



**EMC® Virtual Provisioning™  
for FLARE® OE**  
Version 04.30.000.5.525

**Release Notes**  
P/N 300-011-115  
REV 10  
September 26, 2012

These release notes contain supplemental information about Virtual Provisioning version 04.30.000.5.525. Read these release notes completely before installing or using the software. Topics include:

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## Revision history

The following table presents the revision history of this document:

Revision	Date	Description
10	September 26, 2012	Updated for service pack release
A09	March 30, 2012	Updated for service pack release
A08	January 5, 2012	Updated for service pack release
A07	September 22, 2011	Update for service pack release
A06	June 9, 2011	Update for service pack release
A05	April 5, 2011	Update for service pack release
A04	February 25, 2011	Update for service pack release
A03	December 17, 2010	Updates for service pack release
A02	September 10, 2010	Updates to "Fixed Problems" and "Known Problems and Limitations"
A01	August 11, 2010	Initial release

## Product description

This release of EMC<sup>®</sup> Virtual Provisioning<sup>™</sup> software provides several new features, including expanded ease of provisioning, auto-tiering, and compression.

### Virtual Provisioning

EMC Virtual Provisioning software provides simplified storage provisioning. To accomplish this, all LUNs are provisioned out of a storage pool, thereby simplifying the creation and allocation of storage capacity. The basic elements of Virtual Provisioning used to allocate the storage are storage pools, fully provisioned LUNs, and thinly provisioned LUNs. For thinly provisioned LUNs, you must install the Thin Provisioning enabler on the storage system. All LUNs in a storage pool support shrink and expand operations. Virtual provisioning can allocate storage from pools that have mixed drives and different performance characteristics by assigning a tier preference to the LUN.

### Storage pools

A storage pool is a set of disks with the same RAID protection (RAID 5, RAID 6 or RAID 1/0 only). A storage pool shares its user capacity with one or more pool LUNs. You can expand the user capacity by adding

more disks to the storage pool. Since all LUNs are created from a storage pool, the storage behaves very much like a traditional LUN because the storage is assigned from the shared storage pool.

## LUNs

### Thick LUNs

A thick LUN is a logical unit of storage created within a storage pool. This specific LUN is a fully provisioned LUN that reserves the physical storage of the LUN size from the storage pool, when the LUN is created. You can shrink or expand a thick LUN.

### Thin LUNs

A thin LUN is a logical unit of storage created within a thin pool. Unlike thick LUNs, it does not reserve storage at the time of LUN creation. Instead, it consumes physical storage from the thin pool only when data is written to it and competes with other thin LUNs in the pool for available thin pool storage. The host-visible size of the thin LUN is independent of the available physical storage in the thin pool. You can shrink or expand thin LUNs.

Virtual Provisioning is integrated into EMC Unisphere™ software, a web-based management tool for the EMC CLARiiON® storage systems. Unisphere lets you easily configure and manage storage pools and LUNs.

## Managing Virtual Provisioning

To manage Virtual Provisioning, use either the UI-based Unisphere or EMC Navisphere® Secure CLI as described in the Unisphere help.

## Using Virtual Provisioning with other CLARiiON software

If the storage system supports replication technology, such as EMC SnapView™, EMC Virtual LUN Migration, EMC MirrorView™, EMC SAN Copy™, or EMC RecoverPoint Splitter, you can use these replication technologies with pool LUNs in the same way that you use them with traditional LUNs.

## Using Virtual Provisioning with Unisphere Quality of Service Manager software

I/O to thin LUNs exhibits different behavior from traditional LUNs. The response time of I/O to thin LUNs is not as predictable as that of traditional LUNs and is more difficult for the control algorithms to manage. When thin LUNs are in an I/O class, you will see slightly

longer times set on cruise control policies and wider variations in limits policies. Cruise control policies with narrow tolerances can be expected to fail more frequently. Wider tolerances will deliver better results.

## Limits

The following tables list the maximum pool capacities.

[Table 1](#) lists the storage pool limits.

**Table 1: Storage pool limits**

Guidelines	CX4-960	CX4-480	CX4-240	CX4-120
Maximum number of storage pools	60	40	40	20
Maximum number of disks in a storage pool	955	475	235	115
Maximum number of usable disks for all storage pools	955	475	235	115
Maximum number of disks that can be added to a pool at a time	180	120	80	40
Maximum number of pool LUNs per storage pool	2048	2048	1024	512

[Table 2](#) lists the Pool LUN limits.

**Table 2: Pool LUN Limits**

Guidelines	CX4-960	CX4-480	CX4-240	CX4-120
Minimum user capacity	1 block	1 block	1 block	1 block
Minimum user capacity	14 TB	14 TB	14 TB	14 TB
Maximum number of pool LUNs per storage system	2048	2048	1024	512

## New features and changes

### Version 04.30.000.5.525

There were no new features added in this release.

### Version 04.30.000.5.524

There were no new features added in this release.

### Version 04.30.000.5.522

There were no new features added in this release.

The following features or enhancements have been added in previous releases:

- ◆ Thick LUNs
- ◆ LUN expand and shrink
- ◆ Tiering preference
- ◆ Per-tier tracking support of pool usage
- ◆ RAID 1/0 support for pools
- ◆ Increased limits for drive usage in pools

## Environment and system requirements

### Hardware

This version of software runs on the following EMC CX4™ series storage systems: CX4-960, CX4-480, CX4-240, and CX4-120 storage systems.

### Storage-system software

This version of EMC Virtual Provisioning requires EMC FLARE® Operating Environment version 04.30.000.5.xxx. In addition, if you want to create and manage thin LUNs, you must install the Thin Provisioning enabler version 01.01.5.001. However you do not need this enabler to create and manage storage pools or thick LUNs.

### Unisphere management software

Virtual Provisioning is compatible with the following minimum revisions of EMC Unisphere management software:

- ◆ Navisphere Secure CLI 7.30.0.x.x

- ◆ Unisphere 1.0.0

## Fixed problems

This section lists significant problems that users encountered in earlier versions and describes the solutions that this new version provides.

### Problems fixed in version 04.30.000.5.525

Platforms	Symptom Description	Fix Summary	Solution (or workaround)
All supported platforms	Pool remained offline after recovery. (468554 / 45719050)  <u>Frequency of occurrence:</u> Always under a rare set of circumstances.  <u>Severity:</u> Critical	Corrected internal coding.	<u>Fixed in versions:</u> 04.30.000.5.525 <u>Exists in versions:</u> 04.30.000.5.524 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004
All supported platforms	Pool LUN was not accepting I/O requests. (469401 / 45612100)  <u>Frequency of occurrence:</u> Always under a specific set of circumstances.  <u>Severity:</u> Critical	Corrected internal coding.	<u>Fixed in versions:</u> 04.30.000.5.525 <u>Exists in versions:</u> 04.30.000.5.524 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517
All supported platforms	Pool LUN went offline when trespassed. (481432)  <u>Frequency of occurrence:</u> Likely under a rare set of circumstances.  <u>Severity:</u> Critical	Corrected internal coding.	<u>Fixed in versions:</u> 04.30.000.5.525 <u>Exists in versions:</u> 04.30.000.5.524 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509

Platforms	Symptom Description	Fix Summary	Solution (or workaround)
			04.30.000.5.505 04.30.000.5.004
All supported platforms	<p>Pool LUN failed to come online after recovery. (456550)</p> <p><u>Frequency of occurrence:</u> Likely under a specific set of circumstances.</p> <p><u>Severity:</u> Critical</p>	Corrected internal coding.	<p><u>Fixed in versions:</u> 04.30.000.5.525</p> <p><u>Exists in versions:</u> 04.30.000.5.524 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004</p>
All supported platforms	<p>Thin LUNs failed to come online. (476406 / 46624696)</p> <p><u>Frequency of occurrence:</u> Infrequently under a rare set of circumstances.</p> <p><u>Severity:</u> Critical</p>	Corrected internal coding.	<p><u>Fixed in versions:</u> 04.30.000.5.525</p> <p><u>Exists in versions:</u> 04.30.000.5.524 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004</p>
All supported platforms	<p>After a storage processor reboot, pool failed to come online. (408432)</p> <p><u>Frequency of occurrence:</u> Rarely under a specific set of circumstances.</p> <p><u>Severity:</u> Critical</p>	Corrected internal coding.	<p><u>Fixed in versions:</u> 04.30.000.5.525</p> <p><u>Exists in versions:</u> 04.30.000.5.524 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004</p>

