



## Symantec Enabled Arrays - Array Support Libraries and Array Policy Modules to support storage arrays on Veritas Volume Manager™ 6.1 and 6.2

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This TechFile provides information about the Array Support Libraries and Array Policy Modules to support arrays listed in the HCL for Veritas Volume Manager™ 6.1 and 6.2

### NOTE:

*The information provided in this document is **NOT** a statement of support for a particular array, model, mode, or feature for Veritas Volume manager 6.1 and 6.2; please reference the 6.1/6.2 HCL (<http://www.symantec.com/docs/TECH211575>) for supportability.*

For more information about the arrays in the HCL, including specific settings, see High Availability Solutions Hardware TechNote <http://www.symantec.com/docs/TECH47728>

<b>Package Name</b>	: VRTSaslapm
<b>Package Description</b>	: Array Support Libraries and Array Policy Modules for Veritas Volume Manager
<b>6.1 Package Version</b>	: 6.1.1.400 (AIX/Linux/Solaris)
<b>6.2 Package Version</b>	: 6.2.1.100 (AIX/Linux/Solaris)
<b>Veritas Volume Manager Version</b>	: 6.1, 6.2
<b>6.1 Operating Systems</b>	: AIX (6.1, 7.1) Linux (SLES 11, RHEL 5, RHEL 6) Solaris SPARC (10, 11)
<b>6.2 Operating Systems</b>	: AIX (6.1, 7.1) Linux (SLES 11, SLES 12, RHEL 6, RHEL 7) Solaris SPARC (10, 11)
<b>Supported Arrays and Modes</b>	: Please refer to the 6.1/6.2 HCL <a href="http://www.symantec.com/docs/TECH211575">http://www.symantec.com/docs/TECH211575</a>

**NOTE:**

This document contains the following information:

1. Where to get the latest VRTSaslapm package.
2. Change Log mentioning the changes/additions made in this VRTSaslapm package release.
3. Contents of the VRTSaslapm package (ASLs/APMs).
4. Some details regarding the Extended Attributes discovered by the ASLs.

## Where to get the Latest VRTSaslapm Package

The latest VRTSaslapm package for Volume Manager 6.1 and 6.2 can be downloaded from:

<https://sort.symantec.com/asl>

The direct links to the latest packages for **6.1** are:

AIX: <https://sort.symantec.com/asl/details/726>  
Linux: <https://sort.symantec.com/asl/details/727>  
Solaris: <https://sort.symantec.com/asl/details/728>

The direct links to the latest packages for **6.2** are:

AIX: <https://sort.symantec.com/asl/details/729>  
Linux: <https://sort.symantec.com/asl/details/730>  
Solaris: <https://sort.symantec.com/asl/details/731>

## Change Log

**Notice:**

*In some situations, we are forced to modify the Unique Disk Identifier (UDID) for certain ASLs to fix a bug or to add support for a new feature of an array. Such changes would result in these devices being marked with “udid\_mismatch” flags (which can be seen in the ‘vxdisk list’ output) after the new VRTSaslapm package is installed. This flag is an indication of a disk changing its identity and must be cleared before proceeding. To clear the flag we need to update the on disk UDID to match the UDID constructed by the latest ASL. We can accomplish this by running “vxdisk -c updateudid <da-name>”. If the DG is currently imported, you will have to deport the DG first. We will point out any changes that may result in this situation in the change logs below. Additional information about UDID can be found in the document: <http://www.symantec.com/docs/HOWTO101477>*

**6.1:**

The following table outlines the changes/additions to the latest VRTSaslapm package for 6.1 as compared to the previous release.

**Changes made to version 6.1.1.400(AIX/HPUX/Linux/Solaris)  
(May 29 2015)**

Incident #	OS	ASL/APM	Description
3738063	AIX, HPUX, Linux, Solaris	libvxpurestorage	Set media_type to "ssd" as this is an all flash array
3731157	Linux	libvxfusionio	Modified FusionIO ASL to support gen3 cards (SX/PX)
3783058	Linux	VRTSaslapm Packaging	Update the boot partion during package upgrade installation
3771410	AIX, HPUX, Linux, Solaris	dmp7x10	Modified the APM to not require registering PGR keys during failover time
3719027	AIX, HPUX, Linux, Solaris	libvxFJTSYe8k	Add claim support for Fujitsu ETERNUS DX8700 S3/ETERNUS DX8900 S3 (ETERNUS_DXH)
3710395	AIX, HPUX, Linux, Solaris	libvxhdsusp	Added claim support for Hitachi HM800 series arrays
3785473	AIX, HPUX, Linux, Solaris	libvxnimble	Created an ASL to claim Nimble storage array

**Changes made to version 6.1.1.300(AIX/Linux/Solaris)  
(January 30 2015)**

Incident #	OS	ASL/APM	Description
3482795	Linux	libvxfusionio	Changed FusionIO ASL to claim ioScale/ioScale2 devices
3698147	AIX, Linux Solaris	libvxfusionION	Changed cabinet SN length of Fusion ION ASL from 8 to 16. The cabinet SN can be from 8 to 16. <i>This will result in a UDID mismatch for those Fusion ION disks that has a cabinet SN greater than 8 characters.</i>
3700204	AIX, Linux, Solaris	dmpsvc	Changed IBM SVC APM to detect offline devices
3647609	AIX, Linux, Solaris	libvxXtremio, libvxpp	Changed EMC XtremIO ASL and PowerPath ASL to detect SACD(Storage Array Controller Device) and skip them
3653092	AIX, Linux, Solaris	libvxhuawei	Changed Huawei ASL to correctly determine if a disk is a command device
3676723	AIX, Linux, Solaris	libvxmsa2kfc_sa	Changed HP MSA ASL to add 1040 SAS and 2040 SAS support. Also added Thin provisioning capabilities
3701627	AIX, Linux, Solaris	libvxpp	Changed EMC PowerPath ASL to extract the FW version from correct location
3583845	AIX, Linux, Solaris	libvxemcscaleIO	Added new ASL for EMC ScaleIO devices
3621746	Linux	libvxnetapplsi	Changed Netapp E-Series ASL to extract LUN name and set it as an extended attribute
3601355	Linux	libvxintel	Changed the Intel SSD ASL to extract cabinet SN from page 0x03
3695706	AIX, Linux, Solaris	libvxnetapp	Changed Netapp ASL to remove "Status OK" from extended attribute
3572714	AIX, Linux, Solaris	libvxxp12k, libvxhdsusp	Changed HP XP ASL and Hitachi USP ASL to correctly report physically allocated space and adjust maximum reclaim size

