Aspect Architecture Document

Alert and Event Notification

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Feature-Level Variation Control Sequence:
EXCLUDE: <default>
INCLUDE: AlertAndEventNotification

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CHANGES TO DOCUMENT

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Variation Point List

AlertAndEventNotification
Definition:
Requirements Mapping:

REVISION HISTORY

Revision	Description of Changes
A.3	Updated Event Configuration Table section for clarity Clarify that listed severity level definitions only apply to the default settings Removed the term persistent in the Needs Attention configuration setting section Updated needs attention cleared event section to the correct formatting Update to only use the existing getMelEntries SYMbol call for both the client and the persistent monitor. With this change, the HSW will be required to do the necessary filtering.
A.2 ~~1~~	Update per review meeting ~~Initial revision.~~
A.1 ~~2~~	Initial revision. ~~Update per review meeting~~

1. Element Functional Behavior Changes

This document updates the current alert and event definition by defining an Event Configuration Table that defines the individual behaviors of all of the MEL ~~events.The~~ events. The following MEL event attributes are set based on the values contained in the Event Configuration Table.

- Severity
- Event is viewable from the management client
- A needs attention indication and recovery guru entry is generated when the event occurs
- An alert message is generated when the event occurs
- The event's end user information string

Another behavior change defined by this version is that a ~~completion~~ needs attention cleared event is generated when a needs attention condition is cleared.

2. Introduction

The controller firmware identifies and logs events that occur during an array's operation. These events are persistently stored and retrievable through the management client software, as SNMP traps, or dispatched as email based alert notifications. This feature also allows for compile time configuration to allow an OEM to define the actions taken when the event ~~is posted~~ occurs.

3. Operational Behavior

3.1. Event Logging

Topic ID: 2010-03-26T15:45:00Z-1088-6206-IDACDFCE

The controller firmware provides the ability to chronologically log events that occur on an array. These events can provide information about configuration changes, indicate a degraded operational status, identify a hardware component failure, provide information about normal operations such as background data scans, or provide debug information to provide insight on a failure. These events are stored in a circular queue that persists across controller reboots. Events are retrieved through a SYMbol interface call and are displayed or retrieved using the management client.

3.2. Event Configuration Table

~~An event configuration table is used to populate specific attributes for an event.~~ The event configuration table is a stand-alone source controlled XML based file that is used to populate specific attributes for an event. When built, the table contains a listing of all MEL events associated with a release. Each MEL event entry in the list contains attributes associated with the MEL that are configurable. The configurable attributes are initially set to default values, but can be modified by an OEM to customize the configurable values for any MEL event. Once the table is modified, the filled in configuration table's information is used to generate a file used during controller firmware compilation to set the configurable MEL values. In addition, the configuration table is used to generate string files used during the storage management client's compilation.

~~The event table is comprised of a list of all events associated with a release. Each task in the list contains a group of attributes that are configurable. The default table is built using values defined by external requirements documents. In the event that a default value needs to be modified to comply with an OEM's requirements, the OEM shall modify the tasks attribute to a supported value. When a build is created, the event configuration table (either the default or OEM modified) is compiled as part of the firmware build to set all of the events' values. In addition, information in the table is used to generate event specific strings that are used when compiling the configuration management software.~~

The table contains the following configurable attributes:

Architecture Note: Note that any change~~s~~ to the default event configuration table ~~imply,~~ implies that an OEM specific build must be built.

Architecture Note: The preferable way to allow ~~configuration~~ an OEM to modify ~~of~~ the event configuration table ~~by an OEM~~ is to present it as a web interface where the available options are under our control. The web interface tool can then generate any source that's needed to compile the firmware or host software builds.

3.2.1. Severity level

Topic ID: 2010-04-01T21:47:00Z-1422-8106-IDAIBZ0D

This attribute assigns a severity level to the event. Note that while a severity level must be one of those listed below, the definition of what a severity level represents can be defined by an OEM. The definitions provided are considered default definitions and are used as a guideline for assigning generic severity levels.

The following severity levels are supported:

- Critical - An error has occurred that needs to be addressed immediately. The implication is that information has been lost or will be lost if the error is not immediately corrected. An example of a Critical error is a volume transitioning to failed due to drive failure(s)
- Warning - An error has occurred that has degraded the performance or the array's ability to recover from another error. The implication is that information has not been lost, but the error should be corrected to prevent information loss if another error occurs. An example of a Warning error is a single drive failure on a volume configured to RAID 5. The array can operate in this degraded state, but another drive failure on this volume will lead to lost information.
- Informational - An event has occurred that provides information that will verify a change in configuration or will be useful when evaluating whether a system is operating as expected. The implication is that during normal operation, an event has occurred that does not affect the normal operation of the system, but is useful to the user of a system. An example of an informational event is notification when the background data scrub operation starts and stops or the array transitions from degraded to optimal after the replacement of a failed fan canister.
- Debug - An event has occurred that provides information that will help troubleshoot or debug the steps or states that led to an error case. This information should not be visible to the user, but available to a support or development group to help identify and fix problems.

