To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
Date: 24 July 2006
Subject: 06-281r3 SAS-2 Enable and disable zoning

Revision history
Revision 0 (15 June 2006) First revision
Revision 1 (4 July 2006) Incorported comments from 20 June 2006 SAS zoning WG
Revision 2 (9 July 2006) Incorported comments from 6 July 2006 SAS zoning WG
Revision 3 (24 July 2006) Incorporated comments from 13 July 2006 SAS zoning WG

Related documents
sas2r04 - Serial Attached SCSI - 2 (SAS-2) revision 4
06-213 SAS-2 REPORT GENERAL additions for zoning and self configuration (Steve Johnson, LSI Logic)
06-260 SAS-2 zone management use cases (Rob Elliott, HP)
06-279 SAS-2 Allow more than one ZPSDS in a SAS domain (Rob Elliott, HP)

Overview
There are cases where the zone manager may want to add additional expander devices into a zoned portion of a service delivery subsystem (ZPSDS) using only in-band communication over SAS.

If the new expander device has zoning disabled, the zone manager needs a way to enable it and add it to the ZPSDS. However, this cannot be accepted from any SMP initiator port, or any rogue software could enable zoning and block communication through it.

If the new expander device already has zoning enabled and configured (perhaps because it was already a member of a different ZPSDS), probably with incompatible zone group assignments and permissions, then those existing settings need to be removed and reconfigured before it is added to the ZPSDS. If zoning is enabled, then any SMP initiator port with access to zone group 2 is allowed to perform any zoning configuration changes, including disabling zoning. This access must be carefully limited to trusted components. Note that all expanders inside the ZPSDS are in zone group 1 and thus have access to zone group 2.

One mechanism that can be used to address this problem is physical presence. If an expander knows that a user is physically present, it can allow zoning to be enabled or disabled.

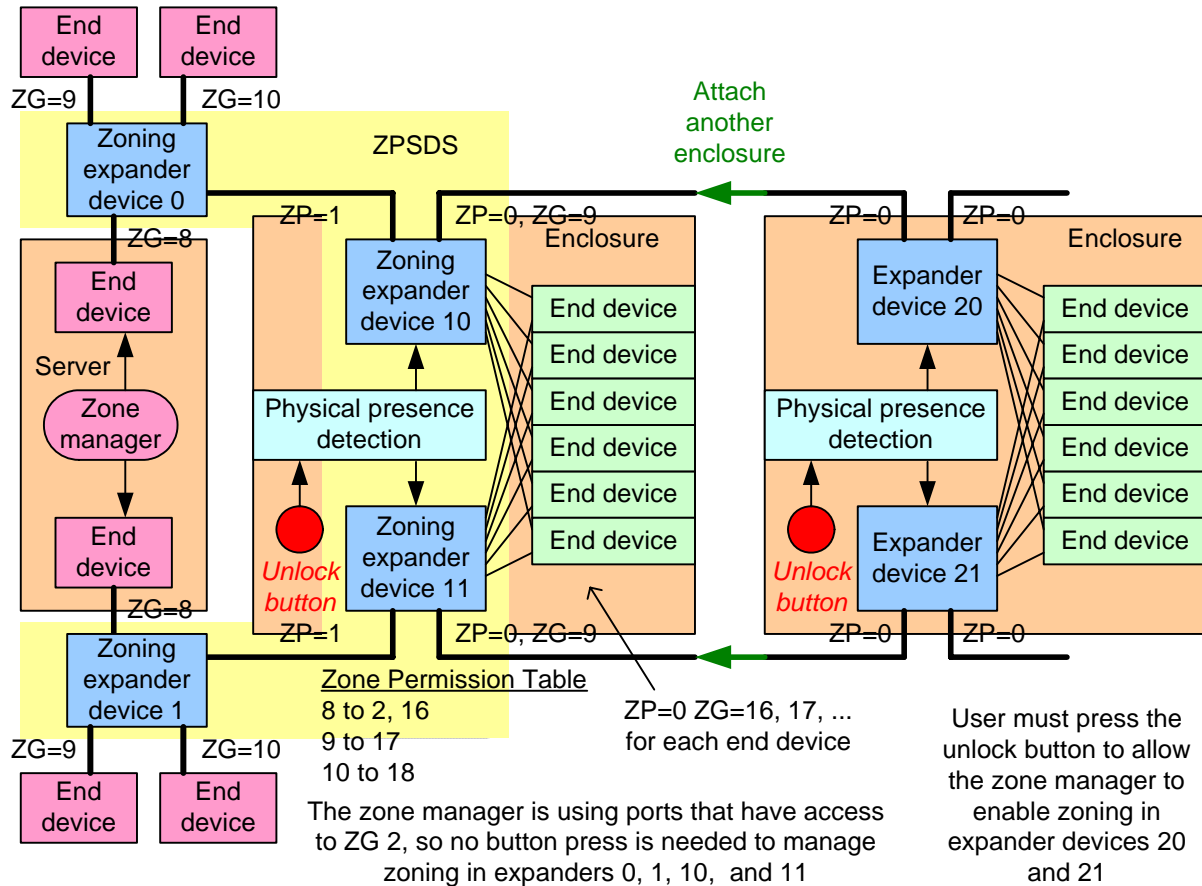Figure 1 shows an enclosure (e.g., a JBOD) being added to an existing ZPSDS.

