ENDL
TEXAS

Date: 20 February 2006
To: T10 Technical Committee
From: Ralph O. Weber
Subject: SAS-2 Zoning sans Management

Summary

Discussions during the ongoing SAS Zoning conference calls strongly suggest three critical points:

1) Reaching consensus regarding Zoning management will not be achieved until at least May;
2) Consensus has already been reached regarding those aspects of Zoning that require hardware (i.e., not firmware) changes; and
3) Approving the hardware changes needed by SAS-2 Zoning should have been accomplished in January (i.e., the changes needed be in SAS-2 yesterday).

It has been said that there is no way to separating the hardware aspects of the primary SAS-2 Zoning proposal (06-019r4) from the firmware aspects. As part of a never ending effort to prove that fools rush in where angels fear to tread, this document attempts to achieve the impossible separation and define the agreed upon hardware aspects SAS-2 Zoning without prejudice as to how they are managed.

Referenced Documents

SAS-2 revision 2	(http://www.t10.org/ftp/t10/drafts/sas2/sas2r02.pdf)
SAM-4 revision 5	(http://www.t10.org/ftp/t10/drafts/sam4/sam4r05.pdf)
SAS-2 Zoning [06-019r4]	(http://www.t10.org/ftp/t10/document.06/06-019r4.pdf)

Revision History

r0 Initial revision

Known Substantial Changes from 06-019r4

Because it seems more like a management security feature than anything else, the ZONE SUPERVISOR bit has been greyed out of this proposal. A ZONING FEATURES bit has been introduced in its place, with all the set to zero and ignored specifications found on the COMPATIBLE FEATURES byte in SAS-2. Admittedly, this is a slap-dash change that falls way short of satisfying the debated needs.

Two paths look promising for r1 of this proposal but some discussion is needed in Denver to decide the right course of action. The two options are as follows:

a) Define an 8-bit ZONING ATTRIBUTES structure that is composed on the well known, 7-bit ZONE GROUP field and one reserved bit. Specify that the full ZONING ATTRIBUTES byte be copied to the OPEN address frame in place of the current coping of the ZONE GROUP field. This would nail down the hardware rules and postpone defining the meaning of the reserved bit until the management issues are resolved; or
b) Define a mechanism to use zone group 2 as the zoning management group. The details of this approach are not yet fully realized, but a couple of key points are:
   A) Some type of SMP request type field would need to be added to the OPEN address frame; and
   B) A phy that sets a value in the ZONE GROUP field would be obliged to check the PROTOCOL field for SMP plus the new field for the type, and under specified conditions, set the ZONE GROUP field to 2 instead of the value associated with the phy.

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Option a) involves minimal changes but results in limits on future expansion of SAS Zoning features. Option b) allows the number of zone groups to be doubled at some future date and also points the direction to future use of other reserved zone groups (e.g., the pattern set by option b) could be followed to define zone group 3 to handle a new SMP feature added in SAS-4 in the same way that zoning management is handled in SAS-2).

SAM-4 r05 specifies that there is exactly one service delivery subsystem in a SCSI domain. The term zone service delivery subsystem engenders the possibility that some readers will assume equivalence between a SAS domain and a zone service delivery subsystem. Therefore, the term 'zone service delivery subsystem' has been replaced with 'zoned portion of a service delivery subsystem'. Since zoned service delivery subsystem is represented by an acronym, this change amounts to substituting ZPSDS for ZSDS.

A requirement has been added restricting to one the number of ZPSDS instances in a SAS domain.

Notation Conventions

The goal of this proposal is to duplicate the hardware semantics of 06-019r4 without transcription errors. Suffering from a perhaps exaggerated confidence in my ability to draft standardeze, however, no attempt has been made to preserve the exact 06-019r4 wording.

