

VERITASTM

Veritas Enabled Arrays - Array Support Libraries and Array Policy Modules to support storage arrays on Veritas Volume Manager™ 6.0 and 6.0.x (6.0.1, 6.0.2, 6.0.3, 6.0.4, 6.0.5)

This TechFile provides information about the Array Support Libraries and Array Policy Modules to support arrays listed in the HCL for Veritas Volume Manager™ 6.0 and 6.0.x

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 6.0 or 6.0.1; please refer to the 6.0, 6.0.x HCL (http://www.veritas.com/support/en_US/article.TECH170013) for supportability.*

For more information about the arrays in the HCL, including specific settings, see High Availability Solutions Hardware TechNote :

http://www.veritas.com/support/en_US/article.TECH47728

Package Name	: VRTSaslapm
Package Description	: Array Support Libraries and Array Policy Modules for Veritas Volume Manager
6.0 Package Version	: 6.0.000.400
6.0.1 Package Version	: 6.0.500.600 (AIX/Linux/HPUX/Solaris)
Veritas Volume Manager Version	: 6.0, 6.0.1, 6.0.2, 6.0.3, 6.0.4, 6.0.5
Supported Operating Systems	: AIX (5.3, 6.1, 7.1) Linux (SLES 10, SLES 11, RHEL 5, RHEL 6) Solaris (10, 10(x86_64), 11, 11(x86_64)) HPUX 11iV3
Supported Arrays and Modes	: Please refer to the 6.0, 6.0.x HCL http://www.veritas.com/support/en_US/article.TECH170013

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 6.0, 6.0.x can be downloaded from: <https://sort.veritas.com/asl>

The direct links to the latest packages for **6.0** are:

AIX: <https://sort.veritas.com/asl/details/604>
Linux: <https://sort.veritas.com/asl/details/605>
Solaris: <https://sort.veritas.com/asl/details/606>
HPUX: <https://sort.veritas.com/asl/details/607>

The direct links to the latest packages for **6.0.x** are:

AIX: <https://sort.veritas.com/asl/details/764>
Linux: <https://sort.veritas.com/asl/details/765>
Solaris: <https://sort.veritas.com/asl/details/766>
HPUX: <https://sort.veritas.com/asl/details/767>

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.veritas.com/support/en_US/article.HOWTO101477

6.0.x:

The following table outlines the changes/additions in this latest VRTSaslapm package for 6.0.x as compared to the previous release.

Changes made to version 6.0.500.700(AIX/HPUX/Linux/Solaris) (March 31 2016)			
Incident #	OS	ASL/APM	Description
3871180	Linux	dmpnalsi	Fixed an issue with Unit attention not being handled correctly leading to paths being disabled
3870819	Linux, Solaris	libvxsun7x10	Modified the ASL to claim COMSTAR devices
3859498	AIX, HPUX,	libvxnetapp	Added logic to detect TP support using SCSI page 0xB2, if page

	Linux, Solaris		0xB2 not supported then use FW version as before
3868338	Linux	libvxfusionio, libvxxvirtio, libvxxkove	Fix a vxconfigd crash issue due to driver names (in /proc/devices) being longer than 32 characters
3869728	AIX, HPUX, Linux, Solaris	libvxxviolin	Modified the ASL to claim V7000 (Concerto Array) devices

**Changes made to version 6.0.500.600(AIX/HPUX/Linux/Solaris)
(October 31 2015)**

Incident #	OS	ASL/APM	Description
3833474	Linux	libvxfusionio	Trim support detected correctly for PX/SX cards
3837234	AIX, HPUX, Linux, Solaris	libvxlslall, libvxlslalua (HPUX)	DS5100 array incorrectly identified as DS3950
3837208	Linux, Solaris	libvxsun7x10	Added new PIDs ZFS Storage 7350, 7355, 7470

**Changes made to version 6.0.500.500(AIX/HPUX/Linux/Solaris)
(May 29 2015)**

Incident #	OS	ASL/APM	Description
3736984	AIX, HPUX, Linux, Solaris	libvxpurestorage	Set media_type to "ssd" as this is an all flash array
3783016	Linux	libvxfusionio	Modified FusionIO ASL to support gen3 cards (SX/PX)
3783059	Linux	VRTSaslapm Packaging	Update the boot partition during package upgrade installation
3771411	Linux, Solaris	dmpsun7x10alua	Modified the APM to not require registering PGR keys during failover time
3719025	AIX, HPUX, Linux, Solaris	libvxFJTSYe8k	Add claim support for Fujitsu ETERNUS DX8700 S3/ETERNUS DX8900 S3 (ETERNUS_DXH)
3710396	AIX, HPUX, Linux, Solaris	libvxhdsusp	Added claim support for Hitachi HM800 series arrays
3785474	AIX, HPUX, Linux, Solaris	libvxnimble	Created an ASL to claim Nimble storage array

