AssuredSAN Pro 5000 Series
Events Reference Guide

Adobe PostScript

Contents

About this guide

This guide describes events that the AssuredSAN™ Pro 5000 Series storage system may report and recommended actions to take in response to those events. It also gives more details for troubleshooting leftover disks, using the scrub utility, and warnings for usage of the `trust` command.

Intended audience

This guide is intended for storage system administrators and service personnel.

Prerequisites

Prerequisites for using this product include knowledge of:

- Network administration
- Storage system configuration
- SAN management and DAS
- FC, SAS, and Ethernet protocols
- RAID technology

Before you begin to follow procedures in this guide, you must have already installed enclosures and learned of any late-breaking information related to system operation, as described in the Setup Guide and in Release Notes.

Related documentation

For information about	See
Enhancements, known issues, and late-breaking information not included in product documentation	Release Notes
Overview of product shipkit contents and setup tasks	Getting Started*
Regulatory compliance and safety and disposal information	AssuredSAN Product Regulatory Compliance and Safety*
Installing and using optional host-based software components (CAPI Proxy, MPIO DSM, VDS Provider, VSS Provider, SES Driver)	AssuredSAN Installing Optional Software for Microsoft Windows® Server
Recommendations for using optional data-protection features (AssuredSnap, AssuredCopy, AssuredRemote)	AssuredSAN Pro 5000 Series Using Data Protection Software
Using a rackmount bracket kit to install an enclosure into a rack	AssuredSAN Rackmount Bracket Kit Installation* *or* AssuredSAN 2-Post Rackmount Bracket Kit Installation*
Product hardware setup and related troubleshooting	AssuredSAN Pro 5000 Series Setup Guide
Obtaining and installing a license to use licensed features	AssuredSAN Pro 5000 Series Obtaining and Installing a License Certificate File
Using the web interface to configure and manage the product	AssuredSAN Pro 5000 Series Storage Management Console User Guide
Using the CLI to configure and manage the product	AssuredSAN Pro 5000 Series CLI Reference Guide
Identifying and installing or replacing FRUs	AssuredSAN Pro 5000 Series FRU Installation and Replacement Guide

* Printed document included in product shipkit.

For additional information, see Dot Hill's Customer Resource Center (CRC) web site: http://crc.dothill.com.

Document conventions and symbols

Table 1 Document conventions

Convention	Element
Blue text	Cross-reference links and e-mail addresses
Blue, underlined text	Web site addresses
Bold font	• Key names • Text typed into a GUI element, such as into a box • GUI elements that are clicked or selected, such as menu and list items, buttons, and check boxes
Italics font	Text emphasis
`Monospace font`	• File and directory names • System output • Code • Text typed at the command-line
`Monospace, italic font`	• Code variables • Command-line variables
`Monospace, bold font`	Emphasis of file and directory names, system output, code, and text typed at the command line

△ **CAUTION:**   Indicates that failure to follow directions could result in damage to equipment or data.

📝 **IMPORTANT:**   Provides clarifying information or specific instructions.

📝 **NOTE:**   Provides additional information.

☼ **TIP:**   Provides helpful hints and shortcuts.

1   Event descriptions

Introduction

This guide is for reference by storage administrators and technical support personnel to help troubleshoot storage-system issues. It describes event messages that may be reported during system operation and specifies any actions recommended in response to an event.

Events and event messages

When an event occurs in a storage system, an event message is recorded in the system's event log and, depending on the system's event notification settings, may also be sent to users (using email) and host-based applications (via SNMP or SMI-S).

Each event has a numeric code that identifies the type of event that occurred, and has one of the following severities:

- Critical: A failure occurred that may cause a controller to shut down. Correct the problem *immediately*.
- Error: A failure occurred that may affect data integrity or system stability. Correct the problem as soon as possible.
- Warning: A problem occurred that may affect system stability but not data integrity. Evaluate the problem and correct it if necessary.
- Informational: A configuration or state change occurred, or a problem occurred that the system corrected. No immediate action is required. In this guide, this severity is abbreviated as "Info."

An event message may specify an associated error code or reason code, which provides additional detail for technical support. Error codes and reason codes are outside the scope of this guide.

Event format in this guide

This guide lists events by event code and severity, where the most severe form of an event is described first. Events are listed in the following format.

Event code

Severity   Event description.

Recommended actions

- If the event indicates a problem, actions to take to resolve the problem.

Resources for diagnosing and resolving problems

For further information about diagnosing and resolving problems, see:

- The troubleshooting chapter and the LED descriptions appendix in your product's documentation
- The topics about verifying component failure in your product's documentation
- For a summary of storage events and corresponding SMI-S indications, see Events sent as indications to SMI-S clients on page 66.

Event descriptions

1

Warning If the indicated storage-pool component uses RAID 6, it is operating with degraded health due to the failure of two disks.

If the indicated storage-pool component does not use RAID 6, it is operating with degraded health due to the failure of one disk. The storage-pool component is online but cannot tolerate another disk failure.

If a spare disk of the proper type and size is present, that spare is used to automatically reconstruct the storage-pool component; events 9 and 37 are logged to indicate this.

Recommended actions

- If no spare was present (that is, event 37 was *not* logged), replace the failed disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity. The new disk will be used to automatically reconstruct the storage-pool component; confirm this by checking that events 9 and 37 are logged.
- Otherwise, reconstruction automatically started and event 37 was logged. Replace the failed disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity.
- For continued optimum I/O performance, the replacement disk should have the same or better performance.
- Confirm that all failed disks have been replaced

3

Error The indicated storage-pool component went offline.

Three disks failed for RAID 6, or two disks failed for other RAID levels. The storage-pool component cannot be reconstructed. In most cases, the data in the storage-pool component will be automatically migrated to another storage tier so no user data is lost. Data will be lost only if the disk failures occur in rapid succession so there is not enough time to migrate the data, or if there is insufficient space to fit the data in another tier, or if failed disks are not replaced promptly by the user.

Recommended actions

- Replace the failed disk or disks. (Look for event 8 in the event log to determine which disks failed and for advice on replacing them.)
- Delete the storage-pool component (`remove storage` CLI command).
- Re-create the storage-pool component (`add storage` CLI command).
- To prevent this problem in the future, replace failed disks promptly.

4

Info. The indicated disk had an uncorrectable error and the controller reassigned the indicated block.

Recommended actions

- Monitor the error trend and whether the number of errors approaches the total number of bad-block replacements available.

6

Warning A failure occurred during initialization of the indicated storage-pool component. This was probably caused by the failure of a disk drive. The initialization may have completed but the storage-pool component probably has a status of FTDN (fault tolerant with a down disk), CRIT (critical), or OFFL (offline), depending on the RAID level and the number of disks that failed.

Recommended actions

- Look for another event logged at approximately the same time that indicates a disk failure, such as event 55, 58, or 412. Follow the recommended actions for that event.

Info. Creation of a storage-pool component failed immediately. The user was given immediate feedback that it failed at the time they attempted to create it.

Recommended actions

- No action is required.

7

Error In a testing environment, a controller diagnostic failed and reports a product-specific diagnostic code.

Recommended actions

- Perform failure analysis.

8

Warning The indicated disk in the indicated storage-pool component failed and the storage-pool component probably has a status of FTDN (fault tolerant with a down disk), CRIT (critical), or OFFL (offline), depending on the RAID level and the number of disks that failed. If a spare is present and the storage-pool component is not offline, the controller automatically uses the spare to reconstruct the storage-pool component. Subsequent events indicate the changes that happen to the storage-pool component.

When the problem is resolved, event 9 is logged.

Recommended actions

Table 2 Disk error conditions and recommended actions

Condition	Recommended action
Excessive media errors.	Replace the disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity. For continued optimum I/O performance, the replacement disk should have performance that is the same as or better than the one it is replacing.
Disk failure is imminent.	Replace the disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity. For continued optimum I/O performance, the replacement disk should have performance that is the same as or better than the one it is replacing.
The disk has a possible hardware failure.	Replace the disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity. For continued optimum I/O performance, the replacement disk should have performance that is the same as or better than the one it is replacing.
The disk is not supported.	Replace the disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity. For continued optimum I/O performance, the replacement disk should have performance that is the same as or better than the one it is replacing.
A user forced the disk out of the storage-pool component.	If the associated storage-pool component is offline or quarantined, contact technical support; otherwise, clear the disk's metadata to reuse the disk.

Table 2 Disk error conditions and recommended actions

Condition	Recommended action
Reconstruction of a storage-pool component failed. The disk has become leftover.	The indicated disk was being used as the target disk for reconstructing the indicated storage-pool component. While the storage-pool component was reconstructing, another disk in the storage-pool component failed and the status of the storage-pool component went to OFFL (offline). The indicated disk has a status of LEFTOVR (leftover).
	The CLI `trust` command may be able to recover some of the data in the storage-pool component. It will only be able to recover that portion of the data that had already been reconstructed on the target disk at the time the other disk failed. See the CLI help for the `trust` command. It is recommended that you contact technical support for assistance in determining if the trust operation is applicable to your situation and for assistance in performing it.
	If you choose to not use the `trust` command, perform these steps:
	• Delete the storage-pool component (`remove storage` CLI command).
	• Clear the indicated disk's metadata so the disk can be reused (`clear disk-metadata` CLI command).
	• Replace the failed disk or disks. (Look for other instances of event 8 in the event log to determine which disks failed.)
	• Re-create the storage-pool component (`add storage` CLI command).
A previously detected disk is no longer present.	Reinsert the disk or insert a replacement disk of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity as the one that was in the slot. For continued optimum I/O performance, the replacement disk should have performance that is the same as or better than the one it is replacing.
	If the disk then has a status of leftover (LEFTOVR), see clear the metadata to reuse the disk.
	If the associated storage-pool component is offline or quarantined, contact technical support.
Unknown reason	If the associated storage-pool component is offline or quarantined, contact technical support; otherwise, clear the disk's metadata to reuse the disk.

9

Info.   The indicated spare disk has been used in the indicated storage-pool component to bring it back to a fault-tolerant status.

Reconstruction of the storage-pool component starts automatically. This event indicates that a problem reported by event 8 is resolved.

Recommended actions

• No action is required.

16

Info.   The indicated disk has been designated a global spare.

Recommended actions

• No action is required.

18

Warning Reconstruction of the indicated storage-pool component failed.

When a disk fails, reconstruction is performed using a spare disk. However, this operation failed.

- Some of the data in the other disk(s) in the storage-pool component is unreadable (uncorrectable media error), so part of the data cannot be reconstructed.
- This is probably because the disk that was used as a replacement for the failed disk is also faulty. This failure may also be caused by a fault in the midplane of the enclosure that the disks are inserted into.

Recommended actions

- If you do not have a backup copy of the data in the storage pool, make a backup.
-
- Look for another event logged at approximately the same time that indicates a disk failure, such as event 8, 55, 58, or 412. Follow the recommended actions for that event.
- Remove the storage-pool component.
- Add the storage-pool component.
- Restore the data from the backup.
- If the problem then recurs for the same slot, replace the chassis- and midplane-FRU.

Info. Reconstruction of the indicated storage-pool component completed.

Recommended actions

- No action is required.

19

Info. A rescan has completed.

Recommended actions

- No action is required.

20

Info. Storage Controller firmware update has completed.

Recommended actions

- No action is required.

21

Error Verification of the indicated storage-pool component completed. Errors were found but not corrected.

- Perform a storage-pool-component scrub to find and correct the errors.

Warning Verification of the indicated storage-pool component did not complete because of an internally detected condition such as a failed disk.

If a disk fails, data may be at risk.

Recommended actions

- Resolve any non-disk hardware problems, such as a cooling problem or a faulty controller module, expansion module, or power supply.
- Check whether any disks in the storage-pool component have logged SMART events or unrecoverable read errors.
    - If so, replace the faulty disks. Before replacing a disk, confirm that a reconstruction is not currently running on the storage-pool component. It is also recommended to make a full backup of all the data in the storage-pool component before replacing disks. If more than one disk in the

storage-pool component has errors, replace the disks one at a time and allow reconstruction to complete after each disk is replaced.

Info.   Verification of the indicated storage-pool component failed immediately, was aborted by a user, or succeeded.

- No action is required.

23

Info.   Creation of a storage-pool component has started.

Recommended actions

- No action is required.

27

Info.   Cache parameters have been changed for the indicated storage-pool component.

Recommended actions

- No action is required.

28

Info.   Controller parameters have been changed.

This event is logged when general configuration changes are made; for example, utility priority, remote notification settings, user interface passwords, and network port IP values. This event is *not* logged when changes are made to storage-pool or volume configuration.

Recommended actions

- No action is required.

31

Info.   The indicated disk is no longer a spare.

Recommended actions

- No action is required.

32

Info.   of the indicated storage-pool component

Recommended actions

- No action is required.

33

Info.   Controller time/date has been changed.

This event is logged before the change happens, so the timestamp of the event shows the old time. This event may occur often if NTP is enabled

Recommended actions

- No action is required.

34

Info.   The controller configuration has been restored to factory defaults.

Recommended actions

- For an FC controller, restart it to make the default loop ID take effect.

37

Info.   of the indicated storage-pool component has started.

When complete, event 18 is logged.

Recommended actions

- No action is required.

39

Warning The sensors monitored a temperature or voltage in the warning range.

Recommended actions

- Check that the storage system's fans are running.
- Check that the ambient temperature is not too warm. The enclosure operating range is 5–40° C (41° F–104° F).
- Check for any obstructions to the airflow.
- Check that there is a module or blank plate in every module slot in the enclosure.
- If none of the above explanations apply, replace the controller module that reported the error.

When the problem is fixed, event 47 is logged.

40

Error   The sensors monitored a temperature or voltage in the failure range.

Recommended actions

- Check that the storage system's fans are running.
- Check that the ambient temperature is not too warm. The enclosure operating range is 5–40° C (41° F–104° F).
- Check that there is a module or blank plate in every module slot in the enclosure.
- If none of the above explanations apply, replace the controller module that reported the error.

When the problem is fixed, event 47 is logged.

43

Info.   The indicated storage-pool component has been deleted.

Recommended actions

- No action is required.

44

Warning The controller contains cache data for the indicated volume but the corresponding storage-pool component is not online.

Recommended actions

- Determine the reason why the disks comprising the storage-pool component are not online.
- If an enclosure is down, determine corrective action.
- If the storage-pool component longer needed, you can clear the orphan data; this will result in lost data.
- If the storage-pool component was not intentionally removed, see "Resources for diagnosing and resolving problems" in the WBI help for the event log panel, or the CLI help for the `show events` command.

47

Info. An error detected by the sensors has been cleared. This event indicates that a problem reported by event 39 or 40 is resolved.