To aid those who wish to apply their own CRC to transcription efforts, the following conventions have been applied:

- All the text found in 06-019r4 up to but not including the clause 10 changes appears in this document;
- Text from 06-019r4 that concerns management appears in grey and shall not be consider part of the SAS-2 changes proposed by this document;
- Unmodified text from 06-019r4 appears in black and shall be considered part of the proposed SAS-2 changes;
- Changes from 06-019r4 that are part of this proposal appear in dark red with 06-019r4 text that is proposed for removal shown in ~~dark red strikeouts~~;
- Totally new additions proposed by this document are shown in bright red; and
- Notes (i.e., text that is not intended for inclusion in SAS-2) are shown in green.

Proposed SAS-2 Changes

3 Definitions, symbols, abbreviations, keywords, and conventions

3.1 Definitions

[Start of new definitions]

[Start: Editors note: Renamed SMP zoning functions to SMP zone management function. Supervising priority renamed to supervisor priority for consistency with other supervisor control references and revised definition of a zone supervisor device to include relationship to supervisor bit]

3.1.4 active zone supervisor device: The supervisor device that has been elected to configure all zoning expander zone route tables and zone permission tables in the ZSDS.

3.1.211 SMP zone management functions: SMP functions used for ZSDS configuration (see 9.4.3.1.)

3.1.260 zone group: A set of expander phys in a ZPSDS ~~ZSDS that~~ all of which have the same access permission.

3.1.261 zone permission table: The table that defines access permission between the zone group of an initiating phy and the zone group of the destination phy.

ROW Note 1: Subclause 4.9.1 uses the terms 'source port' and 'destination port'. Should this be 'source phy' and 'destination phy'?

3.1.262 ~~zone~~ zoned portion of a service delivery subsystem (ZPSDS): A group of zoning expanders that cooperate to control phy access. The ~~zone service delivery subsystem~~ ZPSDS may include all or part of the service delivery subsystem (see 4.1.6).

3.1.263 zone supervisor priority: The priority of a zone supervisor device for election to active zone supervisor device.

3.1.264 zone supervisor device: A zoning expander device or a zoning device attached to a phy with the ZONE SUPERVISOR bit set to one.

3.1.265 zoning device: A SAS expander device or an end device that is an SMP initiator and an SMP target and supports all SMP zone management functions.

3.1.266 zoning expander device: A SAS expander device that is an SMP initiator and an SMP target and supports all SMP zone management functions (see 4.9.2).

[End of new definitions]

3.2 Symbols and abbreviations

[Start of new abbreviations]

Abbreviation	Meaning
~~ZSDS~~	~~Zone Service Delivery Subsystem~~
ZP[s,d]	Zone Permission bit for source, s, and destination, d, in the zone permission table (see 4.9.3.2)
ZPSDS	Zoned Portion of a Service Delivery Subsystem
AZSD	Active Zone Supervisor Device

[End of new abbreviations]

4. General

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4.6.5 Broadcast primitive processor (BPP)

The BPP receives broadcast primitive requests from each expander phy and requests transmission of those requests on all expander ports except the expander port from which the broadcast primitive request was received.

In a self-configuring expander device (see 4.1.5), the BPP requests transmission of a BROADCAST (CHANGE) when it completes configuration (see 10.4.3.3).

In a zoning expander device (see 4.9.6), receipt of a broadcast primitive may be translated into a SMP ORIGINATE BROADCAST PRIMITIVES request or vice versa.

4.6.6.5 BPP interface

Table 15 describes the requests from an expander phy to the BPP. See 7.11 for more information on broadcasts. See 4.9.6 for more information on how zoning expander devices handle broadcasts.

[No other changes in 4.6.6.5]

[New Section (i.e., subclause)]

4.9 Zoning

4.9.1 Zoning overview

SAS zoning is implemented by a set of zoning expander devices that define the zoned portion of a service delivery subsystem (ZPSDS). The zoning expander devices control whether a phy is permitted to open a connection to another phy. End devices may support zone features.

There shall be at most one ZPSDS in a SAS domain. The ZPSDS may encompass some or all of the SAS domain.

Every phy ~~of~~ in a ZPSDS belongs to a zone group. All phys in a wide port shall belong to the same zone group. Each zoning expander contains a zone permission table that controls whether a connection is allowed between the zone group of a source port and the zone group of a target port. There are 128 zone groups.

