



Improve reliability and make more efficient use of storage in your small business or branch office

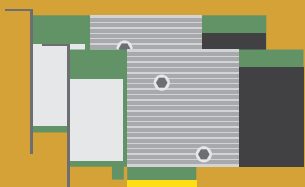
Dell EMC PowerEdge VRTX + UnityVSA software + VMware vSphere

For many smaller organizations or those with branch offices, on-site hardware solutions power transactions and other day-to-day business functions. This hardware must stay up and running so that business doesn't stop. The modular Dell EMC™ PowerEdge™ VRTX platform, Dell EMC UnityVSA™ software, and VMware® vSphere® work together in small spaces to deliver the fault tolerance that businesses need.

Dual Dell Shared PowerEdge RAID controllers (PERCs) and Dell EMC UnityVSA transform standard JBOD storage into a shared virtual storage pool that promotes versatility and easy management. In PT hands-on tests, the Dell EMC PowerEdge VRTX with Dell EMC UnityVSA and VMware vSphere experienced no downtime during simulated failover events when we disabled both internal and external RAID controllers and simulated loss of a compute node. With redundant server nodes, storage, power supplies, and VMware vSphere High Availability (HA) and Fault Tolerance, businesses can increase fault tolerance and minimize downtime.

This shared storage solution also offers features that prioritize data protection, simple backups, and flexibility so that the lone or shared IT contact doesn't get bogged down. Organizations that need on-site hardware solutions can get all these benefits from the combined power of the modular Dell EMC VRTX platform, UnityVSA software, and VMware vSphere.

Minimize storage outages with redundant hardware



Dual Shared PERC

Expand with external storage



Dell EMC storage

Share VRTX storage across departments



Dell EMC UnityVSA

Improving fault tolerance for offices of all sizes

For businesses that need an on-site, easy-to-manage package, Dell EMC offers the modular platform PowerEdge VRTX. Sized for smaller office environments, it packs servers, storage, networking, and management in one shared infrastructure. Our solution couples the VRTX with additional Dell PowerVault™ MD1220 storage arrays and Dell EMC UnityVSA storage software, which can be purchased and deployed separately. The modular approach allows you to build the platform that most fits your business needs.

Smaller offices or departments that need on-site hardware to run I/O-intensive workloads face a couple of challenges. First, the hardware needs to minimize downtime to keep customers happy. Second, because branches or departments may share one busy IT person, the solution must be expandable, ideally without requiring much additional space. That way, if business is booming and an office must grow its infrastructure, it can do so quickly and without borrowing space from employee or customer areas.

Featuring hardware and software that help ensure workloads stay up and running

Business reputations can rise and fall based on the reliability of their hardware infrastructures. If databases go down, customers can't make purchases, employees can't do their jobs, and business can grind to a halt. That's why it's critical that on-site hardware solutions work reliably at all times.

The Dell EMC PowerEdge VRTX solution we tested has several built-in hardware and software redundancy features to minimize the chance that a hardware failure will cause service interruptions for employees or customers. The Dell EMC PowerEdge VRTX solution itself features redundant server nodes, storage, and even power supplies to help maximize workload uptime.

Another way the PowerEdge VRTX solution increases fault tolerance is through dual PowerEdge RAID controller cards, for both the internal VRTX storage and the JBOD external storage, so that the shared storage pool is constantly available. During our simulated failovers of both external and internal PERCs, the VRTX/UnityVSA/vSphere solution experienced no downtime. The databases continued processing orders, with just a brief dip in performance. See [Appendix C](#) for details.

Put your storage in one big pool with UnityVSA

Dell EMC UnityVSA software lets you take your internal VRTX storage and your JBOD storage and link it together in a single, virtual pool. Rather than managing separate chunks of storage, UnityVSA allows for a single expanded capacity storage pool within the VRTX. Dual Shared PERC cards in the internal and external storage make sure that your virtual storage pool is available when you need it.

