page on the Web		

3 Under Management, click Create a cluster. The Create Cluster Wizard window appears.



4 View the instructions and click **Next**. The **Validation Warning** area appears.



5 Click No. I do not require support from Microsoft for this cluster, and therefore do not want to run the validation tests.
 When I click Next, continue creating the cluster option and click Next. The Select Servers area appears.

Note: Click **Click Yes. When I click Next, run configuration validation tests, and then return to the process of creating the cluster** option if you want to run the configuration validation tests. Click **View Report** to view the cluster operation report.

Create Cluster Wiz				X
Before You Begin Select Servers Validation Warning	Add the names of all th	e servers that you want to have in	the cluster. You must add at leas	t one server.
Access Point for Administering the Cluster	Enter server name: Selected servers:	mercury.space.com		Browse
Confirmation		venus.space.com		Remove
Creating New Cluster				11011010
Summary				
		1		
			< Previous Next >	Cancel

- **6** In the **Select Servers** screen, do the following:
 - a In the Enter server name box, enter the relevant server name and click Add. The server name gets added in the Selected servers box.

Note: You can either enter the server name or click **Browse** to select the relevant server name.

b Click Next. The Access Point for Administering the Cluster area appears.

Freate Cluster Wi	zard X
Before You Begin Select Servers Validation Warning Access Point for Administering the Cluster Confirmation Creating New Cluster Summary	Type the name you want to use when administering the cluster. Cluster Name: One or more DHCP IPv4 addresses were configured automatically. All networks were configured automatically.
	More about the administrative Access Point for a cluster
	< Previous Next > Cancel

7 In the **Cluster Name** box, enter the name of the cluster and click **Next**. The **Confirmation** area appears.

Note: Enter a valid IP address for the cluster to be created if the IP address is not configured through Dynamic Host Configuration Protocol (DHCP).

Confirma	tion		
Before You Begin Select Servers	You are ready to create a The wizard will create yo	a cluster. ur cluster with the following settings:	
Validation Warning Access Point for Administering the Cluster Confirmation Creating New Cluster Summary	Cluster: Node: Node: IP Address:	Stars1 capricorn.space.com gemini.space.com DHCP address on 10.91.60.0/23	×
	To continue, click Next.		
		< Previous Next >	Cancel

8 Click Next. The cluster is created and the Summary area appears.

Create Cluster Wi	zard		
Summary	,		
tefore You Begin ielect Servers	You have suc	ccessfully completed the Create Cluster Wizard.	
/alidation Warning Access Point for Administering the Cluster		Create Cluster	^
Confirmation Creating New Cluster Summary	Cluster: Node: Node: Quorum:	Planet mercury.space.com venus.space.com Node Majority	-
	To view the report cre To close this wizard, c	ated by the wizard, click View Report. lick Finish.	View Report
			Finish

9 Click **View Report** to view the cluster report created by the wizard or click **Finish** to close the **Create Cluster Wizard** window

Disabling the Plant Network for the Cluster Communication

After creating the Failover cluster using two or more Network Cards enabled, Make sure only Primary Network card which is used for the Communication between the Hyper-V nodes is enabled for the Failover Communication Disable the remaining Cluster Networks

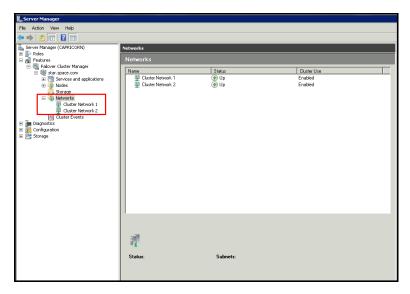
To disable the plant network for the Cluster Communication

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

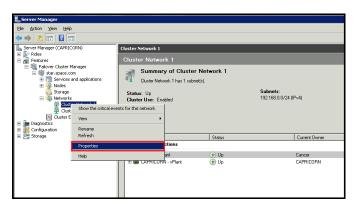
Note: You can also access the **Server Manager** window from the Administrative Tools window or the Start menu.

1			
Manager (CAPRICORN) es atures gnostics	Server Manager (CAPRICORN)	us of this server, perform top management tasks, and add or remov	ve server roles and features.
rage	 Server Summary 		Server Summary Help
	Computer Information		🕵 Change System Properties
	Full Computer Name:	CAPRICORN.space.com	View Network Connections Configure Remote Desktop
	Domain:	space.com	L Configure Server Manager Remote
	vDomain:	Assigned by DHCP	Management
	vPlant:	192.168.0.165, IPv6 enabled	
	Remote Desktop:	Enabled	
	Server Manager Remote Management:	Enabled	
	Product ID:	00486-001-0001076-84653 (Activated)	
	Do not show me this console a	It logon. This setting is controlled by Group Policy.	
	Security Information		😭 Go to Windows Firewal
	Windows Firewall:	Domain: Off, Public: Off	Configure Updates
	Windows Updates:	Install updates automatically using Windows Update	✤ Check for New Roles B Run Security Configuration Wizard
	Last checked for updates:	Never	Configure IE ESC

2 Expand the **Failover Cluster Manager** and select **Networks** to check how many networks are participating in the cluster.



3 Select Network of which is not required to be part of the Cluster Communication (for example, Private Network) and right-click to select **Properties.** The Cluster Network Properties menu dialog box appears.



4 Select the **Do not Allow cluster communication on this network** option from the **Properties** dialog box and click **OK** to apply the changes.

Cluster Network 1 Properties	×
General	
Cluster Network 1	
Name:	
Cluster Network 1	
C Allow cluster network communication on this network	vork
Allow clients to connect through this network	
Allow clents to connect through this network	
Do not allow cluster network communication on the second secon	his network
Status: Up	
Subnets: 192.168.0.0/24	
OK Cancel	Apply

5 Check the summary pane of the networks and ensure Cluster Use is disabled for the network which is not required for cluster communication

L Server Manager						
File Action View Help						
🗢 🔿 🔁 📷 🛛 🖬	🗢 🧇 📩 🖬 🔛 📷					
Server Manager (CAPRICORN)	Networks					
Roles Features	Networks					
Failover Cluster Manager						
 star.space.com m m Services and applications 	Name Cluster Network 1	Status (*) Up	Disabled			
 Imported and applications Nodes 	Cluster Network 2	() Up	Enabled			
Sorge						

Note: Repeat the above process if more than two networks which are not required for cluster communication are involved in the Cluster Setup.

Configure Cluster Quorum Settings

Quorum is the number of elements that need to be online to enable continuous running of a cluster. In most instances, the elements are nodes. In some cases, the elements also consist of disk or file share witnesses. Each of these elements determines whether the cluster should continue to run.

All elements, except the file share witnesses, have a copy of the cluster configuration. The cluster service ensures that the copies are always synchronized. The cluster should stop running if there are multiple failures or if there is a communication error between the cluster nodes.

After both nodes have been added to the cluster, and the cluster networking components have been configured, you must configure the failover cluster quorum.

The file share to be used for the node and File Share Majority quorum must be created and secured before configuring the failover cluster quorum. If the file share has not been created or correctly secured, the following procedure to configure a cluster quorum will fail. The file share can be hosted on any computer running a Windows operating system.

To configure the cluster quorum, you need to perform the following procedures:

- Create and secure a file share for the node and file share majority quorum
- Use the failover cluster management tool to configure a node and file share majority quorum

To create and secure a file share for the node and file share majority quorum

- **1** Create a new folder on the system that will host the share directory.
- 2 Right-click the folder that you created and click **Properties**. The **Quorum Properties** window for the folder you created appears.

Note: In the following procedure, Quorum is the name of the folder.

📜 Quoru	n Properl	ties		×
General	Sharing	Security Previo	us Versions 🗍 Cust	tomize
	ork File and Quorur Not Sh ork Path:			
Not S	hared			
Set c advar	nced Sharir ustom perm nced sharir Advanced	issions, create mu ng options.	Iltiple shares, and :	set other
		OK	Cancel	Apply

3 Click the Sharing tab, and then click Advanced Sharing. The Advanced Sharing window appears.

Advanced Sharing	×
Share this folder	
Settings	
Share name:	
Quorum	
Add Remove	
Limit the number of simultaneous users to: $16777\frac{4}{2}$	
Comments:	
Permissions Caching	
OK Cancel Apply	

4 Select the **Share this folder** check box and click **Permissions**. The **Permissions for Quorum** window appears.

📕 Permissions for Quorum		×
Share Permissions		
Group or user names:		
Sector Se		
	Add	Remove
Permissions for Everyone	Allow	Deny
Full Control		
Change Read		
Learn about access control and p	ermissions	
ОК	Cancel	Apply

5 Click Add. The Select Users, Computers, Service Accounts, or Groups window appears.

Select Users, Computers, Service Accounts, or Groups	? ×
Select this object type:	
Users, Groups, or Built-in security principals	Object Types
From this location:	
	Locations
Enter the object names to select (<u>examples</u>):	
<node1>,<node2>,<cluster name=""></cluster></node2></node1>	Check Names
Advanced	DK Cancel

6 In the Enter the object name to select box, enter the two node names used for the cluster in the medium node configuration and click OK. The node names are added and the Permissions for Quorum window appears.

🔋 Permissions for Quorum		×
Share Permissions		
Group or user names:		
Everyone		
	Add	Remove
Permissions for Everyone	Allow	Deny
Full Control		
Change Read		
Learn about access control and p	ermissions	
ОК	Cancel	Apply

7 Select the Full Control, Change, and Read check boxes and click OK. The Properties window appears.

📙 Quorum Properties 🛛 🛛 🔀
General Sharing Security Previous Versions Customize
Network File and Folder Sharing Quorum Not Shared Network Path: Not Shared Share
Advanced Sharing Set custom permissions, create multiple shares, and set other advanced sharing options.
OK Cancel Apply

8 Click **Ok**. The folder is shared and can be used to create virtual machines.

To configure a node and file share majority quorum using the failover cluster management tool

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

Server Manager					
	Help				
🗢 🔿 🔁 💽 🛛	? 📊				
🛼 Server Manager (C	APRICORN)	Star.space.com		l .	
E P Roles		Cluster Star.sp	ace.com		
E 📑 Hyper-1	/ Manager PRICORN	Summary	of Cluster Star		
E 🚮 Features	ister Manager	Starhas 0 ap	plications/services and 2 nodes		
● 鬰 Star.e	Configure a Se	rvice or Application	h		Networks: Cluster Network 1, Cluster Network 2
Diagnostics Configuration	Validate This C		: Capricom		Subnets: 2 IPv4 and 0 IPv6
E Storage -	View Validation	idation Report In: 🗼 Node Majority - Warning: Failure of a node will cause the cluster to fail. Check the status of the nodes.			node will cause the cluster to fail. Check the status of the nodes.
한 Windows	Enable Cluster	Shared Volumes	hts: None in the last 24 hours		
📑 Disk Mana	Add Node				
	Close Connect	ion		-	
	More Actions	. 🕨	Configure Cluster Quorum Setti	ngs	e or more servers (nodes), or migrate services and applications from a cluster Server 2008 R2.
	View	۰,	Migrate services and application	is	and applications you can configure for high availability
	Refresh		Shut down Cluster		nding cluster validation tests
	Properties		Destroy Cluster		nding Cluster Shared Volumes
	Help		2	Add a se	rver to your cluster
		Migrate service:	s and applications	Migrating Server 2	a cluster from Windows Server 2003, Windows Server 2008, or Windows 008 R2
		Navigate to Sto	rage to add disks		

2 Right-click the name of the cluster you created and click More Actions. Click Configure Cluster Quorum Settings. The Configure Cluster Quorum Wizard window appears.

Configure Cluster Quorum Wizard				
Before Y	'ou Begin			
Before You Begin Select Quorum Configuration Confirmation Configure Cluster	This wizard guides you through configuration of the quorum for a fallover cluster. The quorum configuration determines the point at which too many failures of certain cluster elements will stop the cluster from running. The relevant cluster elements are the nodes and in some quorum configurations, a disk whites which contains a copy of the cluster configuration (or file share whitese). A majority of these elements must remain online and in communication, or the cluster "loses quorum" and must stop running.			
Quorum Settings Summary	Note that full function of a cluster depends not just on quorum, but on the capacity of each node to support the services and applications that fail over to that node, rowsample, a cluster that has it've nodes could still have quorum after two nodes fail, but each remaining cluster node would continue serving clients only if it had enough capacity to support the services and applications that failed over to it. Important: Run this wizard only if you have determined that you need to change the quorum configuration			
	for your cluster. When you create a cluster, the cluster software automatically chooses the quorum configuration that will provide the highest availability for your cluster. To continue, click Next. <u>More about quorum configurations</u>			
	Do not show this page again Next > Cancel			

3 View the instructions on the wizard and click **Next**. The **Select Quorum Configuration** area appears.

Note: The **Before you Begin** screen appears the first time you run the wizard. You can hide this screen on subsequent uses of the wizard.

Configure Cluster Quorum Wizard		
Before You Begin Select Quorum Configure File Share Witness Confirmation Configure Cluster Quorum Settings Summary	Read the descriptions and then select a quorum configuration for your cluster. The recommendations are based on providing the highest availability for your cluster. Node Majority (not recommended for your current number of nodes) Can sustain failures of 0 node(s). Node and Disk Majority Can sustain failures of 1 node(s) with the disk witness online. Can sustain failures of 0 node(s) if the disk witness online. Can sustain failures of 0 node(s) if the disk witness online. Can sustain failures of 0 node(s) if the disk witness goes offline or fails. Node and File Share Majority (for clusters with special configurations) Can sustain failures of 1 node(s) if the file share witness ternains available. Can sustain failures of 0 node(s) if the file share witness envirable. Can sustain failures of 0 node(s) if the file share witness ternains available. Can sustain failures of 1 node(s) if the file share witness ternains available. Can sustain failures of 1 node(s) if the file share witness ternains available. Can sustain failures of 1 node(s) the file share witness ternains available. Can sustain failures of 1 node(s) the file share witness ternains available. Can sustain failures of 1 node(s) the file share witness ternains available. Can sustain failures of all nodes except 1. Cannot sustain a failure of the quorum disk. This configuration is not recommended because the disk is a single point of failure. More about quorum configurations	
	< Previous Next> Cancel	

4 You need to select the relevant quorum node. For special configurations, click the **Node and File Share Majority** option and click **Next**. The **Configure File Share Witness** area appears.

Note: Click the **Node Majority** option if the cluster is configured for node majority or a single quorum resource. Click the **Node and Disk Majority** option if the number of nodes is even and not part of a multi site cluster. Click the **No Majority: Disk Only** option if the disk being used is only for the quorum.

Configure Cluster Quorum Wizard		
Before You Begin Select Quorum Configuration Configure File Share Witness Confirmation Configure Cluster Quorum Settings Summary	Please select a shared folder that will be used by the file share witness resource. This shared folder must not be hosted by this cluster. It can be made more available by hosting it on another cluster. Schared Folder Path: Nuniverse\Shared Browse	
	< <u>Previous</u> Cancel	

5 In the **Shared Folder Path** box, enter the Universal Naming Convention (UNC) path to the file share that you created in the Shared Folder Path field, and then click **Next**. Permissions to the share are verified. If there are no problems with the access to the share, the **Confirmation** screen appears.

Note: You can either enter the server name or click **Browse** to select the relevant shared path.

Configure Cluster	
Before You Begin Select Quorum Configuration	You are ready to configure the quorum settings of the cluster.
Configure File Share Witness	Share: \\universe\Shared Quorum Configuration: Node and File Share Majority
Confirmation Configure Cluster Quorum Settings Summary	Your cluster quorum configuration will be changed to the configuration shown above.
	< Previous Next > Cancel

6 The details you selected are displayed. To confirm the details click **Next**. The **Summary** screen appears and the configuration details of the quorum settings are displayed.

📲 Configure Cluster Quorum Wizard 🛛 🗙 🗙				
Summary				
Before You Begin Select Quorum Configuration	You have successfully configured the quorum settings for the cluster.			
Configure File Share Witness	Configure Cluster Quorum Settings 🖹			
Confirmation	comgare chaoter quorum cottinge			
Configure Cluster Quorum Settings Summary	Share: \\universe\Shared Quorum Configuration: Node and File Share Majority			
	To view the report created by the wizard, click View Report. View Report View Report			
	Finish			

7 Click View Report to view a report of the tasks performed, or clickFinish to close the window.

After you configure the cluster quorum, you must validate the cluster. For more information, refer to http://technet.microsoft.com/en-us/library/bb676379(EXCHG.80).aspx.

Configuring Storage

For any virtualization environment, storage is one of the central barriers to implementing a good virtualization strategy. But with Hyper-V, VM storage is kept on a Windows file system. Users can put VMs on any file system that a Hyper-V server can access. As a result, you can build HA into the virtualization platform and storage for the virtual machines. This configuration can accommodate a host failure by making storage accessible to all Hyper-V hosts so that any host can run VMs from the same path on the shared folder. The back-end part of this storage can be a local storage area network, iSCSI or whatever is available to fit the implementation.

The following table lists the minimum storage recommendations for each VM:

System	Processor
Historian Virtual Machine	200 GB
Application Server (GR node) Virtual Machine	100 GB
Application Engine 1(Runtime node) Virtual Machine	80 GB
Application Engine 2 (Runtime node) Virtual Machine	80 GB
InTouch Virtual Machine	80 GB
Information Server Virtual Machine	80 GB
Historian Client	80 GB

The recommended total storage capacity should be minimum 1TB.

Configuring Hyper-V

Microsoft Hyper-V Server 2008 R2 helps in creating virtual environment that improves server utilization. It enhances patching, provisioning, management, support tools, processes, and skills. Microsoft Hyper-V Server 2008 R2 provides live migration, cluster shared volume support, expanded processor, and memory support for host systems.

Hyper-V is available in x64-based versions of Windows Server 2008 R2 operating system, specifically the x64-based versions of Windows Server 2008 R2 Standard, Windows Server 2008 R2 Enterprise, and Windows Server 2008 Datacenter.

The following are the pre-requisites to set up Hyper-V:

- x64-based processor
- Hardware-assisted virtualization
- Hardware Data Execution Prevention (DEP)

To configure Hyper-V

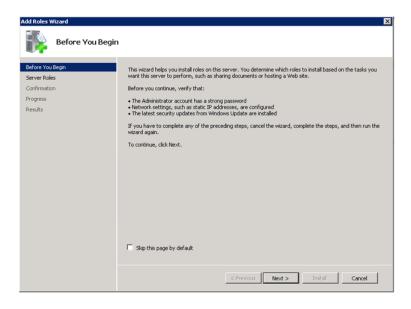
1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

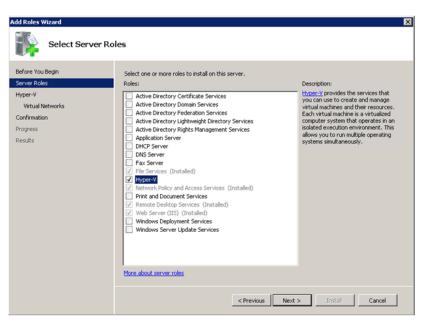
Eserver Manager		_ 8
File Action View Help		
(= =) (<u>*</u> 1		
Server Manager (UNIVERSE) D Server Manager Roles D D D D D D D D D D D D D D Server Server	Roles Wew the health of the roles installed on your server and add or remove roles and features.	
		Add Roles Add Roles Remove Roles
	Active Directory Domain Services	AD DS Help
	Stores directory data and manages communication between users and domains, including user logon processes, authentication, and directory searches.	
	ⓒ Role Status	Go to Active Directory Domain Services
	Messages: 1 System Services: 8 Running, 2 Stopped ② Events: 4 Informational in the last 24 hours Best Practices Analyzer: To start a Best Practices Analyzer scan, go to the Best Practices Analyzer tile on this role's homepage and click Scan this Role	

2 In the Roles Summary area, click Add Roles. The Add Roles Wizard window appears.

Note: You can also right-click **Roles**, and then click **Add Roles Wizard** to open the **Add Roles Wizard** window.



3 View the instructions on the wizard and click **Next**. The **Select Server Roles** area appears.



4 Select the **Hyper-V** check box and click **Next**. The **Create Virtual Networks** area appears.

Add Roles Wizard			×
Create Virtual No	etworks		
Before You Begin Server Roles Hyper-V Virtual Networks Confirmation	can create virtual machines and One virtual network will be create	ed for each network adapter you select. We recomm use with virtual machines. You can add, remove, an	and that you create at
Progress		Michaele & dealers	
Results	Name Local Area Connection	Network Adapter Realtek RTL8139/810x Family Fast Ethernet NIC	
	Local Area Connection 2	Broadcom NetXtreme 57:cc Gigabit Controller	
	network adapter, do not sek	erve one network adapter for remote access to this s ct it for use with a virtual network.	erver. To reserve a
	More about virtual networks		
		< Previous Next > Inst.	Cancel

5 Select the check box next to the required network adapter to make the connection available to virtual machines. Click Next. The Confirmation Installation Selections area appears.

Note: You can select one or more network adapters.

Add Roles Wizard	X
Confirm Installat	ion Selections
Before You Begin Server Roles Hyper-V Virtual Networks	To install the following roles, role services, or features, click Install. 1 informational message below This server might need to be restarted after the installation completes.
Confirmation	⊗ Hyper-¥
Progress Results	Virtual Networks : Local Area Connection
	Print, e-mail, or save this information
	< Previous Next > Instal Cancel

Add Roles Wizard		×
Installation	Results	
Before You Begin Server Roles	One or more of the following roles, role services, or features require you to restart:	
Hyper-V Virtual Networks	Hyper-V A Restart Pending	
Confirmation	A You must restart this server to finish the installation process.	
Progress		
Results		
	Print, e-mail, or save the installation report	
	< Previous Next > Close Cancel	

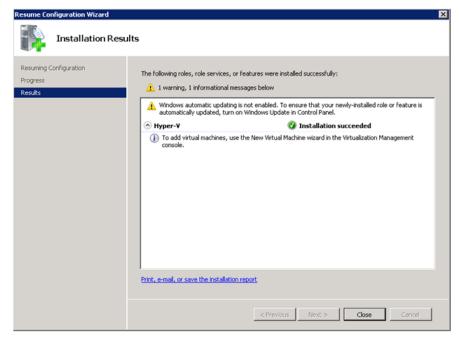
7 A message appears prompting you to restart the computer. Click Close. The Add Roles Wizard pop-up window appears.

Add Roles Wizard	Results	×
Before You Begin Server Roles Hyper-V	One or more of the following roles, 1 warning message below	role services, or features require you to restart:
Virtual Networks	All Hyper-V	🔔 Restart Pending
Confirmation	Add Roles Wizard	
Progress	Do you want to restart n	5woi
	This server must be restarte process. You cannot add or or features until the server i	remove other roles, role services,
	Print, e-mail, or save the installable	<pre>n report </pre>

8 Click **Yes** to restart the computer.

6 Click **Install**. The **Installation Results** area appears.

9 After you restart the computer, log on with the same ID and password you used to install the Hyper V role. The installation is completed and the **Resume Configuration Wizard** window appears with the installation results.



10 Click Close to close the Resume Configuration Wizard window.

Configuring Virtual Machines

After installing Hyper-V, you need to create a virtual machine.

To configure a virtual machine in the disk

1 In the Server Manager window, right-click Features, and then click Failover Cluster Manager. The Failover Cluster Manager tree expands.

📕 Server Manager		
File Action View Help		
🗢 🔿 🔰 💼		
Server Manager (VENUS)	Failover Cluster Manager	Actions
Roles B. Hyper-V	Failover Cluster Manager	Failover Cluster Manager 🛛 🔺
🖃 🏥 Hyper-V Manager	Create failover clusters, validate hardware for potential failover cluste	Validate a Configuration
Features	configuration changes to your failover clusters.	Create a Cluster
🖃 🍓 Fallover Cluster Manager		Manage a Cluster
 Planet.space.com Services and application 	* Overview	View
🗉 🍯 Nodes	A failover cluster is a set of independent computers that work together to	Properties
Call Storage	availability of services and applications. The clustered servers (called nod physical cables and by software. If one of the nodes fails, another node b	🛛 Help
Cluster Events	services (a process known as failover).	-
Diagnostics Configuration		
Storage	* Clusters	
	Planet space.com	
	* Management	
	To begin to use failover clustering, first validate your hardware configurati cluster. After these steps are complete, you can manage the cluster. Ma include migrating services and applications to it from a cluster running Wir Windows Server 2008, or Windows Server 2008 R2.	
	Judestanding	
× >		

2 Right-click Services and applications, click Virtual Machines, and then click New Virtual Machine. The New Virtual Machine Wizard window appears.

🏚 New Yirtual Machine Wizard 🛛 🔀 🔀		
Before You E	Begin	
Before You Begin Specify Name and Location Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	This wizard helps you create a virtual machine. You can use virtual machines in place of physical computers for a variety of uses. You can use this wizard to configure the virtual machine now, and you can change the configuration later using Hyper-V Manager. To create a virtual machine, do one of the following: • Click Finish to create a virtual machine that is configured with default values. • Click Next to create a virtual machine with a custom configuration. To not show this page again More about creating virtual machines	
	<previous next=""> Finish Cancel</previous>	

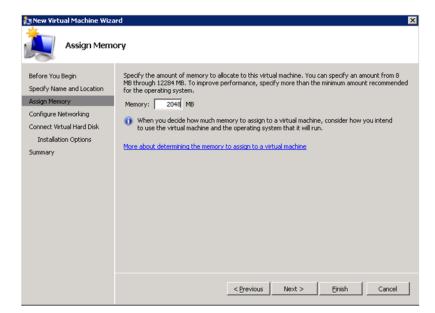
3 View the instructions in the **Before You Begin** area and click **Next**. The **Specify Name and Location** area appears.

New Virtual Machine Wiza	e and Location
Before You Begin Specify Name and Location Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	Choose a name and location for this virtual machine. The name is displayed in Hyper-V Manager. We recommend that you use a name that helps you easily identify this virtual machine, such as the name of the guest operating system or workload. Name: Interview Inte

- **4** In the **Specify Name and Location** area, do the following:
 - **a** In the **Name** box, enter a name for the virtual machine.
 - **b** Select the **Store the virtual machine is a different location** check box to be able to indicate the location of the virtual machine.
 - **c** In the **Location** box, enter the location where you want to store the virtual machine.

Important: In the medium scale virtualization environment, SAN storage disk can be used for creating virtual machines.

Note: You can either enter the path to the filename or click **Browse** to select the relevant server name.



5 Enter the recommended amount of memory in the **Memory** box and click **Next**. The **Configure Networking** area appears.

Configure No	
Before You Begin Specify Name and Location Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	Each new virtual machine includes a network adapter. You can configure the network adapter to use a virtual network, or it can remain disconnected. Connection: Domain = Virtual Network More about configuring network adapters
	< Previous Next > Finish Cancel

d Click Next. The Assign Memory area appears.

6 Select the network to be used for the virtual machine and click **Next**. The **Connect Virtual Hard Disk** area appears.

🏚 New Virtual Machine Wiza	rd 🛛 🗙
Connect Virt	ual Hard Disk
Before You Begin Specify Name and Location Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	A virtual machine requires storage so that you can install an operating system. You can specify the storage now or configure it later by modifying the virtual machine's properties. C Create a virtual hard disk Name: HistorianVM.vhd Location: G:[HistorianVM] Browse Size: 4G GB (Maximum: 2040 GB) C Use an existing virtual hard disk Location: [\verus!Appserver\ Browse C Attach a virtual hard disk later
	< Previous Next > Finish Cancel

- 7 Click the **Create a virtual hard disk** option and then do the following:
 - **a** In the Name box, enter the name of the virtual machine.
 - **b** In the **Location** box, enter the location of the virtual machine.

Note: You can either enter the location or click **Browse** to select the location of the virtual machine and click Next.

c In the **Size** box, enter the size of the virtual machine and then click **Next**. The **Installation Options** area appears.

Note: You need to click either the **Use an existing virtual hard disk** or the **Attach a virtual hard disk later** option, only if you are using an existing virtual hard disk, or you want to attach a virtual disk later.

fore You Begin ecify Name and Location	You can install an operating system now if you have access to the setup media, or you can install it later.
sign Memory	Install an operating system later Install an operating system from a boot CD/DVD-ROM
nfigure Networking nnect Virtual Hard Disk	Media
Installation Options	Physical CD/DVD drive: B:
mmary	C Image file (.iso): Browse
	Install an operating system from a boot floppy disk
	Media
	Virtual floppy disk (.vfd): Browse
	Install an operating system from a network-based installation server

8 Click the Install an operating system later option and click Next. The Completing the New Virtual Machine Window area appears.

Note: If you want to install an operating system from a boot CD/DVD-ROM or a boot floppy disk or a network-based installation server, click the relevant option.

Completing	ard 🛛 🔀
Before You Begin Specify Name and Location Assign Memory Configure Networking Connect Virtual Hard Disk Installation Options Summary	You have successfully completed the New Virtual Machine Wizard. You are about to create the following virtual machine. Description: Name: HistorianVM Memory: 2048 MB Network: Domain - Virtual Network Hard Disk: G:\HistorianVM/HistorianVM.vhd Operating System: Will be installed at a later time
	To create the virtual machine and close the wizard, click Finish. < Previous Next > Finish Cancel

9 Click **Finish**. The virtual machine is created with the details you provided. As we have started this process from the Failover Cluster Manager, after completing the process of creating a virtual machine, the **High Availability Wizard** window appears.

High Availability W	fizard		
Summary			
nfigure High ailability mmary	High availability was successfi	ally configured for the service or application	in.
	🔋 Virtual Machi	ne	
	Name	Result	Description
	HistorianVM		Warning
	To view the report created by the wizar To close this wizard, click Finish.	d, click View Report.	View Report
			Finish

10 Click View Report to view the report or click Finish to close the High Availability Wizard window.

Note: You can use the above procedure to create multiple virtual machines with appropriate names and configuration.

Failover of the Virtual Machine if the Private Network is Disabled

Whenever public network is disconnected on the node where the virtual machines are running, Failover Cluster Manager force failover of all the Virtual Machine Services and application to the other host node in the cluster. If the private network which is not participating in the cluster communication fails, Failover Cluster Manager does not failover any Cluster Service or Application.

To overcome this, we need to add a script which detects the private network failure as a dependency to the Virtual Machine. This results in failover of the Virtual Machine when the script fails.

To add a script which enables the failover of the virtual machine if the private network is disabled

- 1 Add a script to the virtual machine. Follow the process mentioned in the following URL to add the script: http://gallery.technet.microsoft.com/ScriptCenter/5f7b4df3-af02-47 bf-b275-154e5edf17e6/
- **2** After adding the Script to a Virtual Machine, the summary pane of the Virtual Machine will be displayed as below.

NodeNew		
RNodeNew		Recent Cluster Events: 🛕 Erro
Summary of GRNodeN	le w	
Status: Online		Auto Start: Yes
Alerts: <none></none>		
Preferred Owners: Cancer, CAPRICO	IRN	
Current Owner: Cancer		
Name	Status	
Virtual Machine		
표 🍯 Virtual Machine GRNodeNew	💿 Running	
Disk Drives		
🕀 🧰 Cluster Disk 4	💿 Online	
Other Resources		
🖹 nicha Script	💿 Online	

3 Right click on the **Disk Resource** and click on **Properties** menu which opens **Disk Properties Dialog** box.

GRNodeNew				
GRNodeNew Recent Cluster Events: 🔺				
Summary of GRNodeNe	2 ₩			
Status: Online		Auto Start: Yes		
Alerts: <none></none>				
Preferred Owners: Cancer, CAPRICOR	N			
Current Owner: Cancer				
Name	Status			
Virtual Machine				
🗉 📋 Virtual Machine GRNodeNew	💿 Running			
Disk Drives				
🕀 🧰 Cluster Disk 4	📀 Online	Bring this resource online		
Other Besources		Take this resource offline		
🗐 nicha Script	(Online	Change drive letter		
	Ĭ	Remove from GRNodeNew		
		Show the critical events for this resource		
		Show Dependency Report		
		More Actions •		
		Properties		
	-	Help		

4 Navigate to the **Dependencies** tab and select **nicha Script** from the **Resource** Combo box and press **OK**.

Eluster Di	sk 4 Proper	ties 🛛	×
General	Dependenc	ies Policies Advanced Policies Shadow Copies	
		s that must be brought online before this resource can	
	AND/OR	Resource	ł
•		nicha Script 📃 🗾	ł
* CI	lick here to ac	nicha Script	ł
			I
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			I
		Insert Delete	ł
nicha	Script		
nicha (oonpe		
		How resource dependencies work	
		OK Cancel Apply	

Note: By adding this, if the Script fails when Private network is disabled, Disk Resource will also fail and try to move the Virtual Machine service to the backup node.

Configuration of System Platform Products in a Typical Medium Scale Virtualization

To record the expected Recovery Time Objective (RPO) and Recovery Point Objective (RPO), trends and various observations in a medium scale virtualization environment, tests are performed with System Platform Product configuration shown below.

The virtualization host server used for medium scale configuration consists of seven virtual machines listed below.

Node 1 (GR): GR, InTouch and DAS SI Direct – Windows 2008 R2 Standard edition (64bit) OS with SQL Server 2008 SP1 32 bit

Node 2 (AppEngine1): Bootstrap, IDE and InTouch (Managed App) – Windows 2008 R2 Standard edition (64bit) OS

Node 3 (AppEngine2): Bootstrap, IDE – Windows 2008 R2 Standard edition (64bit) OS

Node 4: Historian – Windows 2008 R2 Standard edition (64bit) OS with SQL Server 2008 SP1 32 bit

Node 5: Information Server, Bootstrap and IDE – Windows Server 2008 SP2 (32bit) with SQL Server 2008 SP1 and Office 2007

Node 6: InTouch Terminal Service – Windows 2008 R2 Standard edition (64bit) OS enabled with Terminal Service

Node 7: Historian Client and InTouch – Windows 7 Professional Edition (64bit) OS with SQL Server 2008 SP1 32 bit

Virtual Node	IO tags (Approx.)	Historized tags(Approx.)
AppEngine1	25000	10000
AppEngine2	25000	10000

Historized tags and their Update Rates for this Configuration

The following table shows historized tags and their update rates for this configuration:

Topic Name	Update Rate	Device Items	Active Items
Topic 13	1000	1241	374
Topic 0	500	14	5
Topic 1	1000	1	1
Topic 2	10000	5002	2126
Topic 3	30000	5002	2126
Topic 4	60000	5002	2126
Topic 5	3600000	5001	2125
Topic 7	600000	5001	2589
Topic 8	10000	3841	1545
Topic 9	30000	1281	885
Topic 6	18000000	2504	1002
Topic 39	1000	4	4
Topic 16	180000	1000	350

Real Time data from DAS SI Direct

Late tags and buffered tags from DAS test Server

Topic Name	Update Rate	Device Items	Active Items
Late Data (1 hour)	1000	465	208
Buffered Data	1000	198	119

Application Server Configuration Details

Total No of Engines: 15

Number of objects under each Engine

- Engine 1 : 9
- Engine 2 : 2
- Engine 3 : 492
- Engine 4 : 312
- Engine 5 : 507
- Engine 6 : 2
- Engine 7 : 24
- Engine 8 : 24
- Engine 9 : 250
- Engine 10: 508
- Engine 11: 506
- Engine 12: 4
- Engine 13: 22
- Engine 14: 1
- Engine 15: 1

Number of DI objects: 6

Expected Recovery Time Objective and Recovery Point Objective

This section provides the indicative Recovery Time Objectives (RTO) and Recovery Point Objectives (RPO) for the load of IO and Attributes historized shown above and with the configuration of Host Virtualization Servers and Hyper-V virtual machines explained in the Setup instructions of Medium Scale Virtualization. In addition to these factors, the exact RTO and RPO depend on factors like storage I/O performance, CPU utilization, memory usage, and network usage at the time of failover/migration activity.

RTO and RPO Observations—HA Medium Configuration

Scenarios and observations in this section:

Scenario	Observation
Scenario 1: IT provides maintenance on Virtualization Server	"Scenario 1: IT provides maintenance on Virtualization Server" on page 162
	"Quick Migration" on page 163
	"Quick Migration of all nodes simultaneously" on page 164
Scenario 2: Virtualization Server hardware fails	"Scenario 2: Virtualization Server hardware fails" on page 165
Scenario 3: Network fails on Virtualization Server	"Scenario 3: Network fails on Virtualization Server" on page 166
Scenario 4: Virtualization Server becomes unresponsive	"Scenario 4: Virtualization Server becomes unresponsive" on page 169

The following tables display RTO and RPO observations with approximately 50000 IO points with approximately 20000 attributes being historized:

Scenario 1: IT provides maintenance on Virtualization Server

Live Migration

Products	RTO	RPO	
		Tags	Data Loss Duration
InTouch HMI	13 sec	Data Loss for \$Second tag (Imported to Historian)	13 sec
GR	10 sec	IAS Tag (Script)	12 sec
		IAS IO Tag (DASSiDirect)	59 sec
AppEngine1	15 sec	IAS Tag (Script)	22 sec
	-	IAS IO Tag (DASSiDirect)	57 sec
AppEngine2	7 sec	IAS Tag (Script)	11 sec
	-	IAS IO Tag (DASSiDirect)	57 sec
Historian Client	9 sec	SysTimeSec (Historian)	0 sec
	-	\$Second (InTouch)	2 m sec
	-	IAS Tag (Script)	0 (Data is SFed)
	-	IAS IO Tag (DASSiDirect)	0 (Data is SFed)
DAServer SIDirect	14 sec	N/A	N/A
Historian Client	0 sec	N/A	N/A
Information Server	5 sec	N/A	N/A

Products	RTO	RPO	
		Tags	Data Loss Duration
InTouch HMI	31 sec	Data Loss for \$Second tag (Imported to Historian)	27 sec
GR	50 sec	IAS Tag (Script)	50 sec
		IAS IO Tag (DASSiDirect)	1 Min 51 Sec
AppEngine1	35 sec	IAS Tag (Script)	35 sec
		IAS IO Tag (DASSiDirect)	54 sec
AppEngine2	41 sec	IAS Tag (Script)	44 sec
		IAS IO Tag (DASSiDirect)	1 Min 14 Sec
Historian Client	84 sec	SysTimeSec (Historian)	1 Min 25 Sec
		\$Second (InTouch)	1 Min 51 Sec
		IAS Tag (Script)	0 (data is SFed)
		IAS IO Tag (DASSiDirect)	0 (data is SFed)
DAServer SIDirect	50 sec	N/A	N/A
Historian Client	1 Min 32 Sec	N/A	N/A
Information Server	33 sec	N/A	N/A

Quick Migration

Quick Migration of all nodes simultaneously

The following table displays the data for Quick Migration of all nodes.

		RPO	
Products	RTO		
		Tags	Data Loss Duration
InTouch HMI	28 Sec	Data Loss for \$Second tag (Imported to Historian)	1 Min 40 Sec
GR	104 Sec	IAS Tag (Script)	1 Min 36 Sec
		IAS IO Tag (DASSiDirect)	4 Min 14 Sec
AppEngine1	67 Sec	IAS Tag (Script)	1 Min 20 Sec
		IAS IO Tag (DASSiDirect)	4 Min 11 Sec
AppEngine2	54 Sec	IAS Tag (Script)	52 Sec
		IAS IO Tag (DASSiDirect)	4 Min 28 Sec
Historian Client	73 Sec	SysTimeSec (Historian)	1 Min 14 Sec
		\$Second (InTouch)	1 Min 40 Sec
		IAS Tag (Script)	1 Min 36 Sec
		IAS IO Tag (DASSiDirect)	4 Min 14 Sec
DAServer SIDirect	107 Sec	N/A	
Historian Client	38 Sec	N/A	
Information Server	36 Sec	N/A	

Scenario 2: Virtualization Server hardware fails

The Virtualization Server hardware failure results in failover that is simulated with power-off on the host server. In this case, the VMs restart, after moving to the other host server.

Products	RTO	RPO	
		Tags	Data Loss Duration
InTouch HMI	335 Sec + time taken by the user to start the InTouchView	Data Loss for \$Second tag (Imported to Historian)	6 Min 47 Sec.
		Note: RPO is dependent of user to start the InTouchV and the RTO of the Historia	iew on the InTouch node
GR	313 Sec	IAS Tag (Script)	5 Min 44 Sec
		IAS IO Tag (DASSiDirect)	7 Min 28 Sec
AppEngine1	365 Sec	IAS Tag (Script)	6 Min 35 Sec
		IAS IO Tag (DASSiDirect)	7 Min 29 Sec
AppEngine2	372 Sec	IAS Tag (Script)	6 Min 41 Sec
		IAS IO Tag (DASSiDirect)	7 Min 20 Sec
Historian Client	381 Sec	SysTimeSec (Historian)	6 Min 33 Sec
		\$Second (InTouch)	6 Min 47 Sec
user to start the InTouchV		Note: RPO is dependent on user to start the InTouchView and the RTO of the Historian this tag.	on the InTouch node
		IAS Tag (Script)	5 Min 45 Sec
		IAS IO Tag (DASSiDirect)	7 Min 30 Sec

Products	RTO	RPO	
		Tags	Data Loss Duration
DAS SIDirect	265 Sec	N/A	N/A
Historian Client	214 Sec + time taken by the user to start the Historian Client	N/A	N/A
Information Server	255 Sec + time taken by the user to start the Information Server	N/A	N/A

Scenario 3: Network fails on Virtualization Server

Failover due to Network Disconnect (Public)

In this case, after the VMs move to the other host server, the VMs restart.

Products	RTO	RPO	
		Tags	Data Loss Duration
InTouch HMI	150 sec + time taken by the user to start the InTouchView	Data Loss for \$Second tag (Imported to Historian)	4 Min 14 Sec
		Note: RPO is dependent on user to start the InTouchView and the RTO of the Historian this tag.	on the InTouch node
GR	197 sec	IAS Tag (Script)	3 Min 41 Sec
		IAS IO Tag (DASSiDirect)	3 Min 50 Sec

Products	RTO	RPO)
		Tags	Data Loss Duration
AppEngine1	188 sec	IAS Tag (Script)	3 Min 31 Sec
		IAS IO Tag (DASSiDirect)	4 Min 2 Sec
AppEngine2	200 sec	IAS Tag (Script)	3 Min 41 Sec
		IAS IO Tag (DASSiDirect)	4 Min 08 Sec
Historian Client	236 sec	SysTimeSec (Historian)	3 Min 55 Sec
		\$Second (InTouch)	4 Min 14 Sec
		Note: RPO is dependent the user to start the InTo InTouch node and the RTC node, which historizes thi	uchView on the O of the Historian
		IAS Tag (Script)	3 Min 41 Sec
		IAS IO Tag (DASSiDirect)	3 Min 50 Sec
DAServer SIDirect	174 sec	N/A	N/A
Historian Client	163 sec + time taken by the user to start the Historian Client	N/A	N/A
Information Server	66 sec + time taken by the user to start the Information Server	N/A	N/A

Failover due to network disconnect (plant)

In this case, only the GR Node moves to other host server and restarts. Only GR has data acquisition through Plant network and disconnected Plant network results in failover of GR alone.

Products	RTO	RPO	
		Tags	Data Loss Duration
InTouch HMI	N/A	Data Loss for \$Second tag (Imported to Historian)	N/A
GR	97 Sec	IAS Tag (Script)	1 Min 43 Sec
		IAS IO Tag (DASSiDirect)	1 Min 46 Sec
AppEngine1	N/A	IAS Tag (Script)	N/A
		IAS IO Tag (DASSiDirect)	1 Min 50 Sec
AppEngine2	N/A	IAS Tag (Script)	N/A
		IAS IO Tag (DASSiDirect)	1 Min 58 Sec
Historian Client	N/A	SysTimeSec (Historian)	N/A
		\$Second (InTouch)	N/A
		IAS Tag (Script)	1 Min 43 Sec
		IAS IO Tag (DASSiDirect)	1 Min 46 Sec
DAServer SIDirect	111 Sec	N/A	N/A
Historian Client	N/A	N/A	N/A
Information Server	N/A	N/A	N/A

Scenario 4: Virtualization Server becomes unresponsive

There is no failover of VMs to the other host server when the CPU utilization on the host server is 100%.

Products	RTO	RPO	
		Tags	Data Loss Duration
InTouch HMI	N/A	N/A	N/A
GR	N/A	N/A	N/A
	N/A	N/A	N/A
AppEngine1	N/A	N/A	N/A
	N/A	N/A	N/A
AppEngine2	N/A	N/A	N/A
Historian Client	N/A	N/A	N/A
	N/A	N/A	N/A
	N/A	N/A	N/A
	N/A	N/A	N/A
DAServer SIDirect	N/A	N/A	N/A
Historian Client	N/A	N/A	N/A
Information Server	N/A	N/A	N/A

Chapter 3

Implementing High Availability Using vSphere

The following procedures are designed to help you set up and implement High Availability using VMware vSphere. These procedures assume that you have VMware ESXiTM 5.0, vCenter ServerTM, and vSphere Client already installed.

For basic procedures to install these and other VMware products, see product support and user documentation at http://www.vmware.com/.

The High Availability vSphere implementation assumes that you are implementing a a medium-scale system.

This section contains the following topics:

- Planning the Virtualization Environment
- Configuration of System Platform Products in a Typical Virtualization Environment
- Setting up the Virtualization Environment
- Expected Recovery Time Objective and Recovery Point Objective

Planning the Virtualization Environment

The minimum recommended hardware and software requirements for the Host and Virtual machines used for virtualization environment are provided in the following table:

ESXi Host

Processor	Two 2.79 GHz Intel Xeon with 8 cores (Hyper-threaded)
Operating System	SUSE Linux Enterprise Server for VMware
Memory	48 GB
Storage	SAN with 1TB storage disk

Note: For the ESXi Host to function optimally, the server should have the same processor, RAM, storage and service pack level. Preferably the servers should be purchased in pairs to avoid hardware discrepancies. Though the differences are supported, it will impact the performance during failovers.

Virtual Machines

Using the ESXi host specified above, seven virtual machines can be created in the environment with the configuration given below.

Virtual Machine 1: Historian node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	8 GB
Storage	200 GB
System Platform Products Installed	Historian

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	8 GB
Storage	100 GB
System Platform Products Installed	ArchestrA-Runtime, DAS SI

Virtual Machine 2: Application Server node, DAS SI

Virtual Machine 3: InTouch TS node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	InTouch with TS enabled

Virtual Machine 4: Application Server Runtime node 1

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Application Server Runtime only and InTouch

Virtual Machine 5: Application Server Runtime node 2

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Application Server Runtime only

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Information Server

Virtual Machine 7: Historian Client node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows 7 Enterprise
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Historian Client

Note: There should be a minimum of two vSphere hosts to configure the failover cluster.

Network Requirements

For this high availability architecture, you can use two physical network cards that need to be installed on a host computer and configured to separate the domain network and the process network.

Configuration of System Platform Products in a Typical Virtualization Environment

To record the expected Recovery Time Objective (RPO) and Recovery Point Objective (RPO), trends and various observations in a virtualization environment, tests are performed with System Platform Product configuration shown below.

The virtualization host server used for configuration consists of seven virtual machines listed below.

Node 1 (GR): GR, InTouch and DAS SI Direct – Windows 2008 R2 Standard edition (64bit) OS with SQL Server 2008 SP1 32 bit

Node 2 (AppEngine1): Bootstrap, IDE and InTouch (Managed App) – Windows 2008 R2 Standard edition (64bit) OS

Node 3 (AppEngine2): Bootstrap, IDE – Windows 2008 R2 Standard edition (64bit) OS

Node 4: Historian – Windows 2008 R2 Standard edition (64bit) OS with SQL Server 2008 SP1 32 bit

Node 5: Information Server, Bootstrap and IDE – Windows Server 2008 SP2 (32bit) with SQL Server 2008 SP1 and Office 2007

Node 6: InTouch Terminal Service – Windows 2008 R2 Standard edition (64bit) OS enabled with Terminal Service

Node 7: Historian Client and InTouch – Windows 7 Professional Edition (64bit) OS with SQL Server 2008 SP1 32 bit

Virtual Node	IO tags (Approx.)	Historized tags(Approx.)
AppEngine1	25000	10000
AppEngine2	25000	10000

Historized tags and their Update Rates for this Configuration

The following table shows historized tags and their update rates for this configuration:

Topic Name	Update Rate	Device Items	Active Items
Topic 13	1000	1241	374
Topic 0	500	14	5
Topic 1	1000	1	1
Topic 2	10000	5002	2126
Topic 3	30000	5002	2126
Topic 4	60000	5002	2126
Topic 5	3600000	5001	2125
Topic 7	600000	5001	2589
Topic 8	10000	3841	1545
Topic 9	30000	1281	885
Topic 6	18000000	2504	1002
Topic 39	1000	4	4
Topic 16	180000	1000	350

Real Time data from DAS SI Direct

Late tags and buffered tags from DAS test Server

Topic Name	Update Rate	Device Items	Active Items
Late Data (1 hour)	1000	465	208
Buffered Data	1000	198	119

Application Server Configuration Details

Total No of Engines: 15

Number of objects under each Engine

- Engine 1 : 9
- Engine 2 : 2
- Engine 3 : 492
- Engine 4 : 312
- Engine 5 : 507
- Engine 6 : 2
- Engine 7 : 24
- Engine 8 : 24
- Engine 9 : 250
- Engine 10: 508
- Engine 11: 506
- Engine 12: 4
- Engine 13: 22
- Engine 14: 1
- Engine 15: 1

Number of DI objects: 6

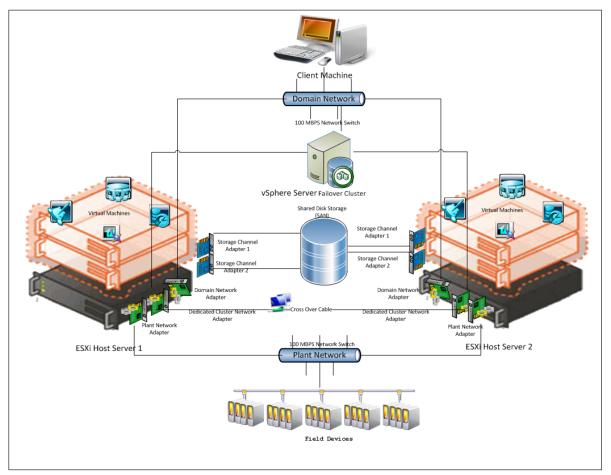
Setting up the Virtualization Environment

The following procedures help you to set up and implement the high availability virtualization environment using vSphere technology.

Note: In the event that the private network becomes disabled, you may need to add a script to enable a failover.

Creating a Datacenter

The vSphere Datacenter virtualizes an infrastructure that includes servers, storage, networks. It provides for end-to-end connectivity between client machines and field devices. The following is the recommended topology of the Datacenter, with a vSphere Failover Cluster, for a High Availability environment.



This setup requires a minimum of two host servers and one storage server shared across two hosts. The following procedures will help you to configure a Datacenter with a Failover Cluster that has two nodes to set up a virtualized High Availability environment.

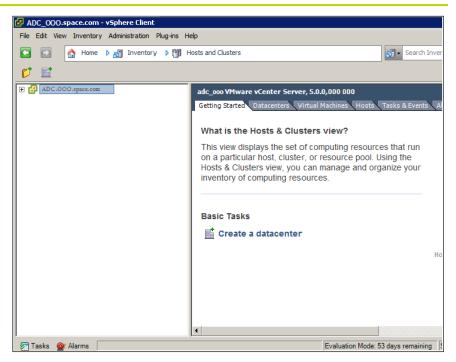
To create a Datacenter

1 Start the vSphere Client. The **VMware vSphere Client** dialog box appears.

🛃 VMware vSphere Client		×
vmware [•] VMware vSphere ^{••} Client		P
To manage multiple hosts, vCenter Server.	e host, enter the IP address or enter the IP address or name o	
IP address / Name:	IP Address/Name	<u> </u>
User name:	domaln\user name	
Password:		
	, Use Windows session crea	1 1

2 Enter the IP address or the host name of the vCenter Server computer, the user name, and the password, and then click Login. The vSphere Client page appears.

Important: If you have administrative rights, then you do not have to enter the log on credentials. Select the **Use Windows session credentials** check box, and then click **Login**.



3 On the **File** menu, click **New**, and then click **Datacenter**. A new datacenter object appears in the Inventory panel.

Tip: You can also right-click an inventory, and then click **New Datacenter**, or you can click the **Create a datacenter** icon to create a new datacenter object.

4 Enter a name for the datacenter and press **ENTER**.

To add a host to the Datacenter

- **1** Double-click the newly created datacenter in the Inventory panel. The **vSphere Client** page appears.
- **2** On the File menu, click New, and then click Add Host. The Add Host Wizard appears.

Add Host Wizard Specify Connection Settings Type in the information used to (connect to this host.
Connection Settings Hoot Summary Virtual Machine Location Ready to Complete	Connection Enter the name or IP address of the host to add to vCenter. Host: (Node Name > Authorization Enter the administrative account information for the host. vSphere Client will use this information to connect to the host and establish a permanent account for its operations. Username: Password:
Help	< Back Next > Cancel

Tip: You can also right-click a datacenter and then click **Add Host**.

3 Enter the IP address and the root credentials of the ESXi host, and then click **Next.** The **Host Summary** area appears.

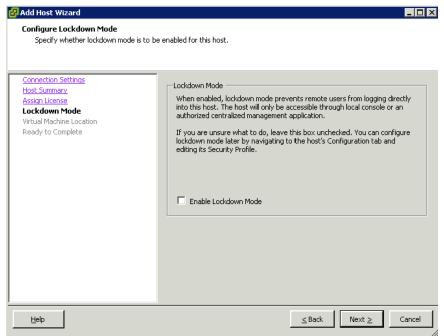
🛃 Add Host Wizard			
Host Information Review the product information for	or the specified bost.		
nonon die product monnation re	s and specified neser		
Connection Settings			
Host Summary Assign License Lockdown Mode	Name: Vendor: Model:	o add the following host to vCenter: mercury.space.com Dell Inc. Precision WorkStation T5500	
Virtual Machine Location Ready to Complete	Version:	Precision WorkStation 15500 VMware ESXi 5.0.0 build-469512	
	Virtual Machines:		
1			
Help		< Back	Next > Cancel

4 Review the host information and then click **Next**. The **Assign License** area appears.

Assign an existing or a new lic	tense key to this host.
Connection Settings Host Summary	 Assign an existing license key to this host
Assign License Lockdown Mode	Product Evaluation Mode
Virtual Machine Location Ready to Complete	(No License Key)
	C Assign a new license key to this host

Note: By default, the **Assign an existing license key to this host** option is selected.

5 Select the Assign a new license key to this host option to enter a new key, and also if your ESXi host does not have an assigned license. Click Next. The Lockdown Mode area appears.



6 Select the **Enable Lockdown Mode** check box if your security policies require the host to be inaccessible to the remote user, and then click **Next**. The **Virtual Machine Location** area appears.

🛃 Add Host Wizard		
Virtual Machine Location		
Select a location in the vCenter Serve	r inventory for the host's virtual machines.	
	-	
Connection Settings	Select a location for this host's virtual machines.	
Host Summary Assign License	Site A	
Lockdown Mode		
Virtual Machine Location		
Ready to Complete		
	1	
		1
Help	<u>≤</u> Back Next ≥	Cancel
		11.

7 Click the datacenter that you have created, and then click Next. The Ready to Complete area appears.

🛃 Add Host Wizard				_ 🗆 🗵
Ready to Complete Review the options you have selecte	d and click Finish to add	the host.		
Connection Settings Host Summary Assign License Lockdown Mode Virtual Machine Location Ready to Complete	Review this sum Host: Version: Networks: Datastores: Lockdown Mode	nary and click Finish. perpury.space.com VMware ESX 5.0.0 build-469512 VM Network datastore1 (1) SHistorian SAppEngine SWIS Disabled		
Help		< Back	Finish C	ancel

8 Review your selections and click **Finish**.

Note: Repeat this procedure to add another ESXi host.

Creating a Failover Cluster

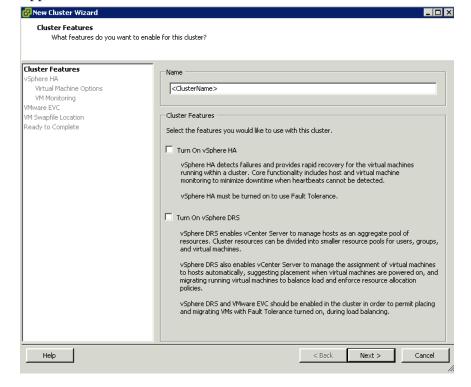
A cluster in vSphere is a group of hosts. Resources of a host added to a cluster, also known as a failover cluster, become part of the cluster's resources, and are managed by the cluster. In a vSphere High Availability environment, virtual machines automatically restart on a different physical server in a cluster if a host fails.

To create a failover cluster

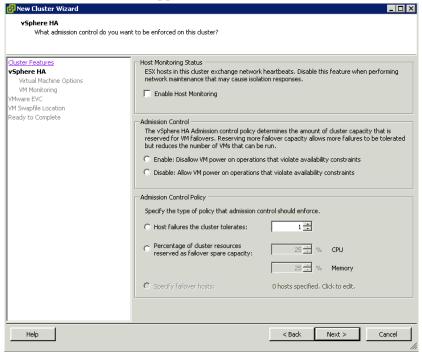
1 On the **vSphere Client** page, right-click a datacenter, and then click **New Cluster** from the context menu.

6								
P ADC_00	DO.space.com 10.00.	.00.00 ¥Mwar	e ESXi, 5.0.0	,000000 Evaluation	(48 day	s remaining)	•	
- 🛅 💋	New Folder	Ctrl+F	ary Vir	tual Machines Perform	ance C	onfiguration	Tasks & Events 🔪 Alarm	15
đ	New Cluster	Ctrl+L						
C.	New Datastore Cluster	Ctrl+U		State	Stat	116	Provisioned Space	Us
	Add Host	Ctrl+H		Powered On	0.00	Normal	74.05 GB	34
6	New Virtual Machine	Ctrl+N		Powered On	š	Normal	74.05 GB	23
-	New vSphere Distributed Switch	h Ctrl+K		Powered On	ŏ	Normal	98.05 GB	28
	Add Datastore			Powered On	0	Normal	74.15 GB	14
	Rescan for Datastores			Powered On	0	Normal	84.05 GB	51
				Powered On	0	Normal	74.05 GB	12
	Migrate Virtual Machine Networ	king		Powered On	0	Normal	197.53 GB	19
	Add Permission	Ctrl+P						
	Alarm		•					
	Open in New Window	Ctrl+Alt+N						
	Remove	CUITAICTIN						
	Rename							

- **2** Enter a name and then press **ENTER**.
- **3** Double-click the newly created cluster. The **New Cluster Wizard** appears.



4 Select the **Turn On vSphere HA** check box, and then click **Next**. The **vSphere HA** area appears.



- **5** Do the following, and then click **Next**:
 - **a** Select the **Enable Host Monitoring** check box.
 - **b** Select an **Admission Control** option.
 - c Select an appropriate Admission Control Policy option.

The Virtual Machine Options area appears.

🚱 New Cluster Wizard			
Virtual Machine Options What restart options do you v	vant to set for VMs in this cluster?		
Cluster Features YSphere HA Virtual Machine Options VM Monitoring Whware EVC VM Swapfile Location Ready to Complete	Set options that define the behavior o	f virtual machines for vSphere H.	A.
Help		< Back I	Vext > Cancel

- **6** Do the following and then click **Next**:
 - **a** From the **VM restart priority** list, select the appropriate restart priority setting.
 - **b** From the **Host Isolation response** list, select a host isolation response.

The VM Monitoring area appears.

🚱 New Cluster Wizard	
VM Monitoring What monitoring do you want t	to set on virtual machines in this cluster?
Cluster Features <u>Victual Machine Options</u> <u>WM Monitoring</u> VMware EVC VM Swapfile Location Ready to Complete	VM Monitoring Status VM Monitoring restarts individual VMs if their VMware tools heartbeats are not received within a set time. vM Monitoring: Low - - VSphere HA will restart the VM if the heartbeat between the host and the VM has not been received within a 30 second interval. vSphere HA restarts the VM after each of the first 3 failures every hour.
Help	< Back Next > Cancel

- **7** Do the following, and then click **Next**.
 - **a** From the **VM Monitoring** list, select the VM monitoring method.

b Set the Monitoring sensitivity, if you have selected VMware Tools for VM Monitoring. The VMware EVC area appears.

🛃 New Cluster Wizard			
VMware EVC Do you want to enable Enhanced v	Motion Compatibility for	this cluster?	
Cluster Features vSphere HA VMware EVC VM Swapfile Location Ready to Complete	Enhanced vMotion Co compatibility. Once er the cluster may be ad	mpatibility (EVC) configures a cluster a nabled, EVC will also ensure that only h Ided to the cluster.	and its hosts to maximize vMotion nosts that are compatible with those in
Ready to Complete	C Disable EVC	C Enable EVC for AMD Hosts	C Enable EVC for Intel® Hosts
	VMware EVC Mode:	Disabled	_
	Description		
Help		< Back	K Next > Cancel

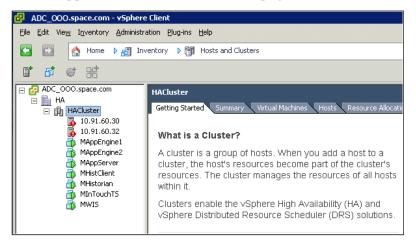
8 Select the Disable EVC option, and then click Next. The VM Swapfile Location area appears.

🚱 New Cluster Wizard		
Virtual Machine Swapfile Location Which swapfile location policy sho	n uld virtual machines use while in this cluster?	
Cluster Features ySphere HA YMware EVC YM Swapfile Location Ready to Complete	Swapfile Policy for Virtual Machines Swapfile Policy for Virtual Machines Store the swapfile in the same directory as the virtual machine (recommended) Store the swapfile in the datastore specified by the host If not possible, store the swapfile in the same directory as the virtual machine. A host specified datastore may degrade vMotion performance for the affected virtual machines.	
Help	< Back Next > Cancel	

9 Select the Store the swapfile in the same directory as the virtual machine (recommended) option to speed up vMotion, and then click Next. The Ready to Complete area appears.

Ready to Complete Cluster Features VMware EVG VM Swaofile Location Ready to Complete VM Restart Priority: VM Restart Priority: Monitoring: VM Monitoring Sensitivity: High VMware EVC Mode: Disabled Virtual Machine Swapfile Location: Same directory as the virtual machine	🛃 New Cluster Wizard			_ 🗆 🗡
VSphere HA VMware EVC VM Swaafie Location Cluster Name: <clustername> VSphere HA Host Monitoring: Running Admission Control: Enabled Admission Control Policy: Number of host Failures cluster tolerates Host Failures Allowed: 1 VM Restart Priority: Medium Host Isolation Response: Leave powered on VSphere HA VM Monitoring: VM Monitoring Cnly Monitoring Sensitivity: High VMware EVC Mode: Disabled Virtual Machine Swapfile Location: Same directory as the virtual machine</clustername>		cluster and click Finish.		
	<u>vSphere HA</u> VMware EVC VM Swapfile Location	Cluster Name: VSphere HA Host Monitoring: Admission Control Policy: Host Failures Allowed: VM Restart Priority: Host Isolation Response: vSphere HA VM Monitoring: Monitoring Sensitivity: VMware EVC Mode:	<clustername> Running Enabled Number of host failures cluster tolerates 1 Medium Leave powered on VM Monitoring Only High Disabled</clustername>	
	Help		< Back Finish	Cancel

10 Review the cluster configuration details, and then click **Finish.** The cluster appears on the **vSphere Client** page.



11 Add the hosts to the newly configured cluster.

Configuring Storage

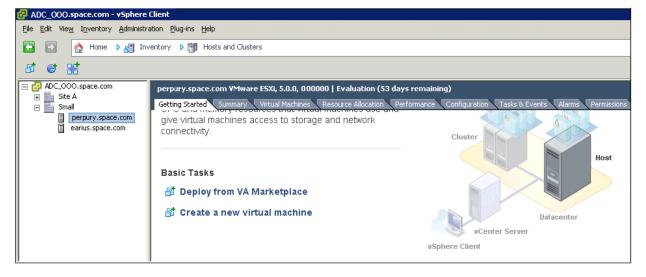
VMware Virtual Machine File System (VMFS) datastores serve as repositories for virtual machines. You can set up VMFS data stores on any SCSI-based storage devices that the host discovers, including Fiber Channel, iSCSI, and local storage devices.

Use the following procedure to create a datastore. Your new datastore is added to all hosts if you use the vCenter Server system to manage your hosts.

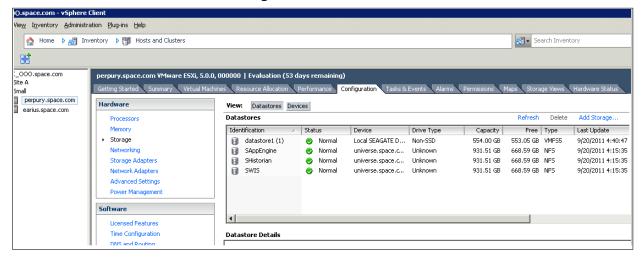
Important: Install and configure any adapter that your storage requires before creating datastores. After you create a datastore, rescan the adapters to discover the new storage device.

To create a datastore

1 Log on to vSphere Client and select a host from the Inventory panel.



- **2** Do the following to add the storage details:
 - a Click the **Configuration** tab, and then click **Storage** in the **Hardware** panel. The configuration details appear in the **Configuration** tabbed area.



b Click **Datastores**, and then click **Add Storage**. The **Add Storage** window appears.

🛃 Add Storage	
Select Storage Type Specify if you want to for	rmat a new volume or use a shared folder over the network.
Disk/LUN Select Disk/LUN File System Version Current Disk Layout Properties Formatting Ready to Complete	 Storage Type Disk/LUN Create a datastore on a Fibre Channel, ISCSI, or local SCSI disk, or mount an existing VMFS volume. Network File System Choose this option if you want to create a Network File System. Adding a datastore on Fibre Channel or ISCSI will add this datastore to all hosts that have access to the storage media.
Help	< Back Next > Cancel

3 Select the **Disk/LUN** option, and then click **Next**. The **Select Disk/LUN** area appears.

🛃 Add Storage				_ 🗆 ×
Select Disk/LUN				
Select a LUN to create a da	tastore or expand the curren	t one		
	-			
Disk/LUN Select Disk/LUN	Name, Identifier, Path ID,	LUN, Capacity, Expandable or VMF	S Label c 👻	Clear
File System Version	Name	Path ID	LUN 🗠 Drive Type	Capacity
Current Disk Layout Properties	DELL Serial Attached SCS	Disk (naa vmhba2:C0:T0:L0	0 Non-SSD	2.00 GB
Formatting	DELL Serial	Attached SCSI Disk (naa.6842b2b0	0044d3c3000002824d251fb1)	
Ready to Complete				
	•			•
				<u>ت</u>
Help			< Back Next >	Cancel

4 Click a device that you will use for your datastore, and then click **Next**. The **File System Version** area appears.

🛃 Add Storage	
File System Version Specify the version of the	VMFS for the datastore
Disk/LUN Select Disk/LUN File System Version Current Disk Layout Properties Formatting Ready to Complete	File System Version • VMFS-5 Select this option to enable additional capabilities, such as 2TB+ support. VMFS-5 is not supported by hosts with an ESX version older than 5.0. • VMFS-3 Select this option if the datastore will be accessed by legacy hosts.
Help	< Back Next > Cancel

5 Select the appropriate **File System Version** option

Important: If you have selected VMFS-3, then you must select the maximum file size in the **Formatting** area.

Click Next. The Current Disk Layout area appears.

Select Disk/LUN	Review the current disk layout:				
File System Version Current Disk Layout Properties Formatting dy to Complete	Device DELL Serial Attached SCSI Disk Location /vmfs/devices/disks/naa.6842b2bi Partition Format MBR Primary Partitions ✓ HPFS/NTFS (DELL Serial Attached There is only one layout configuration pages. All available partitions will be ▲ This configuration will delete partition table format. All file	Capa 2.00 available. Use th e used the current disk	city) GB ne Next button to j layout, change th	e file system and ch	

Important: If you have selected VMFS-3, then you must select the maximum file size in the **Formatting** area.

6 Review the current disk layout, and then click **Next**. The **Properties** area appears.

🛃 Add Storage		
Properties Specify the properties for t	the datatore	
Disk/LUN Select Disk/LUN File System Version Current Disk Layout Properties Formatting Ready to Complete	Enter a datastore name	
Help	< Back Next >	Cancel

7 Type a datastore name and then click **Next**. The **Formatting** area appears.

Add Storage	
Disk/LUN - Formatting	size and capacity of the datastore
opecity the maximum file	size and capacity of the datastore
] <u>Disk/LUN</u> Select Disk/LUN	Capacity
File System Version	• Maximum available space
Current Disk Layout	C Custom space setting
Properties Formatting	2.00 GB of 2.00 GB available space
Ready to Complete	
1	
Help	≤Back Next ≥ Cancel



8 Select the **Custom space setting** option to adjust the capacity values, and then click **Next**. The **Ready to Complete** area appears.

🖁 Add Storage		_ 🗆 ×
Ready to Complete Review the disk layout a	nd click Finish to add storage	
Disk/LUN Ready to Complete	Disk layout:	1
	Device Drive Type Capacity DELL Serial Attached SCSI Disk (n Non-SSD 2.00 GB Location /vmfs/devices/disks/naa.6842b2b00044d3c3000002824d251fb1 Partition Format GPT GPT GPT GPA	LUN O
	Primary Partitions Capacity VMFS (DELL Serial Attached SCSI D 2.00 GB	
	Properties Datastore name: <name></name>	
	Formatting File system: vmfs-5 Block size: 1 MB Maximum file size: 2.00 TB	
Help	<pre>Back Finish</pre>	Cancel

9 Review the datastore configuration information and click **Finish** to create the datastore as per your specifications.

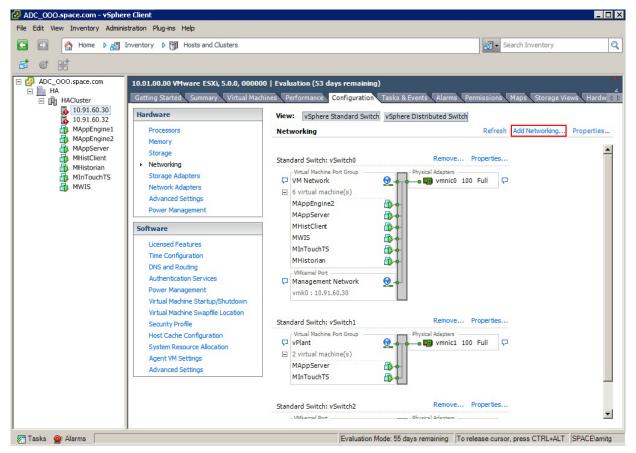
Configuring Networks

You must follow the procedures listed below to configure multiple networks on the ESXi host.

To configure networks on the ESXi host

1 Log on to vSphere Client and select a host from the **Inventory** panel.

2 Click the Configuration tab, and then click Networking on the Hardware panel. The networking details appear in the Configuration tabbed area.



3 Click Add Networking. The Add Network Wizard appears.

Add Network Wizard		_
Connection Type Networking hardware ca	n be partitioned to accommodate each service that requires connectivity.	
Connection Type Network Access Connection Settings Summary	Connection Types Virtual Machine Add a labeled network to handle virtual machine network traffic. VMkernel The VMkernel The VMkernel TCP/IP stack handles traffic for the following ESXi services: vSphere vMotion, iSCSI, NFS, and host management.	
Help	< Back Next > C	ance

4 Select the **Virtual Machine** option, and then click **Next**. The **Network Access** area appears.

Add Network Wizard		
Virtual Machines - Net Virtual machines read	work Access th networks through uplink adapters attached to vSphere standard s	witches.
Connection Type Network Access	Select which vSphere standard switch will handle the network vSphere standard switch using the unclaimed network adapted	
Connection Settings Summary	C Create a vSphere standard switch Speed	Networks
	Broadcom Corporation Broadcom NetXtreme II	
	Down	None
	O Use vSwitch0 Speed	Networks
	Broadcom Corporation Broadcom NetXtreme IJ	10.91.60.1-10.91.60.63
	C Use vSwitch1 Speed Broadcom Corporation Broadcom NetXtreme IJ	Networks
	vmnic1 100 Full	169.254.50.163-169.254.50.163
	Preview:	
	Virtual Machine Port Group Physical Adapt VM Network 2	
Help		< Back Next > Cancel

5 Select an appropriate switch option, and then select the check box associated with it.

Note: The check box is enabled only when you select the switch option.

6 Click Next. The Connection Settings area appears.

🚱 Add Network Wizard		
Virtual Machines - Conn Use network labels to i	ection Settings dentify migration compatible connections common to two or more hosts.	
Connection Type Network Access Connection Settings Summary	Port Group Properties Network Label: VLAN ID (Optional):	
	Preview: Virtual Machine Port Group Physical Adapters Network Name Vrmlc2	
Help	<back next=""> C</back>	Cancel

- 7 Do the following to specify the **Port Group Properties**, and then click **Next**:
 - a Enter the network name in the Network Label box.
 - **b** Enter the VLAN identification number in the **VLAN ID** box.
- Note: The VLAN ID is an optional field.

The **Summary** area appears.

🕜 Add Network Wizard	
Ready to Complete Verify that all new an	d modified vSphere standard switches are configured appropriately.
Connection Type Network Access Connection Settings Summary	Host networking will include the following new and modified standard switches: Preview: Virtual Machine Port Group Physical Adapters Network Name Virtual Machine Port Group Virtual Ma
Help	< Back Finish Cancel

8 Review the switch details, and then click **Finish** to complete the network configuration.

Creating a Virtual Machine in vSphere Client

You can populate your virtualization environment by creating virtual machines, which are the key components in a virtual infrastructure.

When you create a virtual machine, you associate it with a particular datacenter, host, cluster or resource pool, and a datastore. The virtual machine consumes resources dynamically as the workload increases, or it returns resources dynamically as the workload decreases.

Every virtual machine has virtual devices that provide the same function as the physical hardware. A virtual machine derives the following attributes from the host with which it is associated:

- A CPU and memory space
- Access to storage
- Network connectivity

To Create a Virtual Machine in vSphere Client

1 Start the vSphere Client, and click the **Virtual Machines** tab.

🛃 ADC_000.space.com - vSphere	Client						
File Edit View Inventory Administration Plug-ins Help							
💽 💽 🏠 Home 🕨 🛃 Inv	ventory 🕨 🛐 Hosts an	d Clusters				🔊 🗸 Search	1 Inventory
₽ © #							
ADC_000.space.com Site A MHA MrA mapritorn.space.com	Getting Started Sum	1ware ESXi, 5.0.0, 000000 Evalua mary Virtual Machines Performan			Permissions Maps Storage View	vs Hardware Statu me, State or Guest O	
MAppEngine1	Name	State	Status	Provisioned Space	Used Space Host CPU - MHz	Host Mem - MB	Guest Mem - %
🔯 Site A VR	🍈 Site A VRMS	Powered On	Normal	16.05 GB 5	5.66 GB 83	1273	4
	MAppEngine1	Powered Off	🤣 Normal	74.23 GB 6	6.69 GB 0	0	0
Small Gerini.space.com er/urs.space.com er/urs.space.com ear/urs.space.com ear/urs.space.com	V	New Virtual Machine Show Virtual Machines Show Templates Show Virtual Machines and Templates Refresh View Column Export List	•				

2 Right-click the Virtual Machines panel, and then click New Virtual Machine. The Create New Virtual Machine window appears.

🛃 Create New Virtual Machine	- - - - - - - - - - -
Configuration Select the configuration fo	r the virtual machine Version: 8
Configuration Name and Location Storage Guest Operating System Network Create a Disk Ready to Complete	Configuration Typical Create a new virtual machine with the most common devices and configuration options. Custom Create a virtual machine with additional devices or specific configuration options.
Help	<back next=""> Cancel</back>

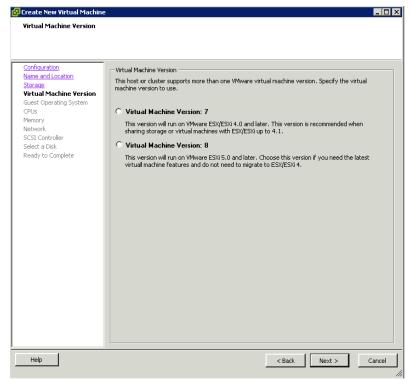
3 Select a **Configuration** option for the new virtual machine, and then click **Next**. The **Name and Location** area appears.

reate New Virtual Machir	ie in the second se	_ 🗆 ×
Name and Location		
Specify a name and locati	ion for this virtual machine	
Configuration	-	
Name and Location	Name:	
Storage	New Virtual Machine	
Virtual Machine Version	Virtual machine (VM) names may contain up to 80 characters and they must be unique within each vCenter Server VM folder.	
Guest Operating System	Venter Server Winder.	
CPUs Memory	Inventory Location:	
Network	Site A	
SCSI Controller		
5elect a Disk		
Ready to Complete		
Help		~ .
	< Back Next >	Cancel

4 Enter a **Name** and an **Inventory Location** for the virtual machine, and then click **Next**. The **Storage** area appears.

reate New Virtual Machi	ine				
Storage Select a destination stor	age for the virtual machine I	files			
Configuration	Select a destination sto	rage for the virtu	al machine files:		
Name and Location	VM Storage Profile:			▼ ▲	
Storage /irtual Machine Version	- j	Duites Terms	Conseiller Durari		Turne This For
Suest Operating System	Name	Drive Type			Type Thin F
IPUs	Pacer_OS	Non-SSD Non-SSD	131.00 GB 971. 79.75 GB 75.1		
1emory	HAAppengine1	Non-SSD	79.75 GB 7.67		
Jetwork	HAAppengnez	Non-SSD	99.75 GB 7.68		
iCSI Controller ielect a Disk	HAHistClient	Non-SSD	79.75 GB 9.88		
teady to Complete	HAHistorian	Non-SSD	199.75 GB 7.72		
(oud) to complete	HAInTouchTS	Non-SSD	79.75 GB 971.		
	HASoftwares	Non-SSD	79.75 GB 8.40		
	HAWIS	Non-SSD	79.75 GB 6.74		
					July 20
	Disable Storage D Select a datastore:	R5 for this virtual	machine		
	Name	Drive Type	Capacity Provision	ned Free	Type Thin Prov
	4			1	<u>p</u>

5 Select a datastore, and then click **Next**. The **Virtual Machine Version** area appears.



Note: This implementation guide provides planning guidance, procedural information, and test information based on ESXi version 5.0.