## Fixed problems

Platforms	Symptom Description	Fix Summary	Solution (or workaround)
All supported platforms	<p>Data may be incorrectly written to a compressed Thin LUN which was heavily written over an extended period of time. (471973)</p> <p><u>Frequency of occurrence</u> Likely under a specific set of circumstances.</p> <p><u>Severity:</u> Critical</p>	Corrected handling of internal counter overflowing.	<p><u>Fixed in versions:</u> 04.30.000.5.525</p> <p><u>Exists in versions:</u> 04.30.000.5.524 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004</p>
All supported platforms	<p>Storage processor unexpectedly panicked and pools required recovery. (490046 / 48019080)</p> <p><u>Frequency of occurrence:</u> Likely under a rare set of circumstances.</p> <p><u>Severity:</u> Critical</p>	Corrected internal coding.	<p><u>Fixed in versions:</u> 04.30.000.5.525</p> <p><u>Exists in versions:</u> 04.30.000.5.524 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004</p>
All supported platforms	<p>Storage processor unexpectedly panicked during a LUN recovery. (456928 / 44419720)</p> <p><u>Frequency of occurrence:</u> Infrequently under a specific set of circumstances.</p> <p><u>Severity:</u> Medium</p>	Corrected internal coding.	<p><u>Fixed in versions:</u> 04.30.000.5.525</p> <p><u>Exists in versions:</u> 04.30.000.5.524 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004</p>
All supported platforms	<p>Commit operations appeared to succeed, but virtual provisioning did not successfully commit. (468309 / 45515704)</p>	Corrected internal coding.	<p><u>Fixed in versions:</u> 04.30.000.5.525</p> <p><u>Exists in versions:</u> 04.30.000.5.524 04.30.000.5.523</p>

Platforms	Symptom Description	Fix Summary	Solution (or workaround)
	<p><u>Frequency of occurrence:</u> Always under a specific set of circumstances.</p> <p><u>Severity:</u> Medium</p>		04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004
All supported platforms	<p>If a pool was created when the storage system was running FLARE OE 28.x, when the storage system is upgraded to FLARE OE 30.x FAST relocations will fail. (473071 / 46122858)</p> <p><u>Frequency of occurrence:</u> Always under a specific set of circumstances.</p> <p><u>Severity:</u> Medium</p>	Corrected internal coding	<p><u>Fixed in versions:</u> 04.30.000.5.525</p> <p><u>Exists in versions:</u>            04.30.000.5.524            04.30.000.5.523            04.30.000.5.522            04.30.000.5.517            04.30.000.5.512            04.30.000.5.511            04.30.000.5.509            04.30.000.5.505            04.30.000.5.004</p>
All supported platforms	<p>Failed to create a Thin LUN. (478433 / 46843134)</p> <p><u>Frequency of occurrence:</u> Infrequently under a specific set of circumstances.</p> <p><u>Severity:</u> Medium</p>	Corrected internal coding.	<p><u>Fixed in versions:</u> 04.30.000.5.525</p> <p><u>Exists in versions:</u>            04.30.000.5.524            04.30.000.5.523            04.30.000.5.522            04.30.000.5.517            04.30.000.5.512            04.30.000.5.511            04.30.000.5.509            04.30.000.5.505            04.30.000.5.004</p>

## Fixed problems

Platforms	Symptom Description	Fix Summary	Solution (or workaround)
All supported platforms	<p>Pool LUN still reported an error after successful recovery. (472847)</p> <p><u>Frequency of occurrence:</u> Always under a specific set of circumstances.</p> <p><u>Severity:</u> Low</p>	Corrected internal coding.	<p><u>Fixed in versions:</u> 04.30.000.5.525</p> <p><u>Exists in versions:</u> 04.30.000.5.524 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004</p>

### Problems fixed in version 04.30.000.5.524

Platforms	Symptom Description	Fix Summary	Solution (or workaround)
All supported platforms	<p>An excessive number of relocation failure messages in the event log, resulted in an unnecessary call-home. (467035 / 45486412)</p> <p><u>Frequency of occurrence:</u> Always under a specific set of circumstances.</p> <p><u>Severity:</u> Low</p>	Removed the inappropriate log messages.	<p><u>Fixed in versions:</u> 04.30.000.5.524</p> <p><u>Exists in versions:</u> 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004</p>
All supported platforms	<p>The pool LUN became inaccessible after a trespass. (459046 / 455572)</p> <p><u>Frequency of occurrence:</u> Rarely under a specific set of circumstances.</p> <p><u>Severity:</u> Critical</p>	Corrected the internal code logic.	<p><u>Fixed in versions:</u> 04.30.000.5.524</p> <p><u>Exists in versions:</u> 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004</p>
All supported	Pool LUN went offline, pool may require recovery.	Corrected the internal code logic.	<p><u>Fixed in versions:</u> 04.30.000.5.524</p>

Platforms	Symptom Description	Fix Summary	Solution (or workaround)
platforms	(458634)  <u>Frequency of occurrence:</u> Rarely under a specific set of circumstances.  <u>Severity:</u> Critical		<u>Exists in versions:</u> 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004
All supported platforms	Recovery of a compressed LUN may have resulted in an unexpected storage processor reboot (various codes). (458620 / 44590970)  <u>Frequency of occurrence:</u> Infrequently under a rare set of circumstances. <u>Severity:</u> Medium	Corrected the internal code logic.	<u>Fixed in versions:</u> 04.30.000.5.524 <u>Exists in versions:</u> 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004
All supported platforms	Tiering properties can be reported incorrectly. (427657 / 42149086)  <u>Frequency of occurrence:</u> Infrequently under a specific set of circumstances. <u>Severity:</u> Low	Correctly handle drive reporting unknown type.	<u>Fixed in versions:</u> 04.30.000.5.524 <u>Exists in versions:</u> 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004

## Fixed problems

Platforms	Symptom Description	Fix Summary	Solution (or workaround)
All supported platforms	<p>Message indicating a failed attempt to destroy a LUN was incorrectly displayed. (433884)</p> <p><u>Frequency of occurrence:</u> Rarely during a specific event.</p> <p><u>Severity:</u> Medium</p>	Correctly report the actual error condition.	<p><u>Fixed in versions:</u> 04.30.000.5.524</p> <p><u>Exists in versions:</u> 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004</p>
All supported platforms	<p>Pool LUN can stay offline after drive faults are corrected. (377936)</p> <p><u>Frequency of occurrence:</u> Infrequently under a rare set of circumstances.</p> <p><u>Severity:</u> Critical</p>	Corrected the internal code logic.	<p><u>Fixed in versions:</u> 04.30.000.5.524</p> <p><u>Exists in versions:</u> 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004</p>
All supported platforms	<p>Offline LUN recovery could fail. (455096 / 44243910)</p> <p><u>Frequency of occurrence:</u> Likely under a specific set of circumstances.</p> <p><u>Severity:</u> Medium</p>	Enhanced recovery tools.	<p><u>Fixed in versions:</u> 04.30.000.5.524</p> <p><u>Exists in versions:</u> 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004</p>
All supported platforms	<p>LUN recovery failed incorrectly. (435944)</p> <p><u>Frequency of occurrence:</u> Always under a rare set of circumstances.</p> <p><u>Severity:</u></p>	Corrected the internal code logic.	<p><u>Fixed in versions:</u> 04.30.000.5.524</p> <p><u>Exists in versions:</u> 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511</p>

