



# DELL EMC UNITY ALL-FLASH STORAGE

## The ultimate in simplicity & all-flash value

The Dell EMC Unity™ All-Flash product line sets new standards for storage with compelling simplicity, modern design, flexible deployments and affordable prices– to meet the needs of resource-constrained IT professionals in large or small companies.

If you are looking for raw power and absolute simplicity in a small footprint, if you are cost-conscious and need the best from the best, Dell EMC Unity All-Flash is for you. Designed for flash with all-inclusive software, it delivers consistent performance with low response times.

## Architecture

Based on the powerful family of Intel E5-2600 processors, Dell EMC's Unity 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. Each system leverages dual storage processors, full 12 Gb SAS back end connectivity and Dell EMC's patented multicore architected operating environment to deliver unparalleled performance & efficiency. Additional storage capacity is added via Disk Array Enclosures (DAEs) and for additional performance, online & offline controller upgrades are available.

## Physical Specifications

	350F	450F	550F	650F
Min/Max Drives	6/150	6/250	6/500	6/1000
Array Enclosure	A 2U Disk Processor Enclosure (DPE) with twenty five 2.5" drives			
Drive Enclosure (DAE - Disk Array Enclosure)	All models support 2U twenty five drive and 3U eighty drive trays for 2.5" drives			
Standby Power System	Dell EMC Unity systems are powered by 2 power supplies (PS) per DPE/DAE. Each power supply can provide power to the entire module if the peer PS has been removed or is faulted. DPE power during a power failure is provided by a Battery Back Up (BBU) module. BBU is located within the SP enclosure and provides power to a single module (power zone)			
RAID Options	1/0, 5, 6			
CPU per Array	2 x Intel 6-core, 1.7GHz	2 x Intel 10-core, 2.2GHz	2 x Intel 14-core, 2.0GHz	2 x Intel 14-core, 2.4GHz
Memory per Array	96 GB	128 GB	256 GB	512 GB
Max IO Modules per Array*	4	4	4	4
Embedded SAS IO Ports per Array	4 x 4 lane 12Gb/s SAS ports for BE (back end) Connection	4 x 4 lane 12Gb/s SAS ports for BE Connection	4 x 4 lane 12Gb/s SAS ports for BE Connection	4 x 4 lane 12Gb/s SAS ports for BE Connection

	350F	450F	550F	650F
Optional SAS IO ports per Array	NA	NA	8 x 4 lane or 4 x 8 lane 12Gb/s SAS ports (for BE Connection)	8 x 4 lane or 4 x 8 lane 12Gb/s SAS ports (for BE Connection)
Base 12 Gb/s SAS BE Buses per Array	2 x 4 Lane	2 x 4 Lane	2 x 4 Lane	2 x 4 Lane
Max 12 Gb/s SAS BE Buses per Array	2 x 4 Lane	2 x 4 Lane	6 x 4 Lane; or 2 x 4 lane and 2 x 8 lane	6 x 4 Lane; or 2 x 4 lane and 2 x 8 lane
Max FE (front end) Total Ports per Array (all types)	24	24	24	24
Max Initiators per Array	1,024	2,048	2,048	4,096
Max FC Ports per Array	20	20	20	20
Embedded 10GbaseT Ports per Array	4	4	4	4
Embedded CNA ports per Array	4 ports: 8/16 Gb FC**, 10Gb IP/iSCSI, or 1Gb RJ45	4 ports: 8/16 Gb FC**, 10Gb IP/iSCSI, or 1Gb RJ45	4 ports: 8/16 Gb FC**, 10Gb IP/iSCSI, or 1Gb RJ45	4 ports: 8/16 Gb FC**, 10Gb IP/iSCSI, or 1Gb RJ45
1 GbaseT/iSCSI Max Total Ports per Array	24	24	24	24
10 GbE/iSCSI Max Total Ports per Array	24	24	24	24
Max Raw Capacity***	2.4 PBs	4.0 PBs	8.0 PBs	16.0 PBs
Max SAN Hosts	512	1,024	1,024	2,048
Max Number of Pools	20	30	40	100
Max Number of LUNs per Array	1,000	1,500	2,000	6,000
Max LUN Size	256 TB	256 TB	256 TB	256 TB
Max file systems per Array	1000	1500	2000	4000
Max File System Size	256 TB	256 TB	256 TB	256 TB
Max attached snapshots per Array (Block)	1000	1500	2000	6000
IOPS****	up to 130K	up to 305K	up to 395K	up to 440K
OS Support	See EMC Simple Support Matrix on emc.com			
<p>* Two IO Modules per Storage Processor (SP), mirrored.  ** 16Gb available in both single mode and multimode.  *** Maximum raw capacity will vary based on drive sizes available at time of purchase.  **** 100% Reads, 8K block size</p>				