Figure 1 — Physical presence detection introduction

Fibre Channel zoning comparison

In Fibre Channel, FC-SW-4's Zone Merge Protocol allows two fabrics using zoning to be merged. There are two zoning Protocols - Basic and Enhanced Zoning. There are two Merge Control settings, Allow and Restrict. If the Merge Control is set to Restrict, the switches will join together if their zoning configuration information is identical; if not, they will place their ports in an Isolated state. (there are also hard zones vs. soft zones, and other options)

For FC-SP compliant switches, the Zoning Check Protocol is used instead of the Zone Merge Protocol. The switches compare hashes of their zoning configuration values rather than the raw zoning configuration information.

In SAS, sideband management of the expanders is not as likely to be available as in Fibre Channel to be able to pre-configure them before a merge. The approach of sending the expander ports to an "Isolated" state seems sufficient for SAS - keep the newly attached expander outside the ZPSDS with restricted permissions, let the zoning manager configure it (i.e., set up all the zone groups and the permission tables) with values appropriate to its new ZPSDS, then enable zoning and add it to the ZPSDS.

Physical presence

The definition of physical presence is vendor-specific. Possible mechanisms include:
   a) set a jumper on a board to an override position;
   b) press a button (causing physical presence to be asserted for some time, e.g., seconds or minutes);
   c) open a door;
   d) enter a password/PIN on a keypad;
   e) attach or remove a USB device (causing physical presence to be asserted for some time); or
   f) attach a specific USB device (e.g. a memory stick containing a key file or a SmartCard).

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The expander includes a hardware input that indicates a user is physically present.

Future enhancements - passwords and secure authentication
Although it is reasonable to require a user to assert physical presence one time for a new piece of hardware, repeated demands are often unacceptable as many systems are managed remotely. To solve this, the user typically enters a password while physically present to install the hardware; later, if software is able to present that password to the device, it lets management occur without requiring physical presence.

As seen with Wireless Ethernet, default passwords created by the manufacturer are generally a bad idea.

The password could be configured through a sideband mechanism (e.g., serial port, Ethernet port, USB key) or in-band if physical presence is asserted.

The password could be configured via a first-come-first-served mechanism. The ATA Security feature set allows the ATA device passwords to be established at any time if they have not previously been established, so the first software that makes the attempt will succeed. If rogue software rather than trusted BIOS software manages to be the first, it could set the passwords to random values, rendering the device unusable.

The definition of the password sent to the expander is vendor-specific. Possible values include:

a)   simple text string. This is susceptible to snooping.
b)   hash value of a simple text string. This makes what transfers on the wire differ from what the user types on a keyboard, but is suceptible to snooping.
c)   secure authentication. Use an authentication method to authorize the zone manager to the expander in an encrypted exchange that is neither snoopable nor subject to reply attacks. FC-SP defines three authentication protocols:
    A)   DH-CHAP (Diffie-Hellman Challenge Handshake Authentication Protocol), a secret-based scheme;
    B)   FCPAP (Fibre Channel Password Authentication Protocol), a password-based scheme; and
    C)   FCAP (Fibre Chanel Certification Authentication Protocol), a digital certificate-based scheme.

Even after authentication has been performed, careful design to ensure there are no security holes. For example, a trusted SMP initiator port could present the correct password, but then a rogue SMP initiator port could send SMP requests using the SAS address of the trusted SMP initiator port unless zoning expanders are validating incoming source SAS addresses. It may end up that all management traffic needs to be encrypted.

This proposal does not tackle a password/authentication mechanism. There are several related efforts underway which should be leveraged when complete:

a)   T10 tape WG on secure delivery of data encryption keys to tape drives
b)   Trusted Computing Group (TCG) work on authentication and secure delivery of data encryption keys to disk drives
c)   Fibre Channel FC-SP standard

Suggested changes to sas2r04a as modified by 06-279r1

3.1.265 zone group: A set of phys in a ZPSDS (see 3.1.267) that all have the same access permission. See 4.8.

3.1.xx zone manager: The entity responsible for configuring a ZPSDS. See 4.8.1.

3.1.266 zone permission table: The table that defines access permission between the zone group of a source phy and the zone group of the destination phy. See 4.8.3.3.

3.1.267 zoned portion of a service delivery subsystem (ZPSDS): A group of zoning expander devices that cooperate to control access between phys. The ZPSDS may include all or part of a service delivery subsystem. See 4.8.

3.1.268 zoning expander device: An expander device that supports zoning. See 4.8.

4.8 Zoning

4.8.1 Zoning overview

SAS zoning is implemented by a set of zoning expander devices with zoning enabled that define a 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.

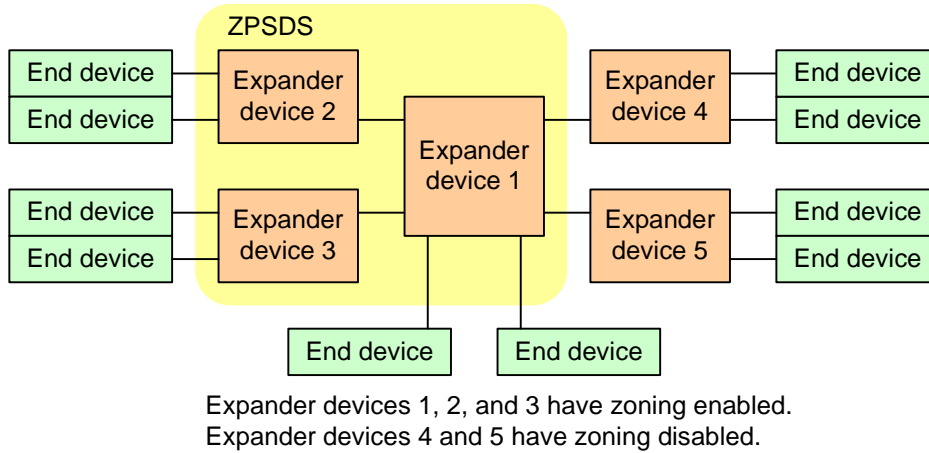Figure 2 shows an example of one ZPSDS in a SAS domain.