6 Select a Virtual Machine Version option, and then click Next. The Guest Operating System area appears.

🛃 Create New Virtual Machine	
Guest Operating System Specify the guest operatin	g system to use with this virtual machine
Configuration Name and Location Storage Vertual Machine Version Guest Operating System CPUs Memory Network SCSI Controller Select a Disk Ready to Complete	Guest Operating System:
Help	<back next=""> Cancel</back>

7 Select a **Guest Operating System** option and then select a version from the **Version** list. Click **Next**. The **CPUs** area appears.

🚰 Create New Virtual Machine	2			
CPUs			Virtual f	Machine Version: 8
Select the number of virtu	al CPUs for the virtual machine.			
Configuration	Number of virtual sockets:			
Name and Location Storage	Number of Virtual sockets:	2 💌		
Virtual Machine Version	Number of cores per virtual socket:	4 👻		
Guest Operating System		,		
CPUs	Total number of cores:	8		
Memory Network	The number of virtual CPUs that you	can add to a VM		
SCSI Controller	depends on the number of CPUs on the number of CPUs supported by the gu	he host and the ect OS		
Select a Disk	namber of Crossapported by the ga	630 05.		
Ready to Complete				
	The virtual CPU configuration specifie	d on this page		
	might violate the license of the guest	O5.		
	Click Help for information on the numb	per of		
	processors supported for various gue	st operating		
	systems.			
Help		< 6	Back Next >	Cancel

8 Select values for the Number of virtual sockets and the Number of cores per virtual socket to configure the virtual machines, and then click Next. The Memory area appears.

🔗 Create New Virtual Machine			
Memory Configure the virtual machir	s's memory size.		Virtual Machine Version: 8
Configuration Name and Location Storage Virtual Machine Version Guest-Operating System CPUs Memory Network SCST Controller Select a Disk Ready to Complete	256 GB - ◀ gue: 128 GB - ◀ Max 128 GB - ↓ Defa 64 GB - ◀ gue: ◀ Minir	Size: 4 GB imum recommended for this st OS: 1011 GB. imum recommended for this st OS: 4 GB. mum recommended for this st OS: 512 MB.	Β.
Help		< Back	Next > Cancel

9 Enter a value for **Memory Size** to configure the virtual memory, and then click **Next**. The **Network** area appears.

🚰 Create New Virtual Machine	
Network Which network connections	will be used by the virtual Machine Version: 8 Virtual Machine Version: 8
Configuration Name and Location Storage Virtual Machine Version Guest Operating System CPUs Memory Network SCSI Controller Select a Disk Ready to Complete	Create Network Connections How many NICs do you want to connect? Network Adapter NiC 1: VM Network Filono FilonoFilono Filono Fi
Help	< Back Next > Cancel

10 Select the number of NICs, and then associate each NIC with a **Network**. Click **Next**. The **SCSI Controller** area appears.

🚱 Create New Virtual Machine	
SCSI Controller Which SCSI controller type	would you like to use?
Configuration Name and Location Storage Virtual Machine Version Guest Operating System CPUs Memory. Network SCSI Controller Select a Disk Ready to Complete	SCSI controller © BusLogic Parallel (not recommended for this guest OS) © LSI Logic Parallel © LSI Logic SAS © VMware Paravirtual
Help	< Back Next > Cancel

11 Select an **SCSI Controller** option, and then click **Next**. The **Select a Disk** area appears.

🗿 Create New Virtual Machine	
Select a Disk	Virtual Machine Version: 8
Select a Disk Configuration Name and Location Storage Virtual Machine Version Guest Operating System CPUs Memory Network SCSI Controller Select a Disk Create a Disk	
Advanced Options Ready to Complete	 Raw Device Mappings Give your virtual machine direct access to SAN. This option allows you to use existing SAN commands to manage the storage and continue to access it using a detastore. Do not create disk Do not create disk Common statement of the storage s
Help	<pre></pre>

- **12** Select a **Disk** option that you will use. You can do any one of the following:
 - Create a new virtual disk
 - Use a previously configured virtual disk
 - Not create a virtual disk

If you click either of the first two options, and then click **Next**, the **Create a Disk** area appears.

🖥 Create New Virtual Machin	e	
Create a Disk Specify the virtual disk siz		Virtual Machine Version: 8
Configuration Name and Location Storage Virtual Machine Version Guest Operating System CPUs Memory Network SCSI Controller Select a Disk Create a Disk Advanced Options Ready to Complete	Capacity Disk Size: 80 - GB Disk Provisioning C Thick Provision Lazy Zeroed C Thick Provision Eager Zeroed C Thin Provision Location C Store with the virtual machine C Specify a datastore or datastore cluster: Provise	
Help	_ < Back Nex	:> Cancel

- **13** Do the following and then click **Next**:
 - a Enter Disk Capacity size.
 - **b** Select a **Disk Provisioning** option.

c Select a **Location** option to swap files. The **Advanced Options** area appears.

🚱 Create New Virtual Machin	e _ 🗆 🗙
Advanced Options These advanced options o	do not usually need to be changed. Virtual Machine Version: 8
Configuration Name and Location Storage Virtual Machine Version Guest Operating System CPUs Memory, Network SCSI Controller Select a Disk Create a Disk Create a Disk Ready to Complete	Specify the advanced options for this virtual disk. These options do not normally need to be changed. Virtual Device Node
Help	< Back Next > Cancel

14 Select a Virtual Device Node option and then select the Independent check box. Select a Mode option, and then click Next. The Ready to Complete area appears.

🛃 Create New Virtual Machin	e	
Ready to Complete Click Finish to start a task	that will create the new virtual machin	Virtual Machine Version: 8 ie
Configuration Name and Location Storage Virtual Machine Version Guest Operating System CPUS Memory. Network SCSI Controller Select a Disk Greate a Disk Advanced Options Ready to Complete	Settings for the new virtual machin Name: Folder: Host/Cluster: Specific Host: Datastore: Guest OS: CPUs: Memory: NICS: NIC 1 Network: NIC 1 Network: NIC 2 Type: SCSI Controller: Create disk: Disk capacity: Disk provisioning: Datastore: Virtual Device Node: Disk mode: Image: Edit the virtual machine setting Creation of the virtual machine system. Install a guest OS on	New Virtual Machine Site A MHA racer.space.com HAAppengine I Microsoft Windows Server 2008 R2 (64-bit) 8 4096 MB 2 VM Network E1000 VPlant E1000 LSI Logic SA5 New virtual disk 80 GB Thin Provision HAAppengine 1 SCSI (0:0) Persistent gs before completion re (VM) does not include automatic installation of the guest operating the VM.
Help		< Back Continue Cancel

15 Review your configuration.

Select the **Edit the virtual machine settings before completion** check box to configure the properties of the virtual machine, and then click **Continue.** The **Virtual Machine Properties** window appears.

🚱 MAppEngine1 - Virtual Machine F	roperties	_ _ ×
Hardware Options Resources Profi	es vServices	Virtual Machine Version: 8
Show All Devices Hardware	Add Remove	Connected
Memory CPUs Video card VMCI device SCSI controller 0 Hard disk 1 D/DVD drive 1 (edited) Network adapter 1 Network adapter 2 Floppy drive 1	4 4096 MB 4 Kestricted LSI Logic SAS Virtual Disk Image File VM Network VPlant Client Device	Device Type Clert Device Note: To connect this device, you must power on the wirtual machine and then click the Connect CD/DVD button in the toobar. Host Device Datastore ISO File Datastore ISO File Browse Mode Passthrough IDE (recommended) Emidate IDE Virtual Device Node To [1:0) CD/DVD drive 1 T
Help		OK Cancel

You can configure the virtual machine properties from the **Virtual Machine Properties** window.

To configure virtual machine properties

On the Virtual Machine Properties window, select
 CD/DVD drive 1 under the Hardware pane on the left panel.

🛃 MAppEngine1 - Virtual Machine	Properties	
Hardware Options Resources Pro	files VServices	Virtual Machine Version: 8
Show All Devices Hardware Memory CPUS VMCI device	Add Remove Add Remove Summary 4096 MB 4 Video card Restricted	Device Status Connected Connect at power on Device Type Client Device Note: To connect this device, you must power on the virtual machine and then click the Connect CD/DVD
SCSI controller 0 Hard disk 1 COVD drive 1 (edited) Network adapter 1 Network adapter 2 Floppy drive 1	LSI Logic SAS Virtual Disk Image File VM Network vPlant Client Device	button in the toolbar. Host Device Datastore ISO File Browse Mode Passthrough IDE (recommended) Emulate IDE Virtual Device Node Dit (1:0) CD/DVD drive 1
Help		OK Cancel

Note: CD/DVD drive 1 is a bootable operating system or graphic that will configure the virtual machine.

- **2** Do any one of the following to configure the properties of a new virtual machine:
 - Select the **Host Device** option, and then select the host device from the list to boot from the host CD/DVD.
 - Select the **Datastore ISO File** option, and then click **Browse**. The **Browse Datastores** dialog box appears.

Browse Datastores			_ 🗆 ×
Look in: ISO		•	
Name	File Size	Last Modified	
en_windows_se	3 GB	9/13/2011 4:23:35 PM	
indows_7	3 GB	9/13/2011 4:32:20 PM	
SW_DVD5_Win	2 GB	9/14/2011 12:54:51 AM	
File type: ISO	D Image (*.iso)		ncel

Select the appropriate ISO file, and then click **Open**. The selected ISO file appears in the **Datastore ISO File** box.

3 Click **OK**, and then switch on the virtual machine to install the operating system.

Important: Follow the installation steps of the operating system that you select to install in the virtual machine.

Enabling vMotion for Migration

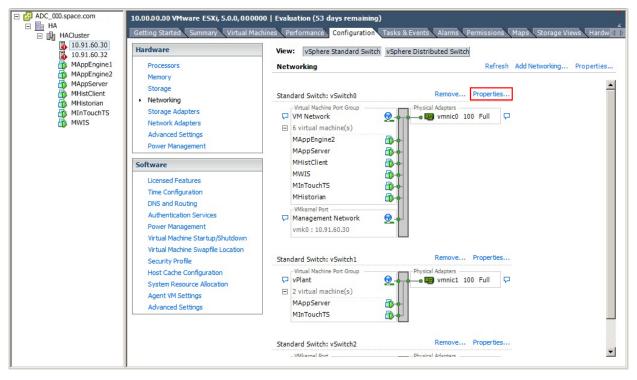
VMware vMotion enables migration of a running virtual machine from one server to another, including the VM's associated storage, network identity, and network connections. Access to the VM's storage switches to the new physical host. Access to the VM continues with its same virtualized network identity.

Following are typical migration scenarios:

- Removing VMs from underperforming or problematic servers
- Performing hardware maintenance and upgrades
- Optimizing VMs within resource pools

To enable vMotion for migration

- **1** Log on to the vSphere Client and select the host from the Inventory panel.
- 2 Click the **Configuration** tab and then click **Networking** on the **Hardware** panel. The switch details appear on the **Configuration** tabbed page.



3 Click the switch that you want to enable for vMotion, and then click **Properties** for that switch. The **vSwitch# Properties** window appears.

🛃 vSwitch0 Properties					_ 🗆 🗙
Ports Network Adapters					
Configuration Summ	mary	Port Properties			¬ ≞
vSwitch 120 F	Ports	Network Label:	Management Network		
VM Network Virtua	ar Machine	/LAN ID:	None (0)		
🧕 Management Net vMoti	tion and IP V	/Motion:	Enabled		
Management Network	k F	Fault Tolerance Logging:	Disabled		
	1	Management Traffic:	Enabled		
	i	SCSI Port Binding:	Disabled		
		VIC Settings			
		-	b8:ac:6f:8a:a0:b7		
	r.	MTU:	1500		
		P Settings			
		P Address:	10.00.00.00		
	9	5ubnet Mask:	200.000.000.0		
				View Routing Table	•
	r-E	Effective Policies			
		5ecurity			
		Promiscuous Mode:	Reject		
		MAC Address Changes:	Accept		
Add Edit.	Remove	Forged Transmits:	Accept		
				Close	Help

Note: The # in vSwitch# Properties refers to any number.

4 Click Management Network under the Configuration pane on the left panel, and then click Edit. The Management Network Properties window appears.

1anagement Network Prop	erties
neral IP Settings Security	Traffic Shaping NIC Teaming
Port Properties	
Network Label:	Management Network
VLAN ID (Optional):	None (0)
vMotion:	Enabled
Fault Tolerance Logging:	Enabled
Management Traffic:	Enabled
iSCSI Port Binding:	Enabled
-NIC Settings	
MTU:	1500

- **5** Do the following to edit the **Port Properties** and **NIC Settings**:
 - a Type or modify the name for Network Label.

Note: Enter a valid **VLAN ID**. This is an optional field.

- **b** Select the **Enabled** check boxes for **vMotion** and **Management Traffic**.
- **c** Enter a value for **MTU**.
- **6** Click **OK** to accept the changes.

Expected Recovery Time Objective and Recovery Point Objective

-

This section provides the expected Recovery Time Objectives (RTO) and Recovery Point Objectives (RPO) for a load of 50,000 I/O and approximately 20,000 historized Attributes by virtualization servers and vSphere VMs set up for High Availability as described in this chapter. The exact RTO and RPO depend on factors such as storage I/O performance, CPU utilization, memory usage, and network usage at the time of failover/migration activity.

Scenarios and observations in this section:

Scenario	Observation
Scenario 1: IT provides maintenance on virtualization server using VMware	"An example of a graceful host server shutdown would be when IT provides maintenance on a virtualization server using VMware" on page 212
Scenario 2: Virtualization server hardware fails while using VMware	"Scenario 2: Virtualization server hardware fails while using VMware" on page 213
Scenario 3: Network fails on Virtualization server that uses VMware	(A): "Scenario 3: Network fails on Virtualization server that uses VMware" on page 214
Scenario 4: Migration of vSphere High Availability Medium Configuration	"Scenario 4: Migration of vSphere High Availability Medium Configuration" on page 215

Scenario 1: Graceful shutdown of the host server

An example of a graceful host server shutdown would be when IT provides maintenance on a virtualization server using VMware

Products	RTO (sec)	RPO	
		Tags	Data Loss Duration
AppEngine1	89	P28762.I15	96
AppEngine2	89	P30443.I1	96
Application Server	77	Integer_001.PV.I1	102
Historian	142	SysTimeSec	163
InTouch HMI	66	\$Second	147

Observations:

- **1** Shut down the slave host machines for the VMs to move to the master host node.
- 2 At least one virtual machine must exist on the master node so that the nodes can migrate from the slave machine to the master machine while you shut down the slave machine; otherwise the virtual machines will not move to the master node.
- **3** The above readings were taken with the WIS node machine is on the master node.
- **4** The VMs are rebooted while they migrate from the slave host machine to the master machine.

Products	RTO (sec)	RPO	
		Tags	Data Loss Duration
AppEngine1	135	P28762.I15	96
AppEngine2	134	P30443.I1	96
Application Server	125	Integer_001.PV.I1	102
Historian	191	SysTimeSec	163
InTouch HMI	117	\$Second	147

Scenario 2: Virtualization server hardware fails while using VMware

Observations

- **1** Remove the power cable of the slave host machine so that the VMs can move to the master host node.
- **2** The above readings were taken when the WIS node machine is on the master node and the remaining VMs are on the slave node.
- **3** You need not have a VM in the master node to migrate VMs while the slave power cables are removed, as in the case of the Slave Shutdown scenario.
- **4** The VMs are rebooted while they migrate from the slave host machine to the master machine.

Products	RTO (sec)	RPO	
		Tags	Data Loss Duration
AppEngine1	185	P28762.I15	120 sec
AppEngine2	190	P30443.I1	120 sec
Application Server	210	Integer_001.PV.I1	150 sec
DAServer	190	N/A	190
Historian	255	SysTimeSec	200 sec
InTouch HMI	190	\$Second	210 sec

Scenario 3: Network fails on Virtualization server that uses VMware

Observations

- **1** Remove the domain Network cable of the slave host machines so that the VMs can move to the master host node.
- **2** You need not have a virtual machine in the master node to migrate VMs, while the slave Domain Network cable is removed as in the case of the Slave Shutdown scenario.
- **3** The above readings were taken when the WIS node machine was on the master node.
- **4** The VMs get rebooted while they migrate from the slave host machine to the master machine.

Scenario 4: Migration of vSphere High Availability Medium Configuration

The following table displays the data loss duration, when the VMs are migrated individually from one host to another using vMotion.

Products	RTO (sec)	RPO	
		Tags	Data Loss Duration
Application Server	1	Integer_001.PV	0.02 sec
AppEngine1	0	P28762.I15	0 sec
AppEngine2	1	P30443.I1	0.01 sec
InTouch HMI	0	\$Second	0 sec
Historian	0	SysTimeSec	0 sec
Wonderware Information Server	0	N/A	N/A
DAServer	0	N/A	N/A
Historian Client	0	N/A	N/A

Observations

- **1** Migrate the VMs individually from one host to another host.
- **2** The VMs will migrate from one host to another host without being rebooted.

Chapter 4

Implementing Disaster Recovery Using Hyper-V

This section introduces several Disaster Recovery (DR) virtualization solutions that improve the availability of System Platform Products. For more information refer to Chapter 1 Getting Started with High Availability and Disaster Recovery.

The set-up and configuration procedures, expected Recovery Time Objective (RTO) observations, Recovery Point Objective (RPO) observations, and data trend snapshots are presented first for small-scale virtualization environment, and are then repeated for medium-scale virtualization environment.

Working with a Small Scale Virtualization Environment

This chapter contains the following topics:

- Setting Up Small Scale Virtualization Environment
- Configuration of System Platform Products in a Typical Small Scale Virtualization
- Expected Recovery Time Objective and Recovery Point Objective
- Working with a Medium Scale Virtualization Environment

Setting Up Small Scale Virtualization Environment

The following procedures help you to set up small scale virtualization disaster recovery environment.

Planning for Disaster Recovery

The minimum and recommended hardware and software requirements for the Host and Virtual machines used for small scale virtualization disaster recovery environment.

Hyper-V Hosts

Processor:	Two - 2.66 GHz Intel Xeon with - 8 Cores
Operating System	Windows Server 2008 R2 Enterprise with Hyper-V Enabled
Memory	12GB
Storage	Local Volume with Capacity of 500 GB

Note: For the Hyper-V Host to function optimally, the server should have the same processor, RAM, storage and service pack level. Preferably, the servers should be purchased in pairs to avoid hardware discrepancies. Though the differences are supported, it will impact the performance during failovers.

Virtual Machines

Using the above Specified Hyper-V Host, three virtual machines can be created with below Configuration.

Virtual Machine 1: DAS SI, Historian, and Application Server (GR) Node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Historian, ArchestrA, DAS SI

Virtual Machine 2: Application Server Runtime Node 1

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	2 GB
Storage	40 GB
System Platform Products Installed	Application Server Runtime only and InTouch

Virtual Machine 3: Information Server Node, InTouch, Historian Client

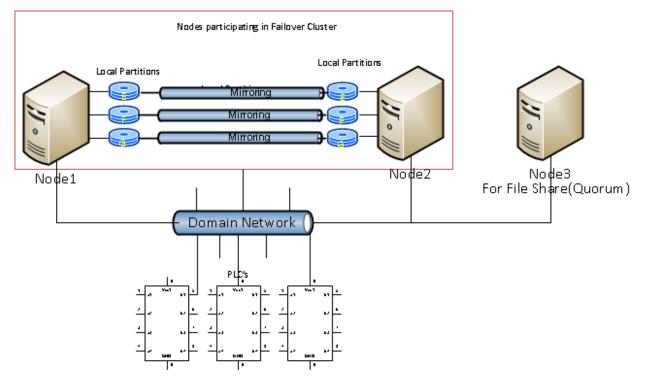
Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 Standard
Memory	4 GB
Storage	40 GB
System Platform Products Installed	Information Server, InTouch, Historian Client

Network Requirements

For this architecture, you can use one physical network card that needs to be installed on a host computer for domain network and the process network.

Configuring Failover Cluster

The recommended topology of the failover cluster for disaster recovery process for small scale virtualization environment is given below:



This setup requires a minimum of two host servers with sufficient local disk space on each server to create logical drives for the virtual machines. Each logical drive is replicated to the two hosts for disaster recovery. Another independent node is used for configuring the quorum. For more information on configuring the quorum, refer to "Configuring Cluster Quorum Settings" on page 231.

The following process will guide how to set up the small virtualization disaster recovery environment.

Installing Failover Cluster

To install the failover cluster feature, you need to run Windows Server 2008 R2 Enterprise Edition on your server.

To install the failover cluster feature on a server

1 On the Initial Configuration Tasks window, under Customize This Server, click Add features. The Add Features Wizard window appears.

Note: The **Initial Configuration Tasks** window appears if you have already installed Windows Server 2008 R2. If it does not appear, open the **Server Manager** window, right-click **Features** and click **Add Features**.

Add Features Wizard	×
Select Features	*
Features Confirmation Progress Results	Select one or more features to install on this server. Features: Description: Image: Select one of more features to installed in the server of the servers to work together to provide the services, connection Manager Administration Kit Desktop Experience DirectAcress Management Console Internet Prinking Client Internet Prinking Client Internet Storage Name Server Description Desktop Experience PR Port Monitor Wetwork Load Balancing Peer Name Resolution Protocol Quality Windows Audio Video Experience Remote Differential Compression More about features More about features
	< Previous Next > Instell Cancel

2 In the Add Features Wizard window, select the Failover Clustering check box, and then click Next. The Confirm Installation Selections area appears.

Add Features Wizard	×
Confirm Installat	ion Selections
Features Confirmation Progress Results	To install the following roles, role services, or features, click Install. 1 Informational message below This server might need to be restarted after the installation completes. Failover Clustering
	Print, e-mail, or save this information
	< Previous Next > Install Cancel

3 Click **Install** to complete the installation. The **Installation Results** area with the installation confirmation message appears.

Add Features Wizard			×
Installation Resul	ts		
Features	The following roles, role services, or fea	atures were installed successfully:	
Confirmation Progress	Failover Clustering	Installation succeeded	
Results			
	Print, e-mail, or save the installation rep	<u>oort</u>	
		<previous next=""> Close</previous>	Cancel

4 Click Close to close the Add Features Wizard window.

Note: Repeat the procedure to include on all the other nodes that will be part of the Cluster configuration process.

Validating Cluster Configuration

Before creating a cluster, you must validate your configuration. Validation helps you confirm that the configuration of your servers, network, and storage meet the specific requirements for failover clusters.

To validate the failover cluster configuration

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

Server Manager			-
e Action View Help			
ed 💽 🚺			
Server Manager (CAPRICORN)	Server Manager (CAPRICORN)		
Features			
Diagnostics	Get an overview of the statu	is of this server, perform top management tasks, and add or remov	ve server roles and features.
Storage			-
	Server Summary		Server Summary Help
	Computer Information		💭 Change System Properties
	Full Computer Name:	CAPRICORN.space.com	View Network Connections
	Domain:	space.com	Configure Remote Desktop Configure Server Manager Remote
	vDomain:	Assigned by DHCP	Management
	vPlant:	192.168.0.165, IPv6 enabled	
	Remote Desktop:	Enabled	
	Server Manager Remote Management:	Enabled	
	Product ID:	00486-001-0001076-84653 (Activated)	
	Do not show me this console at	logon. This setting is controlled by Group Policy.	
	Security Information		🔐 Go to Windows Firewall
	Windows Firewall:	Domain: Off, Public: Off	Configure Updates
	Windows Updates:	Install updates automatically using Windows Update	← Check for New Roles Run Security Configuration Wizard
	Last checked for updates:	Never	Configure IE ESC
	Last Refresh: Today at 3:21 PM Conf	in refresh	
	The contrast raday at a 21 PM Com	ige o ron our	

2 Expand Features and click Failover Cluster Manager. The Failover Cluster Manager pane appears.

Note: If the **User Account Control** dialog box appears, confirm the action you want to perform and click **Yes**.

📕 Server Manager								_ 0
File Action View	Help							
🗢 🔿 🔰 📊 🛽	? 💼							
Server Manager (C	APRICORN)	Failover Clus	ter Manager				Ac	tions
		Failover	ilover Cluster Manager			Fa	ilover Cluster Manager	
Failover Clu Diagnostics Configuration Storage	ster Manager Validate a Co Create a Clu Manage a Cli		st is to your failover clusters.		guration	- 福 - 北	Validate a Configuration Create a Cluster Manage a Cluster	
	View		ew				-	View
	Properties		uster is a set of indepe	endent computers that	work together to increase the availabi	ity of		Properties
	Help	INIOYOF	If one of the nodes fa	istered servers (called i als, another node begin	nodes) are connected by physical cab is to provide services (a process know	vies and vn as	?	Help
		these step	o use failover clustering s are complete, you car	manage the cluster. I	ware configuration, then create a clu fanaging a cluster can include migral dows Server 2003, Windows Server 2	ing		
		🗾 🖸 Vaide	ate a Configuration	?	Understanding cluster validation tes	ts 👘		
		Creat	e a Cluster	?	Creating a failover cluster or adding node	a cluster		
		🔁 Mana	ge a Cluster	?	Managing a failover cluster			
				?	Migrating services and applications cluster	from a		
		^ More	Information					
		E Falos	er cluster topics on the	Web				
		Ealoy	er cluster communities	on the Web				

3 Under Management, click Validate a Configuration. The Validate a Configuration Wizard window appears. Click Next.

👹 Validate a Configu	ration Wizard 🛛 🔀
Before Yo	ou Begin
Before You Begin Select Servers or a Cluster Testing Options Confirmation Validating Summary	This wizard runs validation tests to determine whether this configuration of servers and attached storage is set up correctly to support failover. A cluster solution is supported by Microsoft only if the complete configuration (servers, network, and storage) passes all tests in this wizard. In addition, all hardware components in the cluster solution must be "Certified for Windows Server 2008 R2". If you want to validate a set of unclustered servers, you need to know the names of the servers. Important: the storage connected to the selected servers will be unavailable during validation tests. If you want to validate an existing failover cluster, you need to know the name of the cluster or one of its nodes. You must be a local administrator on each of the servers you want to validate. To continue, click Next.
	More about preparing your hardware for validation More about cluster validation tests Do not show this page again Next > Cancel

- **4** In the **Select Servers** or a **Cluster** screen, you need to do the following:
 - **a** Click **Browse** or enter next to the **Enter name** field and select the relevant server name.
 - **b** From the **Selected servers** list, select the relevant servers and click **Add**.

- **c** Click **Next**. The **Testing Options** screen appears.
- **d** Enter the server name and click **Add**. The server gets added to the server box.
- **Note:** To remove a server, select the server and click **Remove**.

Before You Begin Select Servers or a Dluster		rivers, add the names of all the servers. ster, add the name of the cluster or one of its node:	s.
Testing Options Confirmation Validating Gummary	Enter name: Selected servers:	Capricorn.space.com gemini.space.com	Browse Add Remove

5 Click the Run only the tests I select option to skip the storage validation process, and click Next. The Test Selection screen appears.

Validate a Configu	
Before You Begin Select Servers or a Cluster	Choose between running all tests or running selected tests. The tests include Inventory tasks, Network tests, Storage tests, and System Configuration tests.
Testing Options Test Selection Confirmation Validating	Microsoft supports a cluster solution only if the complete configuration (servers, network, and storage) can pass all tests in this wizard. In addition, all hardware components in the cluster solution must be "Certified for Windows Server 2008 R2".
Summary	Run all tests (recommended) Run only tests I select
	More about cluster validation tests
	< Previous Next > Cancel

Note: Click the **Run all tests (recommended)** option to validate the default selection of tests.

6 Clear the **Storage** check box, and then click **Next**. The **Summary** screen appears.

Before You Begin Select Servers or a Cluster Testing Options Test Selection Confirmation Validating Summary	Select the tests that you want to run. A few tests are dependent on dependent test, the test that it depends on will also run.	other tests. If you choose a Description These tests gather and display information about the nodes.
	More about cluster validation tests	

7 Click View Report to view the test results or click Finish to close the Validate a Configuration Wizard window.

Validate a Configur	ation Wizard	×
Before You Begin Select Servers or a Cluster	Testing has completed for the tests you selected. To confirm that your cluster solution is supported, you must run all tests. A cluster solution is supported by Microsoft only if it passes all cluster validation tests.	
Testing Options		
Test Selection	Failover Cluster Validation Report	
Confirmation		
Validating	Node: capricorn.space.com	
Summary	Node: gemini.space.com	
	To view the report created by the wizard, click View Report. View Report To close this wizard, click Finish. <u>Create the cluster now using the validated nodes</u>]
	More about cluster validation tests	
	Finish]

A warning message appears indicating that all the tests have not been run. This usually happens in a multi site cluster where the storage tests are skipped. You can proceed if there is no other error message. If the report indicates any other error, you need to fix the problem and re-run the tests before you continue. You can view the results of the tests after you close the wizard in

SystemRoot\Cluster\Reports\Validation Report date and time.html where SystemRoot is the folder in which the operating system is installed (for example, C:\Windows).

To know more about cluster validation tests, click **More about cluster** validation tests on Validate a Configuration Wizard window.

Creating a Cluster

To create a cluster, you need to run the Create Cluster wizard.

To create a cluster

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the Start menu.

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The Autors , View - 1988		
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Ly Server Manager (AMMEND)	Autor .	
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	Apare (ar suc 1 Apare), 2 Apart (a) Conto Cofenancello Recht (Mare) End Austran Augure, für der Charl Parlien Andres war, auf ihr für der Austres Augure 16 an die 2003 End Austres Augure 15 der Charl Parlien Andres war, auf ihr für die Austres Augure 16 an die 2003	channessing and did loss this links
	T Auto Serveyore (consider)	and the service
	[Mellens Ma	A free his law on
	[2] A state therein forward in provide that and all the latentity through each for USEX. See Technical Three for States and Use and the Service State Latituded.	
	Passert Societaria	
1	Decrement	

2 Expand Features and click Failover Cluster Manager. The Failover Cluster Manager pane appears.

Note: If the **User Account Control** dialog box appears, confirm the action you want to perform and click **Yes**.

Server Manager (CARRIDDER)	Fallowis Charles Manager	Actions	
in S-Rate II gi Frances	Fullow Clubs Manager	Lauren Barren Barrage	
Digentee Chains Bankeys	😋 Constitution dialogi valitate factores in panele factore statemic, and particul configuration strategies in part factore dialogies	telefe a Collegation	
	4. Overview		
	A failure cluster is a set of independent component had work together to investee the southalding of services and applications. The clustered assess to also funded togets are consolitably adjuster togets and the souther toget togets to also adjust togets are not being assessed to provide a service of togets are clustered.	C human	
	+ Centers		
	- Mesogeneel	1	
	No begin to use failures chartering, that validate uses facefrave configuration, their cruste problem. After faces reprint processing the studie Managing on share care to be regarding annume, and applications for them a charter saving forefares barrier. 2011 Whittee faces 2008, and Window Elever, 2002.		
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	· Mare Information		
	E feine dem test autorite		
	E Celever, deiter, and de Sole		
	D Tarrad Assettance mitte Vid		

3 Under Management, click Create a cluster. The Create Cluster Wizard window appears.



4 View the instructions and click **Next**. The **Validation Warning** area appears.

Before You Begin Select Servers	For the servers you selected for this cluster, the reports from cluster configuration validation tests appear to be missing or incomplete. Microsoft supports a cluster solution only if the complexition configuration (servers, network, and storage) can pass all the tests in the Validate a Configuration
Validation Warning	wizard
Access Point for Administering the Cluster	Do you want to run configuration validation tests before continuing?
Confirmation	View Report
Creating New Cluster Summary	Yes. When I click Next, run configuration validation tests, and then return to the process of creating the cluster.
	No. I do not require support from Microsoft for this cluster, and therefore do not want to run the validation tests. When I click Next, continue creating the cluster.

Click No. I do not require support from Microsoft for this cluster, and therefore do not want to run the validation tests.
 Click When I click Next, continue creating the cluster option and click Next. The Select Servers area appears.

Note: Click **Yes. When I click Next, run configuration validation tests, and then return to the process of creating the cluster** option if you want to run the configuration validation tests. Click **View Report** to view the cluster operation report.

Sefore You Begin Select Servers	Add the names of all the	he servers that you want to have in the cluster. 1	You must add at least one server.
/alidation Warning Access Point for	Enter server name:		
Administering the Cluster			Browse
Confirmation	Selected servers:	mercury.space.com venus.space.com	Add
Dreating New Cluster			Remove .
Summary			

- **6** In the **Select Servers** screen, do the following:
 - **a** In the **Enter server name** box, enter the relevant server name and click **Add**. The server name gets added in the **Selected** servers box.

Note: You can either type the server name or click **Browse** to select the relevant server name.

b Click Next. The Access Point for Administering the Cluster area appears.

Create Cluster Wi	oint for Administering the Cluster
Before You Begin Select Servers Validation Warning Access Point for Administering the Customer Cluster Contension Clearing New Cluster Summary	Type the name you want to use when administering the cluster. Cluster Name One or nore DHCP IPv4 addresses were configured automatically. All networks were configured automatically.
	More about the administrative Access Point for a cluster
	< Previous first Cancel

7 In the Cluster Name box, type the name of the cluster and clickNext. The Confirmation area appears.

Note: Enter a valid IP address for the cluster to be created if the IP address is not configured through Dynamic Host Configuration Protocol (DHCP).

Confirma			
Before You Begin Select Servers	You are ready to create The wizard will create yo	a cluster. ur cluster with the following settings:	
Validation Warning Access Point for Administering the Cluster Confirmation Confirmation Confirmation Contemp New Cluster Summary	Cluster: Node: Node: IP Address:	Stars1 capricorn.space.com gemini-space.com DHCP address on 10.91.600/23	2
	To continue, click. Next.		(*)

8 Click Next. The cluster is created and the Summary area appears.

Create Cluster Wiz Summary	ard		
elan You Begin elect Servers	You have su	ccessfully completed the Create Cluster Wizard.	
alidation Warning ocess Point for disinistening the Juster		Create Cluster	*
entermation eating New Duster	Cluster:	Planet	
mmaty	Node:	mercury.space.com	
	Node: Quorum:	venus.space.com Node Majority	-
	Constant and the second second	ated by the wizard, click View Report.	View Report
			Finish

9 Click **View Report** to view the cluster report created by the wizard or click **Finish** to close the **Create Cluster Wizard** window.

Configuring Cluster Quorum Settings

Quorum is the number of elements that need to be online to enable continuous running of a cluster. In most instances, the elements are nodes. In some cases, the elements also consist of disk or file share witnesses. Each of these elements determines whether the cluster should continue to run.

All elements, except the file share witnesses, have a copy of the cluster configuration. The cluster service ensures that the copies are always synchronized. The cluster should stop running if there are multiple failures or if there is a communication error between the cluster nodes.

After both nodes have been added to the cluster, and the cluster networking components have been configured, you must configure the failover cluster quorum.

The file share to be used for the node and File Share Majority quorum must be created and secured before configuring the failover cluster quorum. If the file share has not been created or correctly secured, the following procedure to configure a cluster quorum will fail. The file share can be hosted on any computer running a Windows operating system.

To configure the cluster quorum, you need to perform the following procedures:

- Create and secure a file share for the node and file share majority quorum
- Use the failover cluster management tool to configure a node and file share majority quorum

To create and secure a file share for the node and file share majority quorum

- **1** Create a new folder on the system that will host the share directory.
- 2 Right-click the folder that you created and click **Properties**. The **Quorum Properties** window for the folder you created appears.

Note: In the following procedure, Quorum is the name of the folder.

📙 Quorum Pro	perties		×
General Shar	ing Security Previou	us Versions 🗍 Cus	tomize
Network File Network Par Network Par Not Shared Share Advanced S Set custom	and Folder Sharing		
Adva	nced Sharing		
	OK	Cancel	Apply

3 Click the Sharing tab, and then click Advanced Sharing. The Advanced Sharing window appears.

Advanced Sharing	×
Share this folder	
Settings	
Share name:	
Quorum	
Add Remove	
Limit the number of simultaneous users to:	
Comments:	
Permissions Caching	
OK Cancel Apply	

4 Select the **Share this folder** check box and click **Permissions**. The **Permissions for Quorum** window appears.

📜 Permissions for Quorum		×
Share Permissions		
Group or user names:		
At Everyone		
	Add	Remove
Permissions for Everyone	Allow	Deny
Full Control		
Change Read		
Learn about access control and p	ermissions	
ОК	Cancel	Apply

5 Click Add. The Select Users, Computers, Service Accounts, or Groups window appears.

Select Users, Computers, Service Accounts, or Groups	? ×
Select this object type:	
Users, Groups, or Built-in security principals	Object Types
From this location:	
	Locations
Enter the object names to select (<u>examples</u>):	
<node1>,<node2>,<cluster name=""></cluster></node2></node1>	Check Names
Advanced OK	Cancel

6 In the Enter the object name to select box, enter the two node names used for the cluster in the small node configuration and click OK. The node names are added and the Permissions for Quorum window appears.

🔋 Permissions for Quorum		×	
Share Permissions			
Group or user names:			
Everyone			
	Add	Remove	
Permissions for Everyone	Allow	Deny	
Full Control			
Change Read			
Learn about access control and permissions			
ОК	Cancel	Apply	

7 Select the Full Control, Change, and Read check boxes and click OK. The Properties window appears.

📜 Quorum Propertie	:5		×
General Sharing S	ecurity Previou	us Versions Cust	omize
Network File and File and File and File Quorum Not Shar Network Path: Not Shared Share	-		
Advanced Sharing Set custom permis: advanced sharing	sions, create mu options.	Itiple shares, and s	et other
	OK	Cancel	Apply

8 Click **OK**. The folder is shared and can be used to create virtual machines.

To configure a node and file share majority quorum using the failover cluster management tool

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

📕 Server Manager				
File Action View	Help			
🗢 🔿 🖄 🔚 🛛	? 🖬			
🚡 Server Manager (C	APRICORN)	Star.space.com		
🖃 🖥 Roles 🖃 🏊 Hyper-V		Cluster Star.sp	ace.com	
🖃 薪 Features	RICORN	EDG .	of Cluster Star	
Fallover Clu H Start Diagnostics M Configuration			n : Capricom	Networks: Cluster Network 1, Cluster Network 2 Subnets: 21Pv4 and 01Pv6
E Storage	Enable Cluster	Shared Volumes	In: A Node Majority - Warning: Fa hts: None in the last 24 hours	ilure of a node will cause the cluster to fail. Check the status of the nodes.
En Disk Marie	Add Node			
	Close Connect	ion		
	More Actions.	. •	Configure Cluster Quorum Settin	ne or more servers (nodes), or migrate services and applications from a cluster Server 2008 R2.
	View	•	Migrate services and application:	and applications you can configure for high availability
	Refresh		Shut down Cluster	nding cluster validation tests
	Properties		Destroy Cluster	nding Cluster Shared Volumes
	Help		2	Add a server to your cluster
			s and applications	Migrating a cluster from Windows Server 2003, Windows Server 2008, or Windows Server 2008 R2

2 Right-click the name of the cluster you created and click More Actions. Click Configure Cluster Quorum Settings. The Configure Cluster Quorum Wizard window appears.

🏙 Configure Cluster	Quorum Wizard	X
Before Y	ou Begin	
Before You Begin Select Quorum Configuration Configuration Quorum Cluster Quorum Settings Summary	This wizard guides you through configuration of the quorum for a failover cluster. The quorum configuration determines the point at which too many failures of certain cluster elements will stop the cluster from running. The relevant cluster elements are the nodes and, in some quorum configurations, a disk witness (which contains a copy of the cluster configuration) or file share witness. A majority of these elements must remain online and in communication, or the cluster "loses quorum" and must stop running. Note that full function of a cluster depends not just on quorum, but on the capacity of each node to support the services and applications that fail over to that node. For example, a cluster that has five nodes could still have quorum after two nodes fail, but each remaining cluster node would continue serving clients only if it had enough capacity to support the services and applications that failed over to it.	
	Important: Run this wizard only if you have determined that you need to change the quorum configuration for your cluster. When you create a cluster, the cluster software automatically chooses the quorum configuration that will provide the highest availability for your cluster. To continue, click Next. More about quorum configurations Do not show this page again	
	Next > Cancel	

3 View the instructions on the wizard and click **Next**. The **Select Quorum Configuration** area appears.

Note: The **Before you Begin** screen appears the first time you run the wizard. You can hide this screen on subsequent uses of the wizard.

🏪 Configure Cluster (Quorum Wizard 🛛 🔀 🗙
Select Qu	uorum Configuration
Before You Begin Select Quorum Configuration Configure File Share Witness Confirmation Configure Cluster Quorum Settings Summary	 Read the descriptions and then select a quorum configuration for your cluster. The recommendations are based on providing the highest availability for your cluster. Node Majority (not recommended for your current number of nodes) Can sustain failures of 0 node(s). Node and Disk Majority Can sustain failures of 1 node(s) with the disk witness online. Can sustain failures of 0 node(s) if the disk witness goes offline or fails. Node and File Share Majority (for clusters with special configurations) Can sustain failures of 1 node(s) if the file share witness becomes unavailable. Can sustain failures of 0 node(s) if the file share witness becomes unavailable. No Majority: Disk Only (not recommended) Can sustain failures of all nodes except 1. Cannot sustain a failure of the quorum disk. This configuration is not recommended because the disk is a single point of failure.
	< Previous Next > Cancel

4 You need to select the relevant quorum node. For special configurations, click the **Node and File Share Majority** option and click **Next**. The **Configure File Share Witness** area appears.

Note: Click the **Node Majority** option if the cluster is configured for node majority or a single quorum resource. Click the **Node and Disk Majority** option if the number of nodes is even and not part of a multi site cluster. Click the **No Majority: Disk Only** option if the disk is being used only for the quorum.

📲 Configure Cluster	Quorum Wizard
Configure	e File Share Witness
Before You Begin Select Quorum Configuration Configure File Share	Please select a shared folder that will be used by the file share witness resource. This shared folder must not be hosted by this cluster. It can be made more available by hosting it on another cluster.
Witness Confirmation Configure Cluster Quorum Settings Summary	Shared Folder Path: \\universe\Shared Browse
Summary	
	< <u>Previous</u> Cancel

5 In the Shared Folder Path box, enter the Universal Naming Convention (UNC) path to the file share that you created in the Configure Cluster Quorum Settings. Click Next. Permissions to the share are verified. If there are no problems with the access to the share, then Confirmation screen appears.

Note: You can either enter the share name or click **Browse** to select the relevant shared path.

Configure Cluster	
Before You Begin Select Quorum Configuration	You are ready to configure the quorum settings of the cluster.
Configure File Share Witness	Share: \\universe\Shared Quorum Configuration: Node and File Share Majority
Configme Cluster Quorum Settings Summary	Your cluster quorum configuration will be changed to the configuration shown above.
	< Previous Next > Cancel

6 The details you selected are displayed. To confirm the details, click **Next**. The **Summary** screen appears and the configuration details of the quorum settings are displayed.

🏙 Configure Cluster	Quorum Wizard	×
Summary		
Before You Begin Select Quorum Configuration	You have successfully configured the quorum settings for the cluster.	
Configure File Share Witness Confirmation	Configure Cluster Quorum Settings]
Configure Cluster Quorum Settings Summary	Share: \\universe\Shared Quorum Configuration: Node and File Share Majority	
	To view the report created by the wizard, click View Report. To close this wizard, click Finish.]
	Finish]

7 Click View Report to view a report of the tasks performed, or clickFinish to close the window.

After you configure the cluster quorum, you must validate the cluster. For more information, refer to http://technet.microsoft.com/en-us/library/bb676379(EXCHG.80).aspx.

Configuring Storage

For a smaller virtualization environment, storage is one of the central considerations in implementing a good virtualization strategy. But with Hyper-V, VM storage is kept on a Windows file system. You can put VMs on any file system that a Hyper-V server can access. As a result, HA can be built into the virtualization platform and storage for the virtual machines. This configuration can accommodate a host failure by making storage accessible to all Hyper-V hosts so that any host can run VMs from the same path on the shared folder. The back-end part of this storage can be a local, storage area network, iSCSI, or whatever is available to fit the implementation.

For this architecture, local partitions are used.

The following table lists the minimum storage recommendations to

configure storage for each VM:

System	Storage Capacity
Historian and Application Server (GR Node) Virtual Machine	80 GB
Application Engine (Runtime Node) Virtual Machine	40 GB
InTouch and Information Server Virtual Machine	40 GB

The total storage capacity should be minimum recommended 1TB.

Configuring Hyper-V

Microsoft Hyper-V Server 2008 R2 helps in creating a virtual environment that improves server utilization. It enhances patching, provisioning, management, support tools, processes, and skills. Microsoft Hyper-V Server 2008 R2 provides live migration, cluster shared volume support, expanded processor, and memory support for host systems.

Hyper-V is available in x64-based versions of Windows Server 2008 R2 operating system, specifically the x64-based versions of Windows Server 2008 R2 Standard, Windows Server 2008 R2 Enterprise, and Windows Server 2008 Datacenter.

The following are the pre-requisites to set up Hyper-V:

- x64-based processor
- Hardware-assisted virtualization
- Hardware Data Execution Prevention (DEP)

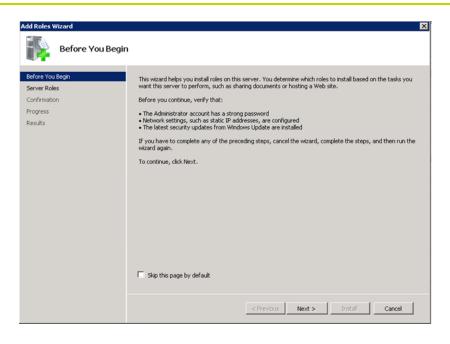
To configure Hyper-V

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

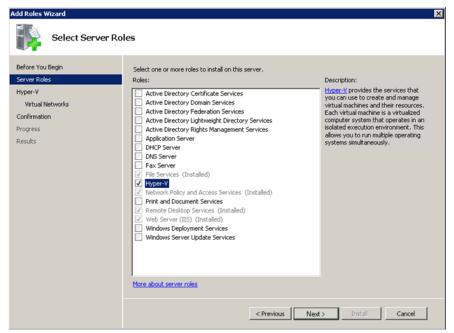
Server Manager			
File Action View Help			
(* *) 🖄 📰 🖬			
Server Manager (UNVERSE) Bales gg Pestures gg Congrestics Gringuration Sorage	Roles Wew the health of the roles installed on y	our server and add or remove roles and features.	
	Roles Summary		Roles Summary Help
	Reless: 3 of 17 installed Active Detectory Comain Services LNS Server File Services		Add Roles
	Active Directory Domain Services		AD DS HIMP
	Stores directory data and manages communication	between users and domains, including user logon processes, authentication, and directory searches.	
	Role Status Messages: 1 System Services: 8 Running, 2 Stopped Events: 4 reformational in the last 24 Nour Bert Practices Analyzer: To start a Best Pre	s action Analyzer Kon, go to the Best Practices Analyzer the on the min's homopops and did. Som the Riek	Go to Active Directory Domain Services
	Role Services: 1 installed		Add Role Services
		2.eta	Remove Role Services
	Server for Network Information Services Password Synchronization	Seculard Nor Installed Nor Installed Nor Installed Nor Installed	
	Description:		

2 In the Roles Summary area, click Add Roles. The Add Roles Wizard window appears.

Note: You can also right-click **Roles** and then click **Add Roles Wizard** to open the **Add Roles Wizard** window.



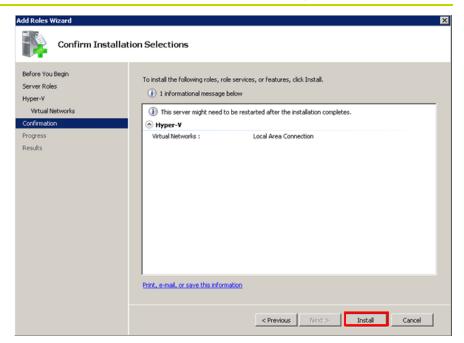
3 View the instructions on the wizard and then click **Next**. The **Select Server Roles** area appears.



4 Select the **Hyper-V** check box and click **Next**. The **Create Virtual Networks** area appears.

Add Roles Wizard			×
Create Virtual Ne	etworks		
Before You Begin Server Roles Hyper-V Virtual Networks Confirmation	can create virtual machines and at One virtual network will be created	for each network adapter you select. We recomme ise with virtual machines. You can add, remove, and	nd that you create at
Progress		Network Advetory	
Results	Name Local Area Connection	Network Adapter Realtek RTL8139/810x Family Fast Ethernet NIC	
	Local Area Connection 2 We recommend that you reser	Broadcom NebStreme 575xc Gigabit Controller ve one network adapter for remote access to this s it for use with a virtual network.	erver. To reserve a
	network adapter, do not selec	i n for use with a virtual network.	
	More about virtual networks		
		< Previous Next > Insta	Cancel

5 Select the check box next to the required network adapter to make the connection available to virtual machines. Click Next. The Confirmation Installation Selections area appears.



Note: You can select one or more network adapters.

6 Click **Install**. The **Installation Results** area appears.

Add Roles Wizard					×
Installation Result	s				
Before You Begin Server Roles Hyper-V	One or more of the following r		features require you to	restart:	
Virtual Networks			🛕 Restart Pendin	g	
Confirmation	🔒 You must restart this s	erver to finish the inst	allation process.		
Progress					
Results					
	Print, e-mail, or save the insta	llation report			
		< Previo	us Next >	Close	Cancel

7 A message appears prompting you to restart the computer. Click **Close**. The **Add Roles Wizard** pop-up window appears.

Before You Begin Select Servers	You are ready to create The wizard will create yo	a cluster. ur cluster with the following settings:	
Validation Warning Access Point for Administering the Cluster Confirmation Creating New Cluster Suriationary	Cluster: Node: Node: IP Address:	Stars1 capricorn.space.com gemini.space.com DHCP address on 10.91.60_0/23	*
			<u>s</u>

- 8 Click **Yes** to restart the computer.
- **9** After you restart the computer, log on with the same ID and password you used to install the **Hyper V** role. The installation is completed and the **Resume Configuration Wizard** window appears with the installation results.

Resume Configuration Wizard	tesults						
Resuming Configuration Progress Results	The following roles, role services, or features were installed successfully: <u> <u> </u> </u>						
	Windows automatic updating is not enabled. To ensure that your newly-installed role or feature is automatically updated, turn on Windows Update in Control Panel.						
	Hyper-Y Ø Installation succeeded						
	(i) To add virtual machines, use the New Virtual Machine witard in the Virtualization Management console.						
	Post, e-mail, or save the installation report						
	APrivaty Ned 3 Close Carol						

10 Click Close to close the Resume Configuration Wizard window.

Configuring SIOS (SteelEye) Mirroring Jobs

SIOS (SteelEye) DataKeeper is replication software for real-time Windows data. It helps replicate all data types, including the following:

- Open files
- SQL and Exchange Server databases
- Hyper-V .vhd files

SteelEye DataKeeper's ability to replicate live Hyper-V virtual machines ensures that a duplicate copy is available in case the primary storage array fails. This helps in disaster recovery (DR) without impacting production.

SteelEye DataKeeper Cluster Edition is a host-based replication solution, which extends Microsoft Windows Server 2008 R2 Failover Clustering (WSFC) and Microsoft Cluster Server (MSCS) features such as cross-subnet failover and tunable heartbeat parameters. These features make it possible to deploy geographically distributed clusters.

You can replicate a virtual machine across LAN, WAN, or any Windows server through SIOS Microsoft Management Console (MMC) interface. You can run the DataKeeper MMC snap-in from any server. The DataKeeper MMC snap-in interface is similar to the existing Microsoft Management tools.

Note: For information on installing the SteelEye DataKeeper, refer to *SteelEye DataKeeper for Windows Server 2003/2008 Planning and Install Guide* and *SteelEye DataKeeper for Windows Server 2003/2008 Administration Guide* at http://www.steeleye.com. Ensure that the local security policies, firewall, and port settings are configured as per the details in these documents.

The following procedures help you set up a virtual machine in the Disaster Recovery environment.

Creating a DataKeeper Mirroring Job

To set up a virtual machine in the Disaster Recovery environment you need to first create a SteelEye mirroring job.

To create a SteelEye DataKeeper mirroring job

1 Click **Start**, and then from the **All Programs** menu, click **SteelEye DataKeeper MMC**. The **DataKeeper** window appears.

Steelline DataKeeper Ale Reports Ale Overview Server Overview	A Da adre	Action	W //			
	State 3da	1.1	reate 3ob provent to Server			
	State	Name	Description		De	scorrect from
	Minoring		InTourn Volume		- 14	ew.
	C Meroning	Applerver volume 903 Heturuen Volume	Applerver Volume			eb

2 In the Actions pane, click Create Job. The SteelEye DataKeeper window appears.

🚟 SteelEye Data	aKeeper 📃 🔲	×
Create a ne	ew job	
	a logical grouping of related mirrors and servers. Provide a name for this new job to help remember it.	
Job name:		
Job description:	Job description:	
	Create Job Cancel	1
	Create Job	-

3 Type the relevant job name and description in the **Job name** and **Job** description boxes, and then click **Create Job.** The **New Mirror window** appears.

New Mirror		_ O ×
Choose	a Source	
Choose a Source Shared Volumes Choose a Target	Choose the server with the source volume. Server: MERCURY.SPACE.COM	Connect to Server
Configure Details	Choose the IP address to use on the server. IP address 10.91.60.47 / 255.255.254.0	2
	Choose the volume on the selected server. Volume: G	
		Nest Cancel

4 In the **Choose a Source** area, select the server name, IP address, and volume and click **Next**. The **Choose a Target** area appears.

New Mirror		
Choose	a Target	
Choose a Source Shared Volumes Choose a Target Shared Volumes	Source server: MERCURY,SPACE.COM Source IP and mask: 10.91.60.47 Source volume: G	
Configure Details	Server: VENUS.SPACE.COM	Lonnect to Server
	Choose the IP address to use on the server. IP address: 10.91.60.27 / 255.255.254.0	2
	Choose the volume on the selected server. Volume: G	2
		Previous Next Cancel

5 Select the destination server name, IP address, and volume and click **Next**. The **Configure Details** area appears.

Choose a Source	Source server: MERCURY.SPACE.C	ом		
Shered Volumes	Source IP and mask: 10.91.60.47			
Choose a Target Shared Volumes	Source volume: G			
Configure Details	Specify how the data should be compressed a	when sent to the tar	get.	
	1	None .		
	How should the source volume data be sent t	o the target volume	7	
	Maximum bandwidth: 0 dbp			

- **6** In the **Configure Details** area, do the following:
 - **a** Move the slider to select the level of data compression.
 - **b** Click the relevant option to indicate the mode in which you want to send the source volume data to the target volume.
 - **c** In the **Maximum** bandwidth box, type the network bandwidth to be used for data replication.

Note: Enter "0" to indicate that the bandwidth is unlimited.

d Click **Done**. The steel eye mirroring job is created.

Disk Management Topologies

After you have completed setting up SteelEye Mirroring Jobs and created the datakeeper, you can view the topologies.

Open Disk Management to view all the disks which are replicated, by running the diskmgmt.msc from Run Command Prompt.

Volume	Layout	Type	File System	Status				Capacity	Free Space	% Free	Fault Toleran
🛥 (C:)	Simple	Basic	NTFS	Healthy (Boot, Page File, Cras	h Dump, Primary Parl	tition)	97.56 GB	69.72 GB	71 %	No
🗈 Appengine (G:)	Simple	Basic	NTFS	Healthy (Logical Drive)			39.06 GB	32.48 GB	83 %	No
Appserver (E:)	Simple	Basic	NTFS	Healthy (Logical Drive)			78.13 GB	70.25 GB	90 %	No
Backups (K:)	Simple	Basic	NTFS	Healthy (Logical Drive)			166.28 GB	161.64 GB	97 %	No
■Historian (D:)	Simple	Basic	NTFS	Healthy (Logical Drive)			78.13 GB	70.08 GB	90 %	No
InTouch (F:)	Simple	Basic	NTES	Healthy (Logical Drive)			39.06 GB	32.48 GB	83 %	No
System Reserved	Simple	Basic	NTFS	Healthy (System, Active, Prima	ary Partition)		100 MB	72 MB	72 %	No
WIS (H:)	Simple	Basic	NTFS	Healthy (Logical Drive)			60.60 GB	48.43 GB	80 %	No
•] [
🗆 Disk 0											
Basic Sys 558.91 GB 100 Online Hea	1 97.56	GB NTF: iy (Boot,	5 78.13	rian (D:) GB NTFS IV (Logical	Appserver (E:) 78.13 GB NTFS Healthy (Logical [InTouch (F:) 39.06 GB NTFS Healthy (Logical	39.06	GB NTFS	WIS (H:) 60.60 GB NTF Healthy (Logic	5 166.	kups (K:) 28 GB NTFS thy (Logical Dr

After creating all the Mirroring Jobs, Open the SteelEye DataKeepr UI from the All Programs menu, click SteelEye DataKeeper MMC. The DataKeeper window appears.

You can navigate to **Job Overview** under **Reports** to view all the Jobs in one place.

 W SteelEye DataKeeper Jobs Ø SyncAppEngine Ø SyncGR 	1	erver Overvie	w R	eport										
🗉 🔮 SyncHistorian														
SyncWIS SyncInTouch	▲ FAIL	OVERTEST01	.MA	GELLANDEV20	DO.DEV.WOND	ERWARE.CO	M (FAILOVERTEST01.MA	AGELLA	NDEV2000.DE	EV.WOND	ERWARE.C	OM)	Mirroring	
Reports	Volume	Mirror Role		State	File System	Total Size								
Job Overview	F	Target	V	Mirroring	N/A	N/A								
Server Overview	D	Target	ō	Mirroring	N/A	N/A								
	E	Source	0	Mirroring	NTFS	43.95 GB								
	н	Source		Mirroring	NTFS	43.95 GB								
	I	Source	0	Mirroring	NTFS	43.95 GB								
	J	None		Not mirrored	NTFS	13.03 GB								
A	▲ FAIL	OVERTEST02	.MA	GELLANDEV20	DO.DEV.WONE	ERWARE.CO	M (FAILOVERTEST02)	O N	Mirroring					
	Volume	Mirror Role		State	File System	Total Size								
	F	Source	V	Mirroring	NTFS	43.95 GB								
	D	Source	0	Mirroring	NTFS	43.95 GB								
	E	Target		Mirroring	N/A	N/A								
	н	Target		Mirroring	N/A	N/A								
1	I	Target		Mirroring	N/A	N/A								
	J	None		Not mirrored	NTFS	13.03 GB								

You can navigate to **Server Overview** under **Reports** to view all the servers involved in job replication in one place.

jj s	Server Overview Report						
▲ MER	CURY.SPACE.	COM (MERCURY)) 🛛 🛕 Resyr	ncing			
Volume	Mirror Role	State	File System	Total Size			
D	Source	Ø Mirroring	NTFS	78.12 GB			
E	Source	📀 Mirroring	NTFS	78.12 GB			
F	Source	🦪 Mirroring	NTFS	39.06 GB			
G	Source	🛕 Resyncing	NTFS	39.06 GB			
н	Source	🛕 Resyncing	NTFS	60.60 GB			
к	None	Not mirrored	NTFS	166.28 GB			
▲ VEN	US.SPACE.CO	M (VENUS)	🔥 Resyncing				
Volume	Mirror Role	State	File System	Total Size			
D	Target	🌏 Mirroring	N/A	N/A			
E	Target	📀 Mirroring	N/A	N/A			
F	Target	📀 Mirroring	N/A	N/A			
G	Target	🛕 Resyncing	N/A	N/A			
н	Target	🛕 Resyncing	N/A	N/A			
К	None	💼 Not mirrored	NTFS	166.28 GB			

Configuring Virtual Machines

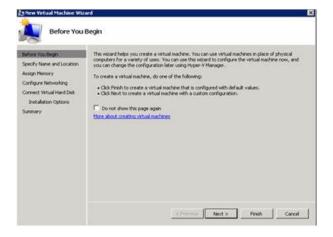
After creating a steel eye mirroring job, you need to create a virtual machine in the disk.

To configure a virtual machine

1 In the Server Manager window, right-click Features and click Failover Cluster Manager. The Failover Cluster Manager tree expands.

Server Manager		
File Action View Help		48000
** 2 17 8 17		
Server Manager (HDMJS)	Fallover Cluster Manager	Actions
E 1 Hyper-V	Failover Cluster Manager	Fabrier Outer Hanager
B of Federes	Create failover clusters, validate hardware for potential failover cluster configuration changes to your failover clusters.	🤤 Create a Cluster
R B Palover Cluster Nanager	• Overview	Ranage a Clutter
in Services and application of the services and application of		Vew
R III Nooks	A failover cluster is a set of independent computers that work together to availability of services and applications. The clustered servers [scaled nod]	Properties
E Custer Events	physicial cables and by software. If one of the nodes fails, another node b services (a process known as failsver)	Heb.
H Configuration H E Sharage	Clusters	
	🕑 Einelune.com	
	* Management	1
	To begin to use failover clusteing, finit validate your hardware configurate cluster. After these steps are complete, you can manage the cluster. Ma include mapping services and applications to 1 hora a cluster narving We Windows Server 2008, or Windows Server 2009 R2	
	🖬 Valdete a Confraction. 🔛 Lindestanding	
<u>ار ا</u>	1	

2 Right-click Services and applications, and click Virtual Machines, and then click New Virtual Machine. The New Virtual Machine Wizard window appears.



3 View the instructions in the **Before You Begin** area and click **Next**. The **Specify Name and Location** area appears.

efore You Begin	Choose a name and location for this virtual machine.
peopy Name and Location sign Memory	The name is displayed in Hyper-Y Manager. We recommend that you use a name that helps you eas identify this virtual reachine, such as the name of the guest operating system or workload.
Configure Networking Connect Virtual Hard Disk Installation Options Summery	Name: Historianiti
	You can create a folder or use an existing folder to store the virtual machine. If you don't select a folder, the virtual machine is stored in the default folder configured for this server. If Store the virtual machine is a different location
contrast (Location: G-\ Browse
	 If you plan to take snapshots of this virtual machine, select a location that has enough free space. Snapshots include virtual machine data and may require a large amount of space.

- **4** In the **Specify Name and Location** area, do the following:
 - **a** In the Name box, type a name for the virtual machine.
 - **b** Select the **Store the virtual machine in a different location** check box to be able to indicate the location of the virtual machine.
 - **c** In the **Location** box, enter the location where you want to store the virtual machine.

Note: You can either type the location or click Browse to select the location where you want to store the virtual machine.

d Click Next. The Assign Memory area appears.



5 Type the recommended amount of memory in the **Memory** box and click **Next**. The **Configure Networking** area appears.

Before You Begin Specify Name and Location Assign Memory	Each new virtual nuchme includes a network adapter. You can configure the network adapter to use a virtual network, or it can remain disconnected.
Gonhann Herhendrag Connect Whuai Hand Dak Instalation Options Summary	Then about configuration entropy address

6 Select the network to be used for the virtual machine and click **Next**. The **Connect Virtual Hard Disk** area appears.

New Virtual Machine Wiz	ad	×
Connect Vir	tual Hard Disk	
Before You Begin Specify Name and Location Assign Memory	A virtual machine requires storage so that you can initial an operating system. You can specify the storage now or configure it later by modifying the virtual machine's properties.	
Configure Networking Connect Vehical Hend Smk Installation Options Summary	Name: Platorari/M vhd Location: [C1/thitoriari/M] Size: 40 (38 (Maximum: 2040 G8)	
	C Use an existing virtual hand disk	
	Attach a viruel hard dis later Chronous Next > Pinish Cancel	l

- 7 Click the **Create a virtual hard disk** option button, and then do the following:
 - **a** In the Name box, type the name of the virtual machine.
 - **b** In the **Location** box, enter the location of the virtual machine.

Note: You can either type the location or click **Browse** to select the location of the virtual machine.

c In the **Size** box, type the size of the virtual machine, and then click **Next**. The **Installation Options** area appears.

Note: You need to click either the **Use an existing virtual hard disk** or **Attach a virtual hard disk later** option, only if you are using an existing virtual hard disk or you want to attach a virtual disk later.

Defore You Begin	You can install an operating system now if you have access to the setup media, or you can install later.
Specify Name and Location Assign Memory	Install an operating system later
Configure Networking Connect Virtual Hard Disk	Install an operating system from a boot CD/DVD-ROM Pledae
Installation Options	R House (COVO drive) (g
Sumary	C Steep (Inc)
	C Install an operating system from a boot floppy disk
	Heda minal Report doi: (white
	C Instal an operating system from a network-based installation server

8 Click the Install an operating system later option and click Next. The Completing the New Virtual Machine Window area appears.

Note: If you want to install an operating system from a boot CD/DVD-ROM or a boot floppy disk or a network-based installation server, click the relevant option.

Before You Begin Specify Name and Location Assign Memory	You have successfully completed the New Virtual Machine Woord. You are about to create the following virtual machine. Description:
Configure Networking Connect Virtual Hard Disk Installation Options Summary	Name: Hotoriam/N Memory: 2040 Mb Network: Domain-Virtual Network Hard Dak: Cirketoriam/Mf/Hotoriam/Nt-Nd Operating System: Will be installed at a later time
] To create the velocal machine and dose the veloard, did. Finish.

9 Click Finish. The virtual machine is created with the details you provided. As we have started this process from the Failover Cluster Manager, after completing the process of creating a virtual machine, the High Availability Wizard window appears.

Summe	иу		
orligue High Validality unersty	High availability was successful	ly configured for the service or application	n
(and a second seco	🕴 Virtual Machin	10	
	Name :	Result	Description
	HistorianVM	1	Warning
	To view the report created by the wided To close this wized, click Finish.	t. click View Report	View Report
			Proh

10 Click **View Report** to view the report or click **Finish** to close the **High Availability Wizard** window.

Adding the Dependency between the Virtual Machine and the DataKeeper volume in the Cluster

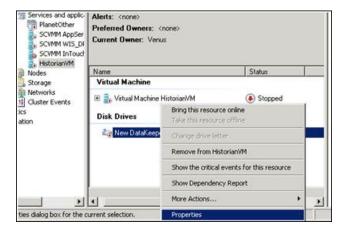
After creating the virtual machine, you need to add the dependency between the virtual machine and the datakeeper volume in the cluster. This dependency triggers the switching of the source and target Servers of the SteelEye DataKeeper Volume resource when failover of the virtual machines occurs in the Failover Cluster Manager.

To add the dependency between the virtual machine and the datakeeper volume in the cluster

1 On the Server Manager window, right-click the virtual machine, that you have created and then point to Add a resource, More Resources and then click Add DataKeeper Volumes. The Add a resource menu appears.



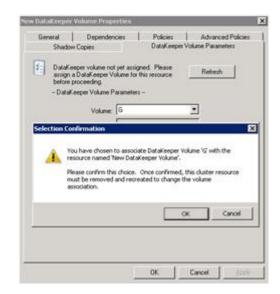
2 The New DataKeeper Volume is added under Disk Drives.



3 Right-click New DataKeeper Volume, and then click Properties. The New DataKeeper Volume Properties window appears.

DataKeep	er Volume Propert	ies		
Date	Dependencie dow Copies Keeper volume not ye	t accign	ed. Please	Advanced Policies Volume Parameters
belo	gn a DataKeeperVolu re proceeding. taKeeperVolume Pas	me for th	is resource	Reliesh
	Volume: Fotal Size:	_		2
	Source System			
		-	OK	Cancel Apply

4 Select the volume that you had entered while creating a SteelEye mirroring job and click **OK**. The **Selection Confirmation** window appears.



5 Click **OK** to validate the details that you have entered. The **Server Manager** window appears.

Server Manager (CAPRICORI)	Historian	Historian				
II. of Fedures	Historian	Historian				
Pathew Outer Manager Pathewouter Pathewoute	kator Infore Status: Office Aleft: conce Partner Operation	Status: Office Alerts: croses Preferred Dewers: croses				
III III Nodes Storage	Nace	Name Statu				
The Sector Events	Virtual Machine					
🛞 🌆 Diagnostics	H B. Vitual Machine Histolan	Stopped				
E Configuration	Disk Drives	Take this resource offline				
	田 むa Historian Volume	Show the ortical events for this resource				
		Show Dependency Report				
		More Actions +				
		Deleta				
		Properties				
		Help:				

Note: To modify the selection, click **Cancel** and modify the detail as required in the **New DataKeeper Volume Properties** window, and then click **Apply**.

6 Under Virtual Machine, right-click the name of the virtual machine that you created. Click Virtual Machine Configuration and click Properties. The Virtual Machine Configuration Historian Properties window appears.

net	al Dependent	cies Policies Advanced Policies
	city the resource rought online:	es that must be brought online before this resource can
	AND/OR	Resource
		Historian Volume
	Click here to a	fiistorian Volume
		Delete
Hist	osian Volume	Delete
fish	orian Volume	Delete
fish	orian Volume	Insert Delete

7 Click the **Dependencies** tab, then from the **Resource** list, select the name of the **DataKeeper Volume** resource that you created and click **OK**.

Server Manager (VENUS)	HistorianVM	HistorianVM				
E holes	Historian∨M					
Hyper-V Manage Yolus Yolus Foliover Outer Mar Wills Foliover Outer Mar Will Services and Services and Sorvies Sorvies Sorvies Sorvies	Summary of Historian's second State: Office Alettic cronol Comment of vertical matchines Second State State: State Second State State Second State State Second State Second State Sta	/M	Aut	o Start		
E B Nodes	Save virtual machines Save virtual noctimes		Status			
Storage Storage Antervorks Guster Eve Diagnostics Configuration	Dive migrate virtual machine to another node Cancel in programs five migration Quick migrate virtual machine(d) to another not Manage virtual machine	4	Stopped			
E Storage	Move virtual machine(s) to another node		 Ottine 			
	Show the critical events for this application					
	Add storage Add a resource					
	Disable auto start					
4	Show Dependency Report	-	and the second s			

8 On the Server Manager window, right-click the name of the virtual machine that you created, and then click Start virtual machines to start the virtual machine.

Note: You can use the above procedure to create multiple virtual machines with appropriate names and configuration.

Configuration of System Platform Products in a Typical Small Scale Virtualization

To record the expected Recovery Time Objective (RTO) and Recovery Point Objective (RPO), trends and various observations in a small scale virtualization environment, tests are performed with System Platform Product configuration shown below.

The virtualization host server used for small scale configuration consists of three virtual machines listed below.

Node 1: GR, Historian and DAS SI Direct – Windows 2008 R2 Standard edition (64bit) OS with SQL Server 2008 SP1 32 bit

Node 2 (AppEngine): Bootstrap, IDE and InTouch (Managed App) – Windows 2008 R2 Standard edition (64bit) OS

Node 3: Information Server, Bootstrap and IDE, InTouch Terminal Service and Historian Client – Windows Server 2008 SP2 (32bit) with SQL Server 2008 SP1 and Office 2007

Virtual Node	IO tags (Approx.)	Historized tags (Approx.)
GR	10000	2500
AppEngine	10000	5000

Historized tags and their Update Rates for this Configuration

The following table shows historized tags and their update rates for this configuration:

Topic Name	Update Rate	Device Items	Active Items
Topic 13	1000	480	144
Topic 1	10000	1	1
Topic 2	10000	1880	796
Topic 3	30000	1880	796
Topic 4	60000	1880	796
Topic 5	3600000	1880	796
Topic 7	600000	40	16
Topic 8	10000	1480	596
Topic 9	30000	520	352
Topic 6	1800000	1480	676
Topic 39	1000	4	4
Topic 16	1800000	1000	350

Real Time data from DAS SI Direct

Late tags and buffered tags from DAS test Server

Topic Name	Update Rate	Device Items	Active Items
Late Data (1 hour)	1000	246	112
Buffered Data	1000	132	79

Application Server Configuration Details

Total No of Engines: 14

Number of objects under each Engine

- Engine 1 : 9
- Engine 2 : 13
- Engine 3 : 13
- Engine 4 : 225
- Engine 5 : 118
- Engine 6 : 118
- Engine 7 : 195
- Engine 8 : 225
- Engine 9 : 102
- Engine 10: 2
- Engine 11: 3
- Engine 12: 21
- Engine 13: 1
- Engine 14: 1

The total number of DI objects is 6.

Expected Recovery Time Objective and Recovery Point Objective

This section provides the indicative Recovery Time Objectives (RTO) and RecoveryPoint Objectives (RPO) for the load of IO and Attributes historized shown above and with the configuration of Host Virtualization Servers and Hyper-V virtual machines explained in the Setup instructions of Small Scale Virtualization. In addition to these factors, the exact RTO and RPO depend on factors like storage I/O performance, CPU utilization, memory usage, and network usage at the time of failover/migration activity.

RTO and RPO Observations - DR Small Configuration

Scenarios and observations in this section:

Scenario	Observation
Scenario 1: IT provides maintenance on Virtualization Server	"Live Migration" on page 259
	"Quick Migration" on page 261
	"Quick Migration of All Nodes Simultaneously" on page 262
Scenario 2: Virtualization Server hardware fails	"Scenario 2: Virtualization Server hardware fails" on page 263
Scenario 3: Network fails on Virtualization Server	"Scenario 3: Network fails on Virtualization server" on page 265
Scenario 4: Virtualization Server becomes unresponsive	"Scenario 4: Virtualization Server becomes unresponsive" on page 267

The following tables display RTO and RPO Observations with approximately 20000 IO points with approximately 7500 attributes being historized:

Scenario 1: IT provides maintenance on Virtualization Server

Live Migration

Primary Node	Products	RTO	RI	
			Tags	Data Loss Duration
GR	IAS	14 sec	IAS tag (Script)	20 sec
			IAS IO tag (DASSiDirect)	26 sec
	Historian Client	19 sec	Historian Local tag	22 sec
			InTouch Tag \$Second	27 sec
			IAS IO Tag (DASSiDirect)	32 sec
			IAS tag (Script)	0 (data is SFed)
	DAServer	21 sec	N/A	N/A
WIS	InTouch HMI	12 sec	\$Second	12 sec
	Wonderware Information Server	12 sec	N/A	N/A
	Historian Client	12 sec	N/A	N/A
AppEngine	AppEngine	12 sec	IAS IO tag (DASSiDirect)	26 sec
			IAS tag Script)	13 sec
	InTouch HMI	12 sec	\$Second	12 sec

Node Name	Products	RTO		RPO
			Tags	Data Loss Duration
GR	IAS	147 sec	IAS tag (Script)	160 sec
			IAS IO Tag (DASSiDirect)	167 sec
	Historian Client	156 sec	Historian Local tag	164 sec
			InTouch tag \$Second	171 sec
			IAS IO Tag (DASSiDirect)	170 sec
			IAS tag (Script)	0 (data is SFed)
	DAServer	156 sec	N/A	N/A
WIS	InTouch HMI	91 sec	\$Second	91 sec
	Wonderware Information Server	91 sec	N/A	N/A
	Historian Client	91 sec	N/A	N/A
AppEngine	AppEngine	59 sec	IAS IO tag (DASSiDirect)	80 sec
			IAS Tag (Script)	73 sec
	InTouch HMI	68 sec	\$Second	68 sec

Quick Migration

Primary node	Products	RTO		RPO
			Tags	Data Loss Duration
GR	IAS	221 sec	IAS tag (Script)	229 sec
			IAS IO tag (DASSiDirect)	234 sec
	Historian Client	225 sec	Historian Local tag	226 sec
			InTouch tag \$Second	238 sec
			IAS IO tag (DASSiDirect)	242 sec
			IAS tag (Script)	160 sec
	DAServer	225 sec	N/A	
WIS	InTouch HMI	225 sec	\$Second	$255 m \ sec$
	Wonderware Information Server	225 sec	N/AS	
	Historian Client	225 sec	N/A	
AppEngine	AppEngine	150 sec	IAS IO tag (DASSiDirect)	242 sec
			IAS tag (Script)	160 sec
	InTouch HMI	149 sec	\$Second	149 sec

Quick Migration of All Nodes Simultaneously

Scenario 2: Virtualization Server hardware fails

The Virtualization Server hardware failure results in failover that is simulated with power-off on the host server. In this case, the VMs restart, after moving to the other host server.