**Changes made to version 6.0.500.400(AIX/HPUX/Linux/Solaris)
(January 30 2015)**

Incident #	OS	ASL/APM	Description
3460563	Linux	libvxfusionio	Changed FusionIO ASL to claim ioScale/ioScale2 devices
3702415	AIX, HPUX, Linux, Solaris	dmpsvc	Changed IBM SVC APM to detect offline devices
3688307	AIX, HPUX, Linux, Solaris	libvXxtremio, libvxxpp	Changed EMC XtremIO ASL and PowerPath ASL to detect SACD(Storage Array Controller Device) and skip them
3653093	AIX, HPUX, Linux, Solaris	libvxhuawei	Changed Huawei ASL to correctly determine if a disk is a command device
3676724	AIX, HPUX, Linux, Solaris	libvxmsa2kfc_sa	Changed HP MSA ASL to add 1040 SAS and 2040 SAS support. Also added Thin provisioning capabilities

3701629	AIX, HPUX, Linux, Solaris	libvxpp	Changed EMC PowerPath ASL to extract the FW version from correct location
3701275	AIX, HPUX, Linux, Solaris	libvxemcscaleIO	Added new ASL for EMC ScaleIO devices
3689704	Linux	libvxnetapplsi	Changed Netapp E-Series ASL to extract LUN name and set it as an extended attribute
3695723	AIX, HPUX, Linux, Solaris	libvxnetapp	Changed Netapp ASL to remove "Status OK" from extended attribute
3572712	AIX, HPUX, 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 6.0.500.200(AIX/HPUX/Linux/Solaris) (September 29 2014)			
Incident #	OS	ASL/APM	Description
3580425	AIX, HPUX, Linux, Solaris	libvxemc	EMC VMAX V3 not showing the port number correctly, print number in decimal
3559822	AIX, HPUX, Linux Solaris	libvxpp	EMC Xtremio PP ASL: not recognizing PP devices correctly
3545765	AIX, HPUX, Linux, Solaris	libvxmsa2kfc_sa	add HP MSA 1040 SAN PID to the ASL
3545756	AIX, HPUX, Linux, Solaris	libvxxp12k	Add HP XP7 array detection code
3511901	AIX, HPUX, Linux, Solaris	libvxxp12k	Added Thin Provisioning capability to HP xp20k disks
3502785	Linux	libvxfusionio	Fusionio linux vxconfigd core dump due to fio-status not able to find library at early boot
3460563	Linux	libvxfusionio	Modify the discovery logic for iodrive/iodrive2 devices
3579253	AIX, HPUX, Linux, Solaris	libvxhuawei	Modify ASL to claim model XSG1
3601417	Linux	dmpCLARiiON	kernel-to-kernel SG_IO interface is broken in newer RHEL7 and SLES11SP3 kernels changing to use SCSI bypass interface
3601485	AIX, HPUX, Linux, Solaris	libvxinfinibox	Create a new ASL to claim Infinibox devices
3604536	AIX, HPUX, Linux, Solaris	libvxhuawei	If TP information is not available then mark the disks as thick
3542714	AIX, HPUX, Linux, Solaris	libvxhdsusp	Modify cabinet SN to match value listed on array console

Changes made to version 6.0.500.100(AIX/HPUX/Linux/Solaris) (May 9 2014)			
Incident #	OS	ASL/APM	Description
3408321	AIX, HPUX, Linux, Solaris	libvxemc	Thin Reclamation fails with EMC 5875 FW due to Max reclaim size not set correctly
3418753	AIX	libvxpp	After migration to power path NR state device disappear if vxconfigd is restarted

3415595	AIX, HPUX, Linux, Solaris	libvxhuawei	Identify Command Devices and skip them, also correct Snapshot detection logic
3416614	AIX, HPUX, Linux, Solaris	libvxpp	Added XtremIO array detection in the PowerPath ASL
3466096	AIX, HPUX, Linux, Solaris	libvxnipnyis	ASL not setting cur-owner property causing secondary path to become Active for short period of time
3466252	AIX, HPUX, Linux, Solaris	libvxlsiall, libvxnetaplsi (Linux)	Modified the ASLs to identify NETAPP branded devices
3296164	AIX, HPUX, Linux, Solaris	Libvxnetaplsi (Linux), libvxnetapp	Created an ASL for LSI NetApp Arrays(E series)
3454093	AIX, HPUX, Linux, Solaris	libvxhdsusp	Added code to detect Hitachi VSP G1000 model to the ASL
3449508	AIX, HPUX, Linux, Solaris	libvxramsan	Enabled ASL to claim IBM FlashSystem 840 model
3357240	AIX, HPUX, 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)
3472649	HPUX	libvxpp	CLARiiON devices getting claimed by PP ASL when it should get claimed by CLARiiON ASL
3427500	AIX, HPUX, Linux, Solaris	libvxpp	Modified the PP ASL to correctly identify PP controlled VNX and VPLEX devices
3462462	AIX, HPUX, Linux, Solaris	libvxibm8k	Removed a debug message about write same from ibm8k ASL