UnityVSA also brings storage tiering to VRTX. Storage tiering ensures that your most-read, or hot, data is available on the fastest storage, so that your workloads get the best performance. UnityVSA pushes cold data to slower storage that has greater capacity, so you can get the best of both worlds in one storage solution.



VMware vSphere software also extends hardware fault tolerance, through both VMware vSphere HA and VMware vSphere Fault Tolerance. vSphere HA detects when a VM isn't working properly and automatically restarts the VM on a different host, where the workload resumes. When we removed an active node on our Dell EMC PowerEdge VRTX solution, the VMs restarted on another node within the cluster, with only a brief outage before service was restored. vSphere Fault Tolerance provides further protection by running a secondary VM in passive mode, so when the primary VM goes offline, the second VM can take over quickly. We tested this feature by forcing a cluster member node offline, and verified that the passive VM assumed the primary role and continued to process the workload.

Dell EMC UnityVSA brings enterprise storage features to smaller offices

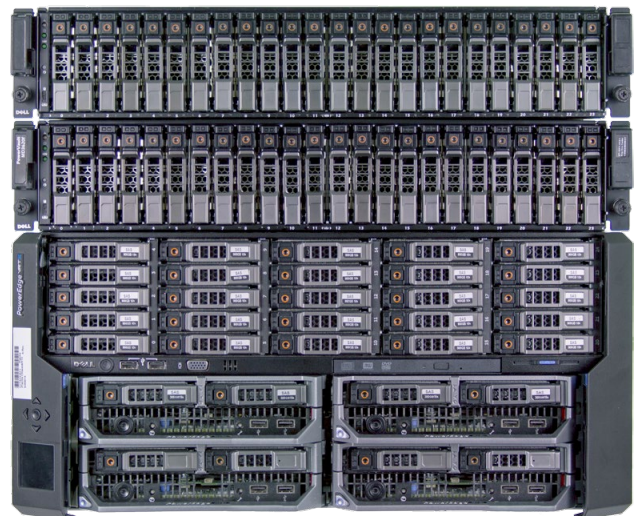
Dell EMC lists a number of features that UnityVSA software offers to improve ease-of-management, backup and recovery, and data protection for workloads no matter your business size, including:

- Online capacity expansion, which lets you add capacity to storage pools without taking the entire solution offline, which could reduce downtime and improve workload availability.
- Data service/protection, including replication and snapshots, which help protect against data loss.
- Backup with Data Domain Virtual Edition, which provides offices data protection and space-saving features comparable to a traditional SAN.
- NFS to external servers, which lets applications running on other servers access storage on your VRTX/JBOD setup, so you can fully use your organization's available storage capacity.
- Cloud integration and archival to cloud (Virtustream Storage Cloud), which provide an off-site disaster recovery solution by archiving data on the cloud.

To learn more about the features that Dell EMC UnityVSA offers, visit <https://store.emc.com/en-us/Product-Family/Unity-Products/Dell-EMC-Unity-VSA/p/EMC-Unity-Virtual-Storage-Appliance>.

Get improved fault tolerance in a small package with shared storage

Smaller offices, remote offices, branches, and even different departments in the same building all need strong, reliable database performance, and they need it on site. The Dell EMC PowerEdge VRTX, in conjunction with MD1220 storage, UnityVSA software, and VMware vSphere, work together to deliver a solution that increases fault tolerance built on an easy-to-manage shared storage pool that works for these types of businesses. The PowerEdge VRTX solution utilizes redundant hardware and software features, so businesses can be confident that their databases won't shut down just because something goes wrong. We found that when we simulated hardware failures, end users experienced no downtime, and the solution suffered only a brief dip in performance. Dell EMC PowerEdge VRTX, UnityVSA, and VMware vSphere can help organizations looking for a compact, on-premises deployment to realize their business goals.



Dell EMC PowerEdge VRTX with M630 server nodes and MD1220 storage

On March 22, 2017, we finalized the hardware and software configurations we tested. Updates for current and recently released hardware and software appear often, so unavoidably these configurations may not represent the latest versions available when this report appears. We concluded hands-on testing on May 31, 2017.

