

Application Note

February 2014

SnapSAN ALUA in an ESXi Environment



Summary

This application note describes how Asymmetric Logical Unit Access (ALUA) functionality works in an ESXi environment with SnapSAN arrays and how to disable it.

Introduction

The benefit of modern SAN design is the ability to create very reliable and fault tolerant storage. It is now possible to have storage with no single point of failure. This is possible because modern arrays allow access to storage on multiple ports with the connectivity type of iSCSI or Fibre Channel.

Asymmetric Logical Unit Access (ALUA) is a SCSI3 (SPC-3) standard that allows a storage device to signify to VMware ESXi host servers which paths are preferred. By default the SnapSAN ALUA is enabled, thus ESXi complies with this configuration.

The SnapSAN is ALUA compliant; this means the LUN is accessible through both storage processors (controllers) as **Active**, but only one of these storage processors actually "owns" the LUN.

The path types are:

- **Optimized Path (Active I/O)** A direct path to the storage processor that owns the LUN.
- Non-optimized Path (Active) A connection with the storage processor that owns the LUN through an interconnected bus.

VMware tracks information about the processor owning the LUNs and prefers sending traffic directly to the owner in the optimized path. The Most Recently Used (MRU) pathing policy takes optimized / non-optimized paths into account. When the optimized path is not available, MRU uses a non-optimized path. Once the optimized path is available, MRU switches back to the optimized path.

The following image depicts the ALUA configuration in an ESXi environment:



This document describes how a SnapSAN Disk Array supports the ALUA functionality in an ESXi environment. This document also explains how to disable ALUA on the SnapSAN in an ESXi environment. The SnapSAN must be at or above the current released firmware/software of U22R.007/082R.007 in order to disable ALUA.

Disabling ALUA on the SnapSAN in VMware ESXi environment can help with the following scenarios:

- When there is a single path to the controllers and performance is hindered when all hosts use the optimized path.
- When there is instability of paths in a SAN that potentially can cause the paths to bounce between online and offline conditions which leads to degradation in performance and stability.
- The shift of hosts to one side of the controllers can be caused by update interruptions.
- Disable Explicit ALUA to prevent conflict of the optimized paths to a shared disk (ESXi cluster) configuration of multiple servers with one path. ALUA sets its own port as the optimized path.

The scenarios listed above causes the unbalanced I/O paths found with VMware and native multipath software.

NOTE: Disabling ALUA on the SnapSAN requires a reboot of the ESXi host. This is required for the changes in ALUA to take effect.

Required Information, Tools, and Files

Before you begin these procedures, the following information, tools, and files are required.

Prerequisites

Prior to performing these procedures, ensure that you have the following:

- Overland Storage SnapSAN S3000/S5000 Disk Array must be installed and configured. You can get additional technical support from our website at http://support.overlandstorage.com, or by contacting Overland Storage using the information found on the <u>Contact Us</u> page on our web site.
- The SnapSAN S3000/S5000 must be running firmware U22R.007 and higher.
- The SnapSAN S3000/S5000 must be running software 082R.007 and higher.
- Verify if the following are installed on a supported Windows Server:
 - VCenter Server
 - VSphere client
- This document assumes that the Storage Pool and Logical Disk have already been created. Additional information on Binding a Pool and Logical Disk can be found in the *SnapSAN S3000/S5000 Disk Array User Guide*.

http://docs.overlandstorage.com/snapsan

- This document assumes that vCenter Server is already installed and running and the reader has a general understanding and familiarity with the VMware ESXi environment. Any and all additional information can be attained through the VMware Knowledge Center.
- The SnapSAN LUN assigned to ESXi host must be available in the ESXi Datastores list.

Versions

The test environment used for illustration in this document uses the following versions:

- Windows Server 2008R2x64 SP1
- VMware ESXi, 5.1, 799733

- vCenter Server, 5.1, 799733
- vSphere Client 5.1.0, Build 786111
- Emulex LPe11000
- SnapSAN S5000 software version 082R.007
- SnapSAN S5000 firmware version U22R.007

Verifying ALUA Functionality

Checking LUN owner and ALUA Status

- 1. Login to the SnapSAN controller using SSH with the following credentials:
 - User: sysadmin
 - Password: sys123

Run the following command:

iSMview -all

The output of the following image shows that the particular logical disk or LUN named **VED_SHARED** with a **Current Owner** and **Default Owner** as **00.** In this case, this is **Controller 0**.