**Changes made to version 6.0.1.300(AIX,HPUX,Solaris), 6.0.400.100(Linux)
(December 20 2013)**

Incident #	OS	ASL/APM	Description
3084877	Solaris	libvxfusionio	Update the Fusion I/O ASL on Solaris x64 to work with all driver versions
3359217	AIX, HPUX, Linux, Solaris	libvxemc	Enabled the ASL to correctly transition devices from NR to RW state
3350848	AIX, Linux, HPUX, Solaris	libvxCLARiiON	Correctly display the ARRAY-PORT-ID of CLARiiON array
3273598	AIX, Linux, HPUX, Solaris	libvxxiv	Display the IBM XIV array FW version correctly on arrays with newer FW
3244882	AIX, Linux, HPUX, Solaris	libvxviolin	Add ALUA support to Violin ASL
3146174	AIX, Linux, HPUX, Solaris	libvxfusionION	Add an ASL to claim fusion ION devices
3356249	AIX, Linux, HPUX, Solaris	libvxpp	The powerpath ASL changed to handle new

			version(5.7.1), which has new powermt output
3315427	AIX, Linux, HPUX, Solaris	libvx3par	Fix 3par ASL to extract Array Volume ID(AVID) from 16 byte LUN Serial Number
3356256	AIX, Linux, HPUX, Solaris	libvxemc	Set 'snap' attribute correctly for EMC Symmetrix devices
3200367	AIX, Linux, HPUX, Solaris	libvxmsa2kfc_sa	Enable the MSA ASL to claim HP MSA 2040 devices
3256369	AIX, Linux, HPUX, Solaris	libvxcompellent	Correctly detect the suport of SCSI page 0xb0 to determin TP support
3356266	AIX, Linux, HPUX, Solaris	libvxdothill	Add ALUA support and AssuredSAN 4000 Series Array claim support to ASL
3021826	AIX, Linux, HPUX, Solaris	libvxemc	Enable detction of physically allocated space via Log Sense for HPUX
3287890	AIX, Linux, HPUX, Solaris	libvxJTSYe8k	Added new PID of ETERNUS_DXM to Fujitsu ASL
3078585	AIX, Linux, HPUX, Solaris	libvxibmds8k	Enable detction of physically allocated space via Log Sense for HPUX
3264016	AIX, Linux, HPUX, Solaris	libvxramsan	Modified the ASL to claim IBM FlashSystem devices
3230150	AIX, Linux, HPUX, Solaris	libvxxiotechE5k	Added support for ISE2400 model
3387346	HPUX	libvxautoraid	Removed the obsoleted ASL libvxautoraid

Changes made to version 6.0.1.200 (June 28 2013)

Incident #	OS	ASL/APM	Description
3021826	AIX, Linux, Solaris	libvxemc	Discover TP allocated space via SCSI log sense page
3095890	AIX, HPUX, Linux, Solaris	libvxviolin	Set MEDIA_TYPE correctly to 'ssd' instead of 'hdd' in output of command 'vxdisk -p list'
3195044	Linux, Solaris	dmpsun7x10alua	Increased the failover time to prevent Sun7x10 iSCSI disks getting marked as failed
3185891	AIX, HPUX, Linux, Solaris	libvxhdsusp	Fixed memory leak in routine get_dynamic_attr()
3185919	AIX, HPUX, Linux, Solaris	libvxpp, libvxibmds8k, libvxemc, libvxCLARiiON, libvxInvista, libvxvscsi, libvxxp12k	Fixed memory leaks
3187698	AIX, HPUX, Linux, Solaris	libvxnetapp	Modified the hard coded TP maximum reclaim size from 256MB to 8MB
3189041	AIX, HPUX, Linux, Solaris	libvxemc	Set Not Ready (nr) extended attribute for all devices and not just for BCV devices, added 'Mirror' attribute
3000424	AIX, HPUX,	libvxlsiall	Added support for IBM DS3500 and DCS3700 arrays in