Appendix A – System information

The table below provides detailed configuration information for the server under test.

Server configuration information	Dell EMC PowerEdge M630
BIOS name and version	Dell 2.3.5
Non-default BIOS settings	None
Operating system name and version/build number	VMware ESXi™ 6.0 Build 4192238
Date of last OS updates/patches applied	02/27/17
Power management policy	Performance
Processor	
Number of processors	2
Vendor and model	Intel® Xeon® E5-2690 v4
Core count (per processor)	14
Core frequency (GHz)	2.60
Stepping	1
Memory module(s)	
Total memory in system (GB)	128
Number of memory modules	8
Vendor and model	Samsung® M393A2G40DB0-CPB
Size (GB)	16
Type	PC4-17000
Speed (MHz)	2,133
Speed running in the server (MHz)	2,133
Storage controller	
Vendor and model	Dell PERC H730 Mini
Cache size	1GB
Firmware version	25.5.0.0018
Driver version	6.606.12.00
Local storage	
Number of drives	2
Drive vendor and model	Seagate® ST9300653SS
Drive size (GB)	300
Drive information (speed, interface, type)	15K, 12Gb SAS, HDD

The tables below provide detailed configuration information for the server enclosure and storage we used in our tests.

Server enclosure configuration information	Dell EMC PowerEdge VRTX
Number of management modules	1
Management module firmware revision	2.22
Hardware version	A02
I/O module	
Vendor and model number	Dell R1-2210 VRTX 10Gb switch
I/O module firmware revision	2.0.0.67
Number of modules	1
Occupied bay(s)	A1
PCIe module	
Vendor and model number	Dell SPERC8-e
Number of modules	2
Occupied fabrics	B, C
Disk drive #1	
Number of drives	13
Drive vendor and model	Toshiba PX02SMF020
Drive size (GB)	200
Drive information (speed, interface, type)	12Gb SAS, SSD
Disk drive #2	
Number of drives	12
Drive vendor and model	Seagate ST300MM0006
Drive size (GB)	300
Drive information (speed, interface, type)	10K, 6Gb SAS, HDD
Power supplies	
Vendor and model number	Dell E1100E-S0
Number of power supplies	4
Wattage of each (W)	1,100
Cooling fans	
Vendor and model number	Dell 0V60TN
Number of fans	6

External JBOD configuration	Dell PowerVault MD1220 #1
Number of management modules	2
Management module firmware revision	1.06
Disk drive #1	
Number of drives	12
Drive vendor and model	Toshiba PX02SMF020
Drive size (GB)	200
Drive information (speed, interface, type)	12Gb SAS, SSD
Disk drive #2	
Number of drives	12
Drive vendor and model	Seagate ST300MM0006
Drive size (GB)	300
Drive information (speed, interface, type)	10K, 6Gb SAS, HDD

External JBOD configuration	Dell PowerVault MD1220 #2
Number of management modules	2
Management module firmware revision	1.06
Disk drive #1	
Number of drives	24
Drive vendor and model	Seagate ST300MM0006
Drive size (GB)	300
Drive information (speed, interface, type)	10K, 6Gb SAS, HDD

Appendix B – How we tested

Installing VMware vCenter Server® Client Integration Plugin

Use the steps above to install vCenter onto a server outside of the testing environment. For the deployment outlined here, your server or VM must have at least two processors and 8 GB of RAM. On a Windows® server or VM, locate the installer image VMware-VIMSetup-all-6.0.0-3634788.iso.

1. Mount the image, navigate to the vcsa folder, and launch VMware-ClientIntegrationPlugin-6.0.0.exe.
2. When the wizard appears, click Next.
3. Accept the terms of the license agreement, and click Next.
4. At the destination folder screen, leave the default or change if desired, and click Next.
5. Click Install.
6. When installation finishes, click Finish.