Primary node	Products	RTO	1	
			Tags	Data Loss Duration
GR	IAS	270 sec	IAS tag (Script)	5 Min 22 sec
			IAS IO tag (DASSiDirect)	5 Min 12 sec
	Historian Client	362 sec	Historian Local tag	6 Min 40 sec
			InTouch tag \$Second	6 Min 58 sec
			φοειστια	Note: RPO is dependent on the time taken by the user to start the InTouchView on the InTouch node and the RTO of the Historian node, which historizes this tag.
			IAS IO tag (DASSiDirect)	5 Min 16 sec
			IAS tag (Script)	4 Min 55 sec
	DAServer	196 sec	N/A	N/A

Primary Node	Products	RTO		RPO
			Tags	Data Loss Duration
WIS	InTouch HMI	240 sec + time taken by the user to start the InTouchView	\$Second	6 Min 58 sec Note: RPO is dependent on the time taken by the user to start the InTouchView on the InTouch node and the RTO of the Historian node, which historizes this tag.
	Wonderware Information Server	240 sec + time taken by the user to start the Information Server	N/A	N/A
	Historian Client	240 sec + time taken by the user to start the Historian Client	N/A	N/A
AppEngine	AppEngine	267 sec	IAS IO tag (DASSiDirect)	5 Min 16 sec
			IAS tag (Script)	4 Min 55 sec
	InTouch HMI	267 sec + time taken by the user to start the ITView	\$Second	267 sec + time taken by the user to start the ITView
			InTouchView on the the RTO of the His	e user to start the InTouch node and

Scenario 3: Network fails on Virtualization server

The failure of network on the Virtualization Server results in failover due to network disconnect (Public). Bandwidth used is 45Mbps and there is no latency. In this case, the VMs restart, after moving to the other host server.

Primary Node	Products	RTO		RPO
			Tags	Data Loss Duration
GR	IAS	251 sec	IAS tag (Script)	4 Min 42 sec
			IAS IO tag (DASSiDirect)	4 Min 47 sec
	Historian Client	290 sec	Historian local tag	5 Min 11 sec
			InTouch tag \$Second	5 Min 10 sec
			φοειστια	Note: RPO is dependent on the time taken by the user to start the InTouchView on the InTouch node and the RTO of the Historian node, which historizes this tag.
			IAS IO tag (DASSiDirect)	4 Min 42 sec
			IAS tag (Script)	3 Min 58 sec
	DAServer	191 sec	N/A	N/A

Primary Node	Products	RTO		RPO
			Tags	Data Loss Duration
WIS	InTouch HMI	215 sec + time taken by the user to start the InTouchView	\$Second	5 Min 10 sec
			taken by th InTouchView or and the RTO of	dependent on time he user to start the h the InTouch node the Historian node historizes this tag.
	Wonderware Information Server	215 sec + time taken by the user to start the Information Server	N/A	N/A
	Historian Client	215 sec + time taken by the user to start the Historian Client	N/A	N/A
AppEngine	AppEngine	209 sec	IAS IO Tag (DASSiDirect)	4 Min 42 sec
			IAS tag (Script)	3 Min 58 sec
	InTouch HMI	195 sec + time taken by the user to start the ITView	\$Second	195 sec
			taken by th InTouchView or and the RTO of	dependent on time he user to start the h the InTouch node the Historian node historizes this tag.

Scenario 4: Virtualization Server becomes unresponsive

There is no failover of VMs to the other host server when the CPU utilization on the host server is 100%.

Primary Node	Products	RTO		RPO
			Tags	Data Loss Duration
GR	IAS	N/A	N/A	N/A
			N/A	N/A
	Historian Client	N/A	N/A	N/A
			N/A	N/A
			N/A	N/A
			N/A	N/A
	DAServer	N/A	N/A	N/A
WIS	InTouch HMI	N/A	N/A	N/A
	Wonderware Information Server	N/A	N/A	N/A
	Historian Client	N/A	N/A	N/A
AppEngine	AppEngine	N/A	N/A	N/A
			N/A	N/A
	InTouch HMI	N/A	N/A	N/A

Working with a Medium Scale Virtualization Environment

This section contains the following topics:

- Setting Up Medium Scale Virtualization Environment
- Configuring System Platform Products in a Typical Medium Scale Virtualization
- Expected Recovery Time Objective and Recovery Point Objective

Setting Up Medium Scale Virtualization Environment

The following procedures help you to set up small scale virtualization disaster recovery environment.

Planning for Disaster Recovery

The minimum and recommended hardware and software requirements for the Host and Virtual machines used for small scale virtualization disaster recovery environment.

Hyper-V Hosts

Two 2.79 GHz Intel Xeon with 24 Cores
Windows Server 2008 R2 Enterprise with Hyper-V enabled
48 GB
SAN with 1TB storage disk

Note: For the Hyper-V Host to function optimally, the server should have the same processor, RAM, storage and service pack level. Preferably the servers should be purchased in pairs to avoid hardware discrepancies. Though the differences are supported, it will impact the performance during failovers.

Virtual Machines

Using the Hyper-V host specified above, seven virtual machines can be created in the environment with the configuration given below.

Virtual Machine 1: Historian Node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	8 GB
Storage	200 GB
System Platform Products Installed	Historian

Virtual Machine 2: Application Server Node, DAS SI

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	8 GB
Storage	100 GB
System Platform Products Installed	ArchestrA-Runtime, DAS SI

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	InTouch with TS enabled

Virtual Machine 4: Application Server Runtime Node 1

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Application Server Runtime only and InTouch

Virtual Machine 5: Application Server Runtime Node 2

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Application Server Runtime only

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Information Server

Virtual Machine 6: Information Server Node

Virtual Machine 7: Historian Client Node

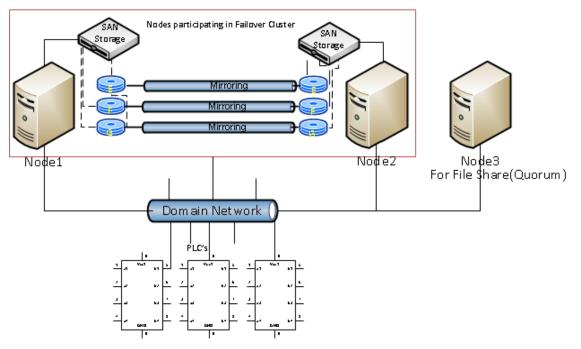
Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows 7 Enterprise
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Historian Client

Network Requirements

For this architecture, you can use one physical network card that needs to be installed on a host computer for the domain network and the process network.

Configuring Failover Cluster

The recommended topology of the failover cluster for disaster recovery process for medium scale virtualization environment is given below:



This setup requires a minimum of two host servers and two storage servers connected to each host independently. Another independent node is used for configuring the quorum. For more information on configuring the quorum, refer to "Configuring Cluster Quorum Settings" on page 282.

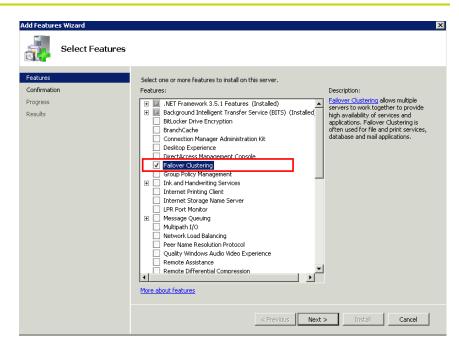
The following procedures help you install and configure a failover cluster that has two nodes to set up on medium configuration.

To install the failover cluster feature, you need to run Windows Server 2008 R2 Enterprise Edition on your server.

To configure failover cluster

1 On the **Initial Configuration Tasks** window, under **Customize This Server**, click **Add** features. The **Add Features Wizard** window appears.

Note: The **Initial Configuration Tasks** window appears if you have already installed Windows Server 2008 R2. If it does not appear, open the **Server Manager** window, right-click **Features** and click **Add Features**.



2 In the Add Features Wizard window, select the Failover Clustering check box, and then click Next. The Confirm Installation Selections area appears.

Add Features Wizard	allation Selections
Continuition Features Continuation Progress Results	To install the following roles, role services, or features, dok Instal.
	Prof., e-mail, or same this information < Previous Toricity Zentral Cancel

3 Click **Install** to complete the installation. The **Installation Results** area with the installation confirmation message appears.

Add Features Wizard			×
Installation Resu	llts		
Features Confirmation Progress Results	The following roles, role services, or f 1 warning message below Windows automatic updating is automatically updated, turn on	eatures were installed successfully: not enabled. To ensure that your newly-installed role Windows Update in Control Panel.	or feature is
	Failover Clustering	🥑 Installation succeeded	
	Print, e-mail, or save the installation r	eport	
		< Previous Next > Close	Cancel

4 Click Close to close the Add Features Wizard window.

Note: Repeat the procedure to include on all the other nodes that will be part of the Cluster configuration process.

Validating Cluster Configuration

Before creating a cluster, you must validate your configuration. Validation helps you confirm that the configuration of your servers, network, and storage meet the specific requirements for failover clusters.

To validate the failover cluster configuration

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

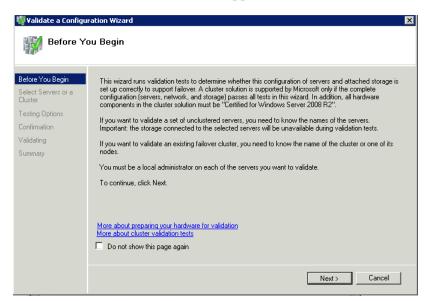
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2 Expand Features and click Failover Cluster Manager. The Failover Cluster Manager pane appears.

Note: If the **User Account Control** dialog box appears, confirm the action you want to perform and click **Yes**.

📕 Server Manager								_ 🗆 🗙
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Server Manager (C.	APRICORN)	Failover Clust	er Manager				Actions	
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	Help				s to provide services (a process known as		👔 Help	
-		idiloverj.						
		* Cluste	rs					
			gement					
		these steps	are complete, you ca	n manage the cluster.	ware configuration, then create a cluster. Aft Aanaging a cluster can include migrating	er		
		services ar Windows 9	d applications to it from erver 2008 R2.	m a cluster running Win	dows Server 2003, Windows Server 2008, or			
			te a Configuration	2	Understanding cluster validation tests			
			a Cluster	2	Creating a failover cluster or adding a cluste			
					node			
		🗾 🗖 Mana	<u>ge a Cluster</u>	?	Managing a failover cluster			
				?	Migrating services and applications from a cluster			
		* More	nformation					
		🛛 🔯 Failov	er cluster topics on the	<u>Web</u>				
		Railov	er cluster communities	on the Web				
This action launches the	validation wizard	d, which guides yo	u through the proces	s of testing the hardwa	re configuration for a cluster.			

3 Under Management, click Validate a Configuration. The Validate a Configuration Wizard window appears. Click Next.



- **4** In the **Select Servers** or a **Cluster** screen, you need to do the following:
 - **a** Click **Browse** or enter next to the **Enter name** box and select the relevant server name.
 - **b** From the **Selected servers** list, select the relevant servers and click **Add**.

- **c** Click **Next**. The **Testing Options** screen appears.
- **d** Enter the server name and click **Add**. The server gets added to the server box.
- **Note:** To remove a server, select the server and click **Remove**.

lefore You Begin ielect Servers or a iluster		ervers, add the names of all the servers. ster, add the name of the cluster or one of its nodes	
esting Options	Enter name:		Browse
alidating	Selected servers:	capricorn.space.com gemini.space.com	Add
ummary			Remove

5 Click the Run only the tests I select option to skip the storage validation process, and click Next. The Test Selection screen appears.

🦉 ¥alidate a Config	aration Wizard
Testing	Options
Before You Begin Select Servers or a Cluster Testing Options Test Selection Confirmation Validating Summary	Choose between running all tests or running selected tests. The tests include Inventory tasks, Network tests, Storage tests, and System Configuration tests. Microsoft supports a cluster solution only if the complete configuration (servers, network, and storage) can pass all tests in this wizard. In addition, all hardware components in the cluster solution must be "Certified for Windows Server 2008 R2". Pun all tests (recommended) Run only tests I select
	More about cluster validation tests
	< Previous Next > Cancel

Note: Click the **Run all tests (recommended)** option to validate the default selection of tests.

6 Clear the **Storage** check box, and then click **Next**. The **Summary** screen appears.

Before You Begin Select Servers or a Cluster Testing Options Test Selection Confirmation Validating Summary	Select the tests that you want to run. A few tests are de dependent test, the test that it depends on will also run.	Description These tests gather and display information about the nodes.
	More about cluster validation tests	< Previous Next > Cancel

7 Click View Report to view the test results or click Finish to close the Validate a Configuration Wizard window.

Summary	uration Wizard Y
efore You Begin elect Servers or a Juster	Testing has completed for the tests you selected. To confirm that your cluster solution is supported, you must run all tests. A cluster solution is supported by Microsoft only if it passes all cluster validation tests.
esting Options	E-ilener Oberten Velidetien Denest 🎽
est Selection	📕 Failover Cluster Validation Report 🧂
onfimation	
alidating	Node: capricorn.space.com
ummary	Node: gemini.space.com
	To view the report created by the wizard, click View Report. To close this wizard, click Finish. Create the cluster now using the validated nodes
	More about cluster validation tests

A warning message appears indicating that all the tests have not been run. This usually happens in a multi site cluster where the storage tests are skipped. You can proceed if there is no other error message. If the report indicates any other error, you need to fix the problem and re-run the tests before you continue. You can view the results of the tests after you close the wizard in

SystemRoot\Cluster\Reports\Validation Report date and time.html where SystemRoot is the folder in which the operating system is installed (for example, C:\Windows).

To know more about cluster validation tests, click **More about cluster** validation tests on Validate a Configuration Wizard window.

Creating a Cluster

To create a cluster, you need to run the **Create Cluster wizard**.

To create a cluster

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

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2 Expand Features and click Failover Cluster Manager. The Failover Cluster Manager pane appears.

Note: If the **User Account Control** dialog box appears, confirm the action you want to perform and click **Yes**.

Corver Name			
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3 Under Management, click **Create a cluster**. The **Create Cluster Wizard** window appears.



4 View the instructions and click **Next**. The **Validation Warning** area appears.

efore You Begin	
lect Servers Idation Warning	For the servers you selected for this cluster, the reports from cluster configuration validation tests and the servers incomplete. Microsoft supports a cluster solution only if the complete configuration tervers, network and storage] can pass all the tests in the Validate a Configuration wizard.
cess Point for Immistering the acter	Do you want to run configuration validation tests before continuing?
ntimation	View Report
	C Yes. When I click Next, run configuration validation tests, and then return to the process of creating the cluster.
rating New Cluster	

5 Click No. I do not require support from Microsoft for this cluster, and therefore do not want to run the validation tests.
 When I click Next, continue creating the cluster option and click Next. The Select Servers area appears.

Note: Click **Click Yes. When I click Next, run configuration validation tests, and then return to the process of creating the cluster** option if you want to run the configuration validation tests. **Click View Report** to view the cluster operation report.

Select Servers Validation Warning Access Point for Enter server name:	
Access Point for Enter server name:	
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Cluster Selected servers: mercury space.com	Add
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Sounda	

- **6** In the **Select Servers** screen, do the following:
 - a In the Enter server name box, enter the relevant server name and click Add. The server name gets added in the Selected servers box.

Note: You can either type the server name or click **Browse** to select the relevant server name.

b Click Next. The Access Point for Administering the Cluster area appears.

Create Cluster Wi	zerd X
Before You Begin Select Servers Validation Warning Access Point for Administering the Custor Continuation Creating New Cluster Summary	Type the name you want to use when administering the cluster. Cluster Name: One or more DHCP IPv4 addresses were configured automatically. All networks were configured automatically.
	More about the administrative Access Point for a cluster
	Cancel

7 In the Cluster Name box, type the name of the cluster and click Next. The Confirmation area appears.

Note: Enter a valid IP address for the cluster to be created if the IP address is not configured through Dynamic Host Configuration Protocol (DHCP).

Before You Begin Select Servers	You are ready to create The wizard will create yo	a cluster. wr cluster with the following settings:	
Validation Warning Access Point for Administering the Cluster Confernation Cinetring New Cluster Summary	Cluster: Node: Node: IP Address:	Stars1 capricom.space.com gemini.space.com DHCP address on 10.91.60.0/23	8
			<u></u>

8 Click Next. The cluster is created and the Summary area appears.

Create Cluster Wi	1999 (C)		
Summary			
Sefore You Begin Select Sinvers	You have sue	ccessfully completed the Create Cluster Wizard.	
aldation Warning ocess Point for dismistering the Juster		Create Cluster	*
ontrimation making New Duster unimary	Cluster: Node: Node:	Planet mercury.space.com venus.space.com	
	Quorum:	Node Majority	*
	To view the report cre To close this wizard, c	ated by the wicard, click View Report. lick Finish.	View Report
			Finish

9 Click **View Report** to view the cluster report created by the wizard or click Finish to close the **Create Cluster Wizard** window.

Configuring Cluster Quorum Settings

Quorum is the number of elements that need to be online to enable continuous running of a cluster. In most instances, the elements are nodes. In some cases, the elements also consist of disk or file share witnesses. Each of these elements determines whether the cluster should continue to run.

All elements, except the file share witnesses, have a copy of the cluster configuration. The cluster service ensures that the copies are always synchronized. The cluster should stop running if there are multiple failures or if there is a communication error between the cluster nodes.

After both nodes have been added to the cluster, and the cluster networking components have been configured, you must configure the failover cluster quorum. You must create and secure the file share that you want to use for the node and the file share majority quorum before configuring the failover cluster quorum. If the file share has not been created or correctly secured, the following procedure to configure a cluster quorum will fail. The file share can be hosted on any computer running a Windows operating system.

To configure the cluster quorum, you need to perform the following procedures:

- Create and secure a file share for the node and file share majority quorum
- Use the failover cluster management tool to configure a node and file share majority quorum

To create and secure a file share for the node and file share majority quorum

- **1** Create a new folder on the system that will host the share directory.
- **2** Right-click the folder that you created and click **Properties**. The **Quorum Properties** window for the folder you created appears.

Note: In the following procedure, Quorum is the name of the folder.

📜 Quorum Propertie	25		×
General Sharing S	iecurity Previou	us Versions 🗍 Cus	tomize
General Sharing S Network File and F Quorum Not Share Network Path: Not Shared Share Advanced Sharing Set custom permis advanced sharing	iolder Sharing ed sions, create mu options.		
	ОК	Cancel	Apply

3 Click the Sharing tab, and then click Advanced Sharing. The Advanced Sharing window appears.

Advanced Sharing	×
Share this folder	
Settings	1
Share name:	
Quorum	
Add Remove	
Limit the number of simultaneous users to:	
Comments:	
Permissions Caching	
OK Cancel Apply	

4 Select the **Share this folder** check box and click **Permissions**. The **Permissions for Quorum** window appears.

📜 Permissions for Quorum		×
Share Permissions		
Group or user names:		
A Everyone		
	Add	Remove
Permissions for Everyone	Allow	Deny
Full Control		
Change Read		
	_	-
Learn about access control and p	permissions	

5 Click Add. The Select Users, Computers, Service Accounts, or Groups window appears.

Select Users, Computers, Service Accounts, or Groups	? ×
Select this object type:	
Users, Groups, or Built-in security principals	Object Types
From this location:	
	Locations
Enter the object names to select (<u>examples</u>):	
<node1>,<node2>,<cluster name=""></cluster></node2></node1>	Check Names
Advanced OK	Cancel

6 In the Enter the object name to select box, enter the two node names used for the cluster in the medium node configuration and click OK. The node names are added and the Permissions for Quorum window appears.

📜 Permissions for Quorum		×
Share Permissions		
Group or user names:		
	Add	Remove
Permissions for Everyone	Allow	Deny
Full Control	<u> </u>	
Change Read		
neau	₹.	
Learn about access control and p	ermissions	
OK	Cancel	Apply

7 Select the Full Control, Change, and Read check boxes and click OK. The Properties window appears.

📙 Quorum Properties	×
General Sharing Security Previous Versions Customize	
Network File and Folder Sharing Quorum Not Shared Network Path: Not Shared Share	
Advanced Sharing Set custom permissions, create multiple shares, and set other advanced sharing options.	
OK Cancel Apply	

8 Click **Ok**. The folder is shared and can be used to create virtual machines.

To configure a node and file share majority quorum using the failover cluster management tool

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

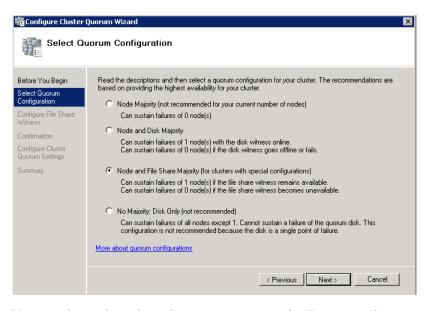
📕 Server Manager					
File Action View	Help				
🗢 🔿 🚺 📰 🗌	? 🖬				
🚡 Server Manager (C	APRICORN)	Star.space.com			
Roles		Cluster Star.sp	ace com		
E 📑 Hyper-					
	PRICORN	Summary	of Cluster Star		
Features Reatures Reatures Reatures	ister Manager	Starhas 0 ap	plications/services and 2 nodes		
■ 聯 Star.s		rvice or Application	h	Networks: Cluster Network 1, Cluster Network 2	
Diagnostics Configuration	Validate This C		Capricom	Subnets: 2 IPv4 and 0 IPv6	
E Storage	View Validation	Report	eport In: A Node Majority - Warning: Failure of a node will cause the cluster to fail. Check the status of the nodes.		
👋 Windows	Enable Cluster	Shared Volumes	nts: None in the last 24 hours		
📑 Disk Mana	Add Node				
	Close Connect	ion	-		
	More Actions.	. •	Configure Cluster Quorum Settin	ttings he or more servers (nodes), or migrate services and applications from a cluster Server 2008 R2.	
	View	•	Migrate services and application:		
	Refresh		Shut down Cluster	nding cluster validation tests	
	Properties		Destroy Cluster	nding Cluster Shared Volumes	
	Help		2	Add a server to your cluster	
		Migrate service	s and applications	Micrating a cluster from Windows Server 2003, Windows Server 2008, or Windows Server 2009 R2	
		Navigate to Sto	rage to add disks		

2 Right-click the name of the cluster you created and click More Actions. Click Configure Cluster Quorum Settings. The Configure Cluster Quorum Wizard window appears.

📲 Configure Cluster Quorum Wizard 🛛 🛛 🗙				
Before Y	ou Begin			
Before You Begin Select Quorum Configuration Configuration Configure Cluster Quorum Settings Summary	This wizard guides you through configuration of the quorum for a failover cluster. The quorum configuration determines the point at which too many failutes of certain cluster elements will stop the cluster from running. The relevant cluster elements are the nodes and, in some quorum configurations, a disk witness (which contains a copy of the cluster configuration) or file share witness. A majority of these elements must remain online and in communication, or the cluster "loses quorum" and must stop running. Note that full function of a cluster depends not just on quorum, but on the capacity of each node to support the services and applications that fail over to that node. For example, a cluster that has five nodes could still have quorum after two nodes fail, but each remaining cluster node would continue serving clients only if it had enough capacity to support the services and applications that failed over to it.			
	Important: Run this wizard only if you have determined that you need to change the quorum configuration for your cluster. When you create a cluster, the cluster software automatically chooses the quorum configuration that will provide the highest availability for your cluster. To continue, click Next. <u>More about quorum configurations</u> Do not show this page again			
	Next > Cancel			

3 View the instructions on the wizard and click **Next**. The **Select Quorum Configuration** area appears.

Note: The **Before you Begin** screen appears the first time you run the wizard. You can hide this screen on subsequent uses of the wizard.



4 You need to select the relevant quorum node. For special configurations, click the **Node and File Share Majority** option and click **Next**. The **Configure File Share Witness** area appears.

Note: Click the **Node Majority** option if the cluster is configured for node majority or a single quorum resource. Click the **Node and Disk Majority** option if the number of nodes is even and not part of a multi site cluster. Click the **No Majority: Disk Only** option if the disk being used is only for the quorum.

Configure Cluster Quorum Wizard	
Before You Begin Select Quorum Configuration Configure File Share Witness Configure Cluster Quorum Settings Summary	Please select a shared folder that will be used by the file share witness resource. This shared folder must not be hosted by this cluster. It can be made more available by hosting it on another cluster. Shared Folder Path: Shared Folder Path: \\u00eduniverse\Shared Browse
	< <u>P</u> revious <u>N</u> ext > Cancel

5 In the **Shared Folder Path** box, enter the Universal Naming Convention (UNC) path to the file share that you created in the Configure Cluster Quorum Settings. Click **Next**. Permissions to the share are verified. If there are no problems with the access to the share, then **Confirmation** screen appears.

Note: You can either enter the share name or click **Browse** to select the relevant shared path.

Configure Cluster	
Before You Begin Select Quorum Configuration	You are ready to configure the quorum settings of the cluster.
Configure File Share Witness	Share: \\universe\Shared Quorum Configuration: Node and File Share Majority
Confirmation Configure Cluster Quorum Settings Summary	Your cluster quorum configuration will be changed to the configuration shown above.
	< Previous Next > Cancel

6 The details you selected are displayed. To confirm the details, click **Next**. The **Summary** screen appears and the configuration details of the quorum settings are displayed.

🏙 Configure Cluster	Quorum Wizard	×
Summary	,	
Before You Begin Select Quorum Configuration	You have successfully configured the quorum settings for the cluster.	
Configure File Share Witness Confirmation	Configure Cluster Quorum Settings	[
Configure Cluster Quorum Settings Summary	Share: \\universe\Shared Quorum Configuration: Node and File Share Majority	
	To view the report created by the wizard, click View Report. To close this wizard, click Finish. View Report]
	Finish]

7 Click View Report to view a report of the tasks performed, or clickFinish to close the window.

After you configure the cluster quorum, you must validate the cluster. For more information, refer to http://technet.microsoft.com/en-us/library/bb676379(EXCHG.80).aspx.

Configuring Storage

For any virtualization environment, storage is one of the central barriers to implementing a good virtualization strategy. But with Hyper-V, VM storage is kept on a Windows file system. Users can put VMs on any file system that a Hyper-V server can access. As a result, you can build HA into the virtualization platform and storage for the virtual machines. This configuration can accommodate a host failure by making storage accessible to all Hyper-V hosts so that any host can run VMs from the same path on the shared folder. The back-end part of this storage can be a local, storage area network, iSCSI or whatever is available to fit the implementation.

The following table lists the minimum storage recommendations for each VM:

System	Storage Capacity
Historian Virtual Machine	200 GB
Application Server (GR node) Virtual Machine	100 GB
Application Engine 1(Runtime node) Virtual Machine	80 GB
Application Engine 2 (Runtime node) Virtual Machine	80 GB
InTouch Virtual Machine	80 GB
Information Server Virtual Machine	80 GB
Historian Client	80 GB

The total storage capacity should be minimum recommended 1 TB.

Configuring Hyper-V

Microsoft® Hyper-V[™] Server 2008 R2 helps in the creating of virtual environment that improves server utilization. It enhances patching, provisioning, management, support tools, processes, and skills. Microsoft Hyper-V Server 2008 R2 provides live migration, cluster shared volume support, expanded processor, and memory support for host systems.

Hyper-V is available in x64-based versions of Windows Server 2008 R2 operating system, specifically the x64-based versions of Windows Server 2008 R2 Standard, Windows Server 2008 R2 Enterprise, and Windows Server 2008 Datacenter.

The following are the pre-requisites to set up Hyper-V:

- x64-based processor
- Hardware-assisted virtualization
- Hardware Data Execution Prevention (DEP)

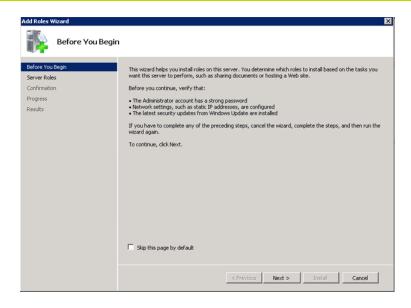
To configure Hyper-V

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

rver Manager			
Action View Help			
) 🖄 📅 🖬			
rver Manager (UNIVERSE)	Roles		
Action View Help Action View Help Particle Conference Diagnostics Configuration Storage	Vew the health of the roles installed on your server and add or remove	roles and features.	
	Roles Summary		Roles Summary Help
	Reless: 3 of 17 installed Active Directory Domain Services DNS Services File Services		🔓 Add Roles Gui Remove Roles
	Active Directory Domain Services		AD DS Help
	Stores directory data and manages communication between users and domains, in	cluding user logon processes, authentication, and directory searches.	
	🛞 Role Status		Go to Active Directory Domain Services
	Messages: 1 System Services: 8 Running, 2 Stopped (2) Events: 4 informational in the last 24 hours Bett Practices Analyzer: To date a Bett Practices Analyzer scan, go to th	e Best Practices Analyzer the on this role's homepage and click Scan this F	lain -
	Role Services: 1 Installed		Add Role Services
	Role Service Status		Remove Role Services
	Active Directory Donand Controller Installed Identity Management for URX Not installed Server for Network IV Inmation Services Not installed Password Synchronization Not installed Adversion Social		
	Description:		

2 In the Roles Summary area, click Add Roles. The Add Roles Wizard window appears.

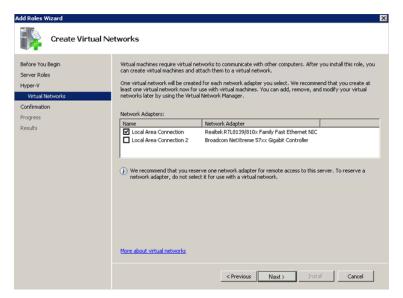
Note: You can also right-click **Roles** and then click **Add Roles Wizard** to open the **Add Roles Wizard** window.



3 View the instructions on the wizard, and then click **Next**. The **Select Server Roles** area appears.

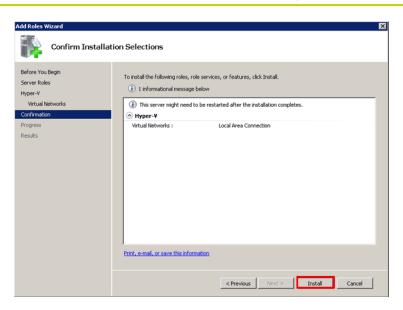
Select Server Roles Bore You Bagin Sever Roles Hyper Y Yetual Networks Confirmation Progress Results Description Distance (Installed) Distance (Installed) Distance (Installed) Progress Distance (Installed) Distance (Installed) Progress Distance (Installed) Windows Server Update Services Distance Services (Installed) Windows Server Update Services Distance Services (Installed) Windows Server Update Services	Add Roles Wizard		X
Server Roles Description: Hyper-V Active Directory Certificate Services therewise services that you can use to create and manage with analysis of the create and manage with analysis of the create and manage with analysis of the create and manage with analysis and their resources. Each vitual matchine is a vitual matchine i	Select Server Rol	es	
< Previous Next> Instal Cancel	Server Roles Hyper-V Virtual Networks Confirmation Progress	Roles: Active Directory Certificate Services Active Directory Certificate Services Active Directory Edhation Services Active Directory Lightweight Directory Services Active Directory Rights Management Services Active Directory Rights Management Services DHCP Server DHCS Server PAS Server Verserver Windows Server (IIS) (Installed) Windows Server Update Services Windows Server Update Services	Burney provides the services that you can use to create and manage visual machines and their resources. Each visual machine is a visualized computer system that operates in an isolated execution environment. This allows you to run multiple operating systems simultaneously.

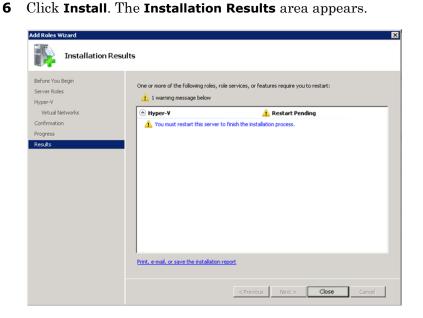
4 Select the **Hyper-V** check box and click **Next**. The **Create Virtual Networks** area appears.



5 Select the check box next to the required network adapter to make the connection available to virtual machines. Click Next. The Confirmation Installation Selections area appears.

Note: You can select one or more network adapters.





7 A message appears prompting you to restart the computer. ClickClose. The Add Roles Wizard pop-up window appears.

Before You Begin Select Servers	You are ready to create The wizard will create yo	a cluster. ur cluster with the following settings:	
Validation Warning Access Point for Administering the Cluster Confirmation Directing New Cluster Summary	Cluster: Node: Node: IP Address:	Stars1 capricorn.space.com gemini.space.com DHCP address on 10.91.60_0/23	*
			<u>*</u>

8 Click **Yes** to restart the computer.

9 After you restart the computer, log on with the same ID and password you used to install the Hyper V role. The installation is completed and the **Resume Configuration Wizard** window appears with the installation results.

Installation R	esults	
Resuming Configuration Progress Results	The following roles, role services, or 1. 1 warning, 1 informational mes	
	automatically updated, turn of	n Windows Update in Control Panel.
	Hyper-V	Installation succeeded
	Part, e-mail, or save the installation	mont
		Christian Case Canad

10 Click Close to close the Resume Configuration Wizard window.

Configuring SIOS(SteelEye)DataKeeper Mirroring Jobs

SteelEye DataKeeper is replication software for real-time Windows data. It helps replicate all data types, including the following:

- Open files
- SQL and Exchange Server databases
- Running Hyper-V virtual machines

SteelEye DataKeeper's ability to replicate live Hyper-V virtual machines ensures that a duplicate copy is available in case the primary storage array fails. This helps in disaster recovery without impacting production.

SteelEye DataKeeper Cluster Edition is a host-based replication solution, which extends Microsoft Windows Server 2008 R2 Failover Clustering (WSFC) and Microsoft Cluster Server (MSCS) features, such as cross-subnet failover and tunable heartbeat parameters. These features make it possible to deploy geographically distributed clusters. You can replicate a virtual machine across LAN, WAN, or any Windows server through SIOS Microsoft Management Console (MMC) interface. You can run the DataKeeper MMC snap-in from any server. The DataKeeper MMC snap-in interface is similar to the existing Microsoft Management tools.

Note: For information on installing the SteelEye DataKeeper, refer to *SteelEye DataKeeper for Windows Server 2003/2008 Planning and Install Guide* and *SteelEye DataKeeper for Windows Server 2003/2008 Administration Guide.* Ensure that the local security policies, firewall, and port settings are configured as per the details in these documents.

The following procedures help you set up a virtual machine in the Disaster Recovery environment.

Creating a SteelEye DataKeeper Mirroring Job

To set up a virtual machine in the disaster recovery environment, you need to first create a SteelEye mirroring job.

To create a SteelEye DataKeeper mirroring job

1 Click **Start**, and then from the **All Programs** menu, click **SteelEye DataKeeper MMC**. The **DataKeeper** window appears.

North and American	AD	dafaaper Job coraad	s of one or more relate	ef mimors. A logical grouping of mimors into Jubs allows easy	Actions
Reports M Server Overview Server Overview	C She	Eye Data Replication	v the entire group of a will be imported as invi- s are logically grouped	serors. NOTE: Minrars created in previous versions of dividual Jobs. The administrator must take care to edit these I topether.	Create 3x8
	State	Name	Desorgition	1	Decorrect from
	S Minoring	FS InTouch Volume	biTouch Volume		View
	C Mercining	AppGenver Volume W05 Historiae Volume	AppGerver Volume		Heb
	COLUMN STATE				

2 In the Actions pane, click Create Job. The SteelEye DataKeeper window appears.

🚟 SteelEye Data	Keeper 📃 🗆 🗙
	w job logical grouping of related mirrors and servers. Provide a name for this new job to help remember it.
Job name: Job description:	Job description:
	Create Job Cancel

3 Type the relevant job name and description in the **Job name** and **Job description** boxes, and then click **Create Job**. The **New Mirror** window appears.

Connect to Ser

4 In the **Choose a Source** area, select the server name, IP address, and volume and click **Next**. The **Choose a Target** area appears.

New Mirror	e a Target		
Choose a Source Shared Volumes Choose a Target Shared Volumes Configure Details	Source server: 8 Source IP and mask: 1 Source volume: 0 Choose the server, which server: VENUS SP Choose the IP address to us IP address: 10.91.60.2 Choose the volume on the st	ACE.COM Se on the server. 7 / 255.255.254.0	Lonnent to Serve
	Volume: G		Previous Next Cancel

5 Select the destination server name, IP address, and volume and click **Next**. The **Configure Details** area appears.

hoose a Source	Source server: MERCURY.SPACE.COM
ihared Volumes	Source IP and mask: 10.91.60.47
hoose a Target hared Volumes	Source volume: G
Configure Details	Specify how the data should be compressed when sent to the target.
	How should the source volume data be sent to the target volume? Asynchronous Maximum bandwidth: 0 Abps

- **6** In the **Configure Details** area, do the following:
 - **a** Move the slider to select the level of data compression.
 - **b** Click the relevant option to indicate the mode in which you want to send the source volume data to the target volume.
 - **c** In the **Maximum bandwidth** box, type the network bandwidth to be used for data replication.

Note: Enter "0" to indicate that the bandwidth is unlimited.

d Click **Done**. The SteelEye mirroring job is created.

Disk Management Topologies

After you have completed setting up SteelEye Mirroring Jobs and created the datakeeper, you can view the following topologies:

Open Disk Management to view all the disks which are replicated, by running the diskmgmt.msc from Run Command Prompt.

Volume	Layout	Туре	File System	Status				Capacity	Free Space	% Free	Fault Toleran
🗩 (C:)	Simple	Basic	NTFS	Healthy (B	Boot, Page File, C	rash Dump, Primary P	artition)	97.56 GB	69.72 GB	71 %	No
🗈 Appengine (G:)	Simple	Basic	NTFS	Healthy (L	ogical Drive)			39.06 GB	32.48 GB	83 %	No
Appserver (E:)	Simple	Basic	NTFS	Healthy (L	ogical Drive)			78.13 GB	70.25 GB	90 %	No
📾 Backups (K:)	Simple	Basic	NTFS	Healthy (L	ogical Drive)			166.28 GB	161.64 GB	97 %	No
🖙 Historian (D:)	Simple	Basic	NTFS	Healthy (L	ogical Drive)			78.13 GB	70.08 GB	90 %	No
🗆 InTouch (F:)	Simple	Basic	NTFS	Healthy (L	ogical Drive)			39.06 GB	32.48 GB	83 %	No
System Reserved	Simple	Basic	NTFS	Healthy (S	System, Active, P	rimary Partition)		100 MB	72 MB	72 %	No
💼 WIS (H:)	Simple	Basic	NTFS	Healthy (L	ogical Drive).			60.60 GB	48.43 GB	80 %	No
•											
💷 Disk 0			_								
558.91 GB		GB NTF	5 78.13	rian (D:) GB NTFS IV (Logical	Appserver (78.13 GB NTF5 Healthy (Logica	39.06 GB NTF5	39.06	GB NTFS	WIS (H:) 60.60 GB NTF: Healthy (Logic	S 166.	kups (K:) 28 GB NTFS thy (Logical Dr

After creating all the Mirroring Jobs, open the **SteelEye DataKeepr UI** from the **All Programs** menu, click **SteelEye DataKeeper MMC**. The **DataKeeper** window appears.

You can navigate to **Server Overview** under **Reports** to view all the servers involved in job replication in one place.

SteelEye DataKeeper Jobs SyncAppEngine SyncGR Ø SyncRetorian	IJ	Server Overvi	ew Report				
🗄 🧑 SyncWIS	A FA	OVERTESTO	MAGELLANDEV200	10.DEV.WONI	ERWARE.CO	M (FAILOVERTEST01.MAGELLANDEV2000.DEV.WONDERWARE.COM)	Mirroring
🗄 🌍 SyncInTouch						· · · · · · · · · · · · · · · · · · ·	•
E Reports		Mirror Role		File System			
Job Overview	F	Target	Mirroring	N/A	N/A		
Server Overview	D	Target	Mirroring	N/A	N/A		
	E	Source	Mirroring	NTFS	43.95 GB		
	н	Source	Mirroring	NTFS	43.95 GB		
	I	Source	Mirroring	NTFS	43.95 GB		
	J	None	Not mirrored	NTFS	13.03 GB		
L3	▲ FA	LOVERTESTO	MAGELLANDEV200			M (FAILOVERTEST02) 🥑 Mirroring	
	Volume	Mirror Role	State	File System	Total Size		
	F	Source	Mirroring	NTFS	43.95 GB		
	D	Source	o Mirroring	NTFS	43.95 GB		
	E	Target	o Mirroring	N/A	N/A		
	н	Target	Mirroring	N/A	N/A		
	I	Target	o Mirroring	N/A	N/A		
	J	None	Not mirrored	NTFS	13.03 GB		

Configuring a Virtual Machine

After creating a DataKeeper mirroring job, you need to create a virtual machine on disk.

To configure a virtual machine

1 In the Server Manager window, right-click Features, and then click Failover Cluster Manager. The Failover Cluster Manager tree expands.

Server Manager		.0
File Action Wew Help		- 63770
** 2 17 1 10 11		
Server Manager (HDM25) E The Roles	Fallover Cluster Manager	Actions
E A Hyper-V E A Hyper-V Manager	Followor Chuster Monoger	Valdate a Configuration
I VOLS	Configuation changes to your fallower clusters	Oreate a Ouster
III III Panet, space.com	* Overview	View
H Nodes	A fallower cluster is a set of independent computers that work together to	Properties
R Terage R Statworks Cuter Events R Tegrotitics	evailability of services and applications. The clustered servers (scaled and physical cables and by software. If one of the nodes Tals, another node b services (a process known as failowe).	Heb.
R Configuration	* Clusters	
	Clatet.space.com	
	* Management	
	To begin to use fallover clusteing, first validate your hardware configurate cluster. After these temps are complete, you can marage the cluster. Ma include inguing services and applications to it from a cluster naming We Windows Server 2008, or Windows Server 2009 R2.	
	🖸 Valdate a Confraention. 📓 Undesstandera	
اير لــــــــــــــــــــــــــــــــــــ		

2 Right-click Services and applications, then click Virtual Machines, and then New Virtual Machine. The New Virtual Machine Wizard window appears.

Before You	
Betwee You Brego. Specify Name and Location Assign Nemory Configure Networking Connect Visitual Hard Dak Instalation Options Summary	This waard helps you create a virtual machine. Tou can use virtual machines in place of physical cosputers for a variety of uses. You can use this woord to configure the virtual machine now, and you can change the configuration later using Hyper-V Manager. To create a virtual machine, do one of the following: • Cloic Rinkih to create a virtual machine that is configured with default values. • Cloic Rinkih to create a virtual machine with a custom configuration. • Cloic Rinkih to create a virtual machine with a custom configuration. • Cloic Rinkih to create a virtual machine with a custom configuration. • Cloic Rinkih to create a virtual machine with a custom configuration. • Cloic Rinkih to create a virtual machine. • Clo
	Chryster Red > Print Cancel

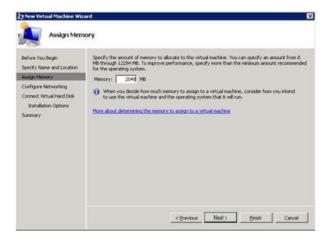
3 View the instructions in the **Before You Begin** area and click **Next**. The **Specify Name and Location** area appears.

0				
fore You Begin	Choose a name and location for this virtual machine.			
ectly Name and Location sign Memory	The name is displayed in Hyper-V Manager. We recommend that you use a name that helps you easi identify this virtual reachine, such as the name of the guest operating system or workload.			
onfigure Networking	Name:			
Installation Options				
Summary	Store the virtual machine in a different location			
	Location: Gr) Browse			
	If you plan to take snapshots of this virtual machine, select a location that has enough free space. Snapshots include virtual machine data and may require a large amount of space.			

- **4** In the **Specify Name and Location** area, do the following:
 - **a** In the Name box, type a name for the virtual machine.
 - **b** Select the **Store the virtual machine in a different location** check box to be able to indicate the location of the virtual machine.
 - **c** In the **Location** box, enter the location where you want to store the virtual machine.

Note: You can either type the location or click **Browse** to select the location where you want to store the virtual machine.

d Click Next. The Assign Memory area appears.



5 Type the recommended amount of memory in the **Memory** box and click **Next**. The **Configure Networking** area appears.

Configure N	
Before You Begin Specify Name and Location Assign Memory	Each new virtual machine includes a network adapter. You can configure the network adapter to use a virtual network, or it can remain disconnected.
Connect Verball Hand Disk Connect Verball Hand Disk Installation Options Summary	Hore about configuring network adapting
	_ <previous< td=""></previous<>

6 Select the network to be used for the virtual machine and click **Next**. The **Connect Virtual Hard Disk** area appears.

Before You Begin Specify Name and Location Assign Memory	A virtual machine requires storage so that you can initial an operating a storage now or configure it later by modifying the virtual machine's prop. Grate a virtual hard disk.	
Configer Networking Connect Vehual Hand Dak Installation Options Summary	Name: Pistorian/M, vhd Location: G(1/Historian/M), Stor: 40 (dk (Mauthum: 2040 GB)	
	Attach a vetual hard dak later	Prints Cascel

- **7** Click the **Create a virtual hard disk** option and then do the following:
 - **a** In the Name box, type the name of the virtual machine.
 - **b** In the **Location** box, enter the location of the virtual machine.

Note: You can either type the location or click **Browse** to select the location of the virtual machine.

c In the **Size** box, type the size of the virtual machine and then click **Next**. The **Installation Options** area appears.

Note: You need to click either the **Use an existing virtual hard disk** or the Attach a virtual hard disk later option, only if you are using an existing virtual hard disk or you want to attach a virtual disk later.

Before You Begin	You can install an operating system now if you have access to the setup media, or you can install it later.			
ipecify Name and Location Issign Memory	Install an operating system later			
Configure Networking Connect Virtual Hard Disk	Install an operating system from a boot CD/DVD-ROM Produe			
bistalation Options Summary	P House 2020/0 drive [0.2]			
	Tental an operating system from a boot Roppy dak Tenta what Propy dak (white			
	C Instal an operating system from a network-based installation server			

8 Click Install an operating system later option and click Next. Completing the New Virtual Machine Window area appears.

Note: If you want to install an operating system from a boot CD/DVD-ROM or a boot floppy disk or a network-based installation server, click the relevant option.

Jefore You Begin Specify Name and Location Assign Memory	You have successfully completed the New Virtual Machine Wicard. You are about to create the Following virtual machine. Description:
Assign Hemory Configure Networking Connect Virtual Hard Disk Installation Options	Name: Historian/M Memory: 2048 M Network: Donan- Vitual Network Hind Ook: Collectorian/Mytual Network Hind Ook: Cilletorian/Mytual Network Operating System: Wile brandled at a later time
	Separation of a finance in the part of an end of a second se
	To create the virtual machine and close the victard, click Finish.

9 Click **Finish**. The virtual machine is created with the details you provided. As we have started this process from the Failover Cluster Manager, after completing the process of creating a virtual machine, the **High Availability Wizard** window appears.

High Availabilit Summe	5255730 1001		
nigae High Niebily	High availability was successful	ly configured for the service or application	n
Zinay	🔋 Virtual Machin	10	
	Name	Result	Description
	HistorianVM	<u>1</u>	Warning
	To view the report created by the wizard To close this wizard, click Finish.	t, click View Report	View Report.
			Posh

10 Click **View Report** to view the report or click **Finish** to close the **High Availability Wizard** window.

Adding the Dependency between the Virtual Machine and the Disk in the Cluster

After creating the virtual machine, you need to add the dependency between the virtual machine and the datakeeper volume in the cluster.This dependency triggers the switching of the source and target Servers of the SteelEye DataKeeper Volume resource when failover of the virtual machines occurs in the Failover Cluster Manager. To add the dependency between the virtual machine and the disk in the cluster

1 On the Server Manager window, right-click the virtual machine, that you have created and then point to Add a resource, More Resources and then click Add DataKeeper Volumes. The Add a resource menu appears.



2 The New DataKeeper Volume is added under Disk Drives.

Services and applic. PlanetOther SCVMM AppSer SCVMM InToud HistorianVM Nodes Storage Networks U Custer Events	Alerts: (none) Preferred Owners: Current Owner: Ve			
	Name		Status	
	Virtual Machine			
	🗉 🛃 Virtual Machine HistorianVM		Stopped	
별 Cluster Events ics ation	Disk Drives	Bring this resource online Take this resource offline		
	a New DataKee	Change drive letter		
		Remove from HistorianVM	1	
		Show the critical events f		
		Show Dependency Repor	t	
	•	More Actions		•
ties dialog box for the c	urrent selection.	Properties		

3 Right-click New DataKeeper Volume and then click Properties. The New DataKeeper Volume Properties window appears.

General Shadow	Dependencies Copies	Policies DataKeeperV	Advanced Policies /olume Parameters
- DataKe	ser volume not yet as: DataKeeper Volume fr sceeding, aper Volume Parametr Volume: Fotal Size: Surce System:	or this resource ars –	Refresh

4 Select the volume for creating a SteelEye mirroring job and clickOK. The Selection Confirmation window appears.

w DataKeep	per Volume Properti	es			
General Sha	Dependencies Idow Copies	1	Policies DataKeeper	Advanced Poli Volume Parameters	cies
and belo	aKeeper volume not yet ign a DataKeeper Volum ore proceeding, staKeeper Volume Parar	ve for this		Reliesh	
	Volume: G			•	
Selection	Confirmation				×
4	You have chosen to a resource named New			olume 'S' with the	
	Please confirm this ch must be removed and association.				
				K Cance	
-					
		Te	ок.	Cancel A	pply.

5 Click **OK** to validate the details that you have entered. The **Server Manager** window appears.

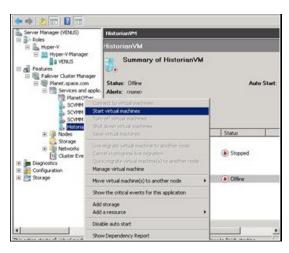
Server Manager (CAPRICORM)	Matorian		
E of festures	Historian		Recent Claster Lyents:
Paleer Outer Marager Paleer Pa	Summary of Historian Status: Office Alerts: come Parlaned Dimes: -come Carent Dimes: Carcon		Auto Start: Yes
II II Nodes	Name	Suba	1
Configuration	Vistual Machine B B, Visual Machine Hatalan Vistual Machine Hatalan	(a) Stopped	
16 🔄 Storage	Disk Drives	Take this resource of line	
	H La Historian Volume	Show the critical events for this resource	
		Show Dependency Report	
		Mare Actions	
		Celeta	
		Properties	
		Help	

Note: To modify the selection, click **Cancel** and modify the detail as required in the **New DataKeeper Volume Properties** window, and click **Apply**.

6 Under Virtual Machine, right-click the name of the virtual machine that you created. Click Virtual Machine Configuration and click Properties. The Virtual Machine Configuration Historian Properties window appears.

ienes	al Dependen	cies Policies Advanced Policies
	ily the resource ought online:	es that must be brought online before this resource can
	AND/OR	Resource
•		Historian Volume
•	Click here to a	fistorian Volume
		Delete
Histo	nian Volume	Delete
Hist	aian Volume	Delete
Hist	aian Volume	Delete How issource dependencies work.

7 Click the **Dependencies** tab. From **Resource** list, select the name of the DataKeeper Volume resource that you created and click **OK**.



8 On the Server Manager window, right-click the name of the virtual machine that you created, and then click Start virtual machines to start the virtual machine.

Configuring System Platform Products in a Typical Medium Scale Virtualization

The expected Recovery Time Objective (RTO) and Recovery Point Objective (RPO), trends and various observations in a medium scale virtualization environment are recorded by performing tests with System Platform Product configuration.

The virtualization host server used for medium scale configuration consists of seven virtual machines listed below.

- Node 1 (GR): GR, InTouch and DAS SI Direct Windows 2008 R2 Standard edition (64bit) OS with SQL Server 2008 SP1 32 bit
- Node 2 (AppEngine1): Bootstrap, IDE and InTouch (Managed App)
 Windows 2008 R2 Standard edition (64bit) OS
- Node 3 (AppEngine2): Bootstrap, IDE Windows 2008 R2 Standard edition (64bit) OS
- Node 4: Historian Windows 2008 R2 Standard edition (64bit) OS with SQL Server 2008 SP1 32 bit
- Node 5: Information Server, Bootstrap and IDE Windows Server 2008 SP2 (32bit) with SQL Server 2008 SP1 and Office 2007
- Node 6: InTouch Terminal Service Windows 2008 R2 Standard edition (64bit) OS enabled with Terminal Service
- Node 7: Historian Client and InTouch Windows 7 Professional Edition (64bit) OS with SQL Server 2008 SP1 32 bit

The following table displays the approximate data of virtual nodes, IO tags and historized tags in a medium scale virtualization environment:

Virtual Node	IO tags (Approx.)	Historized tags(Approx.)
AppEngine1	25000	10000
AppEngine2	25000	10000

Tags getting historized and their update rates for this configuration

The following table shows tags getting historized and their update rates for this configuration:

Topic Name	Update Rate	Device Items	Active Items
Topic 13	1000	1241	374
Topic 0	500	14	5
Topic 1	1000	1	1
Topic 2	10000	5002	2126
Topic 3	30000	5002	2126
Topic 4	60000	5002	2126
Topic 5	3600000	5001	2125
Topic 7	600000	5001	2589
Topic 8	10000	3841	1545
Topic 9	30000	1281	885
Topic 6	18000000	2504	1002
Topic 39	1000	4	4
Topic 16	180000	1000	350

Real Time data from DAS SI Direct

Late tags and buffered tags from DAS test Server

Topic Name	Update Rate	Device Items	Active Items
Late Data (1 hour)	1000	465	208
Buffered Data	1000	198	119

Application Server Configuration Details

Total No of Engines: 15

Number of objects under each Engine

- Engine 1 : 9
- Engine 2 : 2
- Engine 3 : 492
- Engine 4 : 312
- Engine 5 : 507
- Engine 6 : 2
- Engine 7 : 24
- Engine 8 : 24
- Engine 9 : 250
- Engine 10: 508
- Engine 11: 506
- Engine 12: 4
- Engine 13: 22
- Engine 14: 1
- Engine 15: 1

Number of DI objects: 6

Expected Recovery Time Objective and Recovery Point Objective

This section provides the indicative Recovery Time Objectives (RTO) and Recovery Point Objectives (RPO) for the load of IO and Attributes historized shown above and with the configuration of Host Virtualization Servers and Hyper-V virtual machines explained in the Setup instructions of Medium Scale Virtualization. For more information refer to "Setting Up Medium Scale Virtualization Environment" on page 268. In addition to these factors, the exact RTO and RPO depend on factors like storage I/O performance, CPU utilization, memory usage, and network usage at the time of failover/migration activity.

RTO and RPO Observations - DR Medium Configuration

Scenario	Observation
Scenario 1: IT provides maintenance on Virtualization Server	"Live Migration" on page 311
	"Quick Migration of all nodes simultaneously" on page 314
	"Shut down of host server" on page 316
Scenario 2: Virtualization Server hardware fails	"Scenario 2: Virtualization Server hardware fails" on page 317
Scenario 3: Network fails on Virtualization Server	"Scenario 3: Network fails on Virtualization Server" on page 319
Scenario 4: Virtualization Server becomes unresponsive	"Scenario 4: Virtualization Server becomes unresponsive" on page 321

The following tables display RTO and RPO Observations with approximately 50000 IO points with approximately 20000 attributes being historized:

Scenario 1: IT provides maintenance on Virtualization Server

Live Migration

RPO		RTO	Product
Data Loss Duration	Tags		
1min 52 sec	Data Loss for \$Second tag (Imported to Historian)	9 sec	InTouch HMI
13 sec	IAS tag (Script)	8 sec	GR
1 min 35 sec	IAS IO tag (DASSiDirect)		

Product	RTO		RPO
		Tags	Data Loss Duration
AppEngine1	7 sec	IAS tag (Script)	15 sec
		IAS IO Tag (DASSiDirect)	1 min 13 sec
AppEngine2	13 sec	IAS tag (Script)	15 sec
		IAS IO tag (DASSiDirect)	1 min 14 sec

Historian Client	27 sec	SysTimeSec (Historian)	17 sec
		\$Second (InTouch)	26 sec
		IAS tag (Script)	0 (data is SFed)
		IAS IO tag (DASSiDirect)	0 (data is SFed)
DAServer SIDirect	13 sec	N/A	N/A
Historian Client	12 sec	N/A	N/A
Information Server	9 sec	N/A	N/A

Product	RTO	R	
		Tags	Data Loss Duration
InTouch HMI	1 min 18 sec	Data Loss for \$Second tag (Imported to Historian)	1min 23 sec
GR	1 min 55 sec	IAS tag (Script)	2 min 43 sec
		IAS IO tag (DASSiDirect)	2 min 55 sec
AppEngine1	3 min 25 sec	IAS Tag (Script)	3 min 40 sec
		IAS IO Tag (DASSiDirect)	3min 49 sec
AppEngine2	2 min 20 sec	IAS Tag (Script)	2 min 48 sec
		IAS IO tag (DASSiDirect)	2 min 54 sec
Historian Client	6 min 27 sec	SysTimeSec (Historian)	5 min 57 sec
		\$Second (InTouch)	6 min 19 sec
		IAS tag (Script)	0 (data is SFed)
		IAS IO tag (DASSiDirect)	0 (data is SFed)
DAServer SIDirect	2min 1 sec	N/A	N/A

Quick Migration of all nodes simultaneously

Quick Migration of all nodes occurs simultaneously to migrate all nodes.

Product	RTO		RPO
		Tags	Data Loss Duration
InTouch	3 min 29 sec	Data Loss for \$Second tag (Imported to Historian)	12 min 8 sec
GR	6 min 11 sec	IAS tag (Script)	6 Min 35 sec
		IAS IO tag (DASSiDirect)	7 Min 26 sec
AppEngine1	8 min 12 sec	IAS tag (Script)	8 Min 6 sec
		IAS IO Tag (DASSiDirect)	8 Min 28 sec
AppEngine2	6min 6 sec	IAS tag (Script)	6 min 58 sec
		IAS IO tag (DASSiDirect)	7 min 34 sec

Product	RTO		RPO
		Tags	Data Loss Duration
Historian	11 min 59 sec	SysTimeSec (Historian)	12 min 2 sec
		\$Second (InTouch)	12 min 8 sec
		IAS tag (Script)	6 min 35 sec
		IAS IO tag (DASSiDirect)	7 min 26 sec
DAS SIDirect	6 min 48 sec	N/A	N/A
Historian Client	9 min 4 sec	N/A	N/A
Information Server	4 min 59 sec	N/A	N/A

Product	RTO		RPO
		Tags	Data Loss Duration
InTouch	12 min 32 sec	Data Loss for \$Second tag (Imported to Historian)	14 min
GR	11 min 41 sec	IAS tag (Script)	12 Min 58 sec
		IAS IO tag (DASSiDirect)	13 Min 11 sec
AppEngine1	11 min 38 sec	IAS tag (Script)	12 Min 6 sec
		IAS IO Tag (DASSiDirect)	13 Min 49 sec
AppEngine2	11 min 57 sec	IAS tag (Script)	12 Min 58 sec
		IAS IO tag (DASSiDirect)	13 Min 54 sec
Historian	12 Min 55 sec	SysTimeSec (Historian)	13 Min
		\$Second (InTouch)	14 Min
		IAS tag (Script)	12 Min 58 sec
		IAS IO tag (DASSiDirect)	13 Min 11 sec

Shut down of host server

Product	RTO		RPO
		Tags	Data Loss Duration
DAS SIDirect	6 Min 48 sec	N/A	N/A
Historian Client	9 Min 4 sec	N/A	N/A
Information Server	4 Min 59 sec	N/A	N/A

Scenario 2: Virtualization Server hardware fails

The failover occurs due to hardware failure, and it is simulated with power-off on the host server.

Product	RTO		RPO
		Tags	Data Loss Duration
InTouch	11 Min 43 sec + time taken by the user to start the InTouchView	Data Loss for \$Second tag (Imported to Historian)	12 Min 27 Note: RPO is dependent on the time taken by the user to start the InTouchView on the InTouch node and the RTO of the Historian node, which historizes this tag.
GR	10 Min 51 sec	IAS tag (Script)	11 Min 16
		IAS IO tag (DASSiDirect)	11 Min 02
AppEngine1	10 min 29 sec	IAS tag (Script)	10 Min 40
		IAS IO Tag (DASSiDirect)	11 Min 16

Product	RTO		RPO
		Tags	Data Loss Duration
AppEngine2	10 min 59 sec	IAS tag (Script)	9 Min 26
		IAS IO tag (DASSiDirect)	11 Min 08
Historian	14 Min 49 sec	SysTimeSec (Historian)	12 Min 21
		\$Second (InTouch)	12 Min 27 Note: RPO is dependent on the time taken by the user to start the InTouchView on the InTouch node and the RTO of the Historian node which historizes this tag.
		IAS tag (Script)	11 Min 16
		IAS IO tag (DASSiDirect)	11 Min 02
DAS SIDirect	11 Min 20 sec	N/A	N/A

Products	RTO		RPO
		Tags	Data Loss Duration
Historian Client	7 Min 16 sec + time taken by the user to start the Historian Client	N/A	N/A
Information Server	9 Min 39 sec + time taken by the user to start the Information Server	N/A	N/A

Scenario 3: Network fails on Virtualization Server

There is a failover due to network disconnect (Public). In this case, the VMs restart, after moving to the other host server.

Products	RTO		RPO
		Tags	Data Loss Duration
InTouch	8 min 55 sec + time taken by the user to start the InTouchView	Data Loss for \$Second tag (Imported to Historian)	14 min
		taken by the use InTouchView on	the InTouch node and listorian node, which
GR	11 min 32 sec	IAS Tag (Script)	12 min 01
		IAS IO Tag (DASSiDirect)	12 min

Products	RTO		RPO
		Tags	Data Loss Duration
AppEngine1	10 min 52 sec	IAS Tag (Script)	11 min 26
		IAS IO Tag (DASSiDirect)	11 min 58
AppEngine2	10 min 28 sec	IAS Tag (Script)	10 min 19
		IAS IO Tag (DASSiDirect)	12 min 04
Historian	13 min 20 sec	SysTimeSec (Historian)	13 min 52
		\$Second (InTouch) IAS Tag (Script) IAS IO Tag (DASSiDirect)	14 min Note: RPO is dependent on the time taken by the user to start the InTouch View on the InTouch node and the RTO of the Historian node, which historizes this tag. 12 min 01
DAS SIDirect	9 min 9 sec	N/A	N/A

Products	RTO		RPO
		Tags	Data Loss Duration
Historian Client	8 min + time taken by the user to start the Historian Client	N/A	N/A
Information Server	8 min 25 sec + time taken by the user to start the Information Server	N/A	N/A

Scenario 4: Virtualization Server becomes unresponsive

There is no failover of VMs to the other host server when the CPU utilization on the host server is 100%.

Primary Node	Products	RTO(sec)	RPO
InTouch	N/A	N/A	N/A
GR	N/A	N/A	N/A
	N/A	N/A	N/A
AppEngine1	N/A	N/A	N/A
	N/A	N/A	N/A
AppEngine2	N/A	N/A	N/A
	N/A	N/A	N/A
Historian	N/A	N/A	N/A
	N/A	N/A	N/A
	N/A	N/A	N/A
	N/A	N/A	N/A
DAS SIDirect	N/A	N/A	N/A
Historian Client	N/A	N/A	N/A
Information Server	N/A	N/A	N/A

Chapter 5

Implementing Disaster Recovery Using vSphere

The following procedures are designed to help you set up and implement Disaster Recovery using VMware vSphere. These procedures assume that you have VMware ESXi[™] 5.0, vCenter Server[™], and vSphere Client already installed.

For basic procedures to install these and other VMware products, see product support and user documentation at http://www.vmware.com/.

The Disaster Recovery vSphere implementation assumes that you are implementing a medium-scale system.

This section contains the following topics:

- Planning the Virtualization Environment
- Configuring System Platform Products in a Typical Virtualization Environment
- Setting Up the Virtualization Environment
- Recovering Virtual Machines to a Disaster Recovery Site

Planning the Virtualization Environment

The recommended hardware and software requirements for the Host and Virtual machines used for the virtualization Disaster Recovery environment are as follows:

ESXi Hosts

Processor	Two 2.79 GHz Intel Xeon with 8 Cores (Hyper-threaded)
Operating System	SUSE Linux Enterprise Server for VMware
Memory	48 GB
Storage	SAN with 1TB storage disk

Note: For the ESXi Host to function optimally, the server should have the same processor, RAM, storage, and service pack level. To avoid hardware discrepancies, the servers should preferably be purchased in pairs. Though differences are supported, it will impact the performance during failovers.

Virtual Machines

Using the specified ESXi host configuration, seven virtual machines can be created in the environment with the following configuration.

Virtual Machine 1: Historian Node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	8 GB
Storage	200 GB
System Platform Products Installed	Historian

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	8 GB
Storage	100 GB
System Platform Products Installed	ArchestrA-Runtime, DAS SI

Virtual Machine 2: Application Server Node, DAS SI

Virtual Machine 3: InTouch TS Node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	InTouch with TS enabled

Virtual Machine 4: Application Server Runtime Node 1

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Application Server Runtime only and InTouch

Virtual Machine 5: Application Server Runtime Node 2

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Application Server Runtime only

Virtual Machine 6: Information Server Node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Information Server

Virtual Machine 7: Historian Client Node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows 7 Enterprise
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Historian Client

Network Requirements

For this architecture, you can use one physical network card that needs to be installed on a host computer for the domain network and the process network.

Configuring System Platform Products in a Typical Virtualization Environment

The expected Recovery Time Objective (RTO) and Recovery Point Objective (RPO), trends, and various observations in a virtualization environment are recorded by performing tests with System Platform Product configuration.

The virtualization host server consists of the following seven virtual machines:

- Node 1 (GR): GR, InTouch and DAS SI Direct Windows 2008 R2 Standard edition (64bit) OS with SQL Server 2008 SP1 32 bit
- Node 2 (AppEngine1): Bootstrap, IDE and InTouch (Managed App)
 Windows 2008 R2 Standard edition (64bit) OS
- Node 3 (AppEngine2): Bootstrap, IDE Windows 2008 R2 Standard edition (64bit) OS
- Node 4: Historian Windows 2008 R2 Standard edition (64bit) OS with SQL Server 2008 SP1 32 bit
- Node 5: Information Server, Bootstrap and IDE Windows Server 2008 SP2 (32bit) with SQL Server 2008 SP1 and Office 2007
- Node 6: InTouch Terminal Service Windows 2008 R2 Standard edition (64bit) OS enabled with Terminal Service
- Node 7: Historian Client and InTouch Windows 7 Professional Edition (64bit) OS with SQL Server 2008 SP1 32 bit

The following table displays the approximate data of virtual nodes, IO tags and historized tags in the virtualization environment:

Virtual Node	IO tags (Approx.)	Historized tags(Approx.)
AppEngine1	25000	10000
AppEngine2	25000	10000

The following table shows historized tags and their update rates for this configuration:

Topic Name	Update Rate	Device Items	Active Items
Topic 13	1000	1241	374
Topic 0	500	14	5
Topic 1	1000	1	1
Topic 2	10000	5002	2126
Topic 3	30000	5002	2126
Topic 4	60000	5002	2126
Topic 5	3600000	5001	2125
Topic 7	600000	5001	2589
Topic 8	10000	3841	1545
Topic 9	30000	1281	885
Topic 6	18000000	2504	1002
Topic 39	1000	4	4
Topic 16	180000	1000	350

Real Time data from DAS SI Direct

The following table shows late tags and buffered tags from DAS test server:

Late tags and buffered tags from DAS test Server

Topic Name	Update Rate	Device Items	Active Items
Late Data (1 hour)	1000	465	208
Buffered Data	1000	198	119

Application Server Configuration Details

Total number of Engines: 15

Number of objects under each Engine

- Engine 1 : 9
- Engine 2 : 2
- Engine 3 : 492
- Engine 4 : 312
- Engine 5 : 507
- Engine 6 : 2
- Engine 7 : 24
- Engine 8 : 24
- Engine 9 : 250
- Engine 10: 508
- Engine 11: 506
- Engine 12: 4
- Engine 13: 22
- Engine 14: 1
- Engine 15: 1

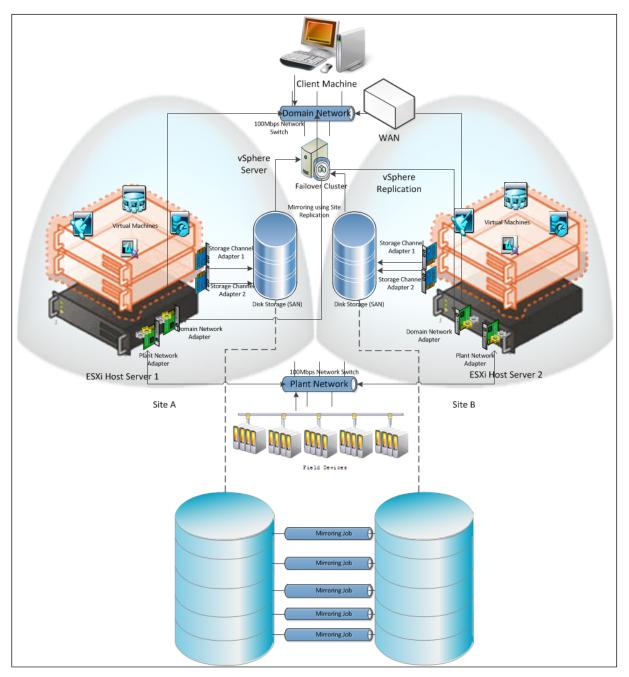
Number of DI objects: 6

Setting Up the Virtualization Environment

The following procedures will help you to set up the virtualization environment for Disaster Recovery using vSphere technology.

Creating a Datacenter

The vSphere Datacenter virtualizes an infrastructure that includes servers, storage, networks, and provides for end-to-end connectivity from client machines to field devices and back. The following is the recommended topology of the Datacenter for a Disaster Recovery environment.



This setup requires a minimum of two host servers and two storage servers connected to each host independently. The following procedures help you configure a Datacenter with a Failover Cluster that has two nodes and two Storage Area Networks (SANs) to set up a virtualized Disaster Recovery environment.

To create a datacenter

1 Start the vSphere Client. The **VMware vSphere Client** dialog box appears.

🛃 YMware vSphere Client	×
vmware [.] VMware vSphere Client	
	e host, enter the IP address or host name. enter the IP address or name of a
IP address / Name:	IP address / Name
User name:	User name
Password:	
	Use Windows session credentials

- **2** Specify the following to log on to the vCenter Server:
 - **a** Enter the IP address or the host name of your vCenter Server machine in the **IP address / Name** text box.
 - **b** Enter User name and Password or select Use Windows session credentials check box.

🛃 abc.space.com-vSphere Client					
File Edit View Inventory Administration Plug-ins Help					
	E Kome D 👸 Inventory D 👘 Hosts and Clusters				
📁 🔛					
🕀 🛃 abc.spa	📁 New Folder	Ctrl+F	n, abc ¥Mware vCenter Server, 5.0.0, 000000		
	New Datacenter	Ctrl+D	enters Virtual Machines Hosts Tasks & Events		
	Add Permission	. Ctrl+P	s & Clusters view?		
	Open in New Win Remove Rename	dow Ctrl+Alt+N	the set of computing resources that run st, cluster, or resource pool. Using the view, you can manage and organize your uting resources.		
		Basic Tasks	datacenter		

3 Click Login. The vSphere Client page appears.

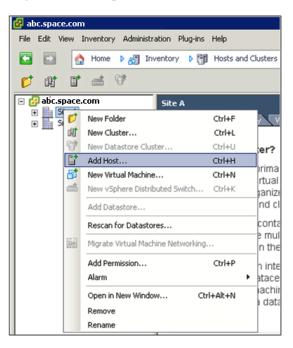
- **4** Do one of the following:
 - Right-click the vSphere Client in the **Inventory** panel and click **New Datacenter**
 - Click the **Create a datacenter** icon on the right panel
 - On the File menu, click New, and then click Datacenter

A new datacenter object appears in the Inventory.

5 Enter a name for the datacenter.

To add hosts to a new datacenter

1 Log on to the vSphere Client. The vSphere Client page appears.



- **2** Do one of the following:
 - Right-click the datacenter in the **Inventory** panel, and then click **Add Host**.
 - On the File menu, click New, and then click Add Host.

The Add Host Wizard appears.

Add Host Wizard Specify Connection Settings Type in the information used to	connect to this host.
Connection Settings Host Summary Virtual Machine Location Ready to Complete	Connection Enter the name or IP address of the host to add to vCenter. Host: Node Name> Authorization Enter the administrative account information for the host, vSphere Client will
	use this information to connect to the host and establish a permanent account for its operations. Username: username Password: ************************************
Help	<back next=""> Cancel</back>

- **3** Specify the following connection settings:
 - **a** Enter the name or the IP address of the host.
 - **b** Enter the **Username** and **Password** for the host.

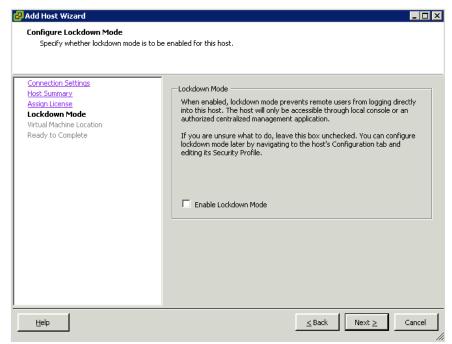
Click Next. The Host Summary area appears.

Add Host Wizard			
Host Information Review the product information	n for the specified host.		
Connection Settings Host Summary	You have choser	n to add the following host to vCenter:	
Assign License	Name:	abc.space.com	
Lockdown Mode	Vendor: Model:	Dell Inc. Precision WorkStation T5500	
Virtual Machine Location	Version:	VMware ESXi 5.0.0 build- 000000	
Ready to Complete			
	Virtual Machine:	5:	
	•		
Help		< Back Next	> Cancel

4 Review the information of the new host and click **Next**. The **Assign License** area appears.

🛿 Add Host Wizard		_ 🗆 ×
Assign License Assign an existing or a new license	key to this host.	
Hasigh an existing of a new iconse		
Connection Settings Host Summary	Assign an existing license key to this host	
Assign License Lockdown Mode	Product Available	
Virtual Machine Location	Evaluation Mode	
Ready to Complete	(No License Key)	
	Assign a new license key to this host	
	Enter Key	
	Product: Evaluation Mode	
	Capacity: -	
	Available: -	
	Expires: 11/12/2011 Label:	
Help	< Back Next >	Cancel

5 Select the Assign a new license key to this host option, and then enter the new license key. Click Next. The Configure Lockdown Mode area appears.



6 Select the **Enable Lockdown Mode** check box if your security policies want to prevent remote users from logging on to the host. Click **Next.** The **Virtual Machine Location** area appears.

🛃 Add Host Wizard		
Virtual Machine Location Select a location in the vCenter Server	inventory for the host's virtual machines.	
Connection Settings Host Summary Assign License Lackdown Mode Virtual Machine Location Ready to Complete	Select a location for this host's virtual machines.	
Help	≤Back Next ≥	Cancel

7 Select the datacenter that you have created, and then click Next. The Ready to Complete area appears.

Add Host Wizard Ready to Complete Review the options you have selected a	and click Finish to add t	he host.	זובו	
Connection Settings Host Summary Assign License Lockdown Mode Virtual Machine Location Ready to Complete	Version: Networks: Datastores:	abc.space.com VMware ESXI 5.0.0 build- 000000 VM Network datastore1 (1) SHistorian SAppEngine SWJS		
Help		< Back	Finish Cance	

8 Review the configured options. Click **Back** to modify your settings or click **Finish** to add the host.

Creating a Failover Cluster

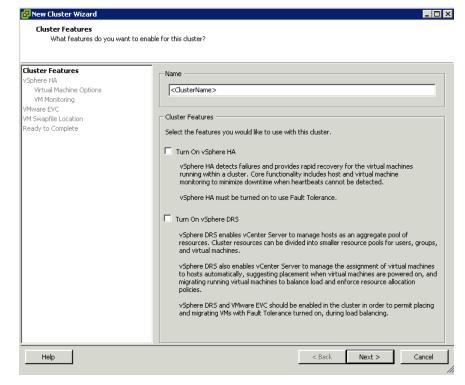
A cluster in vSphere is a group of hosts. Resources of a host added to a cluster, also known as a failover cluster, become part of the cluster's resources, and are managed by the cluster.

To create a cluster

1 Log on to the vSphere Client. Right-click the datacenter from the **Inventory** panel, and then click **New Cluster**.

🛃 abc.spa	ce.co	om-vSphere Client							
File Edit	View	Inventory Administration Plu	ug-ins Help						
	[👌 Home 🕨 💦 Inventory	Hosts and Hosts	nd Cluste	ers				
		+							
6 6	8	5							
🖃 🛃 abc	space HA	e.com 10.00.	00.00 ¥Mware	ESXi, 5	i.0.0, 000000 Evaluation (48 day	s remaining)	
	Ø	New Folder	Ctrl+F	ary	Virtual Machines Performan	nce C	onfiguration	Tasks & Events Alarn	ns Pe
	đ	New Cluster	Ctrl+L						
	e.	New Datastore Cluster	Ctrl+U	_	State	Stal	tus	Provisioned Space	Used
		Add Host	Ctrl+H		Powered On	0	Normal	74.05 GB	34.75
	6	New Virtual Machine	Ctrl+N		Powered On	ĕ	Normal	74.05 GB	23.77
	-	New vSphere Distributed Switch	n Ctrl+K		Powered On	ŏ	Normal	98.05 GB	28.08
		Add Datastore			Powered On	0	Normal	74.15 GB	14.86
				-	Powered On	0	Normal	84.05 GB	51.38
		Rescan for Datastores		_	Powered On	0	Normal	74.05 GB	12.82
	H	Migrate Virtual Machine Network	king		Powered On	0	Normal	197.53 GB	197.5
		Add Permission	Ctrl+P						
		Alarm	,	·					
		Open in New Window	Ctrl+Alt+N						
		Remove							
		Rename							
I I									

- **2** Enter a name for the new cluster.
- **3** Click the newly created cluster. The **New Cluster Wizard** appears.