**Changes made to version 6.1.1.100(AIX/Linux/Solaris)**

**(September 29 2014)**

<b>Incident #</b>	<b>OS</b>	<b>ASL/APM</b>	<b>Description</b>
3575355	AIX, Linux, Solaris	libvxemc	EMC VMAX V3 not showing the port number correctly, print number in decimal
3576889	AIX, Linux Solaris	libvxpp	EMC Xtremio PP ASL: not recognizing PP devices correctly
3497245	AIX, Linux, Solaris	libvxmsa2kfc_sa	add HP MSA 1040 SAN PID to the ASL
3502323	AIX, Linux, Solaris	libvxxp12k	Add HP XP7 array detection code
3511901	AIX, Linux, Solaris	libvxxp12k	Added Thin Provisioning capability to HP xp20k disks
3536815	AIX, Linux, Solaris	libvxxp12k	HP XP arrays does not display allocated space correctly
3502785	Linux	libvxfusionio	Fusionio linux vxconfigd core dump due to fio-status not able to find library at early boot
3482795	Linux	libvxfusionio	Modify the discovery logic for iodrive/iodrive2 devices
3579252	AIX, Linux, Solaris	libvxhuawei	Modify ASL to claim model XSG1
3585182	Linux	dmpCLARiiON	kernel-to-kernel SG_IO interface is broken in newer RHEL7 and SLES11SP3 kernels changing to use SCSI bypass interface
3601484	AIX, Linux, Solaris	libvxinfinibox	Create a new ASL to claim Infinibox devices
3604534	AIX, Linux, Solaris	libvxhuawei	If TP information is not available then mark the disks as thick
3536810	AIX, Linux, Solaris	libvxhdsusp	Modify cabinet SN to match value listed on array console

**Changes made to version 6.1.0.100(AIX/Linux/Solaris)  
(May 9 2014)**

<b>Incident #</b>	<b>OS</b>	<b>ASL/APM</b>	<b>Description</b>
3440232	AIX, Linux, Solaris	libvxemc	Thin Reclamation fails with EMC 5875 FW due to Max reclaim size not set correctly
3421614	AIX, Linux, Solaris	libvxhuawei	Identify Command Devices and skip them, also correct Snapshot detection logic
3417905	AIX, Linux, Solaris	libvxpp	Added XtremIO array detection in the PowerPath ASL
3476342	AIX, Linux, Solaris	libvxnipnyis	ASL not setting cur-owner property causing secondary path to become Active for short period of time
3476350	AIX, Linux, Solaris	libvxlsiall, libvxnetaplsi (Linux)	Modified the ASLs to identify NETAPP branded devices
3428849	AIX, Linux, Solaris	libvxnetaplsi (Linux), libvxnetapp	Created an ASL for LSI NetApp Arrays(E series) (Note: libvxnetapp ASL version remains at 1).

3400635	AIX, Linux, Solaris	libvxhpalua	Added Thin Provisioning (via unmap) to the ASL for HP EVA arrays
3454160	AIX, Linux, Solaris	libvxhdsusp	Added code to detect Hitachi VSP G1000 model to the ASL
3470252	AIX, Linux, Solaris	libvxxiotechE5k	Added code for ISE2400 model and changed array names to x-io
3470266	AIX, Linux, Solaris	libvxramsan	Added IBM Flash Systems to TMS RAMSAN ASL
3470659	AIX, Linux, Solaris	libvxramsan	Enabled ASL to claim IBM FlashSystem 840 model
3420440	AIX, Linux, Solaris	libvxfusionION	Added an ASL to claim Fusion ION arrays
3470261	AIX, Linux, Solaris	libvxCLARiiON	The ARRAY-PORT-ID of CLARiiON array is not shown correctly
3470289	AIX, Linux, Solaris	libvxviolin	Added ALUA mode to the Violin ASL
3470280	AIX, Linux, Solaris	libvxdothill	Added code to claim DotHill AssuredSAN 4000 Series Array(DH4720)
3470697	AIX, Linux, Solaris	libvxhds, libvxhds9980, libvxxp12k, libvxhdsusp, libvxhitachi, libvxhdsalua	In case of Hitachi True Copy : replicated Type is not set if hardware_mirror_s is No(pvol)
3354145	AIX, Linux, Solaris	libvxpp	Modified the PP ASL to correctly identify PP controlled VNX and VPLEX devices
3452062	AIX, Linux, Solaris	libvxemc	Attribute tprclm is not shown for VMAX FW 5875
3501385	AIX, Linux, Solaris	libvxfusionION, libvxlsiall, libvxhuawei	Modified the ASLs to fix a disk claim issue

## 6.2:

The following table outlines the changes/additions to the latest VRTSaslapm package for 6.2 as compared to the previous release.

<b>Changes made to version 6.2.1.100(AIX/Linux/Solaris) (May 29 2015)</b>			
<b>Incident #</b>	<b>OS</b>	<b>ASL/APM</b>	<b>Description</b>
3738062	AIX, HPUX, Linux, Solaris	libvxpurestorage	Set media_type to "ssd" as this is an all flash array
3731156	Linux	libvxfusionio	Modified FusionIO ASL to support gen3 cards (SX/PX)
3714854	Linux	VRTSaslapm	Update the boot partion during package upgrade installation

		Packaging	
3771409	AIX, HPUNIX, Linux, Solaris	dmp7x10	Modified the APM to not require registering PGR keys during failover time
3719029	AIX, HPUNIX, Linux, Solaris	libvxFJTSYe8k	Add claim support for Fujitsu ETERNUS DX8700 S3/ETERNUS DX8900 S3 (ETERNUS_DXH)
3710393	AIX, HPUNIX, Linux, Solaris	libvxhdsusp	Added claim support for Hitachi HM800 series arrays
3766288	AIX, HPUNIX, Linux, Solaris	libvxnimble	Created an ASL to claim Nimble storage array

