

To: T10 Technical Committee
From: Tim Symons, PMC-Sierra (Tim_Symons@pmc-sierra.com)
Date: 28 July 2006
Subject: 06-358r1 SAS-2 Zone Configuration model

Revision Information

- Revision 0: Initial proposal
- **Revision 1: Use of the term "zone manager" extended throughout this document.**

[Start: Changes in the latest revision are shown in red]

Referenced Documents

sas2r05a Serial Attached SCSI – 2 (SAS-2) revision 5a
06-201r5 SAS-2 SMP Configure phy zone (Tim Symons, PMC-Sierra)
06-202r6 SAS-2 SMP Configure zone permission (Tim Symons, PMC-Sierra)
06-203r5 SAS-2 SMP REPORT ZONE PERMISSION (Tim Symons, PMC-Sierra)
06-286r4 SAS-2 SMP ZONE LOCK (Tim Symons, PMC-Sierra).
06-288r5 SAS-2 SMP ZONE ACTIVATE function (Tim Symons, PMC-Sierra)
06-289r4 SAS-2 SMP ZONE UNLOCK (Tim Symons, PMC-Sierra)
06-326r1 SAS-2 SMP Zone Locked Timer (Tim Symons, PMC-Sierra)

Overview

For a ZPSDS to function correctly all zoning expander devices must have identical values in their zone permission tables. The zone configuration model identifies the scenarios encountered when configuring zoning expander devices and defines procedures to minimize **the risk of** corruption of the ZPSDS.

Examples of causes of inconsistent zone permission tables are:

- a) Two or more zone management application clients attempt to update the ZPSDS at the same time;
- b) A device failure causes the process to be aborted part way through an update; and
- c) **A zoning expander device is configured by an out-of-band mechanism.**

[Suggested addition to SAS-2. Additions to existing text are shown in blue. Changes between revisions shown in red]

3.1 Definitions

3.1.267 zone manager: The entity responsible for configuring a ZPSDS (see 3.1.269). See 4.9.1.

3.1.x active zone manager: The zone manager that has successfully locked all zoning expander devices in a ZPSDS.

3.1.x locked: A zoning expander device that has the ZONE LOCKED bit set to one.

3.1.x SMP zone configuration function: SMP functions that are only accepted by a zoning expander device when it is locked.

3.1.x zoning expander shadow registers: registers in each zoning expander device that store all SMP zone configuration function changes.

4.8.2 Zoning expander device requirements

In addition to the requirements for expander devices described in 4.6, a zoning expander device shall:

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- h) contain a shadow zone permission table that supports all zone groups;
- i) contain a shadow phy zone configuration descriptor for each phy; and
- j) support PHYSICAL PRESENCE ASSERTED bit.

4.7.5.x Zone configuration model

4.7.5.x.1 Zone configuration

For a ZPSDS to function correctly, all zoning expander devices must have identical values in their zone permission tables. To make changes to the zone permission tables and phy zone information, a single zone manager locks zoning expander devices in a ZPSDS. Additional zoning expander devices may also be locked when merging them into the ZPSDS.

A zoning expander device shall not accept SMP zone configuration function requests until it is locked, and shall only accept SMP zone configuration function requests from the zone manager that locked the zoning expander device (i.e. the active zone manager). Changes are stored in the zoning expander shadow registers. When changes are complete, the zone manager activates the shadow registers and unlocks the expander devices.

If there is an interruption in the process to change the zone permission table values in a ZPSDS before all zoning expander devices have successfully completed SMP CONFIGURE ZONE PERMISSION requests, then the ZPSDS may be corrupted. The lock, load, activate and unlock procedure minimizes the risk of corruption, and provides positive notification of completion of each step in the process. A zone locked timer is used to ensure that if a device fails then the zoning expanders only remain locked for a finite time. When a zone locked timer expires then zoning expander devices are unlocked.

Figure 1 shows a reference example for zone configuration modeling

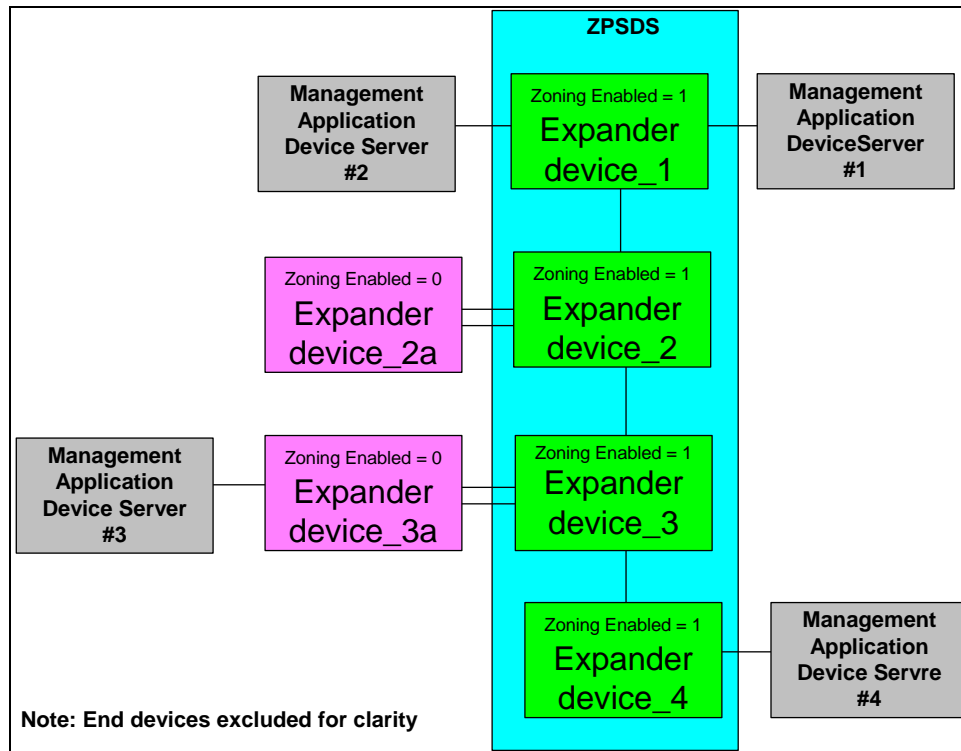


Figure 1 – ZPSDS with Management application clients.