4 Enter a name for the cluster, and select the **Turn on vSphere HA** check box. Click **Next.** The **vSphere HA** area appears.

🛃 New Cluster Wizard		
vSphere HA What admission control do you w	ant to be enforced on this cluster?	
Cluster Features vSphere HA Virtual Machine Options VM Monitoring VMware EVC VM Swapfile Location Ready to Complete	network maintenance that may cause isola Enable Host Monitoring Admission Control The vSphere HA Admission control policy d	letermines the amount of cluster capacity that is failover capacity allows more failures to be tolerated e run. ns that violate availability constraints that violate availability constraints
Help		< Back Next > Cancel

- **5** Configure the following admission control options:
 - **a** Select the **Enable Host Monitoring** check box.
 - **b** Select the **Admission Control** option to enable or disable VMs from being powered on if it violates availability constraints in a failure.
 - **c** Select the **Admission Control Policy** option.

Click Next. The Virtual Machine Options area appears.

🔗 New Cluster Wizard				
Virtual Machine Options What restart options do you war	nt to set for VMs in this cluster?			
Cluster Features YSphere HA Yittual Machine Options VM Monitoring WMware EVC VM Swapfile Location Ready to Complete	Set options that define the beh Cluster Default Settings WI restart priority: Host Isolation response:	avior of virtual machines for vSph	ere HA.	
Help		< Back	Next >	Cancel

- **6** Under **Cluster Default Settings**, do the following:
 - **a** Select an option from the **VM restart priority** list.
 - $\label{eq:bound} \textbf{b} \quad \text{Select an option from the Host Isolation response list.}$

Click Next. The VM Monitoring area appears.

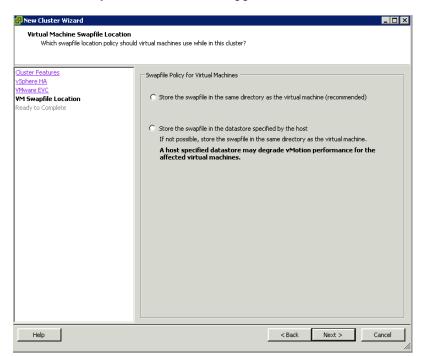
🚱 New Cluster Wizard	
YM Monitoring What monitoring do you wan	t to set on virtual machines in this cluster?
Cluster Features ySphere HA Wrtval Machine Options WM Monitoring VMware EVC WM Swapfile Location Ready to Complete	VM Monitoring Status VM Monitoring restarts individual VMs if their VMware tools heartbeats are not received within a set time. Application heartbeats are not received within a set time. VM Monitoring: VM Monitoring: VM Monitoring set time. VM Monitoring: VM Monitoring sensitivity: Low -
Help	< Back Next > Cancel

- 7 Do the following:
 - a Select VM Monitoring Only from the VM Monitoring Status list.
 - **b** Set the **Monitoring sensitivity** if you enable VM monitoring through VMware Tools.

Click Next. The VMware EVC area appears.

🛃 New Cluster Wizard			
VMware EVC Do you want to enable Enhanced v	Motion Compatibility for I	this cluster?	
Cluster Features ySphere HA VMware EVC VM Swapfile Location	Enhanced vMotion Co compatibility. Once er the cluster may be ad		and its hosts to maximize vMotion hosts that are compatible with those in
Ready to Complete	C Disable EVC	C Enable EVC for AMD Hosts	C Enable EVC for Intel® Hosts
	VMware EVC Mode:	Disabled	
	Description		
Help		< Bac	k Next > Cancel

8 Select the **Disable EVC** option, and then click **Next**. The **Virtual Machine Swapfile Location** area appears.



9 Select the Store the swapfile in the same directory as the virtual machine option to speed up vMotion, and then click Next. The Ready to Complete area appears.

New Cluster Wizard			_ 0
Ready to Complete Review the selected optic	ons for this cluster and click Finish.		
Noview the selected optic	shared and clerch hish.		
luster Features	The cluster will be created with the	e following options:	
<u>Sphere HA</u> Mware EVC	Cluster Name:	<clustername></clustername>	
M Swapfile Location eady to Complete	vSphere HA Host Monitoring: Admission Control: Admission Control Policy: Host Failures Allowed:	Running Enabled Number of host failures cluster tolerates 1	
	VM Restart Priority: Host Isolation Response:	Medium Leave powered on	
	vSphere HA VM Monitoring: Monitoring Sensitivity:	VM Monitoring Only High	
	VMware EVC Mode:	Disabled	
	Virtual Machine Swapfile Location:	Same directory as the virtual machine	
Help		< Back Finish	Cancel

- **10** Review the cluster configuration details. Click **Back** to modify the settings or click **Finish.** The cluster appears on the **vSphere Client** page.
- **11** Add the hosts to the newly-configured cluster.

Configuring Storage

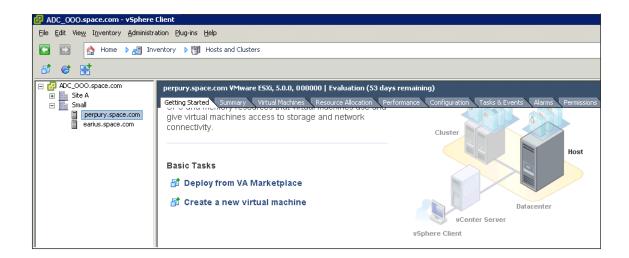
VMware Virtual Machine File System (VMFS) datastores serve as repositories for the virtual machines. You can set up VMFS datastores on any SCSI-based storage devices that the host discovers, including Fibre Channel, iSCSI, and local storage devices.

Use the following procedure to create a datastore. Your new datastore is added to all hosts if you use the vCenter Server system to manage your hosts.

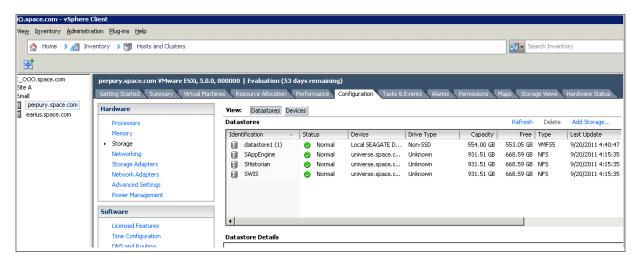
Important: Install and configure any adapters that your storage requires before creating datastores. After you create a datastore, rescan the adapters to discover the new storage device.

To create a datastore

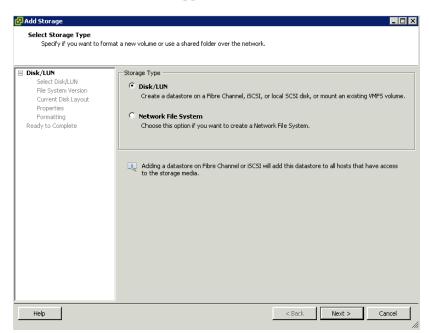
1 Log on to vSphere Client and select a host from the **Inventory** panel



- **2** Do the following to add storage:
 - **a** Click the **Configuration** tab and click **Storage** in the **Hardware** panel. The configuration details appear in the **Configuration** tabbed area.



b Under View click Datastores, and then click Add Storage. The Add Storage window appears.



3 Select the **Disk/LUN** storage type, and then click **Next**. The **Select Disk/LUN** area appears.

🛃 Add Storage				_ 🗆 ×
Select Disk/LUN				
Select a LUN to create a c	datastore or expand the current one			
	_			
Select Disk/LUN	Name, Identifier, Path ID, LUN, (1	Clear
File System Version Current Disk Layout	Name	Path ID	LUN 🛆 Drive	1 1 1
Properties	DELL Serial Attached SCSI Disk (naa vmhba2:C0:T0:L0	0 Non-S	SD 2.00 GB
Formatting	DELL Serial Attach	ed SCSI Disk (naa.6842b2b0	0044d3c300000282	4d251fb1)
Ready to Complete				
				Þ
<u> </u>				
Help			< Back No	ext > Cancel

4 Select the device you want to use for the configured datastore, and then click **Next**. The **File System Version** area appears.

Add Storage File System Version Specify the version of the V	MFS for the datastore
Disk/LUN Select Disk/LUN File System Version Current Disk Layout Properties Formatting Ready to Complete	File System Version • VMFS-5 Select this option to enable additional capabilities, such as 2TB+ support. VMFS-5 is not supported by hosts with an ESX version older than 5.0. • VMFS-3 Select this option if the datastore will be accessed by legacy hosts.
Help	< Back Next > Cancel

Note: If you select **VMFS-3**, select the maximum file size under **Formatting**.

5 Select the version of the VMFS for the datastore, and then clickNext. The Current Disk Layout area appears.

🛃 Add Storage		
Current Disk Layout You can partition and forma	the entire device, all free space, or a single block of free space.	
E Disk/LUN	Review the current disk layout:	
Select DiskUNN File System Version Current Disk Layout Properties Romatting Ready to Complete	Device Drive Type Capacity Available DELL Serial Attached SCSI Disk Non-SSD 2.00 GB None Location /vmfs/device/disks/naa.6842b2b00044d3c3000002824d251fb1 Partition Format. Partition Format MBR Capacity V HPFS/NTFS (DELL Serial Attached 2.00 GB There is only one layout configuration available. Use the Next button to proceed with the oth pages. All available partitions will be used ▲ This configuration will delete the current disk layout, change the file system and char partition table format. All file systems and data will be permanently lost.	
Help	<back next=""></back>	Cancel

6 Review the current disk layout, and then click **Next**. The **Properties** area appears.

🚱 Add Storage		
Properties Specify the properties for t	he datatore	
Disk/UUN Select Disk/UUN File System Version Current Disk Layout Properties Formatting Ready to Complete	Enter a datastore name	
Help		< Back Next > Cancel

7 Enter a datastore name, and then click **Next**. The **Disk/LUN** - **Formatting** area appears.

🛃 Add Storage		
Disk/LUN - Formatting Specify the maximum file size	e and capacity of the datastore	
Disk/LUN Select.Disk/LUN File_System Version Current Disk Layout Properties Formatting Ready to Complete	Capacity Maximum available space Custom space setting 2.00 GB of 2.00 GB available space GB of 2.00 GB available space	
Help		≤ Back Next ≥ Cancel

Note: The default option is Maximum available space.

8 Select **Custom space setting** to adjust the capacity values, and then click **Next**. The **Ready to Complete** area appears.

🛃 Add Storage				_ 🗆 🗙
Ready to Complete Review the disk layout and	click Finish to add storage			
Disk/LUN Ready to Complete	Disk layout:			
keady to Lompiete	Device DELL Serial Attached SCSI Disk (n DELL Serial Attached SCSI Disk (n Location /wmfs/devices/disks/nea.6842b2b000 Partition Format GPT Primary Partitions WMFS (DELL Serial Attached SCSI D Primary Partitions File system: Datastore name: Formatting File system: vmfs-5 Block size: 1 MB Maximum file size: 2.00 TB	044d3c300000282 Capac	ity	LUN
Help	1		< Back Finis	h Cancel

9 Review the datastore configuration information, and then clickFinish. Your datastore will be created according to your specifications.

Configuring Networks

After you create a datacenter, add a host and configure storage. You can configure multiple networks on the ESXi host networks.

To configure networks on the ESXi host

1 Log on to the vSphere Client and select a host from the **Inventory** panel.

10.00.00.00 ¥Mware ESXi, 5.0.0, 000000	l Evaluation (46days remaining)			
Getting Started Summary Virtual Machi	ines Performance Configuration Tasks & Events Alarms Permissions Maps Storage Views Hardware Sta	atus		
Hardware Processors	View: vSphere Standard Switch vSphere Distributed Switch	Refresh	Add Networking	Properties
Memory Storage • Networking Storage Adapters Network Adapters Advanced Settings Power Management	Standard Switch: vSwitch0 Remove Properties Virtual Machine Port Group VMNetwork VMNetwork VMidemel Port VMnagement Network VMid: 110.91.60.30	Kentean	And rectroning	Properties
Software Licensed Features	Standard Switch: vSwitch1 Remove Properties			
Time Configuration DNS and Routing Authentication Services Power Management	Virtual Machine Port Group VPlant Standard Switch: vSwitch2 Remove Properties			
Virtual Machine Startup/Shutdown Virtual Machine Swapfile Location Security Profile Host Cache Configuration	VMismel Port VMigrate vmk1 : 10.20.30.41			

- **2** Click the **Configuration** tab, and then click **Networking** in the **Hardware** panel.
- **3** Click Add Networking. The Add Network Wizard appears.

Add Network Wizard		_ 🗆 ×
Connection Type Networking hardware	an be partitioned to accommodate each service that requires connectivity.	
Connection Type Network Access Connection Settings Summary	Connection Types Virtual Machine Add a labeled network to handle virtual machine network traffic. VMkernel The VMkernel TCP/IP stack handles traffic for the following ESXI services: vSphere vMotion, ISCSI, NFS, and host management.	
Help	< Back Next > C	ancel

4 Select the appropriate **Connection Types** option, and then click **Next**. The **Virtual Machines - Network Access** area appears.

🛃 Add Network Wizard				
Virtual Machines - Netwo Virtual machines reach n	rk Access networks through uplink adapters attached to vSph	ere standard s	witches.	
Connection Type Network Access	Select which vSphere standard switch will hand vSphere standard switch using the unclaimed n			a new
Connection Settings Summary	Create a vSphere standard switch Broadcom Corporation Broadcom	Speed	Networks BCM5709 1000Base-T	1
	V mnic2	Down	None	
	C Use vSwitch0	Speed	Networks	
	Broadcom Corporation Broadcom	etXtreme II	BCM5709 1000Base-T	
	🕅 🛄 vmnic0	100 Full	10.91.60.1-10.91.60.63	
	O Use vSwitch1	Speed	Networks	
	Broadcom Corporation Broadcom		BCM5709 1000Base-T	_
	/ 🔲 📟 vmnic1	100 Full	169.254.50.163-169.254.50.163	•
	Preview:			
	- Virtual Machine Port Group	-Physical Adapte		
Help	<u> </u>		< Back Next >	Cancel

5 Select the appropriate vSphere standard switch, and then click **Next**. The **Virtual Machines - Connection Settings** area appears.

🛃 Add Network Wizard				
Virtual Machines - Conn Use network labels to i	ection Settings identify migration compatible connect	ions common to two or more hosts.		
Connection Type Network Access Connection Settings Summary	Port Group Properties Network Label: VLAN ID (Optional):	Netwrok Name None (0)	Y	
	Preview: - Virtual Machine Port Group - Netwrok Name	Physical Adapters		
Help	<u> </u>		< Back Nex	t > Cancel

- **6** Do the following to configure the **Port Group Properties**.
 - **a** Enter the network name in the **Network Label** box.
 - **b** Select the VLAN ID from the **VLAN ID** list.

Click Next. The Ready to Complete area appears.

🚰 Add Network Wizard	
Ready to Complete Verify that all new ar	d modified vSphere standard switches are configured appropriately.
Connection Type Network Access Connection Settings	Host networking will include the following new and modified standard switches: Preview:
Summary	-Vitual Machine Port Group -Physical Adapters Network Name
Help	< Back Finish Cancel

7 Review the configured options. Click **Back** to modify the settings or click **Finish** to complete the network configuration.

Creating a Virtual Machine in the vSphere Client

You can populate your virtualization environment by creating virtual machines, which are the key components in a virtual infrastructure.

When you create a virtual machine, you associate it to a datastore and datacenter, host, cluster or resource pool. The virtual machine consumes resources dynamically as the workload increases, or it returns resources dynamically as the workload decreases.

Every virtual machine has virtual devices that provide the same function as physical hardware. A virtual machine gets CPU and memory, access to storage, and network connectivity from the host with which it is associated.

To create a virtual machine

1 Start the vSphere Client. Select a host from the **Inventory** panel, and then click the **Virtual Machines** tab.

								Na	ame, State or Guest	: OS contains: •
Nam	e		State	Stal	tus	Provisioned Space	Used Space	Host CPU - MHz	Host Mem - MB	Guest Mem - %
	Site A VRMS		Powered On	0	Normal	16.05 GB	5.66 GB	83	1273	4
ß	MAppEngine	1	Powered Off	0	Normal	74.23 GB	6.69 GB	0	0	0
	I		New Virtual Machine							
			Show Virtual Machines							
			Show Virtual Machines Show Templates							
		>	Show Virtual Machines	5						
		~	Show Virtual Machines Show Templates	s						
		~	Show Virtual Machines Show Templates Show Virtual Machines and Template Refresh	s						
		~	Show Virtual Machines Show Templates Show Virtual Machines and Template	s						

2 Click New Virtual Machine on the context menu. The Create New Virtual Machine window appears.

Configuration Select the configuration	for the virtual machine
Configuration Name and Location Storage Guest Operating System Network Create a Disk Ready to Complete	Configuration • Typical Create a new virtual machine with the most common devices and configuration options. • Custom Create a virtual machine with additional devices or specific configuration options.

3 Select the **Configuration** option for the new virtual machine, and then click **Next.** The **Name and Location** area appears.

🗿 Create New Virtual Machir	ne _ [IX
Name and Location Specify a name and locat	ion for this virtual machine	
Configuration Name and Location Storage Virtual Machine Version Guest Operating System CPUs Memory Network SCSI Controller Select a Disk Ready to Complete	Name: Vew Vitual Machine Vitual machine (VM) names may contain up to 80 characters and they must be unique within each vCenter Server VM folder. Inventory Location: Site A	
Help	< Back Next > Cancel	

4 Enter a **Name**, and then select an **Inventory Location** option for the virtual machine.Click **Next**. The **Storage** area appears.

Configuration	Select a dest	ination stor	age for the virtua	I machine files:				
<u>Name and Location</u> Storage	VM Storage R	Profile:			<u> </u>			
Virtual Machine Version	Name		Drive Type	Capacity	Provisioned	Free	Туре	Thin F
Guest Operating System CPUs	🔋 Pqr_	DS	Non-SSD	131.00 GB	971.00 MB	130.05 GB	VMFS5	Suppo
Memory	📔 HAAp	pengine1	Non-SSD	79.75 GB	75.19 GB	72.10 GB	VMFS5	Suppo
Vetwork	🔋 HAAp	pengine2	Non-SSD	79.75 GB	7.67 GB	72.08 GB	VMFS5	Suppo
5CSI Controller		pserver	Non-SSD	99.75 GB	7.68 GB	92.07 GB	VMFS5	Suppo
ielect a Disk		stClient	Non-SSD	79.75 GB	9.88 GB	69.87 GB	VMFS5	Suppo
Ready to Complete		storian	Non-SSD	199.75 GB		192.03 GB		Suppo
		TouchTS	Non-SSD		971.00 MB	78.80 GB		Suppo
	9	ftwares	Non-SSD	79.75 GB		71.35 GB		Suppo-
	HAW	IS	Non-SSD	79.75 GB	6.74 GB	73.01 GB	VMFS5	Suppo
	_							
	Disable Select a da		S for this virtual r	nachine				
			5 for this virtual r	nachine Capacity Pr	ovisioned	Free	Туре	Thin Pro

5 Select a datastore, and then click **Next**. The **Virtual Machine Version** area appears.

🚱 Create New Virtual Machine	
Virtual Machine Version	
Configuration Name and Location Storage Wirtual Machine Version Guest Operating System CPUS Memory Network SCSI Controller Select a Disk Ready to Complete	 Virtual Machine Version This host or cluster supports more than one VMware virtual machine version. Specify the virtual machine version to use. Virtual Machine Version: 7 This version will run on VMware ESX/ESXI 4.0 and later. This version is recommended when sharing storage or virtual machines with ESX/ESXI up to 4.1. Virtual Machine Version: 8 This version will run on VMware ESX 5.0 and later. Choose this version if you need the latest virtual machine features and do not need to migrate to ESX/ESXI 4.
Help	< Back Next > Cancel

6 Select the Virtual Machine Version, and then click Next. The Guest Operating System area appears.

Note: This implementation guide provides planning guidance, procedural information, and test information based on ESXi version 5.0.

Create New Virtual Machine	
Guest Operating System Specify the guest operating	Virtual Machine Versi system to use with this virtual machine
Configuration Name and Location Storage Virtual Machine Version Guest Operating System CPUs Memory Network SCSI Controller Select a Disk Ready to Complete	Guest Operating System:
Help	< Back Next > Cancel

7 Select the **Guest Operating System** option, and then click **Next**. The **CPUs** area appears.

Create New Virtual Machir	e			_ 🗆 ×
CPUs Select the number of virtu	al CPUs for the virtual machine.		Virtual M	lachine Version: (
Configuration Name and Location Storage Virtual Machine Version Guest-Operating System CPUs Memory Network SCSI Controller Select a Disk Ready to Complete	Number of virtual sockets: Number of cores per virtual socket: Total number of cores: The number of virtual CPUs on t number of CPUs supported by the gu The virtual CPU configuration specific might violate the license of the guest Click Help for information on the num processors supported for various gu systems.	the host and the lest OS. ed on this page : OS. ber of		
Help			< Back Next >	Cancel

8 Configure the virtual CPUs by specifying the Number of virtual sockets and the Number of cores per virtual socket. Click Next. The Memory area appears.

🛃 Create New Virtual Machine			_ 🗆 🗙
Memory Configure the virtual machin	ne's memory size.		Virtual Machine Version: 8
Configuration Name and Location Storage Virtual Machine Version Guest-Operating System CPUs Memory Network SCSI Controller Select a Disk Ready to Complete	Memory Config 1011 GP 4 512 GP 5 256 GP 1 128 GP 4 32 GP 4 4 32 GP 4 4 4 4 4 4 4 4 4 4 4 4 4 4	Arabion Memory Size: 4 - GB Maximum recommended for this guest OS: 1011 GB. Maximum recommended for this guest OS: 4 GB. Minimum recommended for this guest OS: 512 MB.	
Help		< Back Ne	xxt > Cancel

9 Configure the memory size of the virtual machine, and then click **Next**. The **Network** area appears.

Create New Virtual Machin Network Which network connection	e Virtual Machine Version: 8
Configuration Name and Location Storage Virtual Machine Version Guest Operating System CPUs Memory Network SCSI Controller Select a Disk Ready to Complete	Create Network Connections How many NICs do you want to connect? Image: Connect at power On NIC 1: VM Network Image: Connect at power On NIC 2: Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power On Image: Connect at power
Help	< Back Next > Cancel

10 Select the number of NICs and then associate each NIC with a **Network**. Click **Next.** The **SCSI Controller** area appears.

🔗 Create New Virtual Machin	e	
SCSI Controller		1achine Version: 8
Which SCSI controller type Configuration Name and Location Storage Virtual Machine Version Guest Operating System CPUs Memory. Network SCSI Controller		lachine Version: 8
Select a Disk Ready to Complete		
Help	< Back Next >	Cancel

11 Select a **SCSI Controller** type, and then click **Next**. The **Select a Disk** area appears.

- **12** Select one of the following options:
- Create a new virtual disk
- Use an existing virtual disk
- Do not create disk

Click **Next.** The **Create a Disk** area appears if you select the first or the second option.

🖁 Create New ¥irtual Machin	e	_ 🗆 🗵
Create a Disk Specify the virtual disk siz		/irtual Machine Version: 8
Configuration Name and Location Storage Virtual Machine Version Guest Operating System CPUs Memory Network SCSI Controller Select a Disk Create a Disk Advanced Options Ready to Complete	Capacity Disk Size: 80 🗐 GB 💌 Disk Provisioning C Thick Provision Lazy Zeroed C Thick Provision Eager Zeroed C Thin Provision Location C Store with the virtual machine C Specify a datastore or datastore cluster: Browser	
Help	< Back Next	> Cancel

- **13** Do the following to configure the virtual disk:
 - **a** Specify the disk **Capacity** and **Disk Provisioning**.
 - **b** Specify a Location for the swap file. Click Next. The Advanced **Options** area appears.

🚰 Create New Virtual Machine	2	
Advanced Options These advanced options d	o not usually need to be changed.	Virtual Machine Version: 8
	o noc asdany noca co oc changea.	
Configuration Name and Location Storage Virtual Machine Version Guest Operating System CPUs Memory Network SCSI Controller Select a Disk Create a Disk Create a Disk Advanced Options Ready to Complete	Specify the advanced options for this virtual disk. These options do not normally r to be changed. Virtual Device Node SCSI (0:0) DE (0:0) Mode Independent Independent Independent disks are not affected by snapshots. Persistent Changes are immediately and permanently written to the disk. Nonpersistent Changes to this disk are discarded when you power off or revert to the snapshot.	
Help	< Back Nex	: > Cancel

14 Select the Virtual Device Node and the disk Mode. Click Next. The Ready to Complete area appears.

🖁 Create New ¥irtual Machi	ne	
Ready to Complete		Virtual Machine Version: 6
Click Finish to start a tasl	k that will create the new virtual mach	ine
	_	
Configuration Name and Location	Settings for the new virtual mach	nine:
Storage	Name:	New Virtual Machine
Virtual Machine Version	Folder:	Site A
Guest Operating System	Host/Cluster:	MHA
CPUs	Specific Host:	Pgr.space.com
Memory	Datastore:	HAAppengine1
<u>Network</u>	Guest OS:	Microsoft Windows Server 2008 R2 (64-bit)
SCSI Controller	CPUs:	8
Select a Disk	Memory:	4096 MB
Create a Disk	NICs:	2
Advanced Options Ready to Complete	NIC 1 Network:	VM Network
Ready to complete	NIC 1 Type:	E1000
	NIC 2 Network:	vPlant
	NIC 2 Type:	E1000
	SCSI Controller:	LSI Logic SAS
	Create disk:	New virtual disk
	Disk capacity:	80 GB
	Disk provisioning:	Thin Provision
	Datastore:	HAAppengine1
	Virtual Device Node:	SCSI (0:0)
	Disk mode:	Persistent
	Disk mode:	Persistent
	Edit the virtual machine setti	nas before completion
		nine (VM) does not include automatic installation of the guest operating on the VM after creating the VM.
	system, instanti guest OS t	and other croduling the with
Liste 1		
Help		< Back Continue Cancel

15 Review the configuration options of the virtual machine. Select the **Edit the virtual machine settings before completion** check box to configure the OS for the virtual machine.

Click **Continue** to create the new virtual machine.

To configure virtual machine properties

1 After selecting the configuration options for the virtual machine, the **Virtual Machine Properties** window appears.

🛃 MAppEngine1 - Virtual Machine I	Properties	
Hardware Options Resources Prof	les vServices	Virtual Machine Version: 8
	Add Remo	
Hardware	Summary	Connect at power on
Hardware Memory CPUs SCPUs SCSI controller 0 Hard disk 1 CD/DVD drive 1 (edited) Network adapter 1 Hard Stapter 2 Floppy drive 1	Summary 4096 MB 4 Video card Restricted LSI Logic SAS Virtual Disk Image File VM Network vPlant Client Device	Connect at power on
Help		OK Cancel

2 Select the bootable OS/Image from the left panel.

- **3** Do one of the following for the newly created virtual machine:
 - Select the **Host Device** option, and then select the host device from the list to boot from the host CD/DVD drive.
 - Select the **Datastore ISO File** option, and then click **Browse**. The **Browse Datastores** window appears.

🛃 Browse Datastores			_ 🗆 ×
Look in: ISO			
Name	File Size	Last Modified	
en_windows_se	3 GB	9/13/2011 4:23:35 PM	
Image: Strain	3 GB	9/13/2011 4:32:20 PM	
SW_DVD5_Win	2 GB	9/14/2011 12:54:51 AM	
		Op	en
File type:) Image (*.iso)	💌 Can	cel

Select the ISO file for the operating system, and then click **Open**.

4 Click **OK** to complete the process. Switch on the virtual machine to install the operating system.

Note: Follow the wizard instructions to install the OS on the virtual machine.

Setting up Replication

Replicating live virtual machines ensures that a duplicate copy is available in case the primary storage array fails. This helps in Disaster Recovery without impacting production.

To setup vSphere replication

 Log on to the vSphere Client, and then right-click the virtual machine you want to replicate from the **Inventory** panel. Click vSphere Replication on the context menu. The Configure Replication window appears.

Configure Replication - M	1AppEngine1
Replication Settings To enable replication f	or this virtual machine, specify settings below.
Replication Settings Hard disk 1 VR Server Ready to Complete	Recovery Point Objective (RPO) Lower RPO times will reduce potential data loss, but will use more bandwidth and system resources. 15 min
Help	< Back Next > Cancel

- **2** Do the following to configure **Replication Settings**:
 - a Select the Recovery Point Objective (RPO) time.
 - **b** Select the **Guest OS Quiescing** method.

Note: Quiescing is defined as pausing or altering the state of running processes on a computer that might modify information stored on disk during a backup or replication procedure to guarantee a consistent and usable backup or replication.

c Under Target File Location, enter the Source Location and Target Location.

antinetten Cottinen		
teplication Settings Hard disk 1	Disk Replication	
' <u>R Server</u> teady to Complete	Enable replication	
	O Disable replicatio	n for this disk
	Target Disk File Locat	ion (Required)
	Source Location:	[HAAppengine1] MAppEngine1/MAppEngine
	Target Location:	[HAAppEngine1] MAppEngine1 Browse
	Target Disk Type	
	Source Disk Size:	70.00 GB
	Source Disk Type:	Thin
	Target Disk Type:	Use existing disk

Click Next. The Hard disk1 area appears.

3 Select the **Disk Replication**, **Target Disk File Location**, and **Target Disk Type** options. Click **Next.** The **VR Server** area appears.

VR Server Replication Settings Hard disk 1 VR Server Ready to Complete Name Number of Replicated VMs Ste B VR 0	
Hard disk 1 VR Server Ready to Complete VR Server Name Number of Replicated VMs	
VR Server C Auto-assign VR Server Ready to Complete C Specify VR Server Name Number of Replicated VMs	
Ready to Complete C Specify VR Server Name Number of Replicated VMs	
Name Number of Replicated VMs	
Help <	ancel

4 Under VR Server, select the Auto-assign VR Server option to let the system assign the server. You can also select the Specify VR server option. Click Next. The Ready to Complete area appears.

🛃 Configure Replication -	MAppEngine1	×
Ready to Complete Review the following	information then click Finish to start rej	blication.
Replication Settings Hard disk 1 VR Server Ready to Complete	Options: Property Replication Settings Target Location: RPO: Quiescing Method: Hard disk 1 Replication: Target Location: Target Location: Target Disk Type: Initial Copy Found: VR Server VR Server:	Value [HAAppEngine1] MAppEngine1 4 Hours None Enabled [HAAppEngine1] MAppEngine1 Use existing disk Yes Auto-assign
Help		< Back Finish Cancel

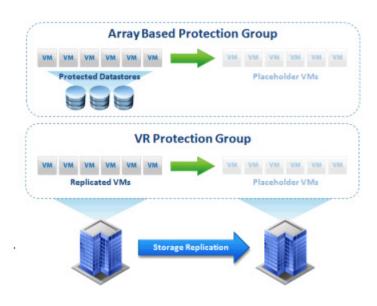
5 Review the replication configuration. Click **Back** to modify your settings or click **Finish**.

After the replication process is complete, the **vSphere Replication** status display appears.

vSphere Replication	Ste B VR						
Name Status	Summary Virtue	al Machines Permiss	sions				_
Site A VR V V Site Recovery for Site B Ste B VR	Source Site: Site Recovery for Site A (Local) Target Site: Site Recovery for Site B						
		Configure Replicat				Remove Replication	
	Virtual Machine	Replication Status Paused Replication	Last Sync Complet 10/5/2011 8:44:	Last Sync I 00:00:02	Duratio Last Sync Size 0.14 MB	RPO 00:15	Target Locati [HAInTouchT:
	MHistorian	Paused Replication	10/5/2011 7:05:	00:00:02	4.50 MB	00:15	[HAHistorian]
I Sites	MAppEngine1	Paused Replication	10/5/2011 8:51:	00:00:14	85.49 MB	00:15	(HAAppEngine
Array Managers	MAppEngine2	Paused Replication	10/5/2011 8:48:	00:00:12	63.35 MB	00:15	[HAAppEngine
	MAppServer	Paused Replication	10/5/2011 8:45:	00:00:03	2.59 MB	00:15	[HAAppserver
Sphere Replication	MHistClient	Paused Replication	10/5/2011 8:46:	00:00:03	1.04 MB	00:15	[HAHistClient]
Protection Groups	MWIS	Paused Replication	10/5/2011 8:53:	00:00:04	7.29 MB	00:15	[HAWIS] MWI
Recovery Plans	•) () () () () () () () () () (
Recent Tasks				N	, lame, Target or Status contain	ns: •	Clear ×

Configuring Protection Groups

Protection groups identify the virtual components that are considered to be most important for maintaining business continuity. Protection groups can define groups of associated VMs that should be recovered together, such as Infrastructure (Windows Active Directory or DNS), Mission Critical, or Business Critical. Storage array-based protection groups include protected datastores. VR protection groups include replicated VMs. Recovery plans, detailed later in this chapter, are encapsulations of one or more protection groups stored at the recovery site to define the Disaster Recovery failover process.



To configure protection groups

 Log on to the vSphere Client and select Site Recovery in the navigation bar. Right-click All Protection Groups in the Protection Groups panel, and then click Create Protection Group on the context menu. The Create Protection Group window appears.

Create Protection Group Select Site and Protecti Select the protected si	on Group Type e and replication type for this protection group.
Protected Site Virtual Machines Name and Description Ready to Complete	Protected Site Site Recovery for Site A (Local) Site Recovery for Site B Protection Group Type vSphere Replication (VR) Array based replication (SAN)
Help	≤Back Next ≥ Cancel

2 Select the appropriate **Protected Site** option where the virtual machines are running, and the **Protection Group Type** option. Click **Next.** The **Select Virtual Machines** area appears.

🚱 Create Protection Group			×
Select Virtual Machines			
Select virtual machines for	this protection group.		
Particular di Cha			
Protected Site Virtual Machines	Replicated Virtual Machines -		
Name and Description	Virtual Machine	Charles and Charle	
Ready to Complete		Status Paused Replication	
	MWIS	Paused Replication	
11-16		and Newly	
Help		<u>≤ Back</u> Next ≥	Cancel

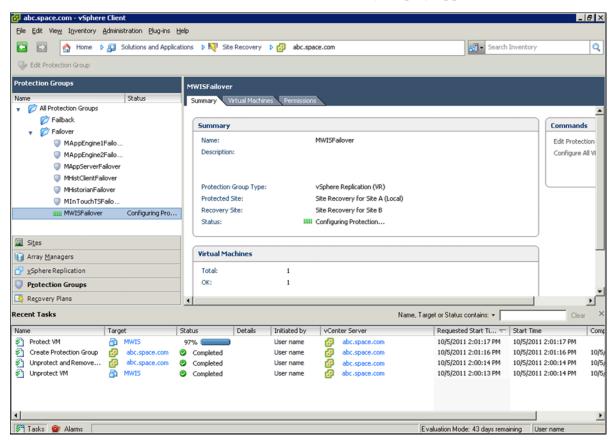
3 Select the **Replicated Virtual Machines** option. Click **Next.** The **Name and Description** area appears.

🚱 Create Protection Group	د
Name and Description Enter a name and descri	ption for this protection group.
Protected Site Virtual Machines Name and Description	Protection Group Name: MWISFallover
Ready to Complete	Description:
	-
Help	< Back Next > Cancel

4 Enter a name and description for the **Protection Group**. Click **Next.** The **Ready to Complete** area appears.

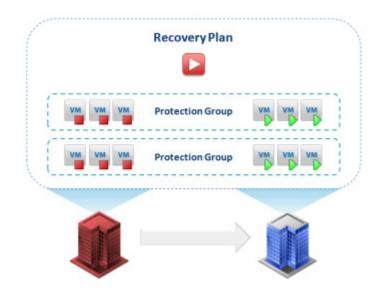
Protected Site Virtual Machines	Options:		
Name and Description	Property	Value	Statu
Ready to Complete	Protection Group Name:	MWISFailover	
	Protection Group Type:	vSphere Replication (VR)	
	Description:		
	Protected Site:	Site Recovery for Site A (Local)	
	Total Virtual Machines:	1	
		-	

5 Review your settings for the protection group. Click Back to modify your settings or click Finish. After the Protection Group is created, the Protection Group summary display appears.



Creating a Recovery Plan

After creating the protection group, you must create the recovery plan for Disaster Recovery.



To create a recovery plan

1 Log on to the vSphere Client and select Site Recovery in the navigation bar. Right-click FailoverPlans in the Recovery Plans panel, and then click Create Recovery Plan. The Create Recovery Plan window appears.

Create Recovery Plan	X
Recovery Site Select the site where	the VMs in this plan will be recovered.
	the VMs in this plan will be recovered. Recovery Site Site Recovery for Site A (Local) Site Recovery for Site B
Help	Kext > Cancel

2 Select the **Recovery Site** where the virtual machines will be recovered. Click **Next.** The **Select Protection Groups** area appears.

Create Recovery Plan Select Protection Gro	pups	X
Select protection gr	roups to use for this recovery plan.	
Recovery Site	Select Protection Groups:	
Protection Groups	Protection Groups Type Description	
Test Networks Name	V 🖉 All Protection Groups	
Ready To Complete	🔻 🧭 Failover	
	VR 🔍 MWISFailover VR	
	🔲 🔍 MInTouchTSFa VR	
	🔲 💭 MHistorianFailo VR	
	🔲 🔍 MHistClientFail VR	
	🔲 💭 MAppServerFai VR	
	🔲 🔍 MAppEngine2F VR	
	🔲 🔍 MAppEngine1F VR	
	🧭 Failback	
Help	< Back Next > Cano	el I
		<u> </u>

3 Select the protection groups for the recovery plan. Click **Next.** The **Test Networks** area appears.

	n		
Test Networks Select the network	ks to use while running tests	of this plan.	
Soloce and Hotman			
Recovery Site Protection Groups	For each network used Select "Auto" if you wa during each test.	by virtual machines in this plan, select nt the system to automatically create a	a network to use while running tests. a new isolated network environment
Fest Networks Name	Datacenter	Recovery Network	Test Network
teady To Complete	Site B	VM Network	Auto
	Site B	vPlant	Auto VM Network vPlant
			THUR .
	Hover over items in the	: Test Network column to display contri	ols for changing the test networks.

4 Map the network between two sites correspondingly so that the virtual machines will run normally after DR. Click **Next.** The **Name and Description** area appears.

reate Recovery Plar		
Name and Descriptio	m description for this recovery plan.	
Encor a fiame and	addiptor of an recovery part.	
Recovery Site		
Protection Groups	Recovery Plan Name:	
Test Networks	WISFailover Plan	
Name		
Ready To Complete	Description:	

5 Enter a name and description for the recovery plan. Click Next. The Ready to Complete area appears.

🛃 Create Recovery Plan			×
Ready to Complete Review the selected	l options then click Finish to continue.		
Recovery Site Protection Groups Test Networks Name Ready To Complete	Options: Property Name: Description: Protected Site: Protection Groups: Test Networks:	Value WISFailover Plan Site Recovery for Site A (Local) MWISFailover VM Network vPlant	
Help		< Back Finish Ca	

6 Review the configured options for the recovery plan. Click **Back** to modify your settings or click **Finish**.

🛃 abc .space.com - vSphere Client		_ @ ×		
Eile Edit View Inventory Administration Plug-ins	elp			
🖸 🔯 Home 🕨 😰 Solutions and Applica	tions 🕨 🔯 Site Recovery 👂 🛃 abc.space.com	Search Inventory		
🕞 Edit Recovery Plan 💽 Test 💽 Cleanup				
Recovery Plans	WISFailover Plan			
Name Status	Summary Protection Groups Virtual Machines Recovery Steps History Permissions			
 All Recovery Plans 				
 Failover Plans 	Test Cleanup Recovery	Reprotect Cancel		
WISFailover Plan				
	Status	Virtual Machines		
	Plan Status: Ready			
	Recovery Step:			
	Recovery step.			
	Protected Site: Site Recovery for Site A (Local)			
	Recovery Site: Site Recovery for Site B			
	Connection: Connected			
		,		
🔛 Si <u>t</u> es		Not Started		
Array Managers	Summary	In Progress		
Sphere Replication	Plan Name: WISFailover Plan	Success		
Protection Groups	Description:	Warning		
Recovery Plans		Error		
Recent Tasks	Name, Target or Status conte	ains: • Clear ×		
Name Target	Status Details Initiated by vCenter Server Requested Sta	art Ti 🗁 Start Time Com;		
Create Recovery Plan 🛃 abc.space.com	Completed User name Abc.space.com 10/5/2011 2:0	02:57 PM 10/5/2011 2:02:57 PM 10/5,		
Destroy Recovery Plan 🔂 abc.space.com	Completed User name Action 10/5/2011 2:0			
Protect VM 🔂 MWIS	Completed User name 🛃 abc.space.com 10/5/2011 2:0			
Create Protection Group 🛃 abc.space.com	Completed User name 🔐 abc.space.com 10/5/2011 2:0			
Unprotect and Remove	Completed User name 🛃 abc.space.com 10/5/2011 2:0			
Unprotect VM 💮 MWIS	Completed User name 🛃 abc.space.com 10/5/2011 2:0	00:13 PM 10/5/2011 2:00:14 PM 10/5,		
•		•		
🚰 Tasks 🞯 Alarms	Evaluation Mode: 43	3 days remaining User name		

After the recovery plan is created, you can view the plan summary.

You can view the recovery steps and modify them in accordance with the priority of the virtual machines.

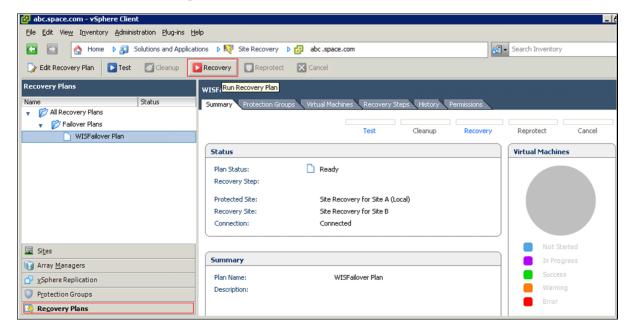
		-		
🖸 🔝 🏠 Home 🕨 😰 Solutions and Aj	pplications 👂 🍀 Site Recovery	delta de la companya de la compan	Search Inve	ntory
🍃 Edit Recovery Plan 🛛 💽 Test 🛛 🖉 Cleanup	Recovery Reprotect	X Cancel		
Recovery Plans	WISFailover Plan			
Vame Status	Summary Protection Gro	ups Virtual Machines Recovery Steps Hist	ory Permissions	
All Recovery Plans	Recovery Step	Status	Step Started	Step Complete
Failover Plans	🔻 👔 1. Synchronize Stora			
🗋 WISFailover Plan	1.1. Protection (
	2. Restore hosts from			
	🛅 3. Suspend Non-critic	cal VMs at Recovery Site		
	🔻 🔯 4. Create Writeable :	Storage Snapshot		
	4.1. Protection (Group MWISFailover		
	🏷 5. Power On Priority	1 VMs		
	🍋 6. Power On Priority	2 VMs		
	💡 🌾 7. Power On Priority	3 VMs		
	7.1. MWIS			
	💛 8. Power On Priority	4 VMs		
Sites	9. Power On Priority	5 VMs		
🗿 Array <u>M</u> anagers				
<u>v</u> Sphere Replication				
2				
Protection Groups				
Protection Groups				
Recovery Plans	<u> </u>	Nar	ne, Target or Status contains: 👻	Clear
Covery Plans Covery Plans Covert Tasks ame Target	Status Details	Nar		Clear art Time
Create Recovery Plans Target Create Recovery Plan	Status Details m 📀 Completed	Initiated by VCenter Server User name 🛃 abc.Space.com	Requested Start Ti Sta 10/5/2011 2:02:57 PM 10,	art Time
	Status Details m 📀 Completed	Initiated by VCenter Server User name 🛃 abc.Space.com User name 🛃 abc.Space.com	Requested Start Ti StartTi Start Ti Start Ti<	art Time //5/2011 2:02:57 PM //5/2011 2:01:41 PM
Recovery Plans scent Tasks ame Target Create Recovery Plan abc.Space.cor Destroy Recovery Plan abc.Space.cor Protect VM MWIS	Status Details m O Completed m Completed O Completed Source	Initiated by vCenter Server User name abc.Space.com User name abc.Space.com User name abc.Space.com User name abc.Space.com	Requested Start Ti Stat 10/5/2011 2:02:57 PM 10/ 10/5/2011 2:01:41 PM 10/ 10/5/2011 2:01:17 PM 10/	art Time /5/2011 2:02:57 PM /5/2011 2:01:41 PM /5/2011 2:01:17 PM
Recovery Plans ccent Tasks ame Target Create Recovery Plan abc.Space.cor Destroy Recovery Plan abc.Space.cor Protect VM MWIS Create Protection Group abc.Space.con	Status Details	Initiated by vCenter Server User name Image: Abc.Space.com	Requested Start Ti ▼ State 10/5/2011 2:02:57 PM 10/ 10/5/2011 2:01:41 PM 10/ 10/5/2011 2:01:17 PM 10/ 10/5/2011 2:01:16 PM 10/	IT Time (5/2011 2:02:57 PM (5/2011 2:01:41 PM (5/2011 2:01:17 PM (5/2011 2:01:16 PM
Recovery Plans ccent Tasks ame Target Create Recovery Plan Babc.Space.cor Protect VM Protect VM Create Protection Group Babc.Space.cor Create Protection Group Babc.Space.con Unprotect and Remove Babc.Space.con	Status Details	Initiated by vCenter Server User name abc.Space.com	Requested Start Ti ▼ State 10/5/2011 2:02:57 PM 10/ 10/5/2011 2:01:41 PM 10/ 10/5/2011 2:01:17 PM 10/ 10/5/2011 2:01:17 PM 10/ 10/5/2011 2:01:17 PM 10/ 10/5/2011 2:01:17 PM 10/	art Time // /5/2011 2:02:57 PM /5/2011 2:01:41 PM /5/2011 2:01:17 PM /5/2011 2:01:16 PM /5/2011 2:00:14 PM
Recovery Plans ccent Tasks ame Target Create Recovery Plan Babc.Space.cor Protect VM Protect VM Create Protection Group Babc.Space.cor Create Protection Group Babc.Space.con Unprotect and Remove Babc.Space.con	Status Details	Initiated by vCenter Server User name Image: Abc.Space.com	Requested Start Ti ▼ State 10/5/2011 2:02:57 PM 10/ 10/5/2011 2:01:41 PM 10/ 10/5/2011 2:01:17 PM 10/ 10/5/2011 2:01:17 PM 10/ 10/5/2011 2:01:17 PM 10/ 10/5/2011 2:01:17 PM 10/	IT Time (5/2011 2:02:57 PM (5/2011 2:01:41 PM (5/2011 2:01:17 PM (5/2011 2:01:16 PM
Recovery Plans ecent Tasks Jame Target Image Image Destroy Recovery Plan Image Destroy Recovery Plan Image Protect VM Image Image Image I	Status Details	Initiated by vCenter Server User name abc.Space.com	Requested Start Ti ▼ State 10/5/2011 2:02:57 PM 10/ 10/5/2011 2:01:41 PM 10/ 10/5/2011 2:01:17 PM 10/ 10/5/2011 2:01:17 PM 10/ 10/5/2011 2:01:17 PM 10/ 10/5/2011 2:01:17 PM 10/	art Time // /5/2011 2:02:57 PM /5/2011 2:01:41 PM /5/2011 2:01:17 PM /5/2011 2:01:16 PM /5/2011 2:00:14 PM

Recovering Virtual Machines to a Disaster Recovery Site

To recover the virtual machines in case of a disaster at a site, you must perform the following procedure.

To recover virtual machines to a disaster recovery site

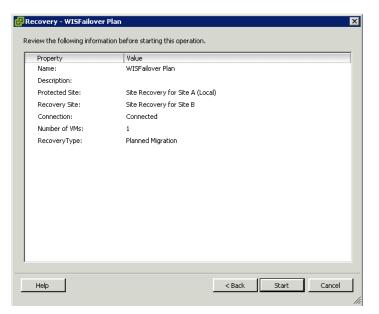
1 Log on to the vSphere Client and select a host from the **Inventory** panel.



2 In the **Recovery Plans** panel, select the recovery plan and then click **Recovery** on the Toolbar. The **Recovery - WISFailover Plan** window appears.

_		
Recovery	- WISFailover Plan	×
Recovery Co	nfirmation	
	Running this plan in recovery mode recover the VMs at the recovery sil	will attempt to shut down the VMs at the protected site and te.
	Protected Site:	Site Recovery for Site A (Local)
	Recovery Site:	Site Recovery for Site B
	Site Connection:	Connected
	Number of VMs:	1
	I understand that this process both the protected and recove	will permanently alter the virtual machines and infrastructure of ry datacenters.
Recovery Typ		
• Pl	anned Migration	
	eplicate recent changes to the recove ust be connected and storage replica	ery site and cancel recovery if errors are encountered. (Sites tion must be available.)
O Di	isaster Recovery	
	ttempt to replicate recent changes to /nchronization data. Continue recove	the recovery site, but otherwise use the most recent storage ry even if errors are encountered.
Help		< Back Next > Cancel

- **3** In the **Recovery Confirmation** panel, select the check box.
- **4** In the **Recovery Type** panel, select the **Recovery Type** based on whether this is **Planned Migration** or **Disaster Recovery**. Click **Next.** The **Review** area appears.



5 Review the information and start the failover operation.

📄 Export Steps 🛛 🖉 Add Step 🖉 Edit Step 🍃 Edit Plan 🖳 Delete Step 🛛 🚰 Add Non-Critical VM View: Recovery St Recovery Step Status Step Started Step Completed 1. Pre-synchronize Storage 1.1. Protection Group System Platofrm Group 音 2. Shutdown VMs at Protected Site a.1. Shutdown Priority 5 VMs 2.2. Shutdown Priority 4 VMs 2.3. Shutdown Priority 3 VMs a.4. Shutdown Priority 2 VMs a.5. Shutdown Priority 1 VMs 🚡 3. Resume VMs Suspended by Previous Recovery 4. Restore hosts from standby Fight 5. Prepare Protected Site VMs for Migration 5.1. Protection Group System Platofrm Group 6. Synchronize Storage 音 7. Suspend Non-critical VMs at Recovery Site 👧 8. Change Recovery Site Storage to Writeable 🏁 9. Power On Priority 1 VMs 闷 10. Power On Priority 2 VMs 🏁 11. Power On Priority 3 VMs 衬 12. Power On Priority 4 VMs

6 After operations get started, you can review the plan status in the Recovery Step tab.

After the failover operation is complete, the virtual machines run normally on the secondary site. When Site A is recovered, to failback the virtual machines to Site A, follow the procedures as described in Setting up Replication through Recovering Virtual Machines to a Disaster Recovery Site.

Note: Before starting replication, delete the virtual machines from the Inventory and ensure that there are no duplicates on the other site.

Chapter 6

Implementing High Availability and Disaster Recovery Using Virtualization

This section introduces several High Availability and Disaster Recovery (HADR) virtualization solutions that improve the availability of System Platform Products. A HADR solution offsets the effects of a hardware or software failure across multiple sites during a disaster. It makes sure all applications are available in order to minimize the downtime during times of crisis.

Important: The information and procedures in this chapter are specific to Hyper-V. You can implement a VMware HADR virtualization solution by following the procedures and settings in Chapter 3, "Implementing High Availability Using vSphere," and in Chapter 5, "Implementing Disaster Recovery Using vSphere."

Working with a Medium Scale Virtualization Environment

This section contains the following topics:

- Setting Up the Virtualization Environment
- Expected Recovery Time Objective and Recovery Point Objective

Setting Up the Virtualization Environment

The following procedures help you to set up and implement the high availability and disaster recovery for the medium scale virtualization environment.

Planning the Virtualization Environment

The minimum recommended hardware and software requirements for the Host and Virtual machines used for this virtualization environment are provided in the table below:

Processor	Two 2.79 GHz Intel Xeon Processor with 24 Cores
Operating System	Windows Server 2008 R2 Enterprise with Hyper-V enabled
Memory	48 GB
Storage	SAN with 1 TB storage disk

Hyper-V Hosts

Note: For the Hyper-V Host to function optimally, the server should have the same processor, RAM, storage, and service pack level. Preferably, the servers should be purchased in pairs to avoid hardware discrepancies. Though the differences are supported, it impacts the performance during failovers.

Virtual Machines

Using the Hyper-V host specified above, seven virtual machines can be created in the environment with the configuration given below.

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	8 GB
Storage	200 GB
System Platform Products Installed	Historian

Virtual Machine 1: Historian Node

Virtual Machine 2: Application Server Node and DAS SI

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	8 GB
Storage	100 GB
System Platform Products Installed	ArchestrA-Runtime and DAS SI

Virtual Machine 3: InTouch TS Node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	InTouch with TS enabled

Virtual Machine 4: Application Server Runtime Node 1

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	InTouch and Application Server Runtime only

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 R2 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Application Server Runtime only

Virtual Machine 5: Application Server Runtime Node 2

Virtual Machine 6: Information Server Node

Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows Server 2008 Standard
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Information Server

Virtual Machine 7: Historian Client Node

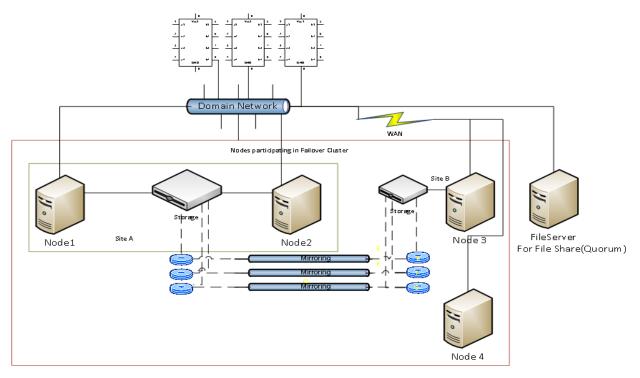
Processor	Host Compatible Processor with 2-4 Cores
Operating System	Windows 7 Enterprise
Memory	4 GB
Storage	80 GB
System Platform Products Installed	Historian Client

Network Requirements

For this architecture, you can use one physical network card that needs to be installed on a host computer for both the domain and the process networks.

Configuring Failover Cluster

The following diagram shows the recommended topology of the failover cluster for high availability and disaster recovery for the virtualization environment:



The following process will guide you on how to setup high availability and disaster recovery for medium scale virtualization environment.

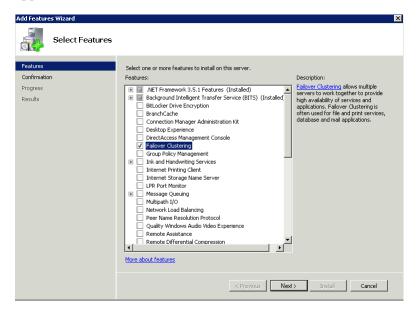
This setup requires a minimum of three host servers and two storage servers with sufficient disk space to host the virtual machines on each disk. One storage server is shared across two servers on one site and another storage server is connected to the third host. Each disk created on the storage server is replicated in all the sites for disaster recovery. Node 4 is used for Node Majority in the failover cluster. Another independent node is used for configuring the quorum. For more information on configuring the quorum, refer to "Configuring Cluster Quorum Settings" on page 395.

Installing Failover Cluster

To install the failover cluster feature, you need to run Windows Server 2008 R2 Enterprise Edition on your server.

To install failover cluster on a server

1 On the Initial Configuration Tasks window, under Customize This Server, click Add features. The Add Features Wizard window appears.



Note: The **Initial Configuration Tasks** window appears if you have already installed Windows Server 2008 R2. If it does not appear, open the **Server Manager** window, right-click **Features** and click **Add Features**.

2 In the Add Features Wizard window, select the Failover Clustering check box, and then click Next. The Confirm Installation Selections area appears.

Add Features Wizard	×
Confirm Installat	tion Selections
Features Contraston Progress Results	To install the following roles, role services, or features, click Install. I informational message below This server might need to be restarted after the installation completes. Fallover Clustering Distribution of the information Particuteneed, or seven this information
	< Previous Next > Instal Cancel

3 Click **Install** to complete the installation. The **Installation Results** area with the installation confirmation message appears.

Add Features Wizard	lts		X
Features Confirmation Progress Results	The following roles, role services, or fo	eatures were installed successfully:	
	Print, e-mail, or save the installation r	sport	
		< Previous Next > Close	Cancel

4 Click Close to close the Add Features Wizard window.

Validating Cluster Configuration

Before creating a cluster, you must validate your configuration. Validation helps you to confirm that the configuration of your servers, network, and storage meet the specific requirements for failover clusters.

To validate failover cluster configuration

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

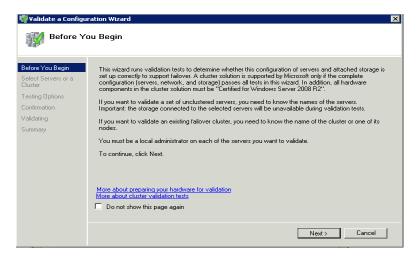
📰 🔽			
ver Manager (CAPRICORN) Roles Features Diagnostics Configuration Storage	E.	us of this server, perform top management tasks, and add or remov	ve server roles and features.
otorage	Server Summary		Server Summary Help
	Computer Information Full Computer Name: Domain: Volmain: Vellant: Remote Desktop: Server Manager Remote Management: Product ID: Ro not show me this cansale a	CAPRICORN space.com space.com Assigned by DHCP 192.168.0.165, IPv6 enabled Enabled D0466-001-0001076-84653 (Activated) & logon. This setting is controlled by Group Policy.	 Change System Properties Wew Network Contractions Confugue Renote Destap Confugue Server Hanager Renote Management
	 Security Information Windows Firewall: Windows Updates: Last checked for updates: 	Domain: Off, Public: Off Install updates automatically using Windows Update Never	 Go to Windows Firewal Configure Updates Check for New Roles Run Security Configuration Wizard Configure IE ESC

2 Expand Features and click Failover Cluster Manager. The Failover Cluster Manager pane appears.

Note: If the **User Account Control** dialog box appears, confirm the action you want to perform and click **Yes**.

File Action Yiew Help Image: Marging Care Actions Image: Marging Care Failover Cluster Manager Image: Marging Care Marging Care Image: Marging Care Marging Care
Server Meager (GARLCOR) Failover Cluster Manager Failover Cluster Manager Failover Cluster Manager Failover Cluster Manager Server Server Server
B Roles Failover (Luster Manager B Follover (Luster Manager B Follover (Luster Manager B Follover (Luster Manager
Big Fedures Failurer Cluster Manager Failurer Cluster Manager Big BigHows Cludes Measure Values Cludes Measure Values Cludes Measure
TE 🐘 Ealinver Cluster Manager
Diagnostics Validate a Configuration Salover clusters, validate hardware for potential failover clusters, and perform configuration to user failure clusters the cluster clusters
Image: Strage Manage a Cluster Image: Strage Manage a Cluster
View Kew View
Properties Leter is a set of independent computers that work together to increase the availability of applications. The clustered servers (called nodes) are connected by physical cables and
Help If one of the nodes fails, another node begins to provide services (a process known as
Clusters
* Management
To begin to use fallower cluthering, first validaties your handware configuration, then create a cuties. After there steps are complete, source and manage the cutiest. If managing a clutter can include migrating envices and applications to firom a clutter running Windows Server 2003, Windows Server 2008, co Windows Server 2006 R2.
Validate a Configuration Image: Configuration Image: Confi
Create a Cluster Create a Cluster Create a Cluster Dode
Manage a Clutter
Micrating services and applications from a cluster
More Information
Ealover cluster topics on the Web
This action lunches the validation wizard, which guides you through the process of testing the bardware configuration for a cluster.

3 Under Management, click Validate a Configuration. The Validate a Configuration Wizard window appears. Click Next.



- **4** In the **Select Servers or a Cluster** area, do the following:
 - **a** In the **Enter name** field, enter the relevant server name.

Note: You can either enter the server name or click **Browse** and select the relevant server name.

- **b** In the **Selected Servers** list, click the required servers, and then click **Add**.
- c Click Next. The Testing Options area appears.

Note: You can add one or more server names. To remove a server from the **Selected servers** list, select the server and click **Remove**.

Create Cluster Wiz				×
Before You Begin Select Servers Validation Warning	Add the names of all th	e servers that you want to have in the clu	uster. You must add at least	one server.
Access Point for Administering the Cluster	Enter server name: Selected servers:	s cancer.space.com		Browse Add
Confirmation Creating New Cluster		capricorn.space.com gemini.space.com moon.space.com		Remove
Summary				
		1		
		<u>< Pr</u>	evious Next >	Cancel

5 Click the Run only the tests I select option to skip the storage validation process, and click Next. The Test Selection screen appears.

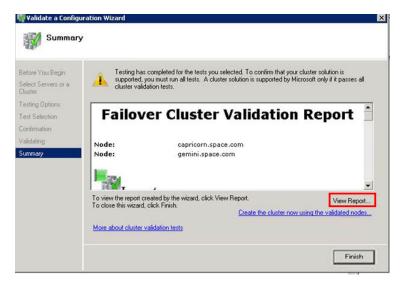
Before You Begin	Choose between running all tests or running selected tests.
Select Servers or a Cluster	The tests include Inventory tasks, Network tests, Storage tests, and System Configuration tests.
Testing Options	Microsoft supports a cluster solution only if the complete configuration (servers, network, and storage) can pass all tests in this wizard. In addition, all hardware components in the cluster solution must be "Certified
Test Selection	for Windows Server 2008 R2".
Confirmation	
/alidating	
Summary	Run all tests (recommended) Run only tests I select
	More about cluster validation tests

Note: Click the **Run all tests (recommended)** option to validate the default selection of tests.

6 Clear the **Storage** check box, and then click **Next**. The **Summary** screen appears.

Validate a Config Validate a Config				
Before You Begin Select Servers or a Cluster Testing Options Test Selection Confirmation Validating Summary	Select the tests that you want to run. A few dependent test, the test that it depends on v	tests are dependent on othe	Description These tests g	
		< Previous	Next>	Cancel

7 Click View Report to view the test results or click Finish to close the Validate a Configuration Wizard window.



A warning message appears indicating that all the tests have not been run. This usually happens in a multi site cluster where the storage tests are skipped. You can proceed if there is no other error message. If the report indicates any other error, you need to fix the problem and re-run the tests before you continue. You can view the results of the tests after you close the wizard in

SystemRoot\Cluster\Reports\Validation Report date and time.html where SystemRoot is the folder in which the operating system is installed (for example, C:\Windows).

To know more about cluster validation tests, click **More about cluster** validation tests on Validate a Configuration Wizard window.

Creating a Cluster

To create a cluster, you need to run the Create Cluster wizard.

To create a cluster

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

	_		
Server Manager (CAPRICORN) Roles Eventures Diagnostics Configuration Storage		cus of this server, perform top management tasks, and add or remo	ve server roles and features.
	Server Summary		Server Summary Help
	Computer Information		🜉 Change System Properties
	Full Computer Name:	CAPRICORN.space.com	View Network Connections
	Domain:	space.com	Configure Server Manager Remote Management
	vDomain:	Assigned by DHCP	Management
	vPlant:	192.168.0.165, IPv6 enabled	
	Remote Desktop:	Enabled	
	Server Manager Remote Management:	Enabled	
	Product ID:	00486-001-0001076-84653 (Activated)	
	M Do not show me this console a	at logon. This setting is controlled by Group Policy.	
	Security Information		😭 Go to Windows Firewall
	Windows Firewall:	Domain: Off, Public: Off	Configure Updates
	Windows Updates:	Install updates automatically using Windows Update	✤ Check for New Roles Run Security Configuration Wizard
	Last checked for updates:	Never	Tonfigure IE ESC

2 Expand Features and click Failover Cluster Manager. The Failover Cluster Manager pane appears.

Note: If the **User Account Control** dialog box appears, confirm the action you want to perform and click **Yes**.

Server Manager							
File Action View	Help						
🗢 🔿 🖄 🕅 🛛	? 🖬						
🌆 Server Manager (C	APRICORN)	Failover Clus	ter Manager			A	tions
 Roles Features 		Failover	Cluster Manager	uster Manager		Fe	ailover Cluster Manager
📧 🎼 Falover Custer Manager		failover clusters, validate hardware for potential failover clusters, and perform configuration		1	Validate a Configuration		
Diagnostics Gonfiguration	Create a Clu				1	Create a Cluster	
🗉 🦉 Storage	Manage a Cli	uster				1	Manage a Cluster
	View	•	ew	ew			View
	Properties		uster is a set of independent comput	ers that w	ork together to increase the availability of		Properties
	Help		If one of the nodes fails, another no	ustered servers (called nodes) are connected by physical cables and ails, another node begins to provide services (a process known as			Help
-		Tanovonj.	-				
		+ Cluste	ers				
		+ Mana	gement				
			2				
the		these step services a	s are complete, you can manage the	cluster. N	ware configuration, then create a cluster. After lanaging a cluster can include migrating lows Server 2003, Windows Server 2008, or		
		Valid.	ate a Configuration	?	Understanding cluster validation tests		
		Creat	e a Cluster	?	Creating a failover cluster or adding a cluster node		
		Mana	ge a Cluster	?	Managing a failover cluster		
				?	Migrating services and applications from a cluster		
▲ More Info		Information					
		Failor	er cluster topics on the Web				
		Eailor	er cluster communities on the Web				
his action launches the	validation wizar	d, which guides y	ou through the process of testing the	hardwar	e configuration for a cluster.		

3 Under Management, click Create a cluster. The Create Cluster Wizard window appears. Click Next.

🍀 Create Cluster Wi	zard	X
Before Y	ou Begin	
Before You Begin Select Servers Validation Warning Access Point for Administering the Cluster Confirmation Creating New Cluster Summary	This wizard creates a cluster, which is a set of servers that work together to increase the availability of clustered services and applications. If one of the servers fails, another server begins hosting the clustered services and applications (a process known as failover). Before you run this wizard, we strongly recommend that you run the Validate a Configuration wizard to ensure that your hardware and hardware settings are compatible with failover clustering. Microsoft supports a cluster solution only if the complete configuration (servers, network, and storage) can pass all tests in the Validate a Configuration wizard. In addition, all hardware components in the cluster solution must be "Certified for Windows Server 2008 R2". You must be a local administrator on each of the servers you want to include in the cluster. To continue, click Next. More about Microsoft support of cluster solutions that have passed validation tests More about the name and IP address information needed for a new cluster. Do not show this page again	
	Next > Cancel	

- **4** In the **Select Servers** screen, do the following:
 - **a** In the **Enter server name** field, enter the relevant server name and click **Add**. The server name gets added in the **Selected servers** box.

Note: You can either enter the server name or click **Browse** and select the relevant server name.

Before You Begin	Add the names of all th	ne servers that you want to have in the cluster. Y	'ou must add at least one server.
Select Servers			
Validation Warning			
Access Point for Administering the	Enter server name:	8	Browse
Cluster	Selected servers:	cancer.space.com capricorn.space.com	Add
Confirmation		gemini.space.com	Remove
Creating New Cluster		moon.space.com	
Summary			

5 Click **Next.** The **Validation Warning** area appears.

罉 Create Cluster Wiz	ard 🔀
Validation	n Warning
Before You Begin Select Servers Validation Warning Access Point for Administering the Cluster	For the servers you selected for this cluster, the reports from cluster configuration validation tests indicate that the hardware or hardware settings are not suitable for clustering. Microsoft supports a cluster solution only if the complete configuration (servers, network and storage) can pass all the tests in the Validate a Configuration wizard. Do you want to run configuration validation tests before continuing?
Confirmation	View Report
Creating New Cluster Summary	Yes. When I click Next, run configuration validation tests, and then return to the process of creating the cluster. No. I do not require support from Microsoft for this cluster, and therefore do not want to run the validation tests. When I click Next, continue creating the cluster.
	< Previous Next > Cancel

6 In the Validation Warning dialog box, click No. I do not require support from Microsoft for this cluster, and therefore do not want to run the validation tests. When I click Next, continue creating the cluster option and click Next. The Access Point for Administering the Cluster area appears.

Note: Click **Yes. When I click Next, run configuration validation tests, and then return to the process of creating the cluster** option if you want to run the configuration validation tests. Click **View Report** to view the cluster operation report.

Before You Begin	Type the name you want to use when administering the cluster.
Select Servers	Cluster Name: <
/alidation Warning	One or more DHCP IPv4 addresses were configured automatically. All networks were configured
Access Point for Administering the	automatically.
Cluster	
Confirmation	
Creating New Cluster	
Summary	
	More about the administrative Access Point for a cluster

7 In the Cluster Name field, type the name of the cluster and click Next. The Confirmation area appears.

Note: Enter a valid IP address for the cluster to be created if the IP address is not configured through Dynamic Host Configuration Protocol (DHCP).

Create Cluster Wiz			X
Before You Begin Select Servers Validation Warning	You are ready to create a The wizard will create yo	a cluster. ur cluster with the following settings:	
Access Point for Administering the Cluster Confirmation Creating New Cluster	Cluster: Node: Node: IP Address:	Stars1 capricorn.space.com gemini.space.com DHCP address on 10.91.60.0/23	<u>_</u>
Summary	To continue, click Next.		¥
		< Previous Next	> Cancel

8 Click Next. The cluster is created and the Summary area appears.

Create Cluster Wizard Summary			
Before You Begin Select Servers	You have su	ccessfully completed the Create Cluster Wizard.	
Validation Warning Access Point for Administering the Cluster		Create Cluster	<u> </u>
Confirmation Creating New Cluster Summary	Cluster: Node: Node: Quorum:	Planet mercury.space.com venus.space.com Node Majority	•
	, To view the report cre To close this wizard, c	ated by the wizard, click View Report. Ilick Finish.	View Report
			Finish

9 Click **View Report** to view the cluster report created by the wizard or click **Finish** to close the **Create Cluster Wizard** window.

Configuring Cluster Quorum Settings

Quorum is the number of elements that need to be online to enable continuous running of a cluster. In most instances, the elements are nodes. In some cases, the elements also consist of disk or file share witnesses. Each of these elements determines whether the cluster should continue to run or not.

All elements, except the file share witnesses, have a copy of the cluster configuration. The cluster service ensures that the copies are always synchronized. The cluster should stop running if there are multiple failures or if there is a communication error between the cluster nodes.

After both nodes have been added to the cluster, and the cluster networking components have been configured, you must configure the failover cluster quorum.

You must create and secure the file share that you want to use for the node and the file share majority quorum before configuring the failover cluster quorum. If the file share has not been created or correctly secured, the following procedure to configure a cluster quorum will fail. The file share can be hosted on any computer running a Windows operating system.

To configure the cluster quorum, you need to perform the following procedures:

- Create and secure a file share for the node and file share majority quorum
- Use the failover cluster management tool to configure a node and file share majority quorum

To create and secure a file share for the node and file share majority quorum

- **1** Create a new folder on the system that will host the share directory.
- 2 Right-click the folder that you have created and click **Properties**. The **Quorum Properties** window for the folder you created appears.

Note: In the following procedure, Quorum is the name of the folder.

📙 Quorum Properties 🛛 🔹		
General Sharing Security Previous Versions Customize		
Network File and Folder Sharing Quorum Not Shared Network Path: Not Shared Share		
Set custom permissions, create multiple shares, and set other advanced sharing options.		
OK Cancel Apply		

3 Click the Sharing tab, and then click Advanced Sharing. The Advanced Sharing window appears.

Advanced Sharing	×
Share this folder	
Settings	1
Share name:	
Quorum	
Add Remove	
Limit the number of simultaneous users to: 16777	
Comments:	
Permissions Caching	
Permissions Caching	
OK Cancel Apply	

4 Select the **Share this folder** check box and click **Permissions**. The **Permissions for Quorum** window appears.

📜 Permissions for Quorum		X
Share Permissions		
Group or user names:		
	Add	Remove
Permissions for Everyone	Allow	Deny
Full Control		
Change Read		
nead	M	
Learn about access control and p	ermissions	
OK	Cancel	Apply

5 Click Add. The Select Users, Computers, Service Accounts, or Groups window appears.

Select Users, Computers, Service Accounts, or Groups	? ×
Select this object type:	
Users, Groups, or Built-in security principals	Object Types
From this location:	
	Locations
Enter the object names to select (<u>examples</u>):	
<node1>,<node2>,<cluster name=""></cluster></node2></node1>	Check Names
Advanced OK	Cancel

6 In the Enter the object name to select box, enter the four node names used for the cluster in the high availability and disaster recovery configuration and click OK. The node names are added and the Permissions for Quorum window appears.

👢 Permissions for Quorum		>
Share Permissions		
Group or user names:		
Serveryone		
	Add	Remove
Permissions for Everyone	Allow	Deny
Full Control		
Change Read		
Learn about access control and permissions		
ОК	Cancel	Apply

7 Select the Full Control, Change, and Read check boxes and click OK. The Properties window appears.

📜 Quorum Propertie	≥5		×
General Sharing S	ecurity Previo	us Versions 🗍 Cust	omize
Network File and F Quorum Not Shar Network Path: Not Shared Share	-		
Advanced Sharing Set custom permis advanced sharing	sions, create mu options.	ltiple shares, and s	et other
	ОК	Cancel	Apply

8 Click **Ok**. The folder is shared and can be used to create virtual machines.

To configure a node and file share majority quorum using the failover cluster management tool

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.

Note: You can also access the **Server Manager** window from the **Administrative Tools** window or the **Start** menu.

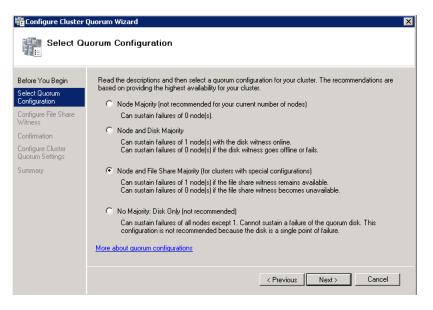
Server Manager File Action View Help Server Manager (CAPRLOORN) Server Manager (CAPRLOORN) Server Manager (CAPRLOORN) Server Manager (CAPRLOORN) Server Manager (CAPRLOORN) Server Manager (CAPRLOORN) Server Manager (CAPRLOORN) Beatures CapRLOORN Compare Custer Manager Summary of Cluster Star Star has 0 applications/services and 2 nodes Networks: Cluster Network 1, Cluster Network 2 View Validation Report Star has 0 application Configure Cluster Star Subnets: 2 IPv4 and 0 IPv6 Wiredwork Configure Cluster Network 2 Disk Manager Node Majority - Warning: Failure of a node will cause the cluster to fail. Check the status of the nodes. Teacher Cluster Shared Volumes Add Mode Close Connection Configure Cluster Quorum Settings More Actions Configure Cluster Quorum Settings More Actions Configure Cluster Quorum Settings
Server Manager (CAPRICORN) Server Manager Corpland Configure 2 Capril Corn Summary of Cluster Star Star.space.com Cluster Star.space.com Configure 2 Capril Corn Summary of Cluster Star Star has 0 applications/services and 2 nodes Server Cluster Manager Configure 2 Capril Corn Summary of Cluster Star Star has 0 applications/services and 2 nodes Server Cluster Manager Configure 2 Capril Corn Summary of Cluster Star Star has 0 applications/services and 2 nodes Server Server Cluster Manager Configure 2 Service or Application View Validation Report Star has 0 applications Node Majority - Warning: Failure of a node will cause the cluster to fail. Check the status of the nodes. Star has 0 application View Validation Report Server Storage Server Manager Configure Cluster Star Storage Server Manager Configure Cluster Star Star has 0 application View Validation Report Server Manager Configure Cluster Star Storage Storage Server Manager Configure Cluster Star Star has 0 application View Validation Report Server Manager Configure Cluster Star Server Manager Configure Cluster Star Server Manager Server
Server Manager (CAPRICORN) Roles Roles Corplications/services and 2 nodes Roles Roles Corplications/services and 2 nodes Roles Roles Roles Roles Corplications/services and 2 nodes Roles
Roles Hyper-V Starksore Configure Services and 2 nodes Starksore Starks
Custer Star. space.com Custer Star. Space. Custer Custer Custer Custer Star. Space.com Cus
Hyper-V Manager Corplications/services and 2 nodes Corplications/services Corplications/services and 2 nodes Corplications/services Co
Summary of Cluster Star Star has 0 applications/services and 2 nodes Star has 0 applications Wet Waldation Report Star has 0 applications View Waldation Report Star has 0 applications Star has 0 applications Star has 0 applications Star has 0 applications View Waldation Report Star has 0 applications Star has 0 applications for a node will cause the cluster to fail. Check the status of the nodes. Star has 0 applications for a cluster Star has 0 applications for a
Image: Partice Start Start As 0 applications/services and 2 nodes Image: Partice Start Star
Reliver Cluster Manager Configure a Service or Application Wei Waldato This Cluster Wei Waldato This Cluster Wei Waldato This Cluster Wei Waldato This Cluster Mode Majority - Warning Failure of a node will cause the cluster to fail. Check the status of the nodes. This None in the last 24 hours Add Node Configure Cluster Cluster Cluster Cluster More Cluster Cluster Cluster The or more servers (nodes), or migrate services and applications from a cluster
Degrostics D
Configuration View Validation Report View Validation Vi
View V adductin Report View Valaductin
Windows Enable Cluster Shared Volumes Add Node Close Connection More Actions Configure Cluster Opport Settings he or more servers (nodes), or migrate services and applications from a cluster
Disk Man Add Node Close Connection More Articine Configure Cluster Opportune Settings he or more servers (nodes), or migrate services and applications from a cluster
More Arctions
More Artigos Configure Cluster Ouggins Settings he or more servers (nodes), or migrate services and applications from a cluster
View Migrate services and applications and applications you can configure for high availability
Refresh Shut down Cluster nding cluster validation tests
Properties Destroy Cluster ndring Cluster Shared Volumes
Help 2 Add a server to your cluster
Migrate services and applications I Migrating a cluster from Windows Server 2003, Windows Server 2008, or Windows Server 2008 R2
Navigate to Storage to add disks

2 Right-click the name of the cluster you have created and click More Actions. Click Configure Cluster Quorum Settings. The Configure Cluster Quorum Wizard window appears.

