

# Lesson 10: Configure Site-Level Fault Tolerance

MOAC 70-412: Configuring Advanced Windows Server 2012 Services

# Overview

- Objective 3.3 – Configure site-level fault tolerance.
  - Configure Hyper-V replica including Hyper-V Replica Broker and VMs
  - Configure multi-site clustering including network settings, Quorum, and failover settings

# Configuring Hyper-V Replica

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# Hyper-V Replica

- **Hyper-V replica** (offline copy):
  - Allows you to replicate a Hyper-V VM from one Hyper-V host at a primary site to another Hyper-V host at the Replica site.
  - Is used as a spare server, which is stored on another central storage device at another site.
  - Tracks the write operations on the primary VM and then replicates the changes to the replica over a wide area network (WAN) link to keep the replica updated.
  - Enables you to restore virtualized workloads to a point in time depending on the Recovery History selections for the VM.
- If the primary site goes down, you can bring up the replica server in minutes.

# Hyper-V Replica

- Hyper-V replica consists of the following components:
  - **Replication engine**
  - **Change tracking**
  - **Network module**
  - ***Hyper-V Replica Broker server role***

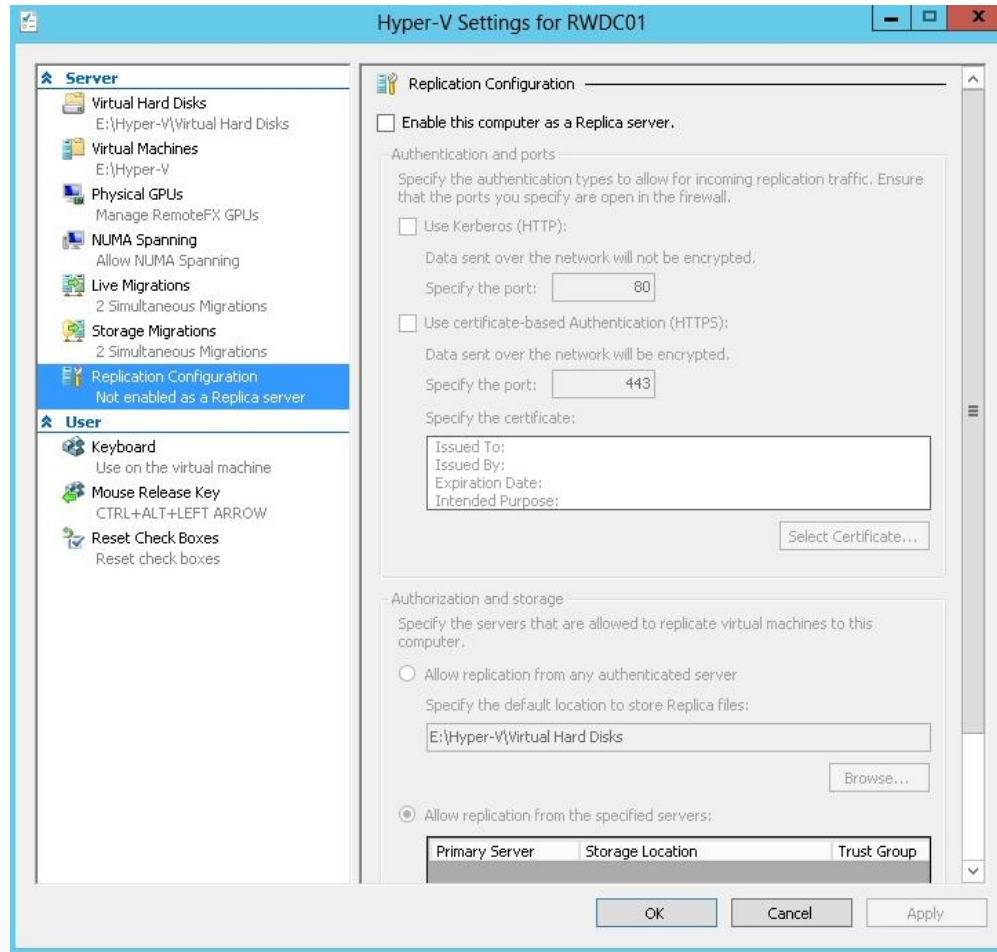
# Deploy Hyper-V Replica

- Hyper-V replica is part of the Hyper-V server role. It can be used on servers that are not part of the cluster.
- To replicate servers that are part of a cluster, use the Hyper-V Replica Broker server role.
- To deploy Hyper-V replica, perform the following steps:
  1. Enable replication between two Hyper-V hosts.
  2. Configure replication of one or more VMs.
  3. Test the replication deployment.

# Hyper-V Encryption

- Use certificate-based authentication (HTTPS) to apply encryption to the replication.
- Then use an existing X.509v3 certificate or create a self-signed certificate.

# Enabling Hyper-V Replication





# Enabling Hyper-V Replication

- After enabling replication on the host, you need to configure the VMs to replicate.
- During this configuration, you must specify the replica server name, options for the connection, and the virtual hard disks drives that you want to replicate.
- Finally, you can configure the recovery history and the initial replication method.

# Initial Replication Method

The screenshot shows a Windows-style dialog box titled "Enable Replication for VM1". The main heading is "Choose Initial Replication Method". On the left is a navigation pane with the following items: "Before You Begin", "Specify Replica Server", "Specify Connection Parameters", "Choose Replication VHDs", "Configure Recovery History", "Choose Initial Replication Method" (highlighted in blue), and "Summary".