LD Detail Informat	:1	on
LDN(h)	:	0012
OS Type	:	UN
LD Name	:	VED_SHARED
LD Capacity	:	54.0GB(57,982,058,496Bytes)
Pool No.(h)	:	0002
Pool Name	:	VED1
RaidType	:	RAID1/10
PD Type	:	SAS
LD State	:	ready
Capacity Allocation	:	virtual
Access Mode	:	ReadWrite
Expansion/		
Rearrangement State	:	
Group	:	LD Set
Purpose	:	
RPL Attribute	:	IV
Snapshot Attribute	:	
Current Owner	:	00
Default Owner	:	00
Cache Resident	:	no
PD List(h)	:	00-0008,0009
Read Cache Mode	:	on
Write Cache Mode	:	on
Sequential Data Mode	:	on
Configuration Change	:	
Data Migration State	:	
MDIR	:	00
ALUA auto trespass tim	ne	: 0

The following image shows the **Target Port Group 00** or **Controller 0** as the recommended active and optimized path. **Target Port Group 01** or **Controller 1** is the non-optimized path and is not recommended.

Target Port Group Inform	at	ion
Target Port Group No.(h)	:	00
LUN Access	:	recommendation
Asymmetric Access State	:	active/optimized/primary
The Cause of Access State	:	02
Relative Target Port List(h)	:	00-00
		00-01
		00-02
		00-03
Target Port Group No.(h)	:	01
LUN Access	:	non-recommendation
Asymmetric Access State	:	active/non-optimized/primary
The Cause of Access State	:	02

The following image shows the **ALUA status** as **enable**.

LD Set Informatio	n ·	
Platform	:	LX
LD Set Name	:	SD-ESX51-3442
Configuration Change	:	
Action mode	:	Normal mode
Explicit ALUA	:	enable 1
Path List	:	1000-0000-C965-63DE
		1000-0000-C965-63DD

Checking Storage Array Type and available Paths

To check the storage array type and its paths from ESXi, perform the following steps:

- 1. From the vSphere Client console, select the **host** from the left-pane.
- 2. Navigate to Configuration> Storage view.
- 3. From Datastores list, select the particular datastore.
- 4. Click the Properties link.
- 5. Click Manage Paths.

E 🛃 VC542-34230	10.20.3	34.42 VMware ESXi, 5.1.0, 799733	3									
SD-TARGET	Gettin	Started Summary Virtual Mach	ines	Performance Config	ratior	Tasks & I	Events Alarms Pe	missions Mans	Storage View	ws Hardw	are Status	Overland Storad
L 10.20.34.41												
10.20.34.42	Hard	ware	Vie	ew: Datastores Dev	ces							
5DW2K834235	P	ocessors	Da	tastores					Refresh D	elete Ad	d Storage	Rescan All
SRMSRA-34231	м	emory	Ic	dentification 🗸	Sta	atus	Device	Drive Type	Capacit	y F	ree Type	Last Update
SRMSRA-34233	+ S	corage	E	datastore1 (1)	0	Normal	Local Adaptec Disk.	Non-SSD	1.36 T	TB 1.1	TB VMFS5	10/23/2013
Vcenter	N	etworking	E	VED_HEARTBEAT	۲	Normal	OVERLAND Fibre	Non-SSD	49.75 6	B 48.80	GB VMFS5	10/23/2013
VC541-34230	S	corage Adapters	E	VED_HEARTBEAT	۲	Normal	OVERLAND Fibre	Non-SSD	49.75 @	B 48.80	GB VMFS5	10/23/2013
W2K8R2-5RM-34234	N	etwork Adapters	E	VED_SHARED	Δ	Warning	OVERLAND Fibre	Non-SSD	53.75 G	B 12.80	GB VMFS5	10/23/2013
W2K8VM1VC		VED_SHARED Properties							×			
Winzka_ved_34.61		Volumo Dronostion							1			
	Fof	General				Format						
	501	Datastore Name: VED_SHARED)	Rename		File System:	VMFS 5	.58				
		Tabal Casardan 50 75 50				Maximum Fil	e Size: 2.00 TB					
		Tutal Capauly: 53.75 GB		Increase		Block Size:	1 MB					
		Storage I/O Control		Les and								Properties
		I Enabled		Advanced						1		<u> </u>
		Extents			E	xtent Devic	e					
		A VMFS file system can span multip	e hard o	disk partitions, or	Т	he extent sel	ected on the left reside	s on the LUN or phy	sical			
		extents, to create a single logical v	olume.		d	isk described	below.					
		Extent		Capacity	Γ	Device		Capac	ity			
		OVERLAND Fibre Channel Disk (eu	.00169	71 54.00 GB		OVERLAN	D Fibre Channel Disk (GB			
						Primary Pa	artitions	Capac	ity	E4 00 CB	Stor	age I/O Con
										54.00 GD	DIS	ableu
						1. VMFS		54.00	GB	53.75 GB		-1
												Þ
												_
Description of the second seco										L		
Recent Tasks										tains: •		Llear
Name Target		1			J					Completed	Time	
							Refre	sh Manage P	aths			
					_							
									1146 L			
Tasks 🞯 Alarms								Close	нер			Administrator
										1		,