👫 Configure Cluster (Quorum Wizard 🛛 🔀
Before Yo	ou Begin
Before You Begin Select Quorum Configuration Confirmation Configure Cluster Quorum Settings Summary	This wizard guides you through configuration of the quorum for a failover cluster. The quorum configuration determines the point at which too many failures of certain cluster elements will stop the cluster from running. The relevant cluster elements are the nodes and, in some quorum configurations, a disk witness (which contains a copy of the cluster configuration) or file share witness. A majority of these elements must remain online and in communication, or the cluster "losse quorum" and must stop running. Note that full function of a cluster depends not just on quorum, but on the capacity of each node to support the services and applications that fail over to that node. For example, a cluster that has five nodes could still have quorum after two nodes fail, but each remaining cluster node would continue serving clients only if it had enough capacity to support the services and applications that failed over to it.
	Important: Run this wizard only if you have determined that you need to change the quorum configuration for your cluster. When you create a cluster, the cluster software automatically chooses the quorum configuration that will provide the highest availability for your cluster. To continue, click Next. <u>More about quorum configurations</u> Do not show this page again
	Next > Cancel

3 View the instructions on the wizard and click **Next**. The **Select Quorum Configuration** area appears.

Note: The **Before you Begin** screen appears the first time you run the wizard. You can hide this screen on subsequent uses of the wizard.



4 You need to select the relevant quorum node. For special configurations, click the **Node and File Share Majority** option and click **Next**. The **Configure File Share Witness** area appears.

Note: Click the **Node Majority** option if the cluster is configured for node majority or a single quorum resource. Click the **Node and Disk Majority** option if the number of nodes is even and not part of a multi site cluster. Click the **No Majority: Disk Only** option if the disk is being used only for the quorum.

🐮 Configure Cluster Quorum Wizard 🛛 🗙		
Configure	e File Share Witness	
Before You Begin Select Quorum Configuration Configure File Share	Please select a shared folder that will be used by the file share witness resource. This shared folder must not be hosted by this cluster. It can be made more available by hosting it on another cluster.	
Configure Plue Shale Witness Configure Cluster Quorum Settings Summary	Shared Folder Path: \\universe\Shared Browse	
	< Previous Next > Cancel	

5 In the **Shared Folder Path** box, enter the Universal Naming Convention (UNC) path to the file share that you have created in the Configure Cluster Quorum Settings. Click **Next**. Permissions to the share are verified. If there are no problems with the access to the share, then the **Confirmation** screen appears.

Note: You can either enter the server name or click **Browse** to select the relevant shared path.

Configure Cluster	
Before You Begin	You are ready to configure the quorum settings of the cluster.
Select Quorum Configuration	
Configure File Share Witness	Share: \\universe\Shared Quorum Configuration: Node and File Share Majority
Confirmation Configure Cluster Quorum Settings	Your cluster quorum configuration will be changed to the configuration shown above.
Summary	*
	To continue, click Next.
	< Previous Next > Cancel

6 The details you have selected are displayed. To confirm the details, click **Next**. The **Summary** screen appears and the configuration details of the quorum settings are displayed.

📲 Configure Cluster (Quorum Wizard	×
Summary		
Before You Begin Select Quorum Configuration	You have successfully configured the quorum settings for the cluster.	
Configure File Share Witness	Configure Cluster Quorum Settings 🖆	
Confirmation	configure cluster quorum settings	
Configure Cluster Quorum Settings	Share: \\universe\Shared	
Summary	Quorum Configuration: Node and File Share Majority To view the report created by the wizard, click View Report. View Report	
	To close this wizard, click Finish.	
	Finish	

7 Click View Report to view a report of the tasks performed, or click Finish to close the window.

After you configure the cluster quorum, you must validate the cluster. For more information, refer to http://technet.microsoft.com/en-us/library/bb676379(EXCHG.80).aspx.

Configuring Storage

For any virtualization environment, storage is one of the central barriers to implementing a good virtualization strategy. However in Hyper-V, VM storage is kept on a Windows file system. You can put VMs on any file system that a Hyper-V server can access. As a result, you can build HA into the virtualization platform and storage for the virtual machines. This configuration can accommodate a host failure by making storage accessible to all Hyper-V hosts so that any host can run VMs from the same path on the shared folder. The back-end of this storage can be a local, storage area network, iSCSI or whatever is available to fit the implementation.

The following table lists the minimum storage recommendations for each VM in medium scale virtualization environment:

System	Storage Capacity
Historian Virtual Machine	200 GB
Application Server 1 (GR Node) Virtual Machine	100 GB
Application Engine 2 (Runtime Node) Virtual Machine	80 GB
InTouch Virtual Machine	80 GB
Information Server Virtual Machine	80 GB
Historian Client	80 GB

To build up High Availability and Disaster Recovery system, you must have a minimum of two SAN storage servers, each installed at different sites with the above storage recommendations.

The total storage capacity should be minimum recommended 1 TB.

Configuring Hyper-V

Microsoft Hyper-V Server 2008 R2 helps in creating virtual environment that improves server utilization. It enhances patching, provisioning, management, support tools, processes, and skills. Microsoft Hyper-V Server 2008 R2 provides live migration, cluster shared volume support, expanded processor, and memory support for host systems.

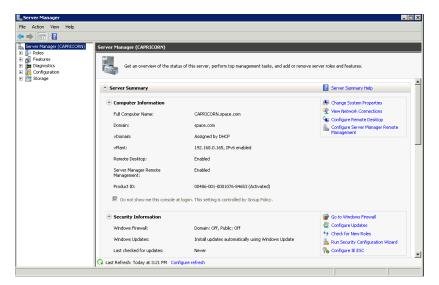
Hyper-V is available in x64-based versions of Windows Server 2008 R2 operating system, specifically the x64-based versions of Windows Server 2008 R2 Standard, Windows Server 2008 R2 Enterprise, and Windows Server 2008 Datacenter.

The following are the pre-requisites to set up Hyper-V:

- x64-based processor
- Hardware-assisted virtualization
- Hardware Data Execution Prevention (DEP)

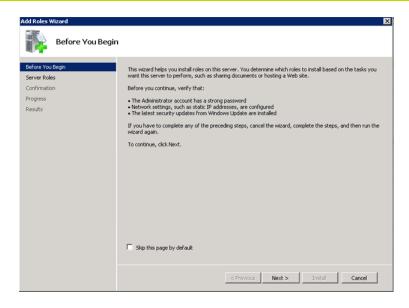
To configure Hyper-V

1 Click the **Server Manager** icon on the toolbar. The **Server Manager** window appears.



2 In the Roles Summary area, click Add Roles. The Add Roles Wizard window appears.

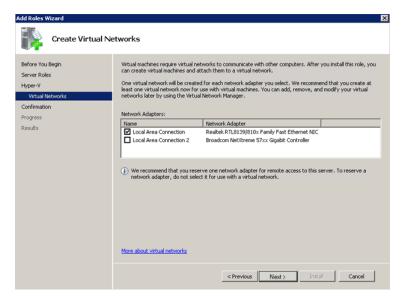
Note: You can also right-click **Roles**, and then click **Add Roles Wizard** to open the **Add Roles Wizard** window.



3 Read the instructions on the wizard and then click **Next**. The **Select Server Roles** area appears.

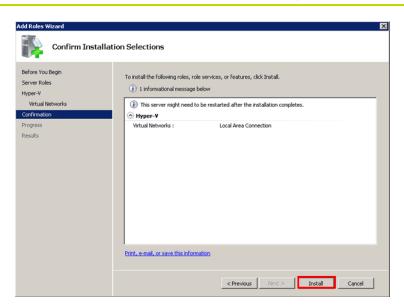
Add Roles Wizard Select Server Rol	s
Before You Begin Server Roles Hyper-V Virtual Networks Confirmation Progress Results	Select one or more roles to install on this server. Description: Roles: Description: Active Directory Centificate Services type://www.installeditory.org/services Active Directory Federation Services type://www.installeditory.org/services Active Directory Federation Services type://www.installeditory.org/services Active Directory Federation Services type://www.installeditory.org/services Active Directory Rights Management Services type://www.installeditory.org/services DHCP Server DHCP Server Pac Server Federation Services (Installed) Windows Server (Its) (Installed) type://www.installeditory.org/services Windows Server Update Services windows Server Update Services Windows Server Update Services windows Server Update Services Windows Server Update Services windows Server Update Services
	<previous next=""> Install Cancel</previous>

4 Select the **Hyper-V** check box and click **Next**. The **Create Virtual Networks** area appears.



5 Select the check box next to the required network adapter to make the connection available to virtual machines. Click Next. The Confirmation Installation Selections area appears.

Note: You can select one or more network adapters.



6 Click **Install**. The **Installation Results** area appears.

Add Roles Wizard			×
Installation Resu	lts		
Before You Begin Server Roles Hyper-V	One or more of the following ro	les, role services, or features require you to restart:	
Virtual Networks	⊘ Hyper-¥	🔔 Restart Pending	
Confirmation	A You must restart this se	rver to finish the installation process.	
Progress			
Results			
	Print, e-mail, or save the install	ation report	
		< Previous Next > Close C	ancel

7 A message appears prompting you to restart the computer. ClickClose. The Add Roles Wizard pop-up window appears.

Add Roles Wizard	X
Installation Re	sults
Before You Begin Server Roles Hyper-V	One or more of the following roles, role services, or features require you to restart:
Virtual Networks Confirmation	Hyper-V Â Restart Pending Add Roles Wizard
Progress Results	Do you want to restart now? This server must be restarted to finish the installation process. You cannot add or remove other roles, rule services, or features until the server is related. Yes No
	Print, e-mail, or save the installation report
	< Previous Next > Cose Cancel

8 Click **Yes** to restart the computer.

9 After you restart the computer, login with the same ID and password you used to install the Hyper-V role. The installation is completed and the **Resume Configuration Wizard** window appears with the installation results.

Resume Configuration Wizard	esults					
Resuming Configuration Progress Results	The following roles, role services, or features were installed successfully: t warring, 1 Informational messages below Windows automatic updatering ran eabled. To ensure that your newly-installed role or feature is wording a successful updatering rank that your newly-installed role or feature is wording a successful updatering rank that your newly-installed role or feature is wording a successful updatering rank that your newly-installed role or feature is wording a successful updatering rank that your newly-installed role or feature is wording a successful updatering rank that your newly-installed role or feature is wording a successful updatering rank that your newly-installed role or feature is wording a successful updatering rank that your newly-installed role or feature is wording a successful updatering rank that your newly-installed role or feature is wording a successful updatering rank that your newly-installed role or feature is wording a successful updatering rank that your newly-installed role or feature is wording rank that your newly-installed role or feature is w					
	Hyper-V Ø Installation succeeded					
	① To add virtual machines, use the New Virtual Machine victard in the Virtualization Management console.					
	Print, e-mail, or save the installation report					
	Canor					

10 Click Close to close the Resume Configuration Wizard window.

Configuring SIOS(SteelEye)DataKeeper Mirroring Jobs

SteelEye DataKeeper is a replication software for real-time Windows data. It helps replicate all data types, including the following:

- Open files
- SQL and Exchange Server databases
- Hyper-V .vhd files

SteelEye DataKeeper's ability to replicate logical disk partitions hosting the .vhd files for the Hyper-V virtual machines ensures that a mirrored disk image is available on the stand-by cluster host in case the primary cluster host fails. This helps provide disaster recovery (DR) solutions.

SteelEye DataKeeper Cluster Edition is a host-based replication solution, which extends Microsoft Windows Server 2008 R2 Failover Clustering (WSFC) and Microsoft Cluster Server (MSCS) features such as cross-subnet failover and tunable heartbeat parameters. These features make it possible to deploy geographically distributed clusters. You can replicate .vhd files across LAN, WAN, or any Windows server through SIOS Microsoft Management Console (MMC) interface. You can run the DataKeeper MMC snap-in from any server. The DataKeeper MMC snap-in interface is similar to the existing Microsoft Management tools.

Note: For information on installing the SteelEye DataKeeper, refer to *SteelEye DataKeeper for Windows Server 2003/2008 Planning and Install Guide* and *SteelEye DataKeeper for Windows Server 2003/2008 Administration Guide* at http://www.steeleye.com. Ensure that the local security policies, firewall, and port settings are configured as per the details in these documents.

The following procedures help you set up a virtual machine in the Disaster Recovery environment.

Creating a SteelEye DataKeeper Mirroring Job

To set up a virtual machine in the Disaster Recovery environment you need to first create a SteelEye DataKeeper mirroring job.

To create a SteelEye DataKeeper mirroring job

1 Click **Start**, and then from the **All Programs** menu, click **SteelEye DataKeeper MMC**. The **DataKeeper** window appears.

Stoeff ye Dutativeper Automatic Stoeff ye Dutativeper Automatic Stoeff ye	A Da	Actions			
	Jobs	Create Job Connect to Server Deconnect from			
	S Maroning	SnTouch Volume AppServer Volume	Description IniTruck Volume Appliener Volume		View

2 In the Actions pane, click Create Job. The SteelEye DataKeeper window appears.

🚟 SteelEye Data	Keeper 📃 🗆 🗙
	w job logical grouping of related mirrors and servers. Provide a name for this new job to help remember it.
Job name: Job description:	Job description:
	Create Job Cancel

3 Type the relevant job name and description in the **Job name** and **Job** description boxes, and then click **Create Job**. The **New Mirror window** appears.

Choose a Source		ver with the source volume.	
Shared Volumes Choose a Target	Server:	MERCURY.SPACE.COM	Connect to Serv
Configure Details	Choose the 1P	address to use on the server.	
		10.91.60.47 / 255.255.254.0	2
	Choose the upl	ume on the selected server.	
	Volume:	G	

4 In the Choose a Source area, select the Server, IP address, and Volume and click Next. The Choose a Target area appears.

New Mirror	e a Target	
Choose a Source Shared Volumes Choose a Target Shared Volumes Configure Details	Source server: MERCURY.SPACE.COM Source IP and mask: 10.91.60.47 Source volume: G Choose the server with the texast volume. Server: PENUS.SPACE.COM	Connect to Some
	Choose the IP address to use on the server. IP address: 10.91.60.27 / 255.255.254.0 Choose the volume on the selected server. Volume: G	
	Previous	Next Cancel

5 Select the destination Server, IP address, and Volume and click Next. The Configure Details area appears.

Choose a Source	Source server: MERCURY.SPACE.COM
Shared Volumes	Source IP and mask: 10.91.60.47 Source volume: G
Choose a Target Shared Volumes	source volume: G
Configure Details	Specify how the data should be compressed when sent to the target.
	None None
	How should the source volume data be sent to the target volume?
	C Synchronous
	Maximum bandwidth: 0 dbps

- **6** In the **Configure Details** area, do the following:
 - **a** Move the slider to select the level of data compression.
 - **b** Click the relevant option to indicate the mode in which you want to send the source volume data to the target volume.
 - **c** In the **Maximum** bandwidth field, type the network bandwidth to be used for data replication.

Note: Enter "0" to indicate that the bandwidth is unlimited.

d Click **Done**. The SteelEye DataKeeper mirroring job is created.

Disk Management Topologies

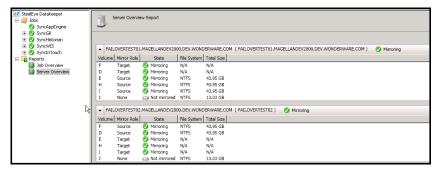
After you have completed setting up SteelEye DataKeeper Mirroring jobs and created the datakeeper, you can view the following topologies:

Open Disk Management to view all the disks which are replicated, by running the diskmgmt.msc from the command prompt.

Volume	Layout	Туре	File System	Status				Capacity	Free Space	% Free	Fault Toleran
🗀 (C:)	Simple	Basic	NTFS	Healthy (B	oot, Page File, Crast	h Dump, Primary Pa	rtition)	97.56 GB	69.72 GB	71 %	No
🖙 Appengine (G:)	Simple	Basic	NTFS	Healthy (L	ogical Drive)			39.06 GB	32.48 GB	83 %	No
Appserver (E:)	Simple	Basic	NTFS	Healthy (L	ogical Drive)			78.13 GB	70.25 GB	90 %	No
📾 Backups (K:)	Simple	Basic	NTFS	Healthy (L	ogical Drive)			166.28 GB	161.64 GB	97 %	No
📾 Historian (D:)	Simple	Basic	NTFS	Healthy (L	ogical Drive)			78.13 GB	70.08 GB	90 %	No
InTouch (F:)	Simple	Basic	NTFS	Healthy (L	ogical Drive)			39.06 GB	32.48 GB	83 %	No
System Reserved	Simple	Basic	NTFS	Healthy (9	ystem, Active, Prima	ary Partition)		100 MB	72 MB	72 %	No
WIS (H:)	Simple	Basic	NTFS	Healthy (L	ogical Drive)			60.60 GB	48.43 GB	80 %	No
4											
Disk 0	/st (C:)		115.05	rian (D:)	Annany (F)	InTouch (F:)		ngine ((WIS (H:)	Ber	kups (K:)
558.91 GB 10	01 97.56	GB NTF	5 78.13	GB NTFS	Appserver (E:) 78.13 GB NTFS Healthy (Logical I	39.06 GB NTFS Healthy (Logical	39.06	GB NTFS	WIS (H:) 60.60 GB NTF Healthy (Logic	5 166.	Kups (K:) 28 GB NTFS thy (Logical Dr

After creating all the Mirroring Jobs, open the SteelEye DataKeepr UI from the All Programs menu, click SteelEye DataKeeper MMC. The DataKeeper window appears.

You can navigate to **Job Overview** under **Reports** to view all the jobs in one place.



You can navigate to **Server Overview** under **Reports** to view all the servers involved in job replication in one place.

9						
▲ MER	CURY.SPACE.	сом	(MERCURY)) 🔥 Resyi	ncing	
Volume	Mirror Role		State	File System	Total Size	
D	Source	0	Mirroring	NTFS	78.12 GB	
E	Source	۷	Mirroring	NTFS	78.12 GB	
F	Source	۷	Mirroring	NTFS	39.06 GB	
G	Source	Ā	Resyncing	NTFS	39.06 GB	
н	Source	Â	Resyncing	NTFS	60.60 GB	
к	None		Not mirrored	NTFS	166.28 GB	
1						
▲ VEN	US.SPACE.CO	м (VENUS)	Resyncing		
Volume	Mirror Role		State	File System	Total Size	
D	Target	0	Mirroring	N/A	N/A	
E	Target	۷	Mirroring	N/A	N/A	
F	Target	۷	Mirroring	N/A	N/A	
G	Target	A	Resyncing	N/A	N/A	
н	Target	Â	Resyncing	N/A	N/A	
к	None		Not mirrored	NTFS	166.28 GB	

Configuring Virtual Machines

After creating a steel eye mirroring job, you need to create a virtual machine in the disk.

To configure virtual machines

1 In the Server Manager window, right-click Features and then click Failover Cluster Manager. The Failover Cluster Manager tree expands.



2 Right-click Services and applications, then click Virtual Machines, and then click New Virtual Machine. The New Virtual Machine Wizard window appears.

Before You	
Before You Brigh Specify Name and Location Assign Memory Configure Networking Connect Hindua Hand Dak Instaliation Options Summary	This record helps you create a virtual machine. Too can use virtual machines in place of physical sous can change the configuration there using higher V Manager. To create a virtual machine, do one of the following: • d.d. Frank to create a virtual machine with a configuration with direct values. • d.d. Frank to create a virtual machine with a configuration. • Do not show this page agen there about creation with all machines.
	Cancel

3 View the instructions in the **Before You Begin** area and click **Next**. The **Specify Name and Location** area appears.

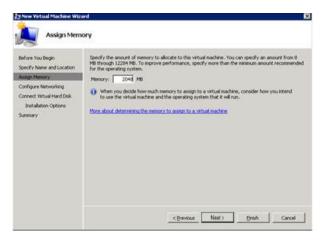
Specify Nam	ad Location	X
Before You Begin Specify Neenery Configure Networking Configure Networking Connect What Need Dek Installation Options Summary	Choose a name and location for this virtual machine. The name is displayed in https:// Hanager. We recommend that you use a name identify this virtual machine, such as the name of the guest operating system or Name: [Instrument] Volucian creates a foldor or use an existing folder to store the virtual machine. If Tolder, the virtual machine in a different location Coston: [C-1] Location: [C-1] If the store the intrude machine data and may regars a large and space. Snapshot's include virtual machine data and may regars a large and	vorkload. you don't select a m. Browse
	<previous next=""> Previous</previous>	Cancel

- **4** In the **Specify Name and Location** area, do the following:
 - **a** In the **Name** field, type a name for the virtual machine.
 - **b** Select the **Store the virtual machine in a different location** check box to be able to indicate the location of the virtual machine.

c In the **Location** field, enter the location where you want to store the virtual machine.

Note: You can either type the location or click **Browse** and select the location where you want to store the virtual machine.

d Click **Next**. The **Assign Memory** area appears.



5 Type the recommended amount of memory in the **Memory** field and click **Next**. The **Configure Networking** area appears.

23 New Virtual Machine Wiz	ard	×
Configure N	etworking	
Before You Begin Specify Name and Location Asign Hemory Confect Minute Inter Disk Installation Options Summery	Each new virtual mechnie includes a network adapter. You can configure the network virtual network, or it can remain disconcected. Connection: <u>Remain - Writed Network</u> There about confraction network adapters	ork adapter to use a
	<previous next=""> Pinish</previous>	Cancel

6 Select the network to be used for the virtual machine from the Connection drop-down list, and click Next. The Connect Virtual Hard Disk area appears.

Before You Begin Specify Name and Location Assign Memory	A virtual machine requires storage so that you can initial an operating in storage now or configure it later by modifying the virtual machine's prop ⁽²⁾ Create a virtual hard disk	
Assign Memory Configere Networking Connect Vehical Hend Disk Installation Options Summary	Name: HistorianVM, vhd Location: GrifestorianVM, Size: 4d G8 (Maximum: 2040 G8) C Use an existing virtual hard disk Location: [inemati/Appendent]	trows
	Attach a virtual hard disk later	Finish Cano

- **7** Click the **Create a virtual hard disk** option and then do the following:
 - **a** In the **Name** field, type the name of the virtual machine.
 - **b** In the **Location** field, enter the location of the virtual machine.

Note: You can either type the location or click **Browse** and select the location of the virtual machine.

c In the **Size** field, type the size of the virtual machine, and then click **Next**. The **Installation Options** area appears.

Note: You need to click the **Use an existing virtual hard disk or the Attach a virtual hard disk later** option, only if you are using an existing virtual hard disk or you want to attach a virtual disk later.

lefore You Begin Specify Name and Location	You can install an operating system now if you have access to the setup media, or you can install later: finital an operating system later
kolga Menoy Configue Networking Connect Witual Hard Dok Benafation Options	Instal an operating system from a boot CD(DVD-HOM Poids Poids
	Install an operating system from a network-based installation server

8 Click Install an operating system later option and click Next. The Completing the New Virtual Machine Window area appears.

Note: If you want to install an operating system from a boot CD/DVD-ROM or a boot floppy disk or a network-based installation server, click the relevant option.

lefore You Begin ipecify Name and Location losion Memory	You have successfully completed the New Virtual Machine Wizard. You are about to create the Following virtual machine. Description:
Configure Networking Connect Virtual Hard Disk Installation Options	Name: HistoriumM Memory: 2048 MB Network: Domain - Virtual Network Herd Gola: G-VietooriumMinketooriuMi.vhd
lanan.ary	Operating System: Will be installed at a later time
	To create the virtual machine and close the vicand, click Finish.

9 Click **Finish**. The virtual machine is created with the details you have provided. As we have started this process from the Failover Cluster Manager, after completing the process of creating a virtual machine, the **High Availability Wizard** window appears.

ligh Availability Summo	22/00/224		
rógue High Nebility	High availability was successfully	configured for the service or application	n
nenaty	Virtual Machin	e	
	Name -	Result	Description
	HistorianVM	<u>1</u>	Warning
	To view the report created by the wicard, To close this wizard, click Finish	click View Report.	View Report
			Finish

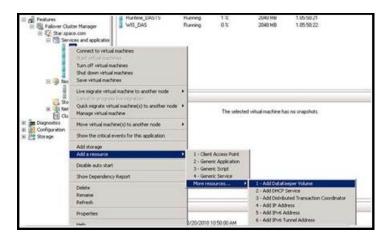
10 Click **View Report** to view the report or click **Finish** to close the **High Availability Wizard** window.

Adding the Dependency between the Virtual Machine and the DataKeeper volume in the Cluster

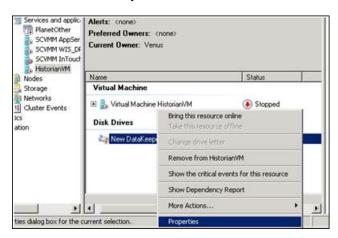
After creating the virtual machine, you need to add the dependency between the virtual machine and the datakeeper volume in the cluster. This dependency triggers the switching of the source and target servers of the SteelEye DataKeeper Volume resource when failover of the virtual machines occurs in the Failover Cluster Manager.

To add the dependency between the virtual machine and the datakeeper volume in the cluster

1 On the Server Manager window, right-click the virtual machine, that you have created and then point to Add a resource, More Resources and then click Add DataKeeper Volumes. The Add a resource menu appears.



2 The New DataKeeper Volume is added under Disk Drives.



3 Right-click **New DataKeeper Volume**, and then click **Properties**. The **New DataKeeper Volume Properties** window appears.

New DataKeeper Volume Properties	×
General Dependencies Policies Shadow Copies DataKeeper	Advanced Policies
DataGeeper volume not yet assigned. Please assign a DataGeeper Volume for this resource before proceeding. DataGeeper Volume Parameters - Volume Total Size Source System:	Retroch
СК	Cancel

4 Select the volume for creating a disk monitoring job and click **OK**. The **Selection Confirmation** window appears.

DataKeep	per Volume Propert	MK.		
Data	Dependencie dow Copies aKeeper volume not ye gn a DataKeeper Volu sre proceeding.	Dal	Sale -	Advanced Policies zne Parameters Refresh
	Volume Para Volume: G Confirmation You have chosen to		2 Keeper Volus	-
	resource named Nev Please confirm this d must be removed an association.	hoice. Once co	n/imed, this	
			OK	Cancel
		0K.	c	ancel Ecoly

5 Click OK to validate the details that you have entered. The Server Manager window appears.

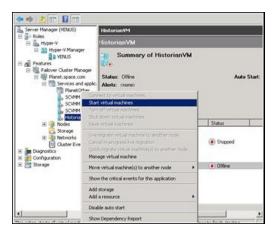
Server Manager (CARGCORM)	Historian		
E all Features E Statuer Outer Manager E Statues con	Historian		Recent Chalm Events
III To Service and application Appendixed Johnson Appendixed Resource Resource Missions Without HerClevet Introducts Withouth Service			Auto Start: Yes
III III Tables	Name	Satur	
Instantis Custor Events Diagnostics Configuration	Vistual Machine III 🚉 Visual Machine Historian Visual Machine Configuration	Stopped	
16 🔄 Storage	Disk Drives	Take this resource offline	100
	H & Historian Volume	Show the collical events for this resource	
		Show Dependency Report	
		More Actions +	
		Delete	
		Properties	
		Help	

Note: To modify the selection, click **Cancel** and modify the detail as required in the **New DataKeeper Volume Properties** window, and then click **Apply**.

6 Under Virtual Machine, right-click the name of the virtual machine that you have created. Right-click Virtual Machine Configuration and click Properties. The Virtual Machine Configuration Historian Properties window appears.

	AND/OR	Resource
		Historian Volume
•	Click here to a	fistorian Volume
		Insent Delete
1. Control	nian Volume	Inset Delete

7 Click the **Dependencies** tab. From **Resource** list, select the name of the DataKeeper Volume resource that you have created and then click **OK**.



8 On the Server Manager window, right-click the name of the virtual machine that you have created and then click Start virtual machines to start the virtual machine.

Note: You can use the above procedure to create multiple virtual machines with appropriate names and configuration.

Expected Recovery Time Objective and Recovery Point Objective

This section provides the indicative Recovery Time Objectives (RTO) and Recovery Point Objectives (RPO) for the load of IO and Attributes historized as shown in Configuring System Platform Products in a Typical Medium Scale Virtualization in Chapter 3 and with the configuration of Host Virtualization Servers and Hyper-V virtual machines explained in the setting up Medium Scale Virtualization Environment. For more information refer to, "Setting Up the Virtualization Environment" on page 380. In addition to these factors, the exact RTO and RPO depend on factors like storage I/O performance, CPU utilization, memory usage, and network usage at the time of failover/migration activity.

RTO and RPO Observations - HADR Medium Configuration

Scenarios and observations in this section:

Scenario	Observation
HA-Scenario: Virtualization Server hardware fails	"HA-Scenario: Virtualization Server hardware fails" on page 422
DR-Scenario: Network fails on Virtualization Server	"DR-Scenario: Network fails on Virtualization Server" on page 424

The following tables display RTO and RPO Observations with approximately 50000 IO points with approximately 20000 attributes being historized:

HA-Scenario: Virtualization Server hardware fails

The failover occurs due to hardware failure, and it is simulated with power-off on the host server.

Products	RTO		RPO
		Tags	Data Loss Duration
InTouch	5 min 35 sec + time taken by the user to start the InTouchView	Data Loss for \$Second tag (Imported to Historian)	6 min 47 sec
		taken by the use InTouchView on	the InTouch node and listorian node, which
GR	5 min 13 sec	IAS Tag (Script) 5 min 44 se	
		IAS IO Tag (DASSiDirect)	7 min 28 sec
AppEngine1	6 min 05 sec	IAS Tag (Script)	6 min 35 sec
		IAS IO Tag (DASSiDirect)	7 min 29 sec
AppEngine2	6 Min 12 sec	IAS Tag (Script)	6 Min 41 sec
		IAS IO Tag (DASSiDirect)	7 Min 20 sec

Products	RTO		RPO
		Tags	Data Loss Duration
Historian	6 min 21 sec	SysTimeSec (Historian)	6 Min 33 sec
		\$Second (InTouch)	6 Min 47 sec
		taken by the use InTouchView on	the InTouch node and listorian node, which
		IAS Tag (Script)	5 Min 45 sec
		IAS IO Tag (DASSiDirect)	7 Min 30 sec
DAS SIDirect	4 Min 25 sec	N/A	N/A
Historian Client	3 Min 34 sec + time taken by the user to start the Historian Client	N/A	N/A
Information Server	4 Min 15 sec + time taken by the user to start the Information Server	N/A	N/A

DR-Scenario: Network fails on Virtualization Server

There is a failover due to network disconnect (Public). In this case, the VMs restart after moving to the other host server.

Products	RTO	RPO	
		Tags	Data Loss Duration
InTouch	11 min 4 sec + time taken by the user to start the InTouchView	Data Loss for \$Second tag (Imported to Historian)	15 min 32 sec
		taken by the use InTouchView on	the InTouch node and listorian node, which
GR	12 min 20 sec	IAS Tag (Script)	13 min 11 sec
		IAS IO Tag (DASSiDirect)	13 min 01 sec
AppEngine1	11 min 35 sec	IAS Tag (Script)	12 min 26 sec
		IAS IO Tag (DASSiDirect)	13 min 05 sec
AppEngine2	11 min 48 sec	IAS Tag (Script)	11 min 24 sec
		IAS IO Tag (DASSiDirect)	13 min 19 sec

Products	RTO		RPO
		Tags	Data Loss Duration
Historian	20 min 0 sec	SysTimeSec (Historian)	15 min 16 sec
		\$Second (InTouch)	15 min 32 sec RPO is dependent on the time taken by the user to start the InTouchView on the InTouch node and the RTO of the Historian node, which historizes this tag.
		IAS Tag (Script)	13 min 11 sec
		IAS IO Tag (DASSiDirect)	13 min 01 sec
DAS SIDirect	12 min 25 sec	N/A	N/A
Historian Client	5 min 32 sec + time taken by the user to start the Historian Client	N/A	N/A
Information Server	5 min 38 sec + time taken by the user to start the Information Server	N/A	N/A

Chapter 7

Working with Windows Server 2008 R2 Features

This chapter describes how to use the features of Windows Server 2008 R2 to perform the following functions:

- Using VLAN for Communication Between System Platform Nodes
- Using VLAN for RMC Communication Between Redundant Application Server Nodes
- Accessing a System Platform Node with a Remote Desktop
- Accessing System Platform Applications as Remote Applications
- Displaying the System Platform Nodes on a Multi-Monitor with a Remote Desktop
- Working with Network Load Balancing
- Hardware Licenses in a Virtualized Environment

About Windows Server 2008 R2 Hyper-V Features

A virtualized environment can run multiple virtual machines (VMs) on a single server, thereby reducing the number of physical servers required on the network. Hyper-V provides a virtualized computing environment on Windows Server 2008 R2. Hyper-V is a hardware-assisted virtualization platform that uses partitions to host VMs. One of the benefits that Hyper-V provides is isolation, which ensures that the child VMs execute in their individual partitions and exist on the host as separate machines. This allows multiple operating systems and conflicting applications to run on the same server.

Windows Server 2008 R2 Hyper-V provides support for using Virtual LANs (VLANs) on both parent and child partitions. By configuring VLAN, VMs can communicate over the specified VLAN using Virtual Network switch.

Microsoft introduced RemoteApp with the release of Windows 2008 Terminal Services. In the past, Windows 2008 TS Microsoft Terminal Services solutions only supported the publication of a full desktop using the RDP protocol. In Windows 2008, it was possible to start an application seamlessly from a Terminal Server making it appear as it were running locally on the client machine.

RemoteApp is an application that runs on from a Terminal Server running seamlessly to the client.

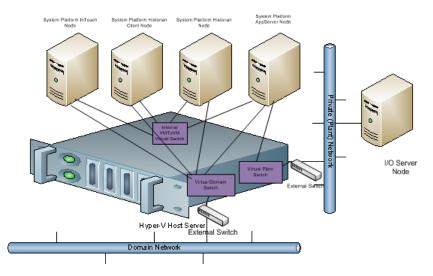
Using VLAN for Communication Between System Platform Nodes

Virtual LANs perform traffic separation within a shared network environment. All released versions of Hyper-V support virtual local area networks (VLANs). Since the VLAN configuration is software-based, you can move a computer and still maintain the network configurations. For each virtual network adapter you connect to a virtual machine, you can configure a VLAN ID for the virtual machine.

You need the following network adapters to configure VLANs:

- A physical network adapter that supports VLANs
- A physical network adapter that supports network packets with VLAN IDs that are already applied

On the management operating system, you need to configure the virtual network to allow network traffic on the physical port. This enables you to use the VLAN IDs internally with the VMs. You can then configure the VM to specify the virtual LAN that the VM will use for all network communications.



Configuring Virtual Network Switches on the Hyper-V Host Server and Adding Virtual Network Adapters on the VM Nodes

You can create virtual networks on a server running Hyper-V to define various networking topologies for VMs and the virtualization server. Following are the three types of virtual networks:

- Private network: Provides communication between VMs
- Internal network: Provides communication between the virtualization server and VMs
- External network: Provides communication between a VM and a physical network by associating to a physical network adapter on the virtualization server

On a Hyper-V host server, you can create the following virtual network adapter switches.

- External Network adapter switch to communicate with the external domain network.
- External Network adapter switch to communicate with the external plant network.
- Internal Network adapter switch to communicate between VM nodes created on Hyper-V host server.

For more information, refer to http://technet.microsoft.com/en-us/library/cc732470(WS.10).aspx

Creating a Virtual Network Switch for Communication Between a VM Node and an External Domain or a Plant Network

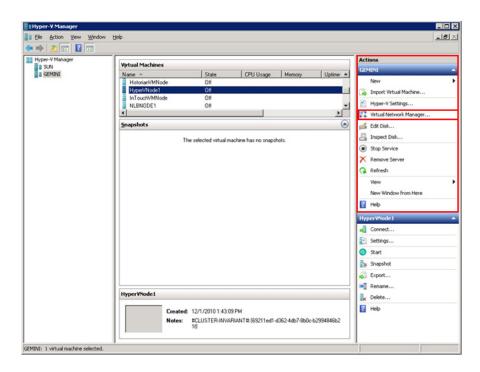
A virtual network switch or a virtual switch is a virtual version of a physical network switch. A virtual network provides access to local or external network resources for one or more VMs. You need to create a virtual network switch to communicate with the external domain or plant network.

Note: A virtual network works like a physical network except that the switch is software based. After an external virtual network is configured, all networking traffic is routed through the virtual switch.

To create a virtual network switch for communication between a VM node and an external domain network or a plant network

1 Open the Hyper-V Manager on a Hyper-V host.

On the **Start** menu, click **Hyper-V Manager**. The **Hyper-V Manager** window appears.



2 Go to the **Virtual Network Manager** window.

On the Actions menu, click Virtual Network Manager. The Virtual Network Manager window appears.

Virtual Network Manager	_ [
 X Virtual Networks Clobal Network Settings Quality Network Settings MAC Addes Range 00-15:50-EB-23:00 to 00-15:50-E 	Create virtual network. What type of virtual network do you want to create? External Drivenal Private
	Add Creates a virtual network that binds to the physical network adapter so that virtual machines can access a physical network. Here about creating virtual networks

- **3** Add a new virtual network.
 - a Under Virtual Networks, click New virtual network.
 - **b** Under Create virtual network, click External.
 - c Click Add. The New Virtual Network section appears.

Virtual Networks	🙏 New Virtual Network —
👯 New virtual network	
📩 ExternalToDomain	Name: ExternalToDomain
Broadcom BCM5709C NetXtr	e
Global Network Settings MAC Address Range	Notes:
MAC Address Range 00-15-5D-EB-23-00 to 00-15-5D-	E
	Connection type
	What do you want to connect this network to?
	Broadcom BCM5709C NetXtreme II GigE (NDIS VBD Client) #3
	Allow management operating system to share this network adapter
	C Internal only
	C Private virtual machine network
	Enable virtual LAN identification for management operating system
	VLAN ID
	The VLAN identifier specifies the virtual LAN that the management operating
	system will use for all network communications through this network adapter. This setting does not affect virtual machine networking.
	secong does not arrect virtual machine networking.
	Remove
	More about managing virtual networks

- 4 Enter the new virtual network details.
- In the **Name** box, enter the Virtual Network name.
- Click the **External** option, and then select the required external domain or plant network that you want to connect to.
- Select the Allow management operating system to share this **network adapter** check box if you want to manage activities on the virtual network switch created.

Note: Do not select this check box if you are creating a virtual network for communication between VM nodes and a plant network.

 Click OK to close the Virtual Network Manager window or click Apply to create the virtual network and continue using Virtual Network Manager.

The external virtual network switch is created and can be used to communicate between the VM nodes and the domain or plant network.

Creating a Virtual Network Switch for Communication Between Internal VM Nodes

To communicate with the other VMs hosted on the Hyper-V host server, you need to create an internal virtual network switch.

To create a virtual network switch for communication between internal VM nodes

1 Open the Hyper-V Manager on a Hyper-V host.

On the **Start** menu, click **Hyper-V Manager**. The **Hyper-V Manager** window appears.

🔿 🙋 🖬 📓 🖬							
Hyper-V Manager	Virtual Machines	Victual Machines					
GEMINI	Name +	State CPU Us	ge Memory	Uptime A	GEMINI		
a sectore	Historian//MNode	0#	go roundy	- Optime -	New		
	Hyper/Node1	Off			🚡 Import Virtual Machine		
	InTouchVMNode	0#					
	NLBNODE1	Off		-	Hyper-V Settings		
	•		5	<u> </u>	📫 Virtual Network Manager		
	Snapshots			۲	💰 Edit Disk		
	The sele	cted virtual machine has no	and the second		📇 Inspect Disk		
			n ngyat hota.		Stop Service		
					X Remove Server		
					Refresh		
					View		
					New Window from Here		
					👔 Help		
					HyperVNode1		
					ornect		
					Settings		
					Start		
					a Snapshot		
					Export		
					T Rename		
	HyperVNode1				-		
	inpervision.				Delete		
	Created: 12/1	/2010 1:43:09 PM			Help		
	Notes: #CU	JSTER-INVARIANT#:(6921		10004040.0			

2 Go to the **Virtual Network Manager** window.

On the Actions menu, click Virtual Network Manager. The Virtual Network Manager window appears.

★ Virtual Networks ★ ExternalToDomain Broadcom BCM5709C NetXtreme II ★ ExternalToPlant Broadcom BCM5709C NetXtreme II ★ Global Network Settings ✓ MAC Address Range 00-15-50-EB-23-00 to 00-15-5D-E ✓ Create virtual network that binds to the physical network adapter so that vir machines can access a physical network. More about creating virtual networks	A <u>d</u> d

- **3** Add a new virtual network.
 - a Under Virtual Networks, click New virtual network.
 - **b** Under Create virtual network, click Internal.
 - c Click Add. The New Virtual Network section appears.

	New Virtual Network
👯 New virtual network	**
🔩 ExternalToDomain	Name: Internal/MToVM
Broadcom BCM5709C NetXtrem	e II
Broadcom BCM5709C NetXtrem	e II Noțes:
🙏 Internal¥MTo¥M	
Internal only	Connection type
Global Network Settings	What do you want to connect this network to?
MAC Address Range 00-15-5D-EB-23-00 to 00-15-5D	D-E C External:
	Broadcom BCM5709C NetXtreme II GigE (NDIS VBD Client)
	Allow management operating system to share this network adapter
	© Internal only
	C Private virtual machine network
	Enable virtual LAN identification for management operating system
	VLAN ID VLAN Identifier specifies the virtual LAN that the management operating system vLAN ID The VLAN identifier specifies the virtual LAN that the management operating system will use for all network communications through this network adapter. This setting does not affect virtual machine networking. 2
	VLAN ID The VLAN identifier specifies the virtual LAN that the management operating system will use for all network communications through this network adapter. This
	VLAN ID The YLAN identifier specifies the virtual LAN that the management operating system will use for all network communications through this network adapter. This setting does not affect virtual machine networking. 2
	VLAN ID The VLAN identifier specifies the virtual LAN that the management operating system will use for all network communications through this network adapter. This setting does not affect virtual machine networking. 2 Remove
	VLAN ID The VLAN identifier specifies the virtual LAN that the management operating system will use for all network communications through this network adapter. This setting does not affect virtual machine networking. 2 Remove
	VLAN ID The VLAN identifier specifies the virtual LAN that the management operating system will use for all network communications through this network adapter. This setting does not affect virtual machine networking. 2 Remove
	VLAN ID The VLAN identifier specifies the virtual LAN that the management operating system will use for all network communications through this network adapter. This setting does not affect virtual machine networking. 2 Remove
	VLAN ID The VLAN identifier specifies the virtual LAN that the management operating system will use for all network communications through this network adapter. This setting does not affect virtual machine networking. 2 Remove

- **4** Enter the new virtual network details.
 - a In the Name box, enter the Virtual Network name.
 - **b** Click the **Internal only** option.
 - **c** Click **OK** to close the **Virtual Network Manager** window or click **Apply** to create the virtual network and continue using Virtual Network Manager.

The internal virtual network switch is created and will be used to communicate between the VM nodes on the host server.

Adding an Internal Virtual Network Adapter to a VM Node for Communication Between VM Nodes

You can configure one or more virtual network adapters for a VM by creating or modifying the hardware profile of a VM.

If you connect a virtual network adapter configured for a VM to an internal network, you can connect to the VMs deployed on the same host and communicate over that internal network.

To add an internal virtual network adapter to a VM node for communication between VM nodes

1 Open the Hyper-V Manager on a Hyper-V host.

On the **Start** menu, click **Hyper-V Manager**. The **Hyper-V Manager** window appears.

2 🖬 🛛 🖬				
Manager				Actions
	Virtual Machines	1		GEMINI
INI	Name ^	State CPU Usage	Memory Uptime A	New
	Histonar/VMNode Hyper/VNode1	Off		
	InTouchVMNode	Off		Import Virtual Machine
	NLBNODE1	Oli	-1	Hyper-V Settings
	•))	Virtual Network Manager
	Snapshots		۲	💰 Edit Disk
				A Inspect Disk
	The se	elected virtual machine has no snag	shots.	Stop Service
				- · ·
				X Remove Server
				🔾 Refresh
				View
				New Window from Here
				👔 Help
				HyperVNode1
				ornect
				Settings
				Start
				a Snapshot
				S Export
	L			Rename
	HyperVNode1			Delete
				Help
		2/1/2010 1:43:09 PM		
	Notes: #0 10	CLUSTER-INVARIANT#:(69211ed)	-d362-4db7-8b0c-b2994846b2	1

2 Shut down the VM node to which you want to add the network adapter.

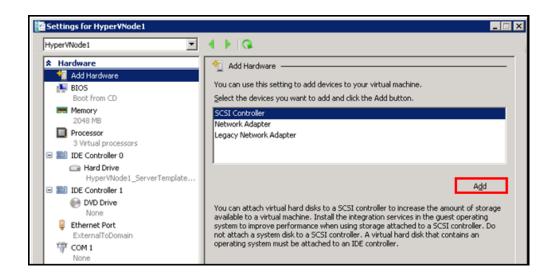
Hyper-V Manager					
File Action View Window	Help				
🗢 🔿 🙎 🖬 📓 🖬					
Hyper-V Manager	Virtual M	lachines			
CAPRICORN	Name ^		State	CPU Usage	Memory
GEMINI	SAppe	Ingine	Running	2%	4096 MB
SUN	SGR	Connect	Running	2%	6144 MB
a VENUS	SHis .	connect	Off		
MERCURY	alnT 📄	Settings	Off		
	Sw1 -	Turn Off	0#		
		Shut Down			
		Save	•		
			-		
		Pause			
		Reset			
	I	Snapshot			
	Snapsh	Rename			
		Help	The selecter	d virtual machine ha	s no snapshots.

Right-click the required VM node. The VM menu appears.

Click Shut Down.

3 Go to the **Settings** window for the required VM node.

Right-click the VM node and click **Settings**. The **Settings** window for the VM node appears.



- **4** Select the hardware settings for the VM node.
 - **a** With Add Hardware selected, click Network Adapter, and then click Add. The Network Adapter area appears.

ły	perVNode1	-	
*	Hardware	-	Network Adapter
	1 Add Hardware		
	N BIOS		Specify the configuration of the network adapter or remove the network adapter.
	Boot from CD		Network:
	2048 MB		Internal/MTo/M
	Processor		MAC Address
	3 Virtual processors		Dynamic
=	IDE Controller 0		C Static
	Hard Drive		
	HyperVNode1_ServerTemp		
=	IDE Controller 1		
	😥 DVD Drive		Enable spoofing of MAC addresses
	None		
	Ethernet Port		Enable virtual LAN identification
	ExternalToDomain	- 11	VLAN ID
	Network Adapter InternalVMToVM		The VLAN identifier specifies the virtual LAN that this virtual machine will use for all network communications through this network adapter.
	COM 1	- 11	
	None		5
	T COM 2		
	None		To remove the network adapter from this virtual machine, click Remove.
	📘 Diskette Drive		Remove
	None		Use a legacy network adapter instead of this network adapter to perform a
*	Management	-11	network-based installation of the guest operating system or when integration
	I Name HyperVNode1		services are not installed in the guest operating system.
	Integration Services		
	All services offered		
	Snapshot File Location		
	K:\HyperVNode1		
	Automatic Start Action		
	None		
	Automatic Stop Action	-	

- **b** In the **Hardware** pane, click the relevant network adapter.
- **c** Select the **Enable Virtual LAN** identification check box.
- **d** In the **VLAN ID** box, enter the **VLAN ID**, and then click **OK** to close the window.

Note: All traffic for the management operating system that goes through the network adapter is tagged with the VLAN ID you enter.

Adding a Virtual Network Adapter to a VM Node for Communication Between a VM Node and a Plant Network

If you connect a virtual network adapter configured for a VM to a physical network adapter on the host on which the VM is deployed, the VM can access the network to which the physical host computer is connected and can function on the host's local area network (LAN) in the same way that physical computers connected to the LAN can function.

To add a virtual network adapter to a VM node for communication between a VM node and a plant network

1 Open the **Hyper-V Manager** on a Hyper-V host.

On the **Start** menu, click **Hyper-V Manager**. The **Hyper-V Manager** window appears.

E Hyper-V Manager						
Ele Action Yew Window	Geb					<u>_18</u> ×
Hyper-V Manager	Virtual Machines					Actions
GEMINE	Name *	State	CPU Usage	Memory	Uptime +	GEMINI A
CLO-UNI	HistorianVMNode	Off	CF0 0sage	Poemory	Opone -	New
	HyperVNode1	0#				A Import Virtual Machine
	InTouch/MNode	Off				
	NLBNODE1	0#			× 1	Hyper-V Settings
					<u> </u>	Virtual Network Manager
	Snapshots				۲	💋 Edit Disk
	The	selected virtual m	achine has no snapsi	hots.		📇 Inspect Disk
						Stop Service
						X Remove Server
						Q Refresh
						View
						New Window from Here
						👔 Help
						Hyper¥Node1
						ornect
						👔 Settings
						Start
						By Snapshot
						S Export
						Rename
	HyperVNode1					Delete
	Notes:	12/1/2010 1:43:0 #CLUSTER-INVA 18}	9 PM RIANT#:(69211ed1-	d362-4db7-8b0c-l	b2994846b2	🕜 Help
EMINE: 1 virtual machine selected.]

2 Shut down the VM node to which you want to add the network adapter.

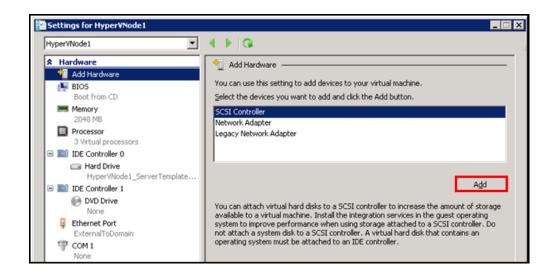
Right-click the required VM node. The VM menu appears.

Hyper-V Manager							
a File Action View Window H	lelp						
(= e) 🖄 🖬 📓 🖬							
Hyper-V Manager	Virtual Machines						
CAPRICORN	Name +		State	CPU Usage	Memory		
a gemini	SAppengine		Running	2%	4096 MB		
I SUN VENUS	SGR SHis	Connect	Running Off	2%	6144 MB		
MERCURY	sinĭ Swi	Settings	Off				
	3 2WI	Turn Off	Un				
		Shut Down Save	•				
	۲ Snapsh	Pause Reset					
		Snapshot					
		Rename					
		Help	The selected	d virtual machine ha	s no snapshots.		

Click Shut Down.

3 Go to the **Settings** window for the required VM node.

Right-click the VM node and click **Settings**. The **Settings** window for the VM node appears.



- **4** Select the hardware settings for the VM node.
 - **a** With Add Hardware selected, click Network Adapter, and then click Add. The Network Adapter area appears.

Settings for Hyper¥Node1	
HyperVNode1	
★ Hardware ▲ ▲ ▲ ▲ ▲ BLOS Boot from CD ■ Processor 3 Virtual processors ■ ■ DE Controller 0 ■ Hard Drive HyperVNode1_ServerTempl ■ DVD Drive None ♥ Ethernet Port ExternalToDomain ♥ Network Adapter	Network Adapter Specify the configuration of the network adapter or remove the network adapter. Network: ExternalToPlant MAC Address © pynamic © static I = 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1
	retwork communications through this network adapter. Z To remove the network adapter from this virtual machine, click Remove. <u>Remove</u> Use a legacy network adapter instead of this network adapter to perform a network-based installation of the guest operating system or when integration services are not installed in the guest operating system.
	QK <u>Cancel</u> Apply

5 In the **Hardware** pane, click the relevant network adapter, and then click **OK** to close the window.

Configuring Network Adapters on the System Platform Virtual Machine (VM) Nodes

By default, one network adapter is added to the VM node when you create the VM nodes on a Hyper-V host server.

Based on the requirements, you can add multiple internal or external network adapters.

For the VM System Platform node to communicate with the external domain or external plant network, it needs to have external network adapter added.

For the VM System Platform node to communicate internally to the other VM System Platform nodes hosted by the Hyper -V server, it needs to have internal network adapter added.

You can create the following VM nodes on the virtualization server for which the VLAN communication needs to be set up:

- InTouch VM node
- Historian VM node
- Application Server VM node
- Historian Client VM node
- Wonderware Information Server VM node

VM nodes on Hyper-V host server have the following network adapters:

- An external network adapter to communicate with the external domain network
- An external network adapter to communicate with the external plant network. This is available if the VM node is acquiring the data from the IOServer connected to the external plant network
- An internal network adapter to communicate internally between the VM nodes configured on Hyper-V host server
- An internal network adapter to communicate between the Application Server nodes to use for Redundancy Message Channel (RMC) communication. Only the Application Server VM nodes configured for Redundant Application Engines have this network adapter.

Each System Platform node can have various combinations of the following network adapters, depending on your configuration:

Note: It is assumed that the host virtualization server is configured with one external virtual network switch to communicate with the domain network, one external virtual network switch to communicate with the plant network, and one internal virtual network switch for the internal VM to VM communication.

Product node	Network adapters
InTouch	 An external network adapter to communicate with the external domain network
	• An external network adapter to communicate with the external plant network (This is to acquire the data from the IOServer which is connected to the plant network.)
	• An internal network adapter to communicate between the other VM nodes configured on a Hyper-V host server (For example, to a Historian VM node)
Historian	• An external network adapter to communicate with the external domain network
	• An external network adapter to communicate with the external plant network (This is to acquire the data from the IOServer which is connected to the plant network.)
	• An internal network adapter to communicate between the other VM nodes configured on a Hyper-V host server (For example, an InTouch VM node.)

Product node	Network adapters
Historian Client	• An external network adapter to communicate with the external domain network
	• An external network adapter to communicate with the external plant network (This is to acquire the data from the IOServer which is connected to the plant network.)
	• An internal network adapter to communicate between the other VM nodes configured on a Hyper-V host server (For example, a Historian VM node.)
Wonderware Information Server (WIS)	• An external network adapter to communicate with the external domain network
	• An internal network adapter to communicate between the other VM nodes configured on a Hyper-V host server (For example, to a Historian Client VM node.)
Wonderware Application Server	• An external network adapter to communicate with the external domain network
	• An external network adapter to communicate with the external plant network (This is to acquire the data from the IOServer which is connected to the plant network.)
	• An internal network adapter to communicate between the other VM nodes configured on a Hyper-V host server (For example, a Historian VM node.)

In the following procedure, the VM nodes are created with the specified OS installed on all the nodes. One physical machine is configured in the workgroup with an IOServer installed and connected to a plant or private network.

To configure virtual network adapters on VM node

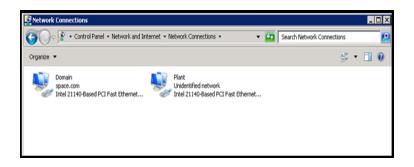
 Add an internal virtual network adapter to the required node, for example, an InTouch node. For more information on adding an internal virtual network adapter, refer to "Adding an Internal Virtual Network Adapter to a VM Node for Communication Between VM Nodes" on page 435.

Note: You must provide the same VLAN ID that you provided for the first VM node you configured.

- 2 Add an external virtual network adapter to the required node, for example an InTouch node. For more information on adding an external virtual network, refer to "Adding a Virtual Network Adapter to a VM Node for Communication Between a VM Node and a Plant Network" on page 438.
- **3** Connect to the required VM node.
- 4 Open the Network Connections window.

In the start menu, click **Control Panel**, **Network and Internet**, **Network and Sharing Center** then **Change Adapter Settings**. The Network Connections area appears.

Note that the network adapters appear in the order they are added to the VM node.



- **5** Configure the required VM node.
 - **a** Right-click the required internal or external network adapter. The **Local Area Connection Properties** window appears.

Local Area Connection Properties	×
Networking	
Connect using:	
Intel(R) 82567LM-3 Gigabit Network Connection	
<u>C</u> onfigure	
This connection uses the following items:	·
✓ QoS Packet Scheduler ✓ Pile and Printer Sharing for Microsoft Networks ✓ Internet Protocol Version 6 (TCP/IPv6) ✓ Internet Protocol Version 4 (TCP/IPv4) ✓ Internet Protocol Version 9 (TCP/IPv4)	
Install Uninstall Properties	
Description Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.	
OK Cancel	

b Select the Internet Protocol Version 4 check box, and then click OK. The Properties window appears for the Internet protocol version you selected.

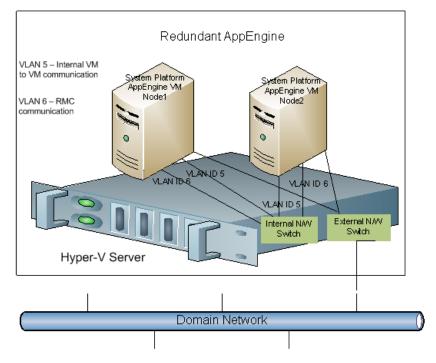
Internet Protocol Version 4 (TCP/IPv4) Properties	? ×
General	
You can get IP settings assigned automatically if your network this capability. Otherwise, you need to ask your network admi for the appropriate IP settings.	
Use the following IP address:	
IP address: 192 . 168 . 0 . 20)2
Subnet mask: 255 . 255 . 255 . 0	
Default gateway:	
C Obtain DNS server address automatically	
Use the following DNS server addresses:	
Preferred DNS server:	
Alternate DNS server:	
Validate settings upon exit	vanced
OK	Cancel

- c Click the Use the following IP address option.
- **d** In the **IP address** box, enter the IP address for the network adapter, and then click **OK**.
 - For the internal network added for communication between VM nodes, enter the required IP address.
 - For external network adapter added for communication between a VM node and an external plant network communication, enter the required static IP address.

Note: Configure the other VM nodes following the same steps.

Using VLAN for RMC Communication Between Redundant Application Server Nodes

For successful communication between a redundant pair of Application Engines, each Application Engine must be assigned to a separate WinPlatform and a valid redundancy message channel (RMC) must be configured for each WinPlatform. You can configure an RMC using a virtual LAN.



Configuring RMC for Redundant AppEngine over a VLAN

For a successful communication between a redundant pair of Application Engines, each Application Engine should configure a valid redundancy message channel (RMC). You can configure the RMC using Virtual LAN (VLAN). For configuring the RMC, Wonderware Application Server VM System Platform node requires the internal network adapters for communication:

- An internal network adapter to communicate between the other VM nodes configured on a Hyper-V host server, for example, a Historian VM node
- An internal network adapter to communicate with the other Wonderware Application Server VM nodes configured as Redundancy Application Engine to use as a RMC

To configure RMC for a Redundant AppEngine node

1 Add an internal virtual network adapter to a Wonderware Application Server node.

For more information on adding an internal virtual network adapter, refer to "Adding an Internal Virtual Network Adapter to a VM Node for Communication Between VM Nodes" on page 435.

Note: In the **Settings** window, enter the same VLAN ID that you entered while configuring the InTouch and Historian Client nodes. This enables the VM nodes to communicate internally over the specified LAN ID.

2 Add an internal virtual network adapter to a Wonderware Application Server node to use as RMC communication.

Note: In the **Settings** window, enter the same VLAN ID you entered on both the Application Server nodes for virtual network adapter. This enables the Application Server VM node to communicate internally over the specified LAN ID as an RMC channel to communicate to another Application Server VM node.

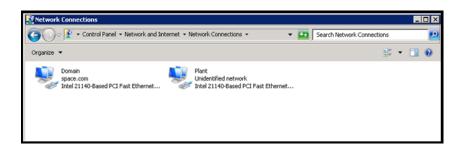
3 Add an external virtual network adapter to a Wonderware Application Server node.

For more information on adding an external virtual network adapter, refer to "Adding a Virtual Network Adapter to a VM Node for Communication Between a VM Node and a Plant Network" on page 438.

4 Connect to the required Wonderware Application Server VM node.

5 Open the Network Connections window.

In the start menu, click **Control Panel**, **Network and Internet**, **Network and Sharing Center** then **Change Adapter Settings**. The **Network Connections** area appears. Note that the network adapters appear in the order they are added to the VM node.



- **6** Configure the node.
 - **a** Right-click the required internal or external network adapter. The **Local Area Connection Properties** window appears.

🖣 Plant Properties	×
Networking Sharing	
Connect using:	
Y Intel 21140-Based PCI Fast Ethernet Adapter (Emulated)	
<u>C</u> onfigure	
This connection uses the following items:	
 Client for Microsoft Networks QoS Packet Scheduler File and Printer Sharing for Microsoft Networks Internet Protocol Version 6 (TCP/IPv6) Internet Protocol Version 4 (TCP/IPv4) Internet Protocol Version 4 (TCP/IPv4) Link-Layer Topology Discovery Mapper I/O Driver Link-Layer Topology Discovery Responder 	
Install Uninstall Properties	
Description Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.	
OK Cancel	

b Select the **Internet Protocol Version 4** check box, and then click **OK**. The **Properties** window appears for the Internet protocol version you selected.

Internet Protocol Version 4 (TCP/IP)	/4) Properties
General	
You can get IP settings assigned auton this capability. Otherwise, you need to for the appropriate IP settings.	ask your network administrator
IP address:	192.168.0.202
Subnet mask:	255.255.255.0
Default gateway:	
O O <u>b</u> tain DNS server address autor	natically
□ ─ • Use the following DNS server add	tresses:
Preferred DNS server:	
<u>A</u> lternate DNS server:	
Validate settings upon exit	Ad <u>v</u> anced
	OK Cancel

- **c** Click the Use the following IP address option.
- **d** Enter the IP address for the network adapter, and then click **OK**.
 - For the internal and external networks added to the Wonderware Application Server node, enter the required IP address in the IP address box.
 - For the internal network adapter added to use as RMC, enter the required static IP address in the **IP address** box and subnet mask in the **Subnet mask** box.

For example:

- 10.0.0.1
- 255.0.0.0
- **7** Follow the same steps to configure another Wonderware Application Server node for Redundant Application Server.

Note: While installing the Wonderware products, select the **Create Local Account** check box and provide the same user name and password to use as network account user.

Accessing a System Platform Node with a Remote Desktop

You can use Hyper-V to access a system platform node through a remote desktop. You can specify the required remote users, who will be able to access the VM running the system platform.

To access a system platform node with a remote desktop

- **1** Log on to the system platform node as a member of the local administrators group.
- **2** Modify the remote settings of the system platform node.
 - a On the Start menu, click Control Panel, System and Security, System then Remote settings. The System Properties window appears.

🗖 Allow Remote Assis	tance connections to this computer	
	Advanca	ed
Remote Desktop		
Click an option, and the	en specify <mark>w</mark> ho can connect, if needed.	
C Don't allow connect	tions to this computer	
Allow connections f Remote Desktop (let	rom computers running any version of ss secure)	
Hemote Desktop (ie		
C Allow connections of	only from computers running Remote ork Level Authentication (more secure)	

b Under **Remote Desktop**, click the relevant option to specify the remote desktop versions you want to allow access to.

- **3** Select users to provide access to the system.
 - a Click Select Users. The Remote Desktop Users window appears.

Remote Desktop Users	? ×
The users listed below can connect to this computer, and any memb the Administrators group can connect even if they are not listed.	ers of
1	
CORP\sunill already has access.	
Add <u>R</u> emove	
To create new user accounts or add users to other groups, go to Co Panel and open <u>User Accounts</u> .	ntrol
OK Can	cel

b Select the users you want to allow access to, click **Add**, and then click **OK** to close the window.

Accessing System Platform Applications as Remote Applications

Remote Desktop Services (RDS) Remote Applications enables you to deploy RemoteApp programs to users. With RemoteApp, the remote session connects with a specific application rather than with the entire desktop. You can access the RemoteApp programs remotely through Remote Desktop Service. A RemoteApp program appears as if it is running on your local computer. Instead of being present on the desktop of the remote terminal server, the RemoteApp program is integrated with the client's desktop, running in its own resizable window with its own entry in the task bar.

Prerequisites for accessing Remote Applications

- A virtual machine node or physical node with Windows Server R2 which has Remote Desktop Session Host server installed
- Remote Applications, part of the Windows Server 2008 Terminal Services role that are available on Windows Server 2008 Standard and Enterprise Editions
- VM nodes (Remote Desktop Session Host server) running IOM Products, such as InTouch and Historian Client need to be on Windows Server 2008 R2 where Remote Desktop Services are available
- Client node with a browser (any operating system)

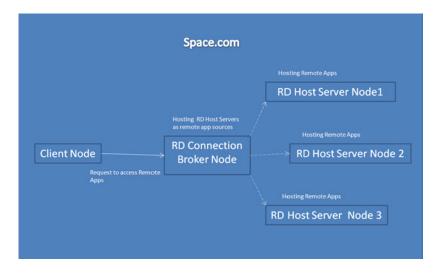
Note: To access RemoteApp programs through Remote Desktop-Web Access, the client computer must be running RDC 6.1. RDC 6.1 is included with Windows Server 2008 operating systems, Windows Vista SP1 or later, and Windows XP SP 3.Use **About** dialog box to verify which version of RDC your system has.

• The client node and the Remote Desktop Session Host server should be able to communicate.

The following figure illustrates how RemoteApps configured at Remote Desktop Host Server node can be accessed:

	Space.com	n
Client Node –	Request to access Remote Apps	Hosting Remote Apps

The following figure illustrates how RemoteApps configured at multiple Remote Desktop Host Server nodes through Remote Desktop Connection Broker server can be accessed:



You need to perform the following procedures to deploy remote application programs through a remote desktop Web access:

- Install and configure the Remote Desktop Web access role service at an Remote Desktop Session Host server node installed with Window 2008 R2.
- Configure remote applications at a server node.
- Access the remote applications from a client node.

Installing and Configuring the Remote Desktop Web Access Role Service at a Remote Desktop Session Host Server Node

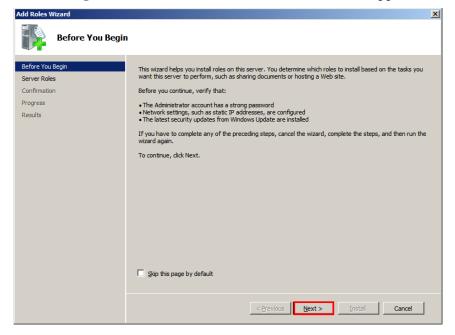
Remote Desktop Web Access service and Remote Desktop Host service (Remote Application) allow you to deploy a single Web site to run programs, access the full remote desktop, or connect remotely to the desktop of any computer in the internal network where you have the required permissions.

To install and configure the Remote Desktop web access role service at an Remote Desktop Session Host server node

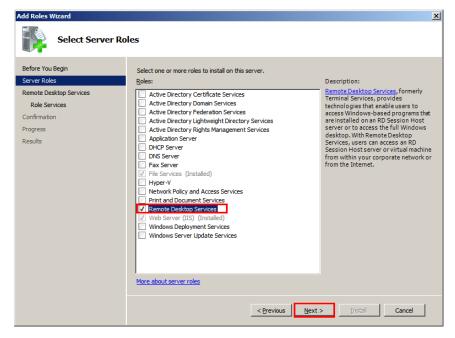
- **1** Log on to the Remote Desktop Session Host server node with local administrator privileges.
- **2** Open the **Server Manager** window.
 - a Click Start, and then click Run.
 - **b** Enter ServerManager.msc, and then click OK. The Server Manager window appears.

ile <u>A</u> ction <u>V</u> iew <u>H</u>	łp		
Þ 🔿 🖄 📶 👔			
Server Manager (HYDI B 💫 Roles	Roles		
 Image: Provide the services Image: Image: Ima	View the health of the roles inst	alled on your server and add or remove roles and features	
 Configuration Task Schedule 	Roles Summary		Roles Summary Help
Windows Firev Services MMI Control			Add Roles
 	File Services Web Server (IIS)		
🗄 📑 Storage	 File Services 		File Services Help
	Provides technologies that help you mana computers	ge storage, enable file replication, manage shared folders,	ensure fast file searching, and enable access for UNIX dient
	Role Status		Go to File Services
	Messages: None		
	System Services: All Running		
	Events: None in the last 24 hours	a	
	Role Services: 1 installed		Add Role Services
	Role Service	Status	Remove Role Services
	👆 File Server	Installed	
	Distributed File System	Not installed	
	DFS Namespaces	Not installed	
	DFS Replication	Not installed	
	File Server Resource Manager	Not installed	
	Services for Network File System	Not installed	
	Services for Network File System		
	Windows Search Service	Not installed	

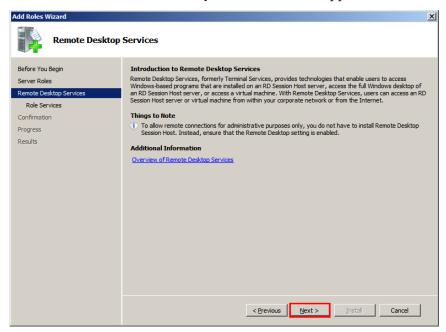
- **3** Add roles and the required role services.
 - a In the Roles Summary section, click Add Roles. The Before You Begin screen in the Add Roles Wizard window appears.



b Click Next. The Select Server Roles screen appears.



c Select the **Remote Desktop Services** check box, and then click **Next**. The **Remote Desktop Services** screen appears.





Add Roles Wizard		×
Select Role Serv	ices	
Before You Begin Server Roles Remote Desktop Services Role Services Application Compatbility Authentication Method Licensing Mode User Groups Client Experience Web Server (IIS) Role Services Confirmation Progress Results	Select the role services to install for Remote Desktop Services: Remote Desktop Session Host Remote Desktop Vitualization Host Remote Desktop Connection Broker Remote Desktop Setway Remote Desktop Vitualization Host Remote Desktop Setway Remote Desktop Vieb Access	Description: Remote Desktop Web Access (RD) Web Access, enables users to access RemoteApp and Desktop Connection through a Web browser. RemoteApp and Desktop Connection provides a customized view of RemoteApp programs and virtual desktops to users.

e Select the Remote Desktop Session Host and Remote Desktop Web Access check boxes. The Add Roles Wizard window appears.

Note: These are the role services that are being installed in this procedure. You can select other role services, as required.

Add Roles	Wizard Add role services required for Remote I You cannot install Remote Desktop Web Access unless the r	
	Role Services:	Description:
	 Web Server (IIS) Web Server Common HTTP Features Health and Diagnostics Performance Security Application Development 	Web Server (IIS) provides a reliable, manageable, and scalable Web application infrastructure.
		Add Required Role Services Cancel
(i) Why	are these role services required?	li

- **f** Click **Add Required Role Services**. Any missing required role services or features for Remote Desktop Web Access role service is added.
- **4** Specify the authentication method for the remote desktop session host.
 - a Click Next. The Specify Authentication Method for Remote Desktop Session Host screen appears.

Add Roles Wizard		×	
Specify Authentication Method for Remote Desktop Session Host			
Before You Begin Server Roles Remote Desktop Services Role Services Application Compatibility Authentication Method Licensing Mode User Groups Client Experience Web Server (IIS) Role Services Confirmation Progress Results	Network Level Authentication is a new authentication method that enhances security by providing user authentication, user authentication occurs before a full Remote Desktop connection to the RD session Host server. With Network Level Authentication, user authentication is required. * Require Network Level Authentication is required. * Require Network Level Authentication of Windows and a version of the Remote Desktop connection to the server. If you are remotely connected to this server, ensure that your computer subports Network Level Authentication to the server. If you are remotely connected to this server, ensure that your computer subports Network Level Authentication to the server. * Do not require Network Level Authentication C Do not require Network Level Authentication C Do not require Network Level Authentication W This option is less secure than when Network Level Authentication is used because user authentication o couns later in the connection process. (1) This setting is controlled by Group Policy. More about Network Level Authentication and supported clients		

b Click an option to specify the required authentication method, and then click **Next**. The **Specify Licensing Mode** screen appears.

Note: Click the **Require Network Level Authentication** option for a secure authentication method.

Add Roles Wizard		×
Specify Licensing	j Mode	
Before You Begin Server Roles Romote Desktop Services Role Services Application Compatbility Authentication Method Liser Groups Client Experience Confirmation Progress Results	The Remote Desktop licensing mode determines the type of Remote Desktop Services client access licenses (RDS CALs) that a license server will issue to clients that connect to this RD Session Host server. Specify the Remote Desktop licensing mode that you want this RD Session Host server to use. © Configure later Remind me to use the Remote Desktop Session Host Configuration tool or Group Policy to configure the licensing mode within the next 120 days. © Per Device An RDS Per Device CAL must be available for each device that connects to this RD Session Host server. @ Per User An RDS Per Device CAL must be available for each user that connects to this RD Session Host server. @ Per User An RDS Per User CAL must be available for each user that connects to this RD Session Host server. @ The Licensing mode that you specify must match the RDS CALs that are available from your Remote Desktop license server. @ More about the Remote Desktop licensing mode Qrevious	

c Click an option to specify the required licensing mode, and then click **Next**. The **Select User Groups Allowed Access To This RD Session Host Server** screen appears.

Add Roles Wizard	2	1	
Select User Groups Allowed Access To This RD Session Host Server			
Before You Begin Server Roles Remote Desktop Services Role Services	Add the users or user groups that can connect to this RD Session Host server. These users and user groups will be added to the local Remote Desktop Users group. The Administrators group is added by default and cannot be removed. Users or User Groups:		
Application Compatibility Authentication Method Licensing Mode User Groups Client Experience	Administrators Add Remove		
Confirmation Progress Results			
	More about the Remote Desktop Users group < Previous Next > Install Cancel		
	<pre></pre>		

- **5** Select the required user group.
 - **a** Click **Add**. The **Select Users, Computers, or Groups** window appears.

Select Users, Computers, or Groups	<u>? ×</u>
Select this object type:	
Users or Groups	Object Types
From this location:	
	Locations
Enter the object names to select (<u>examples</u>):	
	<u>C</u> heck Names
	_
Advanced OK	Cancel

- **b** Select a user or user group you want to allow access to the Remote Desktop Session Host server, and then click **OK** to close the window.
- **c** On the Select User Groups Allowed Access To This RD Session Host Server screen, click Next. The Configure Client Experience screen appears.

Add Roles Wizard		×
Configure Client	Experience	
Before You Begin Server Roles Remote Desktop Services	You can configure the RD Session Host server so that users connecting to a remote desktop session can use functionality similar to that provided by Windows 7. Providing this functionality requires additional system and bandwidth resources and may affect the	
Role Services Application Compatibility Authentication Method Licensing Mode	scalability of the RD Session Host server. Select the functionality that you want to provide. Additional functionality can be configured by using the Remote Desktop Session Host Configuration tool.	
User Groups Client Experience	Selecting audio and video playback or desktop composition will install the <u>Desktop Experience</u> <u>feature</u> on the RD Session Host server.	
Web Server (IIS) Role Services Confirmation	<u>A</u> udio and video playback Audio recording redirection	
Progress Results	<u>D</u> esktop composition (provides the user interface elements of Windows Aero)	
	If a selection is dimmed, a Group Policy setting is currently being applied to the computer that prevents that functionality from being configured. For more information, see Group Policy Settings and Configuring the Client Experience.	
	More about configuring the client experience	
	< <u>Previous</u> <u>Next</u> <u>Install</u> <u>Cancel</u>	

- **6** Go to the **Confirm Installation Selections** screen and install the Remote Desktop Web Access role service.
 - a On the Configure Client Experience screen, click Next. The Web Server (IIS) screen appears.

Add Roles Wizard	<u>×</u>
Web Server (IIS)	
Before You Begin Servier Roles Remote Desktop Services Role Services Application Compatibility Authentication Method Licensing Mode User Groups Client Experience Web Server (115) Role Services Confirmation Progress Results	Introduction to Web Server (IIS) Web servers are computers that have specific software that allows them to accept requests from client computers and return responses to those requests. Web servers let you share information over the Internet, or through intranets and extranets. The Web Server role includes Internet Information Services (IIS) 7.0, a unified Web platform that integrates IIS 7.0, ASP.NET, and Windows Communication Foundation. IIS 7.0 also features enhanced security, simplified diagnostics, and delegated administration. Things to Note
	< Previous [nstal] Cancel

b Click **Next**. The **Select Role Services** screen appears.

Add Roles Wizard Select Role Servi	ces	X
Before You Begin Server Roles Remote Desktop Services Role Services Application Compatbility Authentication Method Licensing Mode User Groups Client Experience Web Server (IIS) Role Services Confirmation Progress Results	Select the role services to install for Web Server (IIS): Bole services: Web Server (Installed) Static Content Static Content Orectory Browsing HTTP Errors HTTP Frors HTTP Frors HTTP Redirection WebDAV Publishing Boplication Development (Installed) AsP GGI SAPI Extensionis SAPI Filters Server Side Includes Health and Diagnostics Health and Diagnostics Merre about role services Morre about role services	

c Click **Next**. The **Confirm Installation Selections** screen appears.

