HA and Failover Clustering

- High Availability
- Hardware
- Creating a Cluster
- HA Resources
- Other Options
High Availability
Hardware
Creating a Cluster
HA Resources
Other Options
What is High Availability?

- The world is now a 24/7 global marketplace
- Systems must be available or customers are lost
- Goal of high availability (HA) is to keep systems, applications, services, email, databases, files & printers readily available
- Every business now has high availability needs

<table>
<thead>
<tr>
<th>Uptime Percentage</th>
<th>Maximum downtime per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>99.999</td>
<td>5 minutes</td>
</tr>
<tr>
<td>99.99</td>
<td>52 minutes</td>
</tr>
<tr>
<td>99.9</td>
<td>8.7 hours</td>
</tr>
<tr>
<td>99.9</td>
<td>3.7 days</td>
</tr>
<tr>
<td>99</td>
<td>3.7 days</td>
</tr>
</tbody>
</table>
Why is HA Important?

- Server downtime is unavoidable
- Keep your business running and competitive
- Servers may go offline due to
  - Maintenance
  - Upgrade
    - Software or Hardware
  - Update
    - Hot Fix, Security Patch
  - Accident
  - Power Outage
  - Disasters

Start planning now!
Failover Clustering

- 2+ machines (nodes)
- Redundancy *everywhere*
  - Storage, NICs, HBAs, MPIO, etc.
- “Shared” storage accessible by all nodes
- 1 node will host a HA application
- Application writes data to storage
Failover Clustering

- Nodes monitor health of other nodes
- If that node fails, health monitoring will cause a “failover” of the resource
- Another node starts the application and reads the last saved information from the storage
- Clients experience a slight interruption in service
What is a Failover Cluster?
Software Requirements

Clustering comes as an in-box feature on:
- Windows Server 2008 Datacenter
- Windows Server 2008 Enterprise
- Windows Server 2008 for Itanium-Based Systems
- Windows Unified Data Storage Server Enterprise

Architecture:
- x64: up to 16 nodes
- x86: up to 8 nodes
- IA64: up to 8 nodes
HA and Failover Clustering

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Building Your Cluster

- 2 or more computers (nodes)
- 2 NICs + dedicated storage adapter
- 3rd NIC for iSCSI
- HBA
- 3 Networks
  - Public
  - Private (heartbeat)
  - Storage / iSCSI
- Shared Storage
- OS, Service or Application
Mix And Match Hardware

- You can use **any hardware configuration** if
  - It passes Validate
  - Each component has a “Certified for Windows Server 2008” logo
    - Servers, Storage, HBAs, MPIO, DSMs, etc...

- **It’s that simple!**
  - Connect your Windows Server 2008 logo’d hardware
  - Pass every test in Validate
    - It is now supported!
  - If you make a change, just re-run Validate

Details: [http://go.microsoft.com/fwlink/?LinkID=119949](http://go.microsoft.com/fwlink/?LinkID=119949)
Integration with Vendors

- Failover Cluster Configuration Program (FCCP)
- Windows Server 2008+
- Buy validated solutions
- Microsoft recommends FCCP solutions
  - Not required for Microsoft support, must be logo’d
- “Validated by Microsoft Failover Cluster Configuration Program”

More information:
Clustering Storage

Windows Server 2008/R2 Supported
Shared Bus Types:

- Fibre Channel
- iSCSI
- SAS

- SCSI-3 SPC-3 compliant SCSI Commands
- Persistent Reservations (PRs)
- Parallel-SCSI deprecated in 2008
- Multipath IO (MPIO) recommended
- Basic GPT and MBR disks supported
Networking

- Key clustering component
  - Public network – clients
  - Private network – cluster communication
  - Storage network – nodes access “shared” storage
- Multiple networks for added redundancy
- Integrated with new TCP/IP Stack
- Full IPv6 Support
- DHCP Support for IPv4 and IPv6 Resources
- Nodes can reside in different subnets
HA and Failover Clustering

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WS03 – Cluster Creation

Welcome to the New Server Cluster Wizard

This wizard helps you create a new server cluster. Using this wizard, you specify the computer that will be the first node in the cluster. After you finish the wizard, you can add additional nodes by using Cluster Administrator.