**Changes made to version 6.2.0.100(AIX/Linux/Solaris)  
(January 30 2015)**

Incident #	OS	ASL/APM	Description
3689227	Linux	libvxfusionio	Changed FusionIO ASL to claim ioScale/ioScale2 devices
3703164	AIX, Linux Solaris	libvxfusionION	Changed cabinet SN length of Fusion ION ASL from 8 to 16. The cabinet SN can be from 8 to 16. <i>This will result in a UDID mismatch for those Fusion ION disks that has a cabinet SN greater than 8.</i>
3661841	AIX, Linux, Solaris	dmpsvc	Changed IBM SVC APM to detect offline devices
3688308	AIX, Linux, Solaris	libvxXtremio, libvxpp	Changed EMC XtremIO ASL and PowerPath ASL to detect SACD(Storage Array Controller Device) and skip them
3655872	AIX, Linux, Solaris	libvxhuawei	Changed Huawei ASL to correctly determine if a disk is a command device
3676722	AIX, Linux, Solaris	libvxmsa2kfc_sa	Changed HP MSA ASL to add 1040 SAS and 2040 SAS support. Also added Thin provisioning capabilities
3701626	AIX, Linux, Solaris	libvxpp	Changed EMC PowerPath ASL to extract the FW version from correct location
3701228	AIX, Linux, Solaris	libvxemcscaleIO	Added new ASL for EMC ScaleIO devices
3689707	AIX, Linux, Solaris	libvxxp12k, libvxhdsusp	Changed HP XP ASL and Hitachi USP ASL to correctly report physically allocated space and adjust maximum reclaim size

## Package Contents

The VRTSaslapm package in VxVM 6.1/6.2 contains the ASL libraries and APM modules to support the arrays as indicated in the HCL.

- The following table lists the ASL libraries **common to all platforms** in VRTSaslapm package

Library	SF 6.1 Version	SF 6.2 Version	VID	PID	Arrays	Mode	Extended Attributes Support
libvx3par	1.0	1.0	3PARdata	VV	InServ series (E200, S400,	A/A	Yes

					S800)		
libvxCLARiiON	2.0	1.0	DGC	CLARiiON	CLARiiON AX100, CLARiiON CX Series (300, 380, 400, 500, 600, 700), CLARiiON CX3 Series (10, 20, 40, 80), CLARiiON CX4 Series ( 120, 240, 480, 960)	A/P, A/P-F, ALUA	Yes
libvxcompellent	1.0	1.0	COMPELNT	Compellent Vol	Storage Center	A/A	Yes
libvxcopan	1.0	1.0	COPANSYS	8814,8818	COPANSYS	A/A-A	No
libvxddns2a	1.0	1.0	DDN	9550	S2A9550	A/A-A	No
libvxddns2a_sfa	1.0	1.0	DDN	S2A 6620, SFA 10000	S2A6620, SFA10K	ALUA	No
libvxdothill	2.0	1.0	DotHill	R/Evo 2730-2R, R/Evo 2530-2R, R/Evo 2330-2R, R/Evo 2130-2RX, R/Evo 2130-2J, R/Evo 5730-2R, DH4720	DotHill (2130, 2330, 2530, 2730, 5730), DH4720	ALUA	No
libvxhillsannet2	1.0	1.0	DotHill	SANnet II FC, SANnet II SCSI, SANnet II SATA, SANnet II U320	SANnetIIFC, SANnetII SCSI, SANnetIISATA, SANnetIIU320	A/A	No
libvxemc	3.0	1.0	EMC	SYMMETRIX	Symmetrix V-Max	A/A	Yes
libvxeqlogic	1.0	1.0	EQLOGIC	100E-00	PS Series	A/A	No
libvxfje3k4ka	1.0	1.0	FUJITSU	E400A, E3000	ETERNUS4000 Series(Models 80/100), ETERNUS3000 Series	A/P-G	No
libvxfjtsye2k	1.0	1.0	FUJITSU	ETERNUS_DXL, E2000	ETERNUS DX60/DX80/DX90, ETERNUS2000 Series	A/A, ALUA	Yes
libvxFJTSYe6k	1.0	1.0	FUJITSU	E6000	ETERNUS 6000 series	A/A	No
libvxFJTSYe8k	2.0	2.0	FUJITSU	ETERNUS_DX400, ETERNUX_DX8000, E4000, E8000, ETERNUS_DXM, ETERNUS_DXH	ETERNUS DX400 Series, ETERNUS DX8000 Series, ETERNUS 4000 Series(Except Models 80/100), ETERNUS 8000 Series, ETERNUS DXM, ETERNUS DXH	A/A, ALUA	Yes
libvxfsc	1.0	1.0	FSC	FibreCAT_SX1	FSC-FibreCAT	A/A	No
libvxhds9980	2.0	1.0	HITACHI	OPEN-*	9980,9970V, StorageTek (9980, 9970)	A/A	Yes
libvxhdsalua	2.0	1.0	HITACHI	DF600,DF600-V, DF600F,DF600F-V	TMS1000, SMS/AMS2000 series (AMS2100,AMS2300, AMS2500), SMS100,AMS200, AMS500,AMS1000, Thunder 9500V series,WMS100, AMS/WMS series,9570V, 9580V, HUS_110, HUS_130,	A/A, A/A-A	Yes

					HUS_150		
libvxhds	2.0	1.0	HITACHI	All	HDS7700E,HDS9960, HDS9910	A/A	Yes
libvxhdsusp	6.0	3.0	HITACHI	OPEN-*	USP V,USP VM,USPV/USPVM, USP/NSC series,USP100, USP600,USP1100,VSP,HUS VM,VSP G1000,VSP Gx00	A/A, A/P	Yes
libvxhitachi	2.0	1.0	HITACHI	DF350,DF400, DF400F,DF500, DF500F	HDS5700,HDS5800, HDS9200	A/P, A/P-GS	Yes
libvxhpalua	2.0	1.0	HP	HSV101,HSV111 (C)COMPAQ, HSV111,HSV200, HSV210,HSV300, HSV400,HSV450, HSV340,HSV360	EVA3000,EVA4000, EVA5000,EVA6000, EVA8000,EVA3000GL, EVA5000GL, EVA8100,EVA4100, EVA4400,EVA6100, EVA6400, StorageWorks EVA GL 3000/5000, StorageWorks EVA4000/6000/8000, StorageWorks EVA4100/6100/8100, P6300, P6500	ALUA	Yes
libvxhuawei	5.0	2.0	HUAWEI, HUASY	S5100, S5300, S5500, S5600, S6800E, S8000, S8000-I, VIS6000, S5500T, S5600T, S5800T, S6800T, S2600T, V1500, V1800, S2100, S2300, S2300E, S2600, S3900- M100, S3900- M200, S3900- M300, S5900- M100, S5900- M200, S6900- M100, Dorado2100, Dorado5100, Dorado2100 G2, S2200T, HVS85T, HVS88T, XSG1	S5100, S5300, S5500, S5600, S6800E, S8000, S8000-I, VIS6000, S5500T, S5600T, S5800T, S6800T, S2600T, V1500, V1800, S2100, S2300, S2300E, S2600, S3900-M100, S3900-M200, S3900-M300, S5900-M100, S5900-M200, S6900-M100, Dorado2100, Dorado5100, D2100G2, S2200T, HVS85T, HVS88T, XSG1	A/A-A, A/A, ALUA, A/P, A/P-F	Yes
libvxibmds6k	1.0	1.0	IBM	2107*,1750*	DS6000 (1750-511),DS6800, System Storage DS6000 series	A/P-C	No
libvxibmds8k	1.0	1.0	IBM	2107*	DS8000,DS8100,	A/A	Yes