Add Roles Wizard		X
Confirm Installat	ion Selections	
Before You Begin Server Roles Remote Desktop Services Role Services Application Compatibility Authentication Method Licensing Mode User Groups Client Experience Web Server (IIS) Role Services Confirmation Progress Results	To install the following roles, role services, or features, dick Install.	
	< <u>Previous</u> <u>Next</u> > <u>Install</u> Cancel]

d Review the details you selected, and then click **Install**.

You will be prompted to restart your computer once the installation is complete. After the machine restarts, close the **Installation Results** screen.

Configuring Remote Applications at Remote Desktop Session Host Server Node

After the Remote Desktop Web Access role is installed and configured, you can configure the remote applications at Remote Desktop Session Host server node.

- **1** Open the **Server Manager** window.
 - a Click Start, and then click Run.
 - **b** Enter "ServerManager.msc", and then click **OK**. The **Server Manager** window appears.
- **2** Add the required remote programs.
 - a Expand Roles, click Remote Desktop Services, and then click RemoteApp Manager.
 - **b** In the Actions pane, click Add RemoteApp Programs. The RemoteApp Wizard window appears.

RemoteApp Wizard	X
	Welcome to the RemoteApp Wizard
	This wizard helps you add programs to the RemoteApp Programs list on this RD Session Host server. After programs are on the list, you can display them in RD Web Access, or package them for distribution.
	Before you run this wizard, ensure that: - You are logged on as the administrator for the server that will host the RemoteApp programs. - The host server is running at least Windows Server 2008.
	To continue, click Next.
	< Back Next > Cancel

c Click Next. The Choose Programs to add to the RemoteApp Programs List screen appears.

Name		 	1.0
aaConfig SQ	L		
	ger Manager		
Alarm DB Pur	ge-Archive		
Alarm DB Re:	store		
🗹 🌒 Alarm Hot Ba	ckup Manager		
🗹 🧲 Alarm Printer			
🗹 🚯 AlarmSuite H	istory Migration		
🗆 🔀 ArchestrA ID	E		
	ense Manager		
Calculator			
Change Netv			
Configurator			
Connect to a			
Data Profile	viewer		

d Select the programs you want to add to the RemoteApps list, and then click **Next**. The **Review Setting** screen appears.

noteApp Wizard	
Review Settings Review the settings that you have chosen. You can go ba settings or click Finish to complete this wizard.	ick to change these
Adding 9 programs	
Program list:	
Alarm DB Logger Manager Path: %SYSTEMDRIVE%\Program Files (x86)\Won RemoteApp program is available through RD Web A Allow command-line arguments: No	
Alarm DB Purge-Archive Path: %SYSTEMDRIVE%\Program Files (x86)\Wonv RemoteApp program is available through RD Web A Allow command-line arguments: No	
Alarm DB Restore Path: %SYSTEMDRIVE%\Program Files (x86)\Won RemoteApp program is available through RD Web A Allow command-line arguments: No	
Alarm Hot Backup Manager	-
•	J F
	•
< Back	Finish Cancel

3 Review your selections, then click **Finish** to close the window.

Allowing Application Access to Specific Users

After the remote applications are configured, you can define users or user groups who can access the applications at the client node, if required.

To allow application access to specific users

1 Configure remote applications.

For more information on configuring remote applications, refer to "Configuring Remote Applications at Remote Desktop Session Host Server Node" on page 462.

fanager (HISTORIANIVODE)	RemoteApp Manager (Histor	RemoteApp Manager (HistorianNode.space.com)			
s Hermonic Dealstop Services Dealstop Services Dealstop Services Distance Manager RO-Gateway Manager RO-Gateway Manager Bo-Gateway Manager Bo-Gateway Manager Bo-Gateway Manager Ro-Gateway Manager	RemoteApp Manag	rams are programs that are accessed through	Remote Desktop, and appear as if they are curving on th de to users, you must add it to the RemoteApp Programs	e dend s local	
Rest Bankets Callong Sarvinss Manager Rest Bankets Callong Sarvinss Rest Sarvinss Manager	 (i) Clients will connect to: ✓ Users can easy start list connection. Ørecomen RB Gateway Settings Dr. (ii) Clients will use RD Gas Group Policy. Digital Signature Settings No signal conflictus in support security.) RDP Settings Change 	Hot Server Setting: Change Distriction with ND With Access Image: Setting Change will convert to Mitroutobics upseudom model sets, decommended The TSW Mode Access Image: Setting Change will convert to Mitroutobics upseudom model sets, decommended Mitroutobics upseudom model sets, decommended Image: Setting Change will convert to Mitroutobics upseudom model sets, decommended Mitroutobics upseudom model sets, decommended Image: Setting Change will convert to Mitroutobics upseudom model sets of Changes Mitroutobics upseudom model sets of Changes Image: Setting Change Mitroutobics upseudom model sets of Changes Image: Setting Change Mitroutobics upseudom model sets of Changes Image: Setting Change Mitroutobics upseudom model sets of Changes will convert with under with BCP with upseudom model sets of Changes Image: Setting Change Mitroutobics upseudom model sets of Changes Image: Setting Changes will convert with updates model sets of Changes Image: Setting Changes Image: Setting Changes Image: Setting Changes will convert with updates model sets of Changes Image: Setting Changes Image: Setting Changes Image: Setting Changes		ry, Hennoteligo Settinga Iga Esport Asenoteligo Settinga Is notek Is notekilibi in RD Is Marko	
	Nane	Perh 80	Yeek Adic. Arguments		

2 Select the required remote application.

In the **Server Manager** window, select the required remote application, and then click **Properties** in the **Action** pane. The **RemoteApp Properties** window appears.

	eApp Properties	?
Properties	s User Assignment	
program.	specify which domain users and domain groups can see the icon for this . To specify domain users and domain groups, the RD Session Host serv an Active Directory domain.	
Ĵ	To run the RemoteApp program, a user must be a member of the P Desktop Users group on the RD Session Host server.	Remote
Select wh	hich users and groups will be able to see the icon for this RemoteApp pr	rogram:
C All a	authenticated domain users	
@ Spe	ecified domain users and domain groups	
Domain u	user and domain group names:	
	CE\SivaN	_
DPAC	re (bivaiv	
Ac	dd Remove	

- **3** Add users.
 - **a** Click the **User Assignment** tab.
 - **b** Click the **Specified domain users** and **domain groups** option.
 - **c** Click **Add**. The **Select Users, Computers, or Groups** window appears.

Select Users, Computers, or Groups	? ×
Select this object type:	
Users or Groups	Object Types
From this location:	
	Locations
Enter the object names to select (examples):	
	<u>C</u> heck Names
Advanced OK	Cancel

d Select the names of the users or user groups you want to provide access to the application, and then click **OK** to close the window. On the **RemoteApp Properties** window, the user names appear in the **Domain user** and **domain group** names box. Click **OK** to close the window.

The added users or user groups can now access the application at the client node.

Accessing the Remote Applications from a Client Node

At the client node, you can access the configured remote applications in the following ways:

- Access a program on a Web site using Remote Desktop Web Access
- Access a program on a Web site using Remote Desktop Web Access with Remote Desktop Connection Broker

Accessing a Program on a Web Site Using Remote Desktop Web Access

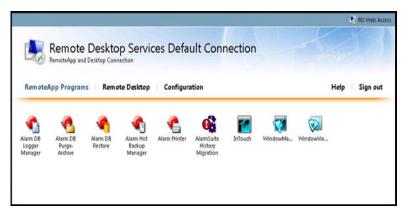
To access a program using Remote Desktop Web Access

1 Connect to the Remote Desktop Web Access Web site.

At the client node, open **Internet Explorer** and connect to the Remote Desktop Web Access Web site using the following URL: https://<Remote Desktop Session Host Server_IP>/rdweb. The **Remote Desktop Services Default Connection** screen appears.



2 Log on with a domain account of the Remote Desktop Session Host server's administrators group. Enter the relevant details in the Domain/user name and Password boxes, and then click Sign in. All applications configured at Remote Desktop Session Host server are displayed.



3 Click an icon to access the required application.

Note: Any application launched from Remote Desktop Connection Broker appears as it were running on your local computer.

Accessing a Program using Remote Desktop Web Access with Remote Desktop Connection Broker

You can also access the configured remote applications from a client through another Remote Desktop Connection Broker Server node.

Remote Desktop Connection Broker (RD Connection Broker), earlier known as Terminal Services Session Broker (TS Session Broker), provides access to remote applications and desktop connections. Accessing the remote applications and a desktop connection you can get a single, personalized, and aggregated view of RemoteApp programs, session-based desktops, and virtual desktops. Remote Desktop Connection Broker also supports load balancing and reconnection to existing sessions on virtual desktops, Remote Desktop sessions, and RemoteApp programs and aggregates RemoteApp sources from multiple Remote Desktop Session host (RD Session Host) servers that host different RemoteApp programs.

Remote Desktop Connection Broker extends the TS Session Broker capabilities included in Windows Server 2008 by creating a unified administrative experience for traditional session-based remote desktops and VM-based remote desktops. A VM-based remote desktop can be either a personal virtual desktop or part of a virtual desktop pool. In case of a personal virtual desktop, there is a one-to-one mapping of VMs. You are assigned a personal virtual desktop that can be personalized and customized. These changes are available to you each time you log on to your personal virtual desktop. For a virtual desktop pool, a single image is replicated across many VMs.Virtual desktop pool is to provide users with a virtual desktop that is dynamically assigned from a pool of identically configured virtual machines. As you connect to the shared virtual desktop pool, you are dynamically assigned a virtual desktop. You may not be assigned the same virtual desktop when you connect the next time. This means that any personalization and customization made by you are not saved. If you use a virtual desktop pool and want to save any customization, you can use roaming profiles and folder redirection.

Note: The improvements to the Remote Desktop Connection Broker role service are particularly useful while implementing a Virtual Desktop Infrastructure (VDI) or deploying session-based desktops or RemoteApp programs. These improvements further enhance the Remote Desktop Services.

Add a Remote Desktop Session Host Server in RemoteApp Sources of Remote Desktop Connection Broker Server

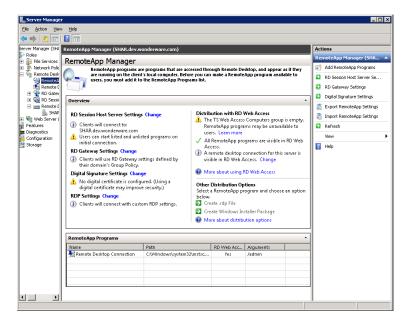
You must add the Remote Desktop Connection Broker role service on a computer running Windows Server 2008 R2, and then use Remote Desktop Connection Manager to identify the RemoteApp programs and virtual desktops that are available through RemoteApp and Desktop Connection.

You need to prepare another node where Remote Desktop role service is installed and Remote Desktop Connection Broker service is enabled. For more information, refer to "Installing and Configuring the Remote Desktop Web Access Role Service at a Remote Desktop Session Host Server Node" on page 453

To add Remote Desktop Session Host server in RemoteApp sources of Remote Desktop connection broker server

1 Open the **Server Manager** window.

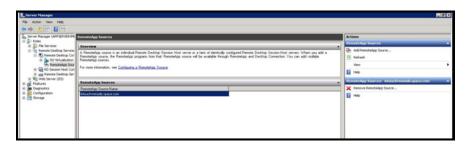
Click the **Server Manager** icon on the task bar of the Remote Desktop Session Host server. The **Server Manager** window appears.



- **2** Go to the **Add RemoteApp Source** window.
 - a Expand Roles, and then click Remote Desktop Services, Remote Desktop Connection Manager, then RemoteApp Sources.
 - **b** In the Actions pane, click Add RemoteApp Source. The Add RemoteApp Source window appears.

3 Add the Remote Desktop Session Host server name.

In the **RemoteApp Source Name** box, enter the Remote Desktop Session Host Server name and click **Add**. The server name is added under **RemoteApp Sources**.



- **4** Add the Remote Desktop Connection Broker Server name in the TS Web Access Computers security group.
 - a On the Remote Desktop Session Host server, click Start, point to Administrative Tools, and then click Computer
 Management. The Computer Management window appears.

Computer Management (Local) Name	Description	Actions	
1 System Tools		Groups	-
Band Flokes Collection Collection	Service DCOM Access Members of this grap are advent t beh-Coprotors Members are advent to laword, acti dCOM Users Members or advent to laword, acti Gards Members of this grap, can advent Gards have the same access as nen origination Operators Members n this grap, can have som origination Operators Members of this grap, and have som ce forbut Users Members of this grap, and access p the source of the same access of the source of	Process Proce Actions	

- **b** Expand Local Users and Groups, and then click Groups.
- **c** Double-click **TS Web Access Computers**. The **TS Web Access Computers Properties** window appears.

TS Web Access Cor	mputers Properties	? ×
General		
TS Wel	b Access Computers	
Description:	Members of this group can query the list of R programs on this computer, including those a	
Members:		
Add	Remove Changes to a user's group m are not effective until the new user logs on.	
	OK Cancel Apply	Help

d Click **Add**. The **Select Users, Computers, or Groups** window appears.

Select Users, Computers, Service Accounts, or Groups	? ×
Select this object type:	
Users, Service Accounts, or Groups	Object Types
From this location:	
	Locations
Enter the object names to select (<u>examples)</u> :	
	Check Names
Advanced OK	Cancel

e Click Object Types. The Object Types window appears.

Note: Enable Network Discovery on the NLB Cluster nodes and RD Connection Broker node so that nodes can able to see each other and other network computers and devices and allows people on other network computers to see your computer.

Object Types	? ×
Select the types of objects you want to find.	
Object types:	
Service Accounts	
🗖 🗖 🍇 Groups	
🗖 🕹 Users	
,	OK Cancel

- **f** Select the **Computers** check box, and then click **OK** to close the window. The **Select Users, Computers, or Groups** window appears.
- **g** In the **Enter the object names to select** box, enter the computer account of the **Remote Desktop Web Access server**, and then click **OK**.
- **h** Click **OK** to close the **TS Web Access Computers Properties** dialog box.
- **5** Add the client node name in TS Web Access Computers security group on the Remote Desktop Connection Broker Server name.

Follow steps **a** to **h** of point 4 to add the client name.

To access RemoteApps configured at a Remote Desktop Session Host server from a client node

1 Connect to the Remote Desktop Web Access Web site.

At the client node, open Internet Explorer and connect to https://<Remote Desktop Session Host Server_IP>/rdweb.

- **2** Open the Enterprise Remote Access window.
 - **a** Click **Start**, and then click **Control Panel**. The **Control Panel** window appears.
 - **b** Click Administrative Tool, Remote Desktop Services,
 - **c** then **Remote Desktop Web Access Configuration**. The **Enterprise Remote Access** window appears.

		RD Web Ac
Enterprise Ren Remoted ap and Desitop Co	note Access	
		Help
	Domain/Loor name: Perswordt	
	Security (<u>those suplanation</u>)	
	Sign in	
	To protect against unauthorized access, your RD Web Access session will automatically time out after a period of inactively. If your session ends, refresh your browser and sign in again.	
Mindows Server 2008		Microsoft

3 Log on with a domain account of the local administrators group in all the nodes (Remote Desktop Connection Broker Server and Remote Desktop Session Host server).

Enter the relevant details in the **Domain/user name** and **Password** boxes, and then click **Sign in**. The **Configuration** area appears

		🔁 RD Web Ar
Enterpris RemoteApp and	se Remote Access	
RemoteApp Program	Remote Desktop Configuration	Help Sign out
RemoteApp programs and Connection through the St	Access to provide users access to RemoteApp and Desitop Connection. Use the testops that are displayed to users through RemoteApp and Desitop Connect it menu on a computer that is running Windows 7 or through the RD Web Acce @ An RD Connection Broker server	on. Users can access RemoteApp and Desktop
Source name:	C One or more RemoteApp sources	
our chance	Enter the NetBIOS name or fully qualified domain name (FQDN) of the RD Co	nnection Broker server.
		OK Cancel
Mindows Server 2008		Microsoft

- **4** Connect to the required Remote Desktop Connection Broker Server.
 - a Click the An RD Connection Broker Server option.
 - b In the Source Name box, enter the Remote Desktop Connection Broker Server IP, and then click OK. All applications configured at Remote Desktop Session Host server are displayed.



5 Click an icon to access the required application.

Note: Any application launched from the RD Connection Server Broker appears as it were running on your local computer. You can connect to the client machine through the VPN and access the RemoteApps.

Historian Application Common In Touch Historian Client Server Utilities Alarm DB **ITTagImporter** Trend ArchestrA ArchestrA Logger Manager IDE License Manager Alarm DB Purge Import InTouch Object Change Query - Archive Historical Data Viewer Network Account Alarm DB aahDBdump Historian Restore Configurator Alarm Hot ITHistImporter License **Backup** Manager Utility Alarm Printer SMC aahHistorianCfg Alarm Suite History Migration InTouch Window Maker Window Viewer

The following table lists the applications which can be accessed as RemoteApp of the different System Platform nodes.

Displaying the System Platform Nodes on a Multi-Monitor with a Remote Desktop

Prerequisites for the client node where the remote desktop is invoked

- Graphics card that supports multi-monitor and associated drivers
- Client Machine with an operating system (OS) that has RDP 7.0
- Client Machine with the following operating systems:
 - Windows XP SP3 Professional (32-bit)
 - Windows 7 Professional Edition (64-bit WOW)
 - Windows Server 2003 R2 SP2 Standard Edition (32-bit)
 - Windows Server 2008 R2 Standard Edition (64-bit WOW)

Note: RDP 7.0 features are available for computers that are running Windows XP Service Pack 3 (SP3), Windows Vista Service Pack 1 (SP1), and Windows Vista Service Pack 2 (SP2). To use Windows XP SP3, Windows Vista SP1 and Windows Vista SP2 client machine must be updated with the RDP 7.0.

Note: Windows Server 2003 does not support RDP 7.0. To use Windows XP, the client machine must be updated with RDP 7.0.

After the client machine is prepared, you can display the system platform on a multi-monitor with a remote desktop.

To display the system platform nodes on a multi-monitor with a remote desktop

 Ensure that the client machine is able to detect plugged-in secondary monitors. On the Start menu, click Control Panel, Display, Change Display Settings, then Detect. This ensures that all plugged-in monitors are detected.

- **2** Modify the display settings.
 - a On the Control Panel window, click Display Change, then
 Display settings. The Change the appearance of your
 displays area appears.

	1 2	Detect Identify
Display:	1. DELL E193FP 💌	
Resolution:	1280 × 1024 (recommended)	
Orientation:	Landscape 👻	
Multiple displays:	Extend these displays	
This is currently yo	ur main display.	Advanced settings
Make text and othe	r items larger or smaller	
What display settin	gs should I choose?	

b From the **Multiple displays** list, select **Extend these displays**, and then click **OK**.

Verifying the Display of System Platform Nodes on a Multi-Monitor with a Remote Desktop

Prerequisites for VMs running on the host Virtualization Server:

- VM nodes with OS that has RDP 7.0
- VM nodes running products such as InTouch

Note: The host virtualization server runs on Windows 2008 R2.

To verify system platform nodes display on a multi-monitor with a remote desktop

- **1** Access any VM node installed with an IOM product from the client machine.
- 2 Open the **Remote Desktop Connection** window. Go to **Run**, and then enter "mstsc /admin". The **Remote Desktop Connection** window appears.

Note: Enter mstsc /console if you are using Windows XP.

General	Display Local Resources Programs Experience Advanced
Display	configuration
×	Choose the size of your remote desktop. Drag the slider all the way to the right to use the full screen.
	Small Large
	Full Screen
	Use all my monitors for the remote session
Colors	
	Choose the color depth of the remote session.
- 3	Highest Quality (32 bit)
Display	the connection bar when I use the full screen

- **3** Verify the System Platform nodes.
 - a Click Display, and select the Use all my monitors for the remote session check box and then click Connect. The VM node opens.

Note: If the client machine does not have RDP 7.0, this option will not be available to you.

b Launch the IOM product and test the application. Drag and drop to move the application between the different monitors.

Using the Multi-Monitors as a Single Display

The multiple monitors configured on the client node, from where the remote desktop session is invoked, are used as independent displays when the remote session is used to connect to the System Platform products except InTouch installed, on the VM nodes. In case of InTouch, the multi-monitors can be used either as independent displays or as a single display.

To use the multi-monitors as a single display

- 1 On an InTouch VM node, go to the path where win.ini exists and open win.ini. For example, the path is C:\User\<User_Name>\AppData\Local\Wonderware, where <User_Name> is the user login with which the remote session from the client connects to this VM node.
- 2 Enter the following parameters under the **InTouch** section and save it.
 - MultiScreen Enter "1" to enable the multi-monitor mode. Enter "0" to disable the multi-monitor mode.
 - MultiScreenWidth Enter the width of a single screen in pixels.
 - MultiScreenHeight Enter the height of a single screen in pixels. For example, if you want to show your InTouch application with a screen resolution of 2560 x 1024 on two horizontal monitors, enter the following:
 - "[InTouch]
 - MultiScreen=1
 - MultiScreenWidth=1280
 - MultiScreenHeight=1024"
- Verify the settings. On the Start menu, click All Programs,
 Wonderware, then InTouch. The InTouch Application Manager window appears. Note that the window appears across all monitors as a single display.

Refer to the TechNote on multi-monitors for InTouch at https://wdnresource.wonderware.com/support/kbcd/html/1/T001115.ht m

Working with Network Load Balancing

Network Load Balancing (NLB) distributes traffic across several servers by using the TCP/IP networking protocol. You can use NLB with a terminal server farm to scale the performance of a single terminal server by distributing sessions across multiple servers.

About the Network Load Balancing Feature

The NLB feature in Windows Server 2008 R2 enhances the availability and scalability of Internet server applications such as those used on Web, FTP, firewall, proxy, virtual private network (VPN), and other mission-critical servers. A single computer running Windows Server 2008 R2 provides a limited level of server reliability and scalable performance. However, by combining the resources of two or more computers running one of the products in Windows Server 2008 R2 into a single virtual cluster, an NLB can deliver the reliability and performance that Web servers and other mission-critical servers need.

About Remote Desktop Connection Broker

Remote Desktop Connection Broker keeps track of user sessions in a load-balanced Remote Desktop Session Host server farm. The Remote Desktop Connection Broker database stores session information, (including the name of the Remote Desktop Session Host server where each session resides), the session state for each session, the session ID for each session; and the user name associated with each session. Remote Desktop Connection Broker uses this information to redirect a user who has an existing session to the Remote Desktop Session Host server where the user's session resides.

Remote Desktop Connection Broker is also used to provide users with access to RemoteApp and Desktop Connection. RemoteApp and Desktop Connection provide a customized view of RemoteApp programs and virtual desktops. Remote Desktop Connection Broker supports load balancing and reconnection to existing sessions on virtual desktops accessed by using RemoteApp and Desktop Connection. To configure the Remote Desktop Connection Broker server to support RemoteApp and Desktop Connection, use the Remote Desktop Connection Manager tool. For more information, see the Remote Desktop Connection Manager Help in Windows Server 2008 R2. Remote Desktop Connection Broker that is used in an NLB setup is included in Windows Server® 2008 R2 Standard, Windows Server 2008 R2 Enterprise and Windows 2008 R2 Datacenter.

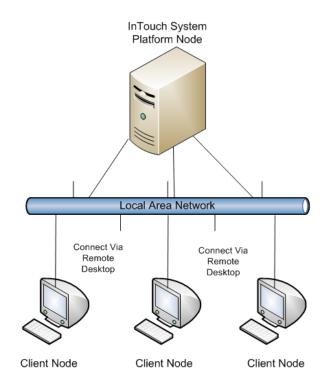
The NLB feature is included in Windows Server 2008 R2. You do not require a license to use this feature.

You need a Microsoft TS license for managing the remote desktop terminal server sessions.

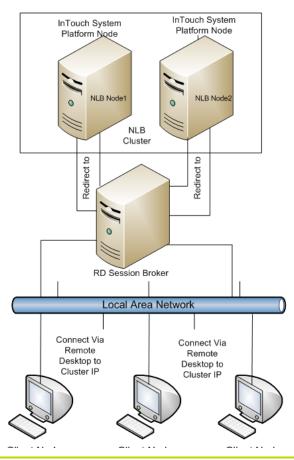
About Managed InTouch Application with Network Load Balancing

The features provided by Remote Desktop are made available through the Remote Desktop Protocol (RDP). RDP is a presentation protocol that allows a Windows-based terminal (WBT), or other Windows-based clients, to communicate with a Windows-based Terminal Server. RDP is designed to provide remote display and input capabilities over network connections for Windows-based applications running on your Windows XP Professional desktop.

In this topology, clients can access the InTouch System Platform node via Remote Desktop. Whenever a new connection is requested to the InTouch System Platform Node, a new session is created. So all the traffic goes to the system platform node and degrades the performance of the InTouch node. The following figure displays a topology without Network Load Balancing (NLB):



Network Load Balancing distributes IP traffic to multiple copies (or instances) of a TCP/IP service, such as a Web server, each running on a host within the cluster. Network Load Balancing transparently partitions the client requests among the hosts and enables the client to access the cluster using one or more "virtual" IP addresses. The cluster appears to be a single server that answers these client requests.



The following figure displays a topology with Networking Load Balancing:

Note: The Remote Desktop Connection Broker shown, as a separate node in the above topology, can be configured on one of the NLB cluster nodes itself.

You can leverage the load balancing for InTouch-managed applications.

To configure an NLB for managed InTouch application

- **1** Configure one VM or Physical machine with Wonderware Application Server
- **2** On both the NLB cluster nodes, install InTouch TS with terminal server license.
- **3** Configure an NLB cluster as explained below.
- **4** On Wonderware Application Server node, develop managed InTouch application and deploy it on each of the NLB Cluster node.

Configuring an NLB for InTouch System Platform nodes, allows you to combine application servers to provide a level of scaling and availability that is not possible with an individual server.

NLB distributes incoming client requests to InTouch System Platform nodes among the servers in the cluster to more evenly balance the workload of each InTouch System Platform server and prevent overload on any InTouch System Platform server. To client computers, the NLB cluster appears as a single server that is highly scalable and fault tolerant.

Setting Up Network Load Balancing Cluster

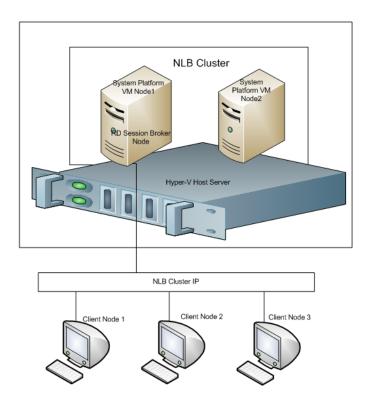
To setup an NLB:

- **1** Prepare two VM nodes that are remote desktop-enabled and have Windows Server 2008 R2 Operating System.
- **2** Assign static IPs to both nodes.

Note: NLB disables Dynamic Host Configuration Protocol (DHCP) on each interface it configures, so the IP addresses must be static.

Topology 1: Leveraging Network Load Balancing by Configuring Remote Desktop Connection Broker on One of the NLB Cluster Nodes

You can configure an NLB cluster configuring the Remote Desktop Connection Broker on one of the NLB cluster nodes.



To configure NLB with Topology 1

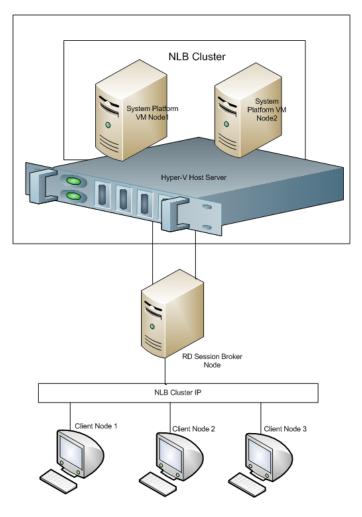
1 On each of the cluster nodes install Remote Desktop Services. For more information, refer to "Installing Remote Desktop Services" on page 488.

Note: On the **Select Role Services** screen, select Remote Desktop Session Host and Remote Desktop Connection Broker on one of the Cluster Nodes to configure it as NLB Cluster node as well as RD connection broker node. On the other NLB Cluster node, select only Remote Desktop Session Host.

- **2** On each of the cluster nodes, install Network Load Balancing. For more information, refer to "Installing Network Load Balancing" on page 495.
- **3** On the NLB cluster node which is configured as RD connection broker as well, add a Remote Desktop Session Host Server. For more information, refer to "Adding a Remote Desktop Session Host Server" on page 497.
- **4** On each of the cluster nodes, create a Network Load Balancing Cluster. For more information, refer to "Creating a Network Load Balancing Cluster" on page 499.
- 5 On each of the cluster nodes, configure Remote Desktop Connection Broker Settings. For more information, refer to "Configuring Remote Desktop Connection Broker Settings" on page 508.

Topology 2: Leveraging Network Load Balancing by Configuring Remote Desktop Connection Broker on a Separate Node

Instead of configuring the Remote Desktop Connection Broker on one of the NLB cluster nodes, you can also configure the Remote Desktop Connection Broker on a separate node.



To configure NLB with Topology 2

On the NLB Cluster nodes, do the following:

1 Install Remote Desktop Services. For more information refer to "Installing Remote Desktop Services" on page 488.

Note: In **Select Role Services** screen, select **Remote Desktop Session Host** on the NLB Cluster nodes.

- **2** Install Network Load Balancing. For more information, refer to "Installing Remote Desktop Services" on page 488.
- **3** Create a Network Load Balancing Cluster. For more information, refer to "Creating a Network Load Balancing Cluster" on page 499.
- **4** Configure remote desktop connection broker settings.For more information, refer to "Configuring Remote Desktop Connection Broker Settings" on page 508.

On the Remote Desktop Connection Broker Node do the following:

1 Install Remote Desktop Services. For more information, refer to "Installing Remote Desktop Services" on page 488.

Note: On the **Select Role Services** screen, select only Remote Desktop Connection Broker on the Remote Desktop Connection Broker Node.

2 Add a Remote Desktop Session Host Server. For more information, refer to "Adding a Remote Desktop Session Host Server" on page 497.

Installing Remote Desktop Services

Remote Desktop Services, earlier called Terminal Services, provides technologies that enable access to session-based desktops, VM-based desktops, or applications in the datacenter from both within a corporate network and the Internet. Remote Desktop Services enables a rich-fidelity desktop or application experience, and helps to securely connect remote users from managed or unmanaged devices.

To install Remote Desktop Services

1 Open the **Server Manager** window.

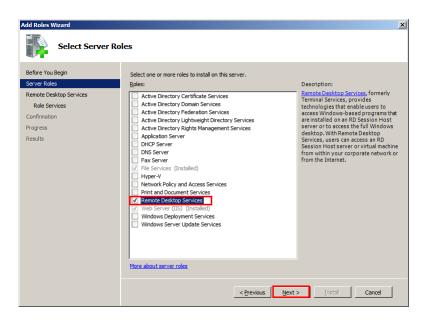
On node 1, click **Start**, point to **Administrative Tools**, and then click **Server Manager**. The **Server Manager** window appears.

E Server Manager			
Elle Action View Help			
🧇 🔿 🖄 📅 🚺			
Server Manager (HYDI	Roles		
🖃 🖥 Roles	million.		
File Services Web Server (I	View the health of the roles inst	alled on your server and add or remove roles and features.	
🗉 👩 Features	a second		
Diagnostics Configuration			
🗉 🕘 Task Schedule	Roles Summary		Roles Summary Help
Windows Fire Services	Roles: 2 of 17 installed		Add Roles
WMI Control			Remove Roles
E Local Users an Users	File Services Web Server (IIS)		
Groups	web server (115)		
💌 🚔 Storage			
	 File Services 		File Services Help
	Provides technologies that help you manage computers	ge storage, enable file replication, manage shared folders, ensure fast file	searching, and enable access for UNIX dient
	Role Status		Go to File Services
	Messages: None		
	System Services: All Running		
	Events: None in the last 24 hours		
			-
	Role Services: 1 installed		Add Role Services
	Role Service	Status	Remove kole services
	File Server Distributed File System	Installed Not installed	
	DFS Namespaces	Not installed	
	DFS Replication	Not installed	
	File Server Resource Manager	Not installed	
	Services for Network File System		
	Windows Search Service	Not installed	<u>•</u>
	Last Refresh: Today at 12:08 PM Config	ure refresh	

- **2** Add the required role services.
 - **a** On the Server Manager window, click Roles. The Roles area appears.
 - **b** Click Add Roles. The Before You Begin screen in the Add Features Wizard window appears.

Add Roles Wizard	×
Before You Begin	
Before You Begin Server Roles Confirmation Progress Results	This wizard helps you install roles on this server. You determine which roles to install based on the tasks you with this server to perform, such as sharing documents or hosting a Web site. Before you continue, verify that: 1 • Le Administrator account has a strong password 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, such as static IP addresses, are configured 1 • Lethords testings, are configured 1 • Lethords testings, are configured 1 • Lethords testings, are configured 1 • Lethords testin

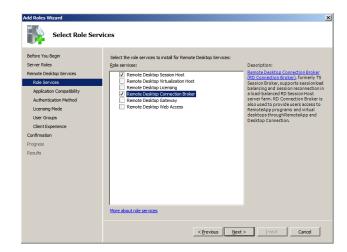
c Click Next. The Select Server Roles screen appears.



d Select the **Remote Desktop Services** check box, and then click **Next**. The **Remote Desktop Services** screen appears.

Add Roles Wizard	×	1
Remote Desktop	Services	
Before You Begin Servor Roles Rede Services Confirmation Progress Results	Introduction to Remote Deaktop Services, Remote Deaktop Services, formerly Terminal Services, provides technologies that enable users to access white/whole backop or grant that are nexted of an nD Section host server, access the fAl Vindows deaktop of the services in host server or virtual machine from within your corporate network or from the Internet. Tings to tote Image: Tings and the services and the services and the services are been host. Tings to tote Image: Tings and the services are been host server, access the fAl Vindows deaktop of the services are been host. Tings to tote Image: Tings and the services are been host server, access are been host. Children Lindows: Tings and the connections for administrative purposes only, you do not have to install Remote Deaktop setting is enabled. Additional Information Additional Additional Second Dearwise: of Remote Deaktop Services Additional Information	
	< Previous [Next > [Install Cancel	

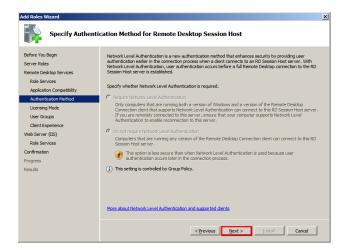
e Click Next. The Select Role Services screen appears.



f Select the Remote Desktop Session Host and Remote Desktop Connection Broker check boxes, and then click Next. The Uninstall and Reinstall Applications for Compatibility screen appears.

Add Roles Wizard	×
Uninstall and Rei	install Applications for Compatibility
Before You Begin Server Roles Renote Deaktop Services Role Services Application Compatibility Authenbiaction Method Licensing Mode Licensing Mode Client Experience Web Server (IIS) Role Services Confirmation Progress Results	It is recommended that you install Remote Desktop Session Host before you install any applications that you wont in male available to users.
	More about installing applications on an RD Session Host server
	< Previous Lext> Install Cancel

g Click Next. The Specify Authentication Method for Remote Desktop Session Host screen appears.



h Click the **Do not require Network Level Authentication** option, and then click **Next**. The **Specify Licensing Mode** screen appears.

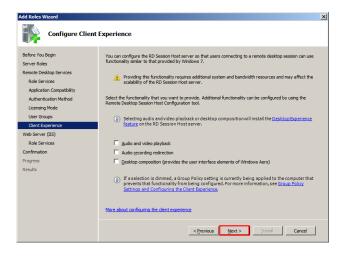
Add Roles Wizard		×
Specify Licensin	g Mode	
Before You Begin Server Roles Renote Desktop Services Role Services Application Compatibility Authentication Method Licensing Mode Client Experience Confirmation Progress Results	Be Remote Desktop Kenning mode determines the type of Remote Desktop Services dient access kennes (RSS CAL) that a kenne server will issue to dents that correct to thin RD Session Host server. Specify the Remote Desktop Kenning mode that you want this RD Session Host server to use. Gengrave later Remot ne to use the Remote Desktop Kenning mode within the next 120 days. Per Qenic An RDS Per Device CAL must be available for each device that connects to this RD Session Host server. An RDS Per Device CAL must be available for each device that connects to this RD Session Host server. (•) On the User An RDS Per User CAL must be available for each user that connects to this RD Session Host server. (•) The Gening mode that you specify must match the RDS CALs that are available form your Remote Desktop Kenne server.	

i Click the Per User option or Per Device option based on license availability, and then click Next. The Select User Groups Allowed Access To This Remote Desktop Session Host Server screen appears.

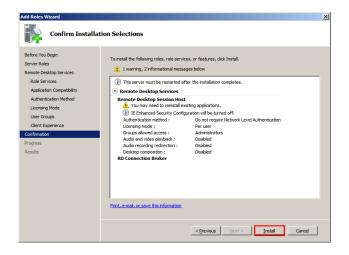
Add Roles Wizard		×
Select User Grou	ps Allowed Access To This RD Session Host Server	
Before You Begin Server Roles Remote Desktop Services Role Services Application Compatibility Authentication Method Licensing Mode	Add the users or user groups that can connect to this RD Session Host server. These users and user groups will be added to the local Remote Desktop Users group. The Administrators group is added by default and cannot be removed. Users or User Groups: Addministrators Add Remove]
Licensing Mode User Groups Client Experience Web Server (IIS) Role Services Confirmation Progress Results	More about the Remote Desktop Users group < Previous	

Note: There are two types of Windows Client Access Licenses from which to choose: device-based or user-based, also known as Windows Device CALs or Windows User CALs. This means you can choose to acquire a Windows CAL for every device (used by any user) accessing your servers, or you can choose to acquire a Windows CAL for every named user accessing your servers (from any device).

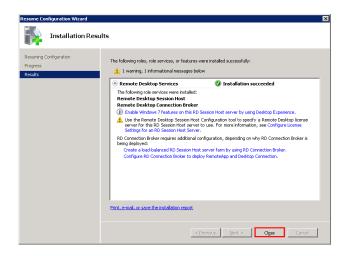
- **3** Confirm the details you entered, and install the services.
 - On the Select User Groups Allowed Access To This Remote
 Desktop Session Host Server screen, click Next. The
 Configure Client Experience screen appears.



b Click **Next**. The **Confirm Installation Selections** screen appears.



c Click Install. The Installation Results screen appears.



After the installation, restart the node. To complete the installation restart the node.

Installing Network Load Balancing

You need to install an NLB on the network adapter that you want to use for the Remote Desktop Protocol (RDP) connection.

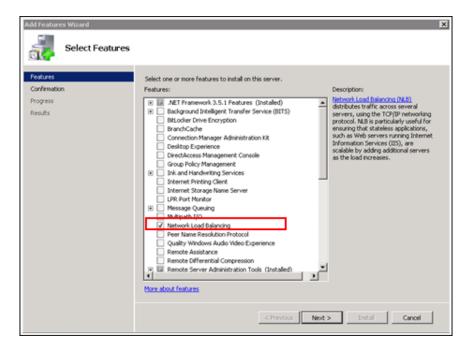
To install an NLB

1 Open the **Server Manager** window.

Click Start, point to Administrative Tools, and then click Server Manager. The Server Manager window appears.

Server Manager		
Elle Action View	Help	
🗇 🔿 🔁 📅 🛽	2	
Server Manager (Features	
Roles Features Diagnostics Configuration Storage	Vew the status of features installed on this server and add or remove features.	
	Features Summary	Features Summary Help
	⊙ Features: 3 of 41 installed	Add Features
	Remote Server Administration Tools	Remove reatures
	Role Administration Tools	
	Web Server (IIS) Tools Windows Process Activation Service	
	Process Model	
	.NET Environment	
	Configuration APIs	
	.NET Framework 3.5.1 Features	
	.NET Framework 3.5.1 WCF Activation	
	HTTP Activation	
	Non-HTTP Activation	
	0	
	Refresh Disabled Enable	

- **2** Add the required features.
 - **a** On the Server Manager window, click Features. The Features area appears.
 - **b** Click Add Features. The Select Features screen in the Add Features Wizard window appears.



c Select the **Network Load Balancing** check box, and then click **Next**. The **Confirm Installation Selections** screen appears.

Add Features Wizard		×
Confirm Installa	tion Selections	
Features Confirmation Progress Results	To install the following roles, role services, or features, click Install.	
	Print, e-mail, or save this information	
	< Previous Next > Instal Cancel]

d Click **Install**. NLB is installed

Adding a Remote Desktop Session Host Server

A Remote Desktop Session host (RD Session Host) server hosts Windows-based programs or the full Windows desktop for Remote Desktop services client. You can connect to an Remote Desktop Session Host server to run programs, save files, and use network resources on this server. You can access an Remote Desktop Session Host server by using Remote Desktop Connection or RemoteApp.

You can add a Remote Desktop Session Host server to the connection broker computers' local group.

To add an RD Session Host server

1 Open the **Server Manager** window.

Click Start, point to Administrative Tools, and then click Server Manager. The Server Manager window appears.

Server Manager (NLBNODE2)	Groups 22 Group(s)	Actions
Roles	Name Description	Groups
Features Diagnostics Configuration	Administrators Administrators have complete and u Backup Operators Certificate Service DCO Members of this group are allowed t	More Actions Session Broker Computers
Image: Streader Image: Streader	Construction Construction Const	More Actions

- **2** Select the required group to add to the Remote Desktop Session Host server.
 - a On the Server Manager window, expand Configuration, then Local Users and Groups. Click Groups. The Groups area appears.
 - **b** Right-click the **Session Broker Computers** group, and then click **Properties**. The Properties window for the selected group appears.

Session Broker Co	mputers Properties	<u>? ×</u>
General		
Session	n Broker Computers	
D <u>e</u> scription:	List of Remote Desktop Session Host serv that can join RD Connection Broker	er computers
<u>M</u> embers:		
, A <u>d</u> d	<u>Remove</u> <u>Changes to a user's group</u> are not effective until the r user logs on.	
	OK Cancel Apply	Help

c Click **Add**. The **Select Users, Computers, or Groups** window appears.

Select Users, Computers, Service Accounts, or Groups	? ×
Select this object type:	
Users, Service Accounts, or Groups	Object Types
Erom this location:	
	Locations
Enter the object names to select (<u>examples</u>):	
1	<u>C</u> heck Names
Advanced	Cancel

d Click **Object Types**. The **Object Types** window appears.

Object Types	? 🗙
Select the types of objects you want to find.	
Diject types:	
Service Accounts	
Image: Provide the second secon	
1	
	OK Cancel

- e Select the **Computers** check box, and then click **OK**. The node names of the computer appear in the **Select Users**, **Computers**, or **Groups** window.
- **f** Click **OK** to add the computer account for the Remote Desktop Session Host server.

Creating a Network Load Balancing Cluster

To configure an NLB cluster, you need to configure the following parameters:

- Host parameters that are specific to each host in an NLB cluster.
- Cluster parameters that apply to an NLB cluster as a whole.
- Port rules

Note: You can also use the default port rules to create an NLB cluster.

To create an NLB cluster

1 Open the Network Load Balancing Manager window.

On node 1 of the required VM with NLB, click **Start**, point to **Administrative Tools**, and then click **Network Load Balancing Manager**. The **Network Load Balancing Manager** window appears.

👷 Network Load Balancing Manager	
File Cluster Host Options Help	
🕑 🍰 Network Load Ralancing Clusters	Ouster configuration for all known NLB clusters
New Cluster	Cluster name Cluster IP address Cluster IP subnet mask Cluster mode
Connect to Exating	Louin none Louin in addent Louin in John Roak, Louin Rook
	1
Log Entry Date Time Cluster Host	Description
0001 17-11-2010 15:14:40	NLB Manager session started
0002 17-11-2010 15:14:40	Loading locally bound instances
	li.

- **2** Connect the required host to a new cluster.
 - a Right-click Network Load Balancing Clusters, and then click New Cluster. The New Cluster window appears.

v Cluster : Connect				
Connect to one host that is	to be part of the r	new cluster and :	select the clu	ister interface
Host: NLBNODE1				Connect
Connection status				
Connected				
lataría an an Tabla íor an	6	-1		
Interfaces available for con	ngunng a new ciu	Interface IP		
Local Area Connection		10.91.60.167		
	(Pask	Marth	Cancel	Help
_	< Back	Next >	Cancel	Heip

b In the **Host** box, enter the name of the host (node 1), and then click **Connect**.

C Under Interfaces available for configuring a new cluster, select the interface to be used with the cluster, and then click
 Next. The Host Parameters section in the New Cluster window appears.

Subnet mask
255.255.254.0
Add Edit Remove
Started

- **3** Enter relevant details and create the new cluster.
 - a In the **Priority** list, click the required value, and then click **Next**. The **Cluster IP Addresses** section in the **New Cluster** window appears.

Note: The value in the **Priority** box is the unique ID for each host. The host with the lowest numerical priority among the current members of the cluster handles the entire cluster's network traffic that is not covered by a port rule. You can override these priorities or provide load balancing for specific ranges of ports by specifying the rules on the **Port rules** tab of the **Network Load Balancing Properties** window.

The cluster IP address The first IP address list heartbeats.	es are shared by every mer	ber of the cluster for load balancir cluster IP address and used for c	ng. Iluster
IP address		Subnet mask	
		dd Edit Rem	ove
	< Back Nex	> Cancel H	lelp

b Click **Add** to add a cluster IP address. The **Add IP Address** window appears

Add IP Address Add IPv4 add IPv4 address:	dress: 10 . 91 . 60 . 169
Subnet mask:	255 . 255 . 254 . 3
C Add IPv6 add IPv6 address:	tress:
Generate IPv	r6 addresses: □ Site-local □ Global
	OK Cancel

C In the IPv4 Address box, enter the new cluster static IP address and in the Subnet mask box, enter the subnet mask. Click OK to close the window. The IP address appears on the Cluser IP Addresses section of the New Cluster window.

The cluster IP addresses are shared by every member of the cluster for load balancing. The first IP address listed is considered the primary cluster IP address and used for cluster heartbeats.					
Cluster IP addresses:			Subnet mask		
		Add.	. Edit.	Remove	

d Click **Next**. The **Cluster Parameters** section for the **New Cluster** window appears.

Subnet mask:	10.91.60.169				
Full Internet name:	NLBCluster.space.com				
Network address:	03-bf-0a-5b-3c-a9				
C IGMP multicast					

e In the **Full Internet name** box, enter the name of the new cluster.

f Click the **Multicast** option, and then click **Next**. The Port Rules section in the New Cluster window appears.

Note: If you click the **Unicast** option, NLB instructs the driver that belongs to the cluster adapter to override the adapter's unique, built-in network address and change its MAC address to the cluster's MAC address. Nodes in the cluster can communicate with addresses outside the cluster subnet. However, no communication occurs between the nodes in the cluster subnet.

Note: If you click the **Multicast** option, both network adapter and cluster MAC addresses are enabled. Nodes within the cluster are able to communicate with each other within the cluster subnet, and also with addresses outside the subnet.

Cluster IP address All	Start 0	End 65535	Prot Both	Mode Multiple	Priority 		Affinity Single
•							
				Add	Edi	t	Remove
Port rule description	fic direct						
65535 is balanced of each member.C cluster host.							

g Click **Finish** to create the cluster and close the window. The **Network Load Balancing Manager** window appears.

🗆 🏚 M					Host configuration information for hosts in cluster NLBCluster space.com (10.91.60.169)							
8.99	NLBCluster.s	Add Host 1	fo Ouster		Host (Interface)	Status	Dedicated IP address	Dedicated IP subnet mask	Host priority	Initial host state	1	
	N'ENCOR	Delete Clu	ster	P	NLBNODE1 [Local Area Conn	Converged	10.91.60.167	255.255.254.0	1	started		
		Cluster Pro	operties									
		Refresh										
		Remove Fr	rom Wew									
		Control Ho										
		Control Po	rts									
		Time	Guster	Host	Description]			
og Entry 0001	17-11-2010	15:14:40	Guster	Host	NLB Manager session star]			
0001 0002	17-11-2010 17-11-2010	15:14:40 15:14:40			NLB Manager session star Loading locally bound inst	ances]			
0001	17-11-2010	15:14:40 15:14:40	Quater 10.91.60.169		NLB Manager session star Loading locally bound inst E1 Begin configuration chang	ances je			1			
0001 0002	17-11-2010 17-11-2010	15:14:40 15:14:40 15:30:53		NLENCOE	NLB Manager session star Loading locally bound inst E1 Begin configuration chang	ances je			1			
0001 0002 0003 0004	17-11-2010 17-11-2010 17-11-2010 17-11-2010	15:14:40 15:14:40 15:30:53 15:30:56	10.91.60.169	NLENODE	NLB Manager session star Loading locally bound inst E1 Begin configuration chang E1 Waiting for pending opera	ances je ation 2			J			
0001 0002 0003	17-11-2010 17-11-2010 17-11-2010	15:14:40 15:14:40 15:30:53 15:30:56 15:31:11	10.91.60.169	NLENODE NLENODE NLENODE	NLB Manager session star Loading locally bound inst El Begin configuration chang El Walting for pending opera El Update 2 succeeded (dou	ances je jtion 2 ble click for dets	é]					

- **4** Add another host to the cluster.
 - a Right-click the newly-created cluster, and then click Add Host to Cluster. The Connect section of the Add Host to Cluster window appears.

lost: NLBNODE2			Connect
Connection status			
Connected			
nterfaces available for c	onfiguring the olu	tor	
Interface name	oninguning the clus	Interface IP	
Local Area Connection		10.91.60.168	

b In the **Host** box, enter the name of node 2, then click **Connect**.

c Under Interfaces available for configuring a new cluster, select the interface to be used with the cluster, and then click **Next**. The **Host Parameters** section in the **New Cluster** window appears.

IP address			bnet mask	
10.91.60.167		20	5.255.254.0	
		Add	Edit	Remove
itial host state efault state:	Started		7	
Retain suspended s	,		-	

d In the **Priority** box, enter the required value, and then click **Next**. The **Port Rules** section of the **Add Host to Cluster** window appears.

Cluster IP addres All	s Start 0	End 65535	Prot Both	Mode Multiple	Priority 	Load Equal	Affinity Single
•							
				Add	Edi	····	Remove
Port rule descript TCP and UDP tr 65535 is balance	affic direct d equally	across all	members		ter. Client I		

e Click Finish to add the host and close the window. The Network Load Balancing Manager window appears.

	stwork Load Bal			Host	Host configuration information for hosts in cluster NLBCluster.space.com (10.91.60.169)								
	NLBCluster.sp	iace.com (10.9 1(Local Area C			[Interface]	Status	Dedicated IP address	Dedicated IP subnet mask.	Host priority	Initial host state			
	NUNCCE	s(Local Area C 2(Local Area C	(onnection)		LENODE1[Local Area Corn LENODE2[Local Area Corn		10.91.60.167	255.255.254.0 255.255.254.0	1 2	started started			
									-				
.og Entry 0001	17-11-2010	15:14:40	Guster	Host	Description NEI Manager session start Loading locally bound mice	ances							
0001	17-11-2010 17-11-2010 17-11-2010	15:14:40 15:14:40 15:30:53	10.91.60.169	NLENCOE1	NLB Manager session start Loading locally bound inst Begin configuration chang	ances je			•				
0001 0002 0003	17-11-2010	15:14:40 15:14:40 15:30:53 15:30:56		NLBNCOE1 NLBNCOE1	NLB Manager session start Loading locally bound inst	ances je ition 2	بند]		•				
0001 0002 0003 0004	17-11-2010 17-11-2010 17-11-2010 17-11-2010	15:14:40 15:14:40 15:30:53 15:30:56 15:31:11	10.91.60.169 10.91.60.169 10.91.60.169	NLBNODE1 NLBNODE1 NLBNODE1	NLB Manager session start Loading locally bound inst Begin configuration chang Waiting for pending opera	ances je ition 2 ble click for dets	s]		•				
0001 0002 0003 0004 0005	17-11-2010 17-11-2010 17-11-2010 17-11-2010 17-11-2010	15:14:40 15:14:40 15:30:53 15:30:56 15:31:11 15:31:11	10.91.60.169 10.91.60.169 10.91.60.169	NLENCOE1 NLENCOE1 NLENCOE1 NLENCOE1	NLB Manager session start Loading locally bound inst. Begin configuration chang Waiting for pending opera Update 2 succeeded [dou	ances je ition 2 ble click for deta	њ]						
0001 0002 0003 0004 0005 0005	17-11-2010 17-11-2010 17-11-2010 17-11-2010 17-11-2010 17-11-2010	15:14:40 15:14:40 15:30:53 15:30:56 15:31:11 15:31:11 15:31:11 15:37:46	10.91.60.169 10.91.60.169 10.91.60.169 10.91.60.169	NLBNODE1 NLBNODE1 NLBNODE1 NLBNODE1 NLBNODE2	N.B Manager session start Loading locally bound inst. Begin configuration chang Waiting for pending opera Update 2 succeeded [dou End configuration change	ances je tion 2 ble click for deta je	ste]						
0001 0002 0003 0004 0005 0006 0007	17-11-2010 17-11-2010 17-11-2010 17-11-2010 17-11-2010 17-11-2010 17-11-2010	15:14:40 15:14:40 15:30:53 15:30:56 15:31:11 15:31:11 15:31:11 15:37:46 15:37:46	10.91.60.169 10.91.60.169 10.91.60.169 10.91.60.169 10.91.60.169	NLBNODE1 NLBNODE1 NLBNODE1 NLBNODE1 NLBNODE2 NLBNODE2	NLB Manager session start Loading locally bound inst: Begin configuration chang Waiting for pending opera Update 2 succeeded [dou End configuration change Begin configuration change	ances e tion 2 ble click for deta e e tion 2	-		•				

The statuses of both the hosts are displayed.

To add users to the Remote Desktop Users group to access Network Load Balancing Cluster

1 On the Start menu, click Control Panel, System and Security then System Remote settings. The System Properties window appears

omputer Name Hardwa	are Advanced Remo	te
Remote Assistance		
C Allow Remote Assis	stance connections to th	is computer
		Advanced
Remote Desktop		
Click an option, and the	en specify <mark>w</mark> ho can conr	nect, if needed.
C Don't allow connec	tions to this computer	
Allow connections t Remote Desktop (#	from computers running a ess secure)	any version of
	only from computers runr ork Level Authentication	
Help me choose		Select Users

2 Under **Remote Desktop**, click the relevant option to specify the remote desktop versions you want to allow access to.

- **3** Select users to provide access to the system
 - a Click Select Users. The Remote Desktop Users window appears

Remote Desktop Users	? ×
The users listed below can connect to this computer, and any member the Administrators group can connect even if they are not listed.	rs of
CORP\sunill already has access.	
Add <u>R</u> emove	
To create new user accounts or add users to other groups, go to Cont Panel and open <u>User Accounts</u> .	rol
OK Cance	*

4 Select the users you want to allow access to, click Add, and then click OK to close the window.

Note: The users can be local users and need not be domain users/administrators. If the users are local users they should be added on both the NLB cluster nodes with same user name and password.

Configuring Remote Desktop Connection Broker Settings

Remote Desktop Connection Broker, earlier called Terminal Services Session Broker (TS Session Broker), is a role service that enables you to do the following:

- Reconnect to existing sessions in a load-balanced Remote Desktop Session Host server farm. You cannot connect a different Remote Desktop Session Host server with a disconnected session and start a new session
- Evenly distribute the session load among Remote Desktop Session Host servers in a load-balanced Remote Desktop Session Host server farm.
- Access virtual desktops hosted on Remote Desktop Virtualization host servers and RemoteApp programs hosted on Remote Desktop Session Host servers through RemoteApp and Desktop Connection.

To configure Remote Desktop connection broker settings

1 Open the **Remote Desktop Session Host Configuration** window.

Click Start, Administrative Tools, Remote Desktop Services, then Remote Desktop Session Host Configuration. The Remote Desktop Session Host Configuration window appears.

Remote Desktop Session Hos	st Configuration						
Elle Action View Help							
(m m) 🔐 🚺 🖬							
RD Session Host Configuration:	Configuration	for Remote De	ekton Se	sector Host s	anver:	_	Actions
🖭 🦣 Licensing Diagnosis	NLBNODE2	Tor remote De	aktop St	5351011 11031 3	51461.	_	RD Session Host Configuration: NLB 🔺
	You can use Remote D	esktop Session Host Con	figuration to co	onfigure settings for new	v connections, modily the setting	ps of ex-	🚢 Create New Connection
	connections, and delete whole.	connections. You can c	onligure settin	gs on a per-connection	basis, or for the RD Session Ho	ist serv	Refresh
						_	Connect to Remote Desktop Sessio
	Connections					_	View F
	Connection Name	Connection Type		Encryption	Comment	_	Help
	RDP-Top	Microsoft RDP 6.1	top	Client Compatible		_	1 1 Kap
						_	
						_	
	L					_	
						_	
	Edit settings					_	
	General					_	
	🖆 Delete temporary fo		Yes			_	
	🖆 Use temporary folde		Yes			_	
	Restrict each user I	to a single session	Yes			_	
	🖆 User logon mode		Allow all	connections		_	
	Licensing					_	
	😤 Remote Desktop in	ensing mode	Per User			_	
	🖹 🖹 Remote Desktop lic	ense servers	Not spec	ified		_	
	RD Connection B	oker				_	
	Member of farm in F	3D Connection Broker	No			_	
			110			_	
	BD IP Virtualizatio	on				_	
	🖆 IP Virtualization		Not Enal	bled		_	
						_	
<u> </u>	L					Þ	
)							

- 2 Edit settings.
 - a In the Edit settings area, under Remote Desktop Connection
 Broker, double-click Member of farm in RD Connection
 Broker. The Properties window appears.

Properties	×
General Licensing RD C	Connection Broker RD IP Virtualization
S <u>e</u> rver purpose:	No farm membership or redirection
<u>BD</u> Connection Broker:	Not applicable
Farm name:	Not applicable
	C <u>h</u> ange Settings
E Participate in Conne	ction Broker Load-Balancing
Relative weight of th	is server in the farm: 100 🚔
Use IP address redirect	ion (recommended)
	only if your load balancer supports the
use of <u>RD_Connection E</u>	Stoker routing tokens.
	be used for reconnection:
IP Address	Network Connection
10.91.38.4	Local Area Connection
	OK Cancel Apply

b Click **Change Settings**. The **RD Connection Broker Settings** window appears.

	er to be used with RD Connect
e Desktop Virtualization	
✓irtual machine redirection	
Provides redirection for virtual machines used in Remo	oteApp and Desktop Connectio
te Desktop Services	
Dedicated farm redirection	
Provides dedicated redirection for the specified farm.	
Earm member Joins this Remote Desktop Session Host server to the	specified farm.
$\underline{N}o$ farm membership or redirection This remote desktop will neither be a farm member nor	r provide redirection.
nnection Broker server name:	
IODE1	
lame:	
arm1	

- **c** Click the **Farm member** option.
- **d** In the **RD Connection Broker server name** box, enter the name of the node where RD Connection Broker is installed.

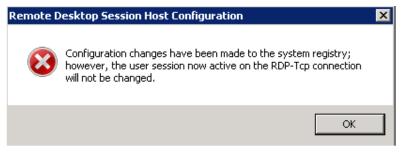
e In the Farm Name box, enter the name of the farm that you want to join in the Remote Desktop Session Broker, and then click OK to close the window.

Properties
General Licensing RD Connection Broker RD IP Virtualization
Server purpose: No farm membership or redirection
RD Connection Broker: Not applicable
Farm name: Not applicable
Change Settings
Participate in Connection Broker Load-Balancing
Relative weight of this server in the farm: 50
Use IP address redirection (recommended)
Select token redirection only if your load balancer supports the
use of <u>RD_Connection Broker routing tokens</u> .
Select IP addresses to be used for reconnection:
IP Address Network Connection
10.91.60.167 Local Area Connection 10.91.60.169 Local Area Connection
L 10.51.60.165 Eccal Area Connection
OK Cancel Apply

- f In the Properties window, select the Participate in Connection Broker Load Balancing check box.
- **g** In the **Relative weight of this server in the farm** box, enter the required weight of the server.

Note: By assigning a relative weight value, you can distribute the load between more powerful and less powerful servers in the farm. By default, the weight of each server is "100". You can modify this value, as required.

h Under **Select IP addresses to be useful for reconnection**, select the check box next to the IP address you provided while creating the cluster, and then click OK. A warning message appears.



Click **OK** to close the window. The settings are configured.

Note: Repeat this procedure on node 2. Ensure that you enter the same details in each step for node2 as you did for node 1. In **Farm Name** box, enter the same Farm Name used while configuring the node 1.

Disconnecting from and Connecting to a Remote Desktop Session

If you disconnect from a session (whether intentionally or because of a network failure), the applications you were running will continue to run. When you reconnect, the Remote Desktop Connection Broker is queried to determine whether you had an existing session, and if so, on which Remote Desktop Session Host server. If there is an existing session, Remote Desktop Connection Broker redirects the client to the Remote Desktop Session Host server where the session exists.

With Remote Desktop Connection Broker Load Balancing, if you do not have an existing session and you connect to an Remote Desktop Session Host server in the load-balanced Remote Desktop Session Host server farm, you will be redirected to the Remote Desktop Session Host server with the fewest sessions. If you have an existing session and you reconnect, you will be redirected to the Remote Desktop Session Host server where your existing session resides. To distribute the session load between more powerful and less powerful servers in the farm, you can assign a relative server weight value to a server.

Viewing Connected Sessions

You can use Remote Desktop Services Manager to view sessions connected to each node of the NLB cluster, and view information and monitor users and processes on Remote Desktop Session host (RD Session Host) servers.

To view sessions connected to each node of the cluster

1 On any node of NLB, open the Remote Desktop Services Manager window.

Click Start, point to Administrative Tools. On the Administrative Tools menu, point to Remote Desktop Services, and then click Remote Desktop Services Manager. The Remote Desktop Services Manager window appears.

Remote Desktop Services Manage	a.							
File Action View Help								
🚸 🔿 🖄 📅 월 🕅								
Remote Desktop Services Manager	🦣 Manage	Remote D	esktop Sessio	h Host Ser	ver. NLBN	ODE1	Actions NUNCOLI	
Add Computer Empty Group	Users Sessions Po		Causing 10	Cista	Life Time	Logfaling	Remove from group	
Refrech Delet Renorme Help	Server <u>B</u> ₂ NLBNOOE1 <u>B</u> ₂ NLBNOOE1 <u>B</u> ₂ NLBNOOE1 <u>B</u> ₂ NLBNOOE1 <u>B</u> ₂ NLBNOOE1	User Tradition ribuit ribuit ribuit ribuit	Secon ID ROPTC. 2 ROPTC. 3 ROPTC. 3 ROPTC. 4 ROPTC. 5	State Active Active Active Active	IdoTine 3	LogOTINE 01-12:0010 01-12:0010 01-12:0010 01-12:2010	 Refrech Verr Help 	
Add Computer	<u> </u>					1.1		

- **2** Create a new group.
 - a In the left pane, right-click **Remote Desktop Services** Manager, and select **New Group**. The **Create Group** window appears.

Create Group			X	l
Type a name f	or a group of c	omputers		
<u>G</u> roup Name	NbCluster			
	_			
		ОК	Cancel	

b In the **Group Name** box, enter the name of the group, and then click **OK** to close the window.

Note: The group name need not be the same as the cluster name.

c Repeat steps c and d of point 3 to add other node names of the cluster to the newly-created group.

🔿 📶 🖬 🖬 📷									
Remote Desktop Services Manager	-							Act	tions
0 NLBNODE1	C. Manag	ge Remot	e Deskto	p Sess	ion Host	Server Gr	oup: NIbCluster	NB	Cluster
NbCluster	Manage User: Sessions F Server: Server: Server: Serve: Server: Server: Serve: Serve: Server: Serve: Serve: Serve: Serve: Serve: Serve:		Session RDP-Tc., RDP-Tc., RDP-Tc., RDP-Tc., RDP-Tc., RDP-Tc., RDP-Tc.,	1D 2 3 4 5 1 2 3	State Active Active Active Active Active Active	IdeTine 1.39 1.42 1.35 1.36 1.37 1.27	Log0nTme 01-12-2010 01-12-2010 01-12-2010 01-12-2010 01-12-2010 01-12-2010 01-12-2010 01-12-2010 01-12-2010		Cluster Add Computer Emply Group Refresh Vew Delete Rename Heb

You can now select the newly-created group name in the left pane and view the sessions connected to each node of the cluster.

- **3** Add the required computers to the group.
 - **a** In the left pane, right-click the newly created group, and then click **Add Computer**. The **Select Computer** window appears.

Select Computer	×
Select the name of the computer.	
This snap-in will choose:	
C Local computer: (the computer this console is running on)	
<u>A</u> nother computer:	
NLBNODE1	Browse
	1
ОК	Cancel

- **4** Enter name of the new computer.
 - a Click the Another Computer option.
 - b In the Another Computer box, enter the node 1 name of the cluster, and then click OK to close the window. The Remote Desktop Services Manager window appears.

Note: You can either type or click **Browse** to select the required node name.

c Repeat steps 3c and 3d of point 3 to add other node names of the cluster to the newly-created group.

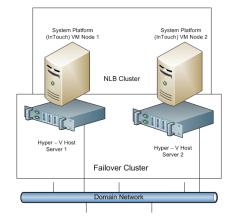
Remote Desitop Services Manager M.BNODE1 Merrore Model Model	Manage Remote Desktop Session Host Server Group: NIbClus								
	Server	User	Session	ID.	State	IdeTime	LogOnTime		
	NLBNODE1	sunithea	RDP-Tc	2	Active		01-12-2010		
	S. NLBNODE1	nbu1	ROP-Te.	3	Active	1:39	01-12-2010		
	& NLBNODE1	nbu3	RDP-Tc	4	Active	1:42	01-12-2010		
	NLBNODE1	nbu5	RDP-Tc	5	Active	1:35	01-12-2010		
	RENLENODE2	sunithaa	Console	1	Active		01-12-2010		
	Se NLBNODE2	nbu2	RDP-Tc.		Active	1:36	01-12-2010		
	NLBNODE2		RDP-Tc		Active	1:37	01-12-2010		
	ALBNODE2	nbu6	RDP-Tc	4	Active	1:27	01-12-2010		

You can now select the newly-created group name in the left pane and view the sessions connected to each node of the cluster.

Configuring Network Load Balancing Cluster on Microsoft Failover Cluster

Windows Server® 2008 R2 provides two clustering technologies: failover clusters and NLB. Failover clusters primarily provide high availability; NLB provides scalability and, at the same time, helps increase availability of Web-based services.

By using a failover cluster, you can ensure that there is nearly constant access to important server-based resources. A failover cluster is a set of independent computers that work together to increase the availability of services and applications. The clustered servers (called nodes) are connected by physical cables and by software. If one of the nodes fails, another node begins to provide service through a process known as failover. NLB that is configured in a failover cluster offers high performance in environments in which each request from a client is stateless, and there is no in-memory application state to maintain



To configure NLB cluster on Microsoft failover cluster

- **1** Set up Microsoft Failover Cluster out of two Hyper-V host servers.
- **2** Configure two VM nodes one on each Hyper-V host server.
- 3 Configure the NLB cluster out of two VM nodes hosted by each Hyper-V host server following the procedures in Leveraging NLB by Configuring Remote Desktop Session Broker on a NLB Cluster Node explained in topology 1. For more information, refer to "Topology 1: Leveraging Network Load Balancing by Configuring Remote Desktop Connection Broker on One of the NLB Cluster Nodes" on page 485.

Understanding the Behavior of NLB Cluster in Microsoft Failover Cluster

- 1 During a live migration of one of the NLB cluster nodes, there are no disruptions in the active sessions connected to the cluster node. The Reconnect window will not appear on the NLB cluster node as there is no disruption of the active session. After the live migration is complete all sessions connected to the NLB cluster node are retained.
- 2 During a quick migration, when one of the Hyper-V host servers (Microsoft Failover Cluster Node) is shut down or switched off and the failover is completed, all active sessions on the NLB cluster node hosted by the Microsoft failover cluster node are automatically connected and all sessions on the NLB cluster node are retained.

Observation while using NLB for Managed InTouch System Platform node Observations:

- The NLB feature is qualified for InTouch managed application. InTouch TSE license is required on each of the NLB cluster nodes.
- Local InTouch Tag Alarms are local to the session. Local InTouch Tag alarms updated in a session remain local to that session only.
- ArchestrA Alarms are common across all sessions. ArchestrA Alarms updated in one of the sessions get reflected across all the sessions.
- For IO tags poking in one session, the data reflects across all the sessions. However, while poking local InTouch tags, data does not get updated across all sessions since it is local to the session.
- When you lose the NLB cluster node with the active sessions, all the active sessions on the NLB cluster node closes. To retain all the active sessions, configure the NLB Cluster in a Microsoft Failover Cluster in a Hyper-V environment. The NLB cluster nodes are VM nodes hosted by Hyper-V host servers and Hyper-V host. For more information, refer to "Configuring Network Load Balancing Cluster on Microsoft Failover Cluster" on page 515.

Hardware Licenses in a Virtualized Environment

Hardware licenses are not supported in the Hyper-V virtualized environment with the release of Windows Server 2008 R2. You may want to verify support under later server editions.

Chapter 8

Creating Virtual Images

About Virtual Images

A virtual image is a software implementation of a machine or computer that executes programs as though it were a physical machine. It is an isolated software container that runs its own operating systems and applications and contains its own virtual or software-based CPU, RAM, hard disk, and network interface card.

There is no functional difference between a virtual and a physical machine. However, a virtual machine offers the following advantages over a physical machine:

- Multiple operating system (OS) environments can exist on the same computer, in isolation from each other
- A virtual machine provides an Instruction Set Architecture (ISA) that is somewhat different from a real machine
- A virtual machine enables application provisioning, maintenance, high availability, and disaster recovery

In a Microsoft virtual environment, you can create and manage virtual images with either System Center Virtual Machine Manager 2008 R2 (SCVMM) or Microsoft® Hyper-V Manager.

SCVMM has specific advantages over Hyper-V Manager, and is used in creating and managing the virtual machines.

SCVMM is a stand-alone server application for managing a virtual environment running on Windows Server 2008 Hyper-V, Microsoft Virtual Server, and VMware hosts. By using SCVMM, you can centrally manage physical and virtual machine infrastructures through a single console. You can create and configure virtual machines in SCVMM by using the SCVMM library, and manage virtual machine hosts by creating host groups.

SCVMM Features

Virtual Machine and Host Management

This feature is used to create and manage virtual machines. If you add a host running Windows Server 2008, which is not Hyper-V enabled, SCVMM 2008 automatically enables the Hyper-V role on the host.

Intelligent Placement

When a virtual machine is deployed, SCVMM 2008 analyzes performance data and resource requirements for both the workload and the host. By using this analysis, you can modify placement algorithms to get customized deployment recommendations.

Library Management

The SCVMM library contains file-based resources and hardware profiles that you can use to create standardized virtual machines.

Physical to Virtual (P2V) and Virtual to Virtual (V2V) Conversion

SCVMM 2008 helps improve the P2V experience by integrating the P2V conversion process and using the Volume Shadow Copy Service (VSS) of Windows Server.

SCVMM 2008 also provides a wizard that converts VMware virtual machines to virtual hard disks (VHDs) through an easy and speedy V2V transfer process.

Existing Storage Area Network (SAN)

Virtual machine images are often very large and are slow to move across a local area network (LAN). You can configure SCVMM 2008 to use the application in an environment that has a fiber channel or a SAN, so that you can perform SAN transfers within SCVMM.

After VMM 2008 is configured, the application automatically detects and uses an existing SAN infrastructure to transfer virtual machine files. This transfer facilitates the movement of large virtual machine files at the fastest possible speed, and reduces the impact on LAN.

Virtual Machine Self-Service Portal

You can designate self-service to users and grant them controlled access to specific virtual machines, templates, and other SCVMM 2008 resources through a Web-based portal. This controlled access helps users, such as testers and developers, to allot new virtual machines to themselves. The users can allot the virtual machines according to the controls you set by using the self-service policies.

Automation with Windows PowerShell

For increased automation and control, you can use Windows PowerShell to run remote scripted services against multiple virtual machines. This lets you avoid the manual processes that are performed in a graphical user interface (GUI). You can also manage host systems by using Windows PowerShell.

Centralized Monitoring and Reporting

Server virtualization enables multiple operating systems to run on a single physical computer as virtual machines. By using the server virtualization technology and VMM, you can consolidate workloads of underutilized servers on to a smaller number of fully-utilized servers and provision new virtual machines. Fewer physical computers lead to reduced costs because of lower hardware, energy, and management overheads.

For more information on SCVMM, refer to "Microsoft System Center Virtual Machine Manager 2008 R2 Reviewer's Guide".

For more information on installation, refer to http://msdn.microsoft.com/en-us/library/dd380687.aspx#SCVMM.

You can create a virtual image (VM) from the following sources:

Operating system ISO image

You can create a VM from an operating system with either an existing ISO file on a network location or an extracted ISO file available on a CD or DVD.

In this process, you can use an ISO on the network location or on a CD, and then modify the hardware configuration. You can then create and generate a VM and store it.

For more information, refer to "Preparing a Virtual Image from an Operating System (OS) Image" on page 523.

Physical machine

You can perform a P2V conversion online or offline.

To start a P2V conversion, SCVMM temporarily installs an agent on the physical source computer that you want to convert. In an online P2V conversion, SCVMM uses VSS to copy data, while the server continues to work with user requests. In this conversion, the source computer does not restart. In an offline P2V conversion, the source computer restarts into the Windows Pre-installation Environment (Windows PE) before SCVMM converts the physical disks to VHDs.

For more information, refer to "Preparing a Virtual Image from a Physical Machine" on page 548.

Another VM image

SCVMM allows you to copy existing virtual machines and create Hyper-V virtual machines.

A V2V conversion process converts virtual machines to VHDs. You can use a V2V conversion to convert either an entire virtual machine or its disk image file to the Microsoft virtual machine format.

To perform a V2V conversion

- **a** Add the host server-based virtual machine files to a SCVMM library.
- **b** Select the **Convert Virtual Machine** option in the Library view in the SCVMM administrator console.

For more information, refer to "Preparing a Virtual Image from Another Virtual Image" on page 574.

Ghost backup

You can create VMs from images supported by third-party vendors, such as Norton (Norton Ghost).

SCVMM allows you to create a virtual machine using VHD images. The VHD images are created using a ghost backup.

To create a virtual machine from a ghost backup

- **a** Create a ghost backup (.GHO).
- **b** Convert a ghost backup (.GHO) to a virtual hard disk (.VHD).
- **c** Create a virtual machine from .VHD.

For more information, refer to "Preparing a Virtual Image from a Ghost Backup" on page 593.

For more information on creating VMs, refer to http://technet.microsoft.com/en-us/library/cc764227.aspx.

The following sections describe how to create virtual images using SCVMM.

Preparing a Virtual Image from an Operating System (OS) Image

You can create virtual images (VMs) from an operating system ISO image. An ISO image (International Organization for Standardization) is an archive file or a disk image of an optical disk. The image is composed of data contents of all the written sectors of an optical disk, including the optical disk file system. VMs can be created from either an existing ISO file on your network location or an extracted ISO file available on a CD or DVD.

Creating a Virtual Image with an ISO File on the Network Location

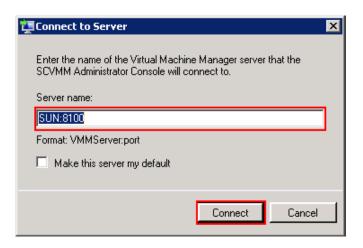
You need to place the ISO file that is available in your network location in the SCVMM library. You can then use the ISO file to create a virtual machine.

To create a virtual image with an ISO file on the network location

1 Copy the required ISO files to the library.

On the library server, copy the ISO files to the required library. For more information, refer to http://technet.microsoft.com/en-us/library/cc956015.aspx).

- 2 Open System Center Virtual Machine Manager (SCVMM).
 - On the Start menu, click All Programs. On the menu, click
 Virtual Machine Manager 2008 R2, and then Virtual Machine
 Manager Administrator Console. The Connect to Server
 window appears.



b In the Server name box, enter "localhost:<port number>" or "<SCVMM server name>:<port number>", and then click
 Connect. The Virtual Machine Manager window appears.

Note: By default, the port number is 8100. However, you can modify it in the SCVMM Server configuration, if required.

	s 🔚 PRO Tes (2) 🚕 Networker	ig 🗾 Powershell 🚯 Help				
Aachines	star.space.com Wit	al Machines (Ritered 9)				Actions
ps	VM				× • Owner	Virtual Machine Manager
ev.	Name ~	Status	Job Status	Host	CPU Average	New virtual machine
dun .	E 2 Owner: SPACE\SivaN					Convert physical server
star	E & Owner: SPACE\sriniva	say				Convert virtual machine
2 Cancer	VMAPP2nT	Running		capricom	3%	Add library server
apricom	WMAppServer	Running		capricom	3 %	Add host
penini al	VMDas	Running		capricom	1 %	Add VMware VirtualCenter server
	VMHistClient	Running		capricom	0%	R Help
	VMHistorian	Running		capricom	6 %	Host Cluster
	VMEnTouch	Running		Cancer	0%	A Move
						2 Refresh
	1					Remove host cluster
	1					T Properties
	1					
						1
Clea						1
-						1
-						1
rstern •						_
						*
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	1					1
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1111100						
Hachines						

- **3** Add ISO files in the SCVMM library.
 - **a** On the **Virtual Machine Manager** window, click **Go**. On the menu, click **Library**. The library servers are displayed.

