DELL Technologies

Technical White Paper

Dell EMC Unity XT: Introduction to the Platform

A detailed review

Abstract

This white paper introduces the Dell EMC Unity XT series platform which includes Unity 380/F, 480/F, 680/F, and 880/F models. This paper provides an overview of the purpose-built Dell EMC Unity XT systems and similarities and differences between the All-Flash and Hybrid variants.

For hardware details on the X00/F and X50F Dell EMC Unity models, please refer to the *Dell EMC Unity: Introduction to the Platform* white paper available on Dell EMC Online Support.

For a software overview on all Dell EMC Unity Family systems, please refer to the *Dell EMC Unity: Operating Environment (OE) Overview* white paper available on Dell EMC Online Support.

June 2021

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Executive summary

In this constantly changing world of increasing complexity and scale, the need for an easy-to-use intelligent storage system has only grown greater. Customers using new applications and solutions require dependable storage and are often tasked with the challenge of “doing more with less”. The Dell EMC Unity family addresses this challenge by packaging a powerful storage system into a cost and space-efficient profile. Some of Dell EMC Unity’s highlight features include:

- **Dual-Active Architecture** – Dell EMC Unity uses both Storage Processors (SP) to serve host I/O and run data operations in an active/active manner thereby efficiently making use of all available hardware resources and optimizing performance, cost, and density in customer datacenters.
- **Truly Unified Offering** – Dell EMC Unity delivers a full block and file unified environment in a single 2U enclosure. Use the same Pool to provision and host LUNs, Consistency Groups, NAS Servers, File Systems, and Virtual Volumes alike. The Unisphere management interface offers a consistent look and feel whether you are managing block resources, file resources, or both.
- **A Modern, Simple Interface** – Unisphere, Dell EMC Unity’s management interface has been built with the modern-day data center administrator in mind. Using browser-native HTML5, Unisphere can be used across a variety of Operating Systems and web browsers without the need of additional plug-ins. The interface has been designed to mimic the practical flow of an administrator’s daily life, organizing provisioning and management functions into easy-to-find categories and sections.
- **Flexible Deployment Options** – With Dell EMC Unity, a deployment offering exists for a range of different use cases and budgets, from the virtual offering of Dell EMC UnityVSA to the purpose-built Dell EMC Unity platform. The purpose-built Dell EMC Unity system can be configured as an All Flash system with only solid-state drives, or as a Hybrid system with a mix of solid state and spinning media to deliver the best on both performance and economics.
- **Inline Data Reduction** – Data reduction technologies play a critical role in environments in which storage administrators are attempting to do more with less. Dell EMC Unity Data Reduction aids in this effort by attempting to reduce the amount of physical storage needed to save a dataset, which helps reduce the Total Cost of Ownership of a Dell EMC Unity storage system. Dell EMC Unity Data Reduction provides space savings through the use of data deduplication and compression. Data reduction is easy to manage, and once enabled, is intelligently controlled by the storage system.
- **Optional I/O Modules** – A diverse variety of connectivity is supported on the purpose-built Dell EMC Unity platform. Also, I/O Modules that support iSCSI and NAS may be used for both simultaneously.
- **Expanded File System** – At its heart, the Dell EMC Unity File System is a 64-bit based file system architecture that provides increased maximums to keep pace with the modern data center. Provision file systems and VMware NFS Datastores in sizes as large as 256TB, and enjoy creating multiple millions of files per directory and subdirectories per directory.
- **Native Data Protection** – Security and availability of data are critical concerns for many customers, and Dell EMC Unity offers multiple solutions to address this need. Unified Snapshots provide point-in-time copies of block and file data that can be used for backup and restoration purposes. Asynchronous Replication offers an IP-based replication strategy within a system or between two systems. Synchronous Block Replication benefits FC environments that are close together and require a zero-data loss schema. Data at Rest Encryption ensures user data on the system is protected from physical theft and can stand in the place of drive disposal processes, such as shredding.
- **VMware Integration** – Discovery of a VMware environment has never been easier, with Dell EMC Unity’s VMware Aware Integration (VAI). Use VAI to retrieve the ESXi host and vCenter environment details into Unisphere for efficient management of your virtualization environment. Support for VMware vStorage APIs for Storage Awareness (VASA) and later enables the provisioning and use of

VMware Virtual Volumes (vVols), a virtualization storage technology delivered by VMware's ESXi. Dell EMC Unity supports vVols for both block and file configurations.

- **Multiple Management Paths** – Configure and manage your Dell EMC Unity system in the way you are most comfortable. The Unisphere GUI is browser-based and provides a graphical view of your system and its resources. Use Unisphere CLI (UEMCLI) via SSH or over a Windows host to run CLI commands against the system. Dell EMC Unity also has a full REST API library available. Any function possible in Unisphere is also possible using Dell EMC Unity REST API. Developing scripts or integrating management of your Dell EMC Unity system into existing frameworks has never been easier.

Audience

This white paper is intended for IT administrators, storage architects, partners, Dell EMC employees and any other individuals involved in the evaluation, acquisition, management, operation, or design of a Dell EMC networked storage environment utilizing the Dell EMC Unity XT Series family of storage systems.

1 Introduction

This white paper provides an overview of the Dell EMC Unity XT Series platform relating specifically to hardware and includes information about the available virtual deployments of Dell EMC Unity. For information about utilizing software features on the Dell EMC Unity platform, the *Dell EMC Unity: Operating Environment (OE) Overview* white paper provides an overview on available software and explains other product integration into the platform. Also, step-by-step instructions for using software features within Dell EMC Unity can be found in Unisphere Online Help.

1.1 Terminology

- **Dynamic Host Configuration Protocol (DHCP)** – A protocol used to handle the allocation and administration of IP address space from a centralized server to devices on a network.
- **Fibre Channel Protocol** – A protocol used to perform Internet Protocol (IP) and Small Computer Systems Interface (SCSI) commands over a Fibre Channel network.
- **File System** – A storage resource that can be accessed through file sharing protocols such as SMB or NFS.
- **Fully Automated Storage Tiering for Virtual Pools (FAST VP)** – A feature that relocates data to the most appropriate disk type depending on activity level to improve performance while reducing cost.
- **FAST Cache** – A feature that allows Flash drives to be configured as a large capacity secondary cache for the Pools on the system.
- **Internet Small Computer System Interface (iSCSI)** – Provides a mechanism for accessing block-level data storage over network connections.
- **Logical Unit Number (LUN)** – A block-level storage device that can be shared out using a protocol such as iSCSI.
- **Network Attached Storage (NAS) Server** – A file-level storage server used to host file systems. A NAS Server is required in order to create file systems that use SMB or NFS shares, as well as VMware NFS Datastores and VMware Virtual Volumes (File).
- **Network File System (NFS)** – An access protocol that allows data access from Linux/UNIX hosts located on a network.
- **Pool** – A repository of drives from which storage resources such as LUNs and file systems can be created.
- **REpresentational State Transfer (REST) API** – A lightweight communications architecture style that enables the execution of discrete actions against web services.
- **Server Message Block (SMB)** – A network file sharing protocol, sometimes referred to as CIFS, used by Microsoft Windows environments. SMB is used to provide access to files and folders from Windows hosts located on a network.
- **Snapshot** – A point-in-time view of data stored on a storage resource. A user can recover files from a snapshot, restore a storage resource from a snapshot, or provide access to a host.
- **Software Defined Storage** – A storage architecture where the software storage stack is decoupled from the physical storage hardware.
- **Storage Policy Based Management (SPBM)** – Using storage policies to dictate where a VM will be stored, as opposed to choosing a datastore manually.
- **Storage Processor (SP)** – A storage node that provides the processing resources for performing storage operations as well as servicing I/O between storage and hosts.
- **Unisphere** – An HTML5 graphical user interface that's used to manage Dell EMC Unity systems.
- **Unisphere Command Line Interface (UEMCLI)** – An interface that allows a user to perform tasks on the storage system by typing commands instead of using the graphical user interface.

