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ITAS 166 - Virtualization and Cloud Computing I - Spring 2022

Project 2 - Hyper-V VM Mobility and Replicas with Dobby

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Introduction

In project two a total of five VMs will be used. Two host Hyper-V VMs will be created in a failover cluster, a Domain Controller server, File Server, and another Hyper-V server that is not a part of the failover cluster. This document will outline the procedures and steps used to create the Hyper-V failover cluster, the conversion of the domain controller from VMWare to a Hyper-V VM and finally how to replicate the domain controller VM to the other Hyper-V hosts. This should achieve a high level of redundancy for our domain controller. This documentation will assume the reader has created the necessary VMs.

1x – File Server, used for the iSCSI storage location for your VMs. Using additional 100GB drive.

2x – Hyper-V Servers in a Failover Cluster. With virtualization enabled in Vmware.

1x – Domain controller, doobythehouseelf.local.

1x - ServerHyper-V From Previous labs

Part 1 – iSCSI Configuration and Setup

Objective: Create shared iSCSI storage on the File Server VM and move Domain controller to a new hypervisor (Hyper-V).

1. Power on and log into all your servers.
2. On the file server we need to install File and iSCSI services. Launch Server Manager, press manage then Add roles and Features.
3. Press next until you reach the list of available features.
4. Click to expand the File and Storage Services entry then select the File and iSCSI box. Make sure

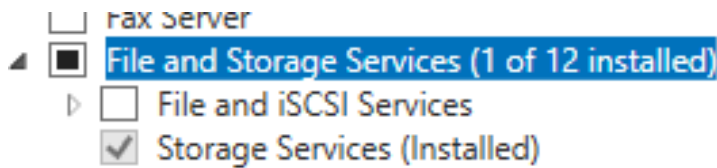


Figure 1 File and iSCSI Services

iSCSI target server is selected inside the File and iSCSI dropdown.

5. Press next twice then press install to complete the addition of the feature.
6. Once the installation is completed select the File and Storage Services tab then select iSCSI. You should see in the empty space a blue link to begin the process of setting up the iSCSI target server.
7. This will open Windows iSCSI wizard. Select you secondary 100GB drive as the iSCSI virtual disk location and press next.
8. Name it iSCSI-Share and press next.
9. Now you specify the size, enter the maximum amount available and leave the option for dynamically expanding on. Click next.
10. In the Assign iSCSI target we keep the new option selected and press next.

11. Enter iSCSI-Target for the target name and press next.

12. Now we need to specify the access servers. We will be adding both our Hyper-V hosts. Press add then enter the server's name into the Query initiator text box. See figure 2.

Select a method to identify the initiator:

☒ Query initiator computer for ID (not supported on Windows Server 2008 R2, Windows 7, or earlier):
AS-HYPERV-2.dobbythehouseelf.local Browse...

☐ Select from the initiator cache on the target server:

☐ Enter a value for the selected type
Type: Value:
IQN Browse...

OK Cancel

Figure 2 Add Server to Access Servers List

13. Your list should now be updated with your servers and there IQN tags. Click next.

Click Add to specify the iSCSI initiator(s) that will access this iSCSI virtual disk.

Type	Value
IQN	iqn.1991-05.com.microsoft:as-hyperv.dobbythehouseelf.local
IQN	iqn.1991-05.com.microsoft:as-hyperv-2.dobbythehouseelf.local

Figure 3 List of Access Servers

14. We have the option to enable CHAP but that will not be used for this project. Leave it blank and press next.

Confirm that the following are the correct settings, and then click Create.