					DS8300, System Storage DS8000 series		
libvxibmsvc	1.0	1.0	IBM	2145	SANVC(2145), StorwizeV7000	ALUA	Yes
libvxlsiall	2.0	1.0	DELL	MD3000,MD32xxi, MD32xx, MD36xxi, MD36xxf, MD36xx	MD3000,MD32xxi, MD32xx, MD36xxi, MD36xxf, MD36xx	A/P-F, ALUA	No
libvxlsiall	2.0	1.0	IBM	1742,1722-600, 1724-100*FAStT, 1815*FAStT, 1814*FAStT, 1818, 3526, 3552, 3542	DS4400 (FAStT700), DS4500 (FAStT900), DS4300 (FAStT600), DS4100 (FAStT100), DS4700,DS4800, TotalStorage DS4000 series,DS3200,DS3300, DS3400,DS3500,DS5100, DCS3700-, DCS3700PP, DCS3860-	A/P-F, ALUA	No
libvxlsiall	2.0	1.0	SUN	LCSM100_I, LCSM100_S, LCSM100_F, CSM100*, CSM200*, STK6580_6780	StorageTek (2510, 2530, 2540, 6130, 6140, 6180, 6580, 6780)	A/P-F, ALUA	No
libvxlsiall	2.0	1.0	STK	OPENstorage*, BladeCtrlr*, FLEXLINE*	FlexLine FLX280, FlexLine 200/300 series, FlexLine FLX380, StorageTek 6540	A/P-C, ALUA	No
libvxmsa2k	1.0	1.0	HP	MSA2012fc, MSA2212fc, MSA2012i	MSA2012fc, MSA2212fc, MSA2012i	A/A	No
libvxmsa2kfc_sa	3.0	2.0	HP	MSA2312fc, MSA2324fc, MSA2012sa, MSA2312sa, MSA2324sa, MSA2312i, MSA2324i, P2000 G3 FC, P2000G3 FC/iSCSI, P2000 G3 SAS, P2000 G3 iSCSI, MSA 2040 SAN, MSA 1040 SAN, MSA 1040 SAS, MSA 2040 SAS	MSA2312fc, MSA2324fc, MSA2012sa, MSA2312sa, MSA2324sa, MSA2312i, MSA2324i, HP_P2000G3_FC, P2000G3_FC iSCSI, P2000G3_SAS,P2000G3_iSCSI, MSA2040_SAN, MSA1040_SAN, MSA1040_SAS, MSA2040_SAS	ALUA	Yes
libvxnetapp	2.0	1.0	NETAPP	All	FAS2000/FAS900/FAS200 series, FAS250,FAS270, FAS270c, V3000 series	A/A, ALUA	Yes

					(3020,3040, 3070), FAS3000 series (3020,3020c,3040, 3050,3070), FAS6000 series (FAS6030,FAS6070), V6000 series (V6030,V6070) , FAS920c,FAS940c, FAS960c,FAS980c		
libvxnexsan	1.0	1.0	Nexsan	SATABoy2, SATABeast2, NXS-B01-000	NXSATABOY2, NXSATABEAST2, NXESERIES	ALUA	No
libvxnipnyis	2.0	1.0	NEC	iStorage 1000, iStorage 2000, iStorage 4000, DISK ARRAY	iStorage S1000 Series,iStorage S2000 Series,iStorage S4000, iStorage M Series.	A/A, ALUA	No
libvxpillaraxiom	1.0	1.0	Pillar	Axiom 300,Axiom 500,Axiom 600	PILLAR-AXIOM	ALUA	No
libvxpp	5.0 6.0(HPUX)	3.0	EMC	All	PP_EMCC, PP_EMCC_VPLEX, PP_EMCC_Invista, PP_EMCC_XtremIO	A/A	No
libvxpp	5.0 6.0(HPUX)	3.0	DGC	All	PP_EMCC_CLARiiON	A/A	No
libvxpurple	1.0	1.0	SUN	T300	T3	A/P, A/PF-T3PLUS	No
libvxramsan	3.0	1.0	TMS, IBM	RamSan 400*, RamSan, FlashSystem*	RamSan 400, RamSan-620, FlashSystem	A/A	No
libvxshark	1.0	1.0	IBM	2105	ESS 2105-800, ESS 750/800 series	A/A	No
libvxtsbf	1.0	1.0	TOSHIBA	AF_AF3500, AF_AF1500, AF2_AF7000, AF2_AF2000, AF3_AF1700, AF3_AF7500, AF3_AF2500, AF3_AF900	AF3500, AF1500, AF7000, AF2000, AF1700, AF7500, AF2500, AF900	A/A	No
libvxxiotechE5k	2.0	1.0	XIOTECH	ISE1400, ISE2400	X-IO_E5000, X-IO_ISE2400	A/A	No
libvxxiv	1.0	1.0	IBM	2810XIV	XIV	A/A	Yes
libvxxp1281024	1.0	1.0	HP	OPEN-*	XP128,XP1024	A/A	No
libvxxp12k	4.0	2.0	HP	OPEN-*	XP10000,XP12000, XP20000,XP24000, P9500, XP7	A/A	Yes
libvxxp256	1.0	1.0	HP	OPEN-*	XP48,XP256,XP512	A/A	No
libvxInvista	1.0	1.0	EMC	Invista	Invista,VPLEX	A/A	No
libvxpromise	1.0	1.0	Promise	VTrak E610f, VTrak	VTrak E610f, VTrak E310f,	A/A	No