6. The SnapSAN is ALUA aware thus the Storage Array Type by default is VMW_SATP_ALUA this is displayed in the following image along with the available paths:

OVERLAND Fibre	Channel Disk (eui.00169712241d0012) Mana	ge Paths		
Policy				
Path Selection:	Most Recently Used (VMware)			Change
Storage Array Ty	pe: VMW_SATP_ALUA			
Paths				
Runtime Name	Target	LUN	Status	Preferred
vmhba4:C0:T1:L0	20:00:00:16:97:12:24:1d 29:00:00:16:97:12:2	4:1d 0	Active	Non-optimized
vmhba3:C0:T0:L0	20:00:00:16:97:12:24:1d 29:00:00:16:97:12:2	4:1d 0	🔶 Active	
vmhba3:C0:T1:L0	20:00:00:16:97:12:24:1d 21:00:00:16:97:12:2	4:1d 0	🔶 Active	Optimized
vmhba4:C0:T0:L0	20:00:00:16:97:12:24:1d 21:00:00:16:97:12:2	4:1d 0	 Active 	I/O)
Name: Runtime Name:	fc.20000000c96563dd:10000000c96563dd-fc.2000 vmhba4:C0:T0:L0	00169712241d:21000	0169712241d-eui	.00169712241d0012
Fibre Channel				
Adapter:	20:00:00:00:c9:65:63:dd 10:00:00:c9:65:63:dd			
Target:	20:00:00:16:97:12:24:1d 21:00:00:16:97:12:24:1d	I		
				Close Help

- vmhba4:C0:T1:L0 and vmhba3:C0:T0:L0 are non-optimized paths.
- vmhba3:C0:T1:L0 and vmhba4:C0:T0:L0 are optimized paths.

Disabling the Active (I/O) path

The following steps show how failover of the Active I/O takes place with ALUA. The examples provided show how Active I/O paths behave when the paths become unavailable (**Disabled**) and how SnapSAN works in an ESXi environment.

1. Right-click the path with Active (I/O) and select Disable.

Path Selection	Most Receptly Liced (VMware)			T Chapter
Fact Delection.	(Minist Recently used (Ministre)			Change
Storage Array Type:	VMW_SATP_ALUA			
aths				
Runtime Name	Target	LUN	Status	Preferred
vmhba4:C0:T1:L0	20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d	0	🔶 Active	
vmhba3:C0:T0:L0	20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d	0	🔶 Active	
vmhba3:C0:T1:L0	20:00:00:16:97:12:24:1d 21:00:00:16:97:12:24:1d	0	🔶 Active	
vmhba4:C0:T0:L0	20:00:00:16:97:12:24:1d 21:00:00:16		Active (I/O)	
	Distole			
	Preferred			
	Copy path to	clipboard		

2. The results after disabling the default path show that the second optimized path is now the primary with a status of **Active I/O**.

ath Selection:	Most Recently Used (VMware)			 Change
Storage Array Type	: VMW_SATP_ALUA			
-11				
atns Runtime Name	Target	LUN	Status	Preferred
/mhba4:C0:T1:L0	20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d	0	 Active 	
mhba3:C0:T0:L0	20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d	0	Active	
mbba3·C0·T1·L0	20:00:00:16:97:12:24:1d 21:00:00:16:97:12:24:1d	0	🔶 🛛 Active (I/O)	
AUDIO CONTINUO		0	 Dicabled 	

3. Repeat Step 1 to disable the other optimized path.

This assigns the Active (I/O) to a non-optimized path:

ath Selection:	Most Recently Used (VMware)			Change
orage Array Type:	VMW_SATP_ALUA			
hs				
intime Name	Target	LUN	Status	Preferred
hba4:C0:T1:L0	20:00:00:16:97:12:24:1d 21:00:00:16:97:12:24:1	d 0	🔶 🛛 Active (I/O)
hba3:C0:T0:L0	20:00:00:16:97:12:24:1d 21:00:00:16:97:12:24:1	d 0	 Disabled 	
hba3:C0:T1:L0	20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1	d 0	🔶 Active	
hba4:C0:T0:L0	20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1	d 0	🔶 Active	

4. Right-click on the optimized path and select Activate.

Immediately after the enable action, the **Active (I/O)** switches back to one of the optimized paths from a non-optimized path.