A requested connection shall only be opened if the zone permission table indicates that access between the zone group of the source port and the zone group of the target port is allowed.

The zone route table is an extended version of the expander route table (see 4.6.7.3) ~~extended to include~~ that includes zone phy information. The zone permission table and zone route table are configured by the active zone supervisor device (AZSD).

Expander devices that do not support zoning may be part of the service delivery subsystem, but they ~~remain~~ are treated as being outside the boundary of the ZPSDS (i.e., non-zoning expander devices are treated in the same manner as end devices). All phys ~~of the~~ in a non-zoning expander device belong to the zone group specified for the phy that attaches the non-zoning expander device to the ZPSDS.

[Start: Editors note: Restated usage of ZSDS and interaction with zone supervisor devices]

The ZSDS shall be managed and configured by zone supervisor devices. SMP zone management functions shall only be processed if originated by a zone supervisor device. One supervisor device shall be elected to be the AZSD. The AZSD shall be the only device to propagate zone access permission changes throughout the ZSDS.

The proper configuration of the ZSDS depends on the election of an AZSD. This dependency may be satisfied by setting a value greater than zero in the zone priority field of one of more supervisor devices in the ZSDS.

Figure n1 shows an example of a ZPSDS.

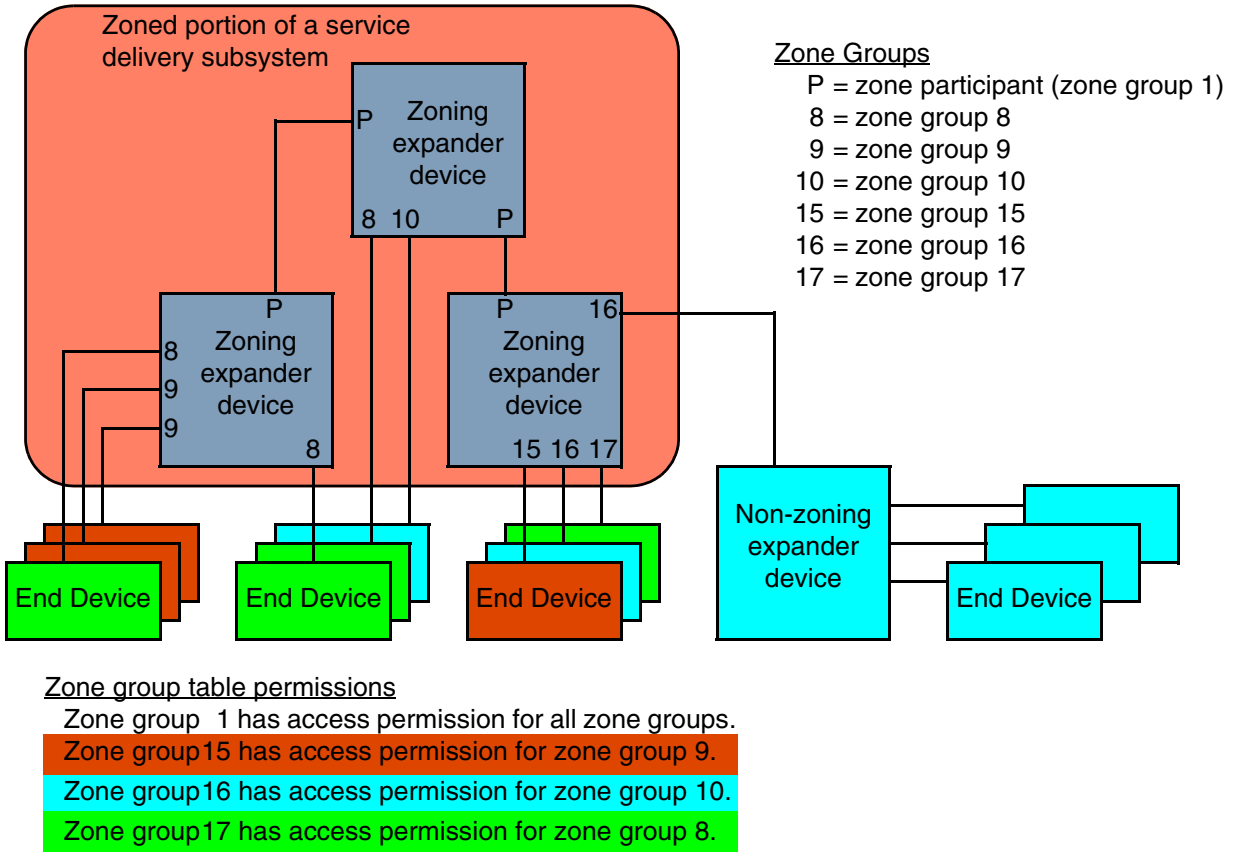

Figure n1 — Example of a ZPSDS

4.9.2 Zoning expander device requirements

A zoning expander device shall ~~support~~ have the following attributes:

a) contain~~s~~ a zone expander zone route table (see 4.9.3.4);
b) contain~~s~~ a zone permission table that supports 128 zone groups (see 4.9.3.3);
c) allow~~s~~ or ~~denies~~ deny connection requests ~~following~~ based on the zoning permissions;
d) set~~s~~ the ZONE DEVICE bit to one in its SMP REPORT GENERAL response;
e) be self-configuring;
f) contain~~s~~ an SMP initiator and SMP target (see 4.6.1); and
g) support~~s~~ all zoning related SMP functions (see TBD).

ROW Note 2: The list above has been reordered in comparison to 06-019r4. The more phy-oriented requirements are listed first and the management requirements are listed later. Since there is no dispute regarding management at this level of generality, removing the management requirements seems unnecessary in this specific case.