ISCSI VIRTUAL DISK LOCATION
Server: AS-FileServer
Cluster role: Not Clustered
Path: I:\ISCSI\VirtualDisks\iSCSI-Share.vhdx

ISCSI VIRTUAL DISK PROPERTIES
Name: iSCSI-Share
Size: 99.9 GB

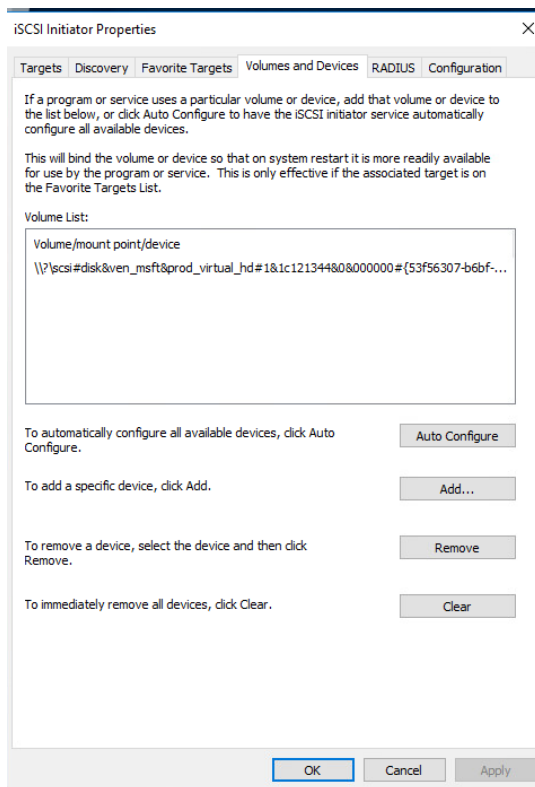
TARGET PROPERTIES
Name: iscsi-target

ACCESS SERVERS
IQN: iqn.1991-05.com.microsoft:as-hyperv.dobbythehouseelf.local
IQN: iqn.1991-05.com.microsoft:as-hyperv-2.dobbythehouseelf.local

SECURITY
CHAP: Disabled
Reverse CHAP: Disabled

Figure 4 iSCSI Confirmation

15. Confirm your settings and press create.
16. Now we can add the shared iSCSI to your Hyper-V host servers. These next steps will apply to both servers.
17. Open server manager on the Hyper-V server then select iSCSI initiator in the tools menu.
18. Click yes to turn on the service. In the target text box enter the name of your file server. In my case it was AS-FileServer. A quick connect window will pop up and then you can select done to close it.
19. Now click the volumes and devices tab and press auto configure. This should add an entry to the



list. You can now open disk management and verify that drive has been added. Keep disk management open for the next step.

Figure 5 iSCSI Initiator

20. In disk management locate the newly added drive, right click on it, and select Online, then right click again and press initialize. Accept the default partition table and press okay.
21. Now on the white and black space right click and press New Simple Volume. Name the volume iSCSI, format as NTFS and press create. You should see your available storage listed under disk management.

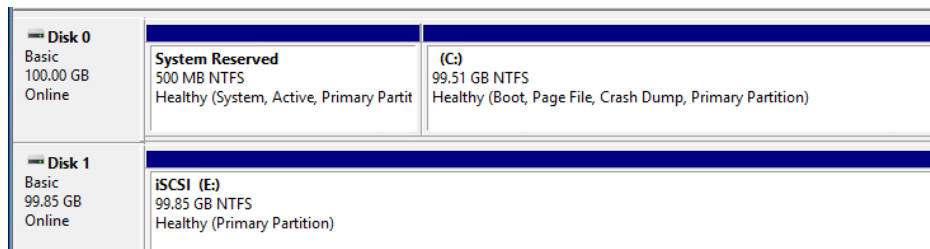


Figure 6 Disk Management

22. Repeat steps 16 - 21 for the other Hyper-V Host VM.

Part 2 – Adding Servers to Failover Cluster

Objective: Part two will go over the installation of the Failover manager feature and the creation of a failover cluster. Two separate networks will be used for the cluster, a class C, and a class B.

1. Part two will be completed on both Hyper-V host VMs.
2. To install the Failover Cluster Manager tool, we need to open PowerShell. Open the windows start menu and right click on PowerShell. Select run as Administrator.
3. Run this command “Install-WindowsFeature Failover-Clustering -IncludeManagementTools”

```
PS C:\Users\Administrator.DB> Install-WindowsFeature -name Failover-Clustering -includeManagementTools
```

Success	Restart Needed	Exit Code	Feature Result
True	No	Success	{Failover Clustering, Remote Server Admini...

Figure 7 Install Failover Manager

You should see the Exit Code of Success.

4. You can now open the Manager in Server Manager under tools as the Failover Cluster Manager option.
5. Repeat steps 1 -4 for both Hyper-V Host Servers.
6. Now it is only necessary to setup the cluster using one of the servers.
7. Inside the Failover Manager select the validate cluster option. It is always best practice to do this before setting up a cluster. It will alert you to any issues in your configuration and allow to fix them before going ahead and creating the cluster.
8. To validate add the server names you would like to create the cluster with, this will be the HyperV host servers. After adding them press next.
9. Select run all tests and press next. The testing will run for a few minutes. After completion review any warnings or errors. If you are happy with the validation results you can close the window and press Create Cluster on the right most toolbar.
10. On the before you begin window read what the wizard will be doing and press next.
11. Type your server by name then press add.

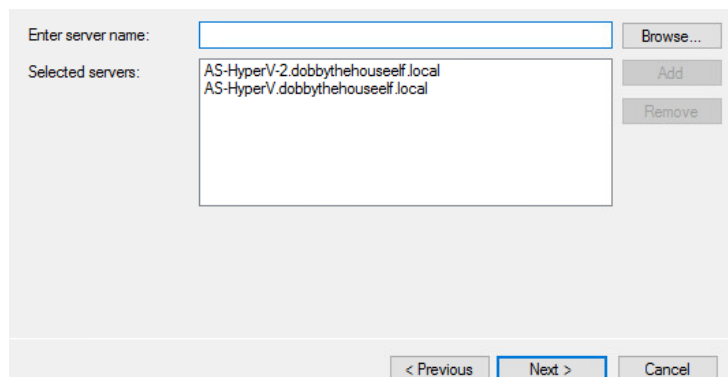


Figure 8 Add Servers to Cluster

12. Now we name the cluster DB-Cluster and set the Class C and B IPs to end in 120. Press next.

13. In the confirmation window, look over the cluster settings then press create.

14. On the summary window look over your cluster information and press finish.

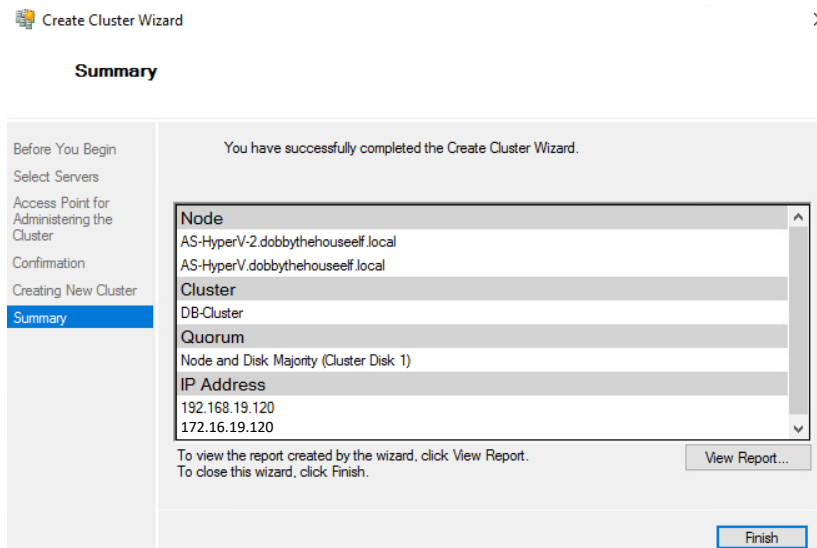


