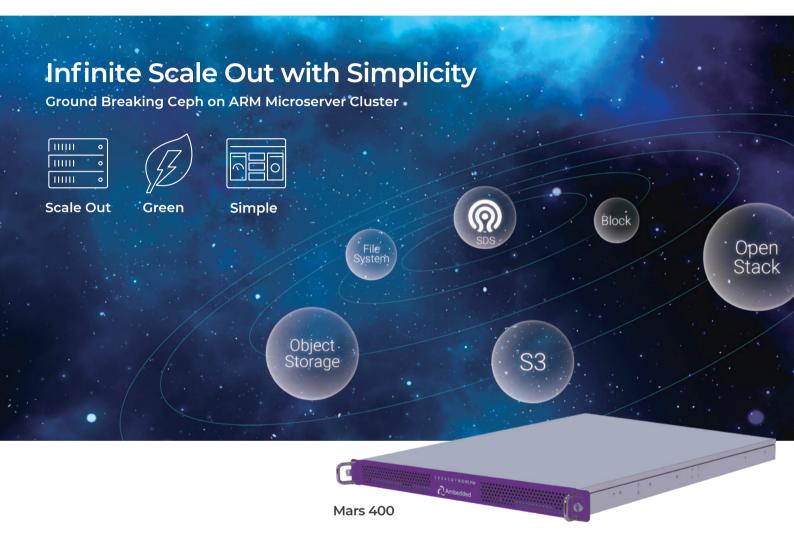
# **Ceph Software Defined Storage Appliance**

Unified distributed data storage cluster with self-healing, auto-balancing and no single point of failure Lowest power consumption in the industry: 70% power saving









BEST CHOICE AWARD Golden 2017

## Mars 400 Infinite Scale Out, Unified Virtual Storage

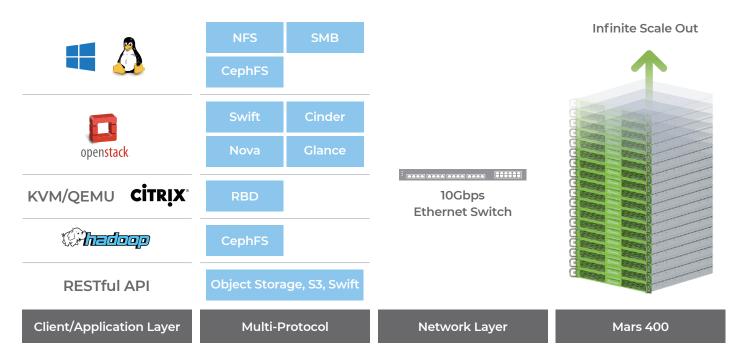
#### Mars 400 Features

- Effortless, Scalable and Auto-Configurable Ceph Appliance
- Easy to use web based Ceph user interface
- · Performance and capacity scale out on demand
- Resilient survival of multiple rack/chassis/host/OSD failures
- Self-healing data protection
- Unified system supports object storage, SAN and NAS on a single device
- Amazon S3 and OpenStack back-end storage
- Configurable on all SSD, hybrid and full HDD
- ARM based Micro-Server architecture minimizes failures
- Consumes less than 100/105 Watts of power: 70% power less than competitors

#### **Use Case & Applications**

- · Big Data Analysis, Machine Learning
- · Hadoop compatible for Telecom and Energy Industries
- Cloud Storage Service, backend storage for OpenStack & Kubernetes
- Edge Data Center for IOT applications such as sensor data aggregation
- Massive Data Backup
- · Database as a Service





## Simplified Design with High Availability

#### **Intelligent Data Protection**

Data replication to diverse chassis and racks to minimize the impact of failure (via the CRUSH rule on UVS software). Self-healing Micro-Server architecture.

#### Minimizes the scale and impact of hardware failure

Each ARM Micro-Server connects to its dedicated drive reducing the impact of failure by 90% compared to an x86 based storage system.

#### Hot-Swappable Hardware

Micro-Server, switch, HDD, SSD and power supplies are all hot-swappable modules. Switches and power supplies are also redundant.