	Linux, Solaris		ALUA mode
3078585	AIX, Linux, Solaris	libvxibmds8k	Added support to extract the TP physically allocated space from SCSI Log Sense page
3021845	AIX, HPUX, Linux, Solaris	libvxhuawei	Added support for Huawei HVS Array
3027570	AIX, HPUX, Linux, Solaris	libvxhdsusp	Modified the ASL to detect the new Non-Disruptive Migration (NDM) function
3041517	AIX, HPUX, Linux, Solaris	libvxXtremio	Added new ASL to support EMC XtremIO array
3034274	Linux, Solaris	libvxsun7x10	Added support for Sun ZFS 7130,7330,7335,7430
3200380	AIX, HPUX, Linux, Solaris	libvxpurestorage	Added new ASL to support PureStorage array
3027572	AIX, HPUX, Linux, Solaris	libvxnetapp	Added extended attributes for Device Name, Snapshot Type, and LUN status
3097607	AIX, HPUX, Linux, Solaris	libvxvmdk	Modified VMDK ASL to return unclaimed, to allow DDL to claim as JBOD, instead of error if LUN is not setup properly
3194982	AIX, HPUX, Linux, Solaris	libvxfjtsye2k, libvxFJTSYe8k	Modified Fujitsu ETERNUS DX400 series/DX8000 series/DX60/DX80/DX90 to add ALUA Support
3073879	Solaris	Packaging change	Modified VRTSaslapm packaging for Solaris 11 to install the package correctly

Changes made to version 6.0.100.100 (January 31 2013)

Incident #	OS	ASL/APM	Description
2877158	AIX, HPUX, Linux, Solaris	libvxhdsusp	Added Hitachi HM700(HUS_VM) support
2865521	AIX, HPUX, Linux, Solaris	libvxCLARiiON	Add TP support for CLARiiON(VNX) HPUX initiator type
2876865	AIX, HPUX, Linux, Solaris	libvxemc	Extended attributes for SRDF luns reported as Mirror
2975735	AIX, HPUX, Linux, Solaris	libvxemc	NR_DEVICE and HARDWARE_MIRROR properties are not getting populated in property list
2933928	AIX, HPUX, Linux, Solaris	libvxemc	Enhance DMP extended attribute content for SRDF device to report the 'WD'(Write Disable) state
2885331	AIX, HPUX, Linux, Solaris	libvxemc	Thin Reclaim failing on FW 5876 for EMC Symmetrix
3021826	Linux	libvxemc	Discover TP physically allocated space via log sense page(0x0c)
2876984	AIX, HPUX, Linux, Solaris	libvxInvista	Support EMC VPLEX in clustered environment
2876992	AIX, HPUX, Linux, Solaris	libvxpp	Add VPLEX support to the PowerPath ASL
2892641	AIX, HPUX, Linux, Solaris	libvxKaminario	Add an ASL to support Kaminario array
2885375	AIX, HPUX,	libvxinfotrend	Add an ASL to support Infotrend/Evertz/winchester

	Linux, Solaris		arrays(removed the old libvxwinsys ASL)
2877190	AIX, HPUX, Linux, Solaris	libvxhuawei	Added Huawei Dorado 5100 array support and A/P mode support
2941728	AIX, HPUX, Linux, Solaris	libvxhuawei	Added support for Arrays Dorado2100 G2 & S2000T
2933921	AIX, HPUX, Linux, Solaris	dmphuawei	Skip re-registering the PGR keys on Secondary paths during failover
2892571	Solaris (x86_64)	libvxfusionio	Added Fusion IO support on Solaris x86
2969637	AIX, HPUX, Linux, Solaris	libvxviolin	Shortened array name from VIOLIN to VMEM and added AVID support
2991783	AIX, HPUX, Linux, Solaris	libvxibmds8k	Add Thin Provisioning/Reclamation support to DS8k ASL
2998931	AIX, Linux, Solaris	libvxlsiall	Added back the support for "INF" for LSI and ENGENIO VIDs
3034163	Linux	libvxvmdk	Added an ASL for LUNs backed by VMDK files on Linux VMWare guests
2915524	AIX, HPUX, Linux, Solaris	libvxtsbaf	Add support for two new array models: AF1700 & AF900. Also, added AVID support

6.0:

The following table outlines the changes/additions in this latest VRTSaslapm package for 6.0 as compared to the previous release.

Changes made to version 6.0.0.400 (January 31 2013)			
Incident #	OS	ASL/APM	Description
2933919	AIX, HPUX, Linux, Solaris	dmphuawei	Skip re-registering the PGR keys on Secondary paths during failover
2933930	AIX, HPUX, Linux, Solaris	libvxemc	Enhance DMP extended attribute content for SRDF device to report the 'WD'(Write Disable) state
3008917	AIX, HPUX, Linux, Solaris	libvxemc	NR_DEVICE and HARDWARE_MIRROR properties are not getting populated in property list
2926815	AIX, HPUX, Linux, Solaris	libvxviolin	Shortened array name from VIOLIN to VMEM and added AVID support
2991784	AIX, HPUX, Linux, Solaris	libvxibmds8k	Add Thin Provisioning/Reclamation support to DS8k ASL
2998929	AIX, Linux, Solaris	libvxlsiall	Added back the support for "INF" for LSI and ENGENIO VIDs
3021837	AIX, HPUX, Linux, Solaris	libvxhuawei	Added Arrays Dorado2100 G2 support
3032941	AIX, HPUX, Linux, Solaris	libvxtsbaf	Add support for two new array models: AF1700 & AF900. Also, added AVID support