- **Virtual Storage Appliance (VSA)** – A storage node that runs as a virtual machine instead of on purpose-built hardware.
- **vSphere API for Array Integration (VAAI)** – A VMware API that allows storage-related tasks to be offloaded to the storage system.
- **vSphere API for Storage Awareness (VASA)** – A VMware API that provides additional insight about the storage capabilities in vSphere.
- **Virtual Volumes (vVols)** – A VMware storage framework which allows VM data to be stored on individual Virtual Volumes. This allows for data services to be applied at a VM-granularity level while utilizing Storage Policy Based Management (SPBM).

2 Dell EMC Unity Family Overview

Figure 1. Dell EMC Unity XT

Dell EMC Unity XT Hybrid and All Flash storage systems implement an integrated architecture for block, file, and VMware vVols with concurrent support for native NAS, iSCSI, and Fibre Channel protocols based on the powerful family of Intel processors. Each system leverages dual storage processors, full 12-Gb SAS back-end connectivity and patented multi-core architected operating environment to deliver unparalleled performance & efficiency. Additional storage capacity is added via Disk Array Enclosures (DAEs). Unity successfully meets many storage requirements of today's IT professionals:

Unity is Simple

Unity solutions set new standards for storage systems with compelling simplicity, modern design, affordable prices, and flexible deployments - to meet the needs of resource-constrained IT professionals in large or small companies.

Unity is Modern

Unity has a modern 2U architecture designed for all-flash, designed to support the high density SSD's including 3D NAND TLC (triple level cell) drives. Unity includes automated data lifecycle management to lower costs, integrated copy data management to control local point-in-time snapshots, built-in encryption and remote replication, and deep ecosystem integration with VMware and Microsoft.

Unity is Affordable

Our dual-active controller system was designed to optimize the performance, density, and cost of your storage to deliver all-flash or hybrid configurations for much less than you thought possible.

Unity is Flexible

Unity is available as a virtual storage appliance, purpose-built all flash or hybrid configurations, or as converged systems - with one Unity operating environment that connects them all together.

For a full workflow on installing a brand-new Dell EMC Unity system in a datacenter, please see the Unity Quick Start Installation video on Unity InfoHub (bit.ly/unityinfohub).

3 Hardware Overview

3.1 Dell EMC Unity Family – Available Models

The purpose-built Dell EMC Unity system is offered in multiple different physical hardware models in both Hybrid configurations and All-Flash configurations. For Hybrid systems, the platform starts with the Dell EMC Unity 300, and scales up to the Dell EMC Unity 880 while for All-Flash systems, the platform starts with the Dell EMC Unity 300F and scales up to the Dell EMC Unity 880F. The models share a number of similarities in form factor and connectivity, but scale in processing and memory capabilities (See Table 1, Table 2, and Table 3).

For software-defined offerings, Dell EMC Unity Family offers a virtual deployment of Unity called Dell EMC UnityVSA which can be installed on applicable VMware ESXi hosts. There is also the option of a dual-SP deployment of Dell EMC UnityVSA called Dell EMC UnityVSA HA which provides greater resiliency against disaster. Lastly, there is a cloud-specific deployment of Unity called Dell EMC Unity Cloud Edition that customers can leverage for file synchronization and disaster recovery operations in the cloud. More information about these available virtual deployments can be found in sections 4 Dell EMC UnityVSA and 5 Dell EMC Unity Cloud Edition.

Additionally, the system limits will change depending on the Dell EMC Unity model. More information on system limits can be found in the Dell EMC Unity Simple Support Matrix on E-Lab Navigator.

Note that this white paper document focuses specifically on the Dell EMC Unity XT Series systems which include the Dell EMC Unity 380/F, 480/F, 680/F, and 880/F models. For more information on other Dell EMC Unity models, see the *Dell EMC Unity: Introduction to the Platform* white paper on Dell EMC Online Support.

Table 1. Dell EMC Unity X00/F Model Comparison

MODEL	DELL EMC UNITY 300 / 300F	DELL EMC UNITY 400 / 400F	DELL EMC UNITY 500 / 500F	DELL EMC UNITY 600 / 600F
PROCESSOR (PER SP)	Intel E5-2603 v3 6c/1.6GHz	Intel E5-2630 v3 8c/2.4GHz	Intel E5-2660 v3 10c/2.6GHz	Intel E5-2680 v3 12c/2.5GHz
MEMORY	24 GB / SP	48 GB / SP	64 GB / SP	128 GB / SP
MAX DRIVES	150	250	500	1000
MAX CAPACITY (RAW)	2.34 PB	3.9 PB	7.8 PB	9.7 PB

Table 2. Dell EMC Unity X50F Model Comparison

MODEL	DELL EMC UNITY 350F	DELL EMC UNITY 450F	DELL EMC UNITY 550F	DELL EMC UNITY 650F
PROCESSOR (PER SP)	Intel E5-2603 v4 6c/1.7GHz	Intel E5-2630 v4 10c/2.2GHz	Intel E5-2660 v4 14c/2.0GHz	Intel E5-2680 v4 14c/2.4GHz
MEMORY	48 GB / SP	64 GB / SP	128 GB / SP	256 GB / SP
MAX DRIVES	150	250	500	1000
MAX CAPACITY (RAW)	2.4 PB	4.0 PB	8.0 PB	16.0 PB

Table 3. Dell EMC Unity X80/F Model Comparison

MODEL	DELL EMC UNITY XT 380 / 380F	DELL EMC UNITY XT 480 / 480F	DELL EMC UNITY XT 680 / 680F	DELL EMC UNITY XT 880 / 880F
PROCESSOR (PER SP)	1x Intel E5-2603 v4 6c/1.7GHz	2x Intel Xeon Silver 4108 8c/1.8GHz	2x Intel Xeon Silver 4116 12c/2.1GHz	2x Intel Xeon Gold 6130 16c/2.1GHz
MEMORY	64 GB / SP	96 GB / SP	192 GB / SP	384 GB / SP
MAX DRIVES	500	750	1000	1500
MAX CAPACITY (RAW)	2.4 PB	4.0 PB	8.0 PB	16.0 PB

3.1.1 Drive Model Comparison

Multiple drive types are supported on the Dell EMC Unity system. All Flash models support Flash drives, while Hybrid Dell EMC Unity models support Flash, SAS, and NL-SAS drives. All drives operate at 12Gb/s speeds. SAS and NL-SAS drives utilize a 4KB drive formatting size, while Flash drives utilize a 520-byte block size. A list of all supported drives can be found on Dell EMC Online Support.

