To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
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Subject: 06-168r0 SAS-2 OPEN address frame SOURCE ZONE GROUP field definition

Revision history
Revision 0 (22 March 2006) First revision

Related documents
sas2r03 - Serial Attached SCSI - 2 (SAS-2) revision 3
06-122r2 SAS-2 zoning - phy features (Ralph Weber, ENDL)
06-167 SAS-2 Filtering OPEN content based on ZONE PARTICIPATING bit (Rob Elliott, HP)

Overview
The description of the SOURCE ZONE GROUP field in the OPEN address frame does not comprehend the zone address resolved mode described by the zoning model.

Suggested changes

4.8.1 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 participate in a connection to another phy.

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

Every phy 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 established 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 zoning expander route table is an extended version of the expander route table (see 4.6.7.3) that also includes zone phy information.

The treatment of OPEN address frames received ~~from expander devices that are outside the~~by phys on the boundary of the ZPSDS depends on:

    a) whether the OPEN address frame enters the ZPSDS via a table routed phy; and
    b) the value of the ZONE ADDRESS RESOLVED bit for the receiving phy (see 4.8.3.6).

The following cases apply:

    a) if an OPEN address frame is received from a non-zoning expander device via a table routed phy for which the ZONE ADDRESS RESOLVED bit is set to one, then the source zone group is determined based on the SAS address in the OPEN address frame. In this case, proper management of the zoning expander device extends the zoning capability to beyond the ZPSDS; or
    b) otherwise, the source zone group is a fixed value that is associated with the receiving phy. In this case, non-zoning expander devices are treated in the same manner as end devices and all phys in ~~a~~ the non-zoning expander device and attached behind the non-zoning expander device belong to the zone group specified for the receiving phy ~~phy that attaches the non-zoning expander device to the ZPSDS~~.

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4.8.3 Zone operation

4.8.3.1 Zone phy information

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

   c)   ZONE PARTICIPATING bit;
   d)   ZONE ADDRESS RESOLVED bit;
   e)   ZONE GROUP PERSISTENT bit; and
   f)   ZONE GROUP field.

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

Editor's Note 1: 06-167 rewrites (or deletes) the previous sentence

The ZONE ADDRESS RESOLVED bit specifies the method used to determine the source zone group for a connection request received by a phy at the boundary of the ZPSDS as specified in table 1 (see).

The ZONE ADDRESS RESOLVED bit may be set to one when:

   a)   the phy is contained within a zoning expander device; and
   b)   the ZONE PARTICIPATING bit for the phy is set to zero.

The ZONE ADDRESS RESOLVED bit shall be set to zero when:

   a)   the phy is contained within a non-zoning expander device; or
   b)   the phy is contained within a zoning expander device and the ZONE PARTICIPATING bit for the phy is set to one.

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

The ZONE GROUP PERSISTENT bit specifies the method of determining the zone group value of the phy after a link reset sequence (see 4.8.4). If the ZONE PARTICIPATING bit is set to one, the ZONE GROUP PERSISTENT bit shall be set to one.

All phys in an expander port shall have the same zone phy information (see 4.6.2).

4.8.3.2 Zone group types

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4.8.3.2.3 SMP zoning configuration zone group testing

Use of the SMP CONFIGURE PHY ZONE function and SMP CONFIGURE ZONE PERMISSION function shall be restricted based on the zone group 2 permission bits and the source zone group of the SMP initiator port requesting the function (see 4.8.3.5). An SMP target port shall retain the contents of the SOURCE ZONE GROUP field from the OPEN address frame until the SMP request is received. If the SMP request is CONFIGURE PHY ZONE or SMP CONFIGURE ZONE PERMISSION and the ZP[source zone group, 2] bit is set to zero, then the function request shall not be processed and an SMP response frame with the FUNCTION RESULT field set to SMP ZONE VIOLATION shall be returned.

Editor's Note 2: 4.8.3.5 describes many cases where the source zone group is not only taken from the SOURCE ZONE GROUP field of the OPEN address frame. If this sentence intends to imply that those functions are only honored from within the ZPSDS, it is far too subtle. I assume that the functions are expected to be allowed from outside the ZPSDS if the zoning permission table permits.

4.8.3.3 Zone permission table

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4.8.3.4 Zoning expander route table

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4.8.3.5 ~~Zone routing~~Source zone group and destination zone group determination

When a zoning expander device receives an OPEN address frame (see 7.8.3):

a) the zone group of the source port (i.e., s) is identified as defined in table 1; and
b) the zone group of the destination port (i.e., d) is identified as defined in table 2.

If the ZP[s, d] bit is set to one then access between the phys shall be permitted and the zoning expander shall perform the ECM arbitration procedure. If the ZP[s, d] bit is set to zero then access between the phys is not permitted and the zoning expander device shall transmit OPEN_REJECT (ZONE VIOLATION) in response to the connection request (see 7.8.3).

Zoning expander devices shall follow the rules in table 1 to determine the zone group of the source port.

Table 1 — Source zone group determination

ZONE ADDRESS RESOLVED bit	Expander phy routing method	ZONE PARTICIPATING bit	
		Zero	**One**
Zero	Any	Zone group of the receiving phy	Source zone group specified by the SOURCE ZONE GROUP field in the OPEN address frame
One	Direct		Not applicable
	Subtractive		
	Table	Zone group stored in the zoning expander route table for the source SAS address. If the source SAS address is not found in the zoning expander route table then zone group of the receiving phy.	

Zoning expander devices shall follow the rules in table 2 to determine the zone group of the destination port.

Table 2 — Destination zone group determination

Expander phy routing method	Description
Direct	Zone group of the destination phy
Subtractive	Zone group of the subtractive phy
Table	Zone group stored in the zoning expander route table for the destination SAS address

~~When an OPEN address frame is transmitted by a zoning expander device and the phy has the ZONE PARTICIPATING bit set to zero, the SOURCE ZONE GROUP field shall be set to zero.~~

Editor's Note 3: that statement is true but better placed in 7.8.3

7.8.3 OPEN address frame

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The SOURCE ZONE GROUP field identifies the zone group ~~that contains~~of the phy making the connection request. The SOURCE ZONE GROUP field shall be:

  a) set to zero when transmitted by an end device;
  b) set to zero when transmitted by an expander device on a phy with the ZONE PARTICIPATING bit set to zero;
  c) set as described in 4.8.3.5 when transmitted by an expander device on a phy with the ZONE PARTICIPATING bit set to one;
  d) ignored when received by an end device;
  e) ignored when received by an expander device on a phy with the ZONE PARTICIPATING bit set to zero; and
  f) used to determine the source zone group as described in 4.8.3.5 when received by an expander device on a phy with the ZONE PARTICIPATING bit set to one.

~~If the OPEN address frame is received on a zoning expander device phy with the ZONE PARTICIPATING bit set to zero (i.e., the source phy is outside the ZPSDS), then the SOURCE ZONE GROUP field of the OPEN address frame shall be set to the zone group that is associated with the zoning expander device phy on which the OPEN address frame was received.~~ Zone source group values between 128 and 255, inclusive, are reserved.