To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
Date: 16 January 2006
Subject: 06-036r1 SES-2 More Additional Element Status descriptors

Revision history
Revision 0 (8 January 2006) First revision
Revision 1 (16 January 2006) Incorporated comments from January 2006 CAP WG.

Related documents
ses2r13 - SCSI Enclosure Services - 2 (SES-2) revision 13

Overview
An SCC controller (a RAID controller) in an enclosure managed by and enclosure services process may contain SCSI initiator ports on its back-end communicating with disk drives, and also may contain SCSI target ports on its front-end communicating to the host system(s). These SCSI ports may be SAS ports, and thus may be attached to either a SAS connector or a SAS expander inside the enclosure.

Current Additional Element Status descriptors can describe SAS expanders attached to SAS connectors and SAS expanders, but cannot describe SAS initiator ports and target ports. An Additional Element Status descriptor for SCSI Initiator Port and SCSI Target Port elements that represent SAS ports is proposed.

Additionally, text implying that physical link numbers in a SAS Connector element are one-based rather than zero-based is corrected.

Suggested changes

6.1.13 Additional Element Status diagnostic page

6.1.13.1 Additional Element Status diagnostic page overview

The optional Additional Element Status diagnostic page provides additional information about Device elements (see 7.3.2), Array Device elements (see 7.3.3), ~~and~~ SAS Expander elements (see 7.3.25), SCSI Initiator Port elements (see 7.3.24), and SCSI Target Port elements (see 7.3.23) containing SAS phys (see 7.3.xx).

The Additional Element Status diagnostic page returns an ~~a~~Additional ~~e~~Element ~~s~~Status descriptor for each of the Device elements, Array Device elements, and SAS Expander elements that have been allowed for by the NUMBER OF POSSIBLE ELEMENTS field in the corresponding type descriptor header in the Configuration diagnostic page (see 6.1.2). It may include Additional Element Status descriptors for SCSI Initiator Port elements and SCSI Target Port elements. The ~~a~~Additional ~~e~~Element ~~s~~Status descriptors shall be in the same order as the ELEMENT STATUS fields in the Enclosure Status diagnostic page (see 6.1.4).

...

6.1.13.2 Additional Element Status descriptor protocol-specific information for SAS

6.1.13.2.1 Additional Element Status descriptor protocol-specific information for SAS overview

Table 30 defines the Additional Element Status descriptor for SAS devices and expander devices (see SAS-1.1). This is used to describe a Device element or an Array Device element that may contain a SAS

device or a SATA device, ~~or to~~ describe a SAS Expander element, or describe an SCSI Initiator Port element or SCSI Target Port element that may contain SAS phys..

Table 1 — Additional Element Status descriptor protocol-specific information for SAS

Byte\Bit	7	6	5	4	3	2	1	0
0	Descriptor-type specific							
1	DESCRIPTOR TYPE		Descriptor-type specific					
2	Descriptor-type specific							
y								

~~A DESCRIPTOR TYPE field set to 00b indicates the descriptor describes a Device element or an Array Device element (see 6.1.13.2.2). A DESCRIPTOR TYPE field set to 01b indicates the descriptor describes a SAS Expander element (see). A DESCRIPTOR TYPE field set to 10b or 11b is reserved.~~

The DESCRIPTOR TYPE field is defined in table 2.

Table 2 — DESCRIPTOR TYPE field

Code	Description
00b	Device element or Array Device element (see 6.1.13.2.2)
01b	SAS Expander element (see 6.1.13.2.3), SCSI Initiator Port element (see 6.1.13.2.4), or SCSI Target Port element (see 6.1.13.2.4)
All others	Reserved

6.1.13.2.2 Additional Element Status descriptor protocol-specific information for Device and Array Device elements for SAS

Table 3 defines the Additional Element Status descriptor protocol-specific information for Device elements and Array Device elements with the EIP bit (see 6.1.13.1) set to one.

Table 3 — Additional Element Status descriptor protocol-specific information for Device and Array Device elements for SAS with the EIP bit set to one

Byte\Bit	7	6	5	4	3	2	1	0
0	NUMBER OF PHY DESCRIPTORS							
1	DESCRIPTOR TYPE (00b)		Reserved					NOT ALL PHYS
2	Reserved							
3	BAY NUMBER							
Phy descriptor list								
4	Phy descriptor (first)(see table 5)							
31								
	...							
z - 27	Phy descriptor (last)(see table 5)							
z								

Table 4 defines the Additional Element Status descriptor protocol-specific information for Device elements and Array Device elements with the EIP bit (see 6.1.13.1) set to zero. This format does not include the two extra bytes including the BAY NUMBER field that are in table 3.

Table 4 — Additional Element Status descriptor protocol-specific information for Device and Array Device elements for SAS with the EIP bit set to zero

Byte\Bit	7	6	5	4	3	2	1	0
0	NUMBER OF PHY DESCRIPTORS							
1	DESCRIPTOR TYPE (00b)		Reserved					NOT ALL PHYS
Phy descriptor list								
2	Phy descriptor (first)(see table 5)							
29								
	...							
z - 27	Phy descriptor (last)(see table 5)							
z								

The DESCRIPTOR TYPE field set to 00b indicates the descriptor is describing a Device element or Array Device element that can contain a SAS device or a SATA device.

The NUMBER OF PHY DESCRIPTORS field indicates how many phy descriptors are in the phy descriptor list.

A NOT ALL PHYS bit set to one indicates that all phys in the SAS device or SATA device may or may not be described. A NOT ALL PHYS bit set to zero indicates that all phys in the SAS device or SATA device are described.

NOTE 1 - The NOT ALL PHYS bit may be set to one for SAS devices with multiple ports, where the enclosure services process only has access to information about the phys in one of the ports (e.g., in the same SAS domain as the enclosure services process).

The BAY NUMBER field, if any, indicates the number of the bay represented by the Device element or Array Device element.

Table 5 defines the phy descriptor.

Table 5 — Phy descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	Reserved	DEVICE TYPE			Reserved			
1	Reserved							
2	Reserved				SSP INITIATOR PORT	STP INITIATOR PORT	SMP INITIATOR PORT	Reserved
3	SATA PORT SELECTOR	Reserved			SSP TARGET PORT	STP TