



Upgrading to Windows Server 2019 on Dell EMC PowerEdge servers: A simple process that can dramatically reduce your storage footprint

This document describes what we tested, how we tested, and what we found. To learn how these facts translate into real-world benefits, read the report Upgrading to Windows Server 2019 on Dell EMC PowerEdge servers: A simple process that can dramatically reduce your storage footprint.

We concluded our hands-on testing on July 9, 2019. During testing, we determined the appropriate hardware and software configurations and applied updates as they became available. The results in this report reflect configurations that we finalized on July 7, 2019 or earlier. Unavoidably, these configurations may not represent the latest versions available when this report appears.

Our results

Deduplication testing

	Vdbench gene	ration settings	Space used	Space used after	Compression ratio	
	Compression/ deduplication ratio	Block size	deduplication (GB)	(GB)		
File server 1 (ISO files)	N/A	N/A	764	312	2.4:1	
File server 2 (Microsoft Office files)	N/A	N/A	304	158	1.9:1	
VDI 1	2:1	8	1,044	273	3.8:1	
VDI 2	4:1	16	1,044	121	8.6:1	
Virtualized backup 1	4:1	4	1,044	119	8.8:1	
Virtualized backup 2	2:1	4	1,044	300	3.5:1	
Virtualized backup 3	4:1	64	1,044	106	9.8:1	
Virtualized backup 4	2:1	64	1,044	279	3.7:1	

Upgrade and live migration processes

	Number of steps	Time to complete
Upgrading from Microsoft® Windows Server® 2016 to Windows Server 2019	25	2 hours 46 minutes
Live migrating a VM to the newly created volume	7	1 hour 34 minutes

System configuration information

The table below presents detailed information on the systems we tested.

Server configuration information	Dell EMC [™] PowerEdge [™] R740xd				
BIOS name and version	Dell 2.1.7				
Operating system 1					
Operating system name and version/build number	Windows Server 2016				
Date of last OS updates/patches applied	6/29/2019				
Power management policy	Custom				
Operating system 2					
Operating system name and version/build number	Windows Server 2019				
Date of last OS updates/patches applied	7/5/2019				
Power management policy	Custom				
Processor					
Number of processors	2				
Vendor and model	Intel® Xeon® Gold 6130				
Core count (per processor)	16				
Core frequency (GHz)	2.10				
Stepping	4				
Memory module(s)					
Total memory in system (GB)	192				
Number of memory modules	12				
Vendor and model	Hynix® HMA82GR7AFR8N-VK				
Size (GB)	16				
Туре	PC4-2666				
Speed (MHz)	2,666				
Speed running in the server (MHz)	2,666				
Storage controller					
Vendor and model	Dell HBA 330 Mini				
Cache size (GB)	0 MB				
Firmware version	16.17.00.03				
Local storage 1					
Number of drives	2				
Drive vendor and model	Intel SSDSCKJB240G7R				
Drive size (GB)	240				
Drive information	m.2 SSD				

Server configuration information	Dell EMC [™] PowerEdge [™] R740xd					
Local storage 2						
Number of drives	4					
Drive vendor and model	Toshiba® THNSF8800CCSE					
Drive size (GB)	800					
Drive information (speed, interface, type)	6 Gb/s, SATA, SSD					
Local storage 3						
Number of drives	8					
Drive vendor and model	Toshiba MG04ACA4					
Drive size (GB)	4,096					
Drive information (speed, interface, type)	6 Gb/s, 7.2K SATA, HDD					
Network adapter						
Vendor and model	Mellanox ConnectX-4 LX 25GbE SFP					
Number and type of ports	2 x 25GbE					
Driver version	14.24.80.00					
Cooling fans						
Vendor and model	Delta PFR0612DHE-C					
Number of cooling fans	6					
Power supplies						
Vendor and model	Dell 05RHVVA00					
Number of power supplies	2					
Wattage of each (W)	750					

How we tested

Setting up the Microsoft Windows Server 2016 Storage Spaces Direct (S2D) cluster

Configuring the out-of-band management switch

We used a Dell S3048 1GbE switch for our out-of-band management of the S2D cluster. We configured four ports with the appropriate VLAN for our S2D iDRAC connections. We also configured one port for our Microsoft Active Directory (AD) and S2D management VMs, and another port to connect our OOB switch to the TOR switch. See our switch configuration in the Vdbench configuration files section.

Configuring the top-of-rack switch

We used a Dell S5048 25GbE switch for our cluster networking traffic. We placed all cluster-facing ports into hybrid mode, enabled Data-Center-Bridging, and enabled Priority Flow Control on all ports. See our switch configuration in the Vdbench configuration files section.

Configuring the infrastructure VM

We used Windows Server 2016 VM as our Active Directory and DNS server. On this VM, we added the Active Directory Domain Service and the DNS Server roles, and created a new domain for our test cluster.

Configuring the S2D cluster nodes

We used four Dell EMC PowerEdge R740xd servers for our test cluster. We configured the iDRAC and BIOS on each server to match the pre-deployment checklist provided by Dell EMC in the Ready Node deployment guide. We first installed Windows Server 2016 Datacenter Edition onto a 240GB virtual disk, consisting of two m.2 SSDs in a RAID 1 pair, separate from the drives designated for cluster storage. We then created a SET switch, configured the network adapters with IP addresses, and joined each server to the domain. Finally, we ran the network and storage commands to enable RDMA and Storage Spaces Direct. We chose the manual deployment method, and performed the following steps for each server:

Installing Windows Server 2016

- 1. Boot the server to the Windows Server 2016 installation media. We used the BMC console virtual media to mount the ISO image and install remotely.
- 2. At the prompt, press any key to boot from the CD/DVD location.
- 3. Click Next.
- 4. Click Install Now.
- 5. Select Windows Server 2016 Datacenter Edition (Desktop Experience), and click Next.
- 6. Check I accept the license terms, and click Next.
- 7. Select the 240GB OS drive, and click Next.
- 8. After installation, enter a password for Administrator, and click Finish.

Installing server roles and features

1. Open a PowerShell window as the domain administrator and run the following command to install the required roles and features for Storage Spaces Direct:

```
Install-WindowsFeature -Name "Data-Center-Bridging", "Failover-Clustering", "Hyper-V", "RSAT-Clustering-
PowerShell", "Hyper-V-PowerShell", "FS-FileServer"
```

Changing the host name

1. In the open PowerShell window, run the following command to change the hostname and restart the server.

Rename-Computer -NewName S2D-Node01 -Restart

Configuring the VM switch and adapters

```
1. Open a PowerShell window as the domain administrator and run the following commands to create and configure the VM switch
and adapters:
New-VMSwitch -Name S2DSwitch -AllowManagementOS $true -NetAdapterName 'SLOT 4 PORT 1', 'SLOT 4 PORT 2'
-MinimumBandwidthMode Weight -Verbose
Add-VMNetworkAdapter -ManagementOS -Name 'Management' -SwitchName S2DSwitch -Passthru | Set-
VMNetworkAdapterVLan -Access -VlanID 100 -Verbose
Add-VMNetworkAdapter -ManagementOS -Name 'Storage1' -SwitchName S2DSwitch -Passthru | Set-
VMNetworkAdapter -ManagementOS -Name 'Storage1' -SwitchName S2DSwitch -Passthru | Set-
VMNetworkAdapter -ManagementOS -Name 'Storage1' -SwitchName S2DSwitch -Passthru | Set-
VMNetworkAdapterVLan -Access -VlanID 101 -Verbose
```

Add-VMNetworkAdapter -ManagementOS -Name 'Storage2' -SwitchName S2DSwitch -Passthru | Set-VMNetworkAdapterVLan -Access -VlanID 102 -Verbose

Rename-NetAdapter "*Management*" Management

Rename-NetAdapter "*Storage1*" Storage1

Rename-NetAdapter "*Storage2*" Storage2

New-NetIPAddress -InterfaceAlias Management -IPAddress 192.168.100.1 -PrefixLength 24 -AddressFamily IPv4 -Verbose

Set-DNsClientServerAddress -InterfaceAlias Management -ServerAddresses 192.168.100.10

New-NetIPAddress -InterfaceAlias Storage1 -IPAddress 192.168.101.1 -PrefixLength 24 -AddressFamily IPv4 -Verbose

New-NetIPAddress -InterfaceAlias Storage2 -IPAddress 192.168.102.1 -PrefixLength 24 -AddressFamily IPv4 -Verbose

Joining the Active Directory domain

 Open a PowerShell window as the domain administrator and run the following command to join the Active Directory domain: \$credential = Get-Credential Add-Computer -DomainName test.local -Credential \$credential -Restart

Configuring the network adapters for RDMA

- 1. Open a PowerShell window as the domain administrator.
- 2. To enable RDMA on the virtual adapters, run the following command:
- Enable-NetAdapterRDMA -Name Storage1, Storage2
- 3. To map the virtual adapters to the physical ports, run the following commands: Set-VMNetworkAdapterTeamMapping -VMNetworkAdapterName "Storage1" -ManagementOS -PhysicalNetAdapterName "SLOT 4 PORT 1" Set-VMNetworkAdapterTeamMapping -VMNetworkAdapterName "Storage2" -ManagementOS -PhysicalNetAdapterName "SLOT 4 PORT 2"
- 4. To enable RDMA for Live Migration Traffic, run the following command:

 $\verb+Set-VMHost-VirtualMachineMigrationPerformanceOptionSMB+$

5. To set a network QoS policy, run the following commands:

New-NetQosPolicy "Cluster" -Cluster -PriorityValue8021Action 7

New-NetQosTrafficClass "Cluster" - Priority 7 - BandwidthPercentage 1 - Algorithm ETS

New-NetQosPolicy -Name 'SMB' -NetDirectPortMatchCondition 445 -PriorityValue8021Action 3

New-NetQosTrafficClass -Name 'SMB' -Priority 3 -BandwidthPercentage 50 -Algorithm ETS

New-NetQosPolicy -Name "Default" -Default -PriorityValue8021Action 0

Enable-NetQosFlowControl -Priority 3

Disable-NetQosFlowControl -Priority 0,1,2,4,5,6,7

Enable-NetAdapterQos -InterfaceAlias 'SLOT 4 PORT 1', 'SLOT 4 PORT 2'

Set-NetQosDcbxSetting -Willing \$false

Running the cluster validation tool

- 1. Open a PowerShell window as the domain administrator.
- 2. To validate the cluster configuration, run the following command:
- Test-Cluster -Node S2D-Node01, S2D-Node02, S2D-Node03, S2D-Node04 -Include 'Storage Spaces Direct', 'Inventory', 'Network', 'System Configuration'
- 3. Open the cluster validation report, and ensure there are no failures. If there are warnings in the report, verify that they are negligible, or correct the warnings before deployment.

Deploying the S2D cluster

- 1. Open a PowerShell window as the domain administrator.
- 2. Run the following command to create a new Storage Spaces Direct cluster without storage (we will add storage later):

```
New-Cluster -Name S2DSystem -Node S2D-Node01, S2D-Node02, S2D-Node03, S2D-Node04 -StaticAddress 192.168.100.6/24 -NoStorage -IgnoreNetwork 192.168.101.0/24, 192.168.102.0/24 -Verbose
```

Enabling the S2D cluster

 Open a PowerShell window as the domain administrator and run the following command: Enable-ClusterStorageSpacesDirect

Removing the host management network from Live Migration

1. Open a PowerShell window as the domain administrator and run the following commands:

\$clusterResourceType = Get-ClusterResourceType -Name 'Virtual Machine'

```
$hostNetworkID = Get-ClusterNetwork | Where-Object { $_.Address -eq '192.168.100.0' } | Select
-ExpandProperty ID
```

Set-ClusterParameter -InputObject \$clusterResourceType -Name MigrationExcludeNetworks -Value \$hostNetworkID

Updating Hardware timeout for Spaces port

1. Open a PowerShell window as the domain administrator and run the following commands:

Set-ItemProperty -Path HKLM:\SYSTEM\CURRENTCONTROLSET\SERVICES\spaceport\Parameters -Name HwTimeout -Value 0x00002710 -Verbose

Updating the firmware, driver, and OS

1. Open a PowerShell window as the domain administrator and run the following commands to see what driver and firmware versions you have:

Get-PnpDevice | Select-Object Name, @{l='DriverVersion' ;e={(Get-PnpDeviceProperty -InstanceID \$_.InstanceID -KeyName 'DEVPKEY_Device_DriverVersion').Data}} -Unique

- 2. Go to support.dell.com and download the latest drivers and firmware, making sure that it's at least the minimum supported in the matrix.
- 3. Open a PowerShell window as the domain administrator and run the following command on the first node: Suspend-Node -Drain
- 4. Run the following command to check and make sure the node is paused:
 - Get-ClusterNode
- 5. Update the node and restart.
- 6. Repeat steps 3 through 5 on the remaining three nodes.

Testing procedure

After the initial cluster setup, we started by creating eight CSVS_ReFS Mirror-Accelerated Parity (MAP) volumes on our Windows Server 2016 Storage Spaces Direct cluster. We then created eight VMs for our testing, and put one VM on each S2D MAP volume.

For our VMs, we created six with CentOS 7 and used Vdbench to generate datasets that the system could compress and deduplicate. For each of the six VMs we used a different block size, compression ratio, and deduplication ratio to generate these data sets. We also created two VMs with Windows Server 2016 to represent general purpose fileservers. We copied ~744 GB of ISO files onto the first fileserver, and ~284GB of Microsoft Office files, PDF files, executables, and other common files to the second fileserver.

Windows Server 2016 does not have the deduplication feature available for Storage Spaces Direct, so that formed our baseline storage usage. After we upgraded the Storage Spaces Direct cluster to Windows Server 2019, we recreated the same eight CSVS_ReFS volumes and migrated each VM over to the newly created volumes. We then enabled deduplication on each volume and let the background deduplication process run.

Creating the MAP volumes

1. Open a PowerShell window on any of the nodes and run the following command:

New-Volume -FriendlyName "Volume" -FileSystem CSVFS_ReFS -StorageTierFriendlyNames Performance, Capacity -StorageTierSizes 1TB, 4TB

2. Repeat step 1 for each VM. We used eight MAP volumes in our testing, one for each VM.

Creating the Vdbench and fileserver VMs

1. Run the following command in PowerShell to create a new VM:

New-VM -Name <vmname> -Path <Path-to-folder> -NoVHD -Generation 2 -MemoryStartupBytes 32GB -SwitchName S2DSwitch

- 2. Open the Hyper-V Manager GUI.
- 3. On the newly created VM, right-click, and select Settings...
- 4. We configured our VM with the following settings:
 - a. 8 vCPUs
 - b. 32GB RAM
 - c. New Hard Disk: 50GB Fixed VHDX (OS)
 - d. New Hard Disk: 1TB Fixed VHDX (Data)
 - e. DVD Drive
- 5. In the DVD Drive tab, click Image file, and navigate to the location of the CentOS 7 ISO for Vdbench VMs, or Windows Server 2016 ISO for fileserver VMs.
- 6. Change the boot order to boot from the newly added ISO.
- 7. Click Apply.
- 8. Click OK.

Installing CentOS 7 on the Vdbench VMs

- 1. Boot the VM from the CentOS 7 ISO.
- 2. Select English, and click Next.
- 3. Select automatic partitioning for the disk.
- 4. Choose Minimal Install.
- 5. Disable kdump.
- 6. Enable the first active network port and configure it. For example, assign static IP address of 192.168.100.1/16 with gateway of 192.168.0.1, and DNS server of 192.168.0.10.
- 7. Set the hostname.
- 8. Set the time zone to Eastern/US; enable NTP to sync from your time server if applicable.
- 9. Click Install.
- 10. Set the root password.
- 11. Reboot when the install has finished.

Installing Windows Server 2016 on the fileserver VMs

- 1. Power on the VM.
- 2. At the prompt, press any key to boot from the CD/DVD location.
- 3. Click Next
- 4. Click Install Now.

- 5. Select Windows Server 2016 Datacenter Edition, and click Next.
- 6. Check I accept the license terms, and click Next.
- 7. Select the OS VHD, and click Next.
- 8. After installation, enter a password for Administrator, and click Finish.
- 9. Run Windows Updates, and reboot when prompted.

Producing the Vdbench dataset

- 1. Log on to the CentOS VM as root.
- Set SELINUX to disabled in the following config file: vi /etc/selinux/config
- 3. Disable the firewall:

systemctl disable firewalld systemctl stop firewalld

4. Install Java:

yum install java

- 5. Download and copy vdbench 5.04.07 zip to the home folder.
- 6. Unzip vdbench.
- 7. Update the OS:

yum update -y

- 8. Reboot.
- 9. Log on as root.
- 10. Navigate to the vdbench folder you unzipped in step 6.
- 11. Run the Vdbench job to create the dataset:
 - ./vdbench -f <config_filename>.cfg -o <config_filename>_out

Upgrading from Windows Server 2016 to Windows Server 2019

1. Check that the servers are running version 14393.2828 or newer of Windows Server 2016.

Administrator: Windows Powersnell	192.168.100.1	- * ^	- D ×
Windows PowerShell Copyright (C) 2016 Microsoft Corporation. All rights reserved.			
PS C:\Users\Administrator.GARCIA> \$PSVersionTable.BuildVersion			
Major Minor Build Revision			
10 0 14393 2969			
PS C:\Users\Administrator.GARCIA> _			
			Activate Windows
			Activate Windows
			do to settings to activate windows.
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2. If you're using a software-defined networking switch with SET, run the following command in an elevated PowerShell session:

Get-ClusterResourceType -Cluster {clusterName} -Name "Virtual Machine" | Set-ClusterParameter -Create SkipMigrationDestinationCheck -Value 1

Set	ministrator: Windows PowerShell	H al	192.168.100.1	- 6 ×	- 0
Marry definit for solid for for for for for for 1993 2001 Marry definit for Cluster Haddeline (Lister Headeroff)ge -Cluster Haddeline (Lister) Set-Cluster/Header - Cruster BrightgestindestinationCheck - value 1 	ight (C) 2016 Microsoft Corporation. All rights reserved.				
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					Activate Windows Go to Settings to activate Windows.

3. Use Hyper-V VM live migration to move the running VM from the server:

a. Right-click the VM you wish to migrate, and select Move.

Hyper-V Manager				Actions	
WS16-S2D-NODE01 Virtual Mach	ines			NCIOIS	
WS16-S2D-NODE02 Name	State	CPU Usage	Assigned Mem	WS16-S2D-NODE01	•
WS16-S2D-NODE03	Rupping	0.9	32768 MB	New	,
WS16-S2D-NODE04	Connect		32768 MB	Import Virtual Machine	
	Settings			Hyper-V Settings	
	Turn Off			🚰 Virtual Switch Manager	
	Shut Down			🛃 Virtual SAN Manager	
5	Save	_	_	🚄 Edit Disk	
				Inspect Disk	
Checkpoints	Pause	_		Stop Service	
	Reset	ne has n	o checkpoints.	X Remove Server	
	Checkpoint			B) Refrach	
	Move			Nerresit Nerresit	
	Export			View	
	Rename			I Help	
	Enable Replication			vdbench	-
				- Connect	
vdbench	Help			Settings	
	-			Turn Off	
	Created: 6/	12/2019 3:14:35	PM Cluster	Shut Down	
	Configuration version: o.	Configuration Version: 8.0 He		Save	
	Generation: 2			U Pauro	
	Notes: No	Notes: None		The Pause	
				IP Reset	
				Checkpoint Checkpoint	

b. At the splash screen, click Next.

c. Select Move the virtual machine, and click Next.

🖶 Move "vdbench" Wizard		×
Choose Mov	ие Туре	
Before You Begin Choose Move Type Specify Destination Choose Move Options Summary	 What type of move do you want to perform? Move the virtual machine Move the virtual machine and, optionally, its storage to another computer running Hyper-V. Move the virtual machine's storage Move only the virtual machine's storage to another location, either on this server or on shared storage. 	
	< Previous Next > Finish Cancel	

d. Specify a name for the destination server, and click Next.

Move "vdbench" Wizard	stination C	Computer					×
Before You Begin Choose Move Type Specify Destination Choose Move Options Virtual Machine Summary	Specify Name:	the name of the d	lestination cor	nputer.			Browse
				< Previous	Next >	Finish	Cancel

e. Select Move only the virtual machine, and click Next.

Move "vdbench" Wizard	× Pe Options
Before You Begin Choose Move Type Specify Destination Choose Move Options Summary	 What do you want to do with the virtual machine's items? Move the virtual machine's data to a single location. This option allows you to specify one location for all of the virtual machine's items. Move the virtual machine's data by selecting where to move the items. This option allows you to select the location of each item to be moved. Move only the virtual machine This option allows you to move the virtual machine without moving its virtual hard disks. The virtual machine's virtual hard disks must be on shared storage.
	< Previous Next > Finish Cancel

f. Review the move details, and click Finish.

📑 Move "vdbench" Wizard		×
	love Wizard	
Before You Begin Choose Move Type Specify Destination Choose Move Options Summary	You are about to perform the following operation. Description: Virtual machine: vdbench Move type: Virtual Machine Destination computer: WS16-S2D-Node02 Move method: SMB	
	To complete the move and close this wizard, click Finish. < Previous	Cancel

4. Pause the cluster service by running the following PowerShell command:

Suspend-ClusterNode -Drain

22 Administrator: Windows Powershell		2.108.100.1	- * *	- 0 ^
aindows PowerShell Copyright (C) 2016 Microsoft Corporation. All rights reserved.				
PS C:\Users\Administrator.GARCIA> \$PSVersionTable.BuildVersion				
Major Minor Build Revision				
10 0 14393 2969				
PS C:\Users\Administrator.GARCIAs Get-ClusterResourceType -Cluster WSI6-Cluste PS C:\Users\Administrator.GARCIAs PS C:\Users\Administrator.GARCIAs PS C:\Users\Administrator.GARCIAs PS C:\Users\Administrator.GARCIAS - Supped-ClusterNode -Drain	er -Name "Virtual Machine" Set-Cluste	Parameter -Create SkipMigratio	onDestinationCheck -Value 1	
Name ID State				
ws16-s2d-node01 2 Paused				
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5. Place the server in storage maintenance mode by running the following PowerShell command:

Get-StorageFaultDomain -type StorageScaleUnit | Where FriendlyName -Eq <ServerName> | Enable-StorageMaintenanceMode

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6. To make sure all of the disks are in maintenance mode, run the following command: Get-PhysicalDisk

Z Administrator: Windows PowerShell	+ al	192.163.100.1	- @ ×	- 0 ×
indows PowerShell lopyright (C) 2016 Microsoft Corporation. All rights reserved.				
PS C:\Users\Administrator.GARCIA> \$PSVersionTable.BuildVersion				/
lajor Minor Build Revision				/
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Wame ID State				/
rs16-s2d-node01 2 Paused				
IS C:\Users\Administrator.GARCIAs Get-StorageFaultDomain -Type StorageScaleUnit IS C:\Users\Administrator.GARCIAs Get-PhysicalDisk Users\Administrator.GARCIAs Get-PhysicalDisk Users\Users\Administrator.GARCIAs Get-PhysicalDisk Users\Users\Administrator.GARCIAs Get-PhysicalDisk Users\Users\Administrator.GARCIAs Get-PhysicalDisk Users\Users\Administrator.GARCIAs Get-PhysicalDisk Users\Users\Administrator.GARCIAs Get-PhysicalDisk Users\Users\Administrator.GARCIAs Get-PhysicalDisk Users\Users\Administrator.GARCIAs Get-PhysicalDisk Users\User	: Where FriendlyName	-Eq WS16-S2D-NodeO1 Enable-Storag	geMaintenanceNode	
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ATA THNSF8800CCSE 676S104HTBUT False OK Healthy	Journal 745 GB			
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TA TOSHIBA MGO4ACA4 2857KIGWF7DE False OK Healthy	Auto-Select 3.64 TB			
TA TOSHIBA MG04AA4 28CCTITATIDE False In Maintenance Mode Warning	Auto-Select 3.64 TB			
TA THNSF8800CCSE 6765103MIB01 False OK Healthy TA THNSF8800CCSE 6765105YTBUT False In Maintenance Mode Warning	Journal 745 GB			
ITA TOSHIBA MG04ACA4 2857KIGXF7DE False in Maintenance Mode Warning ITA TOSHIBA MG04ACA4 2857KIH2F7DE False OK Healthy	Auto-Select 3.64 18 Auto-Select 3.64 TB			
ATA TOSHIBA MG04ACA4 28C8K1FSF7DE False OK Healthy ATA TOSHIBA MG04ACA4 28CCK11YF7DE False OK Healthy	Auto-Select 3.64 TB Auto-Select 3.64 TB			
<pre>ITA TOSHIBA MG04ACA4 2858K17SF7DE False OK Healthy ITA THNSF8800CCSE 676S104CTBUT False OK Healthy</pre>	Auto-Select 3.64 TB Journal 745 GB			
ITA TOSHIBA MG04ACA4 28CCK11NF7DE False OK Healthy ITA TOSHIBA MG04ACA4 28CCK11QF7DE False OK Healthy	Auto-Select 3.64 TB Auto-Select 3.64 TB			
ITA THNSF8800CCSE 67651062TBUT False OK Healthy ITA TOSHIBA NG04ACA4 2857K1H7F7DE False OK Healthy	Journal 745 GB Auto-Select 3,64 TB			/
ATA TOSHIBA MG04ACA4 28CCK11MF7DE False OK Healthy	Auto-Select 3.64 TB			
ITA THNSF8800CCSE 676S105ETBUT False OK Healthy	Journal 745 GB			
TA TOSHIBA MG04ACA4 28CCK110F7DE False In Maintenance Mode Warning	Auto-Select 3.64 TB			
TA TOSHIBA MG04ACA4 28CCK12077DE False OK Healthy TA TOSHIBA MG04ACA4 28CCK12PF7DE False OK Healthy	Auto-Select 3.64 TB			
TA THNSF8800CCSE 676510501801 False in Maintenance Mode Warning TA THNSF8800CCSE 67651049TBUT False OK Healthy	Journal 745 GB			
TA TDSHIBA MG04ACA4 2858K17TF7DE False OK Healthy TA THNSF8800CCSE 6765106RTBUT False OK Healthy	Auto-Select 3.64 TB Journal 745 GB			Contracting (second second second
VIA IOSHIBA MGO4ACA4 28CCK11LF7DE False OK Healthy	Auto-Select 3.64 TB			Activate Windows
PS C:\Users\Administrator.GARCIA>				Go to Settings to activate Windows.
				300 PM
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- 7. Double-click a Windows Server 2019 ISO to mount the image.
- 8. Change directories to the Windows Server 2019 mounted volume.
- 9. Run setup.exe.
- 10. On the Windows Server 2019 Setup screen, select Download updates, drivers and optional features (recommended), and click Next.

Windows Server 2019 Setup	-		×
Get updates, drivers and optional fe These updates will help the installation go smoothly, and can include important fixes, upda additional files which are not on the installation media. If you don't install these updates no function properly after the installation, and you might need to reinstall some optional featu	eatures ated device drive ow, your PC mig ures and languag	ers, and ht not ges.	
O Download updates, drivers and optional features (recommended)			
Not right now			
Lugat to halo make the installation of Windows better			
Privacy statement			
Back	k l	Next	

11. Enter the product key, and click Next.



12. Select Windows Server 2019 Datacenter (Desktop Experience), and click Next.

🖆 Windows Server 2019 Setup	-		×
Select Image			
Please select the image you want to install.			
Operating System:	Language:		
Windows Server 2019 Datacenter	en-US		
Windows Server 2019 Datacenter (Desktop Experience)	en-US		
			-6
This option installs the full Windows graphical environment, consuming extra drive space. I to use the Windows desktop or have an app that requires it.	t can be useful if	you want	
Back	٩	lext	

13. On the EULA screen, click Accept.



 Choose what to keep

 Image: Choose what the to keep
 </t

15. Click Install.



- 16. After the install has finished, log into the host.
- 17. Open an elevated PowerShell session.
- 18. To remove the node from storage maintenance mode, run the following command:

Get-StorageFaultDomain -type StorageScaleUnit | Where FriendlyName -Eq <ServerName> | Disable-StorageMaintenanceMode



19. To resume the cluster service, run the following PowerShell command:

Resume-ClusterNode

Administrator: Windows PowerShell	-H al	192.163.100.1	_ @ ×	- 0 ×
ndows PowerShell pyright (C) Microsoft Corporation. All rights reserved.				
C:\Users\Administrator.GARCIA> Get-StorageFaultDomain	type StorageScaleUnit Where FriendlyName -	Eq WS16-S2D-Node01 Disable-Stora	geMaintenanceMode	
ne State Type				
16-s2d-node01 Up Node				
C:\Users\Administrator.GARCIA>				
				Activate Windows
🛯 A H 🙆 🔚 🦓 🇊 🗵				도 4 <mark>8 6/14/2019</mark> 특

- 20. Wait for the storage jobs to finish before moving to the next server in the cluster.
- 21. To check the state of the storage repair, run the following commands:

Get-StorageJob Get-VirtualDisk					
Administrator: Windows PowerShell PS C:\Users\Administrator.GARCIA> Get-Storage Sc:\Users\Administrator.GARCIA> Get-VirtualI FriendlyName ResiliencySettingName FaultDomain	iob Jisk Redundancy OperationalS	tatus HealthStatus Size Foc	192.168.100.1	_ 8 × _	- a ×
Dedup S2D Volume	OK OK	Healthy 1.49 TB Healthy 50 TB	3.28 TB 45.53% 110 TB 45.45%		
PS C:\Users\Administrator.GARCIA> _					
					Activate Windows Go to Settings to activate Windows.
・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・					도 4 <mark>, 359 PM</mark> 도 4 , 6114 CM 4

- 22. Once the storage job is complete and all virtual disks are returned to a healthy state, repeat steps 3 through 21 on the remaining nodes in the cluster.
- 23. To update the cluster functional level, run the following PowerShell command: Update-ClusterFunctionalLevel
- 24. To update the storage pool, run the following PowerShell command: Get-StoragePool -FriendlyName S2D* | Update-StoragePool
- 25. To set the live migration check back, run the following PowerShell command:

Get-ClusterResourceType -Cluster {clusterName} -Name "Virtual Machine" | Set-ClusterParameter SkipMigrationDestinationCheck -Value 0

Live migrating a VM to the newly created volume

- 1. Open the Hyper-V Manager GUI.
- 2. Right-click the VM, and select Move.



3. Click Next.

Virtual Machines	Virtual Machines Actions S2D-NODE01									
NODE02 Name	State	CPU Usage	Assigned Memory	Uptime	Status	S2D-NODE01				
NODE03 NODE04	Move "vdbench01"	Wizard				×	hine			
	Before	You Begin					ager			
<	ner tou tegyn ose Move Type off Oestination ose Move Options mary	This witzer from one	o hepp you move a virtua location to another locatio	imachine to a diffe	rent computer, or m	iove wrtusi machine storage				
		L Do ho	t show this page again							

4. Select Move the virtual machine's storage, and click Next.

Hyper-V Manager Action View Help Action View Help Hyper-V Manager S2D-NODE3 S2D-NODE3 S2D-NODE3 S2D-NODE3 S2D-NODE34	Virtual Machines						Actions		
2D-NODE02	Name	State	CPU Usage	Assigned Memory	Uptime	Status	S2D-NODE01		
\$2D-NODE04	vdbench01 + M	× hine ager jer							
	c Before	e You Begin se Move Type se Move Options al Machine tary	What typ Move Move • Move store	e of move do you want to the virtual machine the virtual machine and, the virtual machine's stor only the virtual machine's e,	perform? optionally, its storag age storage to another	ge to another compu	ter running Hyper-V.	_	
								-	

5. Select Move all of the virtual machine's data to a single location, and click Next.

File Action View Help									
Wyper-V Manager \$20-NODE01 \$20-NODE02 \$20-NODE03 \$20-NODE04	Virtual Machines Name Valuench01 Valuench01 Valuench01 Valuench01 Valuench01 Valuench01	State State Choose e You Begin se Nove Type se Nove Type se Nove Type and Nove Type and Nove Type se Nove Typ	CPU Usage Witard Options for Mo @ Move This o @ Move This o	Assigned Memory oving Storage ou want to move the stor of all of the virtual machine's ption allows you to specified with all machine's ption allows you to specified only the virtual machine's ption allows you	Uptime age? d data to a single k y one location to s to different locati y individial location y individial location y individial location y locations to move	Status scation fore all the virtual mo ons ins for each of the vir a the virtual machine	Actions S2D-NODED1 S2D-NODED1 schine's items. tual machine's items.	X hine age(ef	,
					< Previous	Next >	Finish Cancel		

6. Browse to the location of the newly created volume, and click Next.

per-V Manager	Virtual Machiner						Actions
520-NODED1 520-NODE02 520-NODE03 520-NODE04	Vidench01 Vidench01 Vidench01 Vidench01 Vidench01 Vidench01 Vidench01 Vidench01 Vidench01	State State Choose Choo	CPU Usage Vizard a new location Specify a New loc Folder Availab Current Size:	Assigned Memory for virtual machin location for the virtual ma ation Explositestic location 1.02 TB	Uptime	Status	S2D-NODE01 X hine ager Provse
					< Previous	Next >	Finish Cancel

7. Review the move summary, and click Finish.

Virtual Machines						Actions			
D-NODE02 Name	State	CPU Usage	Assigned Memory Up	time	Status	S2D-NODE01			
D-NODE03 dench01 D-NODE04 dench05	Move "vdbench01" W	×	ager						
< Checkpoints	Before You Begin Choose Move Type Choose Move Options	You are all Description	bout to perform the following of n:						
	Virtual Machine Summary	Virtual m Move ty Item to r Attacher Attacher Current Checkpo Smart Pa	vachine: pe: move: d virtual hard disk. SCSI Control of virtual hard disk. SCSI Control configuration ints aging	vabench01 Withual Machine Storage New location C:\ClusterStorage\Volume C:\ClusterStorage\Volume C:\ClusterStorage\Volume C:\ClusterStorage\Volume C:\ClusterStorage\Volume		irtual Hard Disks Irtual Hard Disks			
vdbench01		To comple	To complete the move and close this wizard, click Finish.						

Vdbench configuration files

```
vdbench01 build.cfg
messagescan=no
compratio=4
dedupratio=4
dedupunit=4k
sd=sd1,lun=/dev/sdb,openflags=0 direct,thread=1
wd=Prefill,sd=(sd1),xfersize=256k,rdpct=0,seekpct=EOF
rd=Prefill,wd=Prefill,iorate=max,elapsed=100h
vdbench02 build.cfg
messagescan=no
compratio=2
dedupratio=2
dedupunit=4k
sd=sd1,lun=/dev/sdb,openflags=0 direct,thread=1
wd=Prefill,sd=(sd1),xfersize=256k,rdpct=0,seekpct=EOF
rd=Prefill,wd=Prefill,iorate=max,elapsed=100h
vdbench03 build.cfg
messagescan=no
compratio=4
dedupratio=4
dedupunit=64k
sd=sd1,lun=/dev/sdb,openflags=0 direct,thread=1
wd=Prefill,sd=(sd1),xfersize=256k,rdpct=0,seekpct=EOF
rd=Prefill,wd=Prefill,iorate=max,elapsed=100h
vdbench04 build.cfg
messagescan=no
compratio=2
dedupratio=2
dedupunit=64k
sd=sd1,lun=/dev/sdb,openflags=0 direct,thread=1
wd=Prefill,sd=(sd1),xfersize=256k,rdpct=0,seekpct=EOF
rd=Prefill,wd=Prefill,iorate=max,elapsed=100h
vdbench05 build.cfg
messagescan=no
compratio=2
dedupratio=2
dedupunit=8k
sd=sd1,lun=/dev/sdb,openflags=o_direct,thread=1
wd=Prefill,sd=(sd1),xfersize=256k,rdpct=0,seekpct=EOF
rd=Prefill,wd=Prefill,iorate=max,elapsed=100h
vdbench06 build.cfg
messagescan=no
compratio=4
dedupratio=4
dedupunit=16k
sd=sd1,lun=/dev/sdb,openflags=0 direct,thread=1
wd=Prefill,sd=(sd1),xfersize=256k,rdpct=0,seekpct=EOF
rd=Prefill,wd=Prefill,iorate=max,elapsed=100h
```

Read the report at http://facts.pt/syujn3d

This project was commissioned by Dell Technologies.





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