🖥 Virtual Machine Manager - sun.space.com							_	8 ×
File View Go Actions Help								
💱 📴 Actions 💼 Columns 📕 Jobs 🕞 PRO Tips (0) 💷 Networking 🗵 PowerShell 🕐 He	∋′p							
Library	Library Servers 💷						Actions	
Resources	Search				2	V None V	Virtual Machine Manager	
Overview	Name	Library Server	Туре	Operating System	Owner	Status	New virtual machine	
- Library Servers	🔞 WK8R25td-8DGB	Sun.space.com	Template	64-bit edition of Win	SPACE\sripraneethn	OK	Convert physical server	
Sun space.com MSSCVMMLibrary	GRNODENEW	Sun.space.com	Template	64-bit edition of Win	SPACE\leenag	ОК	Convert virtual machine	
H 🗎 VMMLibrary	WISNODE	Sun.space.com	Template	Windows Server 20		ОК	Add library server	
🚡 VMs and Templates	🚱 W7Ent	Sun.space.com	Template	64-bit edition of Win		ОК	Add host	
🖃 🔤 universe. space. com	GRNode	VMMServer	Template	Unknown	Unknown	Under Creation	Add VMware VirtualCenter	
🚘 Hyper V	WK8R25TD5QL2K8	Sun.space.com	Template	64-bit edition of Win		ОК	server	
WMs and Templates Profiles	W2k8STDSQLWSS	Sun.space.com	Template	Windows Server 20	SPACE\sripraneethn	OK	🔞 Help	
Promes	10 W2K8R2-40GB	Sun.space.com	Template	64-bit edition of Win		ок	Library Actions	
	Blank Disk - Large.vhd		Virtual Hard Disk	Unknown	Unknown	ок		
	👝 Blank Disk - Large .vhd		Virtual Hard Disk	Unknown	Unknown	ок	🔯 New template	
	ServerTemplate_dis		Virtual Hard Disk	Unknown	Unknown	A Missing	1 New hardware profile	
	ServerTemplate_dis		Virtual Hard Disk	Unknown	Unknown	A Missing	New guest OS profile	
Filters Clear	WK85td_disk_1	Sun.space.com	Virtual Hard Disk	Unknown	SPACE\sripraneethn	ок	E Library settings	
Туре	AppServer1_disk_1	Sun.space.com	Virtual Hard Disk	Unknown	SPACE\janar	A Missing	Template	•
Owner 👻	WK85td_disk_1	Sun.space.com	Virtual Hard Disk	Unknown	SPACE\sripraneethn	ок	New virtual machine	
Added date 👻	Blank Disk - Small.vhd	Sun.space.com	Virtual Hard Disk	Unknown	Unknown	OK 🗸	New template	
	WK8R2Std-80GB					•	Repair	
	Description:						Disable	
		SPACE'sripraneethn					X Remove	
	Type:	Template					Froperties	
	Operating system:	64-bit edition of Windo	ws Server 2008 R2 Stand	ard				
		Not Detected						
		12/17/2010 1:23:33 PM						
	Modified:	12/24/2010 11:49:54 A	м					
tosts								
👔 Virtual Machines								
🐺 Library								
jobs								
af Administration								
	Summary Latest Job							

- **b** In the **Resources** pane, right-click the library share where you have copied the files, and then click **Refresh**. The files on the share are indexed in the **Virtual Machine Manager** window and displayed in the **Library Servers** list.
- 4 Open the New Virtual Machine window.

On the Actions menu of the Virtual Machine Manager window, point to Virtual Machine Manager, and then click New Virtual Machine. The Select Source screen on the New Virtual Machine window appears.

🗄 New Virtual Machine	<u>×</u>
🗊 Select Sour	ce
Select Source Virtual Machine Identity Configure Hardware	Select the source for the new virtual machine. Use an existing virtual machine, template, or virtual hard dak. Create the new virtual machine with a blank virtual hard dak Create the new virtual machine with a blank virtual hard dak Create the new virtual machine with a blank virtual hard dak Figure to the new virtual machine with a blank virtual hard dak Figure to the new virtual machine with a blank virtual hard dak Figure to the new virtual machine with a blank virtual hard dak Figure to the new virtual machine with a blank virtual hard dak Figure to the new virtual machine with a blank virtual hard dak Figure to the new virtual machine with a blank virtual hard dak Figure to the new virtual machine or virtual hard dak, you can only customize the hardware settings. If you use a stored virtual machine or a virtual hard dak, you can only customize the hardware settings. To be accessed, a virtual hard dak must be stored in the library.
	Ned Cancel

5 Select the source machine or hard disk you want to use for the new VM.

On the Select Source screen, click the Create the new virtual machine with a blank virtual hard disk option, and then click Next. The Virtual Machine Identity screen appears.

Note: By default, the **Use an existing virtual machine, template, or virtual hard disk** option is selected.

🕕 Virtual Ma	chine Identity
elect Source	Virtual machine name:
rtual Machine Identity	Historian
onfigure Hardware	Owner:
elect Destination	SPACE\sivan Browse
elect Host	Format: domain\username
elect Path	Description:
elect Networks	Creating a New Virtual Machine from the ISO which is on Network Location
ditional Properties	
ummary	
anindiy	
	The virtual machine name identifies the virtual machine to VMM. The name does not have to match the computer name of the virtual machine. However, using the same name ensures consistent displays in System Center Operations Manager.

6 Enter the details of the new VM.

Enter the virtual machine name, owner name, and description name, and then click **Next**. The **Configure Hardware** screen appears.

Note: You can either type or click **Browse** to select the relevant owner name.

Select Source Virtual Machine Identity	Configure hardware for the virtual machine. You can import settings from a hardware profile or save a new profile based on your settings.
Configure Hardware Select Detrination Select Host Select Path Select Networks Additional Properties Summary	Hardware profile New

7 Enter the hardware details for the new VM.

Note: In the **Configure Hardware** screen, ensure that there is at least one network adapter listed under **Network Adapters**.

a In the **Configure Hardware** screen, click **Processor**. The **CPU** area appears.

Configure hardware for the virtual machine. You can import settings from a hardware profile or save a new profile based on your settings.
Hardware profile
Save as...
New: Disk SSI Adapter DVD Remove
Adapter Remove
Hardware Profile
CPU

🖈 Hardware Profile 🔺	CPU
EIOS CD	Number of CPUs: 2
Processor (2) 2.80 GHz Pentiu	CPU type: 2.80 GHz Pentium D (dual core)
512 MB	Compatibility
Floppy Drive No Media Captured	To improve compatibility with different processor versions and older guest operating systems. VMM by default limits the processor features that a virtual machine can use. Select any scenarios that you want to enable.
TOM 1 None	Allow migration to a virtual machine host with a different processor version
TOM 2 None	Run an older operating system, such as Windows NT 4.0
★ Bus Configuration	
2 Devices attached	
Historian_disk_1 40.00 GB, Prim	
Virtual DVD drive No Media Capt	
★ Network Adapters	
Network Adapter 1	The CPU type specifies the processor requirements of the virtual machine, not the specific hardware. This setting is used when calculating host ratings
Not connected	and when setting CPU resource allocations.
Advanced	

b In the **Number of CPUs** and **CPU type** lists, click the relevant details, and then click **Memory**. The **Memory** area appears.

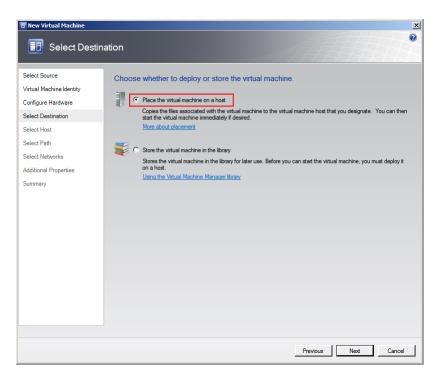
Configure hardware for the profile or save a new profil	e virtual machine. You can import settings from a hardware e based on your settings.
Hardware profile: [New]	•
📙 Save as 🛛 New: 🚙 Disk 🔇	SCSI Adapter 🦼 DVD 🚳 Network Adapter 🛛 📉 Remove
A Hardware Profile BIOS CD CD Processor (2) 1.00 GHz Pentiu Memory 4096 MB Floppy Drive No Media Captured CDM 1	Wemory Virtual machine memory: 4096 ME
None CDM 2 None S Bus Configuration DE Devices 2 Devices attached WISNODE 40.00 GB, Prim Virtual DVD drive No Media Capt S Network Adapters	
 Network Adapter 1 Connected to Exter Network Adapter 2 	Specify how much memory (4.00 MB - 64.00 GB) to allocate to the virtual machine.

c In the **Virtual machine memory** boxes, configure the memory to "4096 MB". Under **Bus Configuration**, click **Virtual DVD drive**. The **Virtual DVD drive** area appears.

📀 Virtual DVD drive
Channel:
Secondary channel (0) (in use)
Capture mode
🔿 No media
Physical CD/DVD drive
 Existing image file:
Browse
Share image file instead of copying it
To share an image file may require additional configuration. More information about sharing image files.
A virtual CD/DVD drive can be linked to a physical CD/DVD drive or an ISO image file.

d Click the **Existing image file** option, and then click **Browse** to select the required ISO image file from the **Select ISO** window. The file name appears in the **Existing image file** box.

e Click Next. The Select Destination screen appears.



f Click the **Place the Virtual Machine on a host** option, and then click **Next**. The **Select Host** screen appears.

🖪 New Virtual Machine				
🗊 Select Host			di litti	
Select Source Virtual Machine Identity Configure Hardware	Select a host for the virtual mathematical based on the virtual machine, click Customize Rat	chine's requirements and de		ange placement options for
Select Destination	Search		P in All Hosts	<u> </u>
Select Host	Rating V Host		Transfer 1	
Select Path		ricorn.space.com		
Select Networks		cer.space.com	Netwo	
Additional Properties	र्व्वत्रेव्वत्रे 🛛 Ven	us.space.com	Netwo	
Summary	☆☆☆☆☆ 🚦 Mere	cury.space.com	Netwo	ərk
		N Explanation		
	Description	ОК		
	Operating system		ver 2008 R2 Enterprise ,	
	Virtualization software	Microsoft Hyper-V		
	Virtualization software status	Up-to-date		
	Virtual machines	Harsh_CommonUI, HCV	ppServerVMNode2, AppVMN1, J /MNODE, HistorianVMNode, InT , NLBNODE3, NLBTEST1, testwi	ouchVMNode,
			Previous	Next Cancel

- 8 Select a host for the new VM.
 - **a** View the rating of each host.
 - **b** Select a suitable host to deploy the VM.

Note: All hosts that are available for placement are given a rating of 0 to 5 stars based on their suitability to host the virtual machine. The ratings are based on the hardware, resource requirements, and expected resource usage of the virtual machine. The ratings are also based on placement settings that you can customize for the VMM or for individual virtual machine deployments. However, the ratings are recommendations. You can select any host that has the required disk space and memory available.

Important: In SCVMM 2008 R2, the host ratings that appear first are based on a preliminary evaluation by SCVMM. The ratings are for the hosts that run Windows Server 2008 R2 or ESX Server. Click a host to view the host rating based on a more thorough evaluation.

c To view the placement settings used by the VMM to rate the hosts, click **Customize Ratings**. The **Customize Ratings** window appears.

C	ustomize Ratings												X
	Placement Options	VM Load											
	Use the following s affect the current o view. <u>More about custor</u>	deploymen	it. To	o modify									
	Placement goal —												-
	Coad balan	icing											
	Hosts with t	the most fi	ee r	esource	es rec	eive hi	gher r	atings.					
	C Resource r	naximizatio	n										
	Hosts that r receive high			l machi	ne's r	equirer	nent w	vith the	e least	free re	esourc	es	
	Resource importan	nce										_	
		Not Im	port	ant						Ver	y Imp	ortant	
	CPU usage:									-			
	Memory free:									-11-		_	
	Disk I/O:	'	1	_iL	·	'	·	'	1			<u>'</u>	
	DISK I/U:												
	Network utilization	с <u> </u>		-ŀ-									
										Restor	e Defa	aults	
									- 7		0 0 0.		
								Г	n	,	1	Cance	
									0	<		cance	

You can modify the settings if required.

- **d** To view additional information about a host rating, select the host and click the following tabs:
- Details

tatus	OK
Operating system	Microsoft Windows Server 2008 R2 Enterprise , Service Pack 1, v.721
Virtualization software	Microsoft Hyper-V
Virtualization software status	Up-to-date
Virtual machines	AppServerVMNode1, AppServerVMNode2, Harsh_CommonUI, HCVMNODE, HistorianVMNode, InTouchVMNode, NLBNODE1, NLBNODE2, NLBNODE3

This tab displays the status of the host and lists the virtual machines that are currently deployed on it.

Ratings Explanation

Details	Rating Explanation	 SAN Explanation 	
١	This host meets all of	the requirements of this	; virtual machine.
I			

This tab lists the conditions that cause a host to receive a zero rating.

• SAN Explanation

Detail	Rating Explanation	 SAN Explanation 			
1	The server gemini.sp cannot be used.	ace.com does not contai	n any host bus adapter (HBA) ports. Fibre Channel SAN transfer		
1	The server gemini.space.com does not have the Microsoft iSCSI Initiator installed. iSCSI SAN transfer cannot be used.				
1	(i) The server gemini.space.com does not have an HBA which supports NPIV.				

This tab lists the conditions that prevent a Storage Area Network (SAN) transfer used to move the virtual machine's files to the host. Click Next. The Select Path screen appears.

е

- × 0 Select Path Select Source Select storage locations on the host for the virtual machine files Virtual Machine Identity Selected host: Cancer.space.com Configure Hardware Guest Operating System Select Destination Browse... Select Host Select Path Select Networks Additional Properties Summary Previous Next Cancel
- **9** Select the storage location for the VM files.

In the **Select Path** screen, enter the path to store the VM files, and then click **Next**. The **Additional Properties** screen appears.

Note: This path refers to the drives that are free to allocate the host machine. One drive is allocated to one virtual machine. You can either type or click **Browse** to select the relevant path.

🗄 New Virtual Machine	X
🕕 Additional P	roperties
Select Source Virtual Machine Identity Configure Hardware Select Destination Select Host Select Path Select Networks Additional Properties Summary	Automatic start action Action when physical server starts: Vever automatically turn on the virtual machine Delay start (Sec): Save State Operating system Speedry the operating system you will install in the virtual machine: 64-bit edition of Windows Server 2008 R2 Enterprise
	Previous Next Cancel

10 Specify any additional properties of the VM.

- a In the Action when physical server starts list, click Never automatically turn on the virtual machine.
- **b** In the Action when physical server stops list, click Save State.

Note: You can configure the details as required.

c From the **Specify the operating system you will install in the virtual machine** list, select the operating system based on the ISO selected, and then click **Next**. The **Summary** screen appears.

🖪 New Virtual Machine		X
🗊 Summary		e e e e e e e e e e e e e e e e e e e
Select Source	Review the virtual n	nachine settings.
Virtual Machine Identity	Summary:	
Configure Hardware	Property	Value
Select Destination	Virtual machine	BASEVMFROMISO
	Owner	SPACE\sivan
Select Host	Destination host	Capricorn.space.com
Select Path	Path	W:\BASEVMFROMISO
Select Networks	Operating System	64-bit edition of Windows Server 2008 R2 Enterprise
Additional Properties		
Summary	✓ Start the virtual maching	he after deploying it on the host
	(j) To create the virtual	machine, click Create. You can track progress of this job by viewing the Jobs page.
		Previous Create Cancel

11 Create the new VM.

Select the **Start the Virtual machine after deploying it on the host** check box if required, and then click **Create**. The virtual machine is created and the **Jobs** window appears.

Refresh host duster Completed 11/23/2010 3:43:19 PM Capricorn.space SPACE\SivaN Create virtual machine Property Previous Value New Value No changes are available while the job is running. Summary Details Change Tracking	Jobs				_ 0
Oreate virtual m 14 % 11/23/2010 3:47:52 BASEVMFRO SPACE\SivaN Refresh host duster Completed 11/23/2010 3:43:19 PM Capricorn.space SPACE\SivaN Create virtual machine Property Previous Value New Value New Value No changes are available while the job is running. Summary Details Change Tracking					(
Refresh host duster Completed 11/23/2010 3:43:19 PM Capricorn.space SPACE\SivaN Create virtual machine Property Previous Value New Value No changes are available while the job is running. Summary Details Change Tracking					
Create virtual machine Property Previous Value No changes are available while the job is running. Summary Details Change Tracking	🜔 Create virtual m.		14 % 11/23/2010 3:47:52	2 BASEVMFRO	SPACE\SivaN
Property Previous Value New Value No changes are available while the job is running. Bummary Details Change Tracking	🕢 Refresh host cluste	r Completed	11/23/2010 3:43:19 PM	Capricorn.space	SPACE\SivaN
Property Previous Value New Value No changes are available while the job is running.					
Property Previous Value New Value No changes are available while the job is running. Summary Details Change Tracking					
Property Previous Value New Value No changes are available while the job is running. Bummary Details Change Tracking					
Property Previous Value New Value No changes are available while the job is running.					
Property Previous Value New Value No changes are available while the job is running.					
Property Previous Value New Value No changes are available while the job is running.					
Property Previous Value New Value No changes are available while the job is running.					
Property Previous Value New Value No changes are available while the job is running. ummary Details Change Tracking					
No changes are available while the job is running.					
Summary Details Change Tracking	Create virtual mac	nine			
	Property	Pre		New Value	
	Property	Pre		New Value	
	Property	Pre		New Value	
	Property	Pre		New Value	
	Property	Pre		New Value	
	Property	Pre		New Value	
	Property	Pre		New Value	
	Property	Pre		New Value	
Show this window when new objects are created Restart Job Cancel Job	Property No changes are available	Pre		New Value	

12 Verify the VM.

Verify if there are any errors logged. The completed status confirms that the VM has been created successfully.

Creating a Virtual Image from Extracted ISO Available on CD or DVD

If you do not have an ISO file available on your network location you can use an ISO file available on a CD or DVD.

To create a virtual image from Extracted ISO Available on CD or DVD

- **1** Open the System Center Virtual Machine Manager (SCVMM).
 - a On the Start menu, click All Programs. On the menu, click
 Virtual Machine Manager 2008 R2, and then Virtual Machine
 Manager Administrator Console. The Connect to Server
 window appears.

📜 Connect to Server	×
Enter the name of the Virtual Machine Manager server that the SCVMM Administrator Console will connect to.	
Server name:	
SUN:8100	
Format: VMMServer:port	
Make this server my default	
Connect Cancel	

b In the Server name box, enter "localhost:<port number>" or "<SCVMM server name>:<port number>", and then click
 Connect. The Virtual Machine Manager window appears.

Note: By default, the port number is 8100. However, you can modify it in the SCVMM server configuration, if required.

achines star.space.com	irtual Machines (Ritered 9)				Actions
s vm				× • Owner	Virtual Machine Manager
Rame ~	Status	Job Status	Host	OPU Average	New virtual machine
					Convert physical server
ar B & Owner: SPACE\srin	ivasay				Convert virtual machine
2 Cancer () VMAPP2nT	Running		capricom	3%	Add library server
emini () VMAppServer	Running		capricom	3 %	Add heat
0	Running		capricom	1%	Add VMware VirtualCenter server
() vessioner	Running		capricare	0%	😧 Help
() VMHstorian	Running		capricorn	6%	Host Cluster
WithTouch	Running		Cancer	0%	Ph. Move
					2 Refresh
					Kemove host cluster
					Properties
					1
Clear					1
*					1
*					1
dem 💌					
 Details 					*
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2 Open the New Virtual Machine window.

On the Actions menu of the Virtual Machine Manager window, point to Virtual Machine Manager, and then click New Virtual Machine. The Select Source screen on the New Virtual Machine window appears.

New Virtual Machine Select Sour	ce	•
Select Source Virtual Machine Identity Configure Hardware	Select the source for the new virtual machine. C Use an existing virtual machine, template, or virtual hard dak C Create the new virtual machine with a blank virtual hard disk	Browse
	If you use a template, you can customize the hardware and operating system settings. machine or a virtual hard disk, you can only customize the hardware settings. To be ac be stored in the library.	F you use a stored virtual cessed, a virtual hard disk must
		Next Cancel

3 Select the source machine or hard disk you want to use for the new VM.

On the Select Source screen, click the Create the new virtual machine with a blank virtual hard disk option, and then click Next. The Virtual Machine Identity screen appears.

🖥 New Virtual Machine				
🗊 Virtual Machin	e Identity			
Select Source	Virtual machine name:			
Virtual Machine Identity	Historian			
Configure Hardware	Owner:			
Select Destination	SPACE\sivan Browse			
Select Host	Format: domain\username			
Select Path	Description:			
Select Networks	Creating a New Virtual Machine from the ISO which is on Network Location			
Additional Properties				
Summary				
	(i) The virtual machine name identifies the virtual machine to VMM. The name does not have to match the computer name of the virtual machine. However, using the same name ensures consistent displays in System Center Operations Manager.			
	Previous Next Cancel			

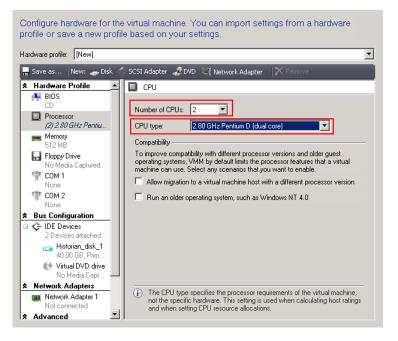
4 Enter the details of the new VM.

Enter the virtual machine name, owner name, and description name, and then click **Next**. The **Configure Hardware** screen appears.

Note: You can either type or click **Browse** to select the relevant owner name.

Select Source Virtual Machine Identity	Configure hardware for the virtual machine. You can import profile or save a new profile based on your settings.	t settings from a hardware
Configure Hardware	Hardware profile: [New]	•
Select Destination	📕 Save as New: 🚙 Disk 🖑 SCSI Adapter 🎿 DVD 🔯 Network Ada	apter X Remove
Select Host	A Hardware Profile	
Select Path	N BIOS	
Select Networks	CD Channel Primary channel (0) (in use)	
dditional Properties	(1) 1.20 GHz Athlon Diak	
	512 MB C Use an existing virtual hard disk	
Summary	Floppy Drive Create a new virtual hard disk	
	No Media Captured C Pass through to physical drive on hos	t
	None	
	Type: Dynamic	<u> </u>
	Size: 40	GB
	G G IDE Devices File name:	
	2 Devices attached [Historian_disk_1 Historian_disk_1 Example: data_disk	
	40.00 GB, Prim	
	Virtual DVD drive No Media Capt	
	A Network Adapters	
	Network Adapter 1	
	Advanced	

- **5** Enter the hardware details for the new VM.
 - **a** On the **Configure Hardware** screen, click **Processor**. The **CPU** area appears.



b In the **Number of CPUs** and **CPU type** lists, click the relevant details, and then click **Memory**. The **Memory** area appears.

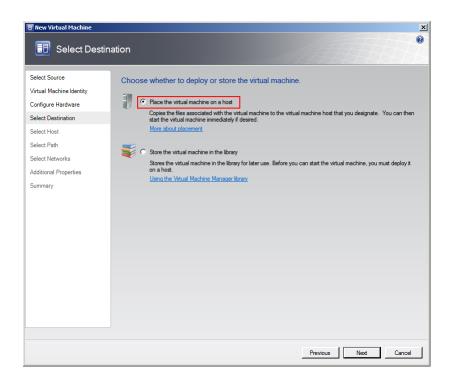
Configure hardware for the virtual machine. You can import settings from a hardware profile or save a new profile based on your settings.		
Hardware profile: [New]		
📙 Save as 🛛 New: 🚙 Disk 🔇	SCSI Adapter 🦼 DVD 🖾 Network Adapter 🛛 📉 Remove	
* Hardware Profile	mm Memory	
EIOS CD		
(2) 1.00 GHz Pentiu	Virtual machine memory: 4096 💮 MB 💌	
Memory 4096 MB		
Floppy Drive		
TOM 1 None		
TOM 2		
Bus Configuration		
DE Devices 2 Devices attached		
G WISNODE 40.00 GB, Prim		
No Media Capt		
★ Network Adapters		
Network Adapter 1 Connected to Exter Network Adapter 2	Specify how much memory (4.00 MB - 64.00 GB) to allocate to the virtual machine.	

c In the **Virtual machine memory** boxes, configure the memory to "4096 MB". Under **Bus Configuration**, click **Virtual DVD drive**. The **Virtual DVD drive** area appears.

📀 Virtual DVD drive
Channel:
Secondary channel (0) (in use)
Capture mode
O No media
Physical CD/DVD drive
C Existing image file:
Browse
Share image file instead of copying it
To share an image file may require additional configuration. More information about sharing image files.
More mornation about snaming made mes.
 A virtual CD/DVD drive can be linked to a physical CD/DVD drive or an ISO image file.

d Click the **Physical CD/DVD drive** option, and then click **Next**. The **Select Destination** screen appears.

Note: You need to insert the bootable OS in the CD/DVD drive of the host server machine when you need to create the virtual machine.



e Click the Place the virtual machine on a host option, and then click Next. The Select Host screen appears.

Select a nost for the Virtual machine. Select Destination Search Searc	New Virtual Machine				
Select a nost for the Virtual machine. Select a nost for the Virtual machine. Select a nost for the Virtual machine and default placement options. To change placement options for this virtual machine, click Customize Ratings. Search Rating Host Rating Host Rating Host Rating Host Carcer.space.com Network Rating Venus.space.com Network Customize Ratings. Detais Virtual machine Venus.space.com Network Customize Ratings. Detais Virtual machine ServerVNNode 1, AppServerVNNode 2, AppVNN1, AppVNN2, Harsh CommonUI, HCVMNOE, InStruct/MNNode, Network Virtual machines Network AppServerVNNode 1, AppServerVNNode 2, AppVNN1, AppVNN2, Harsh CommonUI, HCVMNNOE, NETWORK, Network Netwo	🗊 Select Host				
Details Rating Explanation Image: Constraint of Constraints of Const	Select Source Airtual Machine Identity Configure Hardware Select Destination Select Host Select Path Select Networks Additional Properties Summary	Hosts are rated based on this virtual machine, click Search Rating V	the virtual machine's requirements Customize Ratings. Host gemini.space.com Capricorn.space.com Cancer.space.com Venus.space.com	P in Al Hosts Transfer T Networ Networ Networ Networ	ype Network k k k k
Status OK Operating system Microsoft Windows Server 2008 R2 Enterprise , Virtualization software Microsoft Hyper-V Virtualization software status Up-to-date AppServerVMNode 1, AppServerVMNode2, AppVMN1, AppVMN2, Harsh_CommonUJ, HCVMNODE2, HISTERST 1, etswinsde, Wishole, NERNODE1, NERVSDE2,			ation (j) SAN Explanation	What do these ratings mean?	Customize Ratings
Operating system Microsoft Windows Server 2008 R2 Enterprise , Virtualization software Microsoft Hyper-V Virtualization software status Up-to-date AppServerVMNode 1, AppServerVMNode2, AppVMN1, AppVMN2, Harsh_CommonUJ, HCVMNODE, HistorianVMNode, InTouchVMNode, NERVOEE1, NERVOEE1, NERVOEE1, NERTST1 (testworde, Wistode,					
Virtualization software Microsoft Hyper-V Virtualization software status Up-to-date AppServerVMNode 1, AppServerVMNode2, AppVMN1, AppVMN2, Harsh_CommonUJ, HCVMNODE, HistorianVMNode, InTouchVMNode, NLBNODE1, NLBNODE2, NLBITEST1, testwisnede, Wiskode,				us Server 2008 P.2 Enterprise	
Virtualization software status Up-to-date AppServerVMNode 1, AppServerVMNode2, AppVMN 1, AppVMN2, Harsh_CommonLit, HCVMNODE, HistorianVMNode, InTouchVMNode, Virtual machines NLENDOE1, NLENDOE2, NLENTEST 1, testwinode, Wiskode,					
Virtual machines Harsh_CommonUI, HCVMNODE, HistorianVMNode, InTouchVMNode, NLBNODE1, NLBNODE2, NLBNODE3, NLBTEST1, testwisnode, WisNode,		Virtualization software	e status Up-to-date		
		Virtual machines	Harsh_CommonU NLBNODE1, NLB	JI, HCVMNODE, HistorianVMNode, InTo	uchVMNode,

- 6 Select a host for the new VM.
 - a View the rating of each host.
 - **b** Select a suitable host to deploy the VM.

Note: All hosts that are available for placement are given a rating of 0 to 5 stars based on their suitability to host the virtual machine. The ratings are based on the hardware, resource requirements, and expected resource usage of the virtual machine. The ratings are also based on placement settings that you can customize for the VMM or for individual virtual machine deployments. However, the ratings are recommendations. You can select any host that has the required disk space and memory available.

Important: In SCVMM 2008 R2, the host ratings that appear first are based on a preliminary evaluation by SCVMM. The ratings are for the hosts that run Windows Server 2008 R2 or ESX Server. Click a host to view the host rating based on a more thorough evaluation.

c To view the placement settings used by the VMM to rate the hosts, click **Customize Ratings**. The **Customize Ratings** window appears.

Cu	ustomize Ratings											×
Γ	Placement Options V	M Load	1									
	Use the following set affect the current dep view. More about customiz	oloymer	nt. To	modify								
	Placement goal											
	C Load balancia											
	Hosts with the			esource	es rec	eive n	igner r	atingis				
	C Resource ma Hosts that me receive highe	et the v	virtua	l machi	ne's r	equire	ment v	vith the	e least	free re	sourc	es
	Resource importance											_
		Not In	nporta	ant						Ver	y Impo	ortant
	CPU usage:											
	Memory free:	-		,			,			ļ		
	Disk I/O:	-		ļ		,	,					
	Network utilization:			-		,	,					
										Restor	e Defa	aults
									01	<		Cancel

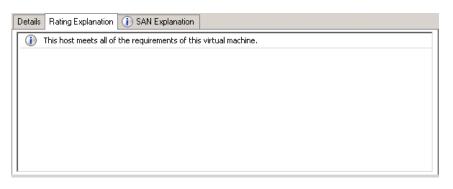
You can modify the settings if required.

- **d** To view additional information about a host rating, select the host and click the following tabs:
- Details

Status	ОК
Operating system	Microsoft Windows Server 2008 R2 Enterprise , Service Pack 1, v.721
Virtualization software	Microsoft Hyper-V
Virtualization software status	Up-to-date
Virtual machines	AppServerVMNode1, AppServerVMNode2, Harsh_CommonUI, HCVMNODE, HistorianVMNode, InTouchVMNode, NLBNODE1, NLBNODE2, NLBNODE3

This tab displays the status of the host and lists the virtual machines that are currently deployed on it.

• Ratings Explanation

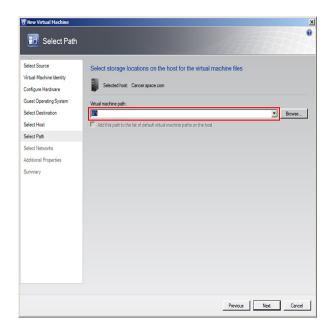


This tab lists the conditions that cause a host to receive a zero rating.

• SAN Explanation

Bating Explanation 🕕 SAN Explanation
The server gemini.space.com does not contain any host bus adapter (HBA) ports. Fibre Channel SAN transfer cannot be used.
The server gemini.space.com does not have the Microsoft iSCSI Initiator installed. iSCSI SAN transfer cannot be used.
The server gemini.space.com does not have an HBA which supports NPIV.
s

This tab lists the conditions that prevent a Storage Area Network (SAN) transfer used to move the virtual machine's files to the host. e Click Next. The Select Path screen appears.



7 Select the storage location for the VM files.

On the **Select Path** screen, enter the path to store the VM files, and then click **Next**. The **Additional Properties** screen appears.

Note: This path refers to the drives which are free to allocate the host machine. One drive is allocated to one virtual machine. You can either type or click **Browse** to select the relevant path.

🖪 New Virtual Machine	×
🗊 Additional Pi	operties
Select Source Virtual Machine Identity Configure Hardware Select Destination Select Path Select Networks Additional Properties Summary	Automatic start action — Action when physical server starts: Never automatically turn on the vartual machine Delay start (Sec): Sec Specify the operating system Specify the operating system Specify the operating system Specify the operating system Specify the operating system
	Previous Next Cancel

- **8** Specify any additional properties of the VM.
 - a In the Action when physical server starts list, click Never automatically turn on the virtual machine.
 - **b** In the Action when physical server stops list, click Save State.

Note: You can configure the details as required.

c From the **Specify the operating system you will install in the virtual machine** list, select the operating system based on the ISO selected, and then click **Next**. The **Summary** screen appears.

🗄 New Virtual Machine		<u>×</u>
🗊 Summary		•
Select Source	Review the virtual n	nachine settings
Virtual Machine Identity	Summary:	naonino sotungs.
Configure Hardware	Property	Value
Select Destination	Virtual machine	BASEVMFROMISO
	Owner	SPACE\sivan
Select Host	Destination host	Capricorn.space.com
Select Path	Path	W:\BASEVMFROMISO
Select Networks	Operating System	64-bit edition of Windows Server 2008 R2 Enterprise
Additional Properties		
Summary		
Summary		
	Start the virtual machin	ne after deploying it on the host
	 To create the virtual 	machine, click Create. You can track progress of this job by viewing the Jobs page.
		Previous Create Cancel

9 Create the new VM.

Select the **Start the Virtual machine after deploying it on the host** check box if required, and then click **Create**. The virtual machine is created and the **Jobs** window appears.

	Name	Status	Start Time		Result Name	Owner
D	Create virtual m		14 % 11/23/2	2010 3:47:52	. BASEVMFRO	SPACE\Sival
V	Refresh host cluster	Completed	11/23/20	10 3:43:19 PM	Capricorn.space	SPACE\SivaN
) C	Create virtual machir	пе				
_		ne	Previous Value		New Value	
Pro	Create virtual machir perty changes are available w				New Value	
Pro	perty				New Value	
Pro	perty				New Value	
Pro	perty				New Value	
Pro	perty				New Value	
Pro	perty				New Value	
Pro	perty				New Value	

10 Verify the VM.

Verify if there are any errors logged. The completed status confirms that the VM has been created successfully.

Tips and Recommendations

Note the following points while creating a VM from an extracted ISO available on a CD or a DVD:

- **1** Insert the bootable OS CD/DVD in the CD/DVD drive of the host server machine.
- **2** Stop the virtual machine created.
- **3** Select **No Media** in the virtual machine properties in the Virtual Drive Area.

If you do not do these, you will get the following warning message:

Warning (12711)

"VMM cannot complete the WMI operation on server <server name> because of error: [MSCluster_Resource.Name="SCVMM Historian DVD"] the group or resource is not in the correct state to perform the requested operation.

(The group or resource is not in the correct state to perform the requested operation (0x139F)"

Preparing a Virtual Image from a Physical Machine

You can prepare a virtual image from a physical machine using the following:

- Disk2vhd
- System Center Virtual Machine Manager (SCVMM)

Disk2vhd helps you create Virtual Hard Disk (VHD) versions of physical disks that you can use in Microsoft Virtual PCs or Microsoft Hyper-V VMs. Disk2vhd also helps you create VHDs on local volumes, even ones being converted, although this is not recommended.

One of the advantages of using Disk2vhd is that you can run it on an online system. Disk2vhd uses Volume Snapshot capability, introduced in Windows XP, to create consistent point-in-time snapshots of the volumes you want to include in a conversion.

For more information on Disk2vhd, refer to http://technet.microsoft.com/en-us/sysinternals/ee656415.aspx.

System Center Virtual Machine Manager (SCVMM) allows you to convert an existing physical computer into a VM. During a physical-to-virtual machine conversion (P2V conversion), images of the hard disks on the physical computer are created and formatted as virtual hard disks. These images are used in the new virtual machine. The new virtual machine has the same computer identity as the source machine. SCVMM provides a conversion wizard that automates most of the conversion process.

The following sections describe how to create a virtual image from a physical machine using SCVMM.

You can create a VM from either an online or an offline source machine.

During the creation of a VM from a source machine, SCVMM temporarily installs an agent on the source computer that you want to convert.

For an online P2V conversion, SCVMM uses Volume Shadow Copy Service (VSS) to copy data while the server continues to work with user requests. The source computer is not restarted during the conversion.

For an offline P2V conversion, the source computer restarts into the Windows Pre-installation Environment (Windows PE) before SCVMM converts the physical disks to VHDs.

Creating a Virtual Image from a Physical Machine - Online Conversion

You can create a virtual machine from a physical machine in the online mode. This means the source machine continues to function normally during the conversion. The Virtual Machine Manager creates a copy of local New Technology File System (NTFS) volumes and data of VSS-aware applications. The VSS ensures that data is backed up consistently while the source machine continues to work with user requests. The VMM uses the read-only checkpoint to create a VHD.

Note: Since SCVMM uses HTTP and WMI services, ensure that WMI service is running and a firewall is not blocking HTTP and WMI traffic at the source machine.

To create a virtual image from an online physical machine

- **1** Open the System Center Virtual Machine Manager (SCVMM).
 - a On the Start menu, click All Programs. On the menu, click
 Virtual Machine Manager 2008 R2, and then Virtual Machine
 Manager Administrator Console. The Connect to Server
 window appears.

📜 Connect to Server	×
Enter the name of the Virtual Machine Manager server that the SCVMM Administrator Console will connect to.	
Server name:	
SUN:8100	
Format: VMMServer:port	
Make this server my default	
Connect	

In the Server name box, enter "localhost:<port number>" or "<SCVMM server name>:<port number>", and then click
 Connect. The Virtual Machine Manager window appears.

Note: By default, the port number is 8100. However, you can modify it in the SCVMM server configuration, if required.

columns i tota 🖬 🕫		ng 📓 Powershell 👔 In tual Machines (Ritered 9)				Actions
clines sta	ispace.com	the restrict (merce t)			X 💌 Owner	Virtual Machine Manager
	Name +	Status	Job Status	Host	OfU Average	
12	Owner: SPACE\Sival		AN DEM	1 1005	1 CPO WHE HOP	New virtual machine
	Owner: SPACE\sriniv					Convert physical server
	WMAPPINT	Running		capricom	3%	Add library server
	WMAppGerver	Running		capricom	3%	Add host
	VHDas	Running		capricom	1%	Add VMware VirtualCenter server
0	VMHstClent	Running		capricom	0%	M Help
Č.	VMHistorian	Running		capricom	6 %	
	VMEnTouch	Running		Cancer	0%	Host Cluster
	-					🚵 Move
						2 Refresh
						🔀 Remove host cluster
						T Properties
						1.10125200000
						1
Clear						1
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m • Defe	2.					-
	15					
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2 Open the Convert Physical Server (P2V) Wizard window.

On the Actions menu of the Virtual Machine Manager window, point to Virtual Machine Manager, and then click Convert Physical Server. The Select Source screen in the Convert Physical Server (P2V) Wizard window appears.

Convert Physical Server		×
Select Source Virtual Machine Identity System Information Volume Configuration Select Hoat Select Hoat Select Path Select Networks Additional Properties Conversion Information Summary	Select the physical computer that you want to convert to a virtual machine. Computer name or IP address: IPCINSQL25 space com Administrative account Specify the administrative account to use to connect to the physical computer. User name: kc Password: Domain or computer name: SPACE IP the source machine is not in a domain, specify the source machine name or IP address.	
	Requirements for a P2V conversion Next Can	cel

3 Enter the source machine details.

On the **Select Source** screen, enter the computer name or IP address, user name, password, and the domain name, and then click **Next**. The **Virtual Machine Identity** screen appears.

Note: You can either type the computer name or click **Browse** to select the required computer name.

🕕 Virtual Mac	hine Identity
elect Source	Virtual machine name:
irtual Machine Identity	IDCINSQL25
ystem Information	Owner:
olume Configuration	SPACE\kc Browse
'M Configuration	Format: domain\username
elect Host	Description:
elect Path	P2V Conversion: Machine Containing IOM Products
elect Networks	
dditional Properties	
onversion Information	
ummary	
	(i) The virtual machine name identifies the virtual machine to VMM. The name does not have to match the computer name of the virtual machine. However, using the same name ensures consistent displays in System Center Operations Manager.

4 Enter the virtual machine details.

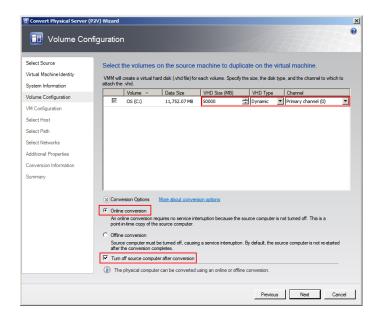
Enter the virtual machine name, owner name, and description name, and then click **Next**. The **System Information** screen appears.

Note: You can either type or click **Browse** to select the relevant owner name.

System Info	To gather system information VMM temporarily installs a VMM agent on the source
Virtual Machine Identity	machine. Click Scan System to install the agent and begin gathering system information.
System Information	
Volume Configuration VM Configuration	More about physical to withus conversions Scan System
Select Host	If the source machine has encrypted volumes, an offline P2V convention might render the system unbodable. We highly recommend that you not convert a source machine that has encrypted volumes.
Select Networks	
Additional Properties Conversion Information	System Information
Summary	Operating System OS Vesion: Microsoft Windows Server 2008 R2 Standard Processor Count: 2 Hard Drive C 48 83 GB Volume C 48 83 GB Network: Adaptes Local Area Connection 5 (Broadcom Net/Unrene 57x: Gigabit Controller)

5 Install an agent in the source machine.

Click **Scan System** to install the agent in the source machine, and then click **Next**. The **Volume Configuration** screen appears.



- **6** Configure the volume for the new VM.
 - **a** Select the relevant VHD size, VHD type, and channel.
 - **b** Click the **Online conversion** option.
 - **c** Select the **Turn Off source computer after conversion** check box, and then click **Next**. The **Virtual Machine Configuration** screen appears.

Convert Physical Server (P	
🕕 Virtual Machi	ine Configuration
Select Source Virtual Machine Identity System Information Volume Configuration Select Host Select Path Select Path Select Networks Additional Properties Conversion Information Summary	Specify the processors and memory for the new machine. Number of processors: 2 * Memory: 4056 * MB *
	Previous Next Cancel

7 Specify the number of processors and memory for the new VM.

Select the required figures from the **Number of processors** and **Memory** boxes, and then click **Next**. The **Select Host** screen appears.

Convert Physical Server			All				
Select Source Virtual Machine Identity System Information	Select a host for the Hosts are rated based on the this virtual machine, click Cu	e virtual machine's requirements a	nd default placement options. To cha	nge placement options for			
Volume Configuration	Search		P in All Hosts	•			
VM Configuration	Rating ~	Host	Transfer T	ype Network			
Select Host	****	Cancer.space.com	Netwo				
Select Path	*****	gemini.space.com	Netwo				
	ARRAR Jacharhan	Venus.space.com	Network Network				
Select Networks	****	Mercury.space.com	Netwo				
Additional Properties	AAAAA	- Hereu y apocercom	12.10010				
Conversion Information							
Summary	S Details		What do these ratings mean?	Customize Ratings			
	Details Rating Explanation	on () SAN Explanation					
	Description						
	Status	ОК					
	Operating system		Server 2008 R2 Enterprise ,				
	Virtualization software		Microsoft Hyper-V Up-to-date BASEVMAPP, BASEVMHISTORIAN, BASEVMINTOUCH, VMAPPINT,				
	Virtual machines		VMAppServer, VMDas, VMHistClient, VMHistorian, VMInTouch, VMWISNode				
			Previous	Next Cancel			

- **8** Select a host for the new VM.
 - a View the rating of each host.
 - **b** Select a suitable host to deploy the VM.

Note: All hosts that are available for placement are given a rating of 0 to 5 stars based on their suitability to host the virtual machine. The ratings are based on the hardware, resource requirements, and expected resource usage of the virtual machine. The ratings are also based on placement settings that you can customize for the VMM or for individual virtual machine deployments. However, the ratings are recommendations. You can select any host that has the required disk space and memory available.

Important: In SCVMM 2008 R2, the host ratings that appear first are based on a preliminary evaluation by SCVMM. The ratings are for the hosts that run Windows Server 2008 R2 or ESX Server. Click a host to view the host rating based on a more thorough evaluation.

c To view the placement settings used by the VMM to rate the hosts, click **Customize Ratings**. The **Customize Ratings** window appears.

Customize Ratings												×
Placement Options	/M Loa	d										_
Use the following settings to configure how host ratings are calculated. Changes only affect the current deployment. To modify the defaults, update settings in Administration view. <u>More about customizing host ratings</u>												
Placement goal												
• Load balance	ing											
Hosts with th	ie most	free re	esource	es rec	eive hi	gher r	atings.					
C Resource ma	aximizat	ion										
	Hosts that meet the virtual machine's requirement with the least free resources receive higher ratings.											
Resource importance	e —											
	Not Ir	nporta	ant						Ve	y Impe	ortant	
CPU usage:	—								-U-			
		1		1	1	1					1	
Memory free:										•	,	
Disk I/O:	_		-#-								_	
Network utilization:			-									
		1	T	1	1	1		1	1		1	
									Restor	e Defa	aults	
								0	<		Cancel	

You can modify the settings if required.

- **d** To view additional information about a host rating, select the host and click the following tabs:
- Details

Status	ОК
Operating system	Microsoft Windows Server 2008 R2 Enterprise , Service Pack 1, v.721
/irtualization software	Microsoft Hyper-V
/irtualization software status	Up-to-date
/irtual machines	AppServerVMNode1, AppServerVMNode2, Harsh_CommonUI, HCVMNODE, HistorianVMNode, InTouchVMNode, NLBNODE1, NLBNODE2, NLBNODE3

This tab displays the status of the host and lists the virtual machines that are currently deployed on it.

Ratings Explanation

Details Rating Explanation 🕕 SAN Explanation
This host meets all of the requirements of this virtual machine.

This tab lists the conditions that cause a host to receive a zero rating.

SAN Explanation

Deta	ails Rating Explanation 🕕 SAN Explanation						
(The server gemini.space.com does not contain any host bus adapter (HBA) ports. Fibre Channel SAN transfer cannot be used.						
(The server gemini.space.com does not have the Microsoft iSCSI Initiator installed. iSCSI SAN transfer cannot be used.						
1	The server gemini.space.com does not have an HBA which supports NPIV.						

This tab lists the conditions that prevent a Storage Area Network (SAN) transfer used to move the virtual machine's files to the host. e Click Next. The Select Path screen appears.

Note: If no host in the list has sufficient disk space to host the new virtual machine, click **Previous** to return to the **Volume Configuration** screen and reduce the size of one or more volumes. You can also override the default placement options that VMM uses to calculate the host ratings. Any changes that you make apply only for the virtual machine that you are deploying.

Convert Physical Server (P	2V) Wizard
🕕 Select Path	•
Select Source	Select storage locations on the host for the virtual machine files
Virtual Machine Identity System Information	Selected host: Cancer space.com
Volume Configuration VM Configuration	Virtual machine path:
Select Host	Browse Add this path to the list of default virtual machine paths on the host.
Select Path	 Place the part to the link of declars without movinine places of the most
Select Networks	
Additional Properties	
Conversion Information	
Summary	
	Previous Next Cancel

9 Select the storage location for the VM files.

On the **Select Path** screen, enter the virtual machine path, and then click **Next**. The **Select Networks** screen appears.

Note: This path refers to the drives that are free to allocate the host machine. One drive is allocated to one virtual machine. You can either type or click **Browse** to select the relevant path.

Convert Physical Server (Select Netwo					2
Select Source Virtual Machine Identity System Information	10	tual networks t	o use for the virtua	I machine.	
Volume Configuration	Physical Network A	Location	Network Tag	Virtual Network	
VM Configuration	Network Adapter 1	space.com		(equivalent) space.com - External	-
Select Host					
Select Path					
Select Networks					
Additional Properties					
Conversion Information					
Summary					
	1			Restore	Defaults
	The Virtual Networe	k field contains virtu	al networks that are config	ured for each physical network adapter on th	e host.
				Previous Next	Cancel

10 Select the network to be used for the new VM.

In the Virtual Network list, click the virtual network you want to use for the virtual machine, and then click Next. The Additional Properties window appears.

E Convert Physical Server (P2V) Wizard X
🕕 Additional P	roperties
Select Source Virtual Machine Identity System Information Volume Configuration VM Configuration Select Host	Automatic start action Action when physical server starts: Never automatically turn on the virtual machine Delay start (Sec) Delay start (Sec) Action when physical server stops: Save State
Select Path Select Networks	
Additional Properties	
Conversion Information Summary	
	Previous Next Cancel

11 Specify the actions you want the VM to perform when the physical server starts or stops.

Select the actions as required, and then click **Next**. The **Conversion Information** screen appears.

E Convert Physical Server (F	P2V) Wizard	×
Conversion I	Information	•
Select Source Virtual Machine Identity System Information Volume Configuration Select Host Select Path Select Networks Additional Properties Conversion Information Summary	To proceed you must resolve the following issues. ① No issues detected. No issues detected.	Check Again
	Previous Next	Cancel

12 Verify if there are any issues with the conversion, and then click **Next**. The **Summary** screen appears.

🖥 Convert Physical Server (Pa	2V) Wizard		X
🗊 Summary			0
Select Source Virtual Machine Identity System Information	Before you conver chose. Summary:	t the physical server to a virtual machine, review th	ne settings that you
Volume Configuration	Property	Value	
	Source	IDCINSQL25.space.com	
VM Configuration	Virtual machine	IDCINSQL25	
Select Host	Owner	SPACE/kc	
Select Path	Destination host	Cancer.space.com	
Select Networks	Path	M:\IDCINSQL25	
Additional Properties			
Conversion Information			
Summary			
	To convert the phys	ne after deploying it on the host ical server into a vitual machine, click Create. You can track progree	View Script
	Jobs page.	Previous	Create Cancel

13 Create the VM.

View the settings that you have selected for the virtual machine, and then click **Create**. The virtual machine is created and the conversion details are displayed in the **Virtual Machine Manager** window.

Note: It takes about 45 minutes to convert to a virtual machine.

File View Go Actions H								
🛿 Actions 🎫 Columns 📓 Jobs	Jobs Jobs (fitered		Help				Actions	
bs	Search	,			(None None	Virtual Machine Manager	_
Overview	Name	Status	Start Time 🔻	End Time	Result Name	Owner		
Jobs	Start virtual ma		11/24/2010 4:04:50 PM	11/24/2010 4:05:00 PM	IDCINSOL25	SPACE\kc	New virtual machine	
	Physical-to-virt	tual conve Completed	11/24/2010 3:15:02 PM	11/24/2010 4:00:36 PM	IDCINSOL25	SPACE\kc	Convert physical server	
	Perform prerect	uisites ch Completed	11/24/2010 3:11:43 PM	11/24/2010 3:11:45 PM	IDCINSQL25.space.com	SPACE\kc	Convert virtual machine	
ers <u>Clear</u>	O Collect machine	e configur Completed	11/24/2010 3:07:14 PM	11/24/2010 3:07:34 PM	IDCINSQL25.space.com	SPACE\kc	🔛 Add library server	
tus 🔻		e machine Completed	11/24/2010 2:53:06 PM	11/24/2010 2:53:16 PM	IDCINSOL25	SPACE\kc	Add host	
ner - Filtered 🔺	Collect machine	e configur Completed	11/24/2010 2:49:18 PM	11/24/2010 2:50:16 PM	IDCINSQL25	SPACE\kc	Add VMware VirtualCente server	r
🛾 🤱 NT AUTHORITY\SYST	Refresh virtual	machine Completed	11/24/2010 2:48:29 PM	11/24/2010 2:48:29 PM	-	SPACE\kc	Help	
SPACE\HarshB	Remove source	e machine Completed	11/24/2010 2:47:11 PM	11/24/2010 2:47:22 PM	IDCINSQL25.space.com	SPACE\kc		
SPACE janar		e configur Completed	11/24/2010 1:59:41 PM	11/24/2010 2:00:41 PM	IDCINSQL25.space.com	SPACE\kc	Job	
SPACE\kc SPACE\SatyaV	-						(Restart	
SPACE\SivaN							X Cancel	
-								
-	Physical-to-virt	ual conversion					-	
-	Physical-to-virt	ual conversion	Property	Previous Value	New Value		-	
-			Property	Previous Value	New Value		_	
-	Status: Command: Result name:	Completed New-P2V IDCINSQL25		Previous Value	New Value		_	
-	Status: Command: Result name: Started:	Completed New-P2V IDCINSQL25 11/24/2010 3: 15:02 PM	E DVD drive - IDCINSQL25				_	
-	Status: Command: Result name: Started: Duration:	Completed New-P2V IDCINSOL25 11/24/2010 3: 15:02 PM 00:45:34	E DVD drive - IDCINSQL25 Adapter position	(none)	1		_	
-	Status: Command: Result name: Started: Duration: Owner:	Completed New P2V IDCINSOL25 11/24/2010 3:15:02 PM 00:45:34 SPACEl/kc	Herein Construction Adapter position Bus number	(none) (none)	1 0		_	
-	Status: Command: Result name: Started: Duration: Owner: Progress:	Completed New-P2V IDCINSOL25 11/24/2010 3:15:02 PM 00:45:34 SPACE/kc 20 100 % complete	B DVD drive - IDCINSQL25 Adapter position Bus number Name Owner	(none) (none) (none) (none)	1 0 IDCINSQL25		_	
-	Status: Command: Result name: Started: Duration: Owner:	Completed New-P2Y IDCINSOL25 11/24/2010 3:15:02 PM 00:45:34 SPACEV[cc 0 100 % complete Physical-to-virtual	Ball DVD drive - IDCINSQL25 Adapter position Bus number Name Owner Ball Ploppy Drive - IDCINSQL	(none) (none) (none) (none) 25	1 0 IDCINSQL25 SPACE\kc		_	
-	Status: Command: Result name: Started: Duration: Owner: Progress:	Completed New-P2V IDCINSOL25 11/24/2010 3:15:02 PM 00:45:34 SPACE/kc 20 100 % complete	B DVD drive - IDCINSQL25 Adapter position Bus number Name Owner B p floppy Drive - IDCINSQL Name	(none) (none) (none) (none) 25 (none)	1 0 IDCINSQL25 SPACE\kc IDCINSQL25		_	
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The **Virtual Machine Manager** window displays the VM conversion details.

Observation

When you create a VM from a physical machine in the online mode, all of the data on the physical machine is not saved in the VM. This happens if an IOM product is installed in the physical machine, for example Historian, which acquires data from a remote SF-enabled Application Server.

Since the physical machine operates during the conversion, any data change that happens during the conversion is stored in the physical machine, but not saved in the VM. The state of the created VM is same as the source machine at the time the conversion is initiated. Hence, any data change that takes place during the conversion is not saved in the VM.

Creating a Virtual Image from a Physical Machine - Offline Conversion

When you create a VM from a physical machine in the offline mode, the source machine restarts in the Windows Pre-installation Environment (Windows PE). SCVMM then clones the disk volume of the source machine to a VHD, and restarts the source machine.

Creating a VM in the offline mode ensures data consistency and is the only method that can be used for Windows 2000 conversion. It is the recommended method to migrate File Allocation Table (FAT) volumes and convert domain controllers.

For more information on Windows PE, refer to http://technet.microsoft.com/en-us/library/cc766093(WS.10).aspx.

Prerequisites for a source machine during an offline P2V conversion

- The source computer must have at least 512 MB of RAM.
- The source computer cannot be in a perimeter network. A perimeter network or a screened subnet is a collection of devices. Subnets are placed between an intranet and the Internet to help protect the intranet from unauthorized Internet users. The source computer for a P2V conversion can be in any other network topology in which the VMM server can connect to the source machine to temporarily install an agent. The VMM server can also make Windows Management Instrumentation (WMI) calls to the source computer.

To create a virtual image from an offline physical machine

- **1** Open the System Center Virtual Machine Manager (SCVMM).
 - a On the Start menu, click All Programs. On the menu, click
 Virtual Machine Manager 2008 R2, and then Virtual Machine
 Manager Administrator Console. The Connect to Server
 window appears.

The Connect to Server
Enter the name of the Virtual Machine Manager server that the SCVMM Administrator Console will connect to.
Server name:
SUN:8100
Format: VMMServer:port
Make this server my default
Connect Cancel

b In the Server name box, enter "localhost:<port number>" or "<SCVMM server name>:<port number>", and then click
 Connect. The Virtual Machine Manager window appears.

Note: By default, the port number is 8100. However, you can modify it in the SCVMM server configuration, if required.

				Actions
			X V Owner	Virtual Machine Manager
Status	Job Status	Host	CPU Average	New virtual machine
				Convert physical server
say				Convert virtual machine
Running		capricom	3%	Add Ibrary server
Running		capricom	3 %	Add host
Running		capricom	1%	Add VMware VirtualCenter server
Running		capricom	0%	😧 Help
Running		capricom	6%	Host Cluster
Running		Cancer	0%	
				Nove 1
				2 Refresh
				Remove host cluster
				III Properties
				1
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				•
				1
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				1
	Status Status Running Running Running Running Running	Status 3x8 Status say Rummg Rummg Rummg Rummg Rummg Rummg	Statu Jati Statu Heat Statu Jati Statu Heat Marge Operanin Running Operanin Running Operanin Running Operanin Running Operanin Running Operanin Running Operanin Running Operanin	

2 Open the Convert Physical Server (P2V) Wizard window.

On the Actions menu of the Virtual Machine Manager window, point to Virtual Machine Manager, and then click Convert Physical Server. The Select Source screen in the Convert Physical Server (P2V) Wizard window appears.

Convert Physical Server	
Select Source Virtual Machine Identity System Information Volume Configuration VM Configuration Select Nat Select Nat Select Path Select Nathorks Additional Properties Conversion Information Summary	Select the physical computer that you want to convert to a virtual machine. Carpoter name or IP address: IDCINSQL25 apace com Administrative account Secty the administrative account to use to connect to the physical computer. User name: Password: Denain or computer name: Specify The source machine is not in a domain, specify the source machine name or IP address.
	Beautements for a P2V conversion Next Cancel

3 Enter the source machine details.

On the **Select Source** screen, enter the computer name or IP address, user name, password, and the domain name, and then click **Next**. The **Virtual Machine Identity** screen appears.

Note: You can either type the computer name or click **Browse** to select the required computer name.

Select Source	Virtual machine name:
Virtual Machine Identity	IDCINSQL25
System Information	Owner:
olume Configuration	SPACE\kc Browse
/M Configuration	Format: domain\username
Select Host	Description:
Select Path	P2V Conversion: Machine Containing IOM Products
Select Networks	
Additional Properties	
Conversion Information	
Summary	
	The virtual machine name identifies the virtual machine to VMM. The name does not have to match the computer name

4 Enter the virtual machine details.

Enter the virtual machine name, owner name, and description name, and then click **Next**. The **System Information** screen appears.

Note: You can either type or click **Browse** to select the relevant owner name.

Convert Physical Server ((P2V) Wizard	x
🗊 System Info	rmation	
Select Source Virtual Machine Identity	To gather system information VMM temporarily installs a VMM agent on the sour machine. Click Scan System to install the agent and begin gathering system infor	
System Information		
Volume Configuration VM Configuration Select Host	More about divested to vitual conversions ▲ If the source machine has encopted volumes, an office P2V conversion night render the system values: a source machine that has encopted volumes: a source m	Scan System
Select Path Select Networks Additional Properties		
Conversion Information Summary	System Montation Operating System OS Version: Nicrosoft Windows Server 2008 R2 Standard Processor Count: 2 Hard Drive 4 Sta GB Volume C 48.83 GB Network Adaptera Local Area Connection 5 (Breadcom Net/Atreme 57or Gigabit Controller)	
	Previous Next	Cancel

5 Install an agent in the source machine.

Click **Scan System** to install the agent in the source machine, and then click **Next**. The **Volume Configuration** screen appears.

E Convert Physical Server (P2	2V) Wizard					×
🕕 Volume Confi	iguration					
Select Source Virtual Machine Identity System Information	Select the volumes of VMM will create a vitual har attach the .vhd.					th to
Volume Configuration	OS (C:)	11,752.07 MB			Primary channel (0)	-
VM Configuration						
Select Host						
Select Path						
Select Networks						
Additional Properties						
Conversion Information						
Summary						
	Online conversion An online conversion req point in-time copy of the C Offline conversion	source computer. e turned off, causing pletes. rrafter conversion	muption because the sou a service interruption. B	y default, the sour	rce computer is not re-start	-
				Previous	Next C	ancel

- **6** Configure the volume for the new VM.
 - **a** Select the relevant VHD size, VHD type, and channel.
 - **b** Click the **Offline conversion** option.
 - **c** Select the **Turn Off source computer after conversion** check box, and then click **Next**. The **Offline Conversion Options** screen appears.

Tonvert Physical Server (F	
Select Source Virtual Machine Identity System Information Offline Configuration Offline Configuration Select Not Select Path Select Networks Additional Properties Conversion Information Summary	Specify offline conversion options. The boot environment on the host requires network access. Choose an option for obtaining an IP address.
	Previous Next Cancel

7 Select an IP address for offline conversion.

Click the required option to obtain an IP address for the offline conversion, and then click **Next**. The **Virtual Machine Configuration** window appears.

Tonvert Physical Server (P2Y) Wizard R
Select Source Virtual Machine Identity System Information Volume Configuration Offline Conversion Options	Specify the processors and memory for the new machine. Number of processor: 2 I Memory: 4056 I MB
VM Configuration Select Host Select Path Select Networks Additional Properties Conversion Information Summary	
	Previous Nest Cancel

8 Specify the number of processors and memory for the new VM.

Select the required figures from the **Number of processors** and **Memory** boxes, and then click **Next**. The **Select Host** screen appears.

🖥 Convert Physical Server (P2	2V) Wizard				×
🗊 Select Host					0
Select Source Virtual Machine Identity System Information Volume Configuration	Select a host for the Hosts are rated based on the this virtual machine, click Cus Search	virtual machine's requirements an		ons. To change plac	cement options for
	Rating *	Host	P.▼∎	Transfer Type	Network
VM Configuration		Cancer.space.com		. Network	INELWOIK
Select Host	*****	gemini.space.com		Network	
Select Path	****	Venus.space.com		Network	
Select Networks	***	Capricorn.space.com		Network	
Additional Properties	***	Mercury.space.com		🔺 Network	
Conversion Information					
Summary	(S) Details		What do these ratin	rgs mean? Cust	omize Ratings
Summary	Details Rating Explanation	n (i) SAN Explanation			
	Description				
	Status	OK			
	Operating system	Microsoft Windows	Server 2008 R2 Enterpri	ise ,	
	Virtualization software	Microsoft Hyper-V			
	Virtualization software st	atus Up-to-date			
	Virtual machines		VMHISTORIAN, BASEVM Das, VMHistClient, VMHist		
			Previou	is Next	Cancel

- **9** Select a host for the new VM.
 - **a** View the rating of each host.
 - **b** Select a suitable host to deploy the VM.

Note: All hosts that are available for placement are given a rating of 0 to 5 stars based on their suitability to host the virtual machine. The ratings are based on the hardware, resource requirements, and expected resource usage of the virtual machine. The ratings are also based on placement settings that you can customize for the VMM or for individual virtual machine deployments. However, the ratings are recommendations. You can select any host that has the required disk space and memory available.

Important: In SCVMM 2008 R2, the host ratings that appear first are based on a preliminary evaluation by SCVMM. The ratings are for the hosts that run Windows Server 2008 R2 or ESX Server. Click a host to view the host rating based on a more thorough evaluation.

c To view the placement settings used by the VMM to rate the hosts, click **Customize Ratings**. The **Customize Ratings** window appears.

			igure h modify								
view. More about customizi	na hor	et ratir	100								
	1101100	se rau	140								
Placement goal											
 Load balancin Hosts with the 	~				aina ki	iahar r	ntinan				
			source	55 160	eive n	igneri	aunys				
C Resource may Hosts that mer			machi	ne's n	equire	ment v	vith the	e least	free re	esourc	es
receive higher	rating	IS.									
Resource importance											_
	Not Ir	mporta	ant						Ve	y Impo	ortant
CPU usage:	_								-iH		_
	1				'			1	÷.	'	'
Memory free:											_
Disk I/O:	_		-JH-								_
Network utilization:	<u> </u>		-iL						'		_
Network utilization:											
								1	Restor	e Defa	aults
								- 7		_	

You can modify the settings if required.

- **d** To view additional information about a host rating, select the host and click the following tabs:
- Details

Status	ок
Operating system	Microsoft Windows Server 2008 R2 Enterprise , Service Pack 1, v.721
Virtualization software	Microsoft Hyper-V
Virtualization software status	Up-to-date
Virtual machines	AppServerVMNode1, AppServerVMNode2, Harsh_CommonUI, HCVMNODE, HistorianVMNode, InTouchVMNode, NLBNODE1, NLBNODE2, NLBNODE3

This tab displays the status of the host and lists the virtual machines that are currently deployed on it.

• Ratings Explanation

Details Rating Explanation (i) SAN Explanation
This host meets all of the requirements of this virtual machine.

This tab lists the conditions that cause a host to receive a zero rating.

• SAN Explanation

 Details
 Rating Explanation
 Image: SAN Explanation

 Image: The server gemini.space.com does not contain any host bus adapter (HBA) ports. Fibre Channel SAN transfer cannot be used.
 Image: The server gemini.space.com does not have the Microsoft iSCSI Initiator installed. iSCSI SAN transfer cannot be used.

 Image: The server gemini.space.com does not have the Microsoft iSCSI Initiator installed. iSCSI SAN transfer cannot be used.
 Image: The server gemini.space.com does not have an HBA which supports NPIV.

This tab lists the conditions that prevent a Storage Area Network (SAN) transfer used to move the virtual machine's files to the host. e Click Next. The Select Path screen appears.

Note: If no host in the list has sufficient disk space to host the new virtual machine, click **Previous** to return to the **Volume Configuration** screen and reduce the size of one or more volumes. You can also override the default placement options that VMM uses to calculate the host ratings. Any changes that you make apply only for the virtual machine that you are deploying.

🖪 New Virtual Machine			×
🗊 Select Path)
Select Source Virtual Machine Identity Configure Hardware Guest Operating System Select Destination	Select storage locations on the host for the virtual machine files Selected host: Cancer space com Vitual machine path: I I I I I I I I I I I I I I I I I I I	Browse	
Select Host Select Path	Add this path to the list of default virtual machine paths on the host		
Select Year Select Networks Additional Properties Summary			
	Previous Next	Cancel	J

10 Select the storage location for the VM files.

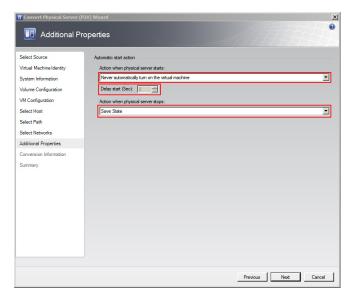
On the **Select Path** screen, enter the virtual machine path, and then click **Next**. The **Select Networks** screen appears.

Note: This path refers to the drives that are free to allocate the host machine. One drive is allocated to one virtual machine. You can either type or click **Browse** to select the relevant path.

elect Source Virtual Machine Identity System Information		tual networks t	o use for the virtua	I machine.	
olume Configuration	Physical Network A	Location	Network Tag	Virtual Network	
/M Configuration	Network Adapter 1	space.com		(equivalent) space.com - Exter	mal 🗾
elect Host					
elect Path					
elect Networks					
ditional Properties					
onversion Information					
ummary					
	1				Restore Defaults
					loctoro Derduita
	(i) The Virtual Networ			ured for each physical network adapte	

11 Select the network to be used for the new VM.

In the Virtual Network list, click the virtual network you want to use for the virtual machine, and then click Next. The Additional Properties window appears.



12 Specify the actions you want the VM to perform when the physical server starts or stops.

Select the actions as required, and then click **Next**. The **Conversion Information** screen appears.

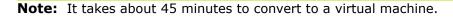
🔋 Convert Physical Server (P2	2V) Wizard	×
Conversion Ir	nformation	0
Select Source Virtual Machine Identity System Information Volume Configuration Select Host Select Path Select Networks Additional Properties Conversion Information Summary	To proceed you must resolve the following issues. I No issues detected. No issues detected.	* Again
	Previous Next	Cancel

13 Verify if there are any issues with the conversion, and then click **Next**. The **Summary** screen appears.

🖥 Convert Physical Server (I	P2V) Wizard		1
🕕 Summary		and the second	•
Select Source		t the physical server to a virtual machine,	review the settings that you
Virtual Machine Identity	chose.		
System Information	Summary:		
Volume Configuration	Property	Value	
-	Source	IDCINSQL25.space.com	
VM Configuration	Virtual machine	IDCINSQL25	
Select Host	Owner	SPACE\kc	
Select Path	Destination host	Cancer.space.com	
Select Networks	Path	M:\IDCINSQL25	
Summary	Start the virtual mach	ne after deploying it on the host	Fill View Scritt
		ical server into a virtual machine, click Create. You can	
		Pr	evious Create Cancel

14 Create the VM.

View the settings that you have selected for the virtual machine, and then click **Create**. The virtual machine is created and the conversion details are displayed in the **Virtual Machine Manager** window.



Urtual Machine Manager - SU	Mispac	e.com									121.
File View Go Actions H	telp										
😫 Actions 💼 Columns 📕 Jobs	F PR		2 PowerShell (
Jobs	Job	S Jobs (filtered 9)								Actions	
Jobs	Search	6		_				P None		Virtual Machine Manager	
Overview	t –	Name	Status		Start Time v	EndTime	Result Name	Owner		New virtual machine	
Jobs	0	Start virtual machine	Completed		11/24/2010 4:04:50 PM	11/24/2010 4:05:00 PM	IDCINSQL25	SPACEVic			
	0	Physical-to-virtual conve-	Completed		11/24/2010 3:15:02 PM	11/24/2010 4:00:36 PM	IDCINSQL25	SPACE\kc		Tonvert physical server	
	0	Perform prerequisites ch.	. Completed		11/24/2010 3:11:43 PM	11/24/2010 3:11:45 PM	IDCINSQL25.space.co	m SPACE\kc		Convert virtual machine	
Filters Clear	0	Collect machine configur.	. Completed		11/24/2010 3:07:14 PM	11/24/2010 3:07:34 PM	IDCINSQL25.space.co	m SPACE\kc		Add library server	
Status	0	Remove source machine	Completed		11/24/2010 2:53:06 PM	11/24/2010 2:53:16 PM	IDCINSQL25	SPACE\kc		Add host	
Owner - Filtered	0	Collect machine configur.	. Completed		11/24/2010 2:49:18 PM	11/24/2010 2:50:16 PM	IDCINSQL25	SPACE\kc		Add VMware VirtualCente	sr
NT AUTHORITY/SYST	0	Refresh virtual machine -	. Completed		11/24/2010 2:48:29 PM	11/24/2010 2:48:29 PM		SPACE\kc		😥 Help	
SPACE\HarshB SPACE\arshB SPACE\arshB	0	Remove source machine	Completed		11/24/2010 2:47:11 PM	11/24/2010 2:47:22 PM	IDCINSQL25.space.co	m SPACE\kc		Job	
SPACE ko	0	Collect machine configur.	. Completed		11/24/2010 1:59:41 PM	11/24/2010 2:00:41 PM	IDCINSQL25.space.co	un SPACE\kc		100	
SPACE SatvaV										@ Restart	
E & SPACE\SwaN										💥 Cancel	
SPACE annivasay											
SPACE\aripraneethn											
SPACE/suni											
SPACE\SunithaA											
Start date 🔻											
	12.0	hysical-to-virtual conv							-	1	
	1.0	nyarcur to virtual convi	Naturi -								
	s	tatus: Compl	sted	Pro	perty	Previous Value	New Value				
	0	ommand: New-F	2V		DVD drive - IDCINSQL25						
	R	esult name: IDCIN	501.25	1-1	Adapter position	(none)	1		- 11		
			2010 3:15:02 PM		Bus number	(none)	0		- 11		
		uration: 00:45			Name	(none)	IDCINSQL	26	- 11		
	0	wher: SPACE	Wec .		Owner	(none)	SPACEIke				
	P	rogress: 🔇 1	00 % complete				SPACE W.				
	0		al-to-virtual	1	Floppy Drive - IDCINSQL2						
		conve	sion		Name	(none)	IDCINSQL				
					Owner	(none)	SPACElike				
					Managed Computer - IDC	INSQL25.space.com					
in Hosts					Name	IDCINSQL25.space.com	(none)				
Wirtual Machines	1				Status	Responding	Removing				
ercual machines					Source Machine Configur	tion - IDCINSQL25.space	.com			1	
😴 Library	1				Name	IDCINSQL25.space.com	(none)				
Dobs	1				Virtual Hard Disk - {3d60						
Jobs				14	Attached file name			OL25\C 2010-11-24T094.		1	
Administration	1				Attached file name	(none)		QL25\C_2010-11-24T094			
	1.								_		
	Sum	nary Details Change Tra	dang								

The **Virtual Machine Manager** window displays the VM conversion details.

Observation

When you create a VM from a physical machine in the offline mode, and if an IOM product is installed in the physical machine, for example Historian, which acquires data from a remote Application Server that is SF-enabled, select the **Turn off source computer after conversion** check box. This helps save all data in the created VM.

Note: If you do not select the **Turn off source computer after conversion** check box, all data changes that take place during the conversion is saved in the source machine.

When the physical machine is in the offline mode during the conversion and the Application Server is in the SF mode, the SF data is forwarded to the VM after it is created.

Tips and Recommendations

Category	Recommendation			
Hardware	 Ensure that the hardware is compatible for conversion before converting it to a virtual machine. You cannot transfer a bad sector on a disk during a conversion. 			
Virtual Machine Manager	• During conversion, SCVMM installs Virtual Machine Manager Agent in the source machine, and this agent takes care of all automation processes After conversion of the source machine to a VM, the SCVMM server sometimes cannot remove this agent automatically from the physical machine. In such situations, you need to uninstall the agent (SCVMM agent) manually from the physical machine (Go to Control Panel and click Add Remove Programs).			
	• Since Virtual Machine Manager uses HTTP and WMI service, ensure that WMI service is running and a firewall is not blocking HTTP and WMI traffic at the source machine.			

Category	Recommendation							
Network					stored at remote machines will be			
VMware	Before you convert a VMware virtual machine to a Hyper-V or Virtual Server virtual machine, you must uninstall VMware tools on the guest operating system of the virtual machine.							
Operating Systems	• VMM does not support P2V conversion for computers with Itanium architecture-based operating systems.							
	 VMM does not support P2V on source computers running Windows NT Server 4.0. However, you can use the Microsoft Virtual Server 2005 Migration Toolkit (VSMT) or third-party solutions for converting computers running Windows NT Server 4.0. 							
	 VMM 2008 R2 does not support converting a physical computer running Windows Server 2003 SP1 to a virtual machine managed by Hyper-V. Hyper-V does not support Integration Components on computers running Windows Server 2003 SP1. As a result, there is no mouse control when you use Remote Desktop Protocol (RDP) to connect to the virtual machine. To avoid this, update the operating system to Windows Server 2003 SP2 before you convert the physical computer. As an alternative, you can convert the computer by using VMM 2008, and then deploy the virtual machine in 							

Preparing a Virtual Image from Another Virtual Image

VMM allows you to copy existing VMware virtual machines and create Hyper-V or Virtual Server VMs. Virtual-to-Virtual (V2V) conversion is a read-only operation that does not delete or affect the original source virtual machine. You can copy VMware virtual machines that are on an ESX host, in the VMM Library, or on a Windows share. The resulting virtual machine matches VMware virtual machine properties, including name, description, memory, disk-to-bus assignment, CD and DVD settings, network adapter settings, and parameters.

To prepare a virtual image from another virtual image, you need to follow a two-step method:

- Create a template from an existing VM
- Create a new VM from the template

A virtual machine template is a library resource and consists of the following parts:

Hardware profile - To define a standard set of hardware settings, you can create a hardware profile and associate it with a template. When you create a new template or create a virtual machine from a template, you can specify the virtual hardware settings or reuse an existing hardware profile from the library. Like operating system profiles, hardware profiles are logical entities that are stored in the database.

Virtual hard disk - You can use a generalized virtual hard disk from the library or create a virtual hard disk from an existing virtual machine. If the source virtual machine for your template has multiple virtual hard disks, select the disk that contains the operating system. To simplify the generalization process, include Virtualization Guest Services (such as Virtual Machine Additions or Integration Components) in your template. **Guest operating system profile** (optional) - To use the same product key, administrator password, time zone, and other items in a set of templates, you can create a guest operating system profile and store it in the library. When you create a new template or a virtual machine from a template, you can specify the settings manually or use an operating system profile associated with your answer files.

Templates provide a standardized group of hardware and software settings that you can use to create multiple new virtual machines configured with those settings. VMM supports both customized and non-customized templates.

Important: Customized templates are the most common VMM templates that require an operating system profile to automate deployment. Non-customized templates do not have an operating system profile attached to it. You can use them for operating systems that cannot be customized like Windows 7 or Linux.

Creating a Template from an Existing VM

When you create a template from an existing virtual machine, consider the following:

- The virtual machine that you use as a source to create a template must be the one deployed on a host (not stored in the library).
- The source virtual machine becomes the new template and is, therefore, no longer available as a virtual machine.

Prerequisites to create a template

Delete all checkpoints from the source VM. Then open the Hyper-V Manager on the host and check the status of the merge operation for the virtual machine. In the Status column, Merge in progress indicates that the checkpoint has not been deleted. Wait until this operation has been completed before you start creating a template.

Stop or save the state of the source VM.