Figure 9 Cluster Confirmation

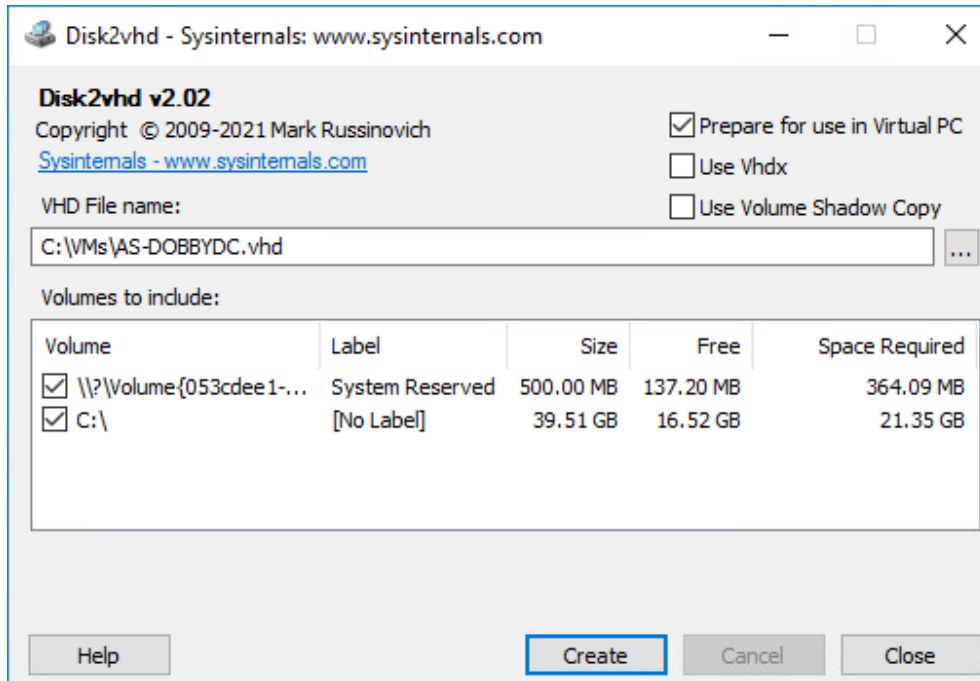
That completes the Failover Cluster basic setup, now we need to convert our Domain Controller to a VHD and import it into Hyper-V.

Part 3 – Converting Domain Controller to VHD

Objective: Convert the local disk on our Domain Controller to VHD allowing us to import the VHD into our Hyper-V cluster. The Disk2vhd utility will be used for this.

1. Log into your Dobby Domain Controller, enable your public LAN NIC through the VMware edit settings tab.
2. Using any web browser locate and download the Disk2vhd utility. (I recommend downloading an alternative to Internet Explorer) <https://docs.microsoft.com/en-us/sysinternals/downloads/disk2vhd>
3. Extract the zip file to your downloads folder and run the Disk2vhd64.exe.

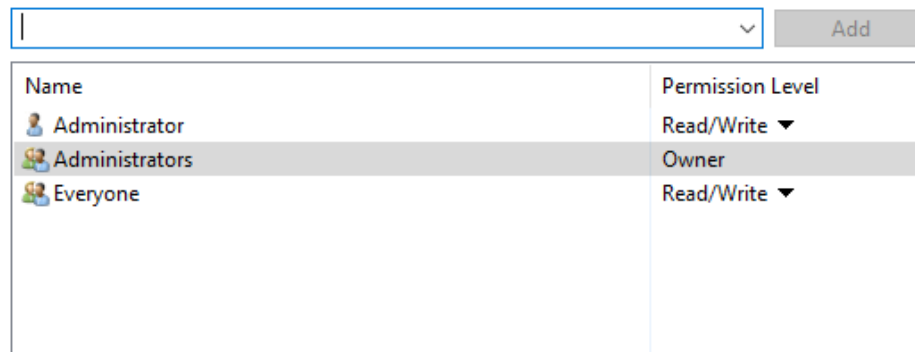
- You will now see the vhd application running, tick the Prepare for use in Virtual PC box and change the location of where it will be saved to the VMs folder on your C drive. Make sure to select both volumes and uncheck the Vhdx option. See figure 10 below for reference.



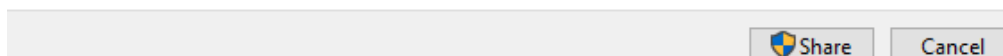
- Press create, this could take a while so be prepared to wait.

Figure 10 Disk2vhd Application

- After completion we need to share the VMs folder to one of our Hyper-V Hosts. Right click the VMs folder and press Share with the specific people.
- Add everyone to the list then grant them the permission level of Read/Write. Press Share.