Recommended actions

- No action is required.

49

Info. A lengthy SCSI maintenance command has completed. (This typically occurs during disk firmware update.)

Recommended actions

- No action is required.

50

Warning A correctable ECC error occurred in cache memory.

A correctable ECC error occurred in cache memory more than 10 times during a 24-hour period, indicating a probable hardware fault.

Recommended actions

- Replace the controller module that logged the events.

Warning A correctable ECC error occurred in cache memory.

This event is logged with Warning severity to provide information that may be useful to technical support, but no action is required now. It will be logged with Error severity if it is necessary to replace the controller module.

Recommended actions

- No action is required.

51

Error An uncorrectable ECC error occurred in cache memory more than once during a 48-hour period, indicating a probable hardware fault.

Recommended actions

- Replace the controller module that logged this event.

Warning An uncorrectable ECC error occurred in cache memory.

This event is logged with Warning severity to provide information that may be useful to technical support, but no action is required now. It will be logged with Error severity is it is necessary to replace the controller module.

Recommended actions

- No action is required.

55

Warning The indicated disk reported a SMART event.

A SMART event indicates impending disk failure.

Recommended actions

- Resolve any non-disk hardware problems, especially a cooling problem or a faulty power supply.
- Replace the faulty disk. Before replacing the disk, confirm that a reconstruction is not currently running on the storage-pool component. It is also recommended to make a full backup of all the data in the storage-pool component before replacing disks. If more than one disk in the storage-pool component has reported SMART events, replace the disks one at a time and allow reconstruction to complete after each disk is replaced.

56

Info.   A controller has powered up or restarted.

Recommended actions
- No action is required.

58

Error   A disk drive detected a serious error, such as a parity error or disk hardware failure.

Recommended actions
- Replace the disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity. For continued optimum I/O performance, the replacement disk should have performance that is the same as or better than the one it is replacing.

Warning A disk drive reset itself due to an internal logic error.

Recommended actions
- The first time this event is logged with Warning severity, if the indicated disk is not running the latest firmware, update the disk firmware.
- If this event is logged with Warning severity for the same disk more than five times in one week, and the indicated disk is running the latest firmware, replace the disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity. For continued optimum I/O performance, the replacement disk should have performance that is the same as or better than the one

Info.   A disk drive reported an event.

Recommended actions
- No action is required.

59

Warning The controller detected a parity event while communicating with the indicated SCSI device. The event was detected by the controller, not the disk.

Recommended actions
- If the event indicates that a disk or an expansion module is bad, replace the indicated device.

Info.   The controller detected a non-parity error while communicating with the indicated SCSI device. The error was detected by the controller, not the disk.

Recommended actions
- No action is required.

61

Error   The controller reset a disk channel to recover from a communication error. This event is logged to identify an error trend over time.

Recommended actions
- If the controller recovers, no action is required.
- View other logged events to determine other action to take.

62

Warning The indicated global spare disk has failed.

Recommended actions
- Replace the disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity. For continued optimum I/O performance, the replacement disk should have performance that is the same as or better than the one it is replacing.
- Configure the new disk as a spare.

65

Error   An uncorrectable ECC error occurred in cache memory on startup.

The controller is automatically restarted and its cache data is restored from the partner controller's cache.

Recommended actions

- Replace the controller module that logged this event.

68

Info.   The controller that logged this event is shut down, or both controllers are shut down.

Recommended actions

- No action is required.

71

Info.   The controller has started or completed failing over.

Recommended actions

- No action is required.

72

Info.   After failover, recovery has either started or completed.

Recommended actions

- No action is required.

73

Info.   The two controllers are communicating with each other and cache redundancy is enabled.

Recommended actions

- No action is required.

74

Info.   The FC loop ID for the indicated storage-pool component was changed to be consistent with the IDs of other storage-pool components. This can occur when disks that constitute a storage-pool component from an enclosure having a different FC loop ID.

This event is also logged by the new owning controller after ownership of a storage-pool component is changed.

Recommended actions

- No action is required.

75

Info.   The indicated volume's LUN has been unassigned because it conflicts with LUNs assigned to other volumes. This can happen when disks containing data for a mapped volume have been moved from one storage system to another.

Recommended actions

- If you want hosts to access the volume data in the inserted disks, map the volume with a different LUN.

76

Info.   The controller is using default configuration settings. This event occurs on the first power up, and might occur after a firmware update.

Recommended actions

• If you have just performed a firmware update and your system requires special configuration settings, you must make those configuration changes before your system will operate as before.

77

Info.   The cache was initialized as a result of power up or failover.

Recommended actions

• No action is required.

78

Warning This occurs when a disk in fails and there is no dedicated spare available and all global spares are too small or. There   are probably at least two failed disks in the system.

Recommended actions

• Replace each failed disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity. For continued optimum I/O performance, the replacement disk should have performance that is the same as or better than the one it is replacing.
• If one of the failed disks was a spare, configure the replacement disk as a spare.

79

Info.   A trust operation has completed for the indicated storage-pool component.

Recommended actions

• Be sure to complete the trust procedure as documented in the CLI help for the `trust` command.

80

Info.   The controller enabled or disabled the indicated parameters for one or more disks.

Recommended actions

• No action is required.

81

Info.   The current controller has unkilled the partner controller. The other controller will restart.

Recommended actions

• No action is required.

83

Info.   The partner controller is changing state (shutting down or restarting).

Recommended actions

• No action is required.

84

Warning The controller that logged this event forced the partner controller to fail over.

Recommended actions

• Download the debug logs from your storage system and contact technical support. A service technician can use the debug logs to determine the problem.

86

Info.   Host-port or disk-channel parameters have been changed.

             Recommended actions

             • No action is required.

87

Warning The mirrored configuration retrieved by this controller from the partner controller has a bad cyclic
         redundancy check (CRC). The local flash configuration will be used instead.

             Recommended actions

             • Restore the default configuration by using the `restore defaults` command, as described in the CLI
               Reference Guide.

88

Warning The mirrored configuration retrieved by this controller from the partner controller is corrupt. The local flash
         configuration will be used instead.

             Recommended actions

             • Restore the default configuration by using the `restore defaults` command, as described in the CLI
               Reference Guide.

89

Warning The mirrored configuration retrieved by this controller from the partner controller has a configuration level
         that is too high for the firmware in this controller to process.

             Recommended actions

             • The controller that logged this event probably has down-level firmware. Update the firmware on the
               down-level controller. Both controllers should have the same firmware versions.

             When the problem is resolved, event 20 is logged.

90

Info.   The partner controller does not have a mirrored configuration image for the current controller, so the current
             controller's local flash configuration is being used.

             This event is expected if the other controller is new or its configuration has been changed.

             Recommended actions

             • No action is required.

91

Error   In a testing environment, the diagnostic that checks hardware reset signals between controllers in
             Active-Active mode failed.

             Recommended actions

             • Perform failure analysis.

95

Error   Both controllers in an Active-Active configuration have the same serial number. Non-unique serial numbers
             can cause system problems; for example, WWNs are determined by serial number.

             Recommended actions

             • Remove one of the controller modules and insert a replacement, then return the removed module to be
               reprogrammed.

96

Info. Pending configuration changes that take effect at startup were ignored because customer data might be present in cache.

Recommended actions

- If the requested configuration changes did not occur, make the changes again and then use a user-interface command to shut down or restart the controller.

103

Info. The name has been changed for the indicated volume.

Recommended actions

- No action is required.

104

Info. The size has been changed for the indicated volume.

Recommended actions

- No action is required.

105

Info. The LUN (logical unit number) has been changed for the indicated volume.

Recommended actions

- No action is required.

106

Info. The indicated volume has been added to the indicated storage pool.

Recommended actions

- No action is required.

107

Error A serious error has been detected by the controller. In a single-controller configuration, the controller will restart automatically. In an Active-Active configuration, the partner controller will kill the controller that experienced the error.

Recommended actions

- Download the debug logs from your storage system and contact technical support. A service technician can use the debug logs to determine the problem.

108

Info. The indicated volume has been deleted.

Recommended actions

- No action is required.

109

Info. The statistics for the indicated volume have been reset.

Recommended actions

- No action is required.

111

Info.   The link for the indicated host port is up.

This event indicates that a problem reported by event 112 is resolved. For a system with FC ports, this event also appears after loop initialization.

Recommended actions

* No action is required.

112

Warning The link for the indicated host port has unexpectedly gone down.

Recommended actions

* Look for corresponding event 111 and monitor excessive transitions. If this event occurs more than 8 times per hour, it should be investigated.
* This event is probably caused by equipment outside of the storage system, such as faulty cabling or a faulty switch.
* If the problem is not outside of the storage system, replace the controller module that logged this event.

Info.   The link for the indicated host port has gone down because the controller is starting up.

Recommended actions

* No action is required.

114

Info.   The link for the indicated disk-channel port is down. Note that events 114 and 211 are logged whenever a user-requested rescan occurs and do not indicate an error.

Recommended actions

* Look for corresponding event 211 and monitor excessive transitions indicating disk problems. If more than 8 transitions occur per hour, see "Resources for diagnosing and resolving problems" in the WBI help for the event log panel, or the CLI help for the `show events` command.

116

Error   After a recovery, the partner controller was killed while mirroring write-back cache data to the current controller that logged this event. The controller that logged this event restarted to avoid losing the data in the partner controller's cache, but if the other controller does not restart successfully, the data will be lost.

Recommended actions

* To determine if data might have been lost, check whether this event was immediately followed by event 56 (Storage Controller booted up), closely followed by event 71 (failover started); the failover indicates that the restart did not succeed.

118

Info.   Cache parameters have been changed for the indicated volume.

Recommended actions

* No action is required.

127

Warning The controller has detected an invalid disk dual-port connection. This event indicates that a controller host port is connected to an expansion port instead of to a port on a host or a switch.

Recommended actions

* Disconnect the host port and expansion port from each other and connect them to the proper devices.

136

Warning Errors detected on the indicated disk channel have caused the controller to mark the channel as degraded.

Recommended actions

- Determine the source of the errors on the indicated disk channel and replace the faulty hardware.

When the problem is resolved, event 189 is logged.

139

Info. The Management Controller (MC) has powered up or restarted.

Recommended actions

- No action is required.

140

Info. The Management Controller (MC) is about to restart.

Recommended actions

- No action is required.

141

Info. This event is logged when the IP address used for management of the system has been changed by a user or by a DHCP server (if DHCP is enabled). This event is also logged during power up or failover recovery, even when the address has not changed.

Recommended actions

- No action is required.

152

Warning The Management Controller (MC) has not communicated with the Storage Controller (SC) for 15 minutes and may have failed.

This event is initially logged as Informational severity. If the problem persists, this event is logged a second time as Warning severity and the MC is automatically restarted in an attempt to recover from the problem. Event 156 is then logged.

Recommended actions

- If this event is logged only one time as Warning severity, no action is required.
- If this event is logged more than one time as Warning severity, do the following:
  - If you are now able to access the management interfaces of the controller that logged this event, do the following:
    - Check the version of the controller firmware and update to the latest firmware if needed.
    - If the latest firmware is already installed, the controller module that logged this event probably has a hardware fault. Replace the module.
  - If you are *not* able to access the management interfaces of the controller that logged this event, do the following:
    - Shut down that controller and reseat the module.
    - If you are then able to access the management interfaces, check the version of the controller firmware and update to the latest firmware if needed.
    - If the problem recurs, replace the module.

Info.   The Management Controller (MC) has not communicated with the Storage Controller (SC) for 160 seconds.

If communication is restored in less than 15 minutes, event 153 is logged. If the problem persists, this event is logged a second time as Warning severity.

> 📝 **NOTE:**   It is normal for this event to be logged as Informational severity during firmware update.

Recommended actions
- Check the version of the controller firmware and update to the latest firmware if needed.
- If the latest firmware is already installed, no action is required.

153

Info.   The Management Controller (MC) has re-established communication with the Storage Controller (SC).

Recommended actions
- No action is required.

154

Info.   New firmware has been loaded in the Management Controller (MC).

Recommended actions
- No action is required.

155

Info.   New loader firmware has been loaded in the Management Controller (MC).

Recommended actions
- No action is required.

156

Warning   The Management Controller (MC) has been restarted from the Storage Controller (SC) for the purpose of error recovery.

Recommended actions
- See the recommended actions for event 152, which is logged at approximately the same time.

Info.   The Management Controller (MC) has been restarted from the Storage Controller (SC) in a normal case, such as when initiated by a user.

Recommended actions
- No action is required.

157

Error   A failure occurred when trying to write to the Storage Controller (SC) flash chip.

Recommended actions
- Replace the controller module that logged this event.

158

Error   A correctable ECC error occurred in Storage Controller CPU memory.

A correctable ECC error occurred in CPU memory more than once during a 12-hour period, indicating a probable hardware fault.

Recommended actions

- Replace the controller module that logged the events.

Warning A correctable ECC error occurred in Storage Controller CPU memory.

This event is logged with Warning severity to provide information that may be useful to technical support, but no action is required now. It will be logged with Error severity is it is necessary to replace the controller module.

Recommended actions

- If this event occurs more than once during any 12-hour period, replace the controller module that logged the events.

161

Info.   One or more enclosures do not have a valid path to an enclosure management processor (EMP).

All enclosure EMPs are disabled.

Recommended actions

- Download the debug logs from your storage system and contact technical support. A service technician can use the debug logs to determine the problem.

162

Warning The host WWNs (node and port) previously presented by this controller module are unknown. In a dual-controller system this event has two possible causes:

- One or both controller modules have been replaced or moved while the system was powered off.
- One or both controller modules have had their flash configuration cleared (this is where the previously used WWNs are stored).

The controller module recovers from this situation by generating a WWN based on its own serial number.

Recommended actions

- If the controller module was replaced or someone reprogrammed its FRU ID data, verify the WWN information for this controller module on all hosts that access it.

163

Warning The host WWNs (node and port) previously presented by the partner controller module, which is currently offline, are unknown.

This event has two possible causes:

- The online controller module reporting the event was replaced or moved while the system was powered off.
- The online controller module had its flash configuration (where previously used WWNs are stored) cleared.

The online controller module recovers from this situation by generating a WWN based on its own serial number for the other controller module.

Recommended actions

- If the controller module was replaced or someone reprogrammed its FRU ID data, verify the WWN information for the other controller module on all hosts that access it.

166

Warning The RAID metadata level of the two controllers does not match, which indicates that the controllers have different firmware levels.

Usually, the controller at the higher firmware level can read metadata written by a controller at a lower firmware level. The reverse is typically not true. Therefore, if the controller at the higher firmware level failed, the surviving controller at the lower firmware level cannot read the metadata in disks that have failed over.