Installing VMware ESXi

We installed the Dell-specific VMware vSphere 6.0 hypervisor onto the Dell EMC PowerEdge M630 servers using the VMware-VMvisor-Installer-6.0.0-2809209.x86_64-Dell_Customized-A01.iso image file burned to a DVD.

1. Insert the VMware vSphere 6.0 installation media into the optical drive.
2. Boot the server to the VMware vSphere installer.
3. To begin the installation wizard, press F11.
4. For the installation location, select the RAID1 SD card pair.
5. For the keyboard type and language, select US English.
6. Enter the root password for the host.
7. To start the installation, press Enter.
8. When the installation completes, press Enter. This reboots the server.
9. After the host reboots, set the management network IP address.
10. Add the host to the existing vCenter, and enable SSH and ESXi shell.

Following this setup, we installed Update Manager for vCenter with default settings, and used it to update the ESXi host to the latest patch level, 4192238.

Deploying UnityVSA through a vCenter server

Use the following steps to deploy UnityVSA onto a VMware ESXi host through a vCenter server.

1. Launch the VMware vSphere Client to access your vCenter server.
2. Select the host, select Actions, and select Deploy OVF template to launch the Deploy OVF Template wizard.
3. To select the source from which to deploy, select Browse to locate and select the local OVA file.
4. Verify the OVF template details, including that the OVA image is signed by EMC.
5. Select Accept extra configuration options to accept revised Network Time Protocol settings made in the template.
6. Specify a name for the UnityVSA server.
7. Select a folder or datacenter location for the deployed template.
8. Select a datastore from the list to store the VM configuration files.
9. Select a disk format for provisioning the VM's virtual disks. (EMC recommends Thick Provision Eager Zero.)
10. Select a VM storage policy, if applicable.
11. Configure the networks the deployed VM should use, making sure that the management network is on a network accessible by the workstation used to access Unisphere, and that the data networks are on networks accessible by the host that will attach to the UnityVSA.
12. Customize the network settings for the UnityVSA VM:
 - a. Enter a user friendly name for the UnityVSA. Leave this field blank to use the default name, which is an automatically generated serial number for UnityVSA.
 - b. If you want to use static IP addresses, enter the IPv4 and IPv6 management settings.
 - c. If you want to use dynamic IP addresses, leave these fields blank for automatic configuration using DHCP.
 - d. If you do not have a dynamic network and you do not specify a static IP address, you must specify the IP address after the OVF template is deployed.
13. Confirm the settings, select the Power on after deployment checkbox (if available), and then click Finish to deploy the OVF template.
14. Select the UnityVSA VM. Select the Summary tab to view information about the VM. If it is not already powered on, select Power On to start the VM.

15. To determine when the UnityVSA VM is fully up and running, monitor the DNS Name field on the Summary tab. When the DNS Name field displays a system name, the UnityVSA VM is ready.
16. If you are not running the UnityVSA VM on a dynamic network using DHCP or SLAAC and you did not configure the management interface when you deployed the OVF template, you must open the vSphere Console and login using the username `service` and password `service` and run the `svc_initial_config` command to assign an IP address. For an IPv4 address, enter: `svc_initial_config -4 "<ipv4_address> <ipv4_netmask> <ipv4_gateway>"`. For an IPv6 address, enter: `svc_initial_config -6 "<ipv6_address> <ipv6_prefix_length> <ipv6_default_gateway>"`.
17. In your browser, enter the UnityVSA management IP address to open Unisphere.

Adding virtual disks

Use the following steps to add virtual disks to the UnityVSA VM.

1. In vSphere, find and select the UnityVSA VM.
2. Select the Summary tab, and locate the VM Hardware panel. Select Edit Settings.
3. On the Virtual Hardware tab, locate the New device field, select New Hard Disk, and select Add.
4. Enter the size and provisioning method of the disk you want to add. (EMC recommends using Thick Provision Eager Zero.)
5. Add at least one virtual disk for user data. As more storage space is needed, you can add more virtual disks up to a maximum of 16.