ZPSDS

| End device | Expander device 2 | | Expander device 4 | End device |
| End device | | | | End device |

Expander device 1

| End device | Expander device 3 | | Expander device 5 | End device |
| End device | | | | End device |

End device   End device

Expander devices 1, 2, and 3 have zoning enabled.
Expander devices 4 and 5 have zoning disabled.

Figure 2 — One ZPSDS example

A ZPSDS has a zone manager responsible for its configuration. The zone manager may have access to an end device with a SAS port whose zone group has access to zone group 2, or may have access to one or more zoning expander devices through a sideband interface (e.g., Ethernet) outside the scope of this standard.

Figure 3 shows examples of zone manager locations in a SAS domain.

Zone manager attached to an end device with a SAS port whose zone group has access to zone group 2
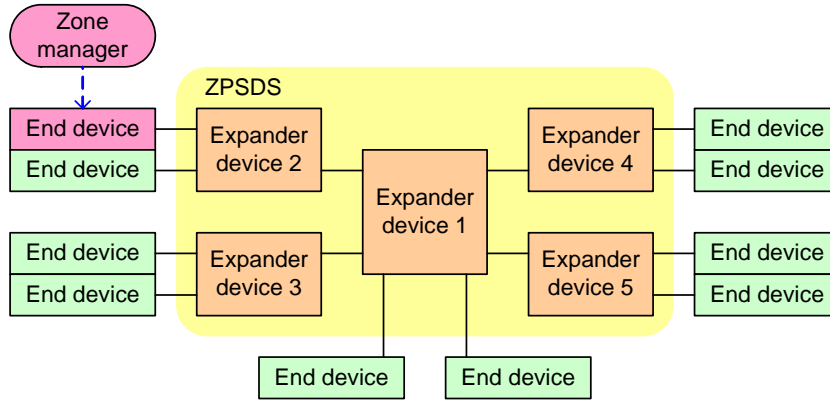
Zone manager attached directly to the expander devices in the ZPSDS
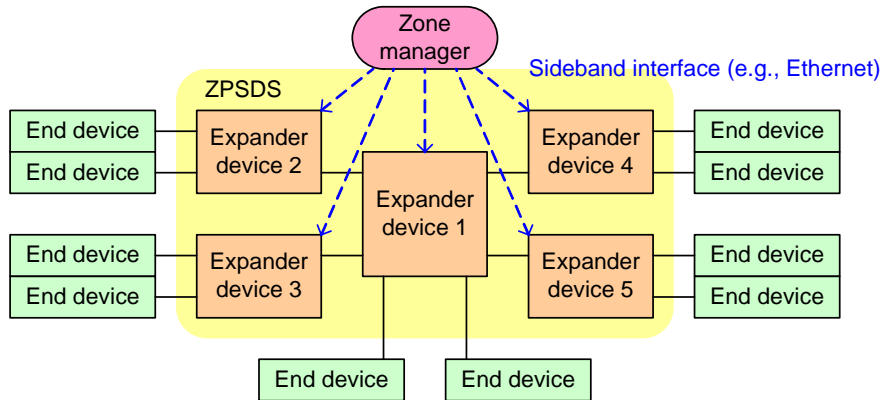
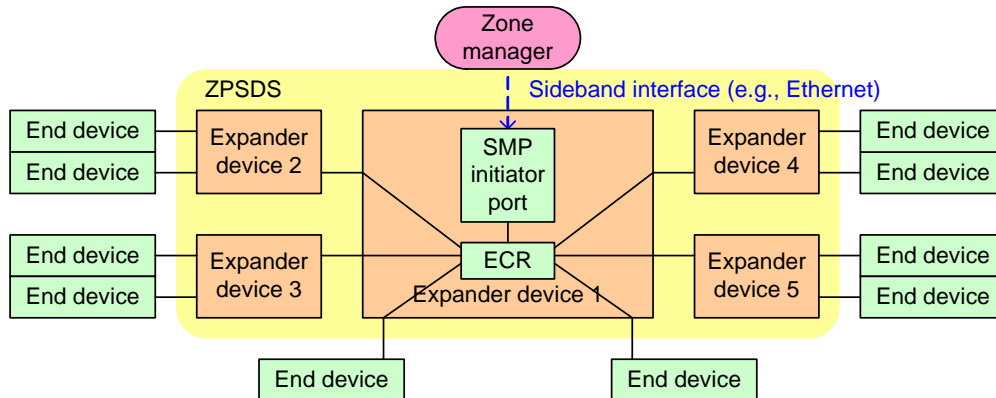Zone manager attached directly to one expander device in the ZPSDS

Figure 3 — Zone manager location examples

There may be any number of non-overlapping ZPSDSes in a service delivery subsystem, particularly as a SAS domain is being reconfigured (e.g., as a user is attaching enclosures together). A ZPSDS may encompass some or all of the service delivery subsystem.