3.2.2. Event is viewable from the management client

Topic ID: 2010-04-01T21:47:00Z-1422-8106-IDAQDZ0D

This attribute defines whether an event, when it occurs, is visible as an entry from the client manager.

3.2.3. Set a needs attention when this event is posted

Topic ID: 2010-04-01T21:47:00Z-1422-8106-IDAFEZ0D

This attribute defines whether an event, when it occurs, sets a needs attention indication in the client management software. A needs attention condition is always associated with a recovery guru entry. The recovery guru entry provides the steps and information needed to resolve the condition. This ~~This~~ requires that a needs attention condition ~~be persistent and~~ be associated with an action that will clear the condition. A Product Requirement entry must be entered and approved for a specific release when an OEM wishes to change an event that's not listed as a needs attention event in the default configuration table to a needs attention event. This will allow development to determine whether the specified event can be a needs attention event and define the recovery steps required to correct the condition.

3.2.4. Send alert notification

Topic ID: 2010-04-01T21:47:00Z-1422-8106-IDALFZ0D

This attribute defines whether the management client will send an associated email/SNMP trap when an event occurs.

3.2.5. Event information string

Topic ID: 2010-04-01T21:47:00Z-1422-8106-IDA5FZ0D

This attribute defines a replacement text string that is associated with the event. When a string is specified for this attribute, the default information string is replaced with the attribute's string. Note that this ability does not change how we currently handle language locale support.

3.3. Needs Attention Cleared Indication

Topic ID: 2010-03-23T20:44:00Z-368-2101-IDAVCB4D

When a MEL ~~n~~ event configured to post a needs attention condition occurs, the specific event is tracked as an active needs attention event by the controller firmware. While the needs attention event is active, the needs attention indicator is set and an associated recovery guru entry is inserted into the failure recovery list (will be displayed in the management client's recovery guru dialog ~~is~~). When an event's recovery steps are completed and the needs attention condition is cleared, the association with the needs attention indication and the recovery guru entry are cleared. When the needs attention indication is cleared, an event is posted informing the user that the recovery steps were successful and the needs attention event has been cleared. The generic severity level for this event is informational.

4. Administrative and Configuration Interfaces

4.1. CLI Interfaces

4.1.1. View Event Log

Topic ID: 2010-03-26T15:45:00Z-1088-6206-IDA0RFCE

The command line interface provides an option to retrieve existing events. When the events are retrieved, they are saved in a ~~text~~ file. For an event to be ~~viewable~~ included in this file, it ~~the event~~ must have its Event is Viewable from the Management Client attribute set in the event configuration table. The user can specify the following options in the command line arguments:

- Retrieve all events or specify only events associated with a specific severity level
- Specify the number of events to be retrieved. When this option is used, the latest specified number of user viewable events are retrieved according to their timestamps
- Specify the filename to be saved and its location. Note that if no filename is specified, a default filename is used.

Architecture Note: The CLI interface provides an undocumented view all events option that will retrieve all events regardless of whether the event's Event is Viewable from the Management Client attribute is set.

4.1.2. resetMel

Topic ID: 2010-05-06T15:54:00Z-2301-13122-IDA3L13D

The command clears all events from the event log. The command cannot be reversed once issued. There are no arguments for this command.

4.2. GUI Interfaces

4.2.1. Event Log Viewer

Topic ID: 2010-03-26T15:45:00Z-1088-6206-IDARVFCE

The management client GUI interface provides the ability to view existing events. Through this interface, the user can perform the following actions:

- View a list of all viewable events.
- Filter viewable events by selecting one or more severity levels to view.

Architecture Note: If the event configuration table is configured so that no events associated with a severity level are viewable, the severity level shall not be listed as a filter option in the interface

- Define the number of most recent events to display
- Select one or more events from the interface and save them to a file
- Clear all events from the controller

4.3. SYMbol Interfaces

4.3.1. MelEntry

Topic ID: 2010-05-06T15:54:00Z-2301-13122-IDAWR13D

This structure is used to return information associated with a particular MEL entry. The following fields are defined for this structure:

- ASC - The Additional Sense Code value associated with this event
- ASCQ - The Additional Sense Code Qualifier associated with this event
- Category - Identifies the activity or event that caused the entry to be generated
- ComponentLocation - The location of the component associated with this entry
- ComponentType - The type of component that is associated with this entry
- EventSourceController - The controller that generated the event (Ctrl 1 or 2)
- EventType - An Integer value that indicates the type of event being reported
- ExtComponentLocation - Extended component location information for this entry
- LocationValid - Boolean value that states if the ComponentLocation field is valid
- Priority - The event severity code associated with this event
- rawData - The raw data stored for this event
- SenseKey - The Sense Key value associated with this event
- sequenceNumber - A unique monotonically increasing 64-bit sequence number
- timeStamp - The time at which the MEL entry was generated
- isClientViewable - If true, the management client will display the event
- setNeedsAttention - If true, the CFW will set a needs attention condition
- sendAlert - If true, the management client will send an email and SNMP alert
- defaultPriority - Lists the default value for support use
- defaultIsClientViewable- Lists the default value for support use
- defaultSetNeedsAttention - Lists the default value for support use
- defaultSendAlert- Lists the default value for support use

Architecture Note: Note that this is the existing structure with additional values to support the configurable event values.

Architecture Note: The default entries will always be set to the values in the default event configuration table. They are intended for support use only

4.3.2. get~~Filtered~~MelEntries ~~E vents~~

Topic ID: 2010-03-26T15:45:00Z-1088-6206-IDALZFCE

The get~~Filtered~~Mel~~E vents~~ Entries procedure is defined in the SYMbol interface to retrieve events from the controller. The procedure has the following arguments:

- MelExtent - The MelExtent contains a lower and upper sequence number that define the set of Mel events to be retrieved.
- ~~SeverityLevelFilter – This argument allows the caller to specify which MEL events to retrieve. The argument is a bitwise field that allows the caller to identify which severity or severities they wish to retrieve. For example, if the caller wishes to retrieve only the Critical and Warning events, they will set the Critical and Warning bit. The following is a list of valid bit values for this argument:~~
  - ~~Critical~~
  - ~~Warning~~
  - ~~Informational~~

- ~~Debug~~

Architecture Note: T ~~Note that t~~his command will ~~replace~~ be used by both the persistent monitor and the management client. The persistent monitor will filter by the alert attribute and the management client will filter the severity level base on the number of severities to show selected by the user. The ~~the existing getMelEntries and~~ getCriticalMelEntries SYMbol call will be ~~. These commands are~~ deprecated.

5. Error Handling and Event Notification

5.1. Needs Attention Cleared Event

Topic ID: 2010-03-22T20:45:00Z-1264-7207-IDAQLHID

EVENT SYNOPSIS: This event is posted when a needs attention event has been cleared
EVENT SYNOPSIS: Informational
MEL AFFECTED COMPONENT: Storage Array
FAILURE TYPE NAME: None
RECOVERY PROCEDURE: None
ADDITIONAL EVENT DETAILS: This event includes the component information associated with the event that was cleared.

EVENT SYNOPSIS: This event is posted when a needs attention event has been cleared.

~~**EVENT SYNOPSIS: Needs Attention Cleared Event**~~

~~Default severity level: Informational~~

~~Affected Component: Storage Array~~

~~Failure Type Name: None~~

~~Recovery Procedure: None~~

5.2. Unable to Map Legacy Event

Topic ID: 2010-04-01T21:47:00Z-1422-8106-IDA0ZZ0D

EVENT SYNOPSIS: This event is posted when an event generated with a previous firmware build is retrieved by a newer firmware build and the event configuration table does not have an entry for the event.
MEL EVENT TYPE: Informational
MEL AFFECTED COMPONENT: Storage Array
FAILURE TYPE NAME: None
RECOVERY PROCEDURE: None
ADDITIONAL EVENT DETAILS: This event includes the MEL event number for the event that existed as a legacy event, but is not included as an event in the event configuration table.

6. Compatibility and Migration

6.1. Inheriting Legacy MEL events during upgrade

Topic ID: 2010-03-22T20:45:00Z-1264-7207-IDA1MHID

After upgrading firmware, any events generated from the previous firmware build ~~persist~~ remain in the circular log queue until they are overwritten. Until they are overwritten, ~~T~~ these events will remain retrievable from the current level of firmware. The legacy events are mapped to the current firmware's event values as defined by the event configuration table. If any legacy events are not defined in the event configuration table, an event is generated that contains the legacy event number that could not be mapped to the new configuration table.

Architecture Note: The expectation is that the legacy events will be processed as they are retrieved. ~~2010-03-22T20:45:00Z-1264-7207-IDAYNHID;~~

7. Serviceability

8. Restrictions and Limits

8.1. Needs Attention Cleared Events and Reboots

Topic ID: 2010-03-22T20:45:00Z-1264-7207-IDAMUHID

Needs Attention events are not persistent across a reboot. All needs attention conditions are cleared when a reboot occurs. During start of day, the system will identify and set needs attention events ~~that~~ for conditions that persist after a reboot. If a needs attention event that is present before the reboot is not present after the reboot, a Need Attention Cleared event will not be generated.