[I'm having trouble sharing](#)



- Note the share path before switching over to a Hyper V host.
- In the Hyper V host open file explorer, then click the network tab. In the search bar enter the path you noted in step 8.
- The VMs folder should now be open.

11. You will now need to drag the VHD into your cluster storage, the location should be as follows:
C:\ClusterStorage\Volume1\VMs.
12. This completes the creation of the VHD from our Dobby Domain Controller.

Part 4 – Failover Cluster Roles and Hyper-V Setup.

Objective: Install the necessary roles into failover manager and import the VHD into Hyper V.

1. Log into to any of your Hyper V hosts, open the Failover Cluster manager and click the roles tab.
2. Click configure role on the right, click next then select the Hyper-V Replica broker option and press next.
3. Name the role DB-Replica and assign the Ips to end with 125. Press next.



Client Access Point

Before You Begin
Select Role
Client Access Point
Confirmation
Configure High Availability
Summary

Type the name that clients will use when accessing this clustered role:

Name:

i The NetBIOS name is limited to 15 characters. One or more IPv4 addresses could not be configured automatically. For each network to be used, make sure the network is selected, and then type an address.

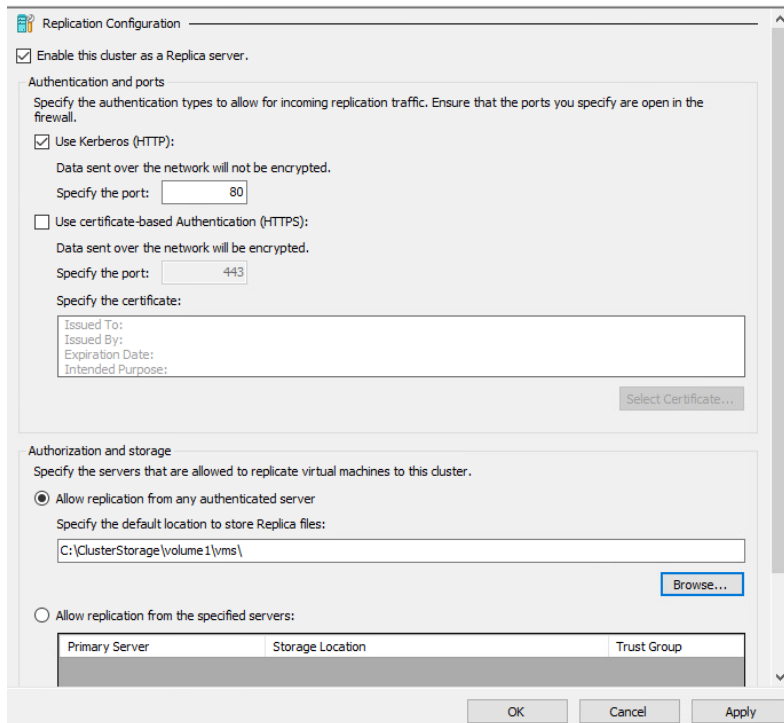
	Networks	Address
<input checked="" type="checkbox"/>	192.168.19.0/24	192.168.19.125
<input checked="" type="checkbox"/>	172.16.0.0/16	172.16.0.125

< Previous
Next >
Cancel

Figure 11 Replica Naming and Addressing

4. Press next on the confirmation page, then finish on the summary screen.
5. Now click the new role and press Replication Setting in the Actions pane on the right side.

6. Tick the box to enable replication, then turn on the Kerberos authentication. Next select the box to allow replication from any authenticated server. For the location place it on the cluster storage in your VMs folder. Press Ok to save these settings.