## Connectivity

Connectivity options via IO modules for both the file for NFS/SMB connectivity and the block storage for FC and iSCSI host connectivity (see above table for number of modules supported per SP).

IO Module Options	
IO Module	Description
Four-Port 16 Gb/s Fibre Channel Module (Block only)	Four port FC module with four ports auto-negotiating to 4/8/16 Gbps; uses single mode or multimode optical SFP and OM2/OM3/OM4 cabling to connect directly to host HBA or FC switch
Four-Port 1 GBASE-T Module (File & Block)	Four port 1GbaseT for IP/iSCSI module with four 1 GBaseT RJ-45 copper connections to Cat 5/6 cabling to Ethernet switch
Four-Port 10 GBASE-T Module (File & Block)	Four port 10GbaseT Ethernet IP/iSCSI module with four 10 GBaseT Ethernet ports with copper connection to Ethernet switch
Two-Port 10 Gb/s Optical Module (File & Block)	Two port 10GbE IP/iSCSI module with choice of SFP+ optical connection or active/passive twinax copper connection to Ethernet switch; includes iSCSI offload engine
Four-Port 10 Gb/s Optical Module (File & Block)	Four port 10GbE IP/iSCSI module with choice of SFP+ optical connection or active/passive twinax copper connection to Ethernet switch
Four-Port 12 Gb/s SAS V3.0 Module*	Four port SAS module, used for back-end storage (DAE) connectivity to Block Storage Processors. Each SAS port has 4 lanes/port @ 12Gbps, delivering 48Gbps nominal throughput. Also available specifically for the 80 drive DAE is 8 lane connectivity utilizing a pair of SAS ports to deliver high bandwidth for added performance.
*Only for 550 and 650 models	

## Maximum Cable Lengths

Shortwave optical OM3: 100 meters (16 Gb) 150 meters (8 Gb), 380 meters (4 Gb), and 500 meters (2 Gb)  
 Shortwave optical OM4: 125 meters (16 Gb) 190 meters (8 Gb), 400 meters (4 Gb), and 500 meters (2 Gb)

## Back-end (Drive) Connectivity

Each storage processor connects to one side of each of two redundant pairs of four-lane x 12 Gb/s Serial Attached SCSI (SAS) buses, providing continuous drive access to hosts in the event of a storage processor or bus fault. All models require four “system” drives and support a platform specific maximum number of disks (see Physical Specifications table above). 107 GB per system drive is consumed by the operating environment software and data structures.

Disk Array Enclosure (DAE)		
	25 X 2.5” Drive DAE	80 X 2.5” Drive DAE
Drive Types Supported	FLASH	FLASH
Controller Interface	12 Gb SAS	12 Gb SAS

Solid State Disk Drives						
Nominal Capacity	400 GB SSD	800 GB SSD	1.92 TB SSD	3.84 TB SSD	7.68TB SSD	15.36 TB SSD
Formatted Capacity (GB)*	366.7	733.5	1751.9	3503.9	7006.9	14014.9
Supported in 25 drive DAE/DPE and 80 drive DAE	√	√	√	√	√	√
Interface	12 Gb SAS					
NOMINAL POWER CONSUMPTION (WATTS)						
Operating Mode	4.25	4.25	4.25	4.25	4.25	4.25

Idle Mode	2.0	2.0	2.0	2.0	2.0	2.0
*GB = Base2 GiB (GB = 1024x1024x1024)						

## Dell EMC Unity OE Protocols and Software Facilities

Support is provided for a wide variety of protocols and advanced features available via various software suites, plug-ins, drivers and packs.