Configuring UnityVSA

Use the following steps to perform the initial configuration of UnityVSA through the Unisphere management interface.

1. Enter the management IP address in your browser to launch Unisphere.
2. Log in with the default username `admin` and password `Password123#`
3. Let the Configuration Wizard run when you log into Unisphere for the first time.
4. Accept the license agreement, and click Next.
5. Provide and confirm a new password for the admin account (and the service account if desired), and click Next.
6. Obtain your Unisphere license file from <http://www.emc.com/auth/elmeval.htm> using the System UUID, and upload and install the license file.
7. Add DNS IP address, and click Next.
8. Add NTP IP address, and click Next.
9. To create the storage tier, click Create Pools.
10. Add a name and description, and click Next.
11. Assign a tier to the storage pool.
12. Select the storage tier, and click Next.
13. Select the available virtual disks, and click Next.
14. Create a capability profile to be used by VMware, and click Next.
15. Create a tag for the storage pool, and click Next.
16. Review the settings, and click Finish.
17. On the Alert Settings page, add the SMTP server IP address and recipient emails.
18. On the iSCSI interfaces page, click Add.
19. On the NAS Servers page, click Next.
20. Click Close.

Changing Unisphere name/IP address

Use the following steps to change the name of Unisphere as well as its IP address.

1. In Unisphere, select the Settings icon, and select Management→Unisphere IPs.
2. Provide a name.
3. For the IPv4 Address, either disable IPv4 management access or set its IP address via DHCP or manually.
4. Click Apply.
5. In the pop-up that appears, click Yes to apply the new settings.

Managing system time and NTP

Use the following steps to configure the system time and NTP server.

1. In Unisphere, select the Settings icon, and select Management→System Time and NTP.
2. To synchronize the storage system time with an NTP server, select Enable NTP synchronization, select Add, and specify the IP address of an NTP server on the network.
3. Click Apply.

Configuring LDAP server and credentials

Use the following steps to configure an LDAP server.

1. Select Settings, and select Users and Groups→Directory Services.
2. Specify the LDAP server credentials. The following information is required:
 - LDAP Domain: Domain name of the LDAP authentication server
 - Distinguished name: (DN) of the service account used for LDAP authentication
 - LDAP server: Network name of the LDAP server
 - LDAP password: Password the system uses for authentication with the LDAP server
3. Click Apply.

Adding a VMware vCenter server or ESXi host

Use the following steps to add a VMware vCenter server or ESXi host to UnityVSA.

1. Under Access, select VMware→vCenters.
2. Select Add.
3. On the Add vCenter or ESXi Host window, enter the relevant details, and click Find.
4. From the list of discovered entries, select the relevant ESXi hosts, and click Next.
5. On the Summary page, review the ESXi hosts, and click Finish.
6. Click Close.

Creating a LUN

Use the following steps to create a LUN and connect it to an ESXi host.

1. Under Storage, select Block→LUNS.
2. Select Add.
3. Add a name, and click Next.
4. Select the pool, tiering policy, and size.
5. Click Add to define the access for the ESXi host.
6. Click Next.
7. Click Next.
8. Review the summary, and click Finish.
9. Click Close.
10. Double-click the newly created LUN, and check the Access Details.
11. In vSphere, connect to the ESXi host to connect to the new LUN.
12. Open the iSCSI Initiator Properties, and add the UnityVSA IP under Dynamic Discovery.
13. Run the iSCSI Rescan to connect to the new LUN.
14. Under the ESXi Storage Settings, Add and Format the new LUN.

Installing Microsoft® Windows Server® 2016 Datacenter Edition

1. Provide a datastore with the Windows Server 2016 installation media.
2. Attach the Windows Server 2016 ISO to the virtual machine.
3. When prompted to boot from DVD, press any key.
4. When the installation screen appears, leave language, time/currency format, and input method as default, and click Next.
5. Click Install now.