This wizard requires that you provide the following information:
- The cluster’s domain
- A cluster name that is unique in the domain
- The name of the first computer to be added to the cluster
- A static IP address
- Login information for a user account in the domain for the cluster service account

To continue, click Next.
WS08/R2 – Cluster Creation
Validating a Cluster

For Microsoft support, cluster must pass the built-in Validate a Cluster Configuration (validate) test

Run during configuration and/or after deployment

Series of end-to-end tests on all cluster components

- Configuration info for support and documentation
- Networking issues
- Troubleshoot in-production clusters

More information

http://go.microsoft.com/fwlink/?LinkID=119949
Validate Inventories

- OS Binary Consistency
  - Same OS version
  - And version that supports clustering
  - Same Hotfix and Service Pack level

- Architecture
  - CPU architecture
  - Memory information

- Configuration
  - Domain membership and role
  - Analysis of unsigned drivers

- Devices
  - PnP device inventory
  - HBAs and NICs
Validate Verifies

**Infrastructure**
- Inter-node communication
- SCSI compatibility with Persistent Reservations

**Hardware**
- Multiple NIC’s per server
- Shared disks accessible from all machines and uniquely identifiable

**Software**
- Each NIC has different IP address on a dissimilar subnet

**Functionality**
- Network and Disk I/O latencies
- Failover simulation
Software Configuration

1. Install Windows Server 2008
2. Install Failover Clustering feature on each node
   *If necessary: install highly available workload*
3. Open the *Failover Cluster Management*
4. Run *Validate a Cluster Configuration*
5. Run *Create a Cluster Wizard*
   to configure your cluster
6. Make your applications highly available
Creating a Cluster
demo
HA Workloads

- The resources, services, roles, features and application you want HA
- Resource Group
  - Application-specific DLL
  - Network Name
  - IP Address
  - Physical Disk Resource
- Most in-box server roles
- Extensible model with 3rd party apps

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# HA Roles and Features

## Common
- Exchange
- File Server
- Hyper-V
- Print
- SQL

## Generic Containers
- Generic Application
- Generic Script
- Generic Service

## Other
- DFS-Namespace
- DFS-Replication (R2)
- DHCP
- DTC
- iSNS
- MSMQ
- NFS
- Remote Desktop (R2)
- WINS
- Other Server

## 3rd Party
- Many different roles
Hyper-V "Host" Clustering

- Cluster physical machines ("hosts")
- The VMs are HA and can recover from crashes
- The VM fails over between host machines
- Most common configuration
Hyper-V "Guest" Clustering

- The VMs are clustered ("guests")
- The application within the VM is HA
- Recovers from guest OS crashes
Hyper-V "Hybrid" Clustering

- Cluster the “hosts” and cluster the “guests”
- HA VMs and HA application within the VMs
HA Resources

demo
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Automated & Manual Management

Command Line
WMI
PowerShell (R2)

Failover Cluster
MMC

SCOM / MOM

Hyper-V Manager
SCVMM

Integrated Tool Experience
Why Cluster With Core?

- Higher Availability!
- Reduces unnecessary program for production servers
  - Less security risks and greater stability
  - Internet Explorer, Windows Media Player, etc.
- Less need to service – cluster stays online longer
- Can still manage with GUI using Remote Server Administrator Tools (RSAT)

> Start /w ocsetup
  FailoverCluster-Core
Multi-Site Clustering

- Nodes in different physical locations
- Unlimited distance
- Disaster recovery
- Survive the loss of an entire datacenter
- Storage at both sites with replication
- Also known as: geographically dispersed or stretched clustering
Summary

- Server downtime is inevitable
- Failover Clustering keeps your apps running and recovers from disasters
- Buy certified solutions or reuse hardware
- Validate simplifies troubleshooting
- Cluster and HA workloads are easy to create
- Make almost anything HA
- Multiple management options
Q & A
Resources

Cluster Information Portal:
Clustering Technical Resources:
Clustering Newsgroup:
TechNet: Configure a Service or Application for High Availability:
Webcast: TechNet Webcast: Failover Clustering 101
Webcast: TechNet Webcast: Build High-Availability Infrastructures with Windows Server 2008 Failover Clustering