Protocols and Facilities Supported		
Access-based Enumeration (ABE) for SMB protocol	Address Resolution Protocol (ARP)	Block Protocols: iSCSI, Fibre Channel (FCP SCSI-3)
Container Storage Interface (CSI) Driver	Controller based Data at Rest Encryption (D@RE), with self-managed keys	DFS Distributed File System (Microsoft) as Leaf node or Standalone Root Server
Direct Host Attach for Fibre Channel and iSCSI	Dynamic Access Control (DAC) with claims support	Fail-Safe Networking (FSN)
Internet Control Message Protocol (ICMP)	Kerberos Authentication	Key Management Interoperability Protocol (KMIP) compliant external key manager for D@RE
LDAP (Lightweight Directory Access Protocol)	LDAP SSL	Link Aggregation for File (IEEE 802.3ad)
Lock Manager (NLM) v1, v2, v3, and v4	Management & Data Ports IPv4 and/or IPv6	NAS Servers Multi-protocol for UNIX and SMB clients (Microsoft, Apple, Samba)
Network Data Management Protocol (NDMP) v1-v4, 2-way & 3-way	Network Information Service (NIS) Client	Network Status Monitor (NSM) v1 Network Status Monitor (NSM) v1
Network Time Protocol (NTP) client	NFS v3/v4 Secure Support	NT LAN Manager (NTLM)
Portmapper v2	REST API: Open API that uses HTTP requests to provide management	Restriction of Hazardous Substances (RoHS) compliance
RSVD v1 for Microsoft Hyper-V	Simple Home Directory access for SMB protocol	SMI-S v1.6.0 compatible Dell EMC Unity Block & File client
Simple Mail Transfer Protocol (SMTP)	Simple Network Management Protocol v2c & v3 (SNMP)	Virtual LAN (IEEE 802.1q)
VMware® Virtual Volumes (VVols) 2.0	VMware® vRealize™ Orchestrator (vRO) Plug-in	

Security & Compliance <small>(applies to all Dell EMC Unity systems, except Dell EMC UnityVSA)</small>
Department of Defense Information Network Approved Products List (DODIN APL) – Dell EMC Unity O.E. v5.0 certified
Common Criteria
Controller based Data at Rest Encryption (D@RE) with self-managed keys
KMIP compliant external key manager for D@RE
FIPS 140-2 Level 1 validation
IPv6 and dual stack (IPv4) modes of operation
Native SHA2 certificate
Security Technical Implementation Guide /Security Requirements Guide (STIG/SRG)
TLS 1.2 support and TLS 1.0 disablement
File-Level Retention: Enterprise FLR-E and Compliance FLR-C with requirements for SEC rule 17a-4(f)