				E310f, VTrak E610s, VTrak E310s	VTrak E610s, VTrak E310s		
libvxInfortrend	1.0	1.0	IFT, WINSYS, EVERTZ	DS B12F-R2840-4, DS B24F-R2840-4, DS B24F-R2850, DS S12F-R2840-4, DS S12F-R2850, DS S16F-R2840-4, DS S16F-R2850, DS S24F-R2840-4, DS S24F-R2850, DS S12E-R2250, DS S16E-R2240, DS S16E-R2250, DS B12E-R2140-4, DS B24E-R2142-6, DS S12E-R2140-4, DS S16E-R2142-6, DS S16E-R2152-6, DS B12S-R2240, DS B24S-R2240, DS S12S-R2240, DS S12S-R2240-4, DS S12S-R2250, DS S16S-R2240, DS S16S-R2240-4, DS S16S-R2250, DS B24F-R2842-6, DS S16F-R2842-6, DS S16F-R2852-6, DS S48F-R2842-6, DS B24S-R2242-4, DS S16S-R2242-4, DS S24S-R2250, VA F60-2830, VA F70-2830, VA E60-2130, VA E60-2230, VA S65-2240, SX2318R, SC10R12, SC20R24, SC30R16, SC40R48	EonStorDS, FlashDisk	ALUA	No
libvxlefthand	1.0	1.0	LEFTHAND	iSCSIDisk	HP_P4000	A/A	No
libvxviolin	2.0	1.0	VIOLIN	SAN ARRAY, SAN ARRAY ALUA	VMEM	A/A, ALUA	No
libvxKaminario	1.0	1.0	KMNRIO	K2	Kaminario_K2	A/A	Yes

libvxxtremio	2.0	2.0	XtremIO	XtremApp	XtremIO	A/A	No
libvxpurestorage	2.0	2.0	PURE	FlashArray	PureStorage	A/A	Yes
libvxfusionION	2.0	2.0	FUSIONIO	ION LUN	ioN_Acclr	ALUA	Yes
libvxinfinibox	1.0	1.0	NFINIDAT	InfiniBox	InfiniBox	A/A	Yes
libvxemcscaleIO	1.0	1.0	EMC	ScaleIO	EMCScaleIO	A/A	No
libvxnimble	1.0	1.0	Nimble	Server	NimbleStorage	ALUA	Yes

➤ The following tables lists all the platform specific ASL libraries in VRTSaslapm package

**AIX:**

Library	SF 6.1 Version	SF 6.2 Version	VID	PID	Arrays	Modes	Extended Attributes Support
libvxstorcomp	1.0	1.0	StorComp	OmniForce	STORCOMP	A/A	No
libvxibmds4k	1.0	1.0	IBM	1722,1724,3552,3542,1742-900,1742,3526,1815,1814	DS4300-, DS4100-, FASTT500-, FASTT200-, DS4500-, DS4400-, IBM_FASTT, DS4800-, DS4700-	A/A-FASTT	No
libvxf700	1.0	1.0	IBM	1742,3552,3542	FASTT700,FASTT500,FASTT200	A/A-FASTT	No
libvxfujitsu	1.0	1.0	FUJITSU	GR710,GR720,GR730,GR740,GR820,GR840	FJ_GR710,FJ_GR720,FJ_GR730,FJ_GR740,FJ_GR820,FJ_GR840	A/A,A/P	No
libvxeccs	1.0	1.0	ECCS	All	ECCS	A/A	No
libvxvpath	1.0	1.0	IBM	2105	VPATH_SHARK	A/A	No
libvxvscsi	1.0	1.0	AIX	VDASD	IBM_VSCSI	VSCSI	No
libvxIBM_SAS_SSD	N/A	1.0	IBM	V1-SG9XCS1B200	IBM_SAS_SSD	A/A	No

**Linux:**

Library	SF 6.1 Version	SF 6.2 Version	VID	PID	Arrays	Modes	Extended Attributes Support
libvxveritas	1.0	1.0	VERITAS	All	VERITAS	A/PF-VERITAS	No
libvxfusionio	4.0	3.0	FIO	ioDrive, ioDrive2, ioScale, ioScale2,	FioDrive, FioDrive2, FioScale, FioScale2,	A/A	No

				ioMemory, fioCARD	FioMemory_SX , FioMemory_PX , FioCARD		
libvxhpmsa	1.0	1.0	HP	MSA VOLUME	MSA1500	ALUA	No
libvxsun7x10	1.0	1.0	SUN	Sun Storage 7410, Sun Storage 7310, Sun Storage 7210, Sun Storage 7110, ZFS Storage 7120, ZFS Storage 7320, ZFS Storage 7420, ZFS Storage 7720, ZFS Storage 7130, ZFS Storage 7330, ZFS Storage 7430, ZFS Storage 7335	SUN_7410, SUN_7310, SUN_7210, SUN_7110, ZFS_7120, ZFS_7320, ZFS_7420, ZFS_7720, ZFS_7130, ZFS_7330, ZFS_7430, ZFS_7335	ALUA	No
libvxsunse3k	1.0	1.0	SUN	StorEdge 3310, StorEdge 3320, StorEdge 3510, StorEdge 3511	SUN3310, SUN3320, SUN3510, SUN3511	A/A	No
libvxvmdk	1.0	1.0	VMware	Virtual disk	vmdk	A/A	No
libvxnetaplsi	2.0	1.0	SYMANTEC	NBU_Appliance	NBU_Appliance	ALUA	No
libvxnetaplsi	2.0	1.0	NETAPP, LSI	INF	NETAPP-E	ALUA	No
libvxintel	2.0	1.0	INTEL(R)	*SSD*	Intel_SSD	A/A	No
libvxintelnvme	N/A	1.0	NVMe	INTEL SSD*	Intel_NVMe	A/A	No
libvxstec	1.0	1.0	STEC	*	STEC_SSD	A/A	No
libvxkove	1.0	1.0	Kove	XPD	Kove_XPD	A/A	No