The image shows a 'Replication Configuration' dialog box. At the top, there is a checkbox labeled 'Enable this cluster as a Replica server.' which is checked. Below this is the 'Authentication and ports' section. It contains two options: 'Use Kerberos (HTTP):' which is checked, and 'Use certificate-based Authentication (HTTPS):' which is unchecked. Under the Kerberos option, there is a text box for 'Specify the port:' with the value '80'. Under the HTTPS option, there is a text box for 'Specify the port:' with the value '443'. Below these is a section for 'Specify the certificate:' with fields for 'Issued To:', 'Issued By:', 'Expiration Date:', and 'Intended Purpose:'. A 'Select Certificate...' button is located to the right of these fields. The 'Authorization and storage' section is below. It starts with the text 'Specify the servers that are allowed to replicate virtual machines to this cluster.' followed by two radio buttons. The first radio button, 'Allow replication from any authenticated server', is selected. Below it is a text box for 'Specify the default location to store Replica files:' containing the path 'C:\ClusterStorage\volume1\vm\'. A 'Browse...' button is to the right of this text box. The second radio button, 'Allow replication from the specified servers:', is unselected. Below it is a table with three columns: 'Primary Server', 'Storage Location', and 'Trust Group'. The table is currently empty. At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Apply'.

Figure 12 Replication Settings

7. Now we need to add our Dobby DC virtual machine to our failover. Press Virtual Machine on the right menu then press new virtual machine.
8. Select the node you would like it to live on for now.
9. On the before you begin page press next.
10. Name the VM DobbyReplica and store the VM in a different location. Store the VM in the cluster storage under the VMs folder. Press next.
11. Choose Generation 1 and press next.
12. Keep default memory and press next.
13. Leave networking default and press next.
14. On the connect virtual hard disk we be using an existing virtual hard disk. Browse to and select the VHD created in part from the cluster storage VMs folder. Press next. See figure 13 below for an example.

Connect Virtual Hard Disk

Before You Begin

Specify Name and Location

Specify Generation

Assign Memory

Configure Networking

Connect Virtual Hard Disk

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.

☐ Create a virtual hard disk

Use this option to create a VHDx dynamically expanding virtual hard disk.

Name: DobbyReplica.vhdx

Location: C:\ClusterStorage\Volume1\VMs\DobbyReplica\Virtual Hard Disks\ Browse...

Size: 127 GB (Maximum: 64 TB)

☒ Use an existing virtual hard disk

Use this option to attach an existing virtual hard disk, either VHD or VHDx format.

Location: ClusterStorage\Volume1\VMs\DC-Replica\Virtual Hard Disks\HDD0.vhd Browse...

☐ Attach a virtual hard disk later

Use this option to skip this step now and attach an existing virtual hard disk later.

< Previous Next > Finish Cancel

Figure 13 Connect VHD

15. Look over the summary and press finish.

Description:

Name: DobbyReplica

Generation: Generation 1

Memory: 1024 MB

Network: Not Connected

Hard Disk: C:\ClusterStorage\Volume1\VMs\DC-Replica\Virtual Hard Disks\HDD0.vhd (VHD, dynamic)

To create the virtual machine and close the wizard, click Finish.

< Previous Next > Finish Cancel

Figure 14 Add VM to Failover Summary

16. You will now see your DobbyDC VM listed under roles.

Roles (2)				
Search				
Queries				
Name	Status	Type	Owner Node	Priority
DB-Replica	Running	Hyper-V Replica Brok...	AS-HyperV	Medium
DobbyReplica	Off	Virtual Machine	AS-HyperV-2	Medium

Figure 15 Roles Page

That completes the roles needed for the Failover as well as the import of the VHD into our cluster.

Part 5 – Enabling Replication

Objective: Now that we have added the Dobby DC to our failover cluster, we will be adding one more layer of redundancy. The Dobby DC VM in the cluster will also be replicated to another Hyper V server outside of the cluster.

1. Power on and log into your non clustered Hyper V VM. Launch Server Manager and open the Hyper-V Manager under tools.
2. In the right actions pane press Hyper-V settings then select Replication Settings.
3. Select Enable this computer for replication, use Kerberos authentication and select to allow replication from any authenticated server. Specify the location of C:\VMs\. Press Okay to save the settings.

☒ Enable this computer as a Replica server.

Authentication and ports
Specify the authentication types to allow for incoming replication traffic. Ensure that the ports you specify are open in the firewall.