Path Selection:	Most Recently Used (VMware)			Change
Storage Array Typ	e: VMW_SATP_ALUA			
aths				
Runtime Name	Target	LUN	Status	Preferred
vmhba4:C0:T1:L0	20:00:00:16:97:12:24:1d 21:00:00:16:97:12:24:1d	d O	 Disabled 	· · ·
vmhba3:C0:T0:L0	20:00:00:16:97:12:24:1d 21:00:00:16:97:12:24:1d	i o	Oisabled	
	20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d	i o	🔶 Active	
vmhba3:C0:T1:L0			 A-Bus (100) 	

Disabling the ALUA

- 1. Login to the SnapSAN controller using SSH as user sysadmin and the password sys123.
- **2.** Run the following **command**:

sysadmin@SSS3000SD-0# iSMcfg setpathpolicy -ldset LX:SD-ESX51-3442 -mode off This command disables ALUA on host (LD set) basis. Check the status of Explicit ALUA which should now show a status of off.

LD Set Information	n ·	
Platform	:	LX
LD Set Name	:	SD-ESX51-3442
Configuration Change	:	
Action mode	:	Normal mode
Action mode Explicit ALUA	:	Normal mode off
Action mode Explicit ALUA Path List	:	Normal mode off 1000-0000-C965-63D#

Verifying the Active (I/O) after disabling ALUA

The following procedure describes how to verify the optimized paths when ALUA is disabled on the SnapSAN array.

- **NOTE:** After disabling ALUA on the SnapSAN array, the ESXi host has to be rebooted. Take all necessary precautions when rebooting the ESXi host. Such precautions can be found in VMware's knowledge base
- 1. **Reboot** the ESXi server on which ALUA is disabled. This is required for the changes in ALUA to take effect.
- 2. From the vSphere Client console, select the **host** in the left pane.
- **3.** Navigate to the **Configuration> Storage** view and select the particular datastore from **Datastores** list.
- 4. Click the Properties link.
- 5. Click Manage Paths.

NOTE: The **Storage Array Type** is now **VMW_SATP_DEFAULT_AA**. For test purposes, we have disabled all the optimized paths.

6. The Active (I/O) now switches to a non-optimized path.

Path Selection:	Most Recently Used (VMware)				
					 Change
Storage Array Type	: VMW_SATP_DEFAULT_AA				
aths					
Runtime Name	Target	LUN	Sta	itus	Preferred
untime Name mhba4:C0:T1:L0	Target 20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d	LUN	Sta	itus Active (I/O)	Preferred
untime Name mhba4:C0:T1:L0 mhba3:C0:T0:L0	Target 20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d 20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d	LUN O O	Sta	tus Active (I/O) Disabled	Preferred
Runtime Name /mhba4:C0:T1:L0 /mhba3:C0:T0:L0 /mhba3:C0:T1:L0	Target 20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d 20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d 20:00:00:16:97:12:24:1d 21:00:00:16:97:12:24:1d	LUN 0 0 0	Sta	tus Active (I/O) Disabled Disabled	Preferred

7. Enable one of the original **optimized paths** and confirm that **Active** (I/O) does not switch back to the optimized path.

This is because ALUA has been disabled on the SnapSAN. In some cases disabling ALUA on the SnapSAN may be beneficial.

licy					
ath Selection:	Most Recently Used (VMware)				Change
torage Array Type	WMW_SATP_DEFAULT_AA				
the					
ths	Target	LUN	Stat	us	Preferred
ths untime Name mhba4:C0:T1:L0	Target 20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d	LUN	Stat	us Active (I/O)	Preferred
ths untime Name mhba4:C0:T1:L0 mhba3:C0:T0:L0	Target 20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d 20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d	LUN 0 0	Stat	us Active (I/O) Disabled	Preferred
ths untime Name mhba4:C0:T1:L0 mhba3:C0:T0:L0 mhba3:C0:T1:L0	Target 20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d 20:00:00:16:97:12:24:1d 29:00:00:16:97:12:24:1d 20:00:00:16:97:12:24:1d 21:00:00:16:97:12:24:1d	LUN 0 0 0	Stat	us Active (I/O) Disabled Disabled	Preferred