

To: T10 Technical Committee
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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.
- **Revision 2: Text improvements identified during conference call. Added Broadcast (Activate)**

[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)
06-373r0 SAS-2 Enable and disable zoning by management identifier key (Rob Elliott, HP)

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 (see 4.7.5.x).

Editors Note: Zone configuration model reference

3.1.x locked zoning expander device: A zoning expander device that has been locked by a zone manager. (see 10.4.3.xx)

Editors Note: SMP ZONE LOCK reference

3.1.x SMP zone configuration function: An SMP function that is only accepted by a zoning expander device when it is locked (see 4.7.5.x).

Editors Note: Zone configuration model reference

3.1.x zoning expander registers: registers in each zoning expander device that contain the active zone permission table and the active zone phy information for each phy of an expander device (see 4.7.5.x).

Editors Note: Zone configuration model reference

3.1.x zoning expander shadow registers: registers in each zoning expander device that are used to temporarily store all SMP zone configuration function changes until the activate process has been successfully completed (see 4.7.5.x)

Editors Note: Zone configuration model reference

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 process

For a ZPSDS to function correctly, all zoning expander devices have identical values in their zone permission tables. A zone manager device locks the zoning expander devices to make changes to the zone permission tables and phy zone information of a zoning expander device (i.e. SMP zone configuration functions). A zoning expander device shall not accept any 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.

Figure 1 shows a reference example for zone configuration modeling

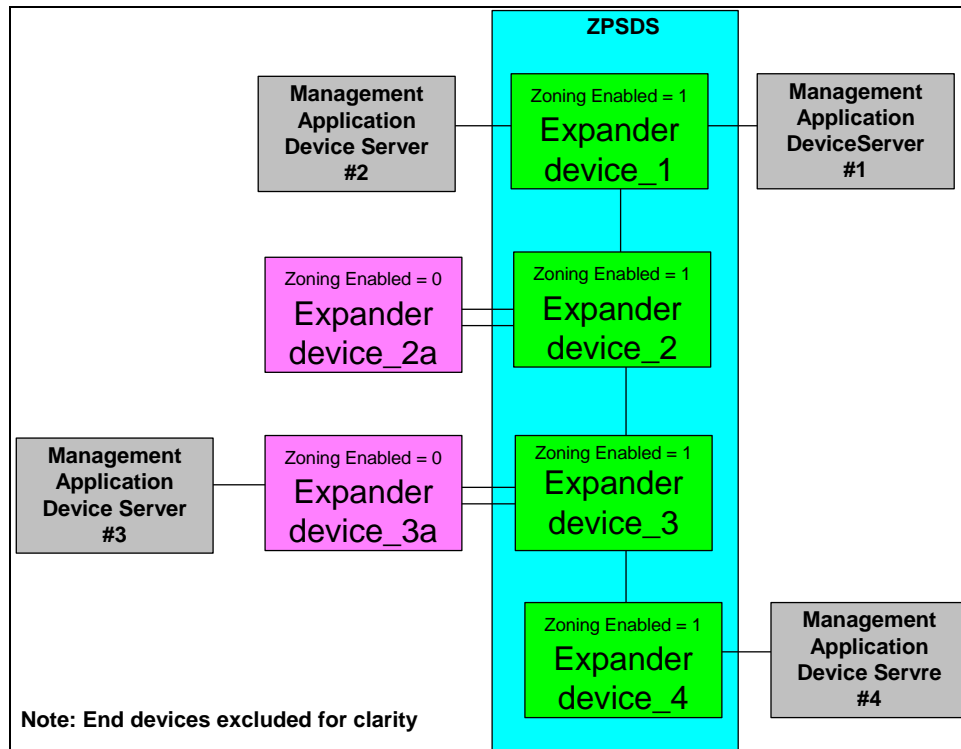


Figure 1 – ZPSDS with Management application clients.

The lock, load, activate and **unlock steps** are:

- 1) **LOCK**: A zone manager uses the SMP ZONE LOCK function (see 10.4.3.xx) to lock zoning expanders. A zoning expander is locked **when** the ZONE LOCKED bit is set to one and **after** the SAS address of the zone management server device **has been** stored. **When a zoning expander device is locked then it may process SMP zone configuration functions.**

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

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

The **CONFIGURING** bit is set to one (see 10.4.3.x) when a zoning expander device processes an SMP zone configuration function request. The SMP zone configuration function values are stored in the shadow registers and are not copied to the zoning expander registers until a Broadcast (Activate) or the SMP ZONE ACTIVATE function have successfully completed.

- 3) **ACTIVATE**: After the active zone manager receives a successful SMP FUNCTION ACCEPTED response to of all outstanding SMP zone configuration functions then the active zone manager shall issue one of the following:
 - a. a Broadcast (Activate) (see 4.1.12) on all ports; or
 - b. an SMP ZONE ACTIVATE request (see 10.4.3.x) to all zoning expander devices;

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

When a locked zoning expander device receives a Broadcast (Activate) or an SMP ZONE ACTIVATE request, the zoning expander shadow registers are copied into the zoning expander registers to make the values active.

The ACTIVATE step is skipped, and the configuration changes are ignored when any of the following events occur:

- a. a zone locked timer expires (see x.x.x.x)
- b. a zone manager unlocks without changes
- c. a higher SAS address zone manager wins the lock

- 4) UNLOCK: After the active zone manager originates a Broadcast (Activate) and all outstanding SMP ZONE ACTIVATE functions have successfully completed then 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) (see 10.4.3.x).

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

4.7.5.x.2 Zone configuration events

4.7.5.x.2.1 Zoning expander power on

A zoning expander device may configure the zone permission table, and zone phy information at power on and become part of a ZPSDS without a zone manager configuring the zoning expander device.

4.7.5.x.2.2 Zoning expander link reset

If a zoning expander device experiences a link reset the zone configuration may be maintained if the persistent bits are set to one (see 4.9.4).

4.7.5.x.2.3 Reconfiguring zone information for a 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.2.4 Adding a zoning expander or merging two or more ZPSDS'

When two or more ZPSDS' are to be merged, or a zoning expander device is to be added to a ZPSDS then the zone manager locks all of the zoning expander devices that are to be included in the final ZPSDS. The active zone manager configures all of the zone permission tables to be identical and the zone phy information for the ZPSDS. The zone manager configures the REQUESTED INSIDE ZPSDS bits to enable the zone expanders to be merged into the ZPSDS.

If a zoning expander device is not zoning enabled, then the physical presence bit shall be one allow the active zone manager to enable zoning. The ZPSDS is complete established when all changes have been successfully activated (see 10.4.3.x) and unlocked (see 10.4.3.x).

[Editors Note : Reference SMP ZONE ACTIVATE, Broadcast (Activate) and SMP ZONE UNLOCK]

4.7.5.x.2.5 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.2.6 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.2.7 Out of band zone configuration

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