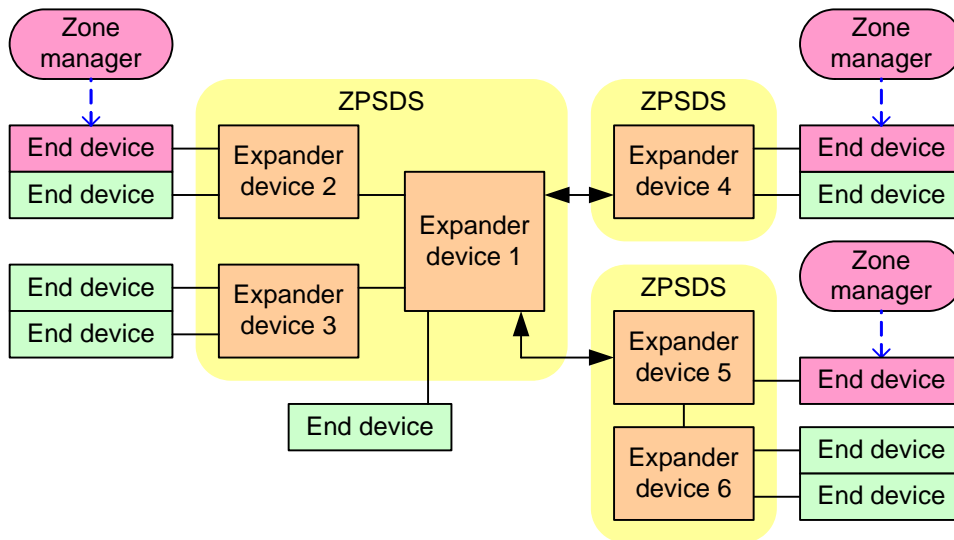Figure 4 shows an example of three ZPSDSes in a SAS domain.

Figure 4 — Three ZPSDSes example

The zone manager assigns zone groups (see 4.8.3.2) to all phys that are capable of participating in connections through the ZPSDS. Every phy in a SAS domain may be assigned to a zone group. There are 128 zone groups numbered 0 through 127. All phys in a wide port shall be assigned to the same zone group. Zone group numbers are assigned to zoning expander phys as part of the zone phy information (see 4.8.3.1) and assigned to SAS addresses in the zoning expander route table (see 4.8.3.4). An expander phy inside a ZPSDS shall be assigned to zone group 1. A phy attached to the boundary of the ZPSDS (i.e., attached to an expander phy with the ZONE PARTICIPATING bit set to zero) belongs to the zone group indicated by the ZONE GROUP field of the expander phy to which it is attached. A phy attached one or more expander devices beyond the boundary of the ZPSDS belongs to a zone group if the ZONE ADDRESS RESOLVED bit is set to one in the boundary expander phy and the zoning expander route table in that expander device contains a zone group value for the phy's SAS address. The zone groups assigned in one ZPSDS have no relationship to the zone groups assigned in another ZPSDS.

Each zoning expander device contains a zone permission table (see 4.8.3.3) that controls whether a connection is allowed between phys based on their zone groups. As defined in 4.8.3.5, 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 (see 4.8.3.4) is an extended version of the expander route table (see 4.6.7.3) that also includes the zone group number of each SAS address.

4.8.2 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 4.8.3.4);
    b)   contain a zone permission table that supports 128 zone groups (see 4.8.3.3);
    c)   if zoning is enabled, allow or deny connection requests based on the zone permission table (see 4.8.3.5);
    d)   set the ZONE DEVICE bit to one in its SMP REPORT GENERAL response (see 10.4.3.3);
    e)   be self-configuring;
    f)   contain an SMP initiator port (see 4.6.1); and
    g)   support all zoning-related SMP functions.

A zoning expander device may include physical presence detection to enable access to certain zoning configuration functions (e.g., ENABLE DISABLE ZONING (see 10.4.3.xx)). The definition of physical presence detection is vendor-specific.