3.1.2 Data-in-Place Conversions

Data-in-Place (DIP) Conversions are not supported on the Dell EMC Unity XT Series systems. Replication can be utilized to replicate data onto Dell EMC Unity XT models from other Dell EMC Unity systems and then run a planned failover to start production on the destination system.

DIP Conversions remain supported on X00 and X50F models. For more information on Dell EMC Unity Data-in-Place Conversions, please see the technical guide titled *Dell EMC Unity Data-in-Place Conversions Guide* on Dell EMC Online Support.

3.2 Disk Processor Enclosure (DPE) – 380/F

Dell EMC Unity's Disk Processor Enclosure (DPE) for Dell EMC Unity XT Series models utilize a 25-drive 2U DPE using 2.5" drives. Note, though, that the Dell EMC Unity 380/F uses a different physical chassis than the 480/F, 680/F, and 880/F models. The following figures and related information are specific to the 380/F model. For information about the DPE for the 480/F, 680/F, and 880/F models, see section 3.3 titled Disk Processor Enclosure (DPE) – 480/F, 680/F, 880/F.

Figure 2. 25-Drive 2U DPE (380/F)

For 380/F systems, on the front of the DPEs (see Figure 2) are LEDs for both the enclosure and drives to indicate status and faults. The first four drives of the DPE are known as system drives and contain copies of data used by the operating environment. While they can be used in Pools to hold user data, the entire formatted capacity of the system drives will not be available as some space is reserved for the system. These drives should not be moved within the DPE or relocated to another enclosure and should be replaced

immediately in the event of a fault. A system drive cannot be used as a hot spare for a non-system drive. For this reason, the minimum number of drives in a system is 5 with system drives configured in a RAID 1/0 (1+1 or 2+2) configuration including a non-system drive hot spare.

The rear of the DPE reveals the Storage Processors (SP) and their on-board connectivity. Each Storage Processor has 2x 12Gb SAS ports, used for connecting additional storage and each SAS port has a 4-lane configuration. For front-end connectivity, the SPs have 2x 10GbE BaseT ports which can auto-negotiate between 10Gb/1Gb/100Mb, as well as 2x Converged Network Adapter (CNA) ports. These CNA ports can be configured to serve 16Gb/8Gb/4Gb Fibre Channel using either multi-mode or single mode FC SFPs, 10GbE Optical using SFP+ connectors or TwinAx cables in active or passive mode, or 1GbE BaseT using RJ45 SFPs. For optical connections, the CNAs feature full iSCSI offload which relieves the Storage Processor from handling TCP/IP network stack operations. For management and service, each SP has a dedicated 1GbE BaseT management port and a dedicated 1GbE BaseT service port; both ports operate at 1Gb/100Mb/10Mb speeds. In Dell EMC Unity OE version 5.1, management port settings can be customized to match the environment by manually changing MTU, port speed and/or duplex settings. The range of these settings include MTU of 1280-9000, port speeds of 1Gbps, 100Mbps, or 10Mbps, and advertised duplex of full, half, or auto. These settings can be changed via **svc_network** service command.

The DPE on 380/F systems is internally connected to Bus 0 which is the same bus that the first SAS expansion port is connected to. Therefore, the DPE is recognized by the system as “Bus 0 Enclosure 0” while the first DAE connected to the first SAS expansion port would be “Bus 0 Enclosure 1”. Furthermore, this means that the twenty-five drives in front of the DPE are internally recognized as “Bus 0 Enclosure 0 Drive 0” – “Bus 0 Enclosure 0 Drive 24”.

For a detailed description of the hardware on Dell EMC Unity 380/F systems, please see the *Dell EMC Unity Family Dell EMC Unity All Flash and Unity Hybrid Hardware Information Guide* on Dell EMC Online Support.

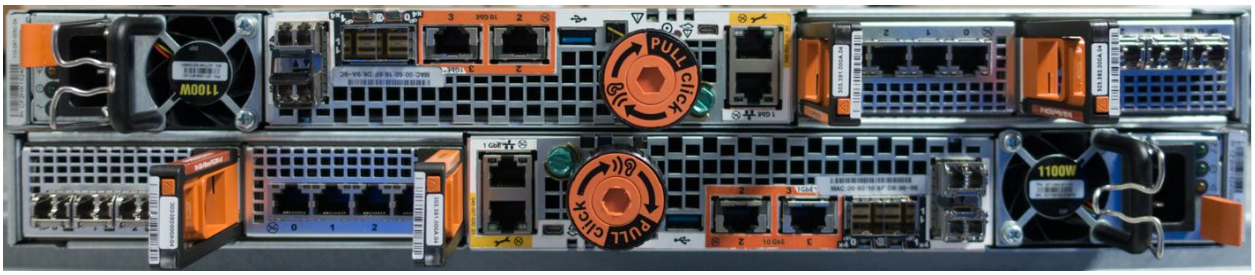

Figure 3. Rear of DPE (380/F)

3.2.1 Storage Processor – 380/F

The Dell EMC Unity 380/F system is powered by an Intel® Xeon® Processor utilizing Intel’s Broadwell architecture, with 6 cores per Storage Processor. Each purpose-built system contains two Storage Processors (SPs), which are used for high availability and load balancing purposes.

3.2.2 M.2 SSD – 380/F

An M.2 SSD device is located inside each Storage Processor and serves as a backup device in the event of an SP failure (Figure 4). In the event of an SP failure, the memory contents of the SP’s cache are written to the M.2 SSD device so it can be recovered once the SP is restored. If the M.2 SSD device itself encounters a failure, cache data can be recovered from the peer Storage Processor. The M.2 SSD device also holds the boot image that is used to run the operating environment.

Figure 4. M.2 SSD Device (380/F)

3.2.3 Cooling Modules – 380/F

Cooling modules or fan packs (Figure 5) are used to provide cool airflow to the Storage Processor's interior. There are five counter-rotating cooling modules in a Storage Processor for 380/F systems. A Storage Processor can tolerate a single cooling module fault; in which case the surviving fans will increase their speed to compensate for the faulted module. If a second cooling module faults, the Storage Processor will gracefully save cache content and shut down to prevent overheating.

