

To: T10 Technical Committee  
From: Tim Symons, PMC-Sierra (Tim\_Symons@pmc-sierra.com)  
Date: 27 Aug 2006  
Subject: 06-358r3 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)
- **Revision 3: Additional text and changes per Seattle working group meeting**

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

### Referenced Documents

sas2r05a Serial Attached SCSI – 2 (SAS-2) revision 5a  
06-201r6 SAS-2 SMP Configure zone phy information (Tim Symons, PMC-Sierra)  
06-202r7 SAS-2 SMP Configure zone permission (Tim Symons, PMC-Sierra)  
06-203r6 SAS-2 SMP REPORT ZONE PERMISSION (Tim Symons, PMC-Sierra)  
06-286r5 SAS-2 SMP ZONE LOCK (Tim Symons, PMC-Sierra).  
06-288r6 SAS-2 SMP ZONE ACTIVATE function (Tim Symons, PMC-Sierra)  
06-289r6 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)  
**06-377r1 SAS-2 Broadcast (Zone Activate)**

### 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.

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

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### 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 successfully locked a zoning expander device (see 4.7.5.x).

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Editors Note: Zone configuration model reference

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

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Editors Note: SMP ZONE LOCK reference

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**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).

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Editors Note: Zone configuration model reference

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**3.1.x zoning expander active values :** the active zone permission table and the active zone phy information for each phy of an expander device (see 4.7.5.x).

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Editors Note: Zone configuration model reference

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**3.1.x zoning expander shadow values:** A copy of the active zone permission tables and zone phy information for each phy of a zoning expander device that is changed by SMP zone configuration function requests until the activate step has been successfully completed (see 4.7.5.x)

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Editors Note: Zone configuration model reference

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## 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) store active zone permission table values;
- i) store shadow zone permission table values;
- j) store active zone phy information values for each phy;
- k) store shadow zone phy information values for each phy; and
- l) 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 are **required to** have identical values in their zone permission tables. A zone manager device locks the zoning expander devices to make changes to the zone permission table **values** and zone phy information of a zoning expander device (i.e. SMP zone configuration functions). A zoning expander device only accepts SMP zone configuration function requests when it is locked, and only accepts SMP zone configuration function requests from the zone manager that locked the zoning expander device (i.e. the active zone manager). **SMP zone configuration functions change the zoning expander shadow values. When changes are complete, the zone manager activates the changes and the zoning expander device sets the zoning expander active values equal to the zoning expander shadow values and then** unlocks the expander devices.

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

- 1) **Lock:** A zone manager **sends** the SMP ZONE LOCK **request** (see 10.4.3.xx) to lock zoning expander **devices**. A zoning expander **device** is locked when the ZONE LOCKED bit

is set to one in any REPORT GENERAL response and after the SAS address of the zone management server device has been stored. A locked zoning expander device processes SMP zone configuration functions.

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

If more than one zone manager attempts to lock a group of zoning expanders, the following rules ensure that any concurrent requests are always resolved:

- 1) If the first SMP ZONE LOCK response received by a zone manager has the FUNCTION RESULT field set to ZONE LOCK VIOLATION (see 10.4.3.2), then the group of zoning expanders is locked by another zone manager and no further requests should be originated until a Broadcast (change) event is received;
- 2) If at least one SMP ZONE LOCK request is successful and at least one other response has:
  - a) the FUNCTION RESULT field set to ZONE LOCK VIOLATION (see 10.4.3.2); and
  - b) the CONFIGURING bit is set to one,

then the group of zoning expanders is locked by another zone manager and no further requests should be originated until a Broadcast (change) event is received; or

- 3) If at least one SMP ZONE LOCK request is successful and at least one other response has:
  - a) the FUNCTION RESULT field set to ZONE LOCK VIOLATION (see 10.4.3.2); and
  - b) the CONFIGURING bit is set to zero,

then another zone manager has locked at least one zoning expander device in the group of expander devices and the zone manager evaluates the ZONE LOCKED SAS ADDRESS field from the SMP ZONE LOCK response;