**Solaris:**

Library	SF 6.1 Version	SF 6.2 Version	VID	PID	Arrays	Modes	Extended Attributes Support
libvxveritas	1.0	1.0	VERITAS	All	VERITAS	A/PF- VERITAS	No

libvxstorcomp	1.0	1.0	StorComp	OmniForce	STORCOMP	A/A	No
libvxfujitsu	1.0	1.0	FUJITSU	GR710,GR720, GR730,GR740, GR820,GR840	FJ_GR710, FJ_GR720, FJ_GR730, FJ_GR740, FJ_GR820, FJ_GR840	A/A, A/P	No
libvxeccs	1.0	1.0	ECCS	All	ECCS	A/A	No
libvxap	1.0	1.0	SUN	All	AP_NODES, AP_SENA, AP_T3, AP_SSA	A/A	No
libvxsena	1.0	1.0	SENA	All	SENA	A/A	No
libvxssa	1.0	1.0	SSA	SSA	SSA	A/A	No
libvxsun7x10	1.0	1.0	SUN	Sun Storage 7410, Sun Storage 7310, Sun Storage 7210, Sun Storage 7110, ZFS Storage 7120, ZFS Storage 7320, ZFS Storage 7420, ZFS Storage 7720, ZFS Storage 7130, ZFS Storage 7330, ZFS Storage 7430, ZFS Storage 7335	SUN_7410, SUN_7310, SUN_7210, SUN_7110, ZFS_7120, ZFS_7320, ZFS_7420, ZFS_7720, ZFS_7130, ZFS_7330, ZFS_7430, ZFS_7335	ALUA	No
libvxsunse3k	1.0	1.0	SUN	StorEdge 3310, StorEdge 3320, StorEdge 3510, StorEdge 3511	SUN3310,SUN33 20, SUN3510,SUN35 11	A/A	No
libvxsunset4	1.0	1.0	SUN	T4	6120-6320	A/P, A/PF- T3PLUS	No
libvxrdac	1.0	1.0	VERITAS	RDACNODES	RDAC	A/A	No
libvxvpath	1.0	1.0	IBM	2105	VPATH_SHARK	A/A	No
libvxfusionio	1.0	1.0	FIO	ioDrive	FusionIo	A/A	No
libvxOracle_SSD	N/A	1.0	ATA	3E128, 2E256	SunF40, SunF80	A/A	No

- The following table lists all the APM modules in VRTSaslapm package

APM NAME	Supported Array Types	Depending Array Types	Corresponding ASL
dmpCLARiiON	CLR-A/P, CLR-A/PF, CLR-ALUA	A/P, ALUA	libvxCLARiiON
dmpEngenio	A/PF-LSI	A/P	libvxlsiall
dmpsvc	IBMSVC-ALUA	ALUA	libvxibmsvc
dmpHuawei	A/A-A-HUAWEI, A/PF-HUAWEI	A/A-A, A/P	libvxhuawei
dmpsun7x10alua <sup>1</sup>	SUN7x10-ALUA	ALUA	libvxsun7x10
dmpInv	Inv-A/A, VPLEX-A/A	A/A	libvxInvista
dmpnlsi <sup>2</sup>	NLSI-ALUA	ALUA	libvxnetaplsi
dmpkove <sup>3</sup>	Kove_XPD-A/A	A/A	libvxkove

<sup>1</sup> The dmpsun7x10alua APM is currently available only for Solaris and Linux.

<sup>2</sup> The dmpnlsi APM is currently available only for Linux.

<sup>3</sup> The dmpkove APM is currently available only for Linux.

## Extended Device Attributes

Extended attributes are the attributes or flags corresponding to a VxVM LUN/Disk which are discovered by DDL (Device Discovery Layer). Each LUN can have one or more of these attributes, which are identified during device discovery by the appropriate ASLs.

One category of attributes that are discovered is the Thin Provisioning (TP) support. There are two levels of TP support:

1. Thin-Reclamation: LUN is identified as a “Thin-reclaimable” LUN, supporting space reclamation.
2. Thin-Discovery: LUN is identified as a “Thin” LUN and it does not support reclamation.

**Note:** Starting with SF 5.1SP1 the *extended attributes, which includes Thin Provisioning, are not supported with Multipathing Third Party Drivers (TPD) such as MPxIO and MPIO. Therefore, Thin provisioning is not supported with these multipathing drivers.*

### ➤ Minimum Microcode Requirements for Thin Provisioning (TP)

The arrays that support TP require a certain level of microcode. The following table outlines the arrays that support TP (Thin-Discovery and/or Thin-Reclamation) with the minimum microcode level required to support them.

Library	Storage Array Model	Min Microcode Thin-Discovery	Min Microcode Thin-RCLM
libvx3par	3PARData	2.2.x	2.3.1
libvxCLARiiON	EMC CLARiiON CX4	FLARE 28.5	FLARE 30
libvxemc	EMC DMX	5773	N/A
	EMC VMAX	5874	5875.135.91 <sup>6</sup>
libvxFJTSYe8k	FUJITSU ETERNUS4000 (Except Models 80/100), ETERNUS8000	V20L40	V20L40
	FUJITSU ETERNUS DX400 S2 Series	V10L10	V10L10
libvxhdsalua	Hitachi AMS(DF800)	0880/A-M	0880/A-M
libvxhdsusp	Hitachi TagmaStore USP-V(R600)	60.06.00.00/00	60.06.05-00
	Hitachi TagmaStore USP-VM(R601)	60.06.00.00/00	60.06.05-00
	Hitachi VSP(R700)	70-02-02-00/00	70-02-02-00/00
	Hitachi HUS VM (HM70)	73-01-01	73-01-01
	Hitachi VSP G1000	80-01-24-00/00	80-01-24-00/00
	Hitachi VSP Gx00	83-01-03	83-01-03
libvxxp12k	HP XP20000	60.06.05-00/00	60.06.05-00/00
	HP XP24000	60.06.05-00/00	60.06.05-00/00
	HP P9500	70-02-06-00/00	70-02-06-00/00
	HP XP7	80-01-24-00/00	80-01-24-00/00
libvxxiv	IBM XIV	10.2.2	10.2.2
libvxnetapp	NetApp	AIX: 7.3.3 Linux: 7.3.1.1 Solaris: 7.3.1.1	AIX: 7.3.3 Linux: 7.3.2 Solaris: 7.3.2
libvxcompellent	Compellent	4.0	5.2
libvxibmsvc <sup>1</sup>	IBM SVC/Storwize V7000	6.2	6.2
libvxfjtsye2k	FUJITSU ETERNUS DX80 S2, DX90 S2	V10L10	V10L10

libvxhuawei	S2600T,S5500T, S5600T,S5800T, S6800T, S3900-M100, S3900-M200, S3900-M300, S5900-M100, S5900-M200, S6900-M100	V100R002C00SPC001B014	V200R002C10B018
libvxibmds8k	DS8000	4.3 <sup>2</sup> 6.2 <sup>3</sup> 6.3 <sup>4</sup>	7.1 <sup>5</sup>
libvxpurstorage	PureStorage	N/A	3.1.4
libvxhpalua	EVA4400, EVA6400, EVA8400, EVA P6300, EVA P6350, EVA P6500, EVA P6550	XCS 11200000	XCS 11200000
libvxmsa2kfc_sa	MSA 1040 SAN, MSA 2040 SAN, MSA 1040 SAS, MSA 2040 SAS	N/A	GL200R007
libvxnimble	NimbleStorage	N/A	2.3.x