The lock, load, activate and release functions are:

- a) **LOCK:** A zone manager uses the SMP ZONE LOCK function to lock zoning expanders. When a zoning expander is locked the ZONE LOCKED bit is set to one and the SAS address of the zone management server device is stored by each locked zoning expander to identify the active zone manager (see 10.4.3.x).

[Editors Note : Reference 10.4.3.x “SMP ZONE LOCK function”]

- b) **LOAD:** A zoning expander device shall only accept SMP zone configuration function requests originated by the active zone manager. The SMP zone configuration functions include:
- CONFIGURE PHY ZONE (see 10.4.3.x); and
 - CONFIGURE ZONE PERMISSION (see 10.4.3.x).

[Editors Note : Reference 10.4.3.x “SMP Configure Phy Zone function” and 10.4.3.x “SMP Configure Zone Permission function”]

SMP zone configuration function values are applied to shadow registers and are not active until the SMP ZONE ACTIVATE function is successfully completed. When a zoning expander device receives an SMP zone configuration function request the CONFIGURING bit is set to one (see 10.4.3.x).

- c) **ACTIVATE:** When all SMP zoning configuration function requests have successfully completed the active zone manager shall issue an SMP ZONE ACTIVATE request to all zoning expander devices to make the shadow registers active (see 10.4.3.x).

[Editors Note : Reference 10.4.3.x “SMP ACTIVATE function”]

- d) **UNLOCK:** When the SMP ZONE ACTIVATE had been successfully completed by all locked zoning expander devices, the active zone manager originates an SMP ZONE UNLOCK request to the locked zoning expander devices. When a zoning expander is

unlocked the ZONE LOCKED bit is set to zero and the CONFIGURING bit is set to zero. The zone expanders originate Broadcast (change) to notify the domain of changes (see 10.4.3.x).

[Editors Note : Reference 10.4.3.x "SMP ZONE UNLOCK function"]

4.7.5.x.2 Link reset zone initialization

When a zoning expander device experiences a link reset and the ZONE GROUP PERSISTENT bit is set to one and the INSIDE ZPSDS PERSISTENT bit is set to one, then the ZPSDS is restored (see 10.4.3.3). If the ZONE GROUP PERSISTENT bit is set to zero or the INSIDE ZPSDS PERSISTENT bit is set to zero, then the zoning expander device is not a member of a ZPSDS.

4.7.5.x.3 Reconfiguring zone information for an established ZPSDS

To change phy zone information a zone manager locks only the zoning expander devices containing the phys to be changed. To change the zone permission tables a zone manager locks all the devices in the ZPSDS and changes all zone permission tables before originating the SMP ACTIVATE request and SMP ZONE UNLOCK requests. When a zoning expander receives an SMP ZONE UNLOCK request, it originates Broadcast (Change) (see 7.11)

4.7.5.x.4 Resolving zoning when merging two or more ZPSDS'

When two or more ZPSDS' are to be merged into an established ZPSDS then the zone manager of the established ZPSDS locks all of the zoning expander devices to be included in the final ZPSDS and configures all of the zone permission tables to be identical. The zone manager configures the REQUESTED INSIDE ZPSDS bit to enable the zone expanders to be merged into the ZPSDS. The ZPSDS is established when all changes have been successfully activated and unlocked (see 10.4.3.x).

[Editors Note : Reference 10.4.3.x "SMP ZONE UNLOCK function"]

4.7.5.x.5 Merging a zoning expander device into a ZPSDS.

The zone manager of the established ZPSDS locks a zoning expander device to configure the zone permission tables and zone phy information. The active zone manager may change the REQUESTED INSIDE ZPSDS bit to one to allow the zoning expander device to be merged into the established ZPSDS. The ZPSDS is established when all changes have been successfully activated and unlocked (see 10.4.3.x).

[Editors Note : Reference 10.4.3.x "SMP ZONE UNLOCK function"]

4.7.5.x.6 Resolving zoning management when two or more zone managers attempt to lock a ZPSDS

If more than one zone manager attempts to lock a group of zoning expanders before all of the zoning expander devices are locked then the zone management client device with the highest SAS address wins the lock (see 10.4.3.x). If a group of zoning expanders are already locked and the CONFIGURING bit is set to one then the established lock remains.

[Editors Note : Reference 10.4.3.x "SMP ZONE LOCK function"]

4.7.5.x.7 Failure to respond during zone configuration

If a zone locked timer expires then the zoning expander devices is unlocked and the zoning expander shadow registers are not activated. A zone locked timer may expire due to any device not responding in the locked group of expander devices.

4.7.5.x.8 Out of band zone configuration

If a zoning expander device is reconfigured by an out of band process it is beyond the scope of this standard to define operation.