Recommended actions

- If this occurs after a firmware update, it indicates that the metadata format changed, which is rare. Update the controller with the lower firmware level to match the firmware level in the other controller.

167

Warning A diagnostic test at controller bootup detected an abnormal operation, which might require a power cycle to correct.

Recommended actions

- Download the debug logs from your storage system and contact technical support. A service technician can use the debug logs to determine the problem.

168

Error The indicated SES alert condition was detected in the indicated enclosure. This event is logged as Error severity when one of the power supplies in an enclosure has no power supplied to it or when a hardware failure is detected.

Recommended actions

- Check that all modules in the enclosure are fully seated in their slots and that their latches are locked.
- If the reported problem is with a power supply, perform these checks:
  - Check that each power supply module has its switch turned on (if equipped with a switch).
  - Check that each power cable is firmly plugged into both the power supply and a functional electrical outlet.
- If the reported problem is with a temperature sensor or fan or power supply, perform these checks:
  - Check that all of the enclosure's fans are running.
  - Check that the ambient temperature is not too warm. The enclosure operating range is 5°–40°C (41°–104°F).
  - Check for any obstructions to the airflow.
  - Check that there is a module or blank plate in every module slot in the enclosure.
- If none of the above resolve the issue, the indicated FRU has probably failed and should be replaced. The failed FRU will probably have an amber LED lit.

When the problem is resolved, event 169 is logged.

Warning The indicated SES alert condition was detected in the indicated enclosure.

Recommended actions

- Check that all modules in the enclosure are fully seated in their slots and that their latches are locked.
- If the reported problem is with a power supply, perform these checks:
  - Check that each power supply module has its switch turned on (if equipped with a switch).
  - Check that each power cable is firmly plugged into both the power supply and a functional electrical outlet.

- If the reported problem is with a temperature sensor or fan or power supply, perform these checks:
  - Check that all of the enclosure's fans are running.
  - Check that the ambient temperature is not too warm. The enclosure operating range is 5°–40°C (41°–104°F).
  - Check for any obstructions to the airflow.
  - Check that there is a module or blank plate in every module slot in the enclosure.
- If none of the above resolve the issue, the indicated FRU has probably failed and should be replaced. The failed FRU will probably have an amber LED lit.

When the problem is resolved, event 169 is logged.

Info.   The indicated SES alert condition was detected in the indicated enclosure.

Recommended actions

- No action is required.

169

Info.   The indicated SES alert condition has been cleared in the indicated enclosure. This event indicates that a problem reported by event 168 is resolved.

Recommended actions

- No action is required.

170

Info.   The last rescan detected that the indicated enclosure was added to the system.

Recommended actions

- No action is required.

171

Info.   The last rescan detected that the indicated enclosure was removed from the system.

Recommended actions

- No action is required.

172

Warning The indicated storage-pool component has been quarantined because not all of its disks are accessible. While the storage-pool component is quarantined, any some or all volumes in the storage-pool may respond with a check condition if access to them is attempted. If all of the disks become accessible, the storage-pool component will be dequarantined automatically with a resulting status of FTOL (fault tolerant and online). If not all of the disks become accessible but enough become accessible to allow reading from and writing to the storage-pool component, the storage-pool component will be dequarantined automatically with a resulting status of FTDN (fault tolerant with a down disk) or CRIT (critical); if a spare disk is available, reconstruction will begin automatically. When the storage-pool component has been removed from quarantine, event 173 is logged. For a more detailed discussion of quarantine, see the CLI help for the `dequarantine` command.

△ **CAUTION:**   Do not use the dequarantine operation as a recovery method when event 172 is logged. All data in the storage-pool component will be lost.

Recommended actions

- If event 173 has subsequently been logged for the indicated storage-pool component, no action is required; the storage-pool component has already been removed from quarantine.
- Otherwise, perform the following actions:
  - Check that all enclosures are powered on.
  - Check that all disks and I/O modules in every enclosure are fully seated in their slots and that their latches are locked.
  - Check that the SAS expansion cables are connected between each enclosure in the storage system.
  - Check that no disks have been removed from the system unintentionally.
  - Check for other events that indicate faults in the system and follow the recommended actions for those events.
- If the storage-pool component is still quarantined after performing the above steps, its data cannot be recovered.
  - Remove the storage-pool component.
  - Add the storage-pool component.
  - Restore the data from a backup, if available.

173

Info.   The indicated storage-pool component has been removed from quarantine.

Recommended actions

- No action is required.

174

Info.   Enclosure or disk firmware update has succeeded, been aborted by a user, or failed.

If the firmware update fails, the user will be notified about the problem immediately and should take care of the problem at that time, so even when there is a failure, this event is logged as Informational severity.

Recommended actions

- No action is required.

175

Info.   The network-port Ethernet link has changed status (up or down) for the indicated controller.

Recommended actions

- If this event is logged indicating the network port is up shortly after the Management Controller (MC) has booted up (event 139), no action is required.
- Otherwise, monitor occurrences of this event for an error trend. If this event occurs more than 8 times per hour, it should be investigated.
  - This event is probably caused by equipment outside of the storage system, such as faulty cabling or a faulty Ethernet switch.
  - If this event is being logged by only one controller in a dual-controller system, swap the network-port Ethernet cables between the two controllers. This will show whether the problem is outside or inside the storage system.
  - If the problem is not outside of the storage system, replace the controller module that logged this event.

176

Info.   The error statistics for the indicated disk have been reset.

Recommended actions

- No action is required.

177

Info.   Cache data were purged for the indicated missing volume.

Recommended actions

- No action is required.

181

Info.   One or more configuration parameters associated with the Management Controller (MC) have been changed, such as configuration for SNMP, SMI-S, email notification, and system strings (system name, system location, etc.).

Recommended actions

- No action is required.

182

Info.   All disk channels have been paused. I/O will not be performed on the disks until all channels are unpaused.

Recommended actions

- If this event occurs in relation to disk firmware update, no action is required. When the condition is cleared, event 183 is logged.
- If this event occurs and you are not performing disk firmware update, see "Resources for diagnosing and resolving problems" in the WBI help for the event log panel, or the CLI help for the `show events` command.

183

Info.   All disk channels have been unpaused, meaning that I/O can resume. An unpause initiates a rescan, which when complete is logged as event 19.

This event indicates that the pause reported by event 182 has ended.

Recommended actions

- No action is required.

185

Info.   An enclosure management processor (EMP) write command has completed.

Recommended actions

- No action is required.

186

Info.   Enclosure parameters have been changed by a user.

Recommended actions

- No action is required.

187

Info.   The write-back cache has been enabled.

Event 188 is the corresponding event that is logged when write-back cash is disabled.

Recommended actions

- No action is required.

188

Info.   Write-back cache has been disabled.

Event 187 is the corresponding even that is logged when write-back cache is disabled.

Recommended actions

- No action is required.

189

Info.   A disk channel that was previously degraded or failed is now healthy.

Recommended actions

- No action is required.

190

Info.   The controller module's supercapacitor pack has started charging.

This change met a condition to trigger the auto-write-through feature, which has disabled write-back cache and put the system in write-through mode. When the fault is resolved, event 191 is logged to indicate that write-back mode has been restored.

Recommended Actions:

- If event 191 is not logged within 5 minutes after this event, the supercapacitor has probably failed and the controller module should be replaced.

191

Info.   The auto-write-through trigger event that caused event 190 to be logged has been resolved.

Recommended Actions:

- No action is required.

192

Info.   The controller module's temperature has exceeded the normal operating range.

This change met a condition to trigger the auto-write-through feature, which has disabled write-back cache and put the system in write-through mode. When the fault is resolved, event 193 is logged to indicate that write-back mode has been restored.

Recommended Actions:

- If event 193 has not been logged since this event was logged, the over-temperature condition probably still exists and should be investigated. Another over-temperature event was probably logged at approximately the same time as this event (such as event 39, 40, 168, 307, 469, 476, or 477); see the recommended actions for that event.

193

Info.   The auto-write-through trigger event that caused event 192 to be logged has been resolved.

Recommended Actions:

- No action is required.

194

Info.   The Storage Controller in the partner controller module is not up.

This indicates that a trigger condition has occurred that has caused the auto-write-through feature to disable write-back cache and put the system in write-through mode. When the fault is resolved, event 195 is logged to indicate that write-back mode has been restored.

Recommended Actions:

- If event 195 has not been logged since this event was logged, the other Storage Controller is probably still down and the cause should be investigated. Other events were probably logged at approximately the same time as this event; see the recommended actions for those events.

195

Info.   The auto-write-through trigger event that caused event 194 to be logged has been resolved.

Recommended Actions:

- No action is required.

198

Info.   A power supply has failed.

This indicates that a trigger condition has occurred that has caused the auto-write-through feature to disable write-back cache and put the system in write-through mode. When the fault is resolved, event 199 is logged to indicate that write-back mode has been restored.

Recommended Actions:

- If event 199 has not been logged since this event was logged, the power supply probably does not have a health of OK and the cause should be investigated. Another power-supply event was probably logged at approximately the same time as this event (such as event 168); see the recommended actions for that event.

199

Info.   The auto-write-through trigger event that caused event 198 to be logged has been resolved.

Recommended Actions:

- No action is required.

200

Info.   A fan has failed.

This indicates that a trigger condition has occurred that has caused the auto-write-through feature to disable write-back cache and put the system in write-through mode. When the fault is resolved, event 201 is logged to indicate that write-back mode has been restored.

Recommended Actions:

- If event 201 has not been logged since this event was logged, the fan probably does not have a health of OK and the cause should be investigated. Another fan event was probably logged at approximately the same time as this event (such as event 168); see the recommended actions for that event.

201

Info.   The auto-write-through trigger event that caused event 200 to be logged has been resolved.

Recommended Actions:

- No action is required.

202

Info.   An auto-write-through trigger condition has been cleared, causing write-back cache to be re-enabled. The environmental change is also logged at approximately the same time as this event (event 191, 193, 195, 199, 201, and 241.)

Recommended actions

- No action is required.

203

Warning An environmental change occurred that allows write-back cache to be enabled, but the auto-write-back preference is not set. The environmental change is also logged at approximately the same time as this event (event 191, 193, 195, 199, 201, or 241).

Recommended actions

- Manually enable write-back cache.

204

Error   This event is generated by the hardware-flush firmware when the boot-processing firmware needs to inform the user about something.

The CompactFlash card is used for backing up unwritten cache data when a controller goes down unexpectedly, such as when a power failure occurs. This event is generated when the Storage Controller (SC) detects a problem with the CompactFlash as it is booting up.

Recommended actions

- Restart the Storage Controller that logged this event.
- If this event is logged again, shut down the Storage Controller, remove the controller module from the enclosure, replace the CompactFlash card (which is accessible from the rear of the controller module, as shown in your product's User Guide), and reinstall the controller module.
- If this event is then logged again, replace the controller module.

Warning This event is generated by the hardware-flush firmware when the boot-processing firmware needs to inform the user about something.

The CompactFlash card is used for backing up unwritten cache data when a controller goes down unexpectedly, such as when a power failure occurs. This event is generated when the Storage Controller (SC) detects a problem with the CompactFlash as it is booting up.

Recommended actions

- Restart the Storage Controller that logged this event.
- If this event is logged again, shut down the Storage Controller and replace the controller module.

Info.   This event is generated by the hardware-flush firmware when the boot-processing firmware needs to inform the user about something.

When logged as Informational severity, this event contains information that is primarily of interest to engineers.

Recommended actions

- No action is required.

205

Info.   The indicated volume has been mapped or unmapped.

Recommended actions

- No action is required.

206

Info.   Scrub of a storage-pool component has started.

The scrub checks disks in the storage-pool component for the following types of errors:

- Data parity errors for a RAID6 storage-pool component.
- Mirror verify errors for a RAID1 storage-pool component.
- Media errors for all RAID levels.

When errors are detected, they are automatically corrected.

When the scrub is complete, event 207 is logged.

Recommended actions

- No action is required.

207

Error   Scrub of a storage-pool component completed and found an excessive number of errors in the indicated storage-pool component.

This event is logged as Error severity when more than 100 parity or mirror mismatches are found and corrected during a scrub or when 1 to 99 parity or mirror mismatches are found and corrected during each of 10 separate scrubs of the same storage-pool component.

Recommended actions

- Resolve any non-disk hardware problems, such as a cooling problem or a faulty controller module, expansion module, or power supply.
- Check whether any disks in the storage-pool component have logged SMART events or unrecoverable read errors.
  - If so, replace the faulty disks. Before replacing a disk, confirm that a reconstruction is not currently running on the storage-pool component. It is also recommended to make a full backup of all the data in the storage-pool component before replacing disks. If more than one disk in the storage-pool component has errors, replace the disks one at a time and allow reconstruction to complete after each disk is replaced.

Warning   Scrub of a storage-pool component did not complete because of an internally detected condition such as a failed disk.

If a disk fails, data may be at risk.

Recommended actions

- Resolve any non-disk hardware problems, such as a cooling problem or a faulty controller module, expansion module, or power supply.
- Check whether any disks in the storage-pool component have logged SMART events or unrecoverable read errors.
  - If so, replace the faulty disks. Before replacing a disk, confirm that a reconstruction is not currently running in the storage-pool component. It is also recommended to make a full backup of all the data in the storage-pool component before replacing disks. If more than one disk in the storage-pool component has errors, replace the disks one at a time and allow reconstruction to complete after each disk is replaced.

Info.   Scrub of a storage-pool component completed or was aborted by a user.

This event is logged as Informational severity when fewer than 100 parity or mirror mismatches are found and corrected during a scrub.

This event is logged as Information severity when fewer than 100 parity or mirror mismatches are found and corrected during a scrub.

Recommended actions

- No action is required.

208

Info.   A scrub-disk job has started for the indicated disk. The result will be logged with event 209.

Recommended actions

- No action is required.

209

Error   A scrub-disk job logged with event 208 has completed and found one or more media errors, SMART events, or hard (non-media) errors.

Recommended actions

- Replace the disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity. For continued optimum I/O performance, the replacement disk should have performance that is the same as or better than the one it is replacing.

Warning   A scrub-disk job logged with event 208 has reassigned a disk block. These bad-block replacements are reported as "other errors".

Recommended actions

- Monitor the error trend and whether the number of errors approaches the total number of bad-block replacements available.

Info.   A scrub-disk job logged with event 208 has completed and found no errors, or a disk being scrubbed (with no errors found) has been added to a storage-pool component, or a user has aborted the job.

Recommended actions

- No action is required.

210

Info.   All snapshots have been deleted for the indicated master volume or snap pool.

Recommended actions

- No action is required.

211

Warning   SAS topology has changed; no elements are detected in the SAS map. The message specifies the number of elements in the SAS map, the number of expanders detected, the number of expansion levels on the native (local controller) side and on the partner (partner controller) side, and the number of device PHYs.