Platforms	Symptom Description	Fix Summary	Solution (or workaround)
	Critical		04.30.000.5.509 04.30.000.5.505 04.30.000.5.004
All supported platforms	When metadata was corrupted on a pool LUN, recovery required manual intervention and so took longer than necessary. (440697)  <u>Frequency of occurrence:</u> Likely under a specific set of circumstances.  <u>Severity:</u> Medium	Enhanced recovery tools.	<u>Fixed in versions:</u> 04.30.000.5.524 <u>Exists in versions:</u> 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004
All supported platforms	LUN recovery failed incorrectly. (440464)  <u>Frequency of occurrence:</u> Rarely under a specific set of circumstances.  <u>Severity:</u> Critical	Enhanced recovery tools.	<u>Fixed in versions:</u> 04.30.000.5.524 <u>Exists in versions:</u> 04.30.000.5.523 04.30.000.5.522 04.30.000.5.517 04.30.000.5.512 04.30.000.5.511 04.30.000.5.509 04.30.000.5.505 04.30.000.5.004

### Problems fixed in version 04.30.000.5.523

Platforms	Symptom details	Problem description	Solution (or workaround)
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## Fixed problems

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	<p>Poor performance on LUNs in a RAID 10 pool. (430936)</p> <p><u>Frequency of occurrence:</u> Always under a specific set of circumstances. <u>Severity:</u> Medium</p>	Corrected the disks-per-stripe calculation for a RAID 10 pool.	<p><u>Fixed in versions:</u> 04.30.000.5.523</p> <p><u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522</p>
All supported platforms	<p>Thin LUN may go offline following an I/O error during a filesystem mount. (429391)</p> <p><u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Critical</p>	Correct handling of I/O errors during filesystem mount.	<p><u>Fixed in versions:</u> 04.30.000.5.523</p> <p><u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522</p>
All supported platforms	<p>SP may have rebooted unexpectedly. (436144)</p> <p><u>Frequency of occurrence:</u> Unlikely under a specific set of circumstances. <u>Severity:</u> Medium</p>	Corrected pointer handling.	<p><u>Fixed in versions:</u> 04.30.000.5.523</p> <p><u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522</p>
All supported platforms	<p>LUN was incorrectly not marked for recovery. (432672)</p> <p><u>Frequency of occurrence:</u> Rarely under a specific set of circumstances. <u>Severity:</u> Critical</p>	Ensure LUN is marked for recovery in this specific failure case.	<p><u>Fixed in versions:</u> 04.30.000.5.523</p> <p><u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522</p>

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	Unexpected storage processor rebooted. (various codes) (431149) <u>Frequency of occurrence</u> : Likely under a specific set of circumstances. <u>Severity</u> : Medium	Correct internal memory management.	<u>Fixed in versions</u> : 04.30.000.5.523 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522
All supported platforms	Unexpected storage processor rebooted (code 0xe1388000). (439788) <u>Frequency of occurrence</u> : Rarely under a specific set of circumstances. <u>Severity</u> : Critical	Corrected internal coding to prevent deadlock condition.	<u>Fixed in versions</u> : 04.30.000.5.523 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522
All supported platforms	Recovery can fail incorrectly. (438977) <u>Frequency of occurrence</u> : Always under a rare set of circumstances. <u>Severity</u> : Critical	Corrected FSCK to be able to fix specific corruption types seen here.	<u>Fixed in versions</u> : 04.30.000.5.523 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522
All supported platforms	Thin LUN may go offline. (431923) <u>Frequency of occurrence</u> : Rarely under a specific set of circumstances. <u>Severity</u> : Critical	Correct handling of internal Thin LUN metadata.	<u>Fixed in versions</u> : 04.30.000.5.523 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522

## Fixed problems

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	Thin LUN could not be shrunk in some error cases. (426131) <u>Frequency of occurrence:</u> Likely under a rare set of circumstances. <u>Severity:</u> Medium	Correct error handling to allow LUN to be shrunk.	<u>Fixed in versions:</u> 04.30.000.5.523 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522
All supported platforms	Pool size could be reported incorrectly after a pool expansion failure. (429544) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	Improved error handling so as to correctly report pool capacity.	<u>Fixed in versions:</u> 04.30.000.5.523 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522
All supported platforms	LUN was unable to be recovered. (435313) <u>Frequency of occurrence:</u> Rarely under a specific set of circumstances. <u>Severity:</u> Critical	Correct handling of internal metadata so that recovery succeeds.	<u>Fixed in versions:</u> 04.30.000.5.523 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522
All supported platforms	Unexpected storage processor reboot (various codes). (426157) <u>Frequency of occurrence:</u> Rarely under a specific set of circumstances. <u>Severity:</u> Critical	Correctly handle error condition.	<u>Fixed in versions:</u> 04.30.000.5.523 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522

## Problems fixed in version 04.30.000.5.522

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	Storage processor may reboot unexpectedly during trespass of all LUNs in a large configuration. (397338) <u>Frequency of occurrence</u> Likely under a specific set of circumstances. <u>Severity</u> : Medium	Trespassing algorithm was traversing all the internal objects regardless of their states which could take a long time resulting in a timeout.	<u>Fixed in version</u> : 04.30.000.5.522 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A pool LUN could unexpectedly go offline. (410372) <u>Frequency of occurrence</u> Likely under a specific set of circumstances. <u>Severity</u> : Medium	An inconsistency in internal counters was caused due to a miscalculation under a specific set of condition.	<u>Fixed in version</u> : 04.30.000.5.522 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A pool LUN recovery may fail. (407731) <u>Frequency of occurrence</u> Likely under a specific set of circumstances. <u>Severity</u> : Medium	Incorrect error returned from an internal functional.	<u>Fixed in version</u> : 04.30.000.5.522 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	Storage processor may reboot unexpectedly during IOs. (359524) <u>Frequency of occurrence</u> Likely under a specific set of circumstances. <u>Severity</u> : Medium	A memory allocation failure was not handled in one of the internal functions.	<u>Fixed in version</u> : 04.30.000.5.522 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517

## Fixed problems

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	A storage processor may reboot unexpectedly during a recovery of a pool LUN. (413908) <u>Frequency of occurrence</u> Likely under a specific set of circumstances. <u>Severity</u> : Medium	An interface discrepancy between two internal component resulted in an unintended behavior of the system.	<u>Fixed in version</u> : 04.30.000.5.522 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A storage processor may reboot unexpectedly during a pool LUN destroy. (414510) <u>Frequency of occurrence</u> : Likely under a specific set of circumstances. <u>Severity</u> : Medium	A particular sequence of internal object state transitions does not handle error path correctly.	<u>Fixed in version</u> : 04.30.000.5.522 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A pool recovery process may get stuck. (414171) <u>Frequency of occurrence</u> : Likely under a specific set of circumstances. <u>Severity</u> : Medium	Under a certain specific situation the code to traverse the internal meta link lists resulted in a loop without a sentinel to break out.	<u>Fixed in version</u> : 04.30.000.5.522 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A thin LUN may result in severe degraded performance. (415600) <u>Frequency of occurrence</u> : Likely under a specific set of circumstances. <u>Severity</u> : Medium	Under a very specific sequence of set of IO pattern an internal cache hash table has heavy collisions resulting in long lists in the same hash bucket.	<u>Fixed in version</u> : 04.30.000.5.522 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A pool LUN recovery process may get stuck. (412760)	A discrepancy in internal reference count caused an outstanding reference	<u>Fixed in version</u> : 04.30.000.5.522 <u>Exists in versions</u> :