Changes made to version 6.0.0.300			
Incident #	OS	ASL/APM	Description
2757964	HPUX	dmpinv	Fixed the issue of: EMC Invista APM (dmpinv) not getting registered at install time
2841471	Linux	libvxfusionio	Modified Fusion IO ASL to add trim support and driver version 3 support (ASL revision unchanged)
2798712	Solaris	libvxfusionio	Added Fusion IO support on Solaris x86(a required VXVM patch is not yet released)
2767637	AIX, HPUX, Linux, Solaris	libvxibmsvc	Added the discovery of AVID attribute to IBM SVC ASL(ASL revision unchanged)
2856536	AIX, HPUX, Linux, Solaris	libvxCLARiiON	For EMC VNX Array with HPUX initiator type added Thin Provisioning support(and other attributes), starting with Firmware revision 5.32
2510911	AIX, HPUX, Linux, Solaris	libvxemc	Fixed the issue of: "/usr/lib/vxvm/diag.d/vxcheckasl libvxemc.so /dev/rdisk/<device name>" showing garbage value for "DDL_THIN_DISK" for symmetrix array
2831620	AIX, HPUX, Linux, Solaris	libvxInvista	Added Support for EMC VPLEX array in clustered environment
2882110	AIX, HPUX, Linux, Solaris	libvxemc	Fixed the issue of: thin reclaim failing with Symmetrix Microcode 5876 due to incorrect size of data in write_same command
2831621	AIX, HPUX, Linux, Solaris	libvxpp	Modified the PP ASL to support EMC VPLEX Array in clustered environment
2628980	AIX, HPUX, Linux, Solaris	libvxemc	Corrected the discovery logic of Extended attributes(such as SRDF, Mirror, bcv) with EMC VMAX arrays
2777458	AIX, HPUX, Linux, Solaris	libvxdds2a_sfa	Removed the "standby" path tag from DataDirect 10k array ASL
2893411	AIX, HPUX, Linux, Solaris	libvxKaminario	Added support for Kaminario array
2731901	AIX, HPUX, Linux, Solaris	libvxinfotrend	Added support for Infotrend/Evertz/winchester arrays. The previous Winchester ASL(libvxwinsys) is removed
2744535	AIX, HPUX, Linux, Solaris	libvxhdsusp	Added support for Hitachi HUS VM (HM700) array
2877187	AIX, HPUX, Linux, Solaris	libvxhuawei, dmphuawei	Added support for Huawei Dorado 5100 array and added A/P and A/P-F mode support
Changes made to version 6.0.0.200			
2632859	AIX, HPUX, Linux, Solaris	libvxlsiall	Identify IBM DS5020, DS5100_DS5300, DS3950, DS4200 using revision number.
2727670	AIX, Linux, Solaris	dmpEngenio	APM failover command issued only when the controller is not the current owner.
2733249	AIX, HPUX, Linux, Solaris	libvxviolin	Added Violin ASL for Violin Memory array.
2733052	AIX, HPUX, Linux, Solaris	libvxdds2a_sfa	Fix logic of determining Standby paths of 10k array.

2748589	AIX, HPUX, Linux, Solaris	libvxemc	Set NR_DEVICE attribute if device is an EMC BCV (NR) established device(Note: ASL revision not changed).
2757964	HPUX	dmpinv	packaging script changed to register/un-register dmpinv APM at package install/remove time.
Changes made to version 6.0.0.100			
2633009	AIX, HPUX, Linux, Solaris	libvxhdsalua	ASL modified to discover DF850(HUS_110, HUS_130, HUS_150) array LUNs
2633023	AIX, HPUX, Linux, Solaris	libvxlefthand	A new ASL is added to claim the HP P4000 (lefthand) array
2667130	AIX, HPUX, Linux, Solaris	libvxCLARiiON, dmpCLARiiON	Detect in-active snapshot LUNs using error code 5/25/01 and avoid doing failover which leads to trespassing
2657901	AIX, HPUX, Linux, Solaris	libvxhuawei	Add ALUA mode and Thin Provisioning capability to the ASL
2626277	Solaris	N/A	Modified the VRTSaslapm packaging post install script to remove the obsolete files from the OS packaging database
2666556	AIX, HPUX, Linux, Solaris	libvxibmsvc	Extended attribute value 'lun' is used to identify a standard device
2614438	AIX, Linux, Solaris	dmpEngenio	Changed the SCSI timeout value in APM to allow for timely failover
2605706	AIX, HPUX, Linux, Solaris	libvxhpalua	Modified the ASL to pass down the SCSI version to indicate LUN supports SCSI commands
2643158	AIX	libvxvscsi	Only open devices that are currently available to prevent error messages due to attempted open of unavailable devices.
2634072	AIX, HPUX, Linux, Solaris	libvxInvista	ASL is modified to interpret the data representing AVID in the SCSI response data as hexadecimal. This AVID then gets used in device names.