Recommended actions

- Perform a rescan to repopulate the SAS map.
- If a rescan does not resolve the problem, then shut down and restart both Storage Controllers.
- If the problem persists, see "Resources for diagnosing and resolving problems" in the WBI help for the event log panel, or the CLI help for the `show events` command.

Info.   SAS topology has changed; the number of SAS expanders has increased or decreased. The message specifies the number of elements in the SAS map, the number of expanders detected, the number of expansion levels on the native (local controller) side and on the partner (partner controller) side, and the number of device PHYs.

Recommended actions

- No action is required.

212

Info.   All master volumes associated with the indicated snap pool have been deleted.

Recommended actions

- No action is required.

213

Info.   The indicated standard volume has been converted to a master volume, or the indicated master volume has been converted to a standard volume.

Recommended actions

- No action is required.

214

Info.   The creation of snapshots is complete. The number of snapshots is indicated.

Additional events give more information for each snapshot.

Recommended actions

- No action is required.

215

Info.   A previously created batch of snapshots is now committed and ready for use. The number of snapshots is indicated.

Additional events give more information for each snapshot.

Recommended actions

- No action is required.

217

Error   A supercapacitor failure occurred in the controller.

Recommended actions

- Replace the controller module that logged this event.

218

Warning The supercapacitor pack is near end of life.

Recommended actions

- Replace the controller module reporting this event.

219

Info.   Utility priority has been changed by a user.

Recommended actions

- No action is required.

220

Info.   Roll back of data in the indicated master standard volume to data in the indicated snapshot has been started by a user.

Recommended actions

- No action is required.

221

Info.   Snapshot reset has completed.

Recommended actions

- No action is required.

222

Info.   The policy for the snap pool has been changed by a user. A policy specifies the action for the system to automatically take when the snap pool reaches the associated threshold level.

Recommended actions

- No action is required.

223

Info.   The threshold level for the snap pool has been changed by a user. Each snap pool has three threshold levels that notify you when the snap pool is reaching decreasing capacity. Each threshold level has an associated policy that specifies system behavior when the threshold is reached.

Recommended actions

- No action is required.

224

Info.   Roll back of data in the indicated master standard volume to data in the indicated snapshot has completed.

Recommended actions

- No action is required.

225

Error   A copy-on-write failure occurred when copying data from the indicated master standard volume to a snapshot. Due to a problem accessing the snap pool, the write operation could not be completed to the disk. Data is left in cache.

Recommended actions

- Delete all snapshots for the master volume and then convert the master volume to a standard volume.

226

Error   Roll back for the indicated master standard volume failed to start due to inability to initialize the snap pool.

The roll back is in a suspended state.

Recommended actions

- Make sure the snap pool and the storage-pool component on which this volume exists are online. Restart the roll back operation.

227

Error   Failed to execute roll back for a particular LBA (logical block address) range of the indicated master standard volume.

Recommended actions

- Restart the roll back operation.

228

Error   Roll back for the indicated master standard volume failed to end due to inability to initialize the snap pool.

The roll back is in a suspended state.

Recommended actions

- Make sure the snap pool and the storage-pool component on which this volume exists are online. Restart the roll back operation.

229

Warning The indicated snap pool has reached its warning threshold.

Recommended actions

- You can expand the snap pool or delete snapshots.

230

Warning The indicated snap pool has reached its error threshold.

When the error threshold is reached, the system automatically takes the action set in the policy for this threshold level. The default policy for the error threshold is to auto-expand the snap pool.

Recommended actions

- You can expand the snap pool or delete snapshots.

231

Warning The indicated snap pool has reached its critical threshold.

When the critical threshold is reached, the system automatically takes the action set in the policy for this threshold level. The default policy for the critical threshold is to delete all snapshots in the snap pool.

Recommended actions

- If the policy is to halt writes, then you must free up space in the snap pool by deleting snapshots.
- For other policies, no action is required.

232

Warning The maximum number of enclosures allowed for the current configuration has been exceeded.

The platform does not support the number of enclosures that are configured. The enclosure indicated by this event has been removed from the configuration.

Recommended actions

- Reconfigure the system.

233

Warning The indicated disk type is invalid and is not allowed in the current configuration.

All disks of the disallowed type have been removed from the configuration.

Recommended actions

- Replace the disallowed disks with ones that are supported.

234

Error The indicated snap pool is unrecoverable and can therefore no longer be used.

Recommended actions

- All the snapshots associated with this snap pool are invalid and you may want to delete them. However, the data in the master volume can be recovered by converting it to a standard volume.

235

Error An enclosure management processor (EMP) detected a serious error.

Recommended actions

- Replace the indicated controller module or expansion module.

Info. An EMP reported an event.

Recommended actions

- No action is required.

236

Info.   A special shutdown operation has started. These special shutdown types are used as part of the firmware-update process.

Recommended actions

- No action is required.

237

Info.   A firmware update has started and is in progress. This event provides details of the steps in a firmware-update operation that may be of interest if you have problems updating firmware.

Recommended actions

- No action is required.

238

Warning   An attempt to install a licensed feature failed due to an invalid license.

Recommended actions

- Check the license for what is allowed for the platform, make corrections as appropriate, and reinstall.

239

Warning   A timeout occurred while flushing the CompactFlash.

Recommended actions

- Restart the Storage Controller that logged this event.
- If this event is logged again, shut down the Storage Controller and replace the controller module.

240

Warning   A failure occurred while flushing the CompactFlash.

Recommended actions

- Restart the Storage Controller that logged this event.
- If this event is logged again, shut down the Storage Controller and replace the controller module.

241

Info.   The auto-write-through trigger event that caused event 242 to be logged has been resolved.

Recommended actions

- No action is required.

242

Error   The controller module's CompactFlash card has failed.

This change met a condition to trigger the auto-write-through feature, which has disabled write-back cache and put the system in write-through mode. When the fault is resolved, event 241 is logged to indicate that write-back mode has been restored.

Recommended actions

- If event 241 has not been logged since this event was logged, the CompactFlash probably does not have health of OK and the cause should be investigated. Another CompactFlash event was probably logged at approximately the same time as this event (such as event 239, 240, or 481); see the recommended actions for that event.

243

Info.   A new controller enclosure has been detected. This happens when a controller module is moved from one enclosure to another and the controller detects that the midplane WWN is different from the WWN it has in its local flash.

Recommended actions

- No action is required.

245

Info.   An existing disk channel target device is not responding to SCSI discovery commands.

Recommended actions

- Check the indicated target device for bad hardware or bad cable, then initiate a rescan.

246

Warning The coin battery is not present, is not properly seated, or has reached end-of-life.

The battery provides backup power for the real-time (date/time) clock. In the event of a power failure, the date and time will revert to 1980-01-01 00:00:00.

Recommended actions

- Replace the controller module that logged this event.

247

Warning The FRU ID SEEPROM for the indicated field replaceable unit (FRU) cannot be read; FRU ID data might not be programmed.

FRU ID data includes the worldwide name, serial numbers, firmware and hardware versions, branding information, etc. This event is logged once each time a Storage Controller (SC) is started for each FRU that is not programmed.

Recommended actions

- Return the FRU to have its FRU ID data reprogrammed.

248

Info.   A valid feature license was successfully installed. See event 249 for details about each licensed feature.

Recommended actions

- No action is required.

249

Info.   After a valid license is installed, this event is logged for each licensed feature to show the new license value for that feature. The event specifies whether the feature is licensed, whether the license is temporary, and whether the temporary license is expired.

Recommended actions

- No action is required.

250

Warning A license could not be installed.

The license is invalid or specifies a feature that is not supported on your product.

Recommended actions

- Review the readme file that came with the license. Verify that you are trying to install the license in the system that the license was generated for.

251

Info.   A volume-copy operation has started for the indicated source volume.

If the source volume is a master standard volume, you can remount it.

If the source volume is a snapshot, do not remount it until the copy is complete (as indicated by event 268).

Recommended actions

- No action is required.

252

Info.   Data written to the indicated snapshot after it was created has been deleted. The snapshot now represents the state of the master standard volume when the snapshot was created.

Recommended actions

- No action is required.

253

Info.   A license was uninstalled.

Recommended actions

- No action is required.

255

Info.   The PBCs across controllers do not match as PBC from controller A and PBC from controller B are from different vendors. This may limit the available configurations.

Recommended actions

- No action is required.

256

Info.   The indicated snapshot has been prepared but is not yet committed.

This can occur when a snapshot is taken by an application, such as the VSS hardware provider, that is timing-sensitive and needs to take a snapshot in two stages.

After the snapshot is committed and event 258 is logged, the snapshot can be used.

Recommended actions

- No action is required.

257

Info.   The indicated snapshot has been prepared and committed and is ready for use.

Recommended actions

- No action is required.

258

Info.   The indicated snapshot has been committed and is ready for use.

Recommended actions

- No action is required.

259

Info.   In-band CAPI commands have been disabled.

Recommended actions

- No action is required.

260

Info.   In-band CAPI commands have been enabled.

             Recommended actions

             • No action is required.

261

Info.   In-band SES commands have been disabled.

             Recommended actions

             • No action is required.

262

Info.   In-band SES commands have been enabled.

             Recommended actions

             • No action is required.

263

Warning The indicated spare disk is missing. Either it was removed or it is not responding.

             Recommended actions

             • Replace the disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity.
             • Configure the disk as a spare.

266

Info.   A volume-copy operation for the indicated volume has been aborted by a user.

             Recommended actions

             • No action is required.

267

Error   While cleaning up resources in metadata at the end of a volume-copy operation, the firmware found at least one error for the indicated volume.

             Recommended actions

             • Make sure that the storage pool and disks associated with the volume copy do not have problems (health OK, status FTOL or UP) and then retry the volume copy.

268

Info.   A volume-copy operation for the indicated volume has completed.

             Recommended actions

             • No action is required.

269

Info.   A partner firmware update operation has started. This operation is used to copy firmware from one controller to the other to bring both controllers up to the same version of firmware.

             Recommended actions

             • No action is required.

270

Warning Either there was a problem reading or writing the persistent IP data from the FRU ID SEEPROM, or invalid data were read from the FRU ID SEEPROM.

Recommended actions

- Check the IP settings (including iSCSI host-port IP settings for an iSCSI system), and update them if they are incorrect.

271

Info. The storage system could not get a valid serial number from the controller's FRU ID SEEPROM, either because it couldn't read the FRU ID data, or because the data in it isn't valid or hasn't been programmed. Therefore, the MAC address is derived by using the controller's serial number from flash. This event is only logged one time during bootup.

Recommended actions

- No action is required.

272

Info. Expansion of the indicated snap pool has started.

Recommended actions

- No action is required.

273

Info. PHY fault isolation has been enabled or disabled by a user for the indicated enclosure and controller module.

Recommended actions

- No action is required.

274

Warning The indicated PHY has been disabled, either automatically or by a user. Drive PHYs are automatically disabled for empty disk slots or if a problem is detected. The following reasons indicate a likely hardware fault:

- Disabled because of error count interrupts
- Disabled because of excessive PHY change counts
- PHY is ready but did not pass COMINIT

Recommended actions

- If none of the reasons listed in the event description is indicated, no action is required.
- If any of the reasons listed in the event description is indicated and the event occurs shortly after the storage system is powered up, do the following:
  - Shut down the Storage Controllers. Then turn off the power for the indicated enclosure, wait a few seconds, and turn it back on.
  - If the problem recurs and the event message identifies a disk slot, replace the disk in that slot.
  - If the problem recurs and the event message identifies a module, do the following:
    - If the indicated PHY type is Egress, replace the cable in the module's egress port.
    - If the indicated PHY type is Ingress, replace the cable in the module's ingress port.
    - For other indicated PHY types or if replacing the cable does not fix the problem, replace the indicated module.

- If the problem persists, check for other events that may indicate faulty hardware, such as an event indicating an over-temperature condition or power supply fault, and follow the recommended actions for those events.
- If the problem still persists, the fault may be in the enclosure midplane. Replace the chassis-and-midplane FRU.
- If any of the reasons listed in the event description is indicated and this event is logged shortly after a failover, user-initiated rescan, or restart, do the following:
  - If the event message identifies a disk slot, reseat the disk in that slot.
  - If the problem persists after reseating the disk, replace the disk.
  - If the event message identifies a module, do the following:
    - If the indicated PHY type is Egress, replace the cable in the module's egress port.
    - If the indicated PHY type is Ingress, replace the cable in the module's ingress port.
    - For other indicated PHY types or if replacing the cable does not fix the problem, replace the indicated module.
    - If the problem persists, check for other events that may indicate faulty hardware, such as an event indicating an over-temperature condition or power supply fault, and follow the recommended actions for those events.
  - If the problem still persists, the fault may be in the enclosure midplane. Replace the chassis-and-midplane FRU.

275

Info.   The indicated PHY has been enabled.

Recommended actions

- No action is required.

298

Warning The controller's real-time clock (RTC) setting is invalid.

This event will most commonly occur after a power loss if the real-time clock battery has failed. The time may have been set to a time that is up to 5 minutes before the power loss occurred, or it may have been reset to 1980-01-01 00:00:00.

Recommended actions

- Check the system date and time. If either is incorrect, set them to the correct date and time.
- Also look for event 246 and follow the recommended action for that event.

299

Info.   The controller's real-time clock (RTC) setting was successfully recovered.

This event will most commonly occur after an unexpected power loss.

Recommended actions

- No action is required, but if event 246 is also logged, follow the recommended action for that event.

300

Info.   CPU frequency has changed to high.

Recommended actions

- No action is required.

301

Info. CPU frequency has changed to low.

Recommended actions

- No action is required.

302

Info. DDR memory clock frequency has changed to high.

Recommended actions

- No action is required.

303

Info. DDR memory clock frequency has changed to low.

Recommended actions

- No action is required.

304

Info. The controller has detected I^2C errors that may have been fully recovered.

Recommended actions

- No action is required.

305

Info. A serial number in Storage Controller (SC) flash memory was found to be invalid when compared to the serial number in the controller-module or midplane FRU ID SEEPROM. The valid serial number has been recovered automatically.

Recommended actions

- No action is required.

306

Info. The controller-module serial number in Storage Controller (SC) flash memory was found to be invalid when compared to the serial number in the controller-module FRU ID SEEPROM. The valid serial number has been recovered automatically.

Recommended actions

- No action is required.

307

Critical A temperature sensor on a controller FRU detected an over-temperature condition that caused the controller to shut down.

Recommended actions

- Check that the storage system's fans are running.
- Check that the ambient temperature is not too warm. The enclosure operating range is 5° C–40° C (41° F–104° F).
- Check for any obstructions to the airflow.
- Check that there is a module or blank plate in every module slot in the enclosure.
- If none of the above explanations apply, replace the controller module that logged the error.