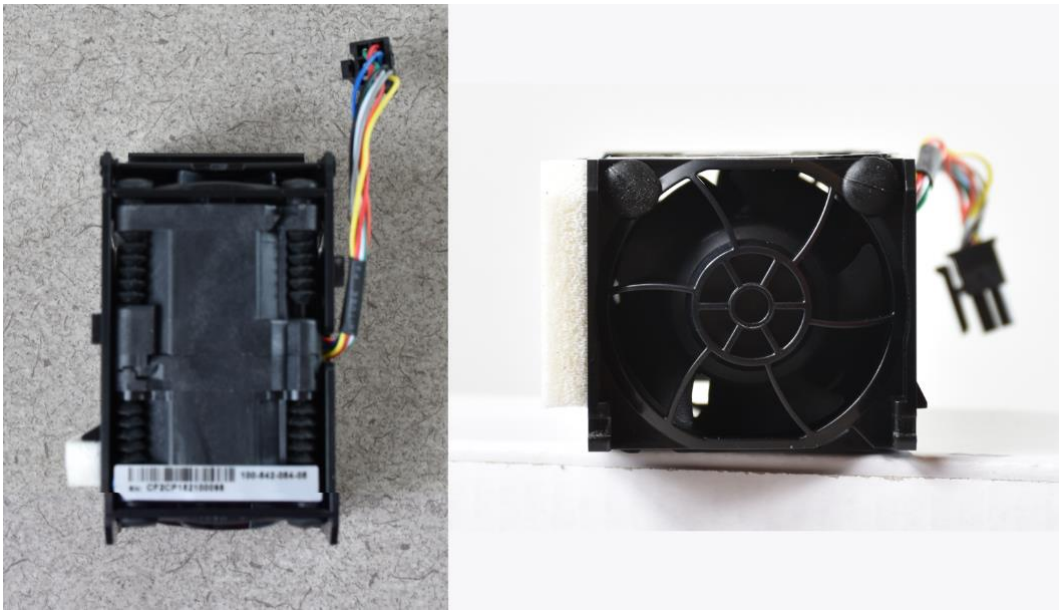

Figure 5. Cooling Module (380/F)

3.2.4 Battery Backup Unit (BBU) – 380/F

The Battery Backup Unit (BBU) provides power to the Storage Processor in the event that cabinet power is lost. The BBU (Figure 6) is designed to power the SP long enough for the system to store SP write cache content to the M.2 SSD device before powering down. The BBU includes sensors which communicate its charge and health status to the SP. In the event the BBU is discharged, the SP will disable write cache until the BBU has recharged. In the event the BBU has faulted or cannot sustain enough charge, an alert will be generated.

Figure 6. Battery Backup Unit (380/F)

3.2.5 Baffle – 380/F

The baffle (Figure 7) directs airflow within the Storage Processor. Cool air drawn in from the cooling modules is directed to the processor and DIMMs for effective thermal management.

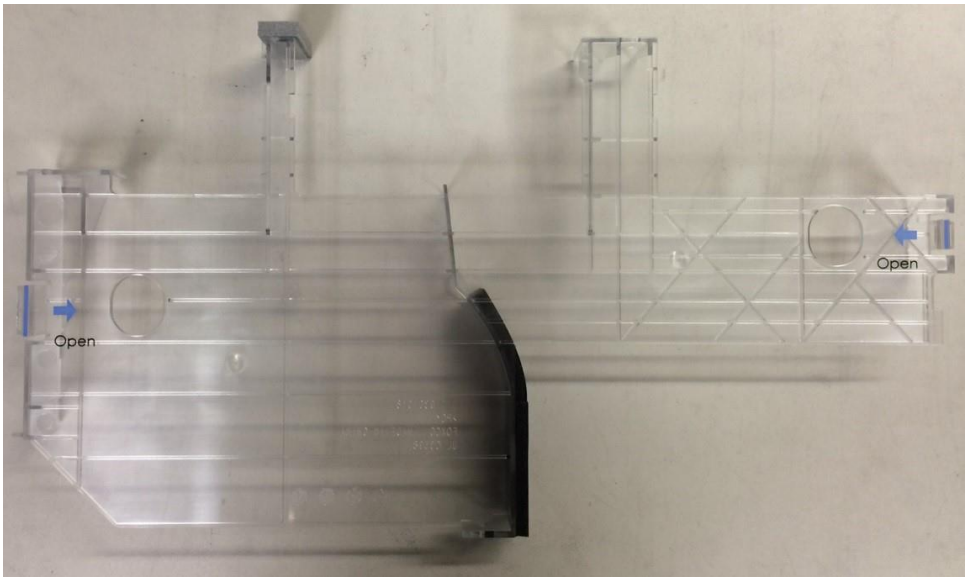

Figure 7. Baffle (380/F)

3.2.6 Dual-Inline Memory Module (DIMM) – 380/F

There are four Dual-Inline Memory Module (DIMM) slots on a Storage Processor for a 380/F system. These are filled with up with four 16GB DIMMs. An example DIMM is represented in Figure 8. DIMMs utilize error-correcting code (ECC) to protect against data corruption. If a DIMM is faulted, the system will boot into Service Mode so the faulted DIMM can be replaced.

Figure 8. Dual-Inline Memory Module (DIMM) (380/F)

3.2.7 Power Supply – 380/F

There are two power supply modules in a Disk Processor Enclosure (DPE), one per Storage Processor. A single power supply is capable of powering the entire DPE. Power supplies can be replaced without having to remove the Storage Processor or shutdown the system. Power supplies are offered for AC power only. DC power options are not available for Dell EMC Unity XT Series systems.

Figure 9. Power Supply (380/F)

3.3 Disk Processor Enclosure (DPE) – 480/F, 680/F, 880/F

Dell EMC Unity's Disk Processor Enclosure (DPE) for Dell EMC Unity XT Series models utilize a 25-drive 2U DPE using 2.5" drives. Note, though, that the Dell EMC Unity 380/F uses a different physical chassis than the 480/F, 680/F, and 880/F models. The following figures and related information are specific to 480/F, 680/F, and 880/F models. For information about the DPE for the 380/F model, reference section 3.2 titled Disk Processor Enclosure (DPE) – 380/F.

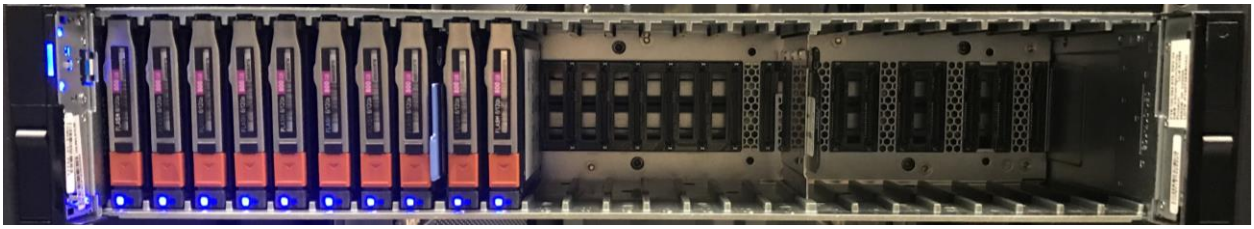

Figure 10. 25-Drive 2U DPE (480/F, 680/F, 880/F)

For 480/F, 680/F, and 880/F systems, on the front of the DPEs (see Figure 10) are LEDs for both the enclosure and drives to indicate status and faults. The first four drives of the DPE are known as system drives, and contain data used by the operating environment. While they can be used in Pools to hold user data, the entire formatted capacity of the system drives will not be available as some space is reserved for the system. These drives should not be moved within the DPE or relocated to another enclosure and should be replaced immediately in the event of a fault. A system drive cannot be used as a hot spare for a non-system

drive. For this reason, the minimum number of drives in a system is 5 with system drives configured in a RAID 1/0 (1+1 or 2+2) configuration including a non-system drive hot spare.