Package Contents

The VRTSaslapm package in VxVM 6.0 and 6.0.1 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 6.0 Version	SF 6.0.1 Version	VID	PID	Arrays	Mode	Extended Attributes Support
libvx3par	1.0	2.0	3PARdata	VV	InServ series (E200, S400, S800)	A/A	Yes
libvxCLARiiON	3.0	4.0	DGC	CLARiiON	CLARiiON AX100, CLARiiON CX Series (300, 380,	A/P, A/P-F,	Yes

					400, 500, 600, 700), CLARiiON CX3 Series (10, 20, 40, 80), CLARiiON CX4 Series (120, 240, 480, 960)	ALUA	
libvxcompellent	1.0	2.0	COMPELNT	Compellent Vol	Storage Center	A/A	Yes
libvxcopan	1.0	1.0	COPANSYS	8814,8818	COPANSYS	A/A-A	No
libvxdds2a	1.0	1.0	DDN	9550	S2A9550	A/A-A	No
libvxdds2a_sfa	3.0	1.0	DDN	S2A 6620, SFA 10000	S2A6620, SFA10K	ALUA	No
libvxdothill	1.0	2.0	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	11.0	EMC	SYMMETRIX	Symmetrix V-Max	A/A	Yes
libvxelogic	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	2.0	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	1.0	4.0	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	1.0	3.0	HITACHI	OPEN-*	9980,9970V, StorageTek (9980, 9970)	A/A	Yes
libvxhdsalua	2.0	3.0	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, HUS_150	A/A, A/A-A	Yes
libvxhds ¹	1.0	3.0	HITACHI	All	HDS7700E,HDS9960, HDS9910	A/A	Yes

libvxhdsusp	2.0	9.0	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 ¹	1.0	3.0	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	No
libvxhuawei	3.0	10.0	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, 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, Dorado2100 G2, S2200T, HVS85T, HVS88T, XSG1	A/A-A, A/A, ALUA, A/P, A/P-F	Yes
libvxibmds6k ¹	1.0	1.0	IBM	2107*,1750*	DS6000 (1750-511),DS6800, System Storage DS6000 series	A/P-C	No
libvxibmds8k	2.0	6.0	IBM	2107*	DS8000,DS8100, DS8300, System Storage DS8000 series	A/A	Yes
libvxibmsvc	2.0	1.0	IBM	2145	SANVC(2145), StorwizeV7000	ALUA	Yes

libvxliall ¹	2.0	5.0	DELL	MD3000,MD32xxi, MD32xx, MD36xxi, MD36xxf, MD36xx	MD3000,MD32xxi, MD32xx, MD36xxi, MD36xxf, MD36xx	A/P-F	No
libvxliall ¹	3.0	5.0	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	No
libvxliall ¹	3.0	5.0	SUN	LCSM100_I, LCSM100_S, LCSM100_F, CSM100*, CSM200*, STK6580_6780	StorageTek (2510, 2530, 2540, 6130, 6140, 6180, 6580, 6780)	A/P-F	No
libvxliall ¹	3.0	5.0	STK	OPENstorage*, BladeCtrlr*, FLEXLINE*	FlexLine FLX280, FlexLine 200/300 series, FlexLine FLX380, StorageTek 6540	A/P-C	No
libvxmsa2k	1.0	1.0	HP	MSA2012fc, MSA2212fc, MSA2012i	MSA2012fc, MSA2212fc, MSA2012i	A/A	No
libvxmsa2kfc_sa	1.0	4.0	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_FCIscsi, P2000G3_SAS,P2000G3_iSCSI, MSA2040_SAN, MSA1040_SAN, MSA1040_SAS, MSA2040_SAS	ALUA	Yes (SF 6.0.1)
libvxnetapp	1.0	5.0	NETAPP	All	FAS2000/FAS900/FAS200 series, FAS250,FAS270, FAS270c, V3000 series (3020,3040, 3070), FAS3000 series (3020,3020c,3040, 3050,3070),	A/A, ALUA	Yes

					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	1.0	2.0	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	2.0	8.0(AIX) 9.0(Linux) 9.0(Solaris) 10.0(HPUX)	EMC	All	PP_EMCC, PP_EMCC_VPLEX, PP_EMCC_Invista, PP_EMCC_XtremIO	A/A	No
libvxpp	2.0	8.0(AIX) 9.0(Linux) 9.0(Solaris) 10.0(HPUX)	DGC	All	PP_EMCC_CLARiiON	A/A	No
libvxpurple ¹	1.0	1.0	SUN	T300	T3	A/P, A/PF-T3PLUS	No
libvxramsan	1.0	3.0	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	2.0	2.0	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	1.0	2.0	XIOTECH	ISE1400, ISE2400	Xiotech_E5000, ISE2400	A/A	No
libvxxiv	1.0	2.0	IBM	2810XIV	XIV	A/A	Yes
libvxxp1281024	1.0	1.0	HP	OPEN-*	XP128,XP1024	A/A	No
libvxxp12k	1.0	5.0	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	3.0	3.0	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	5.0	VIOLIN	SAN ARRAY, SAN ARRAY ALUA, CONCERTO ARRAY	VMEM, Concerto	A/A, ALUA	No
libvxKaminario	1.0	1.0	KMNRIO	K2	Kaminario_K2	A/A	Yes

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

¹: This ASL is not available for HPUX release.