4.9.3 Zone Operation

4.9.3.1 SMP zoning functions

[Start: Editors note: Renamed SMP zoning functions to SMP zone management and rephrasing of SMP CONFIGURE and SMP REPORT ZONE functions]

SMP zone management functions shall be supported by all zoning devices. These functions configure and control the ZSDS are:

a) SMP CONFIGURE PHY ZONE (see 10.4.3.13);
b) SMP CONFIGURE ZONE PERMISSION (see 10.4.3.14);
c) SMP REPORT ZONE PERMISSION (see 10.4.3.15); and
d) d) SMP REPORT ZONE ROUTE TABLE (see 10.4.3.16).

SMP CONFIGURE PHY ZONE and SMP CONFIGURE ZONE PERMISSION functions shall be processed when the requesting device is a zone supervisor device and in all other cases shall result in FUNCTION FAILED.

SMP REPORT ZONE PERMISSION and SMP REPORT ZONE ROUTE PERMISSION functions may be requested by any SMP initiator.

4.9.3.1 Zone phy information

Each phy of a zoning expander device shall support the following zone phy information fields:

a) ZONE PARTICIPATING bit;
b) ZONE SUPERVISOR bit;
c) ZONE SUPERVISOR PRIORITY field; and
b) ZONE GROUP field.

The ZONE PARTICIPATING bit indicates the boundary of the ZPSDS. The ZONE PARTICIPATING bit shall be set to zero when the phy is attached to ~~a~~ an end device or an expander device that does not support zoning. ~~This indicates the boundary of the ZSDS.~~ The ZONE PARTICIPATING bit shall be set to one when the phy is attached to a zoning expander device. The ZONE PARTICIPATING bit should be set to one when the phy is attached to a zoning end device. If the ZONE PARTICIPATING bit is set to zero, then zoning information shall not be sent ~~or received~~ on the phy and any zoning information received on the phy shall be ignored.

The ZONE SUPERVISOR bit set to one indicates that a device attached to the phy may be a zone supervisor device. A ZONE SUPERVISOR bit set to zero indicates that a device attached to the phy shall not be a zone supervisor device.

The ZONE SUPERVISOR PRIORITY field indicates the active zone supervisor priority of the device attached to the phy (see 4.9.4.2). If the ZONE SUPERVISOR PRIORITY field is set to zero then the device shall not be elected to AZSD. If the ZONE SUPERVISOR bit is set to zero then the ZONE SUPERVISOR PRIORITY field shall be ignored and shall be set to zero in all functions.

The ZONE GROUP field has a value in the range 0 to 127 that indicates the zone group ~~that contains~~ to which the phy belongs.

[End: Editors note: Renamed SMP zoning functions to SMP zone management and rephrasing of SMP CONFIGURE and SMP REPORT ZONE functions]

4.9.3.2 Zone permission table

The zone permission table specifies access permission between zone groups. If a bit in the zone permission table ~~entry~~ is set to one then connection requests shall be permitted between phys in the zone groups. If a bit in the zone permission table ~~entry~~ is set to zero then connection requests shall be rejected ~~and fail~~ (see 4.9.3.4).

Zoning expander SMP source and target ports shall belong to zone group 1.

The zone permission table structure is shown in table n1.

Table n1 — Zone permission table

Zone group Y	Zone group X							
	0	**1**	**2**	**…**	**7**	**8**	**…**	**127**
0	0	1	0	…	0	0	…	0
1	0	1	1	…	1	1	…	1
2	0	1	Reserved	…	Reserved	Reserved	…	Reserved
…	…	…	…	…	…	…	…	…
7	0		Reserved	…	Reserved	Reserved	…	Reserved
8	0	1	Reserved	…	Reserved	ZP[8,8]	…	ZP[127,8]
…	…	…	…	…	…	…	…	…
127	0	1	Reserved	…	Reserved	ZP[8,127]	…	ZP[127,127]
Note: Gray shading ~~highlights~~ identifies user configurable zone groups.								

A ZP[X,Y] bit set to one specifies that zone group (X) has permission to access zone group (Y). A ZP[X,Y] bit set to zero specifies that zone group (~~Y~~X) ~~has no~~ does not have permission to access zone group (~~X~~Y).

~~When a value is written to~~ If ZP[X,Y] is set to a value, then ZP[Y,X] ~~is updated with~~ shall be set to the same value.

Zone group 0 shall not have access to any other group except zone group 1 (~~i.e.~~ e.g., bits ZP[0,0] and bits ZP[2…127,0] shall be set to zero).

Zone group 1 shall access all other zone groups (~~i.e.~~ e.g., bits ZP[0…127,1] shall be set to one).

Zone groups 2 through 7 are reserved zone groups. All reserved ZP bits shall be set to zero (~~i.e.~~ e.g., bits ZP[2…7,2…127] shall be set to zero).

4.9.3.3 Zoning expander zone route table

ROW Note 3: The text marked for deletion below duplicates a requirement that is stated in 4.9.2.

~~Zoning expander devices shall be self-configuring.~~ The zone route table ~~of~~ in a zoning expander device shall contain zone phy information in addition to the expander phy information.

Figure 2 shows a representation of a zoning expander ~~zone~~ route table.

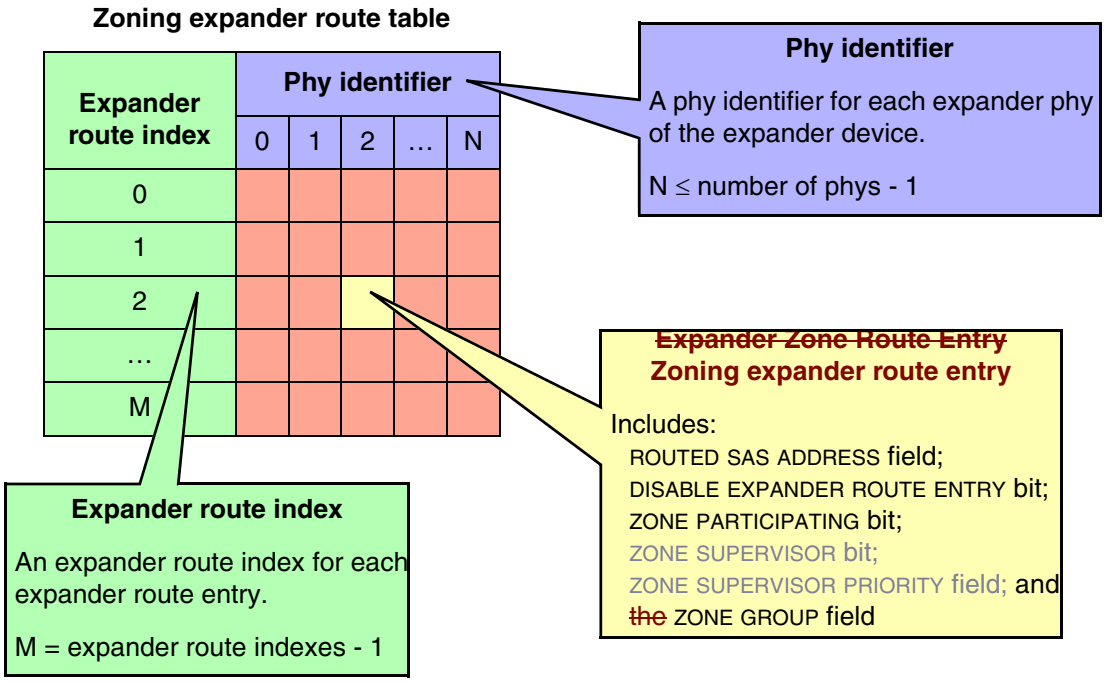

Figure n2 — ~~Figure 45 - Zone~~ Zoning expander route table example

4.9.3.4 Zone routing

[Start: Editors note: rephrasing of sentences to align with T10 language]

When a zoning expander device receives an OPEN request the zone group of the source port and the destination port is identified as defined in table n2 ~~from the zone route table~~. If the ~~zoning permission table entry~~ ZP[source port zone group, destination port zone group] ~~entry~~ bit is set to one then access between the phys shall be permitted and the zoning expander shall process the ~~normal~~ ECM arbitration procedure. If the ~~zone permission table entry~~ ZP[source port zone group, destination port zone group] bit is set to zero then access between the phys is not permitted and the OPEN_REJECT (ZONE VIOLATION) response shall be sent to the device that originated the OPEN request (see 7.8.3).

When a device receives an OPEN_REJECT (ZONE VIOLATION) response, the ZONE VIOLATION bit shall be set to one (see 7.2.5.11).

Zoning expander devices shall follow the rules in table n2 to check the zone group access permission of the DESTINATION SAS ADDRESS field ~~from~~ in the OPEN request.

Table n2 — Routed zone group

Expander phy routing attribute (see 4.6.7.1)	~~Target zone group permission~~ Destination zone group determination
direct routing	zone group of the destination phy~~.~~
table routing	zone group stored in the zone route table for the destination SAS address~~.~~
subtractive routing	zone group of the subtractive phy~~.~~

When an OPEN request is originated by a zoning expander device ~~device inside the ZSDS~~ and is sent to a device that is not a zoning expander device, ~~outside the ZSDS~~ then the phy that has the ZONE PARTICIPATING bit set to zero shall set the SOURCE ZONE GROUP field to zero and the ZONE SUPERVISOR field to zero.

[Start: Editors note: rephrasing of ZSDS management section]

4.9.4 ZSDS Management

4.9.4.1 Zone supervisor device

Zone supervisor devices shall originate SMP zone management function requests to manage and configure the ZSDS. An SMP CONFIGURE ZONE PERMISSION TABLE request shall only be sent to the AZSD from a zone supervisor device.

If a zone supervisor device receives an SMP CONFIGURE ZONE PERMISSION TABLE request and the SOURCE SAS ADDRESS field value is the AZSD then the zone supervisor device shall process the request. If the SOURCE SAS ADDRESS field value is not the AZSD then the zone supervisor device shall respond SMP FUNCTION FAILED.

4.9.4.2 Zone supervisor priority

When a zone supervisor device reports a ZONE SUPERVISOR PRIORITY field value greater than zero in the SMP REPORT GENERAL response, or a phy reports a ZONE SUPERVISOR PRIORITY field value greater than zero in the SMP DISCOVER response, the zone supervisor device is eligible for AZSD.

A zoning expander phy with the ZONE SUPERVISOR bit set to zero shall ignore the ZONE SUPERVISOR PRIORITY field of an attached device and set the ZONE SUPERVISOR PRIORITY field to zero in all zoning functions.

4.9.4.3 Active zone supervisor device (AZSD)

The active zone supervisor device (AZSD) is the elected zone supervisor device.

When the AZSD receives an SMP CONFIGURE ZONE PERMISSION TABLE request and the ZONE SUPERVISOR in the OPEN request is set to one then the AZSD shall process the request. If the ZONE SUPERVISOR in the OPEN request is set to one then the AZSD shall send the response SMP FUNCTION FAILED.

[End: Editors note: rephrasing of ZSDS management section]

4.9.4.4 Active zone supervisor device election

The active zone supervisor device (AZSD) election process shall begin after all zoning expander devices in the ZSDS complete the self-configuration process. The completion of the self-configuration process is identified when the zoning expander device sets the CONFIGURING bit from one to zero in the SMP REPORT GENERAL response and then sends BROADCAST (CHANGE) (see 4.7.1).

A zoning device shall issue SMP DISCOVER request to each phy in the ZSDS and evaluate the highest ZONE SUPERVISOR PRIORITY field value (see Table 3). If the same value is reported by two or more phys or devices, then the highest SAS address is elected.

A zoning expander device shall set the ACTIVE ZONE SUPERVISOR PRIORITY and ACTIVE ZONE SUPERVISOR SAS ADDRESS fields in the SMP REPORT GENERAL response to zero until the active zone supervisor election process is complete.

Table n3 indicates the significance of priority values in the ZONE SUPERVISOR PRIORITY field.

Table n3 — Zone supervisor priority values

Zone supervisor priority	Description
1111b	Highest priority
1110b	Second highest priority
…	…
0010b	Second lowest priority
0001b	Lowest priority
0000b	Does not participate in the election process

If all zone table entries have the zone supervisor priority set to zero then the election process fails and the ACTIVE ZONE SUPERVISOR PRIORITY field and the ACTIVE ZONE SUPERVISOR SAS ADDRESS field is set to zero in the SMP REPORT GENERAL response frame.

4.9.5 Phy reset event

After a phy reset event~~, such as~~ (e.g., the hot swap of an end device), the zone permission table shall be maintained according to the rules in table n4. ~~defined in the phy reset event behavior table (See Table 4).~~

Table n4 — Phy reset event behavior

Initial ~~Condition~~ condition	Event	New ~~PHY ZONE Configuration~~ phy zone configuration
SAS device attached~~,~~. ~~phy~~ Phy in the SP15: SAS_PHY_Ready state, ~~Initial~~ with an initial phy zone configuration assigned~~.~~	Phy exits the SP15: SAS_PHY_Ready state, and later re-enters the SP15: SAS_PHY_Ready state~~,~~ as the result of receiving an IDENTIFY frame with the same SAS address as prior to the exit out of SP15: SAS_PHY_Ready state.	The zoning expander device ~~restores~~ shall set the phy ~~to the zone group~~ ZONE GROUP field to the value that it contained ~~the phy~~ prior to the phy exiting the SP15: SAS_PHY_Ready state.
	Phy exits the SP15: SAS_PHY_Ready state, and later re-enters the SP15 state~~,~~ as the result of receiving an IDENTIFY frame with a different SAS address as prior to the exit out of SP15: SAS_PHY_Ready state.	The zoning expander device ~~assigns~~ shall set the phy ~~to zone group~~ ZONE GROUP field to zero ~~0~~.
SATA device attached~~,~~. ~~phy~~ Phy in the SP22: SATA_PHY_Ready state, ~~Initial~~ with an initial phy zone configuration assigned.	Phy exits the SP22: SATA_PHY_Ready state, and later re-enters the SP22: SATA_PHY_Ready state ~~without having~~ before an expander Hot-Plug Timeout timer expiration event occurs ~~in-between~~.	The zoning expander device ~~restores~~ shall set the phy ~~to the zone group~~ ZONE GROUP field to the value that it contained ~~the phy~~ prior to the phy exiting the SP22: SATA_PHY_Ready state.
	Phy exits the SP22: SATA_PHY_Ready state, and later re-enters the SP22: SATA_PHY_Ready state ~~with~~ after an expander Hot-Plug Timeout timer expiration event has occurred ~~in-between~~.	The zoning expander device ~~assigns~~ shall set the phy ~~to zone group~~ ZONE GROUP field to zero ~~0~~.

4.9.6 BROADCAST events

~~When~~ If a zoning expander device receives a BROADCAST primitive or an SMP ORIGINATE BROADCAST PRIMITIVES request, then the zoning expander devices shall process the broadcast notification ~~and~~ for all other ports ~~send either;~~ by sending one of the following:

a) an SMP ORIGINATE BROADCAST PRIMITIVES request on ports with ZONE PARTICIPATING bit set to one and zone permission to access ~~each~~ any of the zone groups listed in the received SMP ORIGINATE BROADCAST PRIMITIVES request; or
b) the relevant BROADCAST primitive as defined in 7.2.5.4~~.~~ on phys with ZONE PARTICIPATING bit set to zero and zone permission to access ~~each~~ any of the zone groups listed in the received SMP ORIGINATE BROADCAST PRIMITIVES request.

ROW Note 4: The phrasing in the above list seems to miss the mark. Is it not more correct to compare the zone groups associated with the phy to the zone groups listed in the SMP ORIGINATE BROADCAST PRIMITIVES? Also, the list fails to consider the case where a BROADCAST primitive is received as the introduction implies it should.

[End of new Section]

[Start of suggested changes to existing sections]

7.2.5.11 OPEN_REJECT

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Table 85 — OPEN_REJECT abandon primitives

Primitive	Originator	Description
…		
~~OPEN_REJECT (RESERVED ABANDON 0)~~ OPEN_REJECT (ZONE VIOLATION)	Zoning expander phy	~~Reserved. Process the same as OPEN_REJECT (WRONG DESTINATION).~~ The connection request is from a zone group that does not have permission to access the zone group that contains the destination phy. The ZONE VIOLATION field of the phy that received the request shall be set to one. The ZONE VIOLATION field shall be reset to zero when an SMP PHY CONTROL function with an operation code of CLEAR ERROR LOG for the specified phy is received.
…		

[no other changes in 7.2.5.11]

7.8.3 OPEN address frame

Table 95 defines the OPEN address frame format used for connection requests.

Table 95 — OPEN address frame format

Byte/ Bit	7	6	5	4	3	2	1	0
0	INITIATOR PORT	PROTOCOL			ADDRESS FRAME TYPE (1h)			
1	FEATURES				CONNECTION RATE			
2	(MSB)	INITIATOR CONNECTION TAG						
3								(LSB)
4		DESTINATION SAS ADDRESS						
11								
12		SOURCE SAS ADDRESS						
19								
20	ZONE SUPERVISOR ZONING FEATURES	SOURCE ZONE GROUP						
21	PATHWAY BLOCKED COUNT							
22	(MSB)	ARBITRATION WAIT TIME						
23								(LSB)
24		MORE COMPATIBLE FEATURES						
27								
28	(MSB)	CRC						
31								(LSB)

…

The ZONE SUPERVISOR bit set to one indicates that OPEN address frame was originated by a device attached to a phy that is configured to allow a zone supervisor device to be attached. A ZONE SUPERVISOR bit set zero indicates that the OPEN address frame originated by a device attached to a phy that is configured to not allow a zone supervisor device.

The ZONING FEATURES field shall be set to zero. The phys on all devices except phys zoning expander devices shall ignore the ZONING FEATURES field.

The SOURCE ZONE GROUP field identifies the zone group that contains the phy making the connection request. If the OPEN request is received on a zoning expander device phy with the ZONE PARTICIPATING bit set to zero (i.e., the ~~initiating~~ source device is outside the ZPSDS), then the SOURCE ZONE GROUP field of the OPEN request shall be set to the zone group that is associated with ~~of~~ the zoning expander device phy on which the OPEN request has been received.

10 Application layer …

ROW Note 5: Since the application layer is by definition not part of hardware, the remainder of 06-019r4 has not been replicated in this proposal.