6. When the installation prompts you, enter the product key.
7. Select Windows Server 2016 Datacenter Edition (Desktop Experience), and click Next.
8. Check I accept the license terms, and click Next.
9. Click Custom: Install Windows only (advanced).
10. Select Drive 0 Unallocated Space, and click Next, at which point Windows begins automatically, and restarts automatically after completing.
11. When the Settings page appears, complete the Password and Reenter Password fields using the same password.
12. Log in with the password you set up previously.

Installing SQL Server® 2016

1. Attach the installation media ISO for SQL Server 2016 to the VM.
2. Click Run SETUP.EXE. If Autoplay does not begin the installation, navigate to the SQL Server 2016 DVD, and double-click it.
3. In the left pane, click Installation.
4. Click New SQL Server stand-alone installation or add features to an existing installation.
5. To accept the license terms, click the checkbox, and click Next.
6. Click Use Microsoft Update to check for updates, and click Next.
7. To install the setup support files, click Install.
8. If no failures are displayed, click Next.
9. At the Setup Role screen, choose SQL Server Feature Installation, and click Next.
10. At the Feature Selection screen, select Database Engine Services, Full-Text and Semantic Extractions for Search, Client Tools Connectivity, and Client Tools Backwards Compatibility.
11. Click Next.
12. At the Instance Configuration screen, leave the default selection of default instance, and click Next.
13. At the Database Engine Configuration screen, select the authentication method you prefer. For our testing purposes, we selected Mixed Mode.
14. Enter and confirm a password for the system administrator account.
15. Click Add Current user. This may take several seconds.
16. Click Next.
17. At the Error and usage reporting screen, click Next.
18. At the Installation Configuration Rules screen, check that there are no failures or relevant warnings, and click Next.
19. At the Ready to Install screen, click Install.
20. Close the installation window.

Configuring the database workload client

For our testing, we used a virtual client for the Microsoft SQL Server client. To create this client, we installed Windows Server 2008 R2, assigned a static IP address, and installed .NET 3.5.

Configuring the database

We generated the data using the Install.pl script included with DVD Store version 2.1 (DS2), providing the parameters for our 40GB database size and the database platform on which we ran, Microsoft SQL Server 2016. We ran the Install.pl script on a utility system running Linux®. The database schema was also generated by the Install.pl script.

After processing the data generation, we transferred the data files and schema creation files to a Windows-based system running SQL Server 2016. We built the database in SQL Server 2016, and performed a full backup, storing the backup file on the C: drive for quick access. We used that backup file to restore the server between test runs.

The only modifications we made to the schema creation scripts were in the specified file sizes for our database. We deliberately set the file sizes higher than necessary to ensure that no file-growth activity would affect the outputs of the test. Other than this file size modification, we created and loaded the database schema according to the DVD Store documentation. Specifically, we performed the following steps:

1. Generate the data and create the database and file structure using database creation scripts in the DS2 download. Make size modifications specific to your database and the appropriate changes to drive letters.
2. Transfer the files from your Linux data-generation system to a Windows system running SQL Server.
3. Create database tables, stored procedures, and objects using the provided DVD Store scripts.
4. Set the database recovery model to bulk-logged to prevent excess logging.
5. Load the data you generated into the database. For data loading, use the import wizard in SQL Server Management Studio. Where necessary, retain options from the original scripts, such as Enable Identity Insert.
6. Create indices, full-text catalogs, primary keys, and foreign keys using the database-creation scripts.

- Update statistics on each table according to database-creation scripts, which sample 18 percent of the table data.
- On the SQL Server instance, create a ds2user SQL Server login using the following Transact SQL (TSQL) script:

```
USE [master]

GO

CREATE LOGIN [ds2user] WITH PASSWORD=N'',

    DEFAULT_DATABASE=[master],

    DEFAULT_LANGUAGE=[us_english],

    CHECK_EXPIRATION=OFF,

    CHECK_POLICY=OFF

GO
```

- Set the database recovery model back to full.
- Create the necessary full text index using SQL Server Management Studio.
- Create a database user and map this user to the SQL Server login.
- Perform a full backup of the database. This backup allows you to restore the databases to a pristine state relatively quickly between tests.