The rear of the DPE reveals the Storage Processors (SP) and their connectivity options (see Figure 11). Each SP has 1x 1GbE management port, 1x 1GbE service port, 1x 4-port mezzanine card (optional), 2x I/O module slots (optional), and 2x 12Gb SAS ports, used for connecting additional storage and each SAS port has a 4-lane configuration. For management and service, each SP has a dedicated 1GbE BaseT management port and a dedicated 1GbE BaseT service port; both ports can operate at 1Gb/100Mb/10Mb speeds. In Dell EMC Unity OE version 5.1, management port settings can be customized to match the environment by manually changing MTU, port speed and/or duplex settings. The range of these settings include MTU of 1280 through 9000, port speeds of 1Gbps, 100Mbps, or 10Mbps, and advertised duplex of full, half, or auto. These settings can be changed via **svc_network** service command. For front-end connectivity, the SPs have the option of a 4-port mezzanine card which have the option of being a 4-port 25GbE Optical, 4-port 10GbE BaseT, or blank filler based on how the system is ordered. For the 4-port 25GbE Optical option, the port speed is based on the SFP installed in each of the ports. You can mix the types of SFPs on the same card as needed. For the 4-port 10GbE option, the ports can auto-negotiate between 10Gb/1Gb/100Mb speeds as needed. The 4-port card slots can be populated at a later point in time if the system is ordered with blank fillers for those slots.

The DPE on 480/F, 680/F, and 880/F systems is internally connected to Bus 99 which is the separate bus than the first SAS expansion port is connected to which is Bus 0. Therefore, the DPE is recognized by the system as “Bus 99 Enclosure 0” while the first DAE connected to the first SAS expansion port would be “Bus 0 Enclosure 0”. This is different than X00/F, X50F, and 380/F systems. Furthermore, this means that the twenty-five drives in front of the DPE for 480/F, 680/F, and 880/F systems are internally recognized as “Bus 99 Enclosure 0 Drive 0” – “Bus 99 Enclosure 0 Drive 24”. Although in Unisphere, the drives are seen “DPE Drive 0” – “DPE Drive 24”.

For a detailed description of hardware for 480/F, 680/F, and 880/F systems, please see the *Dell EMC Unity All Flash and Unity Hybrid Unity 480/F, Unity 680/F, Unity 880/F Hardware Information Guide* on Dell EMC Online Support.

Figure 11. Rear of DPE (480/F, 680/F, 880/F)

3.3.1 Storage Processor – 480/F, 680/F, 880/F

The purpose-built Dell EMC Unity platform for 480/F, 680/F, and 880/F systems are powered by an Intel® Xeon® Processor utilizing Intel’s Skylake architecture, depending on the system model and the core count will vary between 8 to 18 cores per CPU with two CPUs per Storage Processor. Each purpose-built system contains two Storage Processors (SP), which are used for high availability and load balancing purposes.

3.3.2 M.2 SSD – 480/F, 680/F, 880/F

There are two M.2 SSD devices, one connected via SATA protocol and one connected via NVMe protocol, located inside each Storage Processor for 480/F, 680/F, and 880/F systems. The devices serve two separate purposes; one as a backup device in the event of an SP failure (Figure 12) and one as a boot device for the system operating environment (Figure 13). In the event of an SP failure, the memory contents of the SP's cache are written to the M.2 NVMe SSD device so the data can be recovered once the SP is restored. If the M.2 NVMe SSD device itself encounters a failure, cache data can be recovered from the peer Storage Processor. The M.2 SATA SSD device holds the boot image that is used to boot the operating environment.

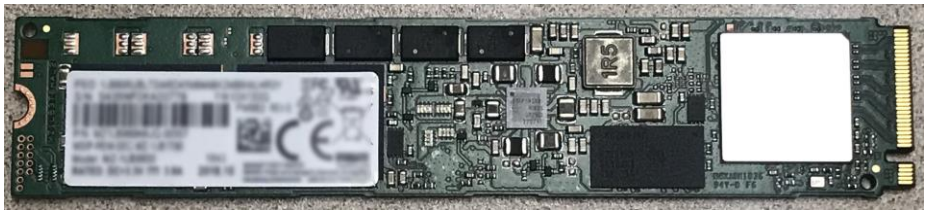

Figure 12. M.2 NVMe SSD Device (480/F, 680/F, 880/F)

Figure 13. M.2 SATA SSD Device (480/F, 680/F, 880/F)

3.3.3 Cooling Modules – 480/F, 680/F, 880/F

Cooling modules or fan packs are used to provide cool airflow to the Storage Processor's interior. There are six counter-rotating cooling modules in a Storage Processor for 480/F, 680/F, and 880/F systems. A Storage Processor can tolerate a single cooling module fault; the surviving fans will increase their speed to compensate for the faulted module. If a second cooling module faults, the Storage Processor will gracefully save write cache content and shut down.

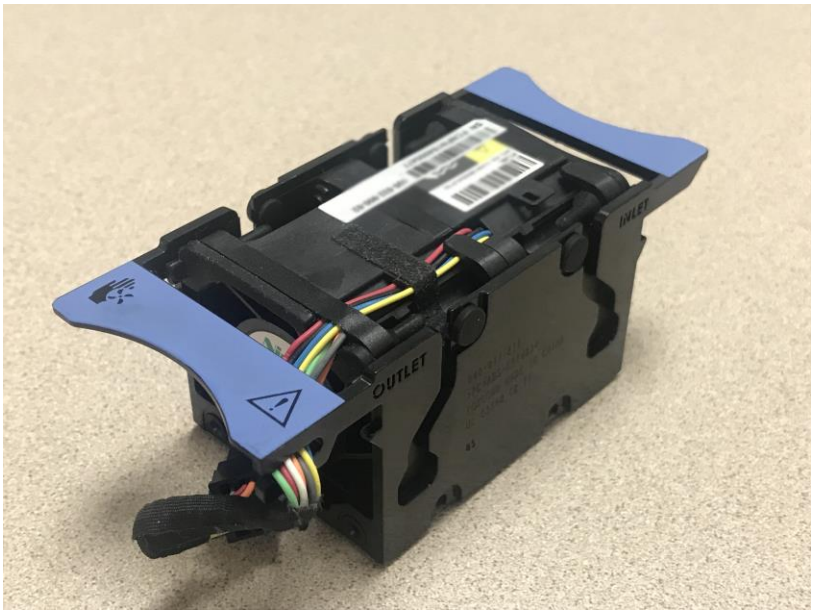

Figure 14. Cooling Module (480/F, 680/F, 880/F)

3.3.4 Battery Backup Unit (BBU) – 480/F, 680/F, 880/F

The Battery Backup Unit (BBU) provides power to the Storage Processor in the event that cabinet power is lost. The BBU is designed to power the SP long enough for the system to store SP cache content to the M.2 SSD devices before powering down. The BBU includes sensors which communicate its charge and health status to the SP. In the event the BBU is discharged, the SP will disable cache until the BBU has recharged. In the event the BBU has faulted or cannot sustain enough charge, an alert will be generated.