The main content area contains the following text and controls:

- Text: "Before replication can start, an initial copy of all virtual hard disks that you selected must be transferred to the Replica server."
- Text: "Size of the initial copy of selected virtual hard disks: 8.38 GB"
- Section: "Initial Replication Method"
  - Radio button (selected): "Send initial copy over the network"
  - Radio button: "Send initial copy using external media"
    - Text: "Specify the location to export initial copy."
    - Text input field with a "Browse..." button.
  - Radio button: "Use an existing virtual machine on the Replica server as the initial copy."
    - Text: "Choose this option if you have restored a copy of this virtual machine on the Replica server. The restored virtual machine will be used as the initial copy."
- Section: "Schedule Initial Replication"
  - Radio button (selected): "Start replication immediately"
  - Radio button: "Start replication on:"
    - Date picker: "1/13/2013"
    - Time picker: "8:00 PM"
    - Text: "You can choose any time up to Sunday, January 20, 2013."

At the bottom of the dialog are four buttons: "< Previous", "Next >", "Finish", and "Cancel".

# Configuring Multi-Site Clustering

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# Multi-Site Clustering

- Many companies have only one office, which is used to define a single site.
- If the site goes down, the company would be at a standstill until a minimum number of servers were brought up and the data was restored from offsite backups.
- For larger companies, this type of solution is unacceptable.
- Therefore, a backup site needs to be established so that it can be brought online and allow the company to function while the primary site is repaired and brought back online.

# Hyper-V Replicas

At the beginning of this lesson, Hyper-V replicas were used to make a backup copy of servers. The replicas can be used to replicate to a second site. However, the Hyper-V replica is a cold server that must be brought online when the primary site is unavailable.

# Multi-Site Failover Cluster

- Another solution is to create a **multi-site failover cluster**. A multi-site failover cluster has the following advantages, as compared to a replica VM:
  - When a failure occurs, a multi-site cluster automatically fails over the clustered service or application to another.
  - Because a site fails over automatically, a multi-site cluster has less administrative overhead than a cold standby server, which needs to be turned on and configured.
- A multi-site failover cluster is similar to a standard failover cluster; however, the two sites are usually connected with a significantly slower WAN link as compared to links found in Local Area Networks (LANs).

# Multi-Site Storage

- Because of the slower WAN link, there is no shared storage that cluster nodes on the two sites can use.
- You need to use two separate storage systems, one at each site, and have some method to replicate the data between the two sites.

# Multi-Site Network Settings

- When you configure multi-site replication, the replication is either:
  - Synchronous
  - Asynchronous
- When a site goes down, your network needs basic network services functioning, which includes Active Directory Domain Services (AD DS) and Domain Name System (DNS).



# Quorum and Failover Settings

- Understand that WAN links will have slower bandwidth and higher latency.
- Since failover is triggered by missing heartbeats, you may need to tweak the quorum and failover settings so that the failover will work more efficiently if it is a multi-site cluster.
- By default, the heartbeat occurs once every second (1,000 milliseconds).
- If a node misses five heartbeats in a row, another node will initiate failover.

# Quorum and Failover Settings

- When sites are geographically dispersed, you cannot use quorum configuration that requires a witness disk.
- You can use the Node Majority with File Share Majority quorum.
- When using Node Majority with File Share Majority quorum, you need to place the file share witness at a third site.
- In a multi-site cluster, a single server can host the file share witness. However, you must create a separate file share for each cluster.

# Configuring Multi-Site Failover Cluster

- These are the high-level steps that you should perform when configuring a multi-site failover cluster:
  1. Ensure that you have enough cluster nodes at each site and that each node has similar hardware configuration and the same version of operating system and service packs.
  2. Ensure that sites have stable connections, with sufficient bandwidth and low network latency. Latency validates when you run the Validate Configuration Wizard in Failover Cluster Manager.
  3. Ensure that you have a reliable storage replication mechanism between sites.

# Configuring Multi-Site Failover Cluster

4. Make sure you have the basic network services available on each site including AD DS, DNS, and DHCP.
5. Run the Validate a Configuration Wizard on all nodes and correct any problems indicated.
6. Create a cluster.
7. Configure the cluster quorum mode.
8. Configure failover/failback settings.
9. Create the clustered role.
10. Test failover and failback.

# Lesson Summary

- Hyper-V replica (offline copy) allows you to replicate a Hyper-V VM from one Hyper-V host at a primary site to another Hyper-V host at the Replica site. The Hyper-V replica is used as a spare server, which is stored on another central storage device on another site.
- To keep the replica updated, Hyper-V replica tracks the write operations on the primary VM and then replicates the changes to the Replica over a WAN link.

# Lesson Summary

- Hyper-V Replica Broker server role is a new server role (introduced in Windows Server 2012) that redirects all VM specific events to the appropriate node in the replica cluster.
- Hyper-V Replica Broker is configured as part of the failover cluster.
- Hyper-V replica is part of the Hyper-V server role.
- To deploy Hyper-V replica, enable replication between two Hyper-V hosts and then configure replication of one or more VMs.

# Lesson Summary

- Because failover is triggered by missing heartbeats, you might need to tweak the quorum and failover settings so that the failover will work more efficiently for a multi-site cluster, particularly if you are using slow or high latency WAN links. The slower WAN link means there is no shared storage that cluster nodes on the two sites can use. Therefore, you need to use two separate storage systems, one at each site, and have some method to replicate the data between the two sites.

# Lesson Summary

- With an odd number of nodes, use the Node Majority quorum. With an even number of nodes, which is typical in a geographically dispersed cluster, use the Node Majority with File Share Majority quorum.
- When using Node Majority with File Share Majority quorum, you need to place the file share witness at a third site.



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