Running the test

Test start and run times

We ran the workloads with one client per target database. The specific testing parameters we used for the benchmark are included below.

Running the DVD Store tests

We created a series of batch files, SQL scripts, and shell scripts to automate the complete test cycle. DVD Store outputs an orders-per-minute metric, which is a running average calculated through the test. In this report, we report the aggregate OPM reported by the clients for each run.

Each complete test cycle consisted of the general steps listed below.

- Clean up prior outputs from the target system and the client driver system.
- Drop the database from the target servers.
- Restore the database on the target servers.
- Shut down the target.
- Reboot the host and client systems.
- Wait for a ping response from the server under test (the hypervisor system), the client system, and the target.
- Let the test server idle for 10 minutes.
- Start the DVD Store driver on each client.
- We used the following DVD Store parameters for testing:

```
ds2sqlserverdriver.exe --target=<target_IP> --ramp_rate=10 --run_time=30 --n_threads=64 --db_size=40GB --think_time=0.03 --detailed_view=Y --warmup_time=10 --csv_output=<drive path>
```

Simulating a failover on the Shared PERCs

- Verify the current active PERC.
 - Log into the Dell VRTX CMC.
 - Click Storage.
 - Click Virtual Disks.
 - Expand the Virtual Disk, and note the active PERC.
 - Perform the above steps for both the internal and external storage.

2. Ensure the VM(s) are located on the storage to be failover tested.
 - a. Log onto the vCenter Server web UI.
 - b. Select the SQL Server VM, and verify the storage it's located on. If it needs to be migrated:
 - i. Right-click the VM, and select Migrate.
 - ii. Select Change Storage Only, and click Next.
 - iii. Select the Storage that is about to be failed over, and click Next.
 - iv. Click Finish.
3. Start the DVD Store driver and performance counters with settings for 20 minutes.
4. Let the DVD Store driver run for approximately 10 minutes.
5. For the external PERCs:
 - a. Identify the active PERC noted earlier at the back of the VRTX chassis. Simultaneously pull the two SAS cables from the ports on the active PERC.
 - b. The remaining passive PERC will become active.
6. For the internal PERCS:
 - a. Open the top cover of the VRTX chassis.
 - b. Locate the active PERC card, and unseat it from the motherboard.
 - c. The remaining passive PERC will become active.
7. Once the DVD Store run is complete, gather and analyze the performance data.

Setting up VMware vSphere High Availability

Creating an HA cluster

1. Log into the vCenter Server Web UI.
2. Click Hosts and Clusters.
3. Right-click the Datacenter icon, and click New Cluster.
4. Click the vSphere HA checkbox, and click OK.
5. Right-click the new cluster, and select Move Hosts into Cluster.
6. Select the hosts to move, and click OK.

Testing failover

1. Ensure the UnityVSA VM is running on a host by itself. Identify the Dell PowerEdge M630 host physically.
2. Hold the power button on the particular host until it powers off.
3. In vCenter, ensure the UnityVSA VM restarts on another good host.

