To: T10 Technical Committee
From: Steve Johnson LSI Logic (steve.johnson@lsi.com)
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Subject: 07-017r0 SAS-2 More Zone Groups

Revision history
Revision 0 (14 January 2007) First revision.

Related documents
sas2r07 - Serial Attached SCSI 2 revision 07

Overview

In the SAS 2.0 time frame there are some blade server topologies that contain many end devices (initiators and targets). The initiators and their respective designated targets need to be zoned from each other with unique zone groups. 127 zone groups will not be enough to support some of these types of topologies, however 254 zone groups is more than enough to support them.

This proposal allows for a zone group permission table size of 256 as discusses in zoning meetings in 2006. Two table sizes are allowed 128 and 256.

Suggested changes

9.4 Zoning

9.4.1 Zoning overview

9.4.2 Zoning expander device requirements

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

   a) contain a zoning expander route table (see 4.9.3.4);
   b) contain active and shadow zone permission tables that supports either 128 or 256 zone groups (see 4.9.3.3);
   c) contain active and shadow zone phy information for each phy;
   d) if zoning is enabled, allow or deny connection requests based on the active zone permission table (see 4.9.3.5);
   e) set the ZONING SUPPORTED bit to one in its SMP REPORT GENERAL response (see 10.4.3.3);
   f) support the ZONING ENABLED bit in the SMP REPORT GENERAL response;
   g) support the zone lock inactivity timer;
   h) be self-configuring;
   i) contain an SMP initiator port (see 4.6.1); and
   j) support zoning-related SMP functions.

b

9.4.3 Zone operation

The ZONE GROUP field contains a value in the range of 0 to ~~127~~ 255 that specifies the zone group to which the phy belongs. The zone group of the SMP initiator port and SMP target port in a zoning expander device shall be 1. 4.9.3.2 defines more about zone groups.

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9.4.3.1 Zone groups

Zone groups function in different ways based on zone group number as shown in table 25.

Table 1 — Zone groups

Zone group	Configurable in zone permission table [a]	Description
0	No	Phys in zone group 0 have access to phys in zone group 1 and do not have access to phys in other zone groups.
1	No	Phys in zone group 1 have access to phys in all zone groups.
2	Yes	Phys in zone group 2 have access to phys in the zone groups indicated by the zone permission table. A management device server in a zoning expander device with zoning enabled only allows management application clients using phys in zone groups with access to zone group 2 to perform the following SMP functions: a) CONFIGURE GENERAL (see 10.4.3.15); b) ENABLE DISABLE ZONING (see 10.4.3.16); and c) ZONE LOCK (see 10.4.3.18). A management device server in a zoning expander device with zoning enabled only allows management application clients to perform certain SMP phy-based control and configuration functions (e.g., PHY CONTROL, PHY TEST FUNCTION, and CONFIGURE PHY EVENT INFORMATION) if the zone group of the management application client's phy has access to zone group 2 or the zone group of the specified phy.
3	Yes	Phys in zone group 3 have access to phys in the zone groups indicated by the zone permission table. A management device server in a zoning expander device with zoning enabled only allows management application clients using a phy in a zone group with access to zone group 3 to perform certain SMP zoning-related functions (i.e., ZONED BROADCAST (see 10.4.3.17)).
4 to 7	Reserved	
8 to ~~127~~254	Yes	Phys in zone groups 8 through ~~127~~254 have access to phys in the zone groups indicated by the zone permission table.
255	Reserved	
[a] A zone group defined as configurable is able to be changed with the SMP CONFIGURE ZONE PERMISSION TABLE function (see 10.4.3.22).		

9.4.3.2 Zone permission table

The zone permission table specifies access permission between zone groups. If a bit in the zone permission table is set to one then connection requests shall be permitted between phys in the zone groups. If a bit in the zone permission table is set to zero then connection requests between phys in the zone groups shall be rejected with OPEN_REJECT (ZONE VIOLATION) or OPEN_REJECT (RETRY) as described in 4.9.3.5.

The zone permission table structure is shown in table 26.

Table 2 — Zone permission table

Destination zone group (i.e., d)	Source zone group (i.e., s)				
	0	**1**	**2 to 3**	**4 to 7**	**8 to ~~127~~254**
0	0	1	0	0	0
1	1	1	1	1	1
2 to 3	0	1	ZP[s = 2 to 3, d = 2 to 3] [a]	Reserved [b]	ZP[s = 8 to ~~127~~254, d = 2 to 3] [a]
4 to 7	0	1	Reserved [b]	Reserved [b]	Reserved [b]
8 to ~~127~~254	0	1	ZP[s = 2 to 3, d = 8 to ~~127~~254] [a]	Reserved [b]	ZP[s = 8 to ~~127~~254, d = 8 to ~~127~~254] [a]

[a] Shading identifies configurable zone groups.
[b] All reserved ZP bits shall be set to zero (e.g., bits ZP[4 to 7, 4 to 127] are set to zero).

9.4.3.3 REPORT GENERAL function

The REPORT GENERAL function...