Software	
All Inclusive Base Software	<p>Management Software:</p> <ul style="list-style-type: none"> <li>• Unisphere: Element Manager</li> <li>• Unisphere Central: Consolidated dashboard and alerting</li> <li>• CloudIQ: Cloud-based storage analytics</li> <li>• Thin Provisioning</li> <li>• Dynamic Pools</li> <li>• Data Reduction: Zero Detect/Deduplication/Compression (Block and File)</li> <li>• Proactive Assist: Configure remote support, online chat, open a service request, etc.</li> <li>• Quality of Service (Block and VVols)</li> <li>• Dell EMC Storage Analytics Adapter for VMware® vRealize™</li> <li>• File &amp; Block Tiering / Archiving to Public/Private Cloud (Cloud Tiering Appliance)</li> <li>• File-Level Retention (FLR-E &amp; FLR-C)</li> </ul> <p>Unified Protocols:</p> <ul style="list-style-type: none"> <li>• File</li> <li>• Block</li> <li>• VVols</li> </ul> <p>Local Protection:</p> <ul style="list-style-type: none"> <li>• Controller Based Encryption (optional), with self-managed or external key management</li> <li>• Local Point-In-Time Copies (Snapshots and Thin Clones)</li> <li>• AppSync Basic</li> <li>• Dell EMC Common Event Enabler; AntiVirus Agent, Event Publishing Agent</li> </ul> <p>Remote Protection:</p> <ul style="list-style-type: none"> <li>• Native Asynchronous Block &amp; File Replication</li> <li>• Native Synchronous Block &amp; File Replication</li> <li>• MetroSync Manager (optional software to automate synchronous file replication sessions)</li> <li>• Snapshot Shipping</li> <li>• Dell EMC RecoverPoint Basic</li> </ul> <p>Migration:</p> <ul style="list-style-type: none"> <li>• Native Block &amp; File migration from Dell EMC VNX</li> <li>• SAN Copy Pull: Integrated Block migration from 3<sup>rd</sup> party arrays</li> </ul>
Interface Protocols	NFSv3, NFSv4, NFSv4.1; CIFS (SMB 1), SMB 2, SMB 3.0, SMB 3.02, and SMB 3.1.1; FTP and SFTP; FC, iSCSI included
Optional Software	<ul style="list-style-type: none"> <li>• AppSync Advanced</li> <li>• Data Protection Suite: Backup, Archive and Collaboration Software</li> <li>• Dell EMC RecoverPoint Advanced</li> <li>• PowerPath Migration Enabler</li> <li>• PowerPath Multipathing</li> <li>• VPLEX</li> </ul>
Note: For more details on software licensing, please contact your sales representative	

## Virtualization Solutions

Dell EMC Unity offers support for a wide variety of protocol and advanced features available via various software suites and packs including but not limited to:

- Dell EMC Storage Integrator (ESI): For provisioning within the Microsoft management context (Systems Center) for Hyper-V and SharePoint
- OpenStack Cinder Driver: For provisioning and managing block volumes within an OpenStack environment
- OpenStack Manila Driver: For managing shared file systems within an OpenStack environment
- Dell EMC Virtual Storage Integrator (VSI) for VMware vSphere™ : For provisioning, management, and cloning
- VMware Site Recovery Manager (SRM) Integration: Managing failover and fallback making disaster recovery rapid and reliable
- Virtualization API Integration: VMware: VAAI and VASA. Hyper-V: Offloaded Data Transfer (ODX) and Offload Copy for File

## Electrical Specifications

All power figures shown represent a worst case product configuration with max normal values operating in an ambient temperature environment of 20°C to 25°C.

The chassis power numbers provided may increase when operating in a higher ambient temperature environment.

Disk Processor Enclosure (DPE)				
	350F DPE 25 2.5"SFF drives and four IO modules	450F DPE 25 2.5"SFF drives and four IO modules	550F DPE 25 2.5"SFF drives and four IO modules	650F DPE 25 2.5"SFF drives and four IO modules
<b>POWER</b>				
AC Line Voltage	100 to 240 VAC ± 10%, single phase, 47 to 63 Hz			
AC Line Current (operating maximum)	10.07 A max at 100 VAC; 5.04 A max at 200VAC	10.18 A max at 100 VAC; 5.09 A max at 200VAC	10.56 A max at 100 VAC; 5.28 A max at 200VAC	10.98 A max at 100 VAC; 5.49 A max at 200VAC
Power Consumption (operating maximum)	1007 VA (970.5 W) max at 100 VAC; 1007 VA (970.5 W) max at 200 VAC	1017.6 VA (981.0 W) max at 100 VAC; 1017.6 VA (981.0 W) max at 200 VAC	1055.6 VA (1019.0 W) max at 100 VAC; 1055.6 VA (1019.0 W) max at 200 VAC	1097.6 VA (1061.0 W) max at 100 VAC; 1097.6 VA (1061.0 W) max at 200 VAC
Power Factor	0.95 minimum at full load, @ 100/ 200 VAC			
Heat Dissipation (operating maximum)	3.49 x 10 <sup>6</sup> J/hr, (3,311 Btu/hr) max at 100 VAC; 3.49 x 10 <sup>6</sup> J/hr, (3,311 Btu/hr) max (100V*)	3.53 x 10 <sup>6</sup> J/hr, (3,347 Btu/hr) max at 100 VAC; 3.53 x 10 <sup>6</sup> J/hr, (3,347 Btu/hr) max (100V*)	3.67 x 10 <sup>6</sup> J/hr, (3,477 Btu/hr) max at 100 VAC; 3.67 x 10 <sup>6</sup> J/hr, (3,477 Btu/hr) max (100V*)	3.82 x 10 <sup>6</sup> J/hr, (3,620 Btu/hr) max at 100 VAC; 3.82 x 10 <sup>6</sup> J/hr, (3,620 Btu/hr) max (100V*)
In-rush Current	45 Apk "cold" per line cord, at any line voltage			
Startup Surge Current	120 Apk "hot" per line cord, at any line voltage			
AC Protection	15 A fuse on each power supply, single line			
AC Inlet Type	IEC320-C14 appliance coupler, per power zone			
Ride-through Time	10 ms min			
Current Sharing	± 5 percent of full load, between power supplies			