Platforms	Symptom details	Problem description	Solution (or workaround)
	<u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	prohibiting recovery progress after a certain point.	04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	Creation of thick LUNs in a pool with maximum capacity creates n-1 LUNs. (417089) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	A incorrect calculation in estimating LUN size and/or LUN count required to fill up the pool with maximum capacity.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	SP may reboot unexpectedly during a double faulted drives. (417109) <u>Frequency of occurrence:</u> Likely under a rare set of circumstances. <u>Severity:</u> Medium	If a backend IO error occurred in the middle of computing the tier statistics an internal functions loops forever causing a timeout.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	Access to pool LUN may be lost. (411740) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	An race condition on handling error condition on recalculation of internal statistics results in a looping forever.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517

## Fixed problems

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	IO performance to a pool LUN may be degraded under certain specific condition. (407225) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	An internal misaligned zero-fill IO pattern caused the cache to force flush resulting in degraded performance.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A storage processor may reboot unexpectedly. (414087) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	Under a specific condition during a background operation of reclaiming free pool space an incorrect status is returned an internal function.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A storage processor may reboot unexpectedly during a upgrade to a new software. (419413) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	A race condition under a particular sequence of storage processor shutting down as part of the upgrade process resulted in accessing the lock that is already unlocked.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A storage processor may reboot multiple times unexpectedly during a recovery of pool LUN. (418001) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	Under a particular meta data correction an access to a link that is already empty resulted in a storage processor reboot.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A shrink operation on a pool LUN may fail	An interdependency amongst internal	<u>Fixed in version:</u>

Platforms	Symptom details	Problem description	Solution (or workaround)
	during trespass of a LUN. (369896, 420806) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	object state transition was incorrectly recognized when the shrink operation moved from one SP to another as part of LUN trespass.	04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	An IO to a pool LUN may timeout on trespass of pool LUN. (420266) <u>Frequency of occurrence:</u> Rarely under a specific set of circumstances. <u>Severity:</u> Medium	A race on a particular sequence of internal object state transitions as part of LUN trespass may delay the trespass completion.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	An IO to a pool LUN may timeout on trespass of pool LUN. (420407) <u>Frequency of occurrence:</u> Rarely under a specific set of circumstances <u>Severity:</u> Medium	A deficiency in the log replay mechanism on trespass could result in delay in trespass completion.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	Access to the pool LUN may be lost due LUN being offline. (420727) <u>Frequency of occurrence:</u> Rarely under a specific set of circumstances. <u>Severity:</u> Medium	A race condition during traversal of link list of internal meta data detected an inconsistency in the internal data structure taking the LUN offline.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517

**Fixed problems**

<b>Platforms</b>	<b>Symptom details</b>	<b>Problem description</b>	<b>Solution (or workaround)</b>
All supported platforms	Access to the pool LUN may be lost due to the LUN being offline. (419138) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	An issue with heapwatch throttle algorithm prevented the trespass of a LUN to get stuck resulting LUN offline.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A storage processor may reboot unexpectedly. (421159) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	Mishandling of a reference count inconsistency.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A storage processor may reboot unexpectedly. (419208) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	A race condition in initialization of an internal structure during a certain IO sequence/pattern.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	Incorrect even log message suggesting the system has detected a hardware fault on the pool LUN. (419024) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	A race condition resulting in an incorrect internal variable was set during an IO to the pool LUN.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A pool LUN recovery may fail. (423466) <u>Frequency of</u>	A race condition in add slice and release slice resulted in an accounting problem	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u>

Platforms	Symptom details	Problem description	Solution (or workaround)
	<u>occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	and caused recovery to fail.	04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A storage processor may reboot unexpectedly. (411264) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	A race condition in an internal hash during a state change entry resulted in a fault.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A storage processor may reboot unexpectedly during space reclamation. (379908) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	An incorrect deallocation of an internal structure while it still has an outstanding reference resulted in a fault.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	A storage processor may reboot unexpectedly while in the process of shutting down during an upgrade. (421159) <u>Frequency of occurrence:</u> Rare under a specific set of circumstances. <u>Severity:</u> Medium	A race condition resulted in an outstanding reference on an internal object.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517

## Fixed problems

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	A storage processor may reboot unexpectedly. (420741) <u>Frequency of occurrence:</u> Rare under a specific set of circumstances. <u>Severity:</u> Medium	Small memory leak under a particular situation accumulated resulting in a fault due to memory exhaustion.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517
All supported platforms	Thin LUN may go offline requiring recovery. (425598) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	An incorrect error status is being returned from an internal functional resulting in a LUN to offline for recovery.	<u>Fixed in version:</u> 04.30.000.5.522 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517

### Problems fixed in version 04.30.000.5.517

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	Unable to create a storage pool or pool-based LUN following an NDU. (413602, 414680, 414163) <u>Frequency of occurrence:</u> Infrequently under a specific set of circumstances. <u>Severity:</u> Medium	Failure to correctly obtain limits during the boot process resulted in being unable to create a pool or pool-based LUN.	<u>Fixed in versions:</u> 04.30.000.5.517 <u>Exists in versions:</u> 04.30.000.5.512
All supported platforms	Using FAST Cache and Compression together could result in severe performance degradation. (405710) <u>Frequency of</u>	Compression can interact with FAST Cache in such a way that IO requests become very slow.	<u>Fixed in versions:</u> 04.30.000.5.517 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511

Platforms	Symptom details	Problem description	Solution (or workaround)
	<u>occurrence</u> : Likely under a specific set of circumstances <u>Severity</u> : Critical		04.30.000.5.512
All supported platforms	Block can be incorrectly zeroed. (411906) <u>Frequency of occurrence</u> : Likely under a rare set of circumstances. <u>Severity</u> : Critical	If a storage processor reboots as a slice is freed, the slice can later be incorrectly zeroed even if it has since been re-used.	<u>Fixed in versions</u> : 04.30.000.5.517 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512
All supported platforms	Pool LUNs become unavailable. (408971) <u>Frequency of occurrence</u> : Likely under a specific set of circumstances <u>Severity</u> : Critical	On a system with FAST active, a heavy trespass load could result in all pool LUNs going offline.	<u>Fixed in versions</u> : 04.30.000.5.517 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512
All supported platforms	Pool LUNs may become unavailable. (410784) <u>Frequency of occurrence</u> : Rarely under a specific set of circumstances. <u>Severity</u> : Critical	Incorrect internal coding could result in a pool going offline.	<u>Fixed in versions</u> : 04.30.000.5.517 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512
All supported platforms	Storage processor could reboot unexpectedly (code 0x3b). (404016, 405605, 409107) <u>Frequency of occurrence</u> : Infrequently under a specific set of circumstances. <u>Severity</u> : Medium	Internal data structures could be handled incorrectly leading to an unexpected storage processor reboot.	<u>Fixed in versions</u> : 04.30.000.5.517 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.505 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512

## Problems fixed in version 04.30.000.5.512

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	Misleading message logged in the event log. (380798 / 36266720) <u>Frequency of occurrence:</u> Likely during a specific event. <u>Severity:</u> Medium	Under a particular condition when LUN migration finished the event log message was piggy backed on a common error message without taking the context in to account resulting in a misleading message.	<u>Fixed in version:</u> 04.30.000.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Extensive trespassing may result in single storage processor bugcheck (D1). (394903 / 37813634) <u>Frequency of occurrence:</u> Rarely under a specific set of circumstances. <u>Severity:</u> Medium	Incorrect handling of reference counts on internal objects resulted in a dangling object causing a bugcheck when accessed.	<u>Fixed in version:</u> 04.30.000.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	I/O requests to pool LUNs can fail. (396757 / 38189532) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances <u>Severity:</u> Critical	Incorrect handling of internal resources resulted in performance degradation and ultimately inability to service I/O requests.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Unexpected storage processor reboot. (397840 / 38201438) <u>Frequency of occurrence:</u> Always under a specific set of circumstances. <u>Severity:</u> Critical	A small memory leak could eventually result in memory exhaustion causing a storage processor reboot.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Unexpected storage processor reboots. (397840 / 406799) <u>Frequency of occurrence:</u> Likely under a specific set of	Large memory footprint of internal structure resulted in memory exhaustions on a large pool storage consumption.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509