Figure 5 shows an example of two enclosures with physical presence detection where zoning is enabled in the expander device in the left enclosure, but is not enabled in the expander devices in the right enclosure. The zone manager is able to configure zoning in zoning expander device A because the zone group of its SMP initiator port has access to zone group 2. However, it is not able to enable or configure zoning in expander device B unless physical presence is asserted.
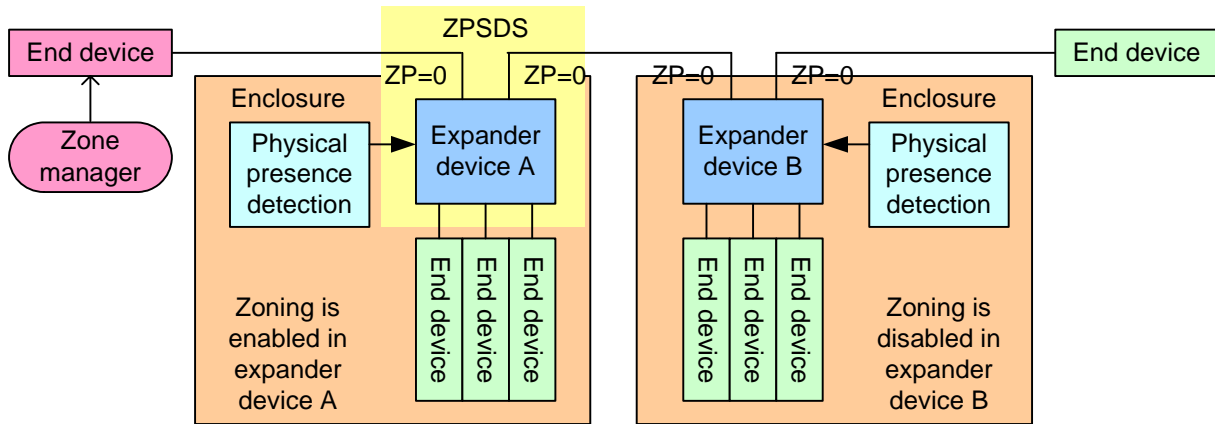
The ZPSDS is extended after the zone manager on the left:
1) configures zone phy information in each expander device, including setting the ZONE PARTICIPATING bit to one in each expander phy that is going to be inside the ZPSDS; and
2) sends an ENABLE DISABLE ZONING request with the ZONING ENABLED bit set to one to expander device B while physical presence is asserted.
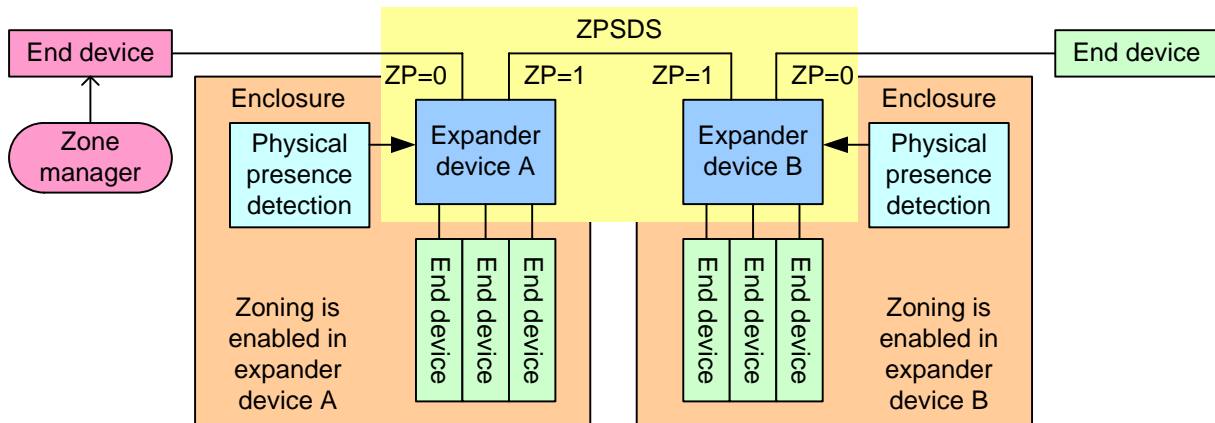
ZP = ZONE PARTICIPATING bit in the phy zone information

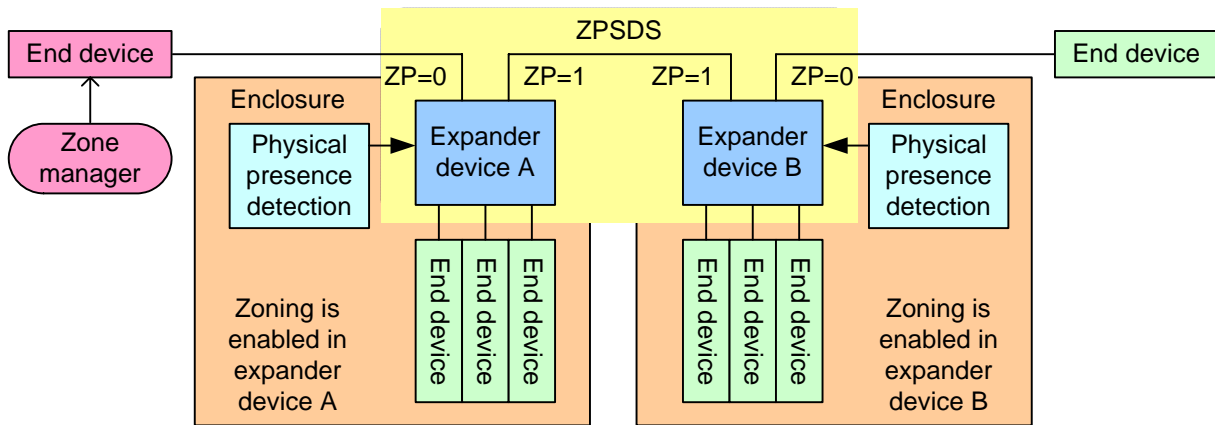**Figure 5 — Physical presence detection extending a ZPSDS example**

Figure 6 shows an example of two enclosures with physical presence detection where zoning is enabled in both the expander devices. The zone manager is able to configure zoning in zoning expander device A

