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Storage Foundation 5.0MP3/5.0.1

Thin Reclamation , Extended attributes &

SMARTMOVE™

Quick Start Guide

Quick Start Guide : SMARTMOVE™ & Thin Reclamation

Table of Contents

| | | |
|----|---|----|
| 1. | Introduction | 3 |
| 2. | Storage Arrays Supported for Thin Reclamation..... | 4 |
| 3. | Operating System and SF Patch Support Matrix for Thin Reclamation | 4 |
| 4. | Discovery: VxVM Devices with <i>thin</i> and <i>thinrlm</i> and other extended attributes | 5 |
| 5. | Triggering Thin Reclamation..... | 7 |
| 6. | Known Limitations of thin reclamation in 5.0MP3/5.0.1..... | 8 |
| 7. | Enabling and Using SmartMove™ | 9 |
| | Appendix A : A simple use case for thin reclamation..... | 10 |
| | GLOSSARY | 12 |

1. Introduction

Thin Reclamation is the ability to reclaim unused or deleted/previously allocated space on *thinrclm* devices online, without modifying host, SAN or storage array configurations

Thin Storage Discovery : With the appropriate Array Support Library (ASL) installed, Storage Foundation automatically discovers LUNS which are *thin* and LUNS that are *thinrclm*.

This allows Storage foundation to enable SmartMove automatically

SMARTMOVE™ is the ability to leverage VxFS knowledge of used and unused blocks to optimize volume copy operations and not spend resources copying unused blocks. As such, SMARTMOVE™ can be used to migrate from thick storage to thin storage online and automatically reclaim the unused space in the VxFS file system.

Storage Foundation 5.0 MP3 supports SMARTMOVE™ on all thin provisioned storage and Thin Reclamation on storage Arrays that support the SF Thin Reclamation API.

2. Storage Arrays Supported for Thin Reclamation

Please refer to the Hardware Compatibility list for Storage Foundation for supported Storage Arrays for thin reclamation as shown in the below URL

<http://seer.entsupport.symantec.com/docs/283161.htm>

For supported Storage Array Firmware/Microcode levels for thin reclamation please refer to the extended attributes document on below URL or contact the storage array vendor

<http://seer.entsupport.symantec.com/docs/338446.htm>

3. Operating System and SF Patch Support Matrix for Thin Reclamation

The below matrix show *minimum* upgrade path to have the right patches required for thin reclamation

| OS Version | SF Version | Patch Level | |
|-----------------------|------------|-------------|--------|
| | | RP Level | Hotfix |
| Solaris _Sparc | 5.0MP3 | RP3 | none |
| Solaris_x86_64 | 5.0MP3 | RP3 | none |
| Linux RHEL5 & RHEL5 | 5.0MP3 | RP3 | HF3 |
| Linux SLES 9 & SLES10 | 5.0MP3 | RP3 | HF3 |
| AIX | 5.0MP3 | RP3 | none |
| HPUX 11.31 | 5.0.1 | none | HF3 |

4. Discovery: VxVM Devices with *thin* and *thinrclm* and other extended attributes

Thin LUNs from supported storage arrays be discovered as being *thin* or *thinrclm*.

Additionally for some storage arrays there are storage specific extended attributes which are discovered.

To determine which extended attributes are discovered by which arrays ,please refer to the below URL

<http://seer.entsupport.symantec.com/docs/338446.htm>

For example for Hitachi USP-V and their SUN OEM Equivalent Arrays an attribute called “*hdp*” is discovered for LUNS supporting **Hitachi Dynamic Provisioning** .

To list these “extended attributes” , please use the command

```
# vxdisk -e thin list
```

To list devices that are known by VxVM to be either *thin* or *thinrclm* using:

```
# vxdisk -o thin list
```

This command displays the "**thin size**" in Megabytes of LUNs in 2nd column and the **allocated size in Megabytes** in 3rd column shown as "PHYS_ALLOC" in below screenshot and can be used for monitoring the physical allocation before and after triggering reclamation

The Type is displayed in the last column as *thin* or *thinrclm*

```
# vxdisk -o thin list
```

| DEVICE | SIZE(mb) | PHYS_ALLOC(mb) | GROUP | TYPE |
|---------|----------|----------------|--------|----------|
| xiv0_0 | 16384 | 111 | xivdg1 | thinrclm |
| xiv0_1 | 16384 | 755 | - | thinrclm |
| xiv0_2 | 16384 | 755 | - | thinrclm |
| xiv0_3 | 16384 | 755 | - | thinrclm |
| xiv0_4 | 16384 | 755 | - | thinrclm |
| xiv0_5 | 16384 | 27 | - | thinrclm |
| xiv0_6 | 16384 | 27 | - | thinrclm |
| xiv0_7 | 16384 | 27 | - | thinrclm |
| xiv0_8 | 16384 | 27 | - | thinrclm |
| xiv0_9 | 16384 | 27 | - | thinrclm |
| xiv0_10 | 16384 | 27 | - | thinrclm |
| xiv0_11 | 16384 | 27 | - | thinrclm |
| xiv0_12 | 16384 | 27 | - | thinrclm |
| xiv0_13 | 16384 | 27 | - | thinrclm |
| xiv0_14 | 16384 | 33 | mydg | thinrclm |
| xiv0_15 | 16384 | 41 | - | thinrclm |