Platforms	Symptom details	Problem description	Solution (or workaround)
	circumstances <u>Severity</u> : Critical		04.30.000.5.511
All supported platforms	Recovery of an offline thin LUN can fail without appropriate information. (401058, 401072 / 38678402) <u>Frequency of occurrence</u> : Likely under a rare set of circumstances. <u>Severity</u> : Medium	An appropriate error message was not being propagated from an internal component to the recovery component.	<u>Fixed in version</u> : 04.30.00.5.512 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	I/O requests to pool LUN could fail during a trespass of the LUN. (402582, 404344 / 38882316) <u>Frequency of occurrence</u> : Rarely under a rare set of circumstances. <u>Severity</u> : Critical	A race condition under a specific condition resulted in deadlock preventing the LUN from going to ready state.	<u>Fixed in version</u> : 04.30.00.5.512 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Unexpected storage processor reboots could result in I/O failure after SP boot-up. (405613, 406106 / 39335354) <u>Frequency of occurrence</u> : Likely under a specific set of circumstances. <u>Severity</u> : Critical	Large storage consumption resulted in memory exhaustions leading to SP reboots. On the SP reboot the LUNs were incorrectly marked for recovery resulting in LUN being offline.	<u>Fixed in version</u> : 04.30.00.5.512 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511

## Fixed problems

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	Trespassing a pool LUN when the pool is offline could cause a storage processor reboot. (405616, 375713 / 39329800) <u>Frequency of occurrence:</u> Rarely under a rare set of circumstances. <u>Severity:</u> Medium	A race condition with SCN thread caused a function pointer set to NULL resulting in SP reboot on it's access.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Unable to create a new pool LUN. (406240, 406998 / 39356912) <u>Frequency of occurrence:</u> Likely under a rare set of circumstances. <u>Severity:</u> Critical	Miscalculation on peer SP slice reservation counters resulted in incorrect storage consumption accounting.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	I/O request to pool LUN can fail. (406629 / 39343130) <u>Frequency of occurrence:</u> Infrequently under a rare set of circumstances. <u>Severity:</u> Critical	A possible deadlock on I/O request to a pool LUN section which currently being evacuated, removed and I/O request resulted in internal storage deallocation.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	I/O request could fail to a pool LUN during a trespass. (381919) <u>Frequency of occurrence:</u> Rarely under a rare set of circumstances. <u>Severity:</u> Critical	A race condition on internal object going to error condition and trespass of the related pool LUN prevented the LUN from going to ready state.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	A storage processor can bugcheck (7E) on pool LUN creation while the pool is still initializing.	An internal function may return an uninitialized value due to pool in initializing state causing the SP	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004

Platforms	Symptom details	Problem description	Solution (or workaround)
	(384530) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	to bugcheck.	04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	I/O requests to pool LUN could fail. (386936) <u>Frequency of occurrence:</u> Infrequently under a specific set of circumstances. <u>Severity:</u> Critical	There is a race condition where the query for LUN ready state occurs before the LUN object state gets a chance to clear its ready state transition flag.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	I/O requests to pool LUN can fail. (391556) <u>Frequency of occurrence:</u> Likely under a rare set of circumstances. <u>Severity:</u> Critical	The reservation counts did not account the meta data storage under particular condition on shrink, resulting incorrect accounting available for free storage.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	I/O request may fail on trespass of a pool LUN while compression is in progress. (393484) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Critical	A LUN object gets stuck as one thread is waiting on the other to return in a different thread context; while the other already has returned in the same thread context.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Unable to diagnose LUN offline situation under a particular condition. (401295) <u>Frequency of occurrence:</u> Likely under specific set of circumstances. <u>Severity:</u> Low	The reason code for LUN being taken offline requiring recovery was not logged.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511

## Fixed problems

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	Recovery of an offline LUN may fail. (368155) <u>Frequency of occurrence:</u> Likely under specific set of circumstances. <u>Severity:</u> Medium	Incorrect assumption that the internal last storage chunk always exists resulting in failure when it does not.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	I/O request to pool LUN may fail if storage processors rebooted while the Shrink operation is in progress. (372931) <u>Frequency of occurrence:</u> Infrequently under a rare set of circumstances. <u>Severity:</u> Critical	An internal component issued a functional call incorrectly under a particular condition, resulting in incorrect accounting on storage consumed by the pool LUN.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Storage processor bugcheck may occur on LUN recovery. (373872, 378583) <u>Frequency of occurrence:</u> Infrequently under a rare set of circumstances. <u>Severity:</u> Medium	A memory pointer was freed twice, resulting in a bugcheck.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	I/O requests can fail to pool LUNs. (374691) <u>Frequency of occurrence:</u> Rarely under a rare set of circumstances. <u>Severity:</u> Critical	A timing window resulting in two threads executed out of order than expected.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Pool LUN recovery may fail with 16TB consumed storage. (374968) <u>Frequency of occurrence:</u> Rarely	A container limitation of an internal structure size may result in failure to cover the 16TB of consumed storage	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005

Platforms	Symptom details	Problem description	Solution (or workaround)
	under a specific set of circumstances. <u>Severity</u> : Medium	LUN recovery.	04.30.000.5.509 04.30.000.5.511
All supported platforms	Pool LUN recovery may hang. (375290) <u>Frequency of occurrence</u> : Rarely under a rare set of circumstances. <u>Severity</u> : Medium	A locking problem resulted in deadlock.	<u>Fixed in version</u> : 04.30.00.5.512 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Pool LUN recovery may fail. (375451, 377054) <u>Frequency of occurrence</u> : Rarely under a rare set of circumstances. <u>Severity</u> : Medium	An incorrect reason code returned from an internal function.	<u>Fixed in version</u> : 04.30.00.5.512 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Unexpected storage processor reboot on pool LUN creation or trespass. (377277) <u>Frequency of occurrence</u> : Rarely under a rare set of circumstances. <u>Severity</u> : Medium	Access to NULL pointer.	<u>Fixed in version</u> : 04.30.00.5.512 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	I/O requests to pool LUN may fail on trespass of a LUN. (377288) <u>Frequency of occurrence</u> : Rarely under a rare set of circumstances. <u>Severity</u> : Critical	After a SP reboot during a particular internal operation the internal intent logging failed.	<u>Fixed in version</u> : 04.30.00.5.512 <u>Exists in versions</u> : 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511

## Fixed problems

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	The pool LUN is displayed incorrectly as faulted instead of offline on a double disk failure. (378244) <u>Frequency of occurrence:</u> Infrequently under a rare set of circumstances. <u>Severity:</u> Medium	An internal object is stuck in a state transition preventing it from going to offline state.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	I/O requests may fail to a pool LUN with FAST turned on for that LUN. (379201) <u>Frequency of occurrence:</u> Rarely under a specific set of circumstances. <u>Severity:</u> Critical	A timing window on data relocation, background check on the data and I/O requests to the same data region could result in inconsistent structure updates causing the LUN to be marked offline.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Storage processor may bugcheck (7E) during a pool LUN recovery. (381422) <u>Frequency of occurrence:</u> Rarely under a rare a set of circumstances. <u>Severity:</u> Low	Accessing NULL pointer resulted in an SP fault.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Unexpected storage processor bugcheck (0) on I/O requests to thin LUNs. (383319) <u>Frequency of occurrence:</u> Infrequently under a specific set of circumstances. <u>Severity:</u> Medium	An insufficient number of hash buckets in a hash table with large number of objects resulted in a lock timeout.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Pool LUN recovery of an offline pool LUN	Failed to set the appropriate flag in the	<u>Fixed in version:</u> 04.30.00.5.512