because the zone group of its SMP initiator port has access to zone group 2. However, it is not able to configure zoning in expander device B unless physical presence is asserted.
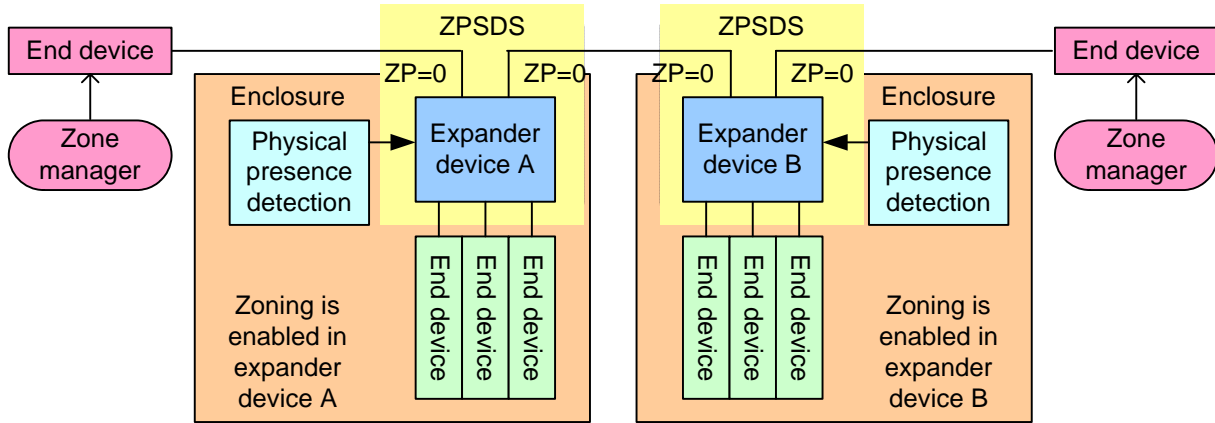
The ZPSDS is extended after the zone manager on the left:
1) sends an ENABLE DISABLE ZONING request with the ZONING ENABLED bit set to zero to expander device B while physical presence is asserted;
2) configures zone phy information in each expander device, including setting the ZONE PARTICIPATING bit to one in each expander phy that is going to be inside the ZPSDS; and
3) sends an ENABLE DISABLE ZONING request with the ZONING ENABLED bit set to one to expander device B while physical presence is asserted

ZP = ZONE PARTICIPATING bit in the zone phy information

Figure 6 — Physical presence detection overtaking a ZPSDS example

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:

   a) ZONE PARTICIPATING bit;
   b) ZONE ADDRESS RESOLVED bit;
   c) ZONE GROUP PERSISTENT bit; and
   d) 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 expander device outside the ZPSDS or to an end device. The ZONE PARTICIPATING bit shall be set to one when the phy is attached to a zoning expander device inside the ZPSDS.

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The ZONE ADDRESS RESOLVED bit indicates 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 25 (see 4.8.3.5).

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 of 0 to 127 that indicates the zone group to which the phy belongs. If the ZONE PARTICIPATING bit of the phy is set to one, the ZONE GROUP field shall be set to 1. The zone group of the SMP initiator port and SMP target port in a zoning expander device shall be 1. 4.8.3.2 defines more about zone groups.

The ZONE GROUP PERSISTENT bit indicates 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 4.8.3.1). The default (e.g., power on) values for the zone phy information fields are vendor-specific. The zone phy information fields should be non-volatile and shall be preserved while zoning is disabled.

4.8.3.2 Zone groups

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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 Source zone group and destination zone group determination

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4.8.4 Zone groups and link reset sequences

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4.8.5 Broadcast processing in a zoning expander device

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10.4.3 SMP functions

10.4.3.1 SMP function request frame format

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The FUNCTION field specifies which SMP function is being requested and is defined in table 1. If the value in the FUNCTION field is not supported by the SMP target port, it shall return a function result of UNKNOWN SMP FUNCTION as described in table 2.

Table 1 — SMP functions (FUNCTION **field)** (part 1 of 2)

Code	SMP function	Description	Reference
00h	REPORT GENERAL	Return general information about the device	10.4.3.3
01h	REPORT MANUFACTURER INFORMATION	Return vendor and product identification	10.4.3.4
02h	READ GPIO REGISTER	See SFF-8485	
03h - 0Fh	Reserved for general SMP input functions		
10h	DISCOVER	Return information about the specified phy	10.4.3.5
11h	REPORT PHY ERROR LOG	Return error logging information about the specified phy	10.4.3.6
12h	REPORT PHY SATA	Return information about a phy currently attached to a SATA phy	10.4.3.7
13h	REPORT ROUTE INFORMATION	Return phy-based expander route table information	10.4.3.8
14h	REPORT PHY EVENT INFORMATION	Return phy event information for the specified phy	10.4.3.9
15h	REPORT PHY BROADCAST COUNTS	Return Broadcast counts	10.4.3.10
16h	DISCOVER LIST	Return information about the specified phys	10.4.3.11
17h	REPORT EXPANDER ROUTE TABLE	Return contents of the expander-based expander route table	10.4.3.12
18h - 1Fh	Reserved for phy-based SMP input functions		
20h - 3Fh	Reserved for SMP input functions		
40h - 7Fh	Vendor specific		
80h	CONFIGURE GENERAL	Configure the device	10.4.3.4
81h	ENABLE DISABLE ZONING	Enable or disable zoning	10.4.3.xx
81h	Reserved for a general SMP output function		
82h	WRITE GPIO REGISTER	See SFF-8485	
83h - 84h	Reserved for general SMP output functions		
85h	ZONED BROADCAST	Transmit the specified Broadcast on the expander ports in the specified zone group(s)	10.4.3.14
86h - 8Fh	Reserved for general SMP output functions		
90h	CONFIGURE ROUTE INFORMATION	Change phy-based expander route table information	10.4.3.15
91h	PHY CONTROL	Request actions by the specified phy	10.4.3.16
92h	PHY TEST FUNCTION	Request a test function by the specified phy	10.4.3.17
93h	CONFIGURE PHY EVENT INFORMATION	Configure phy event information for the specified phy	10.4.3.18

Table 1 — SMP functions (FUNCTION **field) (part 2 of 2)**

Code	SMP function	Description	Reference
94h - 9Fh	Reserved for phy-based SMP output functions		
A0h - BFh	Reserved for SMP output functions		
C0h - FFh	Vendor specific		

10.4.3.2 SMP function response frame format

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The FUNCTION RESULT field is defined in table 2.