309

Info.   Normally when the Management Controller (MC) is started, the IP data is obtained from the midplane FRU ID SEEPROM where it is persisted. If the system is unable to write it to the SEEPROM the last time it changed, a flag is set in flash memory. This flag is checked during startup, and if set, this event is logged and the IP data that is in flash memory is used. The only time that this would not be the correct IP data would be if the controller module was swapped and then whatever data is in the controller's flash memory is used.

Recommended actions

- No action is required.

310

Info.   After a rescan, back-end discovery and initialization of data for at least one EMP (Enclosure Management Processor) has completed. This event is not logged again when processing completes for other EMPs in the system.

Recommended actions

- No action is required.

311

Info.   This event is logged when a user initiates a ping of a host via the iSCSI interface.

Recommended actions

- If the ping operation failed, check connectivity between the storage system and the remote host.

312

Info.   This event is used by email messages and SNMP traps when testing notification settings. This event is not recorded in the event log.

Recommended actions

- No action is required.

313

Error   The indicated controller module has failed. This event can be ignored for a single-controller configuration.

Recommended actions

- If this is a dual-controller system, replace the failed controller module. The module's Fault/Service Required LED will be illuminated (not blinking).

314

Error   The indicated FRU has failed or is not operating correctly. This event follows some other FRU-specific event indicating a problem.

Recommended actions

- To determine whether the FRU needs to be replaced, see the topic about verifying component failure in your product's documentation.

315

Critical   The controller module is incompatible with the enclosure.

The controller will automatically shut down. If two incompatible controllers are inserted at the same time or booted at the same time, one controller will crash and the other will hang. This behavior is expected and prevents data loss.

Recommended actions

- Move the controller module to a compatible enclosure.

316

Warning The temporary license for a feature has expired.

Any components created with the feature remain accessible but new components cannot be created.

Recommended actions

- To continue using the feature, purchase a permanent license.

Info. The temporary license for a feature will expire in 10 days. Any components created with the feature will remain accessible but new components cannot be created.

Recommended actions

- To continue using the feature after the trial period, purchase a permanent license.

317

Error A serious error has been detected on the Storage Controller's disk interface. The controller that logged this event will be killed by its partner.

Recommended actions

- Visually trace the cabling between the controller modules and expansion modules.
- If the cabling is OK, replace the controller module that logged this event.
- If the problem recurs, replace the expansion module that is connected to the controller module.

319

Warning The indicated available disk has failed.

Recommended actions

- Replace the disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity. For continued optimum I/O performance, the replacement disk should have performance that is the same as or better than the one it is replacing.

322

Warning The controller has an older Storage Controller (SC) version than the version used to create the CHAP authentication database in the controller's flash memory.

The CHAP database cannot be read or updated. However, new records can be added, which will replace the existing database with a new database using the latest known version number.

Recommended actions

- Upgrade the controller firmware to a version whose SC is compatible with the indicated database version.
- If no records were added, the database becomes accessible and remains intact.
- If records were added, the database becomes accessible but contains only the new records.

352

Info. Expander Controller (EC) assert data or stack-dump data is available.

Recommended actions

- No action is required.

353

Info. Expander Controller (EC) assert data and stack-dump data have been cleared.

Recommended actions

- No action is required.

354

Warning SAS topology has changed on a host port; at least one PHY has gone down. For example, the SAS cable connecting a controller host port to a host has been disconnected.

Recommended actions

- Check the cable connection between the indicated port and the host.
- Monitor the log to see if the problem persists.

Info. SAS topology has changed on a host port; at least one PHY has gone up. For example, the SAS cable connecting a controller host port to a host has been connected.

Recommended actions

- No action is required.

355

Warning The controller module's debug button was found to be stuck in the On position during boot up.

Recommended actions

- If the button remains stuck, replace the controller module.

356

Warning This event can only result from tests that are run in the manufacturing environment.

Recommended actions

- Follow the manufacturing process.

357

Warning This event can only result from tests that are run in the manufacturing environment.

Recommended actions

- Follow the manufacturing process.

358

Critical All PHYs are down for the indicated disk channel. The system is degraded and is not fault-tolerant because all disks are in a single-ported state.

Recommended actions

- Turn off the power for the controller enclosure, wait a few seconds, and turn it back on.
- If the condition doesn't persist (that is, if event 359 has been logged for the indicated channel), no further action is required.
- If the condition persists, this indicates a hardware problem in one of the controller modules or in the controller enclosure midplane. For help identifying which FRU to replace, see "Resources for diagnosing and resolving problems" in the WBI help for the event log panel, or the CLI help for the `show events` command.

Warning Some, but not all, PHYs are down for the indicated disk channel.

Recommended actions

- Monitor the log to see whether the condition persists.
- If the condition doesn't persist (that is, if event 359 has been logged for the indicated channel), no further action is required.
- If the condition persists, this indicates a hardware problem in one of the controller modules or in the controller enclosure midplane. For help identifying which FRU to replace, see "Resources for diagnosing and resolving problems" in the WBI help for the event log panel, or the CLI help for the `show events` command.

359

Info.   All PHYs that were down for the indicated disk channel have recovered and are now up.

Recommended actions

* No action is required.

360

Info.   The speed of the indicated disk PHY was renegotiated.

Recommended actions

* No action is required.

361

Critical,   The scheduler experienced a problem with the indicated schedule.
Error, or
Warning   Recommended actions

* Take appropriate action based on the indicated problem.

Info.   A scheduled task was initiated.

Recommended actions

* No action is required.

362

Critical,   The scheduler experienced a problem with the indicated task.
Error, or
Warning   Recommended actions

* Take appropriate action based on the indicated problem.

Info.   The scheduler experienced a problem with the indicated task.

Recommended actions

* No action is required.

363

Error   When the Management Controller (MC) is restarted, firmware versions that are currently installed are
            compared against those in the bundle that was most recently installed. When firmware is updated, it is
            important that all components are successfully updated or the system may not work correctly. Components
            checked include the CPLD, Expander Controller (EC), Storage Controller (SC), and MC.

Recommended actions

* Reinstall the firmware bundle.

Info.   When the Management Controller (MC) is restarted, firmware versions that are currently installed are
            compared against those in the bundle that was most recently installed. If the versions match, this event is
            logged as Informational severity. Components checked include the CPLD, Expander Controller (EC),
            Storage Controller (SC), and MC.

Recommended actions

* No action is required.

364

Info.   The broadcast bus is running as generation 1.

Recommended actions

* No action is required.

365

Error   An uncorrectable ECC error occurred in Storage Controller CPU memory.

An uncorrectable ECC error occurred in CPU memory more than once, indicating a probable hardware fault.

Recommended actions

- Replace the controller module that logged this event.

Warning An uncorrectable ECC error occurred in Storage Controller CPU memory.

This event is logged with Warning severity to provide information that may be useful to technical support, but no action is required now. It will be logged with Error severity is it is necessary to replace the controller module.

Recommended actions

- If this event occurs more than once for the same controller module, replace the controller module.

400

Info.   The indicated log has filled to a level at which it needs to be transferred to a log-collection system.

Recommended actions

- No action is required.

401

Warning The indicated log has filled to a level at which diagnostic data will be lost if not transferred to a log-collection system.

Recommended actions

- Transfer the log file to the log-collection system.

402

Error   The indicated log has wrapped and has started to overwrite its oldest diagnostic data.

Recommended actions

- Investigate why the log-collection system is not transferring the logs before they are overwritten. For example, you might have enabled managed logs without configuring a destination to send logs to.

412

Warning One disk in the indicated RAID 6 storage-pool component failed. The storage-pool component is online but has a status of FTDN (fault tolerant with a down disk).

If a spare disk of the proper type and size is present, that spare is used to automatically reconstruct the storage-pool component; events 9 and 37 are logged to indicate this.

Recommended actions

- If no spare was present (that is, event 37 was *not* logged), configure the failed disk and of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity one with. The new disk will be used to automatically reconstruct the storage-pool component; confirm this by checking that events 9 and 37 are logged.
- Otherwise, reconstruction automatically started and event 37 was logged. Replace the failed with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity.
- For continued optimum I/O performance, the replacement disk should have the same or better performance.
- Confirm that all failed disks have been replaced and.

413

Info.　Created a replication set with the indicated primary volume.

Recommended actions
- No action is required.

414

Error　Failed to create the indicated replication set for the indicated volume.

This operation is not permitted if the specified volume is already in a replication set or is not a master standard volume.

Recommended actions
- If the volume is a master standard volume and is not in a replication set, retry the operation.

415

Info.　Deleted the indicated replication set.

Recommended actions
- No action is required.

416

Error　Failed to delete the indicated replication set.

This can occur if an invalid identifier was specified for the replication set, or if the specified primary volume is not in the local system.

Recommended actions
- Repeat the deletion using a valid replication-set identifier, or on the local system for the primary volume.

417

Info.　The indicated snapshot was automatically deleted to make space for a new snapshot or for a remote snapshot proxy volume, or while changing the secondary volume to be the primary volume.

The indicated snapshot was automatically deleted, as determined by the snap pool's policy.

Recommended actions
- No action is required.

418

Warning　A replication operation cannot complete because it needs to create a proxy volume and a replication snapshot in the secondary system, but the maximum number of volumes exists for the destination storage pool and there is no suitable snapshot to automatically delete.

This event is logged in the secondary volume's system only.

Recommended actions
- To enable the replication operation to continue, delete at least one unneeded snapshot or standard volume from the destination storage pool.
- After performing the above action, if the replication fails for the same reason and becomes suspended, events 431 and 418 will be logged. Repeat the above action and resume the replication.
- To allow additional volumes to be created in the future (standard volumes, replication volumes, or snapshots), delete any unneeded volumes.

419

Info.   Started to add the indicated secondary volume to the indicated replication set.

Recommended actions

- No action is required.

420

Error   Failed to add the indicated secondary volume to the indicated replication set.

This can occur for several reasons, such as:

- The volume is already a replication volume.
- The volume is not local to the system.
- The communication link is busy or experienced an error.
- The volume is not the same size as the existing volume or is no longer in the set.
- The volume record is not up to date.
- Replication is not licensed or the license limit would be exceeded.

Recommended actions

- If any of the above problems exist, resolve them. Then repeat the add operation with a valid volume.

421

Info.   Completed adding the indicated secondary volume to the indicated replication set.

Recommended actions

- No action is required.

422

Info.   Completed removing the indicated secondary volume from the indicated replication set.

Recommended actions

- No action is required.

423

Error   Failed to remove the indicated volume from the indicated replication set. This can occur for several reasons, such as:

- The volume record is not found.
- The volume record is not yet available.
- A primary volume conflict exists.
- You cannot delete the volume from a remote system.
- You cannot remove the volume because it is the primary volume.

Recommended actions

- If any of the above problems exist, resolve them. Then repeat the remove operation with a valid volume.

424

Info.   Completed modifying parameters for the indicated secondary volume in the indicated replication set.

Recommended actions

- No action is required.

425

Info.   Started a replication to the indicated secondary volume.

Recommended actions

- No action is required.

426

Info.   Completed a replication to the indicated secondary volume.

Recommended actions

- No action is required.

427

Warning A communication error occurred when sending information between storage systems.

Recommended actions

- Check your network or fabric for abnormally high congestion or connectivity issues.

428

Info.   A user suspended a replication to the indicated secondary volume.

Recommended actions

- No action is required.

429

Info.   A user resumed a replication to the indicated secondary volume.

Recommended actions

- No action is required.

430

Info.   A user aborted a replication to the indicated secondary volume.

Recommended actions

- No action is required.

431

Error   Replication to the indicated secondary volume has suspended due to an error on that volume. User intervention is required to resume replication. This can occur for several reasons, such as:

- The cache request was aborted.
- The cache detected that the source or target volume is offline.
- The cache detected a media error.
- The snap pool is full.
- The communication link is busy or experienced an error.
- The snapshot being used for the replication is invalid.
- There was a problem establishing proxy communication.

Recommended actions

- Resolve the error and then resume the replication.

432

Error   Aborted a replication due to an error in the indicated secondary volume.

Recommended actions
- Verify that the secondary volume is valid and that the system where the volume resides is accessible.

433

Info.   Skipped a replication to the indicated secondary volume.

Recommended actions
- No action is required.

434

Warning   A replication collided with an ongoing replication to the indicated secondary volume.

A replication was in progress for the replication set when a new replication was requested. The new replication has been queued.

Recommended actions
- This can be a normal operation, but in some cases this can indicate a problem. Ensure that: there are no network issues; there is sufficient bandwidth between the primary and secondary systems; the interval between replications is set to a sufficient amount of time to allow replications to complete. Having too many replications queued can result in some replications not completing.

435

Warning   Failed to initialize the indicated replication set.

This can occur because:
- Firmware in the remote system is incompatible with firmware in the local system.
- The primary volume and secondary volume involved in replication cannot communicate.

Recommended actions
- Update the firmware on one or both systems so they are running the same version.
- Check your network or fabric for abnormally high congestion or connectivity issues.

436

Warning   Firmware in the remote system is incompatible with firmware in the local system so they cannot communicate with each other to perform replication operations.

Recommended actions
- Update the firmware on one or both systems so they are running the same version.

437

Info.   Started to change the primary volume for the indicated replication set to the indicated volume.

Recommended actions
- No action is required.

438

Info.   Completed changing the primary volume for the indicated replication set to the indicated volume.

The primary volume of the indicated replication set has been changed by a user to a different volume in the replication set.

Recommended actions
- No action is required.

439

Error   Failed to change the primary volume to the indicated volume for the indicated replication set. This can occur for several reasons, such as:

- The volume is not in the replication set.
- Configuration tag or configuration data not found.
- The retry limit has been reached.

Recommended actions

- Verify that the specified volume is part of the replication set.
- Verify that there are no network issues preventing communication between the local and remote storage systems.

440

Warning Retrying a replication due to an error in the indicated secondary volume.

This can occur for several reasons, such as:

- The cache request was aborted.
- The cache detected that the source or target volume is offline.
- The cache detected a media error.
- The snap pool is full.
- The communication link is busy or experienced an error.
- The snapshot being used for the replication is invalid.
- There was a problem establishing proxy communication.

The replication is being automatically retried according to policies in place. If the issue is resolved before retries are exhausted, the replication will continue on its own; otherwise, it will go into a suspended state unless the policy is set up to retry forever.

Recommended actions

- If any of the above problems exist, resolve them.

441

Error   Failed to forward an add-volume request for a volume in a replication set. The secondary volume cannot be fully added to the replication set.

Recommended actions

- Remove the indicated secondary volume from the replication set.