Platforms	Symptom details	Problem description	Solution (or workaround)
	may fail to complete under an error condition. (392284) <u>Frequency of occurrence:</u> Rarely under a rare set of circumstances. <u>Severity:</u> Low	internal structure on a particular error path.	<u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Pool LUN creation or I/O requests to a pool LUN may fail. (399648) <u>Frequency of occurrence:</u> Rarely under a specific set of circumstances. <u>Severity:</u> Critical	A race condition in repurposing a storage chunk from one operation to another caused a failure.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511
All supported platforms	Unexpected storage processor reboot may occur on consuming very large storage. (403798) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Critical	Incorrect memory allocation to a particular internal structure resulted in memory exhaustion.	<u>Fixed in version:</u> 04.30.00.5.512 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 04.30.000.5.511

### Problems fixed in version 04.30.000.5.511

Platforms	Symptom details	Problem description	Solution (or workaround)
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## Fixed problems

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	Trespassing a FAST Cache enabled pool LUN may result in a single storage processor bugcheck (0xe117b264) or the LUN failing to enable. (38191504/397153 38249280/398938 38599124/400350 38733948/401441) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Critical	Trespassing a FAST Cache enabled pool LUN may result in a single storage processor bugcheck (0xe117b264) or the LUN failing to enable if an I/O request is cancelled during the trespass.	<u>Fixed in version:</u> 04.30.000.5.511 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509
All supported platforms	I/O requests to pool LUNs could fail. (395166, 396757, 403198) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Critical	Incorrect handling of internal resources resulted in performance degradation and ultimately inability to service I/O requests.	<u>Fixed in version:</u> 04.30.000.5.511 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509
All supported platforms	Unexpected storage processor reboot. (various codes). (395529, 404011, 404231, 403582, 403168) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Critical	Sequential I/O to pool LUNs could result in an internal resource becoming exhausted, resulting in a storage processor reboot.	<u>Fixed in version:</u> 04.30.000.5.511 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509
All supported platforms	Storage processor reboots unexpectedly (code 0x7e). (398499, 397840, 397193) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances.	When a commit operation is done, following an upgrade from FLARE 29 to FLARE 30, a storage processor may reboot unexpectedly.	<u>Fixed in version:</u> 04.30.000.5.511 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509

Platforms	Symptom details	Problem description	Solution (or workaround)
	<u>Severity:</u> Medium		
All supported platforms	Memory leak in Virtual Provisioning feature could lead to management restarts or SP Panics. (38442962 / 399255 38809228 / 402243 38825338 / 402934 38703796 / 403149) <u>Frequency of occurrence:</u> Always under a specific set of circumstances. <u>Severity:</u> Medium	Memory leak in Virtual Provisioning feature could lead to management restarts or SP Panics.	Fixed in code <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.509 <u>Fixed in version:</u> 04.30.000.5.511

#### Problems fixed in version 04.30.000.5.509

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	Space not reclaimed after LUN shrink. (381959) <u>Frequency of occurrence:</u> Always under a specific set of circumstances. <u>Severity:</u> Medium	If a LUN exists before a storage system is upgraded to FLARE Release 30, and is then shrunk, the space saved is not made available for reuse.	<u>Fixed in version:</u> 04.30.000.5.509 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005
All supported platforms	Cannot create thin LUNs. (37395890 / 389018) <u>Frequency of occurrence:</u> Unlikely under a specific set of circumstances. <u>Severity:</u> Critical	Following an upgrade to FLARE Release 30 and a commit, in some cases thin LUNs could no longer be created.	<u>Fixed in version:</u> 04.30.000.5.509 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005

## Fixed problems

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	Thin LUN may become inaccessible after an NDU. (37010678 / 385377) <u>Frequency of occurrence:</u> Unlikely under a specific set of circumstances. <u>Severity:</u> Critical	If I/O is ongoing during an upgrade to FLARE Release 30, the upgrade may fail and leave thin LUNs inaccessible.	<u>Fixed in version:</u> 04.30.000.5.509 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005
All supported platforms	Alerts that a pool is becoming full are not generated. (37075318 / 387037 37184264 / 387424) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Medium	Following an upgrade to FLARE Release 30, Unisphere may fail to display alerts as a pool becomes full, possibly allowing the pool to become full without notification.	<u>Fixed in version:</u> 04.30.000.5.509 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005
All supported platforms	Thin LUN recovery could fail. (36450378 / 381193) <u>Frequency of occurrence:</u> Unlikely under a specific set of circumstances. <u>Severity:</u> Critical	Recovery of a thin LUN could fail, resulting in a loss of data from the LUN.	<u>Fixed in version:</u> 04.30.000.5.509 <u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005

### Problems fixed in version 04.30.000.5.005

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	Possible impact to pre-existing Thin LUNs after NDU to R30 software. (381817) <u>Frequency of occurrence:</u> Infrequent <u>Severity:</u> High	After an upgrade to R30, any storage allocated to a pre-existing Thin LUN could potentially be freed if the SP owning the Thin LUN is rebooted prior to a commit of R30 software.	<u>Exists in versions:</u> 04.30.000.5.004 <u>Fixed in version:</u> 04.30.000.5.005

### Problems fixed in version 04.30.000.5.004

This is the initial release of Virtual Provisioning for thick LUNs.

The following table describes the solutions for various problems with thin provisioning.

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	A single SP panic may occur after recovering thin LUNs that were cache dirty. (234605) <u>Frequency of occurrence</u> : Rare <u>Severity</u> : Medium	Fixing cache dirty conditions could result in a data inconsistency that leaves the SP vulnerable to the panic on a rare timing related condition.	<u>Fixed in version</u> : 04.30.000.5.004 <u>Exists in versions</u> : 04.29.000.5.001 04.28.000.5.501 04.28.000.5.504 04.28.000.5.704
All supported platforms	A single SP panic could occur if the CPU usage is above 80% and more than 1000 thin LUNs are present on the storage system. The following events may trigger this panic: <ul style="list-style-type: none"> <li>• Enabling/disabling performance statistics.</li> <li>• Enabling/disabling cache settings.</li> <li>• Disk failures.</li> <li>• Back-end bus failures.</li> </ul> (231270) <u>Frequency of occurrence</u> : Rare <u>Severity</u> : Medium	When a very high CPU load exists on a storage system in a large configuration, the extra load that the events generate is not serviced fast enough and causes a timeout.	<u>Fixed in version</u> : 04.30.000.5.004 <u>Exists in versions</u> : 04.29.000.5.001 04.28.000.5.501 04.28.000.5.504 04.28.000.5.704

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	Thin LUNs being destroyed are not displayed under the thin pool that owns the LUNs in Unisphere. (217247) <u>Frequency of occurrence:</u> Always <u>Severity:</u> Low	The association between the thin LUN and its thin pool is not displayed in the UI while the thin LUN is being destroyed. This may lead you to believe that the thin pool no longer has the thin LUN although the LUN is still in the process of being destroyed.	<u>Fixed in version:</u> 04.30.000.5.004 <u>Exists in version:</u> 04.29.000.5.001
All supported platforms	Failed thin pool expansion operations must be cancelled before the thin pool can be destroyed. (211695) <u>Frequency of occurrence:</u> Frequently <u>Severity:</u> Low	If a thin pool expansion operation fails for any reason, you cancel the failed thin pool expansion before the thin pool can be destroyed. If you attempt to destroy a thin pool that has a failed expansion, the thin pool will not be destroyed and you will see an error message indicating that you must cancel the failed expansion first.	<u>Fixed in version:</u> 04.30.000.5.004 <u>Exists in versions:</u> 04.29.000.5.001 04.28.000.5.501 04.28.000.5.504 04.28.000.5.704
All supported platforms	A single-SP panic may occur under a heavy I/O load to a large number of thin LUNs (more than 100). (221954) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances <u>Severity:</u> Medium	If many writes on a large number of thin LUNs hit a specific boundary condition at the same time on all thin LUNs, a single SP panic is possible.	<u>Fixed in version:</u> 04.30.000.5.004 <u>Exists in versions:</u> 04.29.000.5.001 04.28.000.5.501 04.28.000.5.504 04.28.000.5.704

