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.
  o Configure Hyper-V replica including Hyper-V Replica Broker and VMs
  o 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

Hyper-V Settings for RWDC01

Server
- Virtual Hard Disks
- Virtual Machines
- Physical Disks
- NVM Express
- Live Migrations
- Storage Migrations

Replication Configuration
- Not enabled as a Replica server

User
- Keyboard
- Mouse Release Key
- CTRL-HALT-DELETE
- Restart/Check Boxes

Enable this computer as a Replica server:
- Authentication and ports
  - Use Kerberos (HTTP)
  - Data sent over the network will be encrypted.
  - Specify the port: 80
- Use certificate-based Authentication (HTTPS)
  - Data sent over the network will be encrypted.
  - Specify the port: 443
- Specify the certificates:
  - Issued To:
  - Issued By:
  - Expiration Dates:
  - Intended Purpose:

Authorization and storage:
- Specify the servers that are allowed to replicate virtual machines to this computer:
  - Allow replication from any authenticated server:
  - Specify the default location to store replica files:
    - E:\Hyper-V\Virtual Hard Disks

Allow replication from the specified servers:
- Primary Server
- Storage Location
- Trust Group

OK  Cancel  Apply
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

Before replication can start, an initial copy of all virtual hard disks that you selected must be transferred to the Replica server.

Size of the initial copy of selected virtual hard disks: 8.38 GB

Initial Replication Method

- Send initial copy over the network
- Send initial copy using external media
  - Specify the location to export initial copy.
- Use an existing virtual machine on the Replica server as the initial copy.
  - 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.

Schedule Initial Replication

- Start replication immediately
- Start replication on:
  - 1/13/2013 8:00 PM

You can choose any time up to Sunday, January 20, 2013.
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:
  o Synchronous
  o 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.
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.
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.