442

Warning Power-On Self Test (POST) diagnostics detected a hardware error in a UART chip.

Recommended actions

- Replace the controller module that logged this event.

444

Warning A snap pool reached a capacity threshold and the associated Auto Expand policy failed because there is not enough available space in the snap pool or because the configure maximum snap-pool size has been reached.

Recommended actions

- Increase the available space by deleting any unneeded snapshots or by increasing the configured maximum snap-pool size.

Info. A snap pool reached a capacity threshold and the associated policy completed successfully; for example, the snap pool was expanded successfully, or the oldest snapshot was deleted, or all snapshots were deleted. If the policy is Delete Oldest Snapshot, the serial number of the deleted snapshot is reported.

Recommended actions

- No action is required.

449

Info. Roll back was aborted for the indicated master standard volume.

This can occur if a roll back is in progress and a user selects to roll back a different volume, which will abort the first roll back and start a new roll back. A user can't explicitly abort a roll back because that would corrupt the master standard volume.

Recommended actions

- No action is required.

450

Warning A remote volume's status changed from online to offline.

This can occur for several reasons, such as:

- The communication link is busy or experienced an error.
- The local initiator experienced an error.

Recommended actions

- Verify that there are no network issues preventing communication between the local and remote storage systems.

451

Info. A remote volume's status changed from offline to online.

Recommended actions

- No action is required.

452

Info. The indicated volume has been detached from the indicated replication set.

The volume can now be physically moved to another storage system.

Recommended actions

- No action is required.

453

Info. The indicated volume has been reattached to the indicated replication set.

Recommended actions

- No action is required.

454

Info. A user changed the drive-spin-down delay to the indicated value.

Recommended actions

- No action is required.

455

Warning The controller detected that the configured host-port link speed exceeded the capability of an FC SFP. The speed has been automatically reduced to the maximum value supported by all hardware components in the data path.

Recommended actions

- Replace the SFP in the indicated port with an SFP that supports a higher speed.

456

Warning The system's IQN was generated from the default OUI because the controllers could not read the OUI from the midplane FRU ID data during startup. If the IQN is wrong for the system's branding, iSCSI hosts might be unable to access the system.

Recommended actions

- If event 270 with status code 0 is logged at approximately the same time, restart the Storage Controllers.

457

Info. The indicated storage pool was created.

Recommended actions

- No action is required.

458

Info. Storage-pool component(s) were added to the indicated storage pool.

Recommended actions

- No action is required.

459

Info. Removal of the indicated storage-pool component was started.

When this operation is complete, event 470 is logged.

Recommended actions

- No action is required.

460

Error The indicated storage-pool component is missing from the indicated storage pool.

This may be caused by missing disk drives or unconnected or powered-off enclosures.

Recommended actions

- Ensure that all disks are installed and all enclosures are connected and powered on.

When the problem is resolved, event 461 is logged.

461

Info. The indicated storage-pool component that was missing from the indicated storage pool was recovered.

This event indicates that a problem reported by event 460 is resolved.

Recommended actions

- No action is required.

462

Warning The indicated storage pool exceeded its high threshold for allocated pages and the storage pool is overcommitted.

There are three thresholds, two of which are user-settable. The third and highest setting is set automatically by the controller and cannot be changed. This event is logged with Warning severity if the high threshold is exceeded and the storage pool is overcommitted. Overcommitted means that the total virtual size of all volumes exceeds the physical space in the storage pool. If the storage usage drops below a threshold, event 463 is logged.

Recommended actions

• You should immediately take steps to reduce storage usage or add capacity.

Info The indicated storage pool exceeded its high threshold for allocated pages.

There are three thresholds, two of which are user-settable. The third and highest setting is set automatically by the controller and cannot be changed. This event is logged with Warning severity if the high threshold is exceeded and the storage pool is overcommitted. Overcommitted means that the total virtual size of all volumes exceeds the physical space in the storage pool. If the storage usage drops below a threshold, event 463 is logged.

Recommended actions

• No action is required for the low and mid thresholds. However, you may want to determine if your storage usage is growing at a rate that will result in the high threshold being crossed in the near future. If this will occur, either take steps to reduce storage usage or purchase additional capacity.

• If the high threshold is crossed, you should promptly take steps to reduce storage usage or add capacity.

463

Info. The indicated storage pool has dropped below one of its thresholds for allocated pages.

This event indicates that a condition reported by event 462 is no longer applicable.

Recommended actions

• No action is required.

464

Warning A user inserted an unsupported cable or SFP into the indicated controller host port.

Recommended actions

• Replace the cable or SFP with a supported type, as specified in your product's Setup Guide.

465

Info. A user removed an unsupported cable or SFP from the indicated controller host port.

Recommended actions

• No action is required.

466

Info. The indicated storage pool was deleted.

Recommended actions

• No action is required.

467

Info.   Addition of the indicated storage-pool component completed successfully.

Recommended actions

- No action is required.

468

Info.   FPGA temperature has returned to the normal operating range and the speed of buses connecting the FPGA to downstream adapters has been restored. The speed was reduced to compensate for an FPGA over-temperature condition.

This event indicates that a problem reported by event 469 is resolved.

Recommended actions

- No action is required.

469

Warning The speed of buses connecting the FPGA to downstream adapters has been reduced to compensate for an FPGA over-temperature condition.

The storage system is operational but I/O performance is reduced.

Recommended actions

- Check that the storage system's fans are running.
- Check that the ambient temperature is not too warm. The enclosure operating range is 5°C–40°C (41°F–104°F).
- Check for any obstructions to the airflow.
- Check that there is a module or blank plate in every module slot in the enclosure.
- If none of the above explanations apply, replace the controller module that logged the error.

When the problem is resolved, event 468 is logged.

470

Info.   Removal of the indicated storage-pool component completed successfully.

Recommended actions

- No action is required.

471

Info.   A replication was queued because the indicated secondary volume is detached from the replication set.

Recommended actions

- No action is required.
- To enable the replication to proceed, reattach the secondary volume and then resume the replication.

472

Error   A replication failed to start on the indicated secondary volume.

This can occur when the secondary system is not licensed for replication (for example, a temporary license expired).

Recommended actions

- To perform replication, ensure that the secondary system has a valid replication license.

473

Info.   The indicated volume is using more than its threshold percentage of its storage pool.

This is an indication that the storage usage crossed the user-specified threshold for this volume. If the storage usage drops below the threshold, event 474 is logged.

Recommended actions

- No action is required. How this information is utilized is left to the discretion of the user.

474

Info.   The indicated volume is no longer using more than its threshold percentage of its storage pool.

This event indicates that the condition reported by event 473 is no longer applicable.

Recommended actions

- No action is required.

475

Info.   A replication was queued because the indicated secondary volume is offline.

Recommended actions

- No action is required.
- To enable the replication to proceed, resolve the problem that is preventing access to the secondary volume.

476

Warning The CPU temperature exceeded the safe range so the CPU entered its self-protection state. IOPS were reduced.

Recommended actions:

- Check that the storage system's fans are running.
- Check that the ambient temperature is not too warm. The enclosure operating range is 5°C–40°C (41°F–104°F).
- Check for any obstructions to the airflow.
- Check that there is a module or blank plate in every module slot in the enclosure.
- If none of the above explanations apply, replace the controller module that logged the error.

When the problem is resolved, event 478 is logged.

477

Info.   The CPU temperature exceeded the normal range so the CPU speed was reduced. IOPS were reduced.

Recommended actions:

- Check that the storage system's fans are running.
- Check that the ambient temperature is not too warm. The enclosure operating range is 5°C–40°C (41°F–104°F).
- Check for any obstructions to the airflow.
- Check that there is a module or blank plate in every module slot in the enclosure.
- If none of the above explanations apply, replace the controller module that logged the error.

When the problem is resolved, event 478 is logged.

478

Info.   This event indicates that a problem reported by event 476 or 477 is resolved.

Recommended actions:

• No action is required.

479

Error   The controller reporting this event was unable to flush data to or restore data from non-volatile memory.

This mostly likely indicates a CompactFlash failure, but it could be caused by some other problem with the controller module. The Storage Controller that logged this event will be killed by its partner controller, which will use its own copy of the data to perform the flush or restore operation.

Recommended actions

• If this is the first time this event has been logged, restart the killed Storage Controller.
• If this event is then logged again, replace the controller module.

480

Error   An IP address conflict was detected for the indicated iSCSI port of the storage system. The indicated IP address is already in use.

Recommended actions

• Contact your data-network administrator to help resolve the IP address conflict.

481

Error   The periodic monitor of CompactFlash hardware detected an error. The controller was put in write-through mode, which reduces I/O performance.

Recommended actions

• Restart the Storage Controller that logged this event.
• If this event is logged again, shut down the Storage Controller and replace the controller module.

482

Warning One of the PCIe buses is running with fewer lanes than it should.

This event is the result of a hardware problem that has caused the controller to use fewer lanes. The system works with fewer lanes, but I/O performance is degraded.

Recommended actions:

• Replace the controller module that logged this event.

483

Error   An invalid expansion-module connection was detected for the indicated disk channel. An egress port is connected to an egress port, or an ingress port is connected to an incorrect egress port.

Recommended actions

• Visually trace the cabling between enclosures and correct the cabling.

484

Warning No compatible spares are available to reconstruct this storage-pool component if it experiences a disk failure.

This situation puts data at increased risk because it will require user action to configure a disk as a spare before reconstruction can begin on the indicated storage-pool component if a disk in that storage-pool component fails in the future.

All storage-pool components that use the same size disk are at increased risk.

Note that even though there may be spares still available, they cannot be used for reconstruction of a storage-pool component if that storage-pool component uses larger-capacity disks or a different type of disk; so this event may be logged even when there are unused spares. Recommended actions

- Replace any failed disk with one of the same type (SAS SSD, enterprise SAS, or midline SAS) and the same or greater capacity. For continued optimum I/O performance, the replacement disk should have the same or better performance.
- If the failed disk was part of a storage-pool component, copyback will start automatically; no further action is required.
- If the failed disk was a spare, configure the replacement disk as a spare.

485

Warning The indicated storage-pool component was quarantined to prevent writing invalid data that may exist in the controller that logged this event.

This event is logged to report that the indicated storage-pool component has been put in the quarantined offline state (status of QTOF) to prevent loss of data. The controller that logged this event has detected (via information saved in the storage-pool-component metadata) that it may contain outdated data that should not be written to the storage-pool component. Data may be lost if you do not follow the recommended actions carefully. This situation is typically caused by removal of a controller module without shutting it down first, then inserting a different controller module in its place. To avoid having this problem occur in the future, always shut down the Storage Controller in a controller module before removing it. This situation may also be caused by failure of the CompactFlash card, as indicated by event 204.

Recommended actions

- If event 204 is logged, follow the recommended actions for event 204.
- If event 204 is *not* logged, perform the following recommended actions:
  - If event 486 is not logged at approximately the same time as event 485, reinsert the removed controller module, shut it down, then remove it again.
  - If events 485 and 486 are both logged at approximately the same time, wait at least 5 minutes for the automatic recovery process to complete. Then sign in and confirm that both controller modules are operational. (You can determine if the controllers are operational with the `show controllers` CLI command or with the WBI.) In most cases, the system will come back up and no further action is required. If both controller modules do not become operational in 5 minutes, data may have been lost. If both controllers are not operational, follow this recovery process:
    - Remove the controller module that first logged event 486.
    - Turn off the power for the controller enclosure, wait a few seconds, then turn it back on.
    - Wait for the controller module to restart, then sign in again.
    - Check the status of the storage-pool components. If any of the storage-pool components have a status of quarantined offline (QTOF), dequarantine those storage-pool components.
    - Reinsert the previously removed controller module. It should now restart successfully.

486

Warning A recovery process was initiated to prevent writing invalid data that may exist in the controller that logged this event. The controller that logged this event has detected (via information saved in the storage-pool-component metadata) that it may contain outdated data that should not be written to the disks The controller will log this event, restart the partner controller, wait 10 seconds, then kill itself. The partner controller will then unkill this controller and mirror the correct cache data to it. This procedure will, in most cases, allow all data to be correctly written without any loss of data and without writing any outdated data.

Recommended actions

- Wait at least 5 minutes for the automatic recovery process to complete. Then sign in and confirm that both controller modules are operational. (You can determine if the controllers are operational with the `show redundancy-mode` CLI command or the System Redundancy table in the System Overview panel of the WBI.) In most cases, the system will come back up and no action is required.
- If both controller modules do not become operational in 5 minutes, see the recommended actions for event 485, which will be logged at approximately the same time.

487

Info. Historical performance statistics were reset.

Recommended actions

- No action is required.

488

Info. Creation of a set of volumes started.

Recommended actions

- No action is required.

489

Info. Creation of a group of volumes completed.

Recommended actions

- No action is required.

490

Info. Creation of a group of volumes failed.

Recommended actions

- No action is required.

491

Info. Creation of a local group of volumes started.

Recommended actions

- No action is required.

492

Info. A local group of volumes was dissolved.

Recommended actions

- No action is required.

493

Info.   A local group of volumes was modified.

           Recommended actions

           • No action is required.

494

Info   Reinitialization of a snap pool has completed.

           Recommended actions

           • No action is required.

495

Warning The algorithm for best-path routing selected the alternate path to the indicated disk because the I/O error count on the primary path reached its threshold.

           The controller that logs this event indicates which channel (path) has the problem. For example, if the B controller logs the problem, the problem is in the chain of cables and expansion modules connected to the B controller module.

           Recommended actions

           • If this event is consistently logged for only one disk in an enclosure, perform the following actions:
             • Replace the disk.
             • If that does not resolve the problem, the fault is probably in the enclosure midplane. Replace the chassis-and-midplane FRU for the indicated enclosure.
           • If this event is logged for more than one disk in an enclosure or disks in multiple enclosures, perform the following actions:
             • Check for disconnected SAS cables in the bad path. If no cables are disconnected, replace the cable connecting to the ingress port in the most-upstream enclosure with reported failures. If that does not resolve the problem, replace other cables in the bad path, one at a time until the problem is resolved.
             • If that does not resolve the problem, replace the expansion modules that are in the bad path. Begin with the most-upstream module that is in an enclosure with reported failures. If that does not resolve the problem, replace other expansion modules (and the controller module) upstream of the affected enclosure(s), one at a time until the problem is resolved.
             • If that does not resolve the problem, the fault is probably in the enclosure midplane. Replace the chassis-and-midplane FRU of the most-upstream enclosure with reported failures. If that does not resolve the problem and there is more than one enclosure with reported failures, replace the chassis-and-midplane FRU of the other enclosures with reported failures until the problem is resolved.

496

Warning An unsupported disk type was found.

           Recommended actions

           • Replace the disk with a supported type.