1. Thin reclamation to occur on the array some manual steps are required. Please reference the following documentation for details: <http://public.dhe.ibm.com/partnerworld/pub/whitepaper/1a736.pdf>
2. Thin Provisioning without Peer-to-peer remote copy(PPRC) or Flash Copy(FLC) support
3. Thin Provisioning with FLC
4. Thin Provisioning with PPRC and FLC support
5. Thin Reclamation without PPRC or FLC support
6. Reporting of physically allocated space requires FW level of 5876.159.102 or higher

➤ **Thin Reclamation Attributes**

The following table outlines the thin reclamation attributes discovered and/or hard coded by each ASL using a combination of vendor specific VPD pages, Block limits VPD pages and Log Sense Page. Any specific value mentioned in the table is hard coded in the ASL.

Array Name (ASL Library)	Allocation Unit	Datapool Space	Physically Allocated	Maximum Reclaim	LUN Shift Offset
3PARdata Inserv (libvx3par)	Yes	Yes	Yes	2MB	0

EMC CLARiiON (libvxCLARiiON)	8K	N/A	No	256MB	0
EMC Symmetrix/DMX/ VMAX (libvxemc)	Yes	N/A	Yes	Yes	Yes
FUJITSU ETERNUS4000(Except Models 80/100), ETERNUS8000 (libvxFJTSYe8k)	Yes	N/A	Yes	Yes	0
Hitachi AMS/WMS Series (libvxhdsalua)	Yes	N/A	Yes	Yes	Yes
Hitachi TagmaStore, USP,VSP (libvxhdsusp)	Yes	N/A	Yes	Yes	Yes
HP XP, P9500 (libvxxp12k)	Yes	N/A	Yes	Yes	Yes
IBM DS8000 (libvxibmds8k)	Yes	N/A	Yes	128GB	Yes
IBM 2810XIV (libvxxiv)	Yes	N/A	Yes	Yes	0
NetApp (libvxnetapp)	4K	N/A	No	8MB	0
Compellent (libvxcompellent)	Yes	N/A	Yes	Yes	Yes
FUJITSU ETERNUS DX80 S2, DX90 S2 (libvxfjtsye2k)	Yes	N/A	Yes	Yes	0
IBM SANVC, Storwize V7000 (libvxibmsvc)	Yes	N/A	Yes	Yes	0
HUAWEI (libvxhuawei)	Yes	N/A	Yes	Yes	0
PureStorage (libvxpurestorage)	Yes	N/A	No	Yes	Yes
HP (libvxhpalua)	Yes	N/A	Yes	Yes	Yes
HP (libvxmsa2kfc_sa)	4MB	N/A	Yes(SF 6.2)	Yes	Yes
Nimble (libvxnimble)	Yes	N/A	Yes(SF 6.2)	Yes	Yes

➤ **List of Extended Attributes**

The following table outlines the categories of extended attributes for different arrays.



(libvxcompellent)								
FUJITSU ETERNUS DX80 S2, DX90 S2 (libvxfjtsye2k)	Yes	lun	-	-	-	-	-	tp, tprclm
IBM SANVC, Storwize V7000 (libvxibmsvc)	Yes	lun	-	-	-	-	-	tprclm
HUAWEI (libvxhuawei)	No	lun	-	snapshot	-	-	-	tp, tprclm
Kaminario K2 (libvxKaminrio)	Yes	lun	RAID_10	-	ssd	-	-	-
Violin (libvxviolin)	Yes	-	-	-	-	-	-	-
FusionIO (libvxfusionION)	Yes	-	-	-	ssd	-	-	-
HP (libvxhpalua)	Yes	lun	-	-	-	-	-	tp, tprclm
Infinidat (libvxinfinibox)	Yes	lun	-	-	-	-	-	tprclm
HP (libvxmsa2kfc_sa)	No	lun	-	-	-	-	-	tprclm
Nimble (libvxnimble)	No	lun	-	-	-	-	-	tprclm

1: Limitation – when the LUN carved out of SSD devices is a thin LUN or meta LUN then it cannot be discovered as a ssd. Also, ssd attribute is discovered only for CX4.

2: The extended attributes, in addition to the Thin attributes, requires the Microcode level specified in the “**Minimum Microcode Requirements for Thin Provisioning(TP)**” section.

## ➤ Description of Extended Attributes

Following section describes each of the attributes discovered by the corresponding ASL.

### 1. 3PARdata Inserv Series (libvx3par)

lun	This is the standard device and is not involved in any special operation
tp	Thin device
tprclm	Thin Reclaimable device

### 2. EMC CLARiiON CX3 and CX4 Series (libvxCLARiiON)

DISK	Individual disk
lun	This is the standard device and is not involved in any special operation
RAID_0	RAID level 0
RAID_1	RAID level 1
RAID_3	RAID level 3

RAID_5	RAID level 5
RAID_10	RAID level 1+0
ssd	Solid State Disk. Note: when the LUN carved out of SSD devices is a thin LUN or meta LUN then it cannot be discovered as a ssd
thinlun	Thin device
tprclm	Thin Reclaimable device
RAID 6	RAID level 6; this is also known as VRAID

### 3. EMC Symmetrix/DMX/VMAX (libvxemc)

bcv	Mirror device created by Timefinder operation
nr	Not ready state device
mirror	This is EMC Mirror device
RAID	This is EMC RAID device
RAID+Mirr	This is EMC RAID+Mirror device
snap	This is a snapshot device(such as a BCV device)
srdf-r1	Primary/source device involved in SRDF operation
srdf-r2	Secondary/Target device involved in SRDF operation
std	This is the standard device and is not involved in an special operation
tdev	Thin device
tprclm	Thin Reclaimable device
VRAID	This is EMC V-RAID device
WD	This is EMC Write-Disabled device