Table 217 defines the response format.

Table 217 — REPORT GENERAL response

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (00h)							
...	…							
36	Reserved		ZONE GROUP PERMISSION TABLE SIZE	ZONE LOCKED	PHYSICAL PRESENCE SUPPORTED	PHYSICAL PRESENCE ASSERTED	ZONING SUPPORTED	ZONING ENABLED
...	…							
52	(MSB)			CRC				
55								(LSB)

A ZONE GROUP PERMISSION TABLE SIZE bit set to one indicates that the zoning expander device supports a zone group permission table size of 256. A ZONE GROUP PERMISSION TABLE SIZE bit set to zero indicates that the zoning expander device supports a zone group permission table size of 128.

10.4.3.6.4 Zone permission descriptor

Table 226 defines the zone permission descriptor.

Table 226 — Zone permission descriptor for source zone group (i.e., s)

Byte\Bit	7	6	5	4	3	2	1	0
0	ZP[s, ~~127~~254]	ZP[s, ~~126~~253]	ZP[s, ~~125~~252]	ZP[s, ~~124~~251]	ZP[s, ~~123~~250]	ZP[s, ~~122~~249]	ZP[s, ~~121~~248]	ZP[s, ~~120~~247]
...				...				
~~15~~31	ZP[s, 7] (0b)	ZP[s, 6] (0b)	ZP[s, 5] (0b)	ZP[s, 4] (0b)	ZP[s, 3]	ZP[s, 2]	ZP[s, 1] (1b)	ZP[s, 0] (0b)

The zone permission descriptor contains all of the zone permission table entries for the source zone group (i.e., s).

Table 227 defines how the zone permission descriptor bits shall be set by the management device server.

Table 227 — Zone permission descriptor bit requirements

Source zone group (i.e., s)	Management device server requirement(s)
0	ZP[s, 0] shall be set to zero. ZP[s, 1] shall be set to one. ZP[s, 2 through ~~127~~254] shall be set to zero.
1	ZP[s, 0 through ~~127~~254] shall be set to one.
4, 5, 6 or 7	ZP[s, 0] shall be set to zero. ZP[s, 1] shall be set to one. ZP[s, 4 through ~~127~~254] shall be set to zero.
2, 3, or 8 through ~~127~~254	ZP[s, 0] shall be set to zero. ZP[s, 1] shall be set to one. ZP[s, 2 through 3] shall be set to zero or one as specified by the CONFIGURE ZONE PERMISSION TABLE function (see 10.4.3.22). ZP[s, 4 through 7] shall be set to zero. ZP[s, 8 through ~~127~~]254 shall be set to zero or one as specified by the CONFIGURE ZONE PERMISSION TABLE function.

10.4.3.7 DISCOVER function

The DISCOVER function...

The ZONE GROUP field contains the value of the ZONE GROUP field in the zone phy information (see 4.9.3.1). Zone group value~~s between 128 and 255, inclusive, are~~ 254 is reserved.

10.4.3.17 ZONED BROADCAST function

The ZONED BROADCAST function...

Each BROADCAST SOURCE ZONE GROUP field specifies a source zone group for the Broadcast. The expander device forwards the Broadcast to each destination zone group accessible to that source zone group. Zone group value~~s between 128 and 255, inclusive, are~~ 254 is reserved.

10.4.3.21.3 Zone phy configuration descriptor

The ZONE GROUP field specifies the value of the ZONE GROUP field in the zone phy information (see 4.9.3.1). Zone group value~~s between 128 and 255, inclusive, are~~ 254 is reserved.

10.4.3.22.3 Zone permission configuration descriptor

Table 276 defines the zone permission configuration descriptor.

Table 276 — Zone permission configuration descriptor for source zone group (i.e., s)

Byte\Bit	7	6	5	4	3	2	1	0
0	ZP[s, ~~127~~254]	ZP[s, ~~126~~253]	ZP[s, ~~125~~252]	ZP[s, ~~124~~251]	ZP[s, ~~123~~250]	ZP[s, ~~122~~249]	ZP[s, ~~121~~248]	ZP[s, ~~120~~247]
...	...							
~~15~~31	ZP[s, 7] (0b)	ZP[s, 6] (0b)	ZP[s, 5] (0b)	ZP[s, 4] (0b)	ZP[s, 3]	ZP[s, 2]	ZP[s, 1] (1b)	ZP[s, 0] (0b)

The zone permission configuration descriptor contains all of the zone permission table entries for the source zone group (i.e., s). To preserve symmetry about the ZP[s, s] table axis, the management device server shall apply the same value to both the source and destination zone groups for the zone permission entries.

Table 277 defines how the zone permission descriptor bits shall be set by the management application client and processed by the management device server.

Table 277 — Zone permission configuration descriptor bit requirements

Source zone group (i.e., s)	Management application client requirement(s)	Management device server requirement(s)
0	ZP[s, 0] shall be set to zero. ZP[s, 1] shall be set to one. ZP[s, 2 through ~~127~~254] shall be set to zero.	ZP[s, 0 through ~~127~~254] shall be ignored.
1	ZP[s, 0 through ~~127~~254] shall be set to one.	ZP[s, 0 through ~~127~~254] shall be ignored.
4, 5, 6 or 7	ZP[s, 0] shall be set to zero. ZP[s, 1] shall be set to one. ZP[s, 4 through ~~127~~254] shall be set to zero.	ZP[s, 0 through ~~127~~254] shall be ignored.
2, 3, or 8 through ~~127~~254	ZP[s, 0] shall be set to zero. ZP[s, 1] shall be set to one. ZP[s, 2 through 3] may be set to zero or one. ZP[s, 4 through 7] shall be set to zero. ZP[s, 8 through ~~127~~254] may be set to zero or one.	ZP[s, 0 through 1] shall be ignored. ZP[s, 2 through 3] shall processed. ZP[s, 4 through 7] shall be ignored. ZP[s, 8 through ~~127~~254] shall processed. For each source zone group t other than s, ZP[t, s] shall be set to ZP[s, t].

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Annex A

(informative)

Zone permission configuration descriptor examples

This annex provides examples of using multiple zone permission configuration descriptors in the SMP CONFIGURE ZONE PERMISSION TABLE function (see 10.4.3.22).

Table A.1 shows an example initial value of the zone permission table.

Table A.1 — Zone permission table example initial value

Zone group	0 [a]	1 [a]	2 to 3	4 to 7 [a]	8	9	10	11	12 to ~~127~~254
0 [a]	0	1	0	0	0	0	0	0	0
1 [a]	1	1	1	1	1	1	1	1	1
2 to 3	0	1	0	0	0	0	0	0	0
4 to 7 [a]	0	1	0	0	0	0	0	0	0
8	0	1	0	0	0	0	0	0	0
9	0	1	0	0	0	0	0	0	0
10	0	1	0	0	0	0	0	0	0
11	0	1	0	0	0	0	0	0	0
12 to ~~127~~254	0	1	0	0	0	0	0	0	0
[a] Zone permission table entries for this zone group are not changeable.									

Table 276 shows an example SMP CONFIGURE ZONE PERMISSION TABLE request where the STARTING ZONE GROUP field is set to 10 (i.e., 0Ah) and the zone permission configuration descriptor list contains two zone permission configuration descriptors.

Table A.2 — CONFIGURE ZONE PERMISSION TABLE request example

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (8Bh)							
2	Reserved							
3	REQUEST LENGTH (0Bh)							
4	(MSB)				EXPECTED EXPANDER CHANGE COUNT			
5								(LSB)
6	STARTING SOURCE ZONE GROUP (0Ah)							
7	Reserved	NUMBER OF ZONE PERMISSION CONFIGURATION DESCRIPTORS (02h)						
Zone permission configuration descriptor (first)(source zone group 10)								
8	FFh							
...	(each byte set to FFh)							
23	0Eh							
Zone permission configuration descriptor (second)(source zone group 11)								
24	00h							
...	(each byte set to 00h)							
47	00h							
48	(MSB)				CRC			
51								(LSB)

Table A.3 shows the zone permission table after processing the first zone permission configuration descriptor (i.e., source zone group 10).

Table A.3 — Zone permission table after processing the first zone permission configuration descriptor

Zone group	0 [a]	1 [a]	2 to 3	4 to 7 [a]	8	9	10 [b]	11	12 to ~~127~~254
0 [a]	0	1	0	0	0	0	0	0	0
1 [a]	1	1	1	1	1	1	1	1	1
2 to 3	0	1	0	0	0	0	1	0	0
4 to 7 [a]	0	1	0	0	0	0	0	0	0
8	0	1	0	0	0	0	1	0	0
9	0	1	0	0	0	0	1	0	0
10 [b]	0	1	1	0	1	1	1	1	1
11	0	1	0	0	0	0	1	0	0
12 to ~~127~~254	0	1	0	0	0	0	1	0	0

[a] Zone permission table entries for this zone group are not changeable.
[b] Changeable entries in this zone group are changed by the descriptor.

Table A.4 shows the zone permission table after processing the second zone permission configuration descriptor (i.e., source zone group 11).

Table A.4 — Zone permission table after processing the second zone permission configuration descriptor

Zone group	0 [a]	1 [a]	2 to 3	4 to 7 [a]	8	9	10	11 [b]	12 to ~~127~~254
0 [a]	0	1	0	0	0	0	0	0	0
1 [a]	1	1	1	1	1	1	1	1	1
2 to 3	0	1	0	0	0	0	1	0	0
4 to 7 [a]	0	1	0	0	0	0	0	0	0
8	0	1	0	0	0	0	1	0	0
9	0	1	0	0	0	0	1	0	0
10	0	1	1	0	1	1	1	0	1
11 [b]	0	1	0	0	0	0	0	0	0
12 to ~~127~~254	0	1	0	0	0	0	1	0	0

[a] Zone permission table entries for this zone group are not changeable.
[b] Changeable entries in this zone group are changed by the descriptor.