**Basic Configuration** 

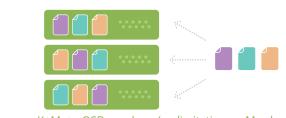
## UVS – Unified Virtual Storage Management

(1) Replica

Web-based Ceph Management GUI Easy to Configure, Deploy, Manage, Monitor, Automate

#### Data replication and protection

- Supports Replication and Erasure Code data protection methods. Support up to 10 x data replication.
- Erasure Code set in efficient, assigned storage space.
- Data is evenly distributed among storage nodes.



K+M < = OSD numbers (no limitation on M value)</li>
 (2) Erasure code Flexible to set up fault-tolerance ratio and overhead capacity



#### Real-Time Self-Healing and Fault-Tolerance

When any drive or Micro-Server fails, MARS 200/400 detects the failure and simultaneously regenerates the lost data per the CRUSH rule.

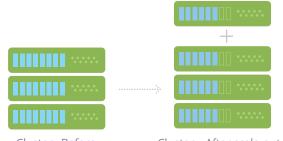
Auto-detection and self-healing ; back to data safe level

#### The CRUSH rule reduces and de-centralizes risk

The CRUSH algorithm distributes data replication/ Erasure code across dispersed racks, chassis and data centers.

え UniVirStore Manager	Dashboard	CEPH-	Object Storage •	Storage •	OpenStack	Settings
CrushMap Tree						
🕂 Create Bucket 🔹 🛱 Move Host	* Crush Rul	e -	elete Bucket			
Expand All Collapse All						
- @ crushroot						
- 📰 rack1						
- 🖬 chassis1						
+  m node74						
+ 🖬 node17						
- 🖬 chassis2						
+ 🗃 node72						
+ 🗃 node14						
- 🖬 chassis3						
+  m node73						
+ 📰 node76						
+ 😡 default						

Define the failure domain through CRUSH map on UVS manager



Cluster – Before Cluster – After scale-out Capacity and performance scale out linearly

#### Scale out and Automatic Load Balancing

- Mars 200 & Mars 400 scale out capacity on demand without service interruption.
- · Limitless linear performance and capacity scaling.
- All storage nodes automatically re-balance whenever there is a change in service.

Rados Gatewa

Ceph Cluster

Realm

Zone Group 1 (USA)

Rados Gatewa

Ceph Cluster



Shorten recovery point objectives (RPO) and Ceph Cluster recovery time objectives (RTO).



Multi-sites active-active support on RadosGW

## Mars 400 CEPH Storage Appliances

	Mars 400
Form Factor	1U Rack mount with 437.8 mm (W) x 43.5mm (H) x 741.2 mm (L) 1U Rack mount with 17.2" (W) x 1.7" (H) x 29.2" (L)
	SOC
	8 x ARM 64-bit Cortex-A72 Quad Core 1.2GHz
	Memory
Micro-Server	4G Bytes DDR4
	<ul> <li>Network Interface: 2 x 2.5Gbps Ethernet</li> <li>Storage Interface: 2 x SATA 3.0 (6 Gbps)</li> <li>Storage: 16GB flash memory for operating system, Ceph software and UVS manager</li> </ul>
Network	<ul> <li>Redundant Dual Hot-Swappable switches (active/active)</li> <li>4 x 10Gps uplink, for client and scale-out</li> <li>Support SFP+ or 10G baseT media with auto-media detection</li> <li>1 x 100Mbps out of band management port (BMC)</li> </ul>
Baseboard Management Controller (BMC)	<ul> <li>1 x 100Mbps Ethernet out-of-band port Functions:</li> <li>Micro-server Console over Ethernet</li> <li>Reset specified Micro-Server</li> <li>Control Micro-Server power ON/OFF</li> <li>Control system power ON/OFF</li> <li>Reset In-chassis switch</li> <li>UID LED control</li> </ul>
Storage Bay (HDD/SSD)	<ul> <li>8 x top accessible hot-swappable SATA3 storage bay (3.5"HDD or 2.5" SSD/HDD)</li> <li>Each Micro-Server has a 120GB SATA 3 M.2 SSD slot for Ceph WAL &amp; DB</li> </ul>
Front Panel	<ul> <li>8 green LED for Micro-Server status</li> <li>UID LED</li> <li>Power ON/OFF switch for power supply</li> <li>HDD backplane with: 8x LEDs for locating HDD positions</li> </ul>
Power Consumption	Max. 105 Watts (exclude 8 x SSD/HDD)
Accessories	<ul> <li>AC input power cord with IEC C14 inlet plug</li> <li>Slide rail kit</li> <li>Cable management arm (optional)</li> </ul>
Power Supply	Dual 300 Watt 80 Plus Silver Redundant Power Supplies (active/active)
Safety	CE/FCC Class A, UKCA

## 1U 8 nodes ARM Micro-Server Cluster

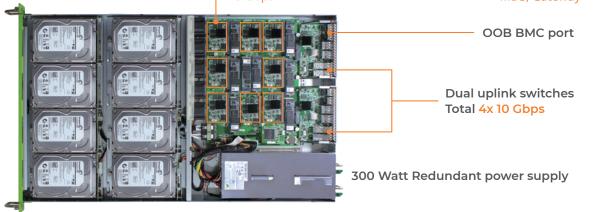
#### **Storage Device**

8x ARM Quad Core Micro-Server

- 4GB DDR4
- 8x SATA3 WAL/DB SSD

• 8x SATA3 HDD/SSD OSD

- 16G Bytes Flash: System disk • <mark>5 Gbps</mark> LAN
- < 5 Watts power consumption</li>
  Every node can be OSD, MON,
  - MDS, Gateway





ARM-based Micro-Server Architecture Energy-Saving Distributed Storage Server

## **Unified Virtual Storage Manager (UVS) Features**

#### **Cluster & NTP Server Deployment**

- Deploy the first Monitor and OSD to bring up Ceph cluster from scratch.
- Setup NTP server: Ceph allows very small clock skew between nodes.
- NTP options may create an NTP server on MON node or use an existing NTP server.
- A single click can push the NTP setting to each Ceph node.

#### Dashboard

The dashboard provides graphical cluster information.

- Ceph cluster status
- Warning and error messages
- OSD and MON status
- Placement Group health status
- Cluster capacity usage
- Throughput metrics

#### MON/OSD Management

- MON create, restart and reboot
- OSD create, restart, reboot and remove
- Add multiple OSDs
- MON and OSD network and health status
- OSD disk SMART information

Se									
						Search		Θ	
	Rank		Node Name	* IP.	Address		Status		
	mon.0		node111-246cf	+	92.168.1.111		Up		
	mon.1		node121-92650	+	92.168.1.121		Up		
	mon.2		node131-22e78	+	92.168.1.131		Up		
	Create New		boot Remove OSD			Search		Ø	111
Se			boot Remove OSD	* IP Address	Status	Search	Journal	G	
54	rvice Restari	t Node Re		<ul> <li>IP Address</li> <li>192.168.1.112</li> </ul>	Status		Journal		
S.	Nice Restar	t Node Re	Node Name			Data SMART			
S.	Rank osd.0	t Node Re	Node Name node112-b555c	<b>1</b> 192.168.1.112	Up	Data SMART	Into		
S.	Rank osd.0 osd.1	t Node Re Class SSd SSd	Node Name node112-b555c node113-5d7ff	<ul><li>₱192.168.1.112</li><li>₱192.168.1.113</li></ul>	Up Up	Data SMART	into Into		
S.	Rank osd.0 osd.1 osd.2	t Node Re Class SSd SSd SSd SSd	Node Name node112-b555c node113-5d7ff node114-98e24	<ul> <li>↑192.168.1.112</li> <li>↑192.168.1.113</li> <li>↑192.168.1.114</li> </ul>	Up Up Up	Data SMART	Info Info Info		
	Rank osd.0 osd.1 osd.2 osd.3	Class SSC SSC SSC SSC SSC SSC SSC	Node Name node112-b555c node113-5d7ff node114-98e24 node115-fcb0e	†192.168.1.112           †192.168.1.113           †192.168.1.114           †192.168.1.115	Up Up Up	Data SMART	Into Into Into Into		
	Rank osd.0 osd.1 osd.2 osd.3 osd.4	Class ssd ssd ssd ssd ssd ssd ssd	Node Name node112-b555c node113-5d7ff node114-98e24 node115-fcb0e node116-f547e	192.168.1.112           192.168.1.113           192.168.1.114           192.168.1.115           192.168.1.115	Up Up Up Up	Data SMART Into Into Into Into	Into Into Into Into Into		
	Rank         osd.0           osd.1         osd.2           osd.3         osd.4           osd.5         osd.5	Class SSG SSG SSG SSG SSG SSG	Node Name node112-b555c node113-5d7ff node114-98e24 node115-fcb0e node116-f547e node116-f547e	192.168.1.112           192.168.1.113           192.168.1.113           192.168.1.114           192.168.1.115           192.168.1.116           192.168.1.117	Ср Ср Ср Ср Ср	Data SMART into into into into into into into	into into into into into		
	Rank osd.0 osd.1 osd.2 osd.3 osd.4 osd.5 osd.5	Class ssd ssd ssd ssd ssd ssd ssd ssd	Node Name node112-0555c node112-0557ff node113-547ff node114-08e24 node115-1cbDe node116-1547e node116-1547e	192.168.1.112           192.168.1.113           192.168.1.113           192.168.1.114           192.168.1.115           192.168.1.116           192.168.1.117           192.168.1.118	00 00 00 00 00 00	Data SMART	Into Into Into Into Into Into		

### **Pool Management & Cache Tiering**

- Pool create/delete
- Pool configuration: Name, Replica/Erasure Code, Quota, CRUSH Rule, Placement Group
- Cache tiering: With different speed pools, a faster pool can be set as the cache tier of a slower pool.

### **CRUSH Map Configuration**

Ceph uses CRUSH algorism to distribute and store replicated data and erasure coding chunks to the configurable failure domain. CRUSH requires a map to avoid single point of failure, performance bottleneck and scalability limitations. UVS enables configuration of the CRUSH map and rule sets.

- Create/Delete bucket: root, rack, chassis
- Move host: Assign hosts to their chassis
- List and create CRUSH Rules
- Graphical CRASH map

Create Bucket -	Hove Host	* Crush Rule -	Delete	Bucket		
Expand All Coll	apse All	LEGEND	ROC	т	888	RACK
		CHASSIS	= HOS	т		OSD
- 🛛 default						
- Emyrack						
🗕 🗖 zone1						
🗕 🖬 node5	2-df658					
aso 💂 osc	1.0					
- = node5	3-6c077					
a osc	.1					
- = node5	4-2960e					
a osc	1.2					
🗕 🖬 node5	5-365b9					

#### **RBD** Image Management & Snapshot

- Create and deleting image
- Assign image object size
- Size and Resize image
- Snapshot, clone and flatten images
- List images with their name, image size, object size and watchers (users).

+ Create Imag				
				Search O I
Pool Name	Image Name	Image Size	Object Size	Action
poelrbd	image1	100 GIB	4 MB	C' Resize 🕴 Delete 🗳 Shapshot 👁 Watchers
	image10	100 GIB	4 MB	Ci Resize 🖹 Delete 🚨 Snapshot 👁 Watchers
	image11	100 GiB	4 MB	Ci Reelze 🔒 Delete 🚨 Snapshot 👁 Watchers
	image12	100 GiB	4 MB	C' Rosize 🖹 Delete 🗳 Snapshot 👁 Watchers
	image13	100 GiB	4 MB	C' Resize E Delete Z Grapshot 👁 Watchers
	image14	100 GiB	4 MB	🖸 Resize 📕 Delete 📑 Snapshot, 👁 Watchers
	image2	100 GiB	4 MB	🖸 Resize 📲 Delete 📑 Snapshot 👁 Watchers
	image3	100 GiB	4 MB	🖸 Resize 📲 Delete 📑 Snapshot 👁 Watchers
	imago4	100 CilB	4 MB	Ci Realze 🔒 Dalate 🛃 Snapshot 👁 Watchers
	image5	100 GiB	4 MB	Ci Resize 🖹 Delate 🗳 Snapshot 👁 Watchers

### **Erasure Code Profile Management**

Before creating an erasure code pool, Administrators create an Erasure Code profile with specified object Data Chunk (K) and Coding Chunk (M) values, and a failure domain. UVS makes this quite straightforward.