## Known problems and limitations

This section identifies:

- ◆ Current bugs likely to be of interest to all customers
- ◆ Functionality that is intentionally not included, but may be expected
- ◆ Issues that may arise, such as known performance limits under certain conditions

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	<p>Large configurations may not be able to achieve theoretical maximum capacity of pool LUNs.</p> <p><u>Frequency of occurrence</u> Always under a specific set of circumstances.</p> <p><u>Severity</u> Medium</p>	<p>With the introduction of 3TB drives in version 04.30.000.5.524, the memory of the storage system is not sufficient to support the theoretical maximum number of pool-based LUNs. Attempting to bind a pool LUN beyond the supportable capacity will fail with an error.</p>	<p>None</p> <p><u>Exists in versions:</u> 04.30.000.5.524 04.30.000.5.525</p>
All supported platforms	<p>Thin LUNs and thin pools were not reported as Faulted after a single SP back-end path failure to a thin pool. (204861)</p> <p><u>Frequency of occurrence:</u> Infrequent</p> <p><u>Severity:</u> Low</p>	<p>If a single SP back-end path failure occurred to one or more drives that make up a thin pool, the thin pool and its thin LUNs may not transition to the Faulted state.</p>	<p>If there is a single SP back-end path failure to drives in a thin pool, an alert will be generated to inform you of the failure(s).</p> <p><u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.507 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522 04.30.000.5.523 04.30.000.5.524 04.30.000.5.525</p>

## Known problems and limitations

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	<p>The pool LUN is reported as READY instead of NOT READY when the pool the LUN belongs to requires recovery. (373411)</p> <p><u>Frequency of occurrence:</u> Likely under a specific set of circumstances.</p> <p><u>Severity:</u> Low</p>	<p>The LUN may report its status as READY when a pool requires recovery. This causes migration to be stuck once the pool comes online.</p>	<p>If any interrupted LUN migrations do not automatically restart after a pool comes back online, manually trespass the migrating LUN to restart the migration.</p> <p><u>Exists in version:</u>            04.30.000.5.004            04.30.000.5.005            04.30.000.5.507            04.30.000.5.509            04.30.000.5.511            04.30.000.5.512            04.30.000.5.517            04.30.000.5.522            04.30.000.5.523            04.30.000.5.524            04.30.000.5.525</p>
All supported platforms	<p>The pool may never be reported as 100% consumed, even after receiving I/O errors, because there is no pool space. (372356)</p> <p><u>Frequency of occurrence:</u> Likely under a specific set of circumstances.</p> <p><u>Severity:</u> Low</p>	<p>Even after all the available storage has been consumed from a pool, it may continue to report 99% consumption while failing writes that require additional storage to be allocated.</p>	<p>To avoid write failures due to unavailable pool storage, proactively add new storage or free up storage to a pool once alerts that indicate the available pool space is getting low are generated.</p> <p><u>Exists in version:</u>            04.30.000.5.004            04.30.000.5.005            04.30.000.5.507            04.30.000.5.509            04.30.000.5.511            04.30.000.5.512            04.30.000.5.517            04.30.000.5.522            04.30.000.5.523            04.30.000.5.524            04.30.000.5.525</p>
All supported platforms	Active LUN shrink and LUN expansion	Once a LUN shrink or LUN expansion	If a LUN shrink or LUN expansion

Platforms	Symptom details	Problem description	Solution (or workaround)
	<p>operations may fail with status 0xc0000010 after an SP failure with heavy I/O in progress occurs. (371961)</p> <p><u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Low</p>	<p>resumes on the peer SP after an SP failure, the SP will attempt to quiesce the LUN. If an evacuation operation is in progress on the LUN when the SP attempts to quiesce that LUN, the evacuation operation will fail.</p>	<p>operation fails with status 0xc0000010, manually trespassing the LUN will resume the failed operation.</p> <p><u>Exists in version:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.507 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522 04.30.000.5.523 04.30.000.5.524 04.30.000.5.525</p>
All supported platforms	<p>The pool creation may fail if it is running while the peer SP is booting. (350674)</p> <p><u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Low</p>	<p>A timing window exists where the creation of internal components of the pool may fail while the peer SP is booting. If this component creation is performed as part of a pool creation, the operation will fail and will display this error Bind request failed because it was rejected by the peer SP board.</p>	<p>If a pool creation fails with the error message Bind request failed because it was rejected by the peer SP board, delete the failed pool, wait for the peer SP to complete booting, and retry the pool creation operation.</p> <p><u>Exists in version:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.507 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522 04.30.000.5.523 04.30.000.5.524 04.30.000.5.525</p>

**Known problems and limitations**

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	<p>Expected storage may not be returned to the pool after a LUN shrink operation. (349167)</p> <p><u>Frequency of occurrence:</u> Likely under a specific set of circumstances.</p> <p><u>Severity:</u> Low</p>	<p>For performance optimization, the storage is prefetched for pool LUNs. Therefore, shrinking a LUN will not return all the storage previously assigned to the "shrunken" portion of the LUN.</p>	<p>No exact solution exists for this particular issue. However, if you need to add more storage to a pool, you can expand the pool by adding drives or free more storage by shrinking or deleting LUNs.</p> <p><u>Exists in version:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.507 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522 04.30.000.5.523 04.30.000.5.524 04.30.000.5.525</p>
All supported platforms	<p>A single SP panic could occur while I/O is in progress on a storage system that has maximum thin LUNs. (369144)</p> <p><u>Frequency of occurrence:</u> Very rare</p> <p><u>Severity:</u> Medium</p>	<p>On a storage system with the maximum number of thin LUNs and with many thin LUNs consuming the maximum capacity, I/O that occurs in a certain pattern to thin LUNs that are not 100% consumed can cause a single SP panic. If the I/O is sent in a burst to a large set of thin LUNs, and then to another large set of thin LUNs and so on, memory exhaustion can occur, causing an SP to panic. The SP will return to functioning as usual after the panic and will behave normally. The peer</p>	<p>Avoid writing to thin LUNs in the pattern defined in the "Problem description" section. If an SP panic occurs because data is written in this particular pattern, the SP will return to its usual functioning and behave normally. The peer SP will continue to service the I/O to all thin LUNs.</p> <p><u>Exists in version:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.507 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517</p>

Platforms	Symptom details	Problem description	Solution (or workaround)
		SP will continue to service the I/O to all thin LUNs until the SP returns to normal functioning.	04.30.000.5.522 04.30.000.5.523 04.30.000.5.524 04.30.000.5.525
All supported platforms	I/O to pool LUNs may receive a busy status during trespassing of 1024 mirrored thick LUNs with heavy I/O going to the LUNs. (368420) <u>Frequency of occurrence:</u> Likely under a specific set of circumstances. <u>Severity:</u> Low	You can encounter this error when the system is very busy due to heavy I/O or to thousands of mirrored pool LUNs trespassing at the same time. This situation causes pool LUN objects to deactivate and activate on the peer SP. Due to the large number of these objects and the heavy I/O load, the system returns a busy status during I/O until the objects reach ready state.	Avoid trespassing the maximum number of pool LUNs at the same time while the storage system is under a heavy I/O load. Once the LUNs have successfully trespassed, you can resume the heavy I/O load. <u>Exists in version:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.507 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522 04.30.000.5.523 04.30.000.5.524 04.30.000.5.525