### 4. FUJITSU ETERNUS4000(Except Models 80/100), ETERNUS8000 (libvxJTJSYe8k)

lun	This is the standard device and is not involved in any special operation
tp	Thin device
tprclm	Thin Reclaimable device
RAID_1	RAID level 1
RAID_5	RAID level 5
RAID_6	RAID level 6

### 5. Hitachi AMS 2000 Series (libvxhdsalua)

bd	BD Drive
fc	FC Drive
hdp	Thin device (Hitachi Dynamic provisioning volume)
hdprclm	Thin Reclaimable device (Hitachi Dynamic provisioning volume)
nl_fc	Node Port supporting FC arbitrated loop
pvol	Shadow image primary/original device
RAID_1	RAID level 1
RAID_5	RAID level 5

RAID_6	RAID level 6
sata	Serial Advanced Technology Attachment(SATA) Drive
ssd	Solid State Disk
lun	This is the standard device and is not involved in any special operation
svol	Shadow image secondary/clone device
tc-pvol	Truecopy primary/original device. Hitachi Universal Replication (HUR) device
tc-svol	Truecopy secondary/clone device. Hitachi Universal Replication (HUR) device
vvol	Copy-on-write SnapShot

6. Hitachi HDS [5700/5800/9200] (libvxhitachi)

pvol	Shadow image primary/original device
lun	This is the standard HDS device and is not involved in any special operation
svol	Shadow image secondary/clone device
tc-pvol	Truecopy primary/original device
tc-svol	Truecopy secondary/clone device

7. Hitachi HDS[9910/9960] (libvxhds)

pvol	Shadow image primary/original device
lun	This is the standard HDS device and is not involved in any special operation
svol	Shadow image secondary/clone device
tc-pvol	Truecopy primary/original device
tc-svol	Truecopy secondary/clone device

8. Hitachi HDS[9970/9980] (libvxhds9980)

pvol	Shadow image primary/original device
lun	This is the standard HDS device and is not involved in any special operation
svol	Shadow image secondary/clone device

9. Hitachi TagmaStore-USP Series[USPV/USPVM/VSP/SUN StorEdge 9990](libvxhdsusp)

bd	BD Drive
fc	FC Drive
hdp	Thin device (Hitachi Dynamic provisioning volume)
hdprclm	Thin Reclaimable device (Hitachi Dynamic provisioning volume)
nl_fc	Node Port supporting FC arbitrated loop
pvol	Shadow image primary/original device
RAID_1	RAID level 1

RAID_5	RAID level 5
RAID_6	RAID level 6
sata	Serial Advanced Technology Attachment(SATA) Drive
ssd	Solid State Disk
lun	This is the standard device and is not involved in any special operation
svol	Shadow image secondary/clone device
tc-pvol	Truecopy primary/original device. Hitachi Universal Replication (HUR) device
tc-svol	Truecopy secondary/clone device. Hitachi Universal Replication (HUR) device

**10. HP XP 10k/12k/20k/24k/P9500 (libvxp12k)**

bd	BD Drive
fc	FC Drive
nl_fc	Node Port supporting FC arbitrated loop
pvol	Shadow image primary/original device
RAID_1	RAID level 1
RAID_5	RAID level 5
RAID_6	RAID level 6
sata	Serial Advanced Technology Attachment(SATA) Drive
ssd	Solid State Disk
lun	This is the standard device and is not involved in any special operation
svol	Shadow image secondary/clone device
tc-pvol	Truecopy primary/original device.
tc-svol	Truecopy secondary/clone device.
tp	Thin device
tprcm	Thin Reclaimable device

**11. IBM DS8000 (libvxbm8k)**

flashcopy	Disk is involved in Point in time copy operation and it is the target
lun	This is the standard device and is not involved in any special operation
tp	Thin device
tprcm	Thin Reclaimable device

**12. IBM 2810XIV (libvxxiv)**

fully_allocated	Fully allocated thin LUN
optimized_snapshot	Space optimized snapshot

pvol	Replicated source, primary volume
sata	Serial Advanced Technology Attachment(SATA) Drive
snapshot	Full snapshot LUN
lun	This is the standard device and is not involved in any special operation
svol	Replicated destination, secondary volume
tprclm	Thin Reclaimable device

### 13. NetApp (libvxnetapp)

tp	Thin device
tprclm	Thin Reclaimable device
Status: OFFLINE NVFAIL NODEV NOSPC ROFS UNKNOWN_ERR	OFFLINE: Volume is offline NVFAIL: NVRAM has failed NODEV: No such device NOSPC: No space available ROFS: Read only file-system UNKNOWN_ERR: unknown condition
DEV_NAME	Path of virtual disk, starts from root of volume.  (This is shown with 'vxdisk -p list' output)
SNAPSHOT_NAME	Name of snapshotted file backing virtual disk (This is shown with 'vxdisk -p list' output)

### 14. Compellent (libvxcompellent)

tp	Thin device
tprclm	Thin Reclaimable device

### 15. FUJITSU ETERNUS DX80 S2, DX90 S2 (libvxfjtsye2k)

lun	This is the standard device and is not involved in any special operation
tp	Thin device
tprclm	Thin Reclaimable device

### 16. IBM SANVC/Storwize V7000 (libvxibmsvc)

lun	This is the standard device and is not involved in any special operation
tprclm	Thin Reclaimable device

### 17. HUAWEI (libvxhuawei)

lun	This is the standard device and is not involved in any special operation
tp	Thin device
tpclm	Thin Reclaimable device
snapshot	This is a full snapshot device

**18. Kaminario (libvxKaminario)**

lun	This is the standard device and is not involved in any special operation
RAID_10	RAID level 10
ssd	Solid State Disk

**19. PureStorage (libvxpurestorage)**

tpclm	Thin Reclaimable device
lun	This is the standard device and is not involved in any special operation
ssd	Solid State Disk

**20. FusionIO (libvxfusionION)**

ssd	Solid State Disk
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**21. HP (libvxhpalua)**

lun	This is the standard device and is not involved in any special operation
tp	Thin device
tpclm	Thin Reclaimable device

**22. Infinidat (libvxinfinibox)**

lun	This is the standard device and is not involved in any special operation
tpclm	Thin Reclaimable device

**23. HP (libvxmsa2kfc\_sa)**

lun	This is the standard device and is not involved in any special operation
tpclm	Thin Reclaimable device

**24. Nimble (libvxnimble)**

lun	This is the standard device and is not involved in any special operation
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tprclm	Thin Reclaimable device
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