+ New Profile								
					Search		Θ	
Profile Name	*	Object Chunk (K)	Coding Chunk (M)	Ruleset Failure Dom	ain / ROOT	Ac	tion	
default		2	1	host / default			🛙 Dele	to
1042		4	2	host / default			Dele	to
newec42		4	2	host / default			🗄 Dele	to

### **Client User Access Control**

Ceph requires authentication and authorization via username / keyring. UVS manages user access and creates the associated keyring, which administrators can download after creation.

New User							
				Searc	h	٥	ш.
Jser Name *	Key	Capabilities	Action				
nramp	AQDIHMxatDvNxAAzS2gtvW9Fe1vpaiuWonWdA==	allow *	E Delete	El Edit	Download Key		
bduser	AQCCAUteeAvFDhAAXPNEaYUz07xioo4yVLOwhw		1 Delete	ElEdit	Download Key		

## Usage Detail

Usage detail lists the size, weight, use percentage and availability of each root, rack, chassis and host/disk.

NAME	TYPE	WEIGHT	925	USE	AWAILABLE	NUSE	
orfault	Acce	109.17999	0	0	e	DTh.	
node112-05550	Pest	5.45900	5580G	1360	5453G	2.4%	
node113-5e77	Pest	6.45900	55800	1290	64800	2.32%	
node114-08e24	heat	6.45800	55800	1130	54780	12.02%	
node116-kdb0e	Peel	6.45900	55800	1160	64730	2.094	
node116-6567e	hest	5.45900	55800	1170	54720	[2 10%	
node117-64414	Post	5.45900	5580G	1080	5483G	[1.01%	
node118-4e3fb	Pest	5.45800	5580G	1200	54530	2.20%	
node/122-068d1	hest	5.45800	55800	1090	5480G	1.00%	
rode123-ef610	Pest	5.45900	55800	1350	54540	2.49	

### **Object Storage**

UVS manager supports the use of object storage. Applications can access the object storage through Amazon S3 and OpenStack Swift compatible API through the RADOS gateway.

+ RADOS GA		anagement	L User Management							
						8	arch .		٥	
iode Name		IP Address		API Port	Туре			Action		
ode111-246c	đ	192.168.1.	***	TCP/7480	Moster Gateway REALM = usa 20NEGROUP = east 20NE = newjersey			2		
iode121-9265	o	192.168.1.	121	TCP/7480	Master Gateway REALM = usa 20NEGROUP = cast 20NE = raviersey			-		
_	of 2 rows wift User Ma	nageme	ent		20ms - harvynswy					
1 s3/s	wift User Ma	nageme	ent		20nii - nengraey		Search		0	
L S3/S + Create	wift User Ma		ent		20nii - nengraey	Quota		tion	6	
L S3/S + Create	wift User Ma • New User Name		Keys 53 Access Key : D 53 Secret Key : N Swift UD : anbed	SpNhWTrUS86F4zU ded:swift		Quota Disable		tion S' Edit Quota	6	

### iSCSI

This feature helps to create iSCSI gateways on external servers or internal MON nodes and manage iSCSI LUNs with CHAP and ACL authentication.

		board CEPH - Oblect Storage - Storage - OperStack Settle	1005 <b>*</b>	
		Create iSCSI LUN	ж	
_		Create ISCSI LUN on't		
SCSI Targets	1	All CEPH Monitors	٥	
E Marage External Gates	ey 🗮 Crea	Backing Store (Pool/Image)*:		
		pooltest/image1	•	
		CHAP Authentication and ACL:		Search 🛛 🖬 -
Target	*	Initiator Node IGN: Example: Syn. 1993-48.org.decian(8):93c8tabc31aa		Action
node111-246cf	icp.2003			Ecit / Delete -
(182.168.1.111)	POOL: Size:1	Leave this filled blank if you do not want AGL based on Node IGN.		
		CHAP UserID:		
Showing 1 to 1 of 1 rows				
		Leave Usemane and Paseword fields blank if you want to deable CHAP authentication.		
		CHAP Password:		
		Create		
			Close	
			_	

## And more with UVS Manager

UVS manager also supports keyring & ceph.conf file generation for OpenStack, Audit logs, Notification/email alert, UVS user management, On-fly firmware update....etc.



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