Setting up VMware vSphere Fault Tolerance

Enabling Fault Tolerance

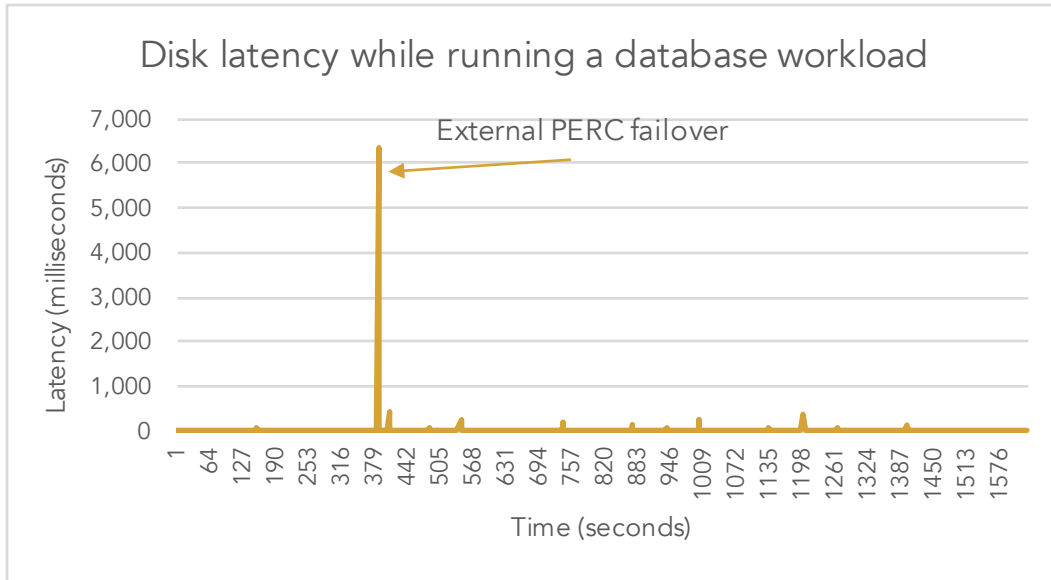
1. Log into the vCenter Server Web UI.
2. Click Hosts and Clusters.
3. Right-click the UnityVSA VM, and select Fault Tolerance→Turn On Fault Tolerance.
4. A dialog should appear. Select the appropriate storage for the fault tolerant VM to reside on, and click Next.
5. Select a host for the fault tolerant VM to reside on, and click Next.
6. Click OK.

Testing Fault Tolerance

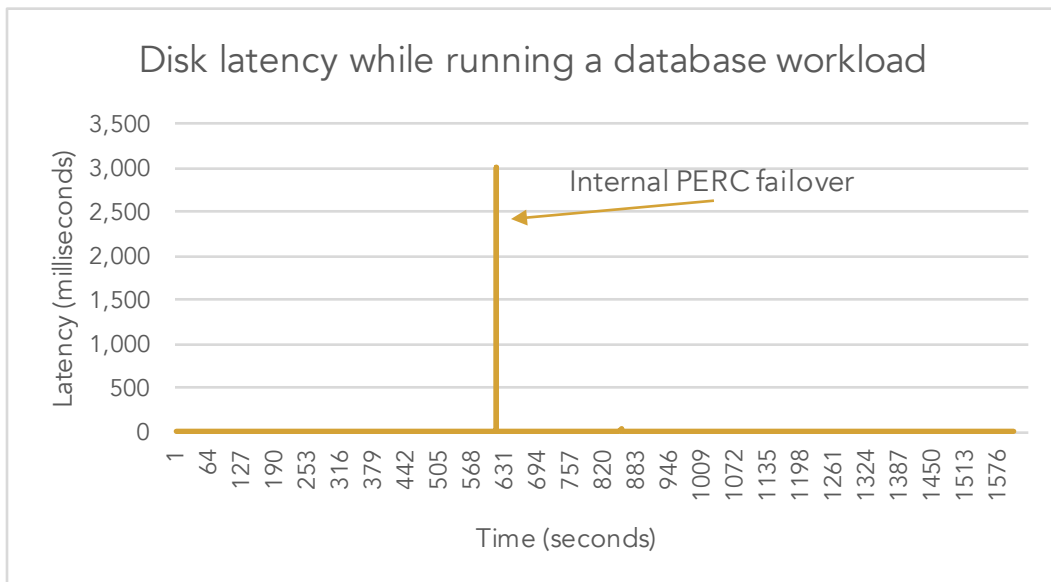
1. Navigate to the Hosts and Clusters view in vCenter Server.
2. Right-click the UnityVSA VM, and select Fault Tolerance→Test Failover.

Appendix C – Failover results

External PERC failover



Internal PERC failover



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