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

AIX:

Library	SF 6.0 Version	SF 6.0.1 Version	VID	PID	Arrays	Modes	Extended Attributes Support
libvxstorcomp	1.0	1.0	StorComp	OmniForce	STORCOMP	A/A	No
libvxibmnds4k	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	2.0	AIX	VDASD	IBM_VSCSI	VSCSI	No

Linux:

Library	SF 6.0 Version	SF 6.0.1 Version	VID	PID	Arrays	Modes	Extended Attributes Support
libvxveritas	1.0	1.0	VERITAS	All	VERITAS	A/PF-VERITAS	No
libvxfusionio	1.0	6.0	FIO	ioDrive, ioDrive2, ioScale,	FusionIo (6.0) FioDrive, FioDrive2,	A/A	No

				ioScale2, ioMemory, fioCARD	FioScale, FioScale2, FioMemory_SX , FioMemory_PX , FioCARD		
libvxhpmsa	1.0	1.0	HP	MSA VOLUME	MSA1500	ALUA	No
libvxsun7x10	1.0	4.0	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, ZFS Storage 7130, ZFS Storage 7330, ZFS Storage 7430, ZFS Storage 7335, ZFS Storage 7350, ZFS Storage 7355, ZFS Storage 7470, COMSTAR	SUN_7410,SUN _7310, SUN_7210, SUN_7110, ZFS_7120, ZFS_7320, ZFS_7420, ZFS_7720, ZFS_7130, ZFS_7330, ZFS_7430, ZFS_7335, ZFS_7350, ZFS_7355, ZFS_7470, COMSTAR	ALUA	No
libvxsunse3k	1.0	1.0	SUN	StorEdge 3310, StorEdge 3320, StorEdge 3510, StorEdge 3511	SUN3310,SUN3 320, SUN3510,SUN3 511	A/A	No
libvxvmdk	N/A	2.0	VMware	Virtual disk	vmdk	A/A	No
libvxnetaplsi	N/A	3.0	SYMANT EC	NBU_Appliance	NBU_Appliance	ALUA	No
libvxnetaplsi	N/A	3.0	NETAPP, LSI	INF	NETAPP-E	ALUA	No
libvxkove	N/A	2.0	Kove	XPD	Kove_XPD	A/A	No
libvxvirtio	1.0	2.0	QEMU	VIRTIO	VirtIO	A/A	No

Solaris:

Library	SF 6.0 Version	SF 6.0.1 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	2.0	4.0	SUN	Sun Storage 7410, Sun Storage 7310, Sun Storage 7210, Sun Storage 7110, ZFS Storage 7120, ZFS Storage 7210, ZFS Storage 7110, ZFS Storage 7120, ZFS Storage 7320, ZFS Storage 7420, ZFS Storage 7110, ZFS Storage 7120, ZFS Storage 7320, ZFS Storage 7430, ZFS Storage 7335, ZFS Storage 7350, ZFS Storage 7420, ZFS Storage 7720, ZFS Storage 7130, ZFS Storage 7330, ZFS Storage 7430, ZFS Storage 7335, ZFS Storage 7355, ZFS Storage 7470, COMSTAR	SUN_7410, SUN_7310, SUN_7210, SUN_7110, ZFS_7120, ZFS_7320, ZFS_7420, ZFS_7720, ZFS_7130, ZFS_7330, ZFS_7430, ZFS_7335, ZFS_7350, ZFS_7355, ZFS_7470, COMSTAR	ALUA	No

				7350, ZFS Storage 7355, ZFS Storage 7470, COMSTAR			
libvxsunse3k	1.0	1.0	SUN	StorEdge 3310, StorEdge 3320, StorEdge 3510, StorEdge 3511	SUN3310,SUN 3320, SUN3510,SUN 3511	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	2.0	2.0	FIO	ioDrive	FusionIo	A/A	No

HPUX:

Library	SF 6.0 Version	SF 6.0.1 Version	VID	PID	Arrays	Modes	Extended Attributes Support
libvxlsialua	2.0	5.0	IBM	1815 FASTT, 1814, 1818	DS4800-, DS4700-, DS5100-	ALUA- STANDBY	No
libvxlsialua	2.0	5.0	SUN	STK6580_6780, SUN_6180	ST6580_6780- SUN6180-	ALUA- STANDBY	No
libvxhpmsa	1.0	1.0	HP	MSA VOLUME	MSA1500	ALUA	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, libvxlsialua(HPUX)
dmpsvc	IBMSVC-ALUA	ALUA	libvxibmsvc
dmphuawei	A/A-A-HUAWEI, A/PF-HUAWEI	A/A-A, A/P	libvxhuawei

dmpsun7x10alua ¹	SUN7x10-ALUA	ALUA	libvxsun7x10
dmpinv	Inv-A/A,VPLEX-A/A	A/A	libvxInvista
dmpnalsi ²	NLSI-ALUA	ALUA	libvxnetapplsi
dmpkove	Kove_XPD-A/A	A/A	libvxkove

¹ The dmpsun7x10alua APM is currently available only for Solaris and Linux.

² The dmpnalsi APM is currently available only for Linux.

³ 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 ⁶
libvxFJTSYe8k	FUJITSU ETERNUS4000 (Except Models	V20L40	V20L40

	80/100), ETERNUS8000		
	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 ¹	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 ² 6.2 ³ 6.3 ⁴	7.1 ⁵
libvxpurstorage	PureStorage	N/A	4.6.x
libvxmsa2kfc_sa	MSA 1040 SAN,	N/A	GL200R007

	MSA 2040 SAN, MSA 1040 SAS, MSA 2040 SAS		
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 (libvxmsa2kfc_sa)	4MB	N/A	No	Yes	Yes
Nimble (libvxnimble)	Yes	N/A	No	Yes	Yes

➤ **List of Extended Attributes**

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

Array Name (ASL Library)	Reports AVID	LUN Type	RAID LEVELS	SNAP SHOT LUN	Solid State Device	Transport	Replication	Thin Provisioning
3PARdata Inserv (libvx3par)	Yes	lun	-	-	-	-	-	tp, tprclm
EMC CLARiiON (libvxCLARiiON)	Yes	DISK, lun	RAID_0, RAID_1, RAID_3, RAID_5, RAID_10,V RAID,	-	ssd ¹	-	-	thinlun, tprclm
EMC Symmetrix/DMX/ VMAX (libvxemc)	Yes	lun, WD	RAID, VRAID, RAID+Mirr	bcv, nr, mirror, snap	-	-	srdf-r1, srdf-r2	tdev, tprclm
FUJITSU ETERNUS4000(Except Models 80/100), ETERNUS8000 (libvxFJTSYe8k)	Yes	lun	RAID_0, RAID_1, RAID_5, RAID_6	-	-	-	-	tp, tprclm
Hitachi AMS/WMS	Yes	lun	RAID_1,	-	ssd	fc, sata	tc-pvol,	hdp, hdprclm

Series (libvxhdsalua)			RAID_5, RAID_6				tc-svol, pvol, svol	
Hitachi HDS 5700/5800/9200 (libvxhitachi)	No	lun	-	-	-	-	tc-pvol, tc-svol, pvol, svol	-
Hitachi HDS 9910/9960 (libvxhds)	No	lun	-	-	-	-	tc-pvol, tc-svol, pvol, svol	-
Hitachi HDS 9970/9980 (libvxhds9980)	Yes	lun	-	-	-	-	pvol, svol	-
Hitachi TagmaStore, USP,VSP (libvxhdsusp)	Yes	lun	RAID_1, RAID_5, RAID_6	-	ssd	fc, sata	tc-pvol, tc-svol, pvol, svol	hdp, hdprclm
HP XP, P9500 (libvxxp12k)	Yes	lun	RAID_1, RAID_5, RAID_6	-	ssd	fc, sata	tc-pvol, tc-svol, pvol, svol	tp, tprclm
IBM DS8000 (libvxibmds8k)	Yes	lun	-	flashcopy	-	-	-	tp, tprclm
IBM 2810XIV (libvxxiv) ²	Yes	lun		snapshot, optimized_ snapshot		sata	pvol, svol	tprclm, fully_allocated
NetApp (libvxnetapp)	No	-	-	-	-	-	-	tp, tprclm
Compellent (libvxcompellent)	No	-	-	-	-	-	-	tp, tprclm
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	-	-	-
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
tprcldm	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
tprcldm	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 (libvxJTYSYe8k)

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 (libvxxp12k)

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
tprclm	Thin Reclaimable device

11. IBM DS8000 (libvxibm8k)

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
tprclm	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	OFFLINE: Volume is offline
NVFAIL	NVFAIL: NVRAM has failed
NODEV	NODEV: No such device
NOSPC	NOSPC: No space available
ROFS	ROFS: Read only file-system
UNKNOWN_ERR	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
tprclm	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)

tprclm	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. Infinidat (libvxinfinibox)

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

22. HP (libvxmsa2kfc_sa)

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

23. Nimble (libvxnimble)

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