DIMENSIONS				
Weight kgs/lbs	empty 24.60/54.11	empty 24.60/54.11	empty 24.60/54.11	empty 24.60/54.11
Vertical size	2 NEMA units	2 NEMA units	2 NEMA units	2 NEMA units
Height cm/inches	8.88/3.5	8.88/3.5	8.88/3.5	8.88/3.5
Width cm/inches	44.76/17.62	44.76/17.62	44.76/17.62	44.76/17.62
Depth cm/inches	61.39/24.17	61.39/24.17	61.39/24.17	61.39/24.17
Note: Power consumption values for DPEs and DAEs are based on fully populated enclosures (power supplies, drives and I/O modules).				

Disk Array Enclosure (DAE)		
	25 X 2.5" Drive DAE	80 X 2.5" Drive DAE
<b>POWER</b>		
AC Line Voltage	100 to 240 VAC ± 10%, single phase, 47 to 63 Hz	
AC Line Current (operating maximum)	4.50 A max at 100 VAC, 2.40 A max at 200 VAC	13.18 A max at 100 VAC, 6.59 A max at 200 VAC
Power Consumption (operating maximum)	453.0 VA/ 432.0 W max at 100 VAC 485.0 VA/ 427.0 W max at 200VAC	1318.0 VA/ 1233.0 W max at 100 VAC 1318.0 VA/ 1233.0 W max at 200VAC
Power Factor	0.95 minimum at full load, @ 100V/200V	
Heat Dissipation (operating maximum)	1.56 x 10 <sup>6</sup> J/hr, (1,474 Btu/hr) max at 100 VAC 1.54 x 10 <sup>6</sup> J/hr, (1,457 Btu/hr) max at 200 VAC	4.43 x 10 <sup>6</sup> J/hr, (4,207 Btu/hr) max at 100 VAC 4.43 x 10 <sup>6</sup> J/hr, (4,207 Btu/hr) max at 200 VAC
In-rush Current	30 Apk "cold" per line cord, at any line voltage	45 Apk "cold" per line cord, at any line voltage
Startup Surge Current	40 Apk "cold" per line cord, at any line voltage	120 Apk "hot" per line cord, at any line voltage
AC Protection	15 A fuse on each power supply, single line	
AC Inlet Type	IEC320-C14 appliance coupler, per power zone	
Ride-through Time	12 ms minimum	10 ms minimum
Current Sharing	± 5 percent of full load, between power supplies	
<b>WEIGHT AND DIMENSIONS</b>		
Weight kg/lbs	Empty: 10.0/22.1 Full: 20.23/44.61	Empty: 11.33/25 Full: 58.9/130
Vertical size	2 NEMA units	3 NEMA units
Height cm/inches	8.46/3.40	13.21/5.20
Width cm/inches	44.45/17.5	44.70/17.6
Depth cm/inches	33.02/13	76.20/30
Note: Power consumption values for DPEs and DAEs are based on fully populated enclosures (power supplies, drives and I/O modules).		