Table 2 — FUNCTION RESULT **field (part 1 of 3)**

Code	Name	SMP function(s)	Description
00h	SMP FUNCTION ACCEPTED	All	The SMP target port supports the SMP function. The ADDITIONAL RESPONSE BYTES field contains the requested information.
01h	UNKNOWN SMP FUNCTION	Unknown	The SMP target port does not support the requested SMP function. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
02h	SMP FUNCTION FAILED	All	The SMP target port supports the SMP function, but the requested SMP function failed. The ADDITIONAL RESPONSE BYTES may be present but shall be ignored.
03h	INVALID REQUEST FRAME LENGTH	All	The SMP target port supports the SMP function, but the SMP request frame length was invalid (i.e., did not match the frame size defined for the function). The ADDITIONAL RESPONSE BYTES may be present but shall be ignored.
10h	PHY DOES NOT EXIST	DISCOVER, REPORT PHY ERROR LOG, REPORT PHY SATA, REPORT ROUTE INFORMATION, REPORT PHY EVENT INFORMATION, CONFIGURE ROUTE INFORMATION, PHY CONTROL, PHY TEST FUNCTION, CONFIGURE PHY EVENT INFORMATION	The phy specified by the PHY IDENTIFIER field in the SMP request frame does not exist (e.g., the value is not within the range of zero to the value of the NUMBER OF PHYS field reported in the REPORT GENERAL response). The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.

Table 2 — FUNCTION RESULT **field** (part 2 of 3)

Code	Name	SMP function(s)	Description
11h	INDEX DOES NOT EXIST	REPORT ROUTE INFORMATION, CONFIGURE ROUTE INFORMATION	The phy specified by the PHY IDENTIFIER field in the SMP request frame does not have the table routing attribute (see 4.6.7.1), or the expander route index specified by the EXPANDER ROUTE INDEX field does not exist (i.e., the value is not in the range of 0000h to the value of the EXPANDER ROUTE INDEXES field in the REPORT GENERAL response). The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
12h	PHY DOES NOT SUPPORT SATA	REPORT PHY SATA and PHY CONTROL (TRANSMIT SATA PORT SELECTION SIGNAL)	The phy specified by the PHY IDENTIFIER field in the SMP request frame is not part of an STP target port. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
13h	UNKNOWN PHY OPERATION	PHY CONTROL	The operation specified by the PHY OPERATION field in the SMP request frame is unknown. The SMP function had no affect. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
14h	UNKNOWN PHY TEST FUNCTION	PHY TEST FUNCTION	The operation specified by the PHY TEST FUNCTION field in the SMP request frame is unknown. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
15h	PHY TEST FUNCTION IN PROGRESS	PHY TEST FUNCTION	The specified phy is already performing a phy test function. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
16h	PHY VACANT	DISCOVER, REPORT PHY ERROR LOG, REPORT PHY SATA, REPORT ROUTE INFORMATION, REPORT PHY EVENT INFORMATION, CONFIGURE ROUTE INFORMATION, PHY CONTROL, CONFIGURE PHY EVENT INFORMATION	The SMP target port processing the SMP request frame does not have access to the phy (e.g., because of zoning or vendor-specific reasons), although the value is within the range of zero to the value of the NUMBER OF PHYS field reported in the REPORT GENERAL response. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
17h	PHY EVENT INFORMATION SOURCE NOT SUPPORTED	CONFIGURE PHY EVENT INFORMATION	The phy event information source specified by a PHY EVENT INFORMATION SOURCE field is not supported.

Table 2 — FUNCTION RESULT **field** (part 3 of 3)

Code	Name	SMP function(s)	Description
20h	SMP ZONE VIOLATION	CONFIGURE GENERAL, ENABLE DISABLE ZONING, ZONED BROADCAST, PHY CONTROL, PHY TEST FUNCTION, CONFIGURE PHY EVENT INFORMATION	The SMP target port supports the function, but zoning is enabled and the SMP initiator port does not have access to a necessary zone group according to the zone permission table (see 4.8.3.2).
21h	PHYSICAL PRESENCE NOT ASSERTED	ENABLE DISABLE ZONING	Physical presence was required but was not detected by the expander device when the SMP function was requested.
22h	UNKNOWN ENABLE DISABLE ZONING VALUE	ENABLE DISABLE ZONING	The ENABLE DISABLE ZONING field is set to 11b (i.e., Reserved).
All others	Reserved		

Editor's Note 1: rename PHYSICAL PRESENCE NOT ASSERTED to something more generic that reflects that access to zone group 2 is also sufficient and allows for future mechanisms too

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10.4.3.3 REPORT GENERAL function

The REPORT GENERAL function returns general information about the SAS device (e.g., a SAS device contained in an expander device). This SMP function shall be implemented by all SMP target ports.

Table 3 defines the request format.

Table 3 — REPORT GENERAL request

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (00h)							
2	Reserved							
3	REQUEST LENGTH (00h)							
4	(MSB)							
7				CRC				(LSB)

The SMP FRAME TYPE field shall be set to 40h.

The FUNCTION field shall be set to 00h.