497

Info.   A disk copyback operation started. The indicated disk is the source disk.

When a disk fails, reconstruction is performed using a spare disk. When the failed disk is replaced, the data that was reconstructed on the spare disk (and any new data that was written to it) is copied to the disk in the slot where the data was originally located. This is known as slot affinity. For the copyback operation, the reconstructed disk is called the source disk, and the newly replaced disk is called the destination disk. All of the data is copied from the source disk to the destination disk and the source disk then becomes a spare disk again.

Recommended actions

*   No action is required.

498

Warning

A disk copyback operation failed.

When a disk fails, reconstruction is performed using a spare disk. When the failed disk is replaced, the data that was reconstructed in the spare disk (and any new data that was written to it) is copied to the disk in the slot where the data was originally located. However, this copyback operation failed. Some of the data in the source disk is unreadable (uncorrectable media error) and that data cannot be reconstructed from the other disks in the storage-pool component.

This may be because the disk that was inserted as a replacement for the failed disk is also faulty or because the source disk for the copyback is faulty. This failure may also be caused by a fault in the midplane of the enclosure that the disks are inserted into.

Recommended actions

*   If you do not have a backup copy of the data in the storage-pool, make a backup.
*   Look for another event logged at approximately the same time that indicated a disk failure, such as event 8, 55, 58, or 412. Follow the recommended actions for that event.
*   Remove the storage-pool component.
*   Add the storage-pool component.
*   Restore the data from the backup.
*   If the problem then recurs for the same slot, replace the chassis-and-midplane FRU.

Info.   A disk copyback operation completed.

Recommended actions

*   No action is required.

499

Info.   A disk copyback operation started. The indicated disk is the destination disk.

When a disk fails, reconstruction is performed using a spare disk. When the failed disk is replaced, the data that was reconstructed in the spare disk (and any new data that was written to it) is copied to the disk in the slot where the data was originally located. This is known as slot affinity. For the copyback operation, the reconstructed disk is called the source disk, and the newly replaced disk is called the destination disk. All of the data is copied from the source disk to the destination disk and the source disk then becomes a spare disk again.

Recommended actions

*   If the event message indicates that one or more uncorrectable media errors occurred during the copyback, some user data may have been lost. Use backup copies of the data or other means to restore any lost data.
*   Otherwise, no action is required.

500

Info.   A disk copyback operation completed. The indicated disk was restored to being a spare.

When a disk fails, reconstruction is performed using a spare disk. When the failed disk is replaced, the data that was reconstructed in the spare disk (and any new data that was written to it) is copied to the disk in the slot where the data was originally located. This is known as slot affinity. For the copyback operation, the reconstructed disk is called the source disk, and the newly replaced disk is called the destination disk. All of the data is copied from the source disk to the destination disk and the source disk then becomes a spare disk again.

Recommended actions

- No action is required.

501

Error   The enclosure hardware is not compatible with the I/O module firmware.

The Expander Controller firmware detected an incompatibility with the midplane type. As a preventive measure, disk access was disabled in the enclosure.

Recommended actions

- Update the storage system to the latest firmware.

502

Error   The indicated solid-state disk (SSD) has 1% of its life remaining.

Recommended actions

- Replace the SSD with one of the same type and capacity.

Warning The indicated solid-state disk (SSD) has 5% of its life remaining.

When the device has 1% of its life left, this event will be logged again with a severity of Error.

Recommended actions

- Be sure you have a spare SSD of the same type and capacity available.
- If a spare is available, it is recommended to replace the SSD now.

Info.   The indicated solid-state disk (SSD) has 20% of its life remaining.

When the device has 5% of its life left, this event will be logged again with a severity of Warning.

Recommended actions

- You should obtain a replacement SSD of the same type and capacity if you do not already have one available.

504

Info.   Service debug access to the system has been enabled or disabled by a user.

Allowing service debug access may have security implications. After the diagnosis is complete you may want to disallow such access.

Recommended actions

- No action is required.

505

Warning The indicated storage pool was created with a size smaller than 500 GB.

The storage system may not perform correctly. This event should only be possible by action of a development engineer.

Recommended actions

- No action is required.

506

Info.   Addition of the indicated storage-pool component was started.

When this operation is complete, event 467 is logged.

Recommended actions

* No action is required.

508

Error   The indicated storage pool went offline. All of its volumes also went offline.

All data in the storage pool has been lost. This condition can be caused by corrupt or inaccessible storage-pool metadata.

Recommended actions

* Check for other events that indicate faults in the system and follow the recommended actions for those events.
* Re-create the storage pool.
* Restore the data from a backup, if available.

509

Error   The metadata volume for the indicated storage pool went offline. Volume mappings and persistent reservations are inaccessible or lost.

Recommended actions

* Check for other events that indicate faults in the system and follow the recommended actions for those events.
* Create new mappings for the volumes. Persistent reservations will be restored by host systems automatically.

Troubleshooting steps for leftover disk drives

Storage systems use metadata on hard drives to identify storage-pool component members and identify other disk members of the storage-pool component.

Hard drives enter a Leftover state for several reasons:

* Drive spin up was not completed before a controller polled the drive. When the controller queries the drive and finds the drive is not in a ready state, the controller may place the drive into a Leftover state.
* Improper power-on sequences.
* Firmware upgrade (due to a timing issue).
* Failover taking longer than expected.
* The drive is swapped from another system, or removed and reinserted in the storage system.

Metadata on a disk identifies the disk as being a member of a storage-pool component. Improperly clearing the metadata from a disk may cause permanent data loss.

△ **CAUTION:**   Clearing metadata from a leftover drive should be done with extreme care. Only clear metadata if you are certain the drive has never been associated with a storage-pool component in this system or contains no data. This situation most often occurs when inserting a previously used hard drive into a live system or moving a drive between two systems.

Never clear metadata from a drive if any storage-pool component in the storage system is in an Offline, Quarantined, or inaccessible state. Do not clear metadata from a drive if you are unsure this is the correct step to take. Clearing metadata from a drive permanently clears all data from the drive. In these types of situations, a backup of data should be done if possible.

Using the trust command

The CLI `trust` command should only be used as a last step in a disaster recovery situation. This command has the potential to cause permanent data loss and unstable operation of the storage-pool component. If a storage-pool component with a single disk is in a leftover or failed condition, the `trust` command should never be used. The `trust` command should only be used if the storage-pool component is in an Offline state.

If a single disk in a storage-pool component has failed or been placed into a Leftover state due to errors, reintegrating the disk into the same or a different storage-pool component has the potential to cause data loss. A hard drive that has failed or been placed into a Leftover state due to multiple errors should be replaced with a new hard drive. Assign the new hard drive back to the storage-pool component as a spare and allow reconstruction to complete in order to return the storage-pool component to a fault-tolerant state.

The `trust` command attempts to resynchronize leftover disks in order to make any leftover disk an active member of the storage-pool component again. The user might need to take this step when storage-pool component is offline because there is no data backup, or as a last attempt to try to recover the data on a storage-pool component. In this case, `trust` may work, but only as long as the leftover disk continues to operate. When the "trusted" storage-pool component is back online, backup all data on the storage-pool component and verify all data to ensure it is valid. The user then needs to delete the trusted storage-pool component, create a new storage-pool component, and restore data from the backup to the new storage-pool component.

IMPORTANT: Using `trust` on a storage-pool component is only a disaster-recovery measure; the storage-pool component has no tolerance for additional failures and should never be put back into a production environment.

CAUTION: Before trusting a storage-pool component, carefully read the cautions and procedures for using the `trust` command in the CLI Reference Guide and online help.

Once the `trust` command has been issued on a storage-pool component, further troubleshooting steps may be limited towards disaster recovery. If you are unsure of the correct action to take, contact technical support for further assistance.

PSU faults and recommended actions

Table 3 PSU faults and recommended actions

Fault	Recommended action
PSU fan warning or failure. PSU warning or failure. PSU module status is listed as failed or you receive a voltage event notification. (Event code 168.)	• Check that all modules in the enclosure are properly seated in their slots and that their latches are locked. • Check that each PSU module with a switch has that switch turned on. • Check that each power cable is firmly plugged into both the PSU and a functional electrical outlet. • Check that all of the enclosure's fans are running. • Check that the ambient temperature is not too warm. The enclosure operating range is 5°–40°C (41°–104°F). • Check for any obstructions to the airflow. • Check that there is a module or blank plate in every module slot in the enclosure. • If none of the above resolve the issue, the indicated PSU has probably failed and should be replaced. The failed PSU will probably have an amber LED lit.
Power LED is off.	Same as above.
Voltage/Fan Fault/Service Required LED is on.	Replace the PSU module.

Events sent as indications to SMI-S clients

If the storage system's SMI-S interface is enabled, the system will send events as indications to SMI-S clients so that SMI-S clients can monitor system performance. For information about enabling the SMI-S interface, see the chapter about configuring the system in the Storage Management Console User Guide.

The event categories below pertain to FRU assemblies and certain FRU components.

Table 4 Events and corresponding SMI-S indications

FRU/Event category	Corresponding SMI-S class	Operation status values that would trigger alert conditions
Controller	DHS_Controller	Down, Not Installed, OK
Hard Disk Drive	DHS_DiskDrive	Unknown, Missing, Error, Degraded, OK
Fan	DHS_PSUFan	Error, Stopped, OK
PSU	DHS_PSU	Unknown, Error, Other, Stressed, Degraded, OK
Temperature Sensor	DHS_OverallTempSensor	Unknown, Other, Error, Non-Recoverable Error, Degraded, OK
Battery/SuperCap	DHS_SuperCap	Unknown, Error, OK
FC Port	DHS_FCPort	Stopped, OK
SAS Port	DHS_SASTargetPort	Stopped, OK
iSCSI Port	DHS_ISCSIEthernetPort	Stopped, OK

Glossary

Additional Sense Code/Additional Sense Code Qualifier	See ASC/ASCQ.
Advanced Encryption Standard	See AES.
AES	Advanced Encryption Standard. A specification for the encryption of data using a symmetric-key algorithm.
allocated page	A page of storage-pool space that has been allocated to a volume to store data.
ALUA	Asymmetric Logical Unit Access.
array	See storage system
ASC/ASCQ	Additional Sense Code/Additional Sense Code Qualifier. Information on sense data returned by a SCSI device.
atomic write	A mode that guarantees if a failure (such as I/O being aborted or a controller failure) interrupts a data transfer between a host and the storage system, controller cache will contain either all the old data or all the new data, not a mix of old and new data. This option has a slight performance cost because it maintains a secondary copy of data in cache so that if a data transfer is not completed, the old cache data can be restored.
ATS	Automated tiered storage. A paged storage feature that automatically uses the appropriate tier of disks to store data based on how frequently the data is accessed. This enables higher-cost, higher-speed disks to be used only for frequently needed data, while infrequently needed data can reside in lower-cost, lower-speed disks.
auto-write-through	See AWT.
automated tiered storage	See ATS.
AWT	Auto-write-through. A setting that specifies when the RAID controller cache mode automatically changes from write-back to write-through.
CAPI	Configuration Application Programming Interface. A proprietary protocol used for communication between the SC and the MC in a controller module. CAPI is always enabled.
chassis	The sheetmetal housing of an enclosure.
CIM	Common Information Model. The data model for WBEM. It provides a common definition of management information for systems, networks, applications and services, and allows for vendor extensions.
CIM Query Language	See CQL.
CIMOM	Common Information Model Object Manager. A component in CIM that handles the interactions between management applications and providers.
CMIP	Common Management Interface Protocol. A model that allows modification of information on managed objects.
comma separated values	See CSV.
Common Information Model	See CMI.
Common Information Model Object Manager	See CIMOM
Common Management Interface Protocol	See CMIP

complex programmable logic device	See CPLD.
Configuration Application Programming Interface	See CAPI
controller A (or B)	A short way of referring to controller module A (or B).
controller enclosure	An enclosure that contains one or two controller modules.
controller module	A FRU that contains the following subsystems and devices: an SC processor; an MC processor; a SAS expander and an EC processor; management interfaces; cache protected by a supercapacitor pack and nonvolatile memory (CompactFlash); host, expansion, network, and service ports; and midplane connectivity. In a controller enclosure, the upper controller module is designated *A* and the lower one is designated *B*.
Coordinated Universal Time	See UTC.
CPLD	Complex programmable logic device. An electronic component used to build reconfigurable digital circuits. It can replace large numbers of logic gates.
CQL	CIM Query Language.
CRC	Cyclic Redundancy Check. A mathematical algorithm that, when implemented in software or hardware, can be used to detect errors in data.
CSV	Comma separated values. A format to store tabular data in plain-text form.
Cyclic Redundancy Check	See CRC.
DAS	Direct Attach Storage. A dedicated storage device that connects directly to a host without the use of a switch.
Data Encryption Standard	See DES.
DDR	Double data rate. A class of memory integrated circuits use in computers.
default mapping	Host-access settings that are configured when a volume is created, and that apply to all hosts that are not explicitly mapped to that volume using different settings. See also explicit mapping and masking.
DES	Data Encryption Standard. An algorithm for the encryption of electronic data.
DHCP	Dynamic Host Configuration Protocol. A network configuration protocol for hosts on IP networks.
Direct Attach Storage	See DAS.
disaster recovery management	See DRM.
Distributed Management Task Force	See DMTF.
DMTF	Distributed Management Task Force. An industry organization that develops and maintains standards for system management.
double data rate	See DDR.
drive enclosure	An enclosure that contains one or two expansion modules. Drive enclosures can be connected to a controller enclosure to provide additional storage capacity.
drive spin down	See DSD.
DRM	Disaster recovery management. Storage-system firmware features that, when the SRA feature is enabled, support the use of VMware's Site Recovery Manager to automate disaster-recovery failover and failback tasks. See also SRA.