- a) if the returned SAS address has a lower numeric value than the SMP port SAS address of the zone manager, then the zone manager with the higher numeric value SAS address shall originate an SMP ZONE LOCK request to all zoning expander devices that it has not already locked; or
- b) if the returned ZONE LOCKED SAS ADDRESS field has a higher numeric value than the SMP port SAS address of the zone manager, then the zone manager with the lower numeric value SAS address shall originate an SMP ZONE UNLOCK request to all zoning expander devices that it locked.

- 2) Load: When a zoning expander device is successfully locked then SMP zone configuration function requests originated by the active zone manager may be processed. The SMP zone configuration functions include:

- a) SMP CONFIGURE ZONE PHY INFORMATION (see 10.4.3.x);
- b) SMP CONFIGURE ZONE PERMISSION (see 10.4.3.x);
- c) SMP ZONE ACTIVATE; and
- d) SMP ZONE UNLOCK.

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

After a **locked** zoning expander device processes **any** SMP zone configuration request, the CONFIGURING bit **is set** to one **in any SMP REPORT GENERAL response** (see 10.4.3.x)

**SMP zone configuration functions change the zoning expander shadow values** and do not become zoning expander active values until **the activate step is processed**.

- 3) **Activate**: After **all outstanding SMP zone configuration functions have completed**, then the active zone manager shall issue one of the following:
  - a) a Broadcast (Activate) (see 4.1.12); or
  - b) an SMP ZONE ACTIVATE request (see 10.4.3.x) to all zoning expander devices **in the ZPSDS**;

[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, **then the zoning expander device sets the zoning expander active values equal to the zoning expander shadow values**.

The activate step is skipped, and the configuration changes are ignored **if the zoning expander device is unlocked**.

- 4) **Unlock**: After all outstanding SMP ZONE ACTIVATE functions have successfully completed then the active zone manager **sends** an SMP ZONE UNLOCK request with the **ACTIVATE REQUIRED bit set to zero**, to the locked zoning expander devices.

**After the active zone manager originates a Broadcast (Activate) then active zone manager sends an SMP ZONE UNLOCK request with the ACTIVATE REQUIRED bit set to one, to the locked zoning expander devices**.

**If the SMP ZONE UNLOCK request is successful, then the zoning expander is unlocked and the zoning expander device:**

- 1) **sets the ZONE LOCKED bit to zero and sets the CONFIGURING bit to zero in any REPORT GENERAL response; and (same text as before)**
- 2) **originates Broadcast (change) (see 10.4.3.x).**

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

**If the SMP ZONE UNLOCK response is BUSY (see 10.4.3.2), then the zone manager originates a new SMP ZONE UNLOCK request.**

**If the SMP ZONE UNLOCK response is NOT ACTIVATED (see 10.4.3.2), then the zone manager repeats the activate step and then the unlock step.**

**When all SMP ZONE UNLOCK requests are successful the configuration process is complete.**

#### 4.7.5.x.2 Zone configuration events

##### 4.7.5.x.2.1 Reconfiguring zone phy information for a ZPSDS

To change zone phy 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 is required to complete the steps defined in 4.7.5.x.

##### 4.7.5.x.2.2 Adding a zoning expander or merging two or more ZPSDSes

When two or more ZPSDSes 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 bit for each phy in each zoning expander device to enable the zone expanders to be merged into the ZPSDS.

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

##### 4.7.5.x.2.3 Failure to respond during zone configuration

After a zone locked timer expires then the zoning expander device is unlocked and the zoning expander shadow registers are not activated.

#### 4.9.4 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.

----- Editors note: Put this sentence into the power on section of SAS-2

----- Move existing SAS2-5a 4.9.4 to 4.9.5 ....