Figure 15. Battery Backup Unit (480/F, 680/F, 880/F)

3.3.5 Baffle – 480/F, 680/F, 880/F

The baffle directs airflow within the Storage Processor. Cool air drawn in from the cooling modules is directed to the processor and DIMMs for effective thermal management.

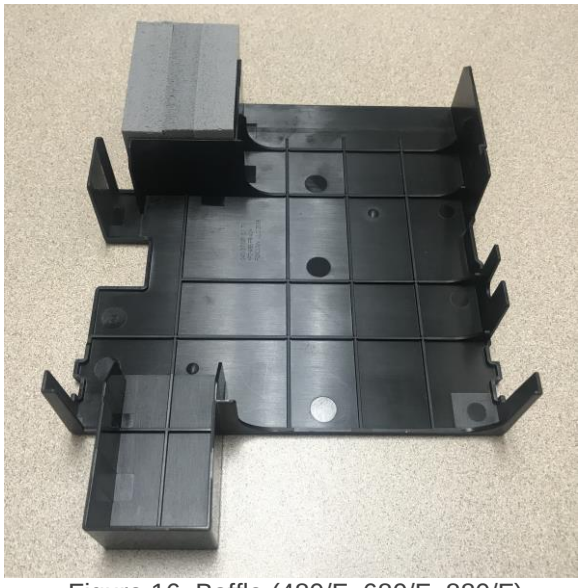

Figure 16. Baffle (480/F, 680/F, 880/F)

3.3.6 Dual-Inline Memory Module (DIMM) – 480/F, 680/F, 880/F

There are twenty-four Dual-Inline Memory Module (DIMM) slots on a Storage Processor. These are filled with up to 12 DIMMs depending on model. An example DIMM is represented in Figure 17. DIMMs are between 16 and 32GB in size and utilize error-correcting code (ECC) to protect against data corruption. If a DIMM is faulted, the system will boot into Service Mode so the faulted DIMM can be replaced.

Figure 17. Dual-Inline Memory Module (DIMM) (480/F, 680/F, 880/F)

3.3.7 Power Supply – 480/F, 680/F, 880/F

There are two power supply modules in a Disk Processor Enclosure (DPE). A single power supply is capable of powering the entire DPE. Power supplies can be replaced without having to remove the Storage Processor. Power supplies are offered for AC power only. DC power options are not available for Dell EMC Unity XT Series systems.

Figure 18. Power Supply (480/F, 680/F, 880/F)

3.4 I/O Module Options – 380/F, 480/F, 680/F, 880/F

Each Storage Processor on Dell EMC Unity XT systems can support up to two I/O modules. I/O modules provide additional connectivity. For the two Storage Processors in a DPE, the I/O Modules configured must match between SPs. Note that Fibre Channel over Ethernet (FCoE) and Fibre Channel over IP (FCIP) are not supported on the Dell EMC Unity platform.

The Dell EMC Unity XT Series systems support the following I/O modules:

- 12Gb SAS (Dell EMC Unity 480/F, 680/F, 880/F only)
- 25GbE Optical (4-Port)
- 16Gb Fibre Channel (4-Port)
- 10GbE BaseT (4-Port)
- 32Gb Fibre Channel (4-port)

The 12Gb SAS (4-Port) I/O module is used to provide additional backend connectivity to Disk Array Enclosures. Note that each SAS port supports up to 10 DAEs and up to a maximum of 250 drives. Note that this module is required when utilizing high-bandwidth x8 SAS lane connections for the 80-drive DAE.

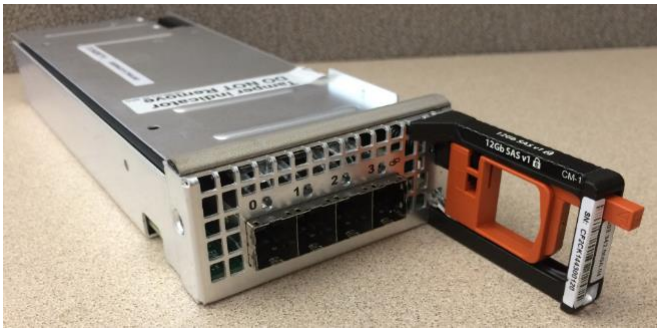

Figure 19. 12Gb SAS I/O Module

The 16Gb Fibre Channel (4-Port) I/O module offers frontend connectivity at 16Gbps speeds and can auto-negotiate to 8Gbps and 4Gbps speeds depending on the SFPs installed. There are ordering options for single-mode SFPs and multi-mode SFPs configurations depending on the use case in a datacenter environment. Note that single-mode SFPs only operate at 16Gb speeds and are not compatible with multi-mode connections. Single-mode connections are usually used for long distance synchronous replication use cases to remote sites while multi-mode is typically used for transmitting data over shorter distances in local-area SAN networks and connections within buildings.

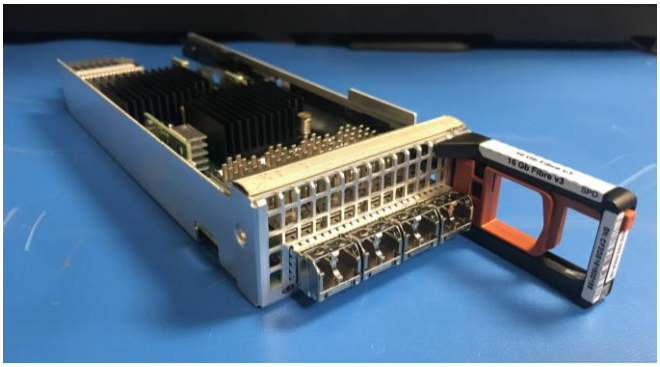

Figure 20. 16Gb Fibre Channel I/O Module

The 10GbE BaseT (4-Port) I/O module operates at up to 10Gb/s speeds and is used for frontend host access and supports both iSCSI and NAS protocols. The I/O module can also auto-negotiate to 1Gbps and 100Mbps speeds as needed. The ports on an individual Ethernet I/O module, as well as the on-board Ethernet ports or Mezz card Ethernet ports support link aggregation, fail safe networking (FSN), and VLAN tagging. Link aggregation can be configured across all available Ethernet ports as needed.

Figure 21. 10GbE BaseT I/O Module

The 25GbE Optical I/O module runs at a fixed speed of 25Gbps given it is utilizing 25Gb SFPs. The I/O module also supports 10Gb SFPs to run at 10Gbps speeds. The Optical I/O module ports support SFP+ and TwinAx (active or passive mode) connections. Note that different SFPs and/or TwinAx cables can be mixed on the same I/O module and are hot swappable.