Cabinets	
	Standard 40U Cabinet
AC Line Voltage	200 to 240 VAC ± 10%, single-phase, 47 to 63 Hz
Power Configuration	One, two, three or four power domains, each redundant
Power Inlet Count	Two, four, six, or eight (two per domain)
Plug Types	NEMA L6-30P or IEC309-332 P6 or IP57 (Australia)
Input Power Capacity	1 Domain: 4,800 VA @ 200 VAC, 5,760 VA @ 240 VAC 2 Domain: 9,600 VA @ 200 VAC, 11,520 VA @ 240 VAC 3 Domain: 14,400 VA @ 200 VAC, 17,280 VA @ 240 VAC 4 Domain: 19,200 VA @ 200 VAC, 20,040 VA @ 240 VAC
AC Protection	30 A site circuit breakers on each power branch
40U Cabinet Dimensions	Height - 75 in (190.8 cm); Width - 24.0 in (61.1 cm); Depth - 39.0 in (99.2 cm); Weight Empty – 380 lb (173 kg)

## Operating environment (meets ASHRAE Equipment Class A4)

	Description	Specification
Recommended Range Operation	The limits under which equipment will operate the most reliably while still achieving reasonably energy-efficient data center operation.	18°C to 27°C (64.4°F to 80.6°F) at 5.5°C (41.9°F) dew point to 60% relative humidity and 15°C (59°F) dew point
Continuous Allowable Range Operation	Data center economization techniques (e.g. free cooling) may be employed to improve overall data center efficiency. These techniques may cause equipment inlet conditions to fall outside the recommended range but still within the continuously allowable range. Equipment may be operated without any hourly limitations in this range.	10°C to 35°C (50°F to 95°F) at 20% to 80% relative humidity with 21°C (69.8°F) maximum dew point (maximum wet bulb temperature). De-rate maximum allowable dry bulb temperature at 1°C per 300m above 950m (1°F per 547 ft above 3117 ft).
Expanded Allowable Range Operation	During certain times of the day or year, equipment inlet conditions may fall outside the continuously allowable range but still within the expanded improbable range. Equipment operation is limited to ≤ 10% of annual operating hours in this range.	5°C to 10°C and 35°C to 40°C (with no direct sunlight on the equipment) at -12°C dew point and 8% to 85% relative humidity with 24°C dew point (maximum wet bulb temperature). Outside the continuously allowable range (10°C to 35°C), the system can operate down to 5°C or up to 40°C for a maximum of 10% of its annual operating hours. For temperatures between 35°C and 40°C (95°F to 104°F), de-rate maximum allowable dry bulb temperature by 1°C per 175m above 950m (1°F per 319 ft above 3117 ft).
Exceptions to Expanded Allowable Range Operation	During certain times of the day or year, equipment inlet conditions may fall outside the continuously allowable range but still within the expanded exceptional range. Equipment operation is limited to ≤ 1% of annual operating hours in this range.	5°C to 10°C and 35°C to 40°C (with no direct sunlight on the equipment) at -12°C dew point and 8% to 85% relative humidity with 24°C dew point (maximum wet bulb temperature). Outside the continuously allowable range (10°C to 35°C), the system can operate down to 5°C or up to 45°C for a maximum of 1% of its annual operating hours. For temperatures between 35°C and 45°C (95°F to 104°F), de-rate maximum allowable dry bulb temperature by 1°C per 125m above 950m (1°F per 228 ft above 3117 ft).
Temperature Gradient		20°C / hour (36°F / hour)
Altitude	Max Operating	3050m (10,000ft)

## Statement of Compliance

Dell EMC Information Technology Equipment is compliant with all currently applicable regulatory requirements for Electromagnetic Compatibility, Product Safety, and Environmental Regulations where placed on market.

Detailed regulatory information and verification of compliance is available at the Dell Regulatory Compliance website. [http://dell.com/regulatory\\_compliance](http://dell.com/regulatory_compliance)



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