5. Triggering Thin Reclamation

Thin Reclamation requires that the storage arrays thin/thinrclm LUNS are on VxVM Volume and a mounted VxFS file system during the reclamation operation. Reclamation can be triggered on all the devices in one or more enclosures, all the devices in one or more disk groups, or a set of disks (specified using their DANAME) or a mount point (file system)

Before triggering reclamation the storage administrator evaluates if space can be reclaimed on a VxFS filesystem after a file purge operation i.e. after comparing the thin LUN allocated size and file system usage

The commands used to reclaim space are :

```
# vxdisk reclaim <dg> | <disk> | <enclosure>
```

NOTE : The VxFS Filesystem needs to be mounted for this command to succeed.

```
# vxdisk reclaim tag2
Reclaiming thin storage on:
Disk tagmastore-usp0_0611 : Done!
Disk tagmastore-usp0_0612 : Done!
Disk tagmastore-usp0_0610 : Done!
Disk tagmastore-usp0_0609 : Done!
~
```

Thin Reclamation can also triggered on a mounted VxFS FileSystem .

```
# /opt/VRTS/bin/fsadm -F vxfs -R <mount point>
```

6. Known Limitations of thin reclamation in 5.0MP3/5.0.1

The following limitations are known at the time

- a. Thin Reclamation does not work on non-mounted VxFS File system .this limitation has been overcome in SF 5.1
- b. Thin reclamation cannot be triggered on a LUN on which a volume or disk group has been deleted/destroyed . this limitation has been addressed in SF 5.1
- c. For Monitoring reclamation there's no task monitor .
Reclamation needs to be monitored via "vxdisk -o thin list"

This limitation has been addressed in SF 5.1 and "vxtask list" can monitor reclamation tasks running in background

7. Enabling and Using SmartMove™

By default, SMARTMOVE™ applies to all copy operations performed on VxVM volumes that contain thin or thinrclm devices, and that support a mounted VxFS file system. If DMP discovers that the device is a thin or thinrclm capable LUNs then SmartMove is enabled by default. Otherwise, user can trigger enablement of SmartMove by CLI.

SmartMove can be controlled by a host wide setting in */etc/default/vxsf*:

usefssmartmove=none|all|thinonly

- ***none***: *Smartmove is disabled on the host.*
- ***all***: *Smartmove is enabled for all copy operations on the host.*
- ***thinonly***: *Smartmove is enabled for volumes that contain thin or thinrclm devices.*

For SmartMove testing, it is recommended to ensure the file exists and contains the tunable set to either 'all' or 'thinonly'. If the file is missing from a host, the default setting of thinonly will apply.

Once SmartMove is either explicitly set to all, or thin devices are configured in a volume, any volume manager copy operation (vxassist move, vxassist evacuate, vxplex, etc.) on that volume will benefit from SmartMove, as long as there's a mounted VxFS file system on it.

Appendix A : A simple use case for thin reclamation

1. Identify LUNs for a thin reclaim capable storage array
2. Label the LUNS if required with OS label and make sure they show the right thin capacity (Solaris and Linux)
3. Initialize the LUNs from VxVM & create VxVM diskgroups & Volume on thin LUNS
4. Create VxFS Filesystem on Volumes on the volumes & mount the filesystem
5. Verify physical allocation that allocation does not grow significantly after creating volume/file-system
6. Populate filesystem with files and or data files
7. Verify the physical allocation that it has grown from original size to the size of the files copied
8. To verify that space can be reclaimed delete some files or shrink files
9. Trigger reclamation via “vxdisk reclaim < > or fsam -R <mount point>

10. Verify the physical allocation via “`vxdisk -o thin list`” that it has reduced proportionately to the space which file system has released


GLOSSARY

| Abbreviation | Explanation |
|----------------------|---|
| A.S.L | Array Support Library – user-land module used to detect Storage Characteristics by VxVM DDL |
| DDL | Device Discovery Layer |
| VxVM | VERITAS Volume Manager |
| Thin Storage/Storage | A Storage Arrays which supports thin or thinrclm capable LUNS |
| VxFS | VERITAS File System |

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