Figure 22. 25GbE Optical I/O Module

The 32Gb Fibre Channel (4-port) I/O module provides frontend host connectivity for speeds up to 32Gbps with a variety of different SFPs. The 32Gb multi-mode SFP is capable of auto-negotiating to 32Gbps, 16Gbps, and 8Gbps. Meanwhile, the 16Gb multi-mode SFP is capable of auto-negotiating to 16Gbps, 8Gbps, and 4Gbps speeds. A single-mode SFP is also supported which operates only at 16Gbps and is generally used for long distance synchronous replication use cases. The 32Gb I/O module can have different SFP types per port. For example, port 0 could have a 32Gbps SFP while ports 1-3 could have a 16Gbps SFP so long as the SAN supports both speeds. When using multiple SFP types, it is recommended to ensure the peer storage processor has the same SFPs inserted into each port. Note that I/O modules are persistent and cannot be upgraded from a 16Gb Fibre Channel I/O module to a 32Gb Fibre Channel I/O module.

Figure 23. 32Gb Fibre Channel I/O Module

3.5 Disk Array Enclosure (DAE) Options – 380/F, 480/F, 680/F, 880/F

The purpose-built Dell EMC Unity XT Series systems have three different DAE configuration options:

- 25-Drive 2U DAE using 2.5” drives
- 15-Drive 3U DAE using 3.5” drives
- 80-Drive 3U DAE using 2.5” drives

3.5.1 25-Drive, 2.5” 2U DAE

The 25-drive, 2.5” 2U DAE holds up to twenty-five 2.5” drives (Figure 24). The back of the DAE includes LEDs to indicate power and fault status. There are also LEDs to indicate bus and enclosure IDs.

Figure 24. 25-Drive 2.5” 2U DAE (Front)

The 25-drive 2.5” 2U DAE can be powered via AC and is attached to the DPE via mini-SAS HD connectors (Figure 25).

Figure 25. 25-Drive 2.5” 2U DAE (Rear)

3.5.2 15-Drive, 3.5” 3U DAE

The 15-drive 3.5” 3U DAE is available for Dell EMC Unity XT Hybrid systems and can be powered via AC power and is attached to the DPE via mini-SAS HD connectors (Figure 26).

Figure 26. 15-Drive 3.5” 3U DAE (Front)

The back of the DAE includes LEDs to indicate power and fault status (Figure 27). There are also LEDs to indicate bus and enclosure IDs.

Figure 27. 15-Drive 3.5” 3U DAE (Rear)

3.5.3 80-Drive, 2.5” 3U DAE

The 80-drive 2.5” 3U DAE is available for Dell EMC Unity XT Hybrid and All Flash systems and can be powered via AC power and is attached to the DPE via mini-SAS HD connectors (Figure 28). A high-bandwidth x8 lane SAS connectivity option to the DPE is also available for models that support the 4-port 12Gb SAS I/O module which include the Dell EMC Unity 480/F, 680/F, and 880/F. For supported drive types/sizes on the 80-drive DAE, please see the Unity Drive Support Matrix on Dell EMC Online Support.

In terms of operating power, the 80-drive DAE operates from 200 to 240V AC at 47 to 63 Hz with a max power consumption of 1,611 VA (1,564 W). For a full listing of power requirements and related hardware information, please see the *Dell EMC Unity Family Hardware Information Guide* on Dell EMC Online Support.

Figure 28. 80-Drive 2.5" 3U DAE

4 Dell EMC UnityVSA

Dell EMC Unity™ is offered in a Virtual Storage Appliance version known as Dell EMC UnityVSA™. Dell EMC UnityVSA is a Software Defined Storage (SDS) solution that runs atop the VMware ESXi Server platform. Dell EMC UnityVSA provides a flexible storage option for environments that do not require purpose-built storage hardware such as test/development or remote office/branch office (ROBO) environments. Users can quickly provision a Dell EMC UnityVSA on general purpose server hardware, which can result in reduced infrastructure costs and a quicker rate of deployment.

In Dell EMC Unity OE version 4.5, a High Availability (HA), version of the UnityVSA was introduced, also known as UnityVSA Dual-SP. UnityVSA Dual-SP is an enhanced version of the single-SP UnityVSA solution. This is accomplished by adding HA functionality whereby Dell EMC UnityVSA Dual-SP can recover from an SP or host failure which significantly increases the system's applicable use case scenarios as well as enables non-disruptive upgrades (NDU). Dell EMC UnityVSA Dual-SP is only available with Professional Edition (PE) licenses. In OE version 5.1, Professional Edition licenses come in capacity choices of 10TB, 25TB, 50TB, or 350TB options. Additionally, the UnityVSA Dual-SP can be deployed as a 2-core CPU / 12GB memory per-SP or a 12-core CPU / 96GB memory per-SP system.

4.1 Overview

Dell EMC UnityVSA retains the ease-of-use and ease-of-management found in the purpose-built Dell EMC Unity product. Its feature set and data services are designed to be on par with the rest of the Dell EMC Unity family. There are some main differences in functionality support, which stem from the virtual nature of the Dell EMC UnityVSA deployment.

4.2 UnityVSA Hardware Requirements

Dell EMC UnityVSA can run on any server that supports VMware ESXi and meets minimum hardware requirements. If local storage is used, a hardware RAID controller on the ESXi server is recommended be used to configure redundant storage for Dell EMC UnityVSA. If storage is being provided from a redundant storage system or server SAN, a RAID controller on the ESXi server is not required. A full description of the minimum server requirements for a single UnityVSA instance is detailed in Table 4.

Table 4. Dell EMC UnityVSA Single-SP Server and VM Requirements

	Minimum requirement	Recommended requirement
ESXi requirements		
ESXi host configuration	ESXi 6.5+	ESXi 6.5+
Hardware processor	Xeon E5 Series Dual Core CPU 64-bit x86 Intel 2GHz+ (SSE4.2 or greater)	Xeon Silver 4110 or higher
Hardware memory	20GB minimum for ESXi 6.5	36GB minimum for ESXi 6.5+
Hardware network	1x 1GbE (management and IO traffic go through the same physical port)	1x 10GbE (management and IO traffic go through the same physical port)
Hardware RAID	RAID Controller: 512MB NV cache and battery backed recommended	RAID Controller: 512MB NV cache and battery backed recommended
Disk	Any disk type as system disks	SSD as system disks
Datastore requirements		
VMware datastore (NFS and VMFS supported)	No particular requirement	Full-SSD datastore
UnityVSA SP requirements		
Virtual processor cores	2 (2GHz+)	2 (2GHz+)
Virtual system memory	12GB	12GB
Virtual network adapters	6 (4 adapters for I/O, 1 for Unisphere, and 1 for system use)	6 (4 adapters for I/O, 1 for Unisphere, and 1 for system use)

Dell EMC UnityVSA HA has similar physical requirements as Dell EMC UnityVSA Single-SP on a per SP basis. In terms of VMware requirements, a vCenter is mandatory in addition to the configuration of internal networks. To comply with best practices, Dell EMC UnityVSA HA requires a separate ESXi host for each SP that is deployed. The white paper titled *Dell EMC UnityVSA* provides further detail on the best practices and the exact VMware requirements. A full description of recommended server requirements for both the 2-core and 12-core CPU deployments of the Dell EMC UnityVSA HA are outlined below.