Platforms	Symptom details	Problem description	Solution (or workaround)
All supported platforms	<p>After an upgrade to version 04.30, any storage deallocated from a pre-existing thin LUN is available for reuse only to that thin LUN. (381959, 382132)</p> <p><u>Frequency of occurrence:</u> Always under a specific set of circumstances.</p> <p><u>Severity:</u> Low</p>	<p>After an upgrade to version 04.30, any storage deallocated from a pre-existing thin LUN (as a result of the shrinking of a pre-existing thin LUN or doing WRITE_SAME zeroes to a pre-existing thin LUN) is available only to that thin LUN for reuse when that storage should be available to all thin LUNs in the pool.</p>	<p>Create a new Thin LUN after committing the R30 code base and migrate the pre-existing Thin LUN to it. This will allow the deallocated storage to be returned back to the pool for other Thin LUNs in the pool to use.</p> <p><u>Exists in version:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.507 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522 04.30.000.5.523 04.30.000.5.524 04.30.000.5.525</p>
All supported platforms	<p>A storage pool incorrectly reported a successful recovery operation as failed on one SP after a previous recovery attempt failed. (470954)</p> <p><u>Frequency of occurrence:</u> Always under a specific set of circumstances.</p> <p><u>Severity:</u> Low</p>	<p>If a pool recovery operation fails, the failed status is (correctly) reported to the user. However, following a second (successful) recovery, the earlier failure status is still (incorrectly) reported on one SP.</p>	<p>Force a full poll from Unisphere.</p> <p><u>Exists in versions:</u> 04.30.000.5.004 04.30.000.5.005 04.30.000.5.507 04.30.000.5.509 04.30.000.5.511 04.30.000.5.512 04.30.000.5.517 04.30.000.5.522 04.30.000.5.523 04.30.000.5.524 04.30.000.5.525</p>

## Technical notes

This section includes the technical information for Virtual Provisioning.

### Generic notes (apply to all platforms)

#### Storage pools and vault drives

You cannot use the vault drives (the first five drives in a storage system) to create or expand a storage pool.

#### Available space in a storage pool

When you destroy or shrink a pool LUN, available space in a storage pool is not updated immediately. Although you can no longer see the pool LUN or the old LUN size, the space it had consumed is incrementally added back to the storage pool in a background process.

#### Pool consumption alerts and thick LUNs

Alerts are generated when a storage pool's consumption threshold has been reached, as well as at regular intervals, until the pool runs out of space. This gives storage administrators time to either add new storage to the pool, or free up storage currently allocated from the pool.

However, if you create a large thick LUN which consumes the remaining storage in a pool, storage administrators may not have sufficient time to add storage before write failures begin occurring to the thin LUN in that pool.

#### SnapView rollback limit

Limit the number of SnapView rollbacks in progress at one time to 64. If more than 64 rollbacks are in progress at one time, a single SP panic may occur. (208424)

#### Host interaction

Plan for the intended growth rate of pool LUNs and have contingencies for over-provisioning. By doing this, you can set a consumption threshold for generating warnings to help monitor storage pool usage. For example, warnings can be set when the pool consumption goes above 75 percent of its capacity, that is, when only 25 percent free space is remaining in the pool. When the pool LUNs associated with the storage pool consumes all the available space from the pool, any writes to a thin LUN region that is unallocated will fail. Under these conditions,

host applications may produce unexpected failures.

The used space reported by Navisphere for a thin LUN can vary from the usage reported by the OS on an attached host, depending on the operating system and where the operating system chooses to write.

Solaris native multipath failover, known as MPxIO or StorEdge Traffic Manager (STMS), cannot take control of thin LUNs in the storage system's default Active/Passive (PNR) failover mode. The workaround is for MPxIO to take control of thin LUNs in ALUA failover mode (Failover Mode = 4).

### **Maximum limits**

A system configured with the maximum number of pool LUNs supported on that platform may not be able to support the creation of the maximum number of all replication objects (clones, snapshots, and so on) due to resource exhaustion.

Similarly, a system configured with the maximum number of replication objects (clones, snapshots, and so on) may not be able to support the creation of the maximum number of pool LUNs. (209108, 209538)

### **LUN IDs**

If you assign a LUN ID of 2000 or higher, you may receive a message that this ID is already being used by a private FLARE LUN. If you receive this message, assign a new ID to the LUN, preferably one that is 1999 or lower. (210421)

### **Write cache disabled**

If you run a storage system with the write cache disabled, it may take several minutes to complete certain storage pool and pool LUN operations. Disabling the write cache may also result in the timeout of host I/O.

### **Deleting an offline pool**

If a storage pool that contains LUNs is offline, and cannot be brought back online, you will not be able to destroy the pool. A service call will be required to clean up the failed pool and its LUNs.

### **Deleting LUNs in an offline pool**

If you delete a LUN in an offline pool, the system will only mark the LUN to be deleted. The LUN will not be deleted until the storage pool comes back online. When this happens, the pool will automatically

destroy the LUN. There is no way to determine if a LUN in an offline storage pool has been marked for deletion.

### Thick LUN consumption per tier

When you create a thick LUN, the pool storage required for that thick LUN is not actually allocated, but rather it is reserved. Since these reservations are based on the pool rather than the tier, this reserved storage is not reflected in the tier breakdown at the thick LUN level until the thick LUN is written to and the storage is actually allocated.

Additionally, when you set a tiering preference for a thick LUN, the storage is reserved for the LUN only, even if the thick LUN appears to be fully provisioned. Since these reservations are not made on a per-tier level, by the time the data is actually allocated to the thick LUN as the result of a write, the originally requested tier of storage may no longer be available. If you enable FAST, this problem will be resolved during subsequent relocations.

### Pool LUNs and replication private LUNs

You cannot use pool LUNs as private LUNs (Clones Private LUN, MirrorView Write Intent Log LUN) for SnapView and MirrorView replication software. You cannot use thin LUNs in a reserved LUN pool.

### Pool LUN offset

Pool LUNs that are a maximum size (14 TB) and have an offset greater than 2 TB do not support compression.

### Pool management

In order to create a pool with the maximum number of drives, you must add some drives to pools during creation and then expand the pool by adding more drives in increments.

### Commit required

In order to perform pool and LUN management the FLARE 04.30 software must be committed.

## Documentation

[Table 3](#) lists the documents and help that apply to Virtual Provisioning. The most up-to-date documentation and help are available in the EMC

Unisphere help.

**Table 3: Available documentation**

Part number	Name
Online help	Unisphere help (available in the Unisphere UI) The Unisphere online help describes how to configure and manage Celerra and CLARiiON systems using the Unisphere GUI. The Help system is also available from the Unisphere help buttons and Help icons.
069-001-181	<i>EMC SnapView Command Line Interface Reference</i>

## Software media, organization, and files

[Table 4](#) lists the applicable software media for this product version:

**Table 4: Software media**

Part number	Description
053-002-301	EMC Thin Provisioning Enabler - CX4 Series

## Installation

To install Virtual Provisioning software on a storage system, use the Unisphere Service Manager (USM). To enable thin provisioning, install the Thin Provisioning enabler. You can download the USM from the Powerlink website. Unless noted otherwise, EMC recommends that a service provider perform the installation or update.

### Installation notes

**IMPORTANT:** When you install new software on a storage system, do not remove or reboot a storage processor while installation is in progress. If you do, you risk leaving the storage system in a transient state where it cannot be restarted. Wait for the entire upgrade process including the automatic reboot of the storage processors to complete.

## Troubleshooting and getting help

This section provides specific instructions for contacting EMC Customer Service and obtaining additional information about EMC products.

**Where to get help**

EMC support, product, and licensing information can be obtained as follows.

**Product information**

For documentation, release notes, software updates, or for information about EMC products, licensing, and service, go to the EMC Powerlink website (registration required) at: <http://Powerlink.EMC.com>

**Technical support**

For technical support, go to Powerlink and choose Support. On the Support page, you will see several options, including one for making a service request. To open a service request, you must have a valid support agreement. Contact your EMC sales representative for details about obtaining a valid support agreement or with questions about your account.

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