DSD	Drive spin down. A power-saving feature that monitors disk activity in the storage system and spins down inactive SAS disks based on user-selectable policies.
dual-port disk	A disk that is connected to both controllers so its data path is fault-tolerant.
Dynamic Host Configuration Protocol	See DHCP.
EC	Expander Controller. A processor, located in the SAS expander in each controller module and expansion module, that controls the SAS expander and provides SES functionality. See also EMP, MC, and SC.
electromagnetic interface	See EMI.
EMI	Electromagnetic interface.
EMP	Enclosure management processor. An EC subsystem that provides SES data such as temperature, PSU and fan status, and the presence or absence of disks.
enclosure	A physical storage device that contains disk drives and other FRUs.
enclosure management processor	See EMP.
Expander Controller	See EC.
expansion enclosure	See drive enclosure.
expansion module	A FRU that contains the following subsystems and devices: a SAS expander and EC processor; host, expansion, and service ports; and midplane connectivity. In a drive enclosure, the upper expansion module is designated *A* and the lower one is designated *B*.
explicit mapping	Access settings for a host to a volume that override the volume's default. See also default mapping and masking.
extrinsic methods	Methods which are particular to a specific class in SMI-S.
failback	See recovery.
failover	In an active-active configuration, failover is the act of temporarily transferring ownership of controller resources from an offline controller to its partner controller, which remains operational. The resources include storage pool, volumes, cache data, host ID information, and LUNs and WWNs. See also Host, LUN, recovery, storage pool, volume, and WWN.
FC-AL	Fibre Channel Arbitrated Loop. The FC topology in which devices are connected in a one-way loop.
Fibre Channel Arbitrated Loop	See FC-AL.
field-programmable gate array	See FPGA.
field-replaceable unit	See FRU.
FPGA	Field-programmable gate array. An integrated circuit designed to be configured after manufacturing.
FRU	Field-replaceable unit. A part that can be removed and replaced by the user or support technician without having to send the product to a repair facility.
HBA	Host bus adapter. A device that facilitates I/O processing and physical connectivity between a host and the storage system.
host	A user-defined group of initiators that represents a server or switch. In this product, *host* is also used to refer to a server or generically to an initiator, host, or host group.
host group	A user-defined group of hosts for ease of management.
host port	A port on a controller module that interfaces to a host computer, either directly or through a network switch.
host bus adapter	See HBA.

image ID	A globally unique serial number that identifies the point-in-time image source for a volume. All volumes that have identical image IDs have identical data content, whether they are snapshots or stand-alone volumes.
initiator	An external port that the storage system is connected to. The external port may be a port in an I/O adapter in a server, or a port in a network switch.
I/O Manager	A MIB-specific term for a controller module.
I/O module	See IOM.
intrinsic methods	Methods inherited from CIM and present in all classes such as getclass, createinstance, enumerateinstances, and associatorNames in SMI-S.
IOM	I/O module. An IOM can be either a controller module or an expansion module.
JBOD	"Just a bunch of disks." See also drive enclosure.
large form factor	See LFF.
LBA	Logical Block Address. The address used for specifying the location of a block of data.
LFF	Large form factor. A type of disk drive.
LIP	Loop Initialization Primitive. An FC primitive used to determine the loop ID for a controller.
Logical Block Address	See LBA.
Logical Unit Number	See LUN.
loop	FC-AL topology.
Loop Initialization Primitive	See LIP.
LUN	Logical Unit Number. A number that identifies a mapped Volume to a host.
MAC Address	Media Access Control Address. A unique identifier assigned to network interfaces for communication on a network.
Management Controller	See MC.
Management Information Base	See MIB.
map/mapping	Settings that specify whether a volume is presented as a storage device to a host, and how the host can access the volume. Mapping settings include an access type (read-write, read-only, or no access), controller host ports through which initiators may access the volume, and a LUN that identifies the volume to the host. See also default mapping, explicit mapping, and masking.
masking	A volume-mapping setting that specifies no access to that volume by hosts. See also default mapping, explicit mapping, and map/mapping.
master volume	A volume that is enabled for snapshots and has an associated snap pool.
MC	Management Controller. A processor located in a controller module that is responsible for human-computer interfaces and computer-computer interfaces, including the WBI, CLI, and FTP interfaces, and interacts with the SC. See also EC and SC.
Media Access Control Address	See MAC Address.
Memory reference code	See MRC.
metadata	Data in the first sectors of a disk drive that stores all disk- and volume-specific information including spare ID, volumes and snapshots host mapping of volumes, and results of the last media scrub.
MIB	Management Information Base. A database used for managing the entities in SNMP.
MMF	Multimode fiber.
mount	To enable access to a volume from a host OS.
MRC	Memory reference code.

multimode fiber	See MMF.
native command queuing	See NCQ.
NCQ	Native command queuing.
network port	An Ethernet port on a controller module through which its MC is connected to the network.
network time protocol	See NTP.
NTP	Network time protocol.
object identifier	See OID.
OID	Object Identifier. A number assigned to devices in a network for identification purposes.
orphan data	See unwritable cache data.
page	A range of contiguous LBAs in a storage-pool components.
paged storage	A method of mapping logical host requests to physical storage that maps the requests to virtualized pages of storage that are in turn mapped to physical storage. This provides more flexibility for expanding capacity and automatically moving data than the traditional, linear method in which requests are directly mapped to storage devices.
Partner Firmware Upgrade	See PFU.
PCBA	Printed circuit board assembly. A printed circuit board populated with electronic components.
persistent group reservations	See PGR.
PFU	Partner Firmware Upgrade. The automatic update of the partner controller when the user updates firmware on one controller.
PGR	Persistent group reservations.
PHY	One of two hardware components that form a physical connection between devices in a SAS network that enables transmission of data.
physical layer	See PHY.
point-to-point	The FC topology where two ports are directly connected.
pool A (or B)	A short way of referring to storage pool A (or B).
POST	Power-On Self Test. Tests that run immediately after a device is powered on.
Power-on Self Test	See POST.
Power Supply Unit	See PSU.
primary volume	The volume that is the source of data in a replication set and that can be mapped to hosts. For disaster recovery purposes, if the primary volume goes offline, a secondary volume can be designated as the primary volume. The primary volume exists in a primary storage-pool component in the primary (or local) storage system.
printed circuit board assembly	See PCBA.
proxy volume	A virtual volume in the local system that represents a volume in a remote system. Proxy volumes are used internally by the controllers to perform actions such as transferring replication data.
PSU	Power Supply Unit. The power supply FRU.
quick rebuild	A feature that reduces the time to restore fault tolerance to a RAID6 storage-pool component that has experienced disk failure. The quick-rebuild process rebuilds only data stripes that contain user data; data stripes that have not been allocated to user data are rebuilt in the background.
RAID1	This RAID level uses a pair of disks, where each disk contains a complete copy of data to protect against the failure of one disk. RAID1 is used for storage-pool components in the Performance tier and for read cache.

RAID6	This RAID level uses block-level data striping with double distributed parity to protect against failure of two disks. RAID6 is used for storage-pool components in the Standard and Archive tiers. Each RAID6 component in the system contains 10 disks (8 data disks and 2 parity disks).
RAID head	See controller enclosure.
read cache	A tiered-storage feature that uses SSDs as read cache only while keeping a separate copy of the data on spinning disks. Read cache is also referred to as read flash cache.
read flash cache	See read cache.
real-time clock	See RTC.
recipe	A pseudo-client code added to SMI-S to demonstrate usage of methods and associations.
recovery	In an active-active configuration, recovery is the act of returning ownership of controller resources to a controller (which was offline) from its partner controller. The resources include storage pools, volumes, cache data, host ID information, and LUNs and WWNs. See also failover.
remote replication	Asynchronous (batch) replication of block-level data from a volume in a primary system to a volume in one or more secondary systems by creating a replication snapshot of the primary volume and copying the snapshot data to the secondary systems via FC links. The capability to perform remote replication is a licensed feature (AssuredRemote).
replication image	Conceptual term for replication snapshot that have the same image in primary and secondary systems. These synchronized snapshots contain identical data and can be used for disaster recovery.
replication-prepared volume	A volume created for the purpose of being the secondary volume in a replication set. Replication-prepared volumes are automatically created by the Storage Management Console's Replication Setup Wizard, or they can be created manually in the CLI.
replication set	Associated primary volumes and secondary volumes that are enabled for replication and that typically reside in two physically or geographically separate storage systems.
replication snapshot	Special type of snapshot, created by the remote replication feature, that preserves the state of data of a replication set's primary volume as it existed when the snapshot was created. For a primary volume, the replication process creates a replication snapshot on both the primary system and, when the replication of primary volume data to the secondary volume is complete, on the secondary system. Replication snapshots are unmappable and are not counted toward a license limit, although they are counted toward the system's maximum number of volume. A replication snapshot can be exported to a regular, licensed snapshot.
replication sync point	State of a replication snapshot whose corresponding primary or secondary snapshot exists and contains identical data. For a replication set, four types of sync point are identified: the only replication snapshot that is copy-complete on any secondary system is the "only sync point"; the latest replication snapshot that is copy-complete on any secondary system is the "current sync point"; the latest replication snapshot that is copy-complete on all secondary systems is the "common sync point"; a common sync point that has been superseded by a new common sync point is an "old common sync point."
remote syslog support	See syslog.
RTC	Real-time clock. A circuit in the controller module that maintains the date and time. The RTC has a battery backup that maintains the time even when there is no power attached to the module.
SC	Storage Controller. A processor located in a controller module that is responsible for RAID controller functions. The SC is also referred to as the RAID controller. See also EC and MC.
SCSI Enclosure Services	See SES.
secondary volume	The volume that is the destination for data in a replication set and that is not accessible to hosts. For disaster recovery purposes, if the primary volume goes offline, a secondary volume can be designated as the primary volume. The contents of a secondary volume are in a constant state of flux and are not in a consistent state while a replication is in process. Only snapshots that are associated with a secondary volume are data consistent.

secure hash algorithm	See SHA.
secure shell	See SSH.
Secure Sockets Layer	See SSL.
SEEPROM	Serial electrically erasable programmable ROM. A type of nonvolatile (persistent if power removed) computer memory used as FRU ID devices.
Self-Monitoring Analysis and Reporting Technology	See SMART.
serial electrically erasable programmable ROM	See SEEPROM.
Service Location Protocol	See SLP.
SES	SCSI Enclosure Services. The protocol that allows the initiator to communicate with the enclosure using SCSI commands.
SFCB	Small Footprint CIM Broker.
SFF	Small form factor. A type of disk drive.
SHA	Secure Hash Algorithm. A cryptographic hash function.
shelf	See enclosure.
SLP	Service Location Protocol. Enables computers and other devices to find services in a local area network without prior configuration.
Small Footprint CIM Broker	See SFCB.
small form factor	See SFF.
SMART	Self-Monitoring Analysis and Reporting Technology. A monitoring system for disk drives that monitors reliability indicators for the purpose of anticipating disk failures and reporting those potential failures.
SMI-S	Storage Management Initiative - Specification. The SNIA standard that enables interoperable management of storage networks and storage devices.
	The interpretation of CIM for storage. It provides a consistent definition and structure of data, using object-oriented techniques.
snap pool	A volume that stores data that is specific to snapshots of an associated master volume, including copy-on-write data and data written explicitly to the snapshots. A snap pool cannot be mapped.
snapshot	Virtual volume that preserves the state of a master volume's data as it existed when the snapshot was created. Data associated with a snapshot is recorded in both the master volume and in its associated snap pool. A snapshot can be mapped and written to. The capability to create snapshots is a licensed feature (AssuredSnap). Snapshots that can be mapped to hosts are counted against the snapshot-license limit, whereas transient and unmappable snapshots are not.
SNIA	Storage Networking Industry Association. An association regarding storage networking technology and applications.
SRA	Storage replication adapter. Host-based software component that allows VMware's Site Recovery Manager to manage the storage-system firmware's DRM features, automating disaster-recovery failover and failback tasks. The SRA uses the CLI XML API to control the storage system.
SSH	Secure Shell. A network protocol for secure data communication.
SSL	Secure Sockets Layer. A cryptographic protocol that provides security over the internet.

standard volume	A volume that can be mapped to initiators and presented as a storage device to a host, and that is enabled for snapshots. In user interfaces, a standard volume is often referred to simply as a volume.
Storage Controller	See SC.
Storage Management Console	The web application that is embedded in each controller module and is the primary management interface for the storage system.
Storage Management Initiative - Specification	See SMI-S.
Storage Networking Industry Association	See SNIA.
storage pool	One or more storage-pool components that, as a group, serve up storage pages to volumes.
storage-pool component	A RAID set in a storage pool. Storage-pool components that serve up storage pages to volumes can use RAID1 or RAID6. Each RAID1 component uses 2 disks. Each RAID6 component uses 10 disks: 8 data disks and 2 parity disks.
storage replication adapter	See SRA.
storage system	A controller enclosure with at least one connected drive enclosure. Product documentation and interfaces use the terms storage system and system interchangeably.
syslog	Remote syslog support. A configuration that, when enabled, sends selected event messages to the syslog on a remote system.
thin provisioning	A feature that allows actual storage for a volume to be assigned as data is written, rather than storage being assigned immediately for the eventual size of the volume.
tier	A class of physical storage, based on disk type, in a hierarchy of performance. The predefined tiers are: Performance, which uses SAS SSDs (high speed, low capacity); Standard, which uses enterprise-class spinning SAS disks (lower speed, higher capacity); and Archive, which uses midline spinning SAS disks (low speed, high capacity).
tier migration	The process of moving data to the appropriate performance tier based on how frequently the data is accessed. Tier migration can occur automatically in accordance with configured thresholds and policies, or can be done manually. \
UCS Transformation Format - 8-bit	See UTF-8.
ULP	Unified LUN Presentation. A RAID controller feature that enables a host to access mapped volumes through either controller's host ports. ULP incorporates ALUA extensions.
under-provisioned	The amount of storage capacity that is allocated to volumes is less than the physical capacity of the storage system.
Unified LUN Presentation	See ULP.
Uninterruptible Power Source	See UPS.
unwritable cache data	Cache data that has not been written to disk and is associated with a volume that no longer exists or whose disks are not online. If the data is needed, the volume's disks must be brought online. If the data is not needed it can be cleared. Unwritable cache data is also called orphan data.
UPS	Uninterruptible Power Source.
UTC	Coordinated universal time. The primary time standard by which the world regulates clocks and time. It replaces Greenwich Mean Time.
UTF-8	UCS transformation format - 8-bit. A variable-width encoding that can represent every character in the Unicode character set used for the CLI and WBI interfaces.
VDS	Volume Disk Service.

volume copy	Independent copy of the data in a volume. The capability to create volume copies is a licensed feature (AssuredCopy) that makes use of snapshot functionality.
volume group	A user-defined group of volumes.
VSS	Volume Shadow Copy Service.
WBEM	Web-Based Enterprise Management. A set of management and internet standard technologies developed to unify the management of enterprise computing environments.
web-based interface/web-browser interface	See WBI.
WBI	Web-based interface/web-browser interface. The primary interface for managing the system. A user can enable the use of HTTP, HTTPS for increased security, or both.
Web-Based Enterprise Management	See WBEM.
Windows Management Instrumentation Query Language	See WQL.
World Wide Name	See WWN.
World Wide Node Name	See WWNN.
World Wide Port Name	See WWPN.
WQL	Windows Management Instrumentation Query Language.
WWN	World Wide Name. A globally unique 64-bit number that identifies a device used in storage technology.
WWNN	World Wide Node Name. A globally unique 64-bit number that identifies a node.
WWPN	World Wide Port Name. A globally unique 64-bit number that identifies a port.