☒ Use Kerberos (HTTP):
Data sent over the network will not be encrypted.
Specify the port:

☐ Use certificate-based Authentication (HTTPS):
Data sent over the network will be encrypted.
Specify the port:

Specify the certificate:
Issued To:
Issued By:
Expiration Date:
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:

☐ Allow replication from the specified servers:

Primary Server	Storage Location	Trust Group
----------------	------------------	-------------

4. Now that replication is enabled on our non-clustered Hyper-V VM, we can go back to one of our Cluster Hyper-V VMs and open the Failover Manager.

5. Click roles then select your VM you added in part 4.

6. Click the replication option the DobbyReplica settings on the right side of the Failover Manager then press Enable Replication.

Figure 16 Enable Replication Hyper-V

7. This will open a replication wizard. Press next on the Before you begin page.
8. To specify the replica server, enter the name of your non-clustered Hyper-V VM. Press next.
9. On the Specify connection parameters page make sure Kerberos and port 80 are enabled and press next.
10. Accept the defaults for Choosing replication VHDs and press next.
11. Now we can choose the replication frequency, this is up to you, but the default should be fine. Press next.
12. Press next on the configure additional recovery points.

13. On the choose initial replication method accept the defaults and press next. This will send a replication over right away instead of waiting for the amount of time specified earlier.

The screenshot shows two sections of a configuration wizard. The first section, 'Initial Replication Method', has three radio button options: 'Send initial copy over the network' (selected), 'Send initial copy using external media' (with a 'Browse...' button), and 'Use an existing virtual machine on the Replica server as the initial copy.' The second section, 'Schedule Initial Replication', has two radio button options: 'Start replication immediately' (selected) and 'Start replication on:' (with a date and time picker set to 2022-04-07 at 10:00 PM). A note at the bottom of the second section states: 'You can choose any time up to April 14, 2022.'

Figure 17 Replication Method

14. Look over the summary and press finish.

The screenshot shows a 'Description:' window with a list of configuration details for replication. At the bottom, there are four buttons: '< Previous', 'Next >', 'Finish' (highlighted with a blue border), and 'Cancel'.

Description:	
Replica server:	AS-ServerHyperV.dobbythehouseelf.local
Replica server port:	80
Compress data:	Yes
Authentication type:	Kerberos authentication
VHDs not selected for replication:	None
Replication Frequency:	5 minutes
Store additional recovery points:	No
Initial replication method:	Using network, start immediately

To enable replication and close the wizard, click Finish.

Figure 18 Replication Summary

Your DobbyReplica server should now be listed on your non-clustered Hyper-V VM.

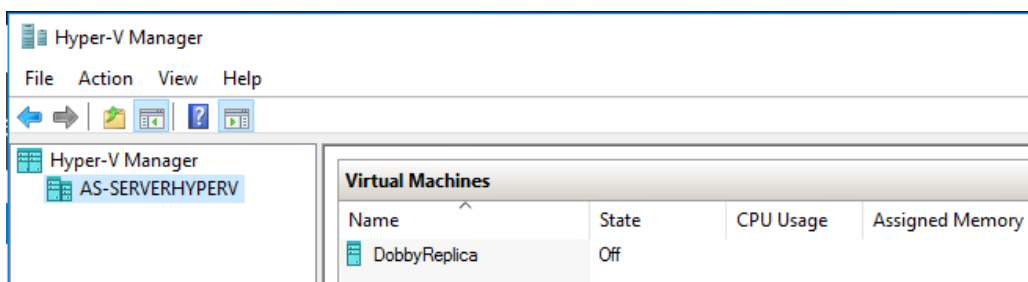


Figure 19 Replica on non-cluster Hyper-V VM

This now completes part 5, we now have some extreme levels of redundancy for our domain controller.

Conclusion

This project has gone deep into replication, failovers, and the redundancy that they can offer. This project was an extreme example of the steps you can take to take to make a Virtual Machine highly available with multiple levels of redundancy. I have working with Microsoft's Failover Clustering a has been quite enjoyable, for the most part it works very well and is intuitive to learn. Which is not often heard when talking about Microsoft products on Windows Server. I look forward to working with Windows clusters again in the future and it is nice to know a few of the ways we can make servers highly available.

Video

<https://youtu.be/e0N6YkJcVlk>