Table 5. Dell EMC UnityVSA HA Hardware Requirements

	2-core UnityVSA	12-core UnityVSA
ESXi requirements		
ESXi host configuration	ESXi 6.5+ with both SPs on separate ESXi hosts	ESXi 6.5+ with both SPs on separate ESXi hosts
Hardware processor	Xeon Silver 4110 or higher	Xeon Silver 4110 or higher
Hardware memory	36GB for ESXi 6.5 or later per host	120GB for ESXi 6.5 or later per host

Hardware network	3 x 10 GbE (1 physical port for SP management and IO ports, 2 for inter-SP network)	3 x 10 GbE (1 physical port for SP management and IO ports, 2 for inter-SP network)
Hardware RAID	RAID card 512MB NV cache, battery backed recommended	RAID card 512MB NV cache, battery backed recommended
Disk	No particular disk type	SSD as system disks
Switch requirements		
Hardware switch	10GbE port support	10GbE port support
Datastore requirements		
VMware datastores (NFS and VMFS supported)	One full-SSD shared datastore and a separate full-SSD local swap datastore	One full-SSD shared datastore and a separate full-SSD local swap datastore
UnityVSA individual SP requirements		
Virtual processor cores	2 (2GHz+) for each SP	12 (2GHz+) for each SP
Virtual system memory	12GB for each SP	96GB for each SP
Virtual network adapters	9 for each SP (4 ports for I/O, 1 for Unisphere, 1 for system use, and 3 for internal communication)	9 for each SP (4 ports for I/O, 1 for Unisphere, 1 for system use, and 3 for internal communication)
vCenter	Required	Required
VLANs	3 (1 for Common Messaging Interface (CMI) SP-to-SP communication, 1 for Heartbeat 0, and 1 for Heartbeat 1) VLANs must be unique and not used elsewhere on the network	3 (1 for Common Messaging Interface (CMI) SP-to-SP communication, 1 for Heartbeat 0, and 1 for Heartbeat 1) VLANs must be unique and not used elsewhere on the network

For more information about the Dell EMC UnityVSA and Dell EMC UnityVSA HA, refer to the white paper titled, *Dell EMC UnityVSA* available on Dell EMC Online Support.

5 Dell EMC Unity Cloud Edition

As customers select a cloud-operating model to support their applications, elasticity and scalability of public clouds and enterprise file capabilities such as tiering, quotas, and snapshots are top requirements. Customers are looking to leverage the cloud for file synchronization and disaster recovery operations.

Dell EMC Unity Cloud Edition addresses these requirements with support for VMC (VMware Cloud) on AWS (Amazon Web Services). Dell EMC Unity Cloud Edition can be easily deployed in a VMware Cloud SDDC (Software-Defined Data Center) to provide native file services such as NFS and SMB. Dell EMC Cloud Edition also enables disaster recover between on premise deployed Dell EMC Unity systems and VMware Cloud-based appliances.

Dell EMC Unity Cloud Edition is a virtualized storage appliance that has a rich feature set, comparable to the rest of the Dell EMC Unity Family. Because of its ease of use and quick deployment time, this makes Dell EMC Unity Cloud Edition the ideal candidate for test/dev environments or production deployments into VMC on AWS.

Dell EMC Unity Cloud Edition supports the same deployment options as Dell EMC UnityVSA. In OE version 5.1 this includes the increased capacity limit of up to 350TB as well as the 2-core / 12GB memory and 12-core / 96GB memory Dual-SP deployment options.

For more information on Dell EMC Unity Cloud Edition and its benefits, please see the paper titled *Dell EMC Unity Cloud Edition with VMware Cloud on AWS* on Dell EMC Online Support.

6 Conclusion

The Dell EMC Unity product family sets a new standard for storage by delivering compelling simplicity, a modern design, and enterprise features at an affordable price and compact footprint. Dell EMC Unity meets the needs of resource-constrained IT professionals in both large and small companies. The purpose-built Dell EMC Unity system is offered in All Flash and Hybrid models, providing flexibility for differing use cases and budgets. The converged offering through the Converged Infrastructure Portfolio delivers industry-leading converged infrastructure powered by Dell EMC Unity. The Dell EMC UnityVSA and Dell EMC Unity Cloud Edition offers a dynamic deployment model that allows you to start for free and grow as business needs evolve.

The Dell EMC Unity system was designed with ease-of-use at the forefront. The modern design of the management interfaces is built with best practices in mind, making it easy to provision storage intelligently without having to micromanage every detail. A software feature set built with the same mindset allows for automation and “set it and forget it” style upkeep. Truly, an IT generalist can set up, configure, and manage a Dell EMC Unity system without needing to become a storage expert. A strong support ecosystem offers a variety of media for learning and troubleshooting, backed by the quality support model of the Dell EMC brand. Lastly, users looking to refresh their existing Dell EMC infrastructure can utilize the easy-to-use native migration capabilities of the Dell EMC Unity platform.

With simplified ordering, all-inclusive software, new differentiated features, internet-enabled management, and a modern design, Dell EMC Unity is where powerful meets simplicity.

A Technical support and resources

Dell.com/support is focused on meeting customer needs with proven services and support.

Storage technical documents and videos provide expertise that helps to ensure customer success on Dell EMC storage platforms.

A.1 Related resources

The following documents can be found on Dell EMC Online Support:

- Dell EMC Unity: Best Practices Guide
- Dell EMC Unity: Cloud Tiering Appliance (CTA)
- Dell EMC Unity: Compression
- Dell EMC Unity: Compression for File
- Dell EMC Unity: Data at Rest Encryption
- Dell EMC Unity: Data Integrity
- Dell EMC Unity: Data Reduction
- Dell EMC Unity: DR Access and Testing
- Dell EMC Unity: Dynamic Pools
- Dell EMC Unity: FAST Technology Overview
- Dell EMC Unity: File-Level Retention (FLR)
- Dell EMC Unity: High Availability
- Dell EMC Unity: Introduction to the Platform
- Dell EMC Unity: NAS Capabilities
- Dell EMC Unity: MetroSync
- Dell EMC Unity: MetroSync and Home Directories
- Dell EMC Unity: MetroSync and VMware vSphere NFS Datastores
- Dell EMC Unity: Migration Technologies
- Dell EMC Unity: OpenStack Best Practices for Ocata Release
- Dell EMC Unity: Performance Metrics
- Dell EMC Unity: Replication Technologies
- Dell EMC Unity: Snapshots and Thin Clones
- Dell EMC Unity: Operating Environment (OE) Overview
- Dell EMC Unity: Unisphere Overview
- Dell EMC Unity: Virtualization Integration
- Dell EMC UnityVSA
- Dell EMC Unity Cloud Edition with VMware Cloud on AWS
- Dell EMC Unity Data Reduction Analysis
- Dell EMC Unity: Migrating to Dell EMC Unity with SAN Copy
- Dell EMC Unity Storage with Microsoft Hyper-V
- Dell EMC Unity Storage with Microsoft SQL Server
- Dell EMC Unity Storage with Microsoft Exchange Server
- Dell EMC Unity Storage with VMware vSphere
- Dell EMC Unity Storage with Oracle Databases
- Dell EMC Unity 350F Storage with VMware Horizon View VDI
- Dell EMC Unity: 3,000 VMware Horizon Linked Clone VDI Users
- Dell EMC Storage with VMware Cloud Foundation