The REQUEST LENGTH field shall be set to 00h.

The CRC field is defined in 10.4.3.1.

Table 4 defines the response format.

Table 4 — REPORT GENERAL response (part 1 of 2)

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (00h)							
2	FUNCTION RESULT							
3	RESPONSE LENGTH (09h)							
4	(MSB)							
5	EXPANDER CHANGE COUNT							(LSB)
6	(MSB)							
7	EXPANDER ROUTE INDEXES							(LSB)
8	Reserved							
9	NUMBER OF PHYS							
10	Reserved						CONFIGURING	CONFIGURABLE ROUTE TABLE
11	Reserved							
12	ENCLOSURE LOGICAL IDENTIFIER							
19								
20	Reserved							
29								
30	(MSB)							
31	STP BUS INACTIVITY TIME LIMIT							(LSB)
32	(MSB)							
33	STP MAXIMUM CONNECT TIME LIMIT							(LSB)
34	(MSB)							
35	STP SMP I_T NEXUS LOSS TIME							(LSB)
36	Reserved				PHYSICAL PRESENCE SUPPORTED	PHYSICAL PRESENCE ASSERTED	ZONING SUPPORTED	ZONING ENABLED
37	Reserved							

Table 4 — REPORT GENERAL response (part 2 of 2)

Byte\Bit	7	6	5	4	3	2	1	0
38	(MSB)							
				MAXIMUM NUMBER OF ROUTED SAS ADDRESSES				
39								(LSB)
40	(MSB)							
					CRC			
43								(LSB)

The SMP FRAME TYPE field shall be set to 41h.

The FUNCTION field shall be set to 00h.

The FUNCTION RESULT field is defined in 10.4.3.2.

The RESPONSE LENGTH field shall be set to 09h. For compatibility with previous versions of this standard, a RESPONSE LENGTH field set to 00h specifies that there are 6 dwords before the CRC field.

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A PHYSICAL PRESENCE SUPPORTED bit set to one indicates that the expander device supports physical presense as a mechanism for allowing zoning to be enabled or disabled from phys in zone groups without access to zone group 2. A PHYSICAL PRESENCE SUPPORTED bit set to zero indicates that the expander device does not support physical presence as a mechanism for allowing zoning to be enabled or disabled.

> Editor's Note 2: If this bit is set to one, zone management software should instruct the user to "press a button (or do whatever the JBOD or switch vendor said to do) to enable zoning overrides." If this bit is set to zero, some other mechanism is needed to take control (like a future in-band authentication scheme, or a completely sideband mechanism).

A PHYSICAL PRESENCE ASSERTED bit set to one indicates that the expander device is currently detecting physical presence. A PHYSICAL PRESENCE ASSERTED bit set to zero indicates that the expander device is not currently detecting physical presence.

> Editor's Note 3: This bit is not strictly needed - an application would not rely on it for anything. However, it could help the user confirm that the physical presence mechanism has been triggered. For example, if it's a jumper, the zone management software could display a warning that zoning is unprotected as long as this bit remains reported as set to one.

A ZONING SUPPORTED bit set to one indicates that zoning is supported by the expander device. A ZONING SUPPORTED bit set to zero indicates that zoning is not supported by the expander device.

A ZONING ENABLED bit set to one indicates that zoning is enabled in the expander device. A ZONING ENABLED bit set to zero indicates that zoning is disabled in the expander device.

...

10.4.3.4 ENABLE DISABLE ZONING function [all new]

The ENABLE DISABLE ZONING function requests actions by the expander device containing the SMP target port. This SMP function shall be supported by SMP target ports in zoning expander devices (see 4.8). Other SMP target ports shall not support this SMP function. This SMP function shall only be processed if:

  a) the request is received from an SMP initiator port that has access to zone group 2 (see 4.8.3.2); or
  b) the request is received from any SMP initiator port while physical presence is asserted.

Table 5 defines the request format.

Table 5 — ENABLE DISABLE ZONING request

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (81h)							
2	Reserved							
3	REQUEST LENGTH (02h)							
4	(MSB)			EXPECTED EXPANDER CHANGE COUNT				
5								(LSB)
6	Reserved							
7								
8	Reserved						ENABLE DISABLE ZONING	
9	Reserved							
11								
12	(MSB)			CRC				
15								(LSB)

The SMP FRAME TYPE field shall be set to 40h.

The FUNCTION field shall be set to 81h.

The REQUEST LENGTH field shall be set to 02h.

The EXPECTED EXPANDER CHANGE COUNT field is defined in the CONFIGURE GENERAL request (see 10.4.1.10).

The ENABLE DISABLE ZONING field is defined in table 5.

Table 6 — ENABLE DISABLE ZONING field

Code	Description
00b	No change
01b	Enable zoning
10b	Disable zoning
11b	Reserved

Editor's Note 4: The ENABLE DISABLE ZONING request frame could be expanded to carry other fields (e.g., password) later.

The CRC field is defined in 10.4.3.1.

Table 7 defines the response format.

Table 7 — ENABLE DISABLE ZONING response

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (81h)							
2	FUNCTION RESULT							
3	RESPONSE LENGTH (00h)							
4	(MSB)							
7				CRC				(LSB)

The SMP FRAME TYPE field shall be set to 41h.

The FUNCTION field shall be set to 81h.

The FUNCTION RESULT field is defined in 10.4.3.2.

The RESPONSE LENGTH field shall be set to 00h.

The CRC field is defined in 10.4.3.2.

[End of all-new section]