To create a template from an existing VM

- **1** Open the System Center Virtual Machine Manager (SCVMM).
 - a On the Start menu, click All Programs. On the menu, click
 Virtual Machine Manager 2008 R2, and then Virtual Machine
 Manager Administrator Console. The Connect to Server
 window appears.

📜 Connect to Server	×
Enter the name of the Virtual Machine Manager server that the SCVMM Administrator Console will connect to.	
Server name:	
SUN:8100	
Format: VMMServer:port	
Make this server my default	
Connect Cancel	

In the Server name box, enter "localhost:<port number>" or "<SCVMM server name>:<port number>", and then click
 Connect. The Virtual Machine Manager window appears.

Note: By default, the port number is 8100. However, you can modify it in the SCVMM server configuration, if required.

Urtual Hachine Hanager -						_ C ×
File View Go Actions						
😫 Actions 💼 Columns 📕 Jo	is 🕞 PRO Tips (0) 🔺 Netv	orling 🔟 Fowershell 😢 H	eb .			
Virtual Machines	star.space.com	Virtual Machines (filtered 9)				Actions ×
Host Groups	VH				X V Owner	Virtual Machine Manager
Overview	Name ~	Status	Job Status	Host	CPU Average	New virtual machine
I Hoats	E 2 Owner: SPACE \S	wall				To convert physical server
C and the	E 2 Owner: SPACE\se	inivasay				Convert virtual machine
Cancer	VMAPP2nT	Running		capricom	3 %	Add1brary server
Capricon	WMppGerver	Running		capricom	3 %	B* Addhost
Small	VMDes	Running		capricom	1%	* Add VMware VirtualCenter server
	VMHstClent	Running		capricom	0%	😥 Help
	VMHistorian	Running		Capricom	6%	Host Cluster
	() VMEnTouch	Running		Cancer	0.74	Nove
						2 Refresh
	1					X Remove host cluster
	1					T Properties
	1					
2						
Filters Cle						
Status						
Owner						
Operating system						
Added date *						•
Tag						
	1					
	1					
	1					
	1					
	1					
	1					
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	1					
D Hosts						
😤 Virtual Machines						
Jobs						
Administration						
	Summary Networking a	nd Storage Latest Job				

2 Select the source VM to create a template.

On the **Virtual Machine Manager** window, right-click the VM you want to use as the source. The VM menu appears.

	Name	Status	Job Status	Host 🔺	Owner	CPU Average	Memory
	PerfHist1	Stopped		Cancer	SPACE\sivan	0%	4.00 GB
•	PerfHist2	Stopport		conricorn	SPACE\sivan	0%	4.00 GB
\mathbf{b}	VMWIS	Start		ricorn	SPACE\sivan	0%	4.00 GB
	VMWISDVD			ricorn	SPACE\sivan	0%	4.00 GB
	VMWISTEST			ricorn	SPACE\sivan	0%	4.00 GB
	9						
	©						
	1	Connect to virtua	al machine				
	E*	Migrate storage					
	F *	 Migrate					
	Ē.	New checkpoint					
	E.	Manage checkpoi	nts				
	6						
	1						
	.	Install virtual que	ct convicos				
			SC SEI VICES				
		New template					
	52	Clone					
	1	Store in library					
	\varkappa	Delete					
	-6-	View networking					
	12	Properties					

- **3** Open the New Template Wizard window.
 - **a** On the VM menu, click **New template**. A warning message appears.

🖪 ¥irtua	l Machine Manager
Â	Creating a template will destroy the source virtual machine VMWISTEST. The virtual hard disks of the virtual machine will be generalized to create the new template and any user data on the virtual machine may be lost. To prevent this, you can create a clone of VMWISTEST before using it to create a template.
	Do you want to continue?
	Yes No

b Click Yes. The **Template Identity** screen in the **New Template Wizard** window appears.

New Template Wizard	entity				
Template Identity	Template name:				
Configure Hardware	VMwIS_Template				
Guest Operating System	Owner:				
Select Library Server	SPACE\sivan Browse				
Select Path	Format domain/username				
Summary	Description: Template of WIS Machine				
	Next Cancel				

4 Enter the template details.

Enter the template name, owner name, and description, and then click **Next**. The **Configure Hardware** screen appears.

Note: You can either type or click **Browse** to select the relevant owner name. The owner must have an Active Directory domain account.

5 Go to the **Guest Operating System** screen.

On the **Configure Hardware** screen, click **Next**. The **Guest Operating System** screen appears.

Select or configure a new operating system profile to specify the identity, network settings, and scripts for the new virtual machine.					
Guest operating system profile: [New]					
🚆 Save as					
★ General Settings Identity Information IMW/S ✓ Admin Password 					
Previous Next Cancel					

6 Enter the details of the new VM.

On the **Guest Operating System** screen, do the following:

- **a** In the **Computer name** box, enter a name for the new VM, and then click **Admin Password** under **General Settings**.
- **b** In the **Password** and **Confirm** boxes, enter the password for the administrator account of the new VM, and then click **Operating System**.

- **c** From the **Operating system** list, select the operating system based on the ISO selected, and then click **Domain/workgroup** under **Networking**.
- **d** Click the relevant option to specify a workgroup or domain for the new VM. If you have clicked the **domain** option, enter user name and password, and then click **Next**. The **Select Library Server** screen appears.

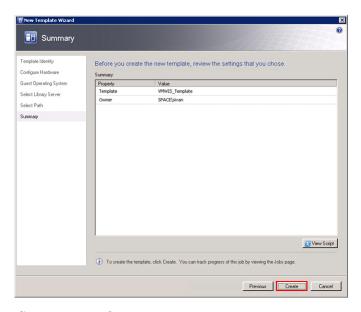
Template Identity	Select a library server for t	he virtual machine.		
Configure Hardware	Search		₽▼in	
Guest Operating System	Library Server A	Transfer Type	Description	<u></u>
Select Library Server	Sun.space.com	Network	Virtual Machine Manager serve	r as library server
	⊘ Hide Details			
	SAN Explanation The server Sun.space.com	does not contain any host bus	adapter (HBA) ports. Fibre Channel S	AN transfer
	SAN Explanation The server Sun.space.com cannot be used.	does not contain any host bus does not have an HBA which s		AN transfer
	SAN Explanation The server Sun.space.com cannot be used.			AN transfer

7 Select a library server for the new VM.

Select a library server for the template to be used, and then click **Next**. The **Select Path** screen appears.

B New Virtual Machine		X
🗊 Select Path		0
Select Source Virtual Machine Identity Configure Hardware Guest Operating System Select Destination Select Host	Select storage locations on the host for the virtual machine files	Browse
Select Path		
Select Networks Addisonal Properties Summary		
	Previous	Cancel

- **8** Select a location to save the new VM.
 - **a** Click **Browse** to select the location of the template. The selected path appears in the **Virtual machine path** box.
 - **b** Click **Next**. The **Summary** screen appears.



9 Create a template.

Click Create. The Jobs window appears.

	Name	Status	Start Time 👻	Result Name	Owner
D	Create virtual m	14	% 11/23/2010 3:47:52	BASEVMFRO	SPACE\SivaN
9	Refresh host duster	Completed	11/23/2010 3:43:19 PM	Capricorn.space	SPACE\SivaN
Prop	reate virtual machir perty hanges are available w	Previous	i Value	New Value	

View the status of the template you created. The completed status confirms that the template has been created successfully.

Note: If the template is not created successfully, you can refer to http://technet.microsoft.com/en-us/library/cc764306.aspx to verify the cause.

Creating a Virtual Machine from a Template

You can create a VM from a template of an existing VM.

Considerations

- You cannot change the system disk or startup disk configuration.
- Templates are database objects that are displayed in the library. The templates are displayed in the VMs and Templates folder in the Library Server.

Requirements

- The virtual hard disk must have a supporting OS installed.
- The administrator password on the virtual hard disk should be blank as part of the Sysprep process. However, the administrator password for the guest OS profile may not be blank.
- For customized templates, the OS on the virtual hard disk must be prepared by removing the computer identity information. For Windows operating systems, you can prepare the virtual hard disk by using the Sysprep tool.

Prerequisite

The template of the source VM should be created before creating the new VM.

For more information on creating a template, refer to "Creating a Template from an Existing VM" on page 575.

To create a virtual machine from a template

- **1** Open the System Center Virtual Machine Manager (SCVMM).
 - a On the Start menu, click All Programs. On the menu, click
 Virtual Machine Manager 2008 R2, and then Virtual Machine
 Manager Administrator Console. The Connect to Server
 window appears.

Tonnect to Server	ĸ
Enter the name of the Virtual Machine Manager server that the SCVMM Administrator Console will connect to.	
Server name:	
SUN:8100	
Format: VMMServer:port	
Make this server my default	
Connect Cancel	

In the Server name box, enter "localhost:<port number>" or "<SCVMM server name>:<port number>", and then click
 Connect. The Virtual Machine Manager window appears.

Note: By default, the port number is 8100. However, you can modify it in the SCVMM server configuration, if required.

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😭 Actors 💼 Columns 📕 Jobs	🕞 PRO Tips (3) 🚕 Networ	king 🔝 PowerShell 🔞 H	rio -				
Virtual Machines	star.space.com	Intual Machines (filtered 9)				Actions	
Host Groups	VM				X V Owner	Virtual Machine Manager	
Cverview	Name ~	Status	Job Status	Host	CPU Average	New virtual machine	
Al Hosts	E 2 Owner: SPACE \Sive	a constantino de la constantino de				Convert physical server	
e 🖓 star	E & Owner: SPACE\srin	ivasay				Convert virtual machine	
Cancer	VMAPP2hT	Running		capricom	3%	Add library server	
apricom	WMAppServer	Running		capricom	3 %	P Add host	
Small	VMDes	Running		capricom	1%	Add VMware VirtualCenter server	
	VPHistClent	Running		capricare	0 %	😥 Help	
	VPHistorian	Running		capricom	6%	Host Cluster	
	VMEnTouch	Running		Cancer	0%		
						B Move	
	I					Remove host cluster	
	1						
	1					III Properties	
	1						
Filters Clear	1						
Status * Owner *	1						
Operating system	1						
Added date	Details					-	
Tag ·							
100	1						
	1						
	1						
	1						
	1						
	1						
	1						
	1						
	1						
	1						
						1	
Hosts						1	
🚆 Virtual Machines	1						
Jobs	1						
Administration	1						
	Summary Networking and	Storage Latest Job					_

2 Open the **New Virtual Machine** window.

On the Actions menu of the Virtual Machine Manager window, point to Virtual Machine Manager, and then click New Virtual Machine. The Select Source screen in the New Virtual Machine window appears.

New Virtual Machine		×
🗊 Select Sour	ce	
Select Source Virtual Machine Identity Configure Hardware	Select the source for the new virtual machine.	Browse
	Create the new virtual machine with a blank virtual hard disk	
	You use a template you can customize the hardware and operating system settings. If machine or a virtual hard dak, you can only customize the hardware settings. To be accident of the terror of the terror.	you use a stored virtual essed, a virtual hard disk must
	un aureu e un aurey.	Next Cancel

- **3** Select the source for the new VM.
 - a Click the Use an existing virtual machine, template, or virtual hard disk option.
 - **b** Click **Browse** to select the source machine template, and then click **OK**. The **Virtual Machine Identity** screen appears.

Virtual Machine Identity	Vitual machine name:				
Configure Hardware	Historian				
Select Destination	Owner:				
Select Host	SPACE\sivan Browse				
select Path	Format: domain/username				
elect Networks	Description:				
Additional Properties	Create a New Virtual Machine using the Template				
Summary					

4 Enter the details of the new VM.

Enter the virtual machine name, owner name, and description, and then click **Next**. The **Configure Hardware** screen appears.

Note: You can either type or click **Browse** to select the relevant owner name. The owner must have an Active Directory domain account.

5 Go to the **Guest Operating System** screen.

On the **Configure Hardware** screen, click **Next**. The **Guest Operating System** screen.

🗄 New Virtual Machine		X
🕕 Guest Oper	ating System	•
Select Source Virtual Machine Klentity Configure Hardware Guest Operating System Select Destination Select Rath Select Path Select Networks Additional Properties Summary	Select or configure a new and scripts for the new vir Guest operating system profile: N Sector Sectors Guest operating System Sectors Veromation Product Rey None Product Rey None Time Zone Product Rey None Time Zone Product Rey None Time Zone Product Rey None Time Zone Product Rey None Product Rey None Product Rey None Product Rey None Product Rey None Product Rey None Product Consult space. Answer File None StallFurOnce] Comma	
		Previous Next Cancel

6 Enter the details of the new VM.

On the Guest Operating System screen, do the following:

- **a** In the **Computer name** box, enter a name for the new VM, and then click **Admin Password** under **General Settings**.
- **b** In the **Password** and **Confirm** boxes, enter the password for the administrator account of the new VM, and then click **Operating System**.

Note: To prompt for a password while creating a virtual machine with the template, enter an asterisk (*) in the **Password** box. If you leave the field blank, you will not be able to create the virtual machine.

c From the **Operating system** list, select the operating system based on the ISO selected, and then click **Domain/workgroup** under **Networking**.

d Click the relevant option to specify a workgroup or domain for the new VM. If you have clicked the **domain** option, enter user name and password, and then click **Next**. The **Select Host** screen appears.

Select Source Virtual Machine Identity Configure Hardware	Select a host for the virtual machine. Host are rated based on the virtual machine's requements and default placement options. To change placement options for the virtual machine, dck Cultomize Retarget.						
Select Destination	Search	Search 🔎			P in Al Hosts		
Select Host	Rating ~	Host			Transfer Type	Network	
Select Path	H H H H H	and the second se	mini.space.com		Network		
Select Networks	*****		pricorn.space.com		Network		
		-	ncer.space.com				
Additional Properties	ງຊິຕງຊີຕງຊີຕງຊີຕງຊີຕ ວຊີຕງຊີຕງຊີຕງຊີຕງຊີຕງຊີຕ			- Network			
	(e) Details			What do these rate	ogs.mean? Cus	tomize Ratings	
	Details Rating Explan	ation () S	AN Explanation				
	Description Status OK						
	Operating system		Microsoft Windows	Server 2008 R2 Enterp	rise ,		
	Virtualization softwar	e	Microsoft Hyper-V				
	Virtualization softwar	e status	Up-to-date				
	Virtual machines	Harsh_CommonUI,	0-048 ppGerverVMNode1, AppServerVMNode2, AppVMN1, AppVMN2, arah_CommonUJ, HCVMNCDE, HistorianVMNode, InTouchVMNode, BNCOE1, NELWINDE2, MLBNOCE3, MLBTEST1, Lestwisnode, Wahlode,				

- **7** Select a host for the new VM.
 - **a** View the rating of each host.
 - **b** Select a suitable host to deploy the VM.

Note: All hosts that are available for placement are given a rating of 0 to 5 stars based on their suitability to host the virtual machine. The ratings are based on the hardware, resource requirements, and expected resource usage of the virtual machine. The ratings are also based on placement settings that you can customize for the VMM or for individual virtual machine deployments. However, the ratings are recommendations. You can select any host that has the required disk space and memory available.

Important: In SCVMM 2008 R2, the host ratings that appear first are based on a preliminary evaluation by SCVMM. The ratings are for the hosts that run Windows Server 2008 R2 or ESX Server. Click a host to view the host rating based on a more thorough evaluation.

c To view the placement settings used by the VMM to rate the hosts, click **Customize Ratings**. The **Customize Ratings** window appears.

Customize Ratings											×
Placement Options V	'M Loa	đ									
Use the following se affect the current de view. <u>More about customiz</u>	ployme	nt. To	modif								
Placement goal											
Coad balanci											
Hosts with th			esourc	es rec	eive h	igher r	atings.				
C Resource ma									,		
Hosts that me receive highe			Imach	ine's r	equirei	ment v	with the	e least	free re	sourc	es
Resource importance	e —										
	Not Ir	nport	ant						Ver	y Impo	ortant
CPU usage:	,								-		
Memory free:	_								-II-		
	1		. i		1	1			1	1	
Disk I/O:					1						
Network utilization:			-ŀ-								
								1	Restor	e Defa	aults
								- 7			
								01	<		Cancel

You can modify the settings if required.

- **d** To view additional information about a host rating, select the host and click the following tabs:
- Details

Status	ок
Operating system	Microsoft Windows Server 2008 R2 Enterprise , Service Pack 1, v.721
Virtualization software	Microsoft Hyper-V
Virtualization software status	Up-to-date
Virtual machines	AppServerVMNode1, AppServerVMNode2, Harsh_CommonUI, HCVMNODE, HistorianVMNode, InTouchVMNode, NLBNODE1, NLBNODE2, NLBNODE3

This tab displays the status of the host and lists the virtual machines that are currently deployed on it.

• Ratings Explanation

Details Rating Explanation (i) SAN Explanation
(i) This host meets all of the requirements of this virtual machine.

This tab lists the conditions that cause a host to receive a zero rating.

• SAN Explanation

Details Rating Explanation (i) SAN Explanation

1	The server gemini.space.com does not contain any host bus adapter (HBA) ports. Fibre Channel SAN transfer cannot be used.
1	The server gemini.space.com does not have the Microsoft iSCSI Initiator installed. iSCSI SAN transfer cannot be used.
1	The server gemini.space.com does not have an HBA which supports NPIV.

This tab lists the conditions that prevent a Storage Area Network (SAN) transfer used to move the virtual machine's files to the host. e Click Next. The Select Path screen appears.

Note: If a host has network optimization enabled, a green arrow appears in the **Network Optimization** column. VMM 2008 R2 enables you to use the network optimization capabilities that are available on Hyper-V hosts that are running Windows Server 2008 R2. For information about network optimization and the hardware that supports it, see the "Windows Server 2008 R2" documentation. After a virtual machine is deployed, this feature is displayed only for virtual machines that are deployed on a host that runs Windows Server 2008 R2.

Convert Physical Server (F Select Path	20) Wizard 🔀
Select Source Virtual Machine Identity System Information Volume Configuration VM Configuration Select Hoat	Select storage locations on the host for the virtual machine files Selected host: Cancerapace.com Witual machine path: A Browse A Browse T Add this path to the list of default virtual machine paths on the host.
Select Path	 Add this path to the last of default writial machine paths on the nost
Select Networks Additional Properties Conversion Information Summary	
	Previous Next Cancel

8 Select the storage location for the VM files.

On the **Select Path** screen, enter the path to store the VM files, and then click **Next**. The **Additional Properties** screen appears.

T Convert Physical Server (P	0
Select Source Virtual Machine Identity System Information Volume Configuration VM Configuration Select Host Select Path Select Path Select Networks Additional Properties Conversion Information Summary	Adomatic stat action
	Previous Nest Cancel

- **9** Specify any additional properties of the VM.
 - **a** In the Action when physical server starts list, click Never automatically turn on the virtual machine.
 - **b** In the Action when physical server stops list, click Save State.
- **Note:** You can configure the details as required.
 - **c** From the **Specify the operating system you will install in the virtual machine** list, select the operating system based on the ISO selected, and then click **Next**. The **Summary** screen appears.

🗄 New Template Wizard		×
🕕 Summary		•
,		
Template Identity	Before you crea	ate the new template, review the settings that you chose.
Configure Hardware	Summary:	
Guest Operating System	Property	Value
Select Library Server	Template	VMWIS_Template
Select Path	Owner	SPACE\sivan
Summary		
Summary		
		Z View Script
	To create the te	emplate, click Create. You can track progress of this job by viewing the Jobs page.
		Previous Create Cancel

10 Create a template.

Click **Create**. The **Jobs** window appears.

	Name	Status	Start Time 👻	Result Name	Owner
D	Create virtual m	14	% 11/23/2010 3:47:52	. BASEVMFRO	SPACE\Siva
9	Refresh host duster	Completed	11/23/2010 3:43:19 PM	Capricorn.space	SPACE\SivaN
	Create virtual machir	ne			
Pro	Create virtual machir perty changes are available w	Previou		New Value	
Pro	perty	Previou		New Value	

View the status of the template you created. The completed status confirms that the template has been created successfully.

Tips and Recommendations

- When creating a template, use a base OS without an SQL Server.
- To create a VM that hosts System Platform Products, select the template with the relevant OS. Install the SQL Server as required, and then install the System Platform Product.
- If you create a template with an SQL Server and/or System Platform Products, and you create a VM with that template, ensure the machine name is the same as the node name in the template. If you use a different name, do the following:

Product	Recommendation	
Historian	 Modify the SQL Server in name with the new host in modify the name, execute following queries in the S Management Studio: sp_dropserver@@serverna sp_addserver <hostname></hostname> 	name. To e the GQL Server
	Then, restart the SQL set service.	rver
	• Register the Historian Set the new host name in the	
	a Right-click the Histor and then select New Registration .	
	b Enter the host name Historian along with required details.	
	• Modify the local IDAS with name.	th the host
Application Server (GR)	• Modify the SQL Server in name with the new host n	
	• Restart the SQL Server s	ervice.
	• While connecting to Gala Application Server IDE, s new host name for GR no	select the
	• Before creating a templat VM, ensure that all Galat are undeployed.	

Preparing a Virtual Image from a Ghost Backup

VMM allows you to create a virtual machine using .VHD images created using a ghost backup. You cannot create a virtual machine directly from a ghost .GHO backup file. Ghost backup images are created using the Symantec Ghost Utility software.

To create a virtual machine from a ghost backup, do the following:

- **a** Create a ghost backup (.GHO).
- **b** Convert a ghost backup (.GHO) to a virtual hard disk (.VHD).
- **c** Create a virtual machine from .VHD.

The procedure to create a .GHO image is explained in the Symantec TM Ghost Imaging Foundation 7 documentation.

Refer to the following links for information on Creation of Ghost Backup (.GHO) and Conversion of Ghost backup (.GHO) to Virtual Hard Disk (.VHD).

- ftp://ftp.symantec.com/public/english_us_canada/products/symantec_ ghost_solution_suite/2.0/manuals/Ghost_imp_guide.pdf
- http://www.symantec.com/business/support/index?page=content&id =DOC2207&key=52023&actp=LIST
- http://www.symantec.com/business/support/resources/sites/BUSINE SS/content/staging/DOCUMENTATION/2000/DOC2565/en_US/1.0 /EM_GIF_user_gde.pdf.

Create a Virtual Machine from a .VHD

You can use the New Virtual Machine feature of the VMM to create a virtual machine from an existing VHD. VMM creates a copy of the source VHD so that the original VHD is not moved or modified. The administrator password on the VHD should be blank as part of the Sysprep process.

You can also create a template from the VHD, and then create the new virtual machine from the template.

Limitations: When creating a new virtual machine directly from an existing VHD, you cannot specify the OS configuration information (sysprep settings). To specify sysprep settings, you need to do the following:

- Create a template
- Create the new virtual machine based on that template

To create a virtual machine from a .VHD

1 Copy the created .VHD file.

Copy the .VHD file that is created using the ghost image to the Virtual Server Library.

- 2 Open the System Center Virtual Machine Manager (SCVMM).
 - On the Start menu, click All Programs. On the menu, click
 Virtual Machine Manager 2008 R2, and then Virtual Machine
 Manager Administrator Console. The Connect to Server
 window appears.

📜 Connect to Server	×
Enter the name of the Virtual Machine Manager server that the SCVMM Administrator Console will connect to.	
Server name:	
SUN:8100	
Format: VMMServer:port	_
Make this server my default	
Connect	el

In the Server name box, enter "localhost:<port number>" or "<SCVMM server name>:<port number>", and then click
 Connect. The Virtual Machine Manager window appears.

Note: By default, the port number is 8100. However, you can modify it in the SCVMM server configuration, if required.

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😫 Actions 💼 Columns 📕 Jobs	i 🔚 (410 Tips (1) 🚕 Network	ng 🗵 PowerShell 🕐 He				
Virtual Machines	star.space.com 10	tual Machines (litered 9)				Actions
Host Groups	VM				X V Owner	Virtual Machine Manager
Overview .	Name ~	Status	Job Status	Host	CPU Average	New virtual machine
Al Hosts	E 2 Owner: SPACE\Sival					Convert physical server
B Medum	E 2 Owner: SPACE \srink	rasay				Convert virtual machine
Cancer	VMAPPInT	Running		capricom	3%	Add Ibrary server
capricom	VMAppServer	Running		capricom	3%	R* Additional
permit	VMDas	Running		capricom	1%	Add VMware VirtualCenter server
Small	VMMstClent	Running		capricorn	0%	R Help
	VMHistorian	Running		capricorn	6%	
	VMEnTouch	Running		Cancer	0%	Host Cluster
						Nove .
						😂 Refresh
	1					X Remove host cluster
	1					T Properties
	1					2222330023
2						
Filters Gear	1					
Status						
Owner *						
Operating system						
Added date	Details					*
Tag						
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1 Hosts	1					
(1) Virtual Machines	1					
🝯 Library						
Jobs						
Administration						
	Summary Networking and S	Rorage Latest Job				

3 Open the **New Virtual Machine** window.

On the Actions menu of the Virtual Machine Manager window, point to Virtual Machine Manager, and then click New Virtual Machine. The Select Source screen in the New Virtual Machine window appears.

New Virtual Machine	
🕕 Select Sour	ce
Select Source Virtual Machine Identity Configure Hardware	Select the source for the new virtual machine.
	If you use a template, you can customize the hardware and openating system settings. If you use a stored vitual machine or a vitual hard disk, you can only customize the hardware settings. To be accessed, a vitual hard disk must be stored in the library.
	Next Cancel

- **4** Select the source for the new VM.
 - a Click the Use an existing virtual machine, template, or virtual hard disk option.
 - **b** Click **Browse** to select the .VHD image, and then click **OK**. The **Virtual Machine Identity** screen appears.

al Machine Identity	
figure Hardware	Virtual machine name: Historian
t Destination	Owner:
st Host	SPACE\sivan Browse
t Path	Format: domain/username
t Networks	Description:
onal Properties	Create a New Virtual Machine using the Template
	The virtual machine name identifies the virtual machine to VMM. The name does not have to match the computer nam of the virtual machine. However, using the same name ensures consistent displays in System Center Operations Manager.

5 Enter the details of the new VM.

Enter the virtual machine name, owner name, and description, and then click **Next**. The **Configure Hardware** screen appears.

Note: You can either type or click **Browse** to select the relevant owner name. The owner must have an Active Directory domain account.

- **6** Go to the **Select Host** screen.
 - a On the Configure Hardware screen, click Next. The Guest Operating System screen.
 - **b** On the **Guest Operating System** screen, click **Next**. The **Select Host** screen appears.

Select Source Virtual Machine Identity Configure Hardware	Select a host for the virtu Hosts are rated based on the virtu this virtual machine, click Customi	al machine's requirements and default placeme ze Ratings.		tions fo
Select Destination	Search		In Al Hosts	
Select Host		lost	Transfer Type Netw	ork
Select Path		gemini.space.com Capricorn.space.com		
Select Networks		Capricorn.space.com		
Additional Properties		Venus.space.com		
Summary		Mercury.space.com	Network	
	Cetails Details Rating Explanation		customize Rat	
	Description			
	Status	OK		
	Operating system	Microsoft Windows Server 2008 R2 E	nterprise ,	
	Virtualization software	Microsoft Hyper-V		
	Virtualization software status			
	Virtual machines	AppServerVMNode1, AppServerVMN Harsh CommonUI, HCVMNODE, Histo		

- **7** Select a host for the new VM.
 - **a** View the rating of each host.
 - **b** Select a suitable host to deploy the VM.

Note: All hosts that are available for placement are given a rating of 0 to 5 stars based on their suitability to host the virtual machine. The ratings are based on the hardware, resource requirements, and expected resource usage of the virtual machine. The ratings are also based on placement settings that you can customize for the VMM or for individual virtual machine deployments. However, the ratings are recommendations. You can select any host that has the required disk space and memory available.

Important: In SCVMM 2008 R2, the host ratings that appear first are based on a preliminary evaluation by SCVMM. The ratings are for the hosts that run Windows Server 2008 R2 or ESX Server. Click a host to view the host rating based on a more thorough evaluation.

c To view the placement settings used by the VMM to rate the hosts, click **Customize Ratings**. The **Customize Ratings** window appears.

istomize Ratings											
Placement Options	/M Loac	I									
Use the following se affect the current de view.											
More about customi:	zing hos	t ratir	ngs								
Placement goal											
Coad balance											
Hosts with th	e most f	ree re	esourc	es rec	eive h	igher r	atings				
C Resource ma	aximizati	on									
Hosts that m receive highe			l mach	ine's r	equire	ment v	vith the	e least	free re	esourc	es
Resource importanc	e ——										_
	Not In	nporta	ant						Ve	ry Impo	ortant
CPU usage:									-II-		_
	1	1			1	1		1	÷		
Memory free:						,	,				_
Disk I/D	_		-11-								_
	1		T		1	1					
Network utilization:			-								
								1	D 1	re Defa	
								1	Hesto	re Dera	Builds
							Г	0	ĸ	1	Cancel
										-	2 2.1000

You can modify the settings if required.

- **d** To view additional information about a host rating, select the host and click the following tabs:
- Details

itatus	ок
Operating system	Microsoft Windows Server 2008 R2 Enterprise , Service Pack 1, v.721
virtualization software	Microsoft Hyper-V
virtualization software status	Up-to-date
/irtual machines	AppServerVMNode1, AppServerVMNode2, Harsh_CommonUI, HCVMNODE, HistorianVMNode, InTouchVMNode, NLBNODE1, NLBNODE2, NLBNODE3

This tab displays the status of the host and lists the virtual machines that are currently deployed on it.

• Ratings Explanation

Details Rating Explanation () SAN Explanation
(i) This host meets all of the requirements of this virtual machine.

This tab lists the conditions that cause a host to receive a zero rating.

• SAN Explanation

 Details
 Rating Explanation
 Image: SAN Explanation

 Image: The server gemini.space.com does not contain any host bus adapter (HBA) ports. Fibre Channel SAN transfer cannot be used.
 Image: The server gemini.space.com does not have the Microsoft iSCSI Initiator installed. iSCSI SAN transfer cannot be used.

 Image: The server gemini.space.com does not have the Microsoft iSCSI Initiator installed. iSCSI SAN transfer cannot be used.
 Image: The server gemini.space.com does not have an HBA which supports NPIV.

This tab lists the conditions that prevent a Storage Area Network (SAN) transfer used to move the virtual machine's files to the host. e Click Next. The Select Path screen appears.

Note: If a host has network optimization enabled, a green arrow appears in the **Network Optimization** column. VMM 2008 R2 enables you to use the network optimization capabilities that are available on Hyper-V hosts that are running Windows Server 2008 R2. For information about network optimization and the hardware that supports it, see the "Windows Server 2008 R2" documentation. After a virtual machine is deployed, this feature is displayed only for virtual machines that are deployed on a host that runs Windows Server 2008 R2.

T Convert Physical Server ()	P2V) Wizard		×
Select Source Virtual Machine Identity System Information Volume Configuration VM Configuration Select Host	Select storage locations on the host for the virtual machine files Selected host: Cancer space.com Virtual machine path: Add this path to the list of default virtual machine paths on the host	Browse	
Select Path Select Networks Additional Properties Conversion Information Summary			
	Previous	Next Cancel	

8 Select the storage location for the VM files.

On the **Select Path** screen, enter the path to store the VM files, and then click **Next**. The **Additional Properties** screen appears.

Convert Physical Server (P	2V) Wizard
🗊 Additional Pr	operties
Select Source Virtual Machine Identity System Information Volume Configuration VM Configuration Select Host	Automatic start action
Select Path Select Networks	
Additional Properties	
Conversion Information Summary	
	Previous Next Cancel

- **9** Specify any additional properties of the VM.
 - a In the Action when physical server starts $list,\,click$ Never automatically turn on the virtual machine.
 - **b** In the Action when physical server stops list, click Save State.

Note: You can configure the details as required.

c From the **Specify the operating system you will install in the virtual machine** list, select the operating system based on the template selected, and then click **Next**. The **Summary** screen appears.

1 New Template Wizard		D
🗊 Summary		e e e e e e e e e e e e e e e e e e e
Template Identity	Before you crea	ate the new template, review the settings that you chose.
Configure Hardware	Summary:	ate the new template, reversities detailings that you encode.
Guest Operating System	Property	Value
Select Library Server	Template	VMWIS_Template
Select Path	Owner	SPACE\sivan
Summary		
		Z View Script
	 To create the te 	emplate, click Create. You can track progress of this job by viewing the Jobs page.
		Previous Create Cancel

10 Create a template. Click **Create**. The **Jobs** window appears.

	Name	Status	Start Time 👻	Result Name	Owner
	Create virtual m		4 % 11/23/2010 3:47:52.	BASEVMFRO	SPACE\Sival
9	Refresh host duster	Completed	11/23/2010 3:43:19 PM	Capricorn.space	SPACE\SivaN
	reate virtual machir	ne			
Prop	perty	Previ	ous Value	New Value	
Prop		Previ		New Value	
Prop	perty	Previ		New Value	
Prop	perty	Previ		New Value	
Prop	perty	Previ		New Value	
Prop	perty	Previ		New Value	
Prop	perty	Previ		New Value	

View the status of the template you created. The completed status confirms that the template has been created successfully.

Recommendation

When taking ghost backup, ensure that all drives where programs are installed are part of the backup.

Chapter 9

Implementing Backup Strategies in a Virtualized Environment

A virtual server backup is a copy of data stored on a virtual server to prevent data loss. There are two fundamental types of backups:

- Guest-level backup
- Host-level backup

Backup and Restore Strategies

There are a number of backup and restore strategies in both virtualized and non-virtualized environments. In the guest level, the virtual machines (VMs) are backed up as if they were physical servers. Although this strategy is among the simplest, it also has several drawbacks. You need to install backup software in each virtual machine (VM) to be copied in Guest Operating Systems, and maintain separate backup jobs (or even multiple backup jobs) per VM. This approach requires additional resources to execute the backups, and can affect the performance of the virtual machines. This backup type is not suitable for restore in the event of a disaster or granular restores within applications, such as databases or email.

Another backup strategy is to use a host-level backup. In this approach, back up the entire VM at one time. However, it can be as granular as your backup and restore application allows it to be. We recommend the host-level backup. It creates a complete disaster recovery image of the virtual server, which can be restored directly into the source virtual infrastructure.

Checkpointing Method

In this method you can take point-in-time checkpoints (snapshots) of the entire VM. We recommend this method as it ensures data consistency and allows for a fast and complete restore of the entire VM. One of the few disadvantages in this method is that you need to restore the entire checkpoint even if a file is lost or corrupt.

In a Microsoft virtualized environment, you can take and restore checkpoints using either System Center Virtual Machine Manager 2008 R2 (VMM) or Microsoft® Hyper-V Manager. The following sections describe how to implement backup strategies using SCVMM.

Taking Checkpoints Using SCVMM

By creating a checkpoint, you can save all contents of a virtual machine hard disk. You can reset your machine to a previous configuration if required, without having to uninstall programs or reinstall operating systems. This also helps you test applications across various configurations.

You can checkpoint one or multiple VMs both in the online and offline modes. However, you can checkpoint a VM only when it is deployed on a host.

Important: Typically, there are dependencies among nodes. Taking a checkpoint of a VM and restoring it later could negatively impact those dependencies. For more information, refer to "Checkpoints of System Platform Products - Observations and Recommendations" on page 623.

Taking a Checkpoint of an Offline VM

It is recommended that you shut down the virtual machine before creating a checkpoint. You can also create a checkpoint of the virtual machine offline. This stops the machine temporarily while the checkpoint is created. Turning off the virtual machine prevents loss of data while the conversion takes place.

To take a checkpoint of an offline VM

- **1** Open the System Center Virtual Machine Manager (SCVMM).
 - a On the Start menu, click All Programs. On the menu, click
 Virtual Machine Manager 2008 R2, and then Virtual Machine
 Manager Administrator Console. The Connect to Server
 window appears.

📜 Connect to Server	×
Enter the name of the Virtual Machine Manager SCVMM Administrator Console will connect to.	erver that the
Server name:	
SUN:8100	
Format: VMMServer:port	
Make this server my default	
Conne	ct Cancel

In the Server name box, enter "localhost:<port number>" or "<SCVMM server name>:<port number>", and then click
 Connect. The Virtual Machine Manager window appears.

Note: By default, the port number is 8100. However, you can modify it, if required.

Urtual Hachine Hana;	144 - 548	Lapace.com					_@×
Actions Columns	3655	🕞 PRO Tes (I) 🚕 Network	ing 🔝 Powershell 😢				
Virtual Machines		star.space.com **	tual Machines (Ritered 9)				Actions ×
Host Groups		VM				X V Owner	Virtual Machine Manager
Overview		Name ~	Status	Job Status	Host	CPU Average	New virtual machine
Al Hosts		E Z Owner: SPACE\Sival					Convert physical server
- a tar		E & Owner: SPACE\srink	rasay				Convert virtual machine
Cancer		VMAPPOnT	Running		capricom	3%	Add library server
Capricon		WMapServer	Running		capricom	3%	Add host
Small		VMDes	Running		capricom	1%	Add VMware VirtualCenter server
		VMHstClent	Running		capricom	0%	😥 Help
		VMHistorian	Running		capricom	6%	Host Cluster
		() VMEnTouch	Running		Cancer	0%	Ph Move
							2 Refresh
							Remove host duster
							Properties
							and enderster
Filters	Clear						
Status							
Owner							
Operating system							
Added date	*	Details					*
Tag	*						
	_						
nosts							
📳 Virtual Machines							
Jobs							
Administration							
		Summary Networking and S	itorage Latest Job				

2 Select the VM that you want to checkpoint.

On the **Virtual Machine Manager** window, right-click the VM for which you want to take a checkpoint. The VM menu appears.

Note: To create checkpoints of all VMs, select all VMs together and then right-click the selection.

Name 🔻	Status	Job Status	Host	CPU Average			
Owner: SPACE\sambasivab							
VMHistorian			Cancer	0 %			
VMHistClient St			Cancer	0 %			
VMDas			Cancer	6 %			
() VMAppServer	use		Cancer	7 %			
X Owner: SPACE\SivaN	we state						
Company COACE) caining	scard saved state						
	ut down		Cancer	2%			
VMInTouch	nnect to virtual machine		Cancer	0 %			
VMAPPInT	grate storage		Cancer	28 %			
F 14	grate						
📕 / Ne	w checkpoint						
🖺 M4	anage checkpoints						
S 🖸	sable undo disks						
¥: Re	pair						
🛃 In	stall virtual guest services						
😪 Ne	w template						
	one						
	ore in library						
	sete						
	sw networking						
	operties						

- **3** Shut down the VM you selected.
 - a On the VM menu, click Shut down.
- **4** Make a new checkpoint.
 - **a** Right-click the VM that is now Shut down (offline) and click **New checkpoint**. The **New Checkpoint** window appears.

Note: The **New Checkpoint** window does not appear if you are creating checkpoints for all VMs.

New Checkpoi	int	×
Name:	VMHistorian - (11/26/2010 15:46:55)	
Description	Historian is getting data from Appserver.	
	Create Cancel	l

 Modify the name of the checkpoint and enter a description for it, and then click Create. The checkpoint is created and the Virtual Machine Manager window appears.

Note: By default, the **Name** box displays the name of the VM and the time when the checkpoint is created.

5 Verify the checkpoint.

Right-click the VM and click Manage checkpoints. The Virtual Machine Properties window appears.

eneral	Hardware Configuration	Checkpoints	Custom Properties	Settings	Actions	
More	kpoints allow you to restore about virtual machine che able checkpoints:	e a virtual mach <u>ckpoints</u>	nine to a previous poi	nt in time.		
_	VMHIstorian - (11/26/2	15:46:55)				New Remove Properties
Chec	kpoint location: J:\VMHi	storian				
						OK Cance

This window displays all the checkpoints created for the VM. The corresponding details indicate the date and time when each checkpoint was created. A green dot appears below the checkpoint you created indicating that it is now active. Click **OK** to exit the window.

Taking a Checkpoint of an Online VM

It is possible to create checkpoints of a virtual machine while it is running. However, creating a checkpoint in online mode requires special application support.

Important: To avoid losing any data, do not make any configuration changes to the machine while creating a checkpoint. For more information, refer to "Checkpoints of System Platform Products - Observations and Recommendations" on page 623.

If you create a checkpoint after making configuration changes when the VM is online there may be issues when you restore the VM to that checkpoint.

For example, if you create a checkpoint for an online IOM Historian Product VM state and then try to restore it, the history block that is created shows a discrepancy in the start and end time and the following errors are displayed.

Warning: aahIndexSvc Attempted to create history block ending in the future

Error: aahIndexSvc ERROR: Invalid file format

To avoid such errors, stop the Historian VM before creating a checkpoint in the online mode.

To take a checkpoint of an online VM

- **1** Open the System Center Virtual Machine Manager (SCVMM).
 - a On the Start menu, click All Programs. On the menu, click
 Virtual Machine Manager 2008 R2, and then Virtual Machine
 Manager Administrator Console. The Connect to Server
 window appears.

📜 Connect to Server	×
Enter the name of the Virtual Machine Manager server that the SCVMM Administrator Console will connect to.	
Server name:	
SUN:8100	
Format: VMMServer:port	
Make this server my default	
Connect Canc	el

In the Server name box, enter "localhost:<port number>" or "<SCVMM server name>:<port number>", and then click
 Connect. The Virtual Machine Manager window appears.

Note: By default, the port number is 8100. However, you can modify it, if required.

Virtual Hachine Hanager -						ž.		
Vie View Go Actions								
	ibis 🕞 (PRO Tipis (1) 🔔 Network		KD					
irtual Machines	star.space.com 🕫	tual Machines (filtered 9)				Actions		
ost Groups	VM				× V Owner	Virtual Machine Manager		
Cverview	Name -	e ^ Status Job Status		Host	CPU Average	New virtual machine		
Al Hosts	E 2 Owner: SPACE\Sival					Convert physical server		
- a tar	E 2 Owner: SPACE\srink	rasay				Convert virtual machine		
Cancer	VMAPPONT	Running		capricom	3%	Add library server		
apricem	WMapServer	Running		capricom	3%	Add host		
Small	VMDes	Running		capricom	1%	Add VMware VirtualCenter server		
-	VMHstClent	Running		capricom	0%	😝 Help		
	() VMHistorian	Running		capricom	6%	Host Cluster		
	WithTouch	Running		Cancer	0%	A Move		
						2 Refresh		
	1							
	1					Remove host duster		
	1					T Properties		
	1							
	-							
ers <u>Cle</u>	ar.							
	* .							
	•							
	*							
	 Details 					*		
	-							
	1							
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	1							
	1							
	1							
	1							
	1							
	1							
Hosts								
Virtual Machines								
Jobs								
Administration								
	-							
	Summary Networking and S	Rorage Latest Jub						

2 Select the VM that you want to checkpoint.

On the **Virtual Machine Manager** window, right-click the VM for which you want to take a checkpoint. The VM menu appears.

Note: To create checkpoints of all VMs, select all VMs together and then right-click the selection.

	Name ^	Status	Job Status	Host	CPU Average		
6 0	wner: SPACE\Siva	N					
<u>2</u> o	wner: SPACE\srini	vasay					
۲	VMAPPInT	Running		capricorn	28 %		
0	VMAppServer	Running		capricorn	7%	0	Start
۲	VMDas	Running		capricorn	2 %	ŏ	Stop
۲	VMHistClient	Running		capricorn	2 %	ŏ	Pause
۲	VMHistorian	Running		capricorn	6 %		
۲	VMInTouch	Running		Cancer	0 %	1	Save state
۲	VMWIS	Running		capricorn	1 %	0	
						\odot	Shut down
						,	Connect to virtual machine
						E.	Mgrate storage
						P *	Mgrate
						H.	New checkpoint
						E.	Manage checkpoints
						0	
						۲i	
						B-	
						1	
						11	
						12	Store in library
						_	Delete
							View networking
							Properties

- **3** Make a new checkpoint.
 - a Click New checkpoint. The New Checkpoint window appears.

Note: The **New Checkpoint** window does not appear, if you are creating checkpoints for all VMs.

New Checkpoir	nt X	1
Name:	VMAppServer - (11/30/2010 12:11:56)	
Description:	Take a snapshot of VMAppServer in turnon mode.	
	Create Cancel	

 b Modify the name of the checkpoint and enter a description for it, and then click Create. The checkpoint is created and the Virtual Machine Manager window appears.

Note: By default, the **Name** box displays the name of the VM and the time when the checkpoint is created.

4 Verify the checkpoint.

Right-click the VM for which you have created a checkpoint and click **Manage checkpoints**. The **Virtual Machine Properties** window for the selected VM appears.

Virtual Machine Properties for VMAppServer	×
General Hardware Configuration Checkpoints Custom Properties Settings Actions	(2)
General Hardware Configuration Checkpoints Custom Properties Settings Actions Checkpoints allow you to restore a virtual machine to a previous point in time. More about virtual machine checkpoints Available checkpoints Available checkpoints:	New Remove Restore Properties
Checkpoint location: E:\VMAppServer	
ок	Cancel

This window displays all the checkpoints created for the VM. The corresponding details indicate the date and time when each checkpoint was created. A green dot appears below the checkpoint you created indicating that it is now active. Click **OK** to exit the window.

Restoring Checkpoints

You can revert a virtual machine to a previous state by restoring it to the required checkpoint. When you restore a virtual machine to a checkpoint, VMM stops the virtual machine and the files on the virtual machine are restored to their previous state.

Important: If the virtual machine has been in use since the checkpoint was created, take a backup of the data files before you restore the virtual machine to avoid loss of any data.

Restoring Checkpoints from a Virtual System Platform Backup

You can restore a VM to its previous state by using checkpoints. You can restore checkpoints of VMs both in the online and offline modes.

Restoring a Checkpoint of an Offline VM

When you restore a VM to a checkpoint taken of an offline VM, there should not be any loss of data. When checkpoints are taken from a VM that is offline, the machine temporarily stops, minimizing data loss during the conversion process.

To restore a checkpoint of an offline VM

- **1** Open the System Center Virtual Machine Manager (SCVMM).
 - a On the Start menu, click All Programs. On the menu, click
 Virtual Machine Manager 2008 R2, and then Virtual Machine
 Manager Administrator Console. The Connect to Server
 window appears.

📜 Connect to Server	×
Enter the name of the Virtual Machine Manager server that the SCVMM Administrator Console will connect to.	
Server name:	
SUN:8100	
Format: VMMServer:port	
Make this server my default	
Connect	ncel

In the Server name box, enter "localhost:<port number>" or "<SCVMM server name>:<port number>", and then click
 Connect. The Virtual Machine Manager window appears.

Note: By default, the port number is 8100. However, you can modify it, if required.

Virtual Machines	star.space.com	rtual Machines (Eltered 9)				Actions ×
Host Groups	VM				X V Owner	Virtual Machine Manager
Overview	Name -	Status	Job Status	Host	CPU Average	New virtual machine
Al Hosts	E 2 Owner: SPACE\Siva					Convert physical server
e and the star	E & Owner: SPACE\srini	vasay				Convert virtual machine
Cancer	VMAPPINT	Running		capricom	3%	Add library server
a capricom	VMAppServer	Running		capricom	3%	Add host
Small	(b) VMDes	Running		capricom	1%	Add VMware VirtualCenter server
- Sum	VMHstClent	Running		capricom	0%	R Help
	VMHistorian	Running		capricom	6%	Host Cluster
	VMEnTouch	Running		Cancer	0 %	
						Phone Nove
	1					🖉 Refresh
	1					🔀 Remove host cluster
	1					Froperties
	1					
	-					
Filters Clea	e					
Status						
Owner 🔫						
Operating system						
Added date ·						*
Tag						
🗿 Hosts						
Virtual Machines						
Jobs						
0						1

2 Select the offline VM for which you want to restore a checkpoint.

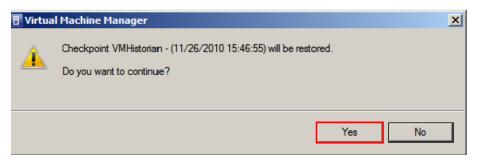
In the **Virtual Machine Manager** window, right-click the VM that you want to restore. The VM menu appears.

wner: SPACE\Siv	aN			
wner: SPACE\sri	nivasay			
) VMAPPInT	Running	capricorn	28 %	
VMAppServer	Running	capricorn	7 %	Start
) VMDas	Running	capricorn	2 %	
) VMHistClient	Running	capricorn	2 %	Stop
) VMHistorian	Running	capricorn	6 %	Pause
) VMInTouch	Running	Cancer	0 %	Save state
) VMWIS	Running	capricorn	1 %	Discard saved state
				3 Shut down
				Connect to virtual machine
				F* Migrate storage
				Migrate
				V New checkpoint
				Manage checkpoints
				Disable undo disks
				Y Repair
				Install virtual guest services
				New template
				Cone
				Store in library
				X Delete
				J. View networking
				Properties

- **3** Restore the checkpoint.
 - **a** Click Manage checkpoints. The Virtual Machine Properties window appears.

Virtual M	achine Properties for V	MHistorian					×
General	Hardware Configuration	Checkpoints	Custom Properties	Settings	Actions		•
Avail	kpoints allow you to restore about virtual machine cher able checkpoints: WHistorian - (11/26/2 in - WHistorian - (11/2	<u>ckpoints</u> 2010 15:46:55)	ine to a previous poi	_		New Remove	
	UMHistorian - ((11/30/2010 1	2:28:24)			Restore	
	Now					Properties	
Chec	kpoint location: J:\VMHi	storian				OK Cancel	

b Select the VM that is offline and click **Restore**. A confirmation message appears.



c Click **Yes**. The checkpoint is restored and the **Virtual Machine Properties** window appears.

New Remove Restore Properties	
Remove	
Remove	
Restore	
Properties	
roperties	
	_
	OK Can

A green dot appears below the checkpoint that you restored indicating that it is now active. Click \mathbf{OK} to exit the window.

Restoring a Checkpoint of an Online VM

You can restore a VM to a checkpoint that was taken when the machine was online. Restoring a VM to a checkpoint taken while online may lead to loss of data. However, if no changes to the configuration were made while creating the checkpoint, there should not be any data loss.

To restore a checkpoint of an online VM

- **1** Open the System Center Virtual Machine Manager (SCVMM).
 - a On the Start menu, click All Programs. On the menu, click
 Virtual Machine Manager 2008 R2, and then Virtual Machine
 Manager Administrator Console. The Connect to Server
 window appears.

Tonnect to Server	×
Enter the name of the Virtual Machine Manager server that the SCVMM Administrator Console will connect to.	
Server name:	
SUN:8100	
Format: VMMServer:port	
Make this server my default	
Connect	<u>;</u>]

b In the Server name box, enter "localhost:<port number>" or "<SCVMM server name>:<port number>", and then click
 Connect. The Virtual Machine Manager window appears.

Note: By default, the port number is 8100. However, you can modify it, if required.

T Virtual Hachine Hanager - so	n.space.com					X
File View Go Actions H	wip					2010 10
Actions Columns 📕 Jobs	🕞 PRO Tas (1) 🗻 Networking	Powershell 🕐 He				
Virtual Machines	star.space.com wh	al Machines (filtered 9)				Actions ×
Host Groups	WH .				X V Owner	Virtual Machine Manager
Cveniew Overview	Name -	Status	Job Status	Host	CPU Average	New virtual machine
B Al Hosts	E 2 Owner: SPACE\Sival					Convert physical server
8 Medun	E 2 Owner: SPACE\sriniva	say				Convert virtual machine
Cancer	VMWPPInT	Running		capricom	3%	Add Ibrary server
a capricom	WMapServer	Running		capricom	3%	Add host
permi	VHCas	Running		capricom	1%	Add VMware VirtualCenter server
Small	VMHstClent	Running		capricom	0%	😝 Help
	VMHistorian	Running		capricom	6%	Host Cluster
	VMbnTouch	Running		Cancer	0%	
						🚵 Mave
						2 Refresh
	1					X Remove host cluster
	1					I Properties
	1					
	4					
Filters Clear	1					
Status *	1					
Owner 💌	1					
Operating system •	Details					
Added date	Lecsis					*
Tag 👻						
	1					
	1					
	1					
	1					
	1					
	1					
	1					
	1					
	1					
In Hosts	1					
P Virtual Machines						
Sector Library	1					
John	1					
Administration						
	Summary Networking and Sta	rage Latest Job				

2 Select the VM for which you want to restore a checkpoint.

On the **Virtual Machine Manager** window, right-click the VM that you want to restore. The VM menu appears.

Name	Status	Job Status	Host	CPU Average			
Owner: SPACE\Siv	aN						
Owner: SPACE\sri	nivasay						
MAPPInT	Running		capricorn	28 %			
VMAppServer	Running		capricorn	7%			l.
VMDas	Running		capricorn	2 %			
VMHistClient	Running		capricorn	2%		Stop	
VMHistorian	Running		capricorn	6 %	🕛 F	Pause	
VMInTouch	Running		Cancer	0 %		Save state	
VMWIS	Running		capricorn	1%	-		
					0	Shut down	
					1	Connect to virtual machine	
					P 1	Migrate storage	
					P •	Migrate	
					E . 1	New checkpoint	
					Ε.	Manage checkpoints	
					0		
					11		
					16 I		
					100 I		
						Store in library	
					_	Delete	
						View networking	
					12 F	Properties	

- **3** Restore the checkpoint.
 - **a** Click Manage checkpoints. The Virtual Machine Properties window appears.

tual Ma	achine Properties for V	MAppServer				
ieneral	Hardware Configuration	Checkpoints	Custom Properties	Settings	Actions	
More Availa	kpoints allow you to restore about virtual machine cher able checkpoints:	<u>ckpoints</u> /2010 11:00:1	5)	nt in time.		New
	□ · · · · · · · · · · · · · · · · · · ·					Remove
	WMAppServer	- (11/30/2010	12:11:56)			Restore
	- Now					Properties
Check	kpoint location: E:\VMAp	op Server				
						OK Cance

b Select the checkpoint that you want to restore and click **Restore**. A confirmation message appears.

🖪 Virtua	l Machine Manager	×
À	Checkpoint VMAppServer - (11/29/2010 15:34:12) will be restored. Do you want to continue?	
	Yes No]

c Click **Yes**. The checkpoint is restored and the **Virtual Machine Properties** window appears.

A green dot appears below the checkpoint you restored indicating that it is now active. Click **OK** to exit the window.

Take and Restore Checkpoints of Products with No Dependencies

You can create and restore checkpoints of IOM products that do not have dependencies. When you restore the VM to a checkpoint, data is restored up to the point at which you took the checkpoint. Data related to all changes made after the checkpoint was taken is not captured and will not be restored.

For example, on an Application Server node, two User Defined Objects (UDOs) are created at different points in time and checkpoints taken at each point. If you restore your VM to the first checkpoint, it will be restored to the state where only the first UDO was created. The second UDO created will not be backed up or restored in your system.

To take and restore checkpoints of products with no dependencies

- **1** Open the System Center Virtual Machine Manager (SCVMM).
 - a On the Start menu, click All Programs. On the menu, click
 Virtual Machine Manager 2008 R2, and then Virtual Machine
 Manager Administrator Console. The Connect to Server
 window appears.

📜 Connect to Server	×
Enter the name of the Virtual Machine Manager server that the SCVMM Administrator Console will connect to.	•
Server name:	
SUN:8100	
Format: VMMServer:port	
Make this server my default	
Connect	incel

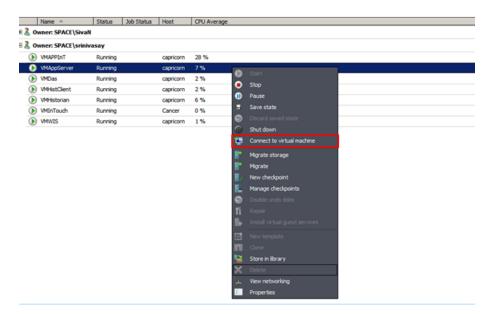
In the Server name box, enter "localhost:<port number>" or "<SCVMM server name>:<port number>", and then click
 Connect. The Virtual Machine Manager window appears.

Note: By default, the port number is 8100. However, you can modify it, if required.

😈 Virtual Hachine Hanager - so						×
File View Go Actions I						
😭 Actions 💼 Columns 📕 Jobs	🖬 MO Tes (0) 🗻 Networ	king 🔝 PowerShell 🛞 H	40			
Virtual Machines	star.space.com *	intual Machines (filtered 9)				Actions ×
Host Groups	VM				× ¥ Owner	Virtual Machine Manager
Overview	Name ~	Status	Job Status	Host	CPU Average	New virtual machine
Al Hosts	IE 2 Owner: SPACE \Siva	8				Convert physical server
- a neutri	E & Owner: SPACE \srin	wasay				Convert virtual machine
Cancer	VPMAPPInT	Running		capricom	3%	Add library server
apricom	WMappGerver	Running		capricom	3%	add host
Small	VMDes	Running		capricom	1%	Add VMware VirtualCenter server
1.00	VMHistClent	Running		capricom	0%	😧 Help
	VMHistorian	Running		capricom	6%	Host Cluster
	() VMEnTouch	Running		Cancer	0%	Ph Move
						2 Refresh
	1					Remove host duster
	1					Properties
	1					all subsets
	1					
Filters Gear	1					
Status ·						
Owner ·	1					
Operating system						
Added date *	Details					*
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	1					
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	1					
It Hosts	1					1
C Virtual Machines						
Library	1					
jobs	1					
Administration	1					
	Summary Networking and	Decese start bob				
-	somery resound and	service cardio 100				

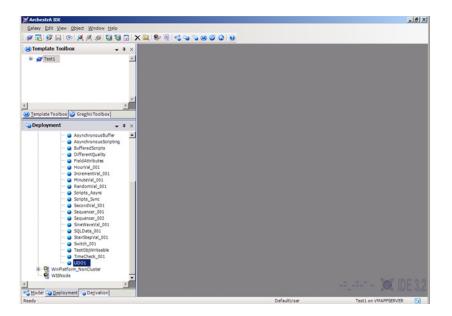
2 Select the VM for which you want to create and restore a checkpoints.

On the **Virtual Machine Manager** window, right-click the VM for which you want to create and restore checkpoints. The VM menu appears.



3 Connect to the virtual machine.

Click Connect to virtual machine. The Virtual Machine Viewer screen appears.



4 Create UDO1.

In Application Server under Platform, Engine, and Area, create UDO1.

5 Select the VM.

In the **Virtual Machine Manager** window, right-click the VM again. The VM menu appears.

- **6** Make a new checkpoint.
 - a Click New checkpoint. The New checkpoint window appears.

New Checkpo	int	-		×
Name:	VMAppServer - (12/02	2/2010 12:19:32)		
Description	Snapshot1			
			Create	Cancel

Modify the name of the checkpoint and type a description for it, and then click Create. The checkpoint is created and the Virtual Machine Manager window appears.

Note: By default, the **Name** box displays the name of the VM and the time when the checkpoint is created.

7 Connect to the virtual machine, if not already connected.

In the Virtual Machine Manager window, right-click the VM. In the VM menu, click Connect to virtual machine. The Virtual Machine Viewer screen appears.

8 Create UDO2.

In Application Server under Platform, Engine, and Area, create UDO2.

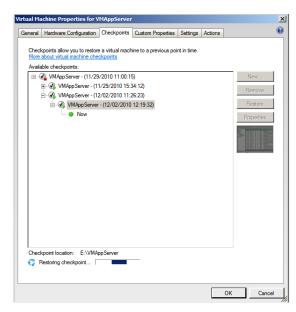
- **9** Restore the VM.
 - a In the Virtual Machine Manager window, right-click the VM and then click Manage Checkpoints. The Virtual Machine Properties window appears.

eneral	Hardware Configuration	Checkpointe	Curton Proportion	Settings	Actions	
citerdi	naidware conliguration		custom rioperties	Settings	Actions	
Chec	kpoints allow you to resto	re a virtual mac	hine to a previous poi	nt in time		
	about virtual machine ch		and to a previous por	ni in unio.		
Availa	able checkpoints:					
	VMAppServer - (11/2	9/2010 11:00:1	5)			New
	+ VMAppServer - (1	1/29/2010 15:	34:12)			Remove
	WMAppServer - (1	2/02/2010 11:	26:23)			Hemove
	🖃 🕢 VMAppServe	r - (12/02/2010) 12:19:32)			Restore
	Now					Properties
						Toportion
uhec	kpoint location: E:\VM/	pserver				

b Select the required checkpoint and click **Restore**. A confirmation message appears.

🗄 Virtua	l Machine Manager	X
Â	Checkpoint VMAppServer - (12/02/2010 11:26:23) will be restored. Do you want to continue?	
	Yes No	

c Click **Yes**. The checkpoint is restored.



A green dot appears below the checkpoint that you restored indicating that it is now active. Click \mathbf{OK} to exit the window.

Checkpoints of System Platform Products -Observations and Recommendations

The following are some of the observations and recommendations to take and restore checkpoints of System Platform Products.

• Take checkpoints of System Platform Products only when there are no configuration changes. For example, some of the scenarios where the checkpoints should not be taken are as follows:

System Platform Product	Configuration Changes
Application Server	deploy, migrate, import, export, check-in, check-out
Historian	import, export, create history block

• You must be aware of the consequences and make decisions when taking and restoring checkpoints of System Platform Products that have dependencies. If the configuration of a System Platform node has a dependency on the configuration of another System Platform node, it is recommended to take and restore checkpoints on such dependent nodes together. For more information, refer to "Recommendations" on page 625.

Taking and Restoring Checkpoints (Snapshots) in the Offline Mode

It is recommended that you take checkpoints of System Platform Products when the VMs hosting them are in the offline mode. Turn off the System Platform Product VM before taking a checkpoint.

Restoring checkpoints of VMs in the offline mode result in smooth functioning of the System Platform Products after the restoration. After restoring a checkpoint, start the VM, and then start the System Platform Product hosted in the VM.

Taking and Restoring Checkpoints (Snapshots) in the Online Mode

While the VM is in the online mode, the System Platform Product hosted on the VM functions in either the following way:

- Scenario 1: If the System Platform Product is not running on an online VM, it functions smoothly after the restoration of checkpoints.
- Scenario 2: If a checkpoint is taken while the System Platform Product is running on an online VM and there are no configuration changes in progress, the System Platform Product performs normally. However, when checkpoints are restored, there would be issues with the System Platform Product running on that VM. Some of the issues are explained in the following table.

Observation	Recommendations
Historian	
	• Do not take checkpoints while a history block chan is in progress. Restoring such a checkpoint leads to unpredictable behavior of the product.
	• In case of communication issues between the Historian and dependent System Platform Products restart the VMs.
	• If a checkpoint is taken before configuring Application Server to historize attributes, re-deploy the platform aft the Historian is restored.
Issue 1 : When you restore a checkpoint of the Historian node taken while the Historian was running and the block change was in progress, there is a conflict in the start and end time in the history block. The following errors and warnings are logged:	As a recovery step of Issue 1, shut down and disable the Historian, and then start and enable it.
Warning: aahIndexSvc Attempted to create history block ending in the future.	
Error: aahIndexSvc ERROR: Invalid file format.	
Issue 2 : While creating a checkpoint there may be an action in progress resulting from an event. The incomplete action is not saved when you restore such a checkpoint.	

Recommendations

Observation	Recommendations
Application Server	
If checkpoints are restored on either GR node or remote IDE node, the configurations might go out of synchronization.	Perform galaxy object component synchronization (GOCS) after opening the IDE on the remote node.
Data Acquisition Server (DAS)	
If checkpoints are restored on DAS, there may be connectivity and configuration mismatch issues for the dependent System Platform Products.	Deactivate, and then activate the DAS with appropriate configuration file. If it does not resolve the connectivity issues restart the dependent System Platform Product VMs.
InTouch	
If the AlarmDBLogger is configured on the local SQL Server, restoring checkpoints results in expected data loss.	If the alarm data is critical, configure the AlarmDBLogger on a remote SQL Server.
Wonderware Information Serv	ver (WIS)
If checkpoints are restored on WIS, there may be connectivity issues for the dependent System Platform Products.	Log off and re-launch the WIS browser.
Historian Client	
If checkpoints are restored on Historian Client, there may be connectivity issues to access the Historian.	Log off the server connection and log on to the Historian Client Applications.

Glossary

Application Engine (AppEngine)	A scan-based engine that hosts and executes the run-time logic contained within Automation Objects.
application object	An Automation Object that represents some element of your production environment. This can include things like:
	• An automation process component. For example, a thermocouple, pump, motor, valve, reactor, or tank
	• An associated application component. For example, function block, PID loop, sequential function chart, ladder logic program, batch phase, or SPC data sheet
Application Server	It is the supervisory control platform. Application Server uses existing Wonderware products, such as InTouch for visualization, Wonderware Historian for data storage, and the device integration product line like a Data Access Server (DAServer) for device communications.
	An Application Server can be distributed across multiple computers as part of a single Galaxy namespace.
ArchestrA	The distributed architecture for supervisory control and manufacturing information systems. It is an open and extensible technology based on a distributed, object-based design.
child partition	Child partitions are made by the hypervisor in response to a request from the parent partition. There are a couple of key differences between a child partition and a parent/root partition. Child partitions are unable to create new partitions. Child partitions do not have direct access to devices (any attempt to interact with hardware directly is routed to the parent partition). Child partitions do not have direct access to memory. When a child partition tries to access memory the hypervisor / virtualization stack re-maps the request to different memory locations.

clone	A VM clone is an exact copy of a VM at a specific moment in time. The most common use of a VM clone is for mass deployment of standardized VMs, called VM templates. VM clones also come in handy for test and development; because they allow use of a real workload without affecting the production environment. A VM clone is not appropriate for backup, disaster recovery, or other data protection methods.
clustered file system	A clustered file system organizes files, stored data, and access for multiple servers in a cluster. Clustered file systems are most useful when clusters work together and require shared access, which individual file systems do not provide. A Windows or Linux clustered file system can also identify and isolate defective nodes in a cluster. A Windows clustered file system will isolate the node logically, while a Linux clustered file system will use a utility to power down the node.
compact	To reduce the size of a dynamically expanding virtual hard disk by removing unused space from the .vhd file. See also dynamically expanding virtual hard disk
differencing disk	A virtual hard disk that is associated with another virtual hard disk in a parent-child relationship. The differencing disk is the child and the associated virtual hard disk is the parent.
differencing virtual hard disk (diffdisk)	A virtual hard disk that stores the changes or "differences" to an associated parent virtual hard disk for the purpose of keeping the parent intact. The differencing disk is a separate .vhd file (that may be stored in a seperate location) that is associated with the .vhd file of the parent disk. These disks are often referred to as "children" or "child" disks to disintguish them from the "parent" disk. There can be only one parent disk in a chain of differencing disks. There can be one or more child disks in a differencing disk chain of disks that are "related" to each other. Changes continue to accumulate in the differencing disk until it is merged to the parent disk. See also virtual hard disk. A common use for differencing disks is to manage storage space on a virtualization server. For example, you can create a base parent disk-such as a Windows 2008 R2 Standard base image - and use it as the foundation for all other guest virtual machines and disks that will be based on Windows Server 2008 R2.
dynamically expanding virtual hard disk (dynamic VHD, DVHD)	A virtual hard disk that grows in size each time it is modified. This type of virtual hard disk starts as a 3 KB .vhd file and can grow as large as the maximum size specified when the file was created. The only way to reduce the file size is to zero out the deleted data and then compact the virtual hard disk. See also virtual hard disk, VHD.
external virtual network	A virtual network that is configured to use a physical network adapter. These networks are used to connect virtual machines to external networks. See also internal virtual network, private virtual network.
failover	In server clusters, failover is the process of taking resource groups offline on one node and bringing them online on another node.

fragmentation	The scattering of parts of the same disk file over different areas of the disk.
guest operating system	This is the operating system/runtime environment that is present inside a partition. Historically with Virtual Server / Virtual PC, in a host operating system and a guest operating system where the host ran on the physical hardware and the guest ran on the host. In Hyper- V, all operating systems on the physical computer are running on top of the hypervisor so the correct equivalent terms are parent guest operating system and child guest operating system. Many find these terms confusing and instead use physical operating system and guest operating system to refer to parent and child guest operating systems, respectively.
guests and hosts	A guest virtual machine and host server are the two main building blocks of virtualization. The guest virtual machine is a file that contains a virtualized operating system and application, and the host server is the hardware on which it runs. The other important component is the hypervisor—the software that creates the guest virtual machine and lets it interact with the host server. The hypervisor also makes the host server run multiple guest virtual machines.
historical storage system (Historian)	The time series data storage system that compresses and stores high volumes of time series data for later retrieval. The standard Historian is the Wonderware Historian.
hypervisor	The hypervisor is to Hyper-V what the kernel is to Windows. The hypervisor is the lowest level component that is responsible for interaction with core hardware. It is responsible for creating, managing, and destroying partitions. It directly controls access to processor resource and enforces an externally-delivered policy on memory and device access. The hypervisor is just over 100k in size and the entire Hyper-V role is around 100mb in size. A full installation of Windows Server 2008 with Hyper-V will be multiple gigabytes in size. After you have installed the Hyper-V role, the hypervisor is loaded as a boot critical device.
live migration	Virtual machine live migration is the process of moving a VM from one host server to another without shutting down the application. The benefits of virtual machine live migration are some of the biggest selling points for virtualization, affecting business continuity, disaster recovery, and server consolidation. Virtual machine live migration is a feature in all of the major virtualization platforms, including VMware vSphere, Microsoft Hyper-V R2, and Citrix Systems XenServer.
logical processor	This is a single execution pipeline on the physical processor.Earlier, if someone told you that they had a two-processor system, you would know exactly what they had. Today, if someone told you they had a two-processor system, you do not know how many cores each processor has, or if hyperthreading is present. A two-processor computer with

	hyperthreading would actually have four execution pipelines, or four logical processors. A two-processor computer with quad-core processors would, in turn, have eight logical processors.
management operating system	The operating system that was originally installed on the physical machine when the Hyper-V role was enabled. After installing the Hyper-V role, this operating system is moved into the parent partition. The management operating system automatically launches when you reboot the physical machine. The management operating system actually runs in a special kind of virtual machine that can create and manage the virtual machines that are used to run workloads and/or different operating systems. These virtual machines are sometimes also called child partitions. The management operating system provides management access to the virtual machines and an execution environment for the Hyper-V services. The management operating system also provides the virtual machines with access to the hardware resources it owns.
memory overcommit	A hypervisor can let a guest VM use more memory space than that available in the host server. This feature is called memory overcommit. Memory overcommit is possible because most VMs use only a little bit of their allocated physical memory. That frees up memory for the few VMs that need more. Hypervisors with memory overcommit features can identify unused memory and reallocate it to more memory-intensive VMs as needed.
Network Load Balancing (NLB)	A Windows network component that uses a distributed algorithm to load-balance IP traffic across a number of hosts, helping to enhance the scalability and availability of mission-critical, IP-based services.
network virtualization	Network virtualization lets you combine multiple networks into one, divide one network into many and even create software-only networks between VMs. The basis of network virtualization is virtual network software, to which there are two approaches: internal and external. Internal network virtualization uses virtual network software to emulate network connectivity among VMs inside a host server. External network virtualization virtual network software to consolidate multiple physical networks or create several virtual networks out of one physical network.
NTFS	An advanced file system that provides performance, security, reliability, and advanced features that are not found in any version of the file allocation table (FAT).
parent partition	The parent partition can call hypervisor and request for new partitions to be created. There can only be one parent partition. In the first release of Hyper-V, the parent and root partitions are one and the same.

partition	A partition is the basic entity that is managed by the hypervisor. It is an abstract container that consists of isolated processor and memory resources with policies on device access. A partition is a lighter weight concept than a virtual machine and could be used outside the context of virtual machines to provide a highly isolated execution environment.
physical computer	The computer, or more specifically, the hardware that is running the Hyper-V role.
physical processor	It is the squarish chip that you put in your computer to make it run. This is sometimes also referred to as a "package" or a "socket".
private virtual network	A virtual network without a virtual network adapter in the management operating system. It allows communication only between virtual machines on the same physical server.
processor topology	This is the concept by which your logical processors correlate to your physical processors. For example, a two processor, quad-core system and a four-processor dual-core system both have eight logical processors but they have different processor topologies.
P2V	A physical-to-virtual server migration, also known as a P2V server migration, is the process of converting a physical workload into a VM. To perform a physical-to-virtual server migration, copy bits from the physical disk to the VM, inject drivers, then modify other bits to support the drivers. Some operating systems and virtual server migration tools let you perform a P2V server migration while the host is running, but others require a shutdown.
release key combination	The key combination (CTRL+ALT+LEFT ARROW by default) that must be pressed to move keyboard and mouse focus from a guest operating system back to the physical computer.
root partition	This is the first partition on the computer. This is the partition that is responsible for starting the hypervisor. It is also the only partition that has direct access to memory and devices.
saved state	A manner of storing a virtual machine so that it can be quickly resumed (similar to a hibernated laptop). When you place a running virtual machine in a saved state, Virtual Server and Hyper-V stop the virtual machine, write the data that exists in memory to temporary files, and stop the consumption of system resources. Restoring a virtual machine from a saved state returns it to the same condition it was in when its state was saved.
small computer system interface (SCSI)	A standard high-speed parallel interface used for connecting microcomputers to peripheral devices, such as hard disks and printers, and to other computers and local area networks (LANs).

snapshot	A VM snapshot backup is the most common way to protect a virtual machine. A VM snapshot is a copy of the state of a VM (and any virtual disks assigned to it) as it exists in server memory at a specific moment. The snapshot is usually saved to the SAN, where it can be recovered in case of a failure. Regular VM snapshot backups can significantly reduce recovery point objectives.
storage area network (SAN)	A set of interconnected devices, such as disks and tapes, and servers that are connected to a common communication and data transfer infrastructure, such as fibre channel.
storage virtualization	Storage virtualization separates the operating system from physical disks used for storage, making the storage location independent. The benefits of storage virtualization include more efficient storage use and better management. Dynamic provisioning is similar to storage virtualization, but it still requires more traditional storage management.
system center virtual machine manager (SCVMM)	A centralized management console that helps you manage and administer a virtual environment.
.vfd or virtual floppy disk	The file format for a virtual floppy disk. See also virtual floppy disk.
.vhd or virtual hard disk	The file format for a virtual hard disk, the storage medium for a virtual machine. It can reside on any storage topology that the management operating system can access, including external devices, storage area networks, and network-attached storage.
virtual hardware	The computing resources that the host server assigns to a guest VM make up the virtual hardware platform. The hypervisor controls the virtual hardware platform and allows the VM to run on any host server, regardless of the physical hardware. The virtual hardware platform includes memory, processor cores, optical drives, network adapters, I/O ports, a disk controller and virtual hard disks. Virtualization lets a user adjust the levels of these resources on each VM as needed.
virtual machine	A virtual machine (VM) is a file that includes an application and an underlying operating system combines with a physical host server and a hypervisor to make server virtualization possible. A virtual machine is a super-set of a child partition. A virtual machine is a child partition combined with virtualization stack components that provide functionality, such as access to emulated devices, and features like being able to save state a virtual machine. As a virtual machine is essentially a specialized partition, the terms "partition" and "virtual machine" is often used interchangeably. But, while a virtual machine will always have a partition associated with it, a partition may not always be a virtual machine.

virtual machine bus	A communications line used in Hyper-V by virtual machines and certain types of virtual devices. The virtual devices that use virtual machine bus have been optimized for use in virtual machines.
virtual machine configuration	The configuration of the resources assigned to a virtual machine. Examples include devices such as disks and network adapters, as well as memory and processors.
Virtual machine connection	A Hyper-V management tool that allows a running virtual machine to be managed through an interactive session.
virtual machine management service	The SCVMM service that provides management access to virtual machines.
virtual machine monitoring	Virtual machine monitoring actually means virtual machine performance monitoring. Virtual machine performance monitoring tools keep tabs on the state of VMs in an environment. Though it is possible to monitor the VM performance from within, but it's recommended to monitor it from outside the VM.
virtual machine snapshot	A virtual machine snapshot is a point in time image of a virtual machine that includes its disk, memory and device state at the time that the snapshot was taken. At any time can be used to return a virtual machine to a specific moment in time, at any time. Virtual machine snapshots can be taken irrespective of the state or type of child guest operating system being used.
virtual network	A virtual version of a physical network switch. A virtual network can be configured to provide access to local or external network resources for one or more virtual machines.
virtual network manager	The Hyper-V component used to create and manage virtual networks.
virtualization server	A physical computer with the Hyper-V role installed. This server contains the management operating system and it provides the environment for creating and running virtual machines. Sometimes referred to as a server running Hyper-V.
virtualization stack	The virtualization stack is everything else that makes up Hyper-V. This is the user interface, management services, virtual machine processes, emulated devices.
virtual processor	A virtual processor is a single logical processor that is exposed to a partition by the hypervisor. Virtual processors can be mapped to any of the available logical processors in the physical computer and are scheduled by the hypervisor to allow you to have more virtual processors than you have logical processors.
virtual switch	A virtual switch is the key to network virtualization. It connects physical switches to VMs through physical network interface cards and ports. A virtual switch is similar to a virtual bridge, which many virtualization platforms use, but it is more advanced. Virtual LANs,

EtherChannel and additional virtual networking tools are only available in a virtual switch. Some virtual switches even offer their own security features. virtualization WMI The WMI provider for virtualization that can be used with the provider hypervisor API to enable developers and scripters to build custom tools, utilities, and enhancements for the virtualization platform. VMDK The Virtual Machine Disk (VMDK) file format is used to identify VMware virtual machines. (In virtualization, the hypervisor creates a VM file that consists of an operating system instance, an application and other associated components.) Other platforms that support the VMDK file format include Sun Microsystems xVM, Oracle VirtualBox, and QEMU. It competes with Microsoft's Virtual Hard Disk format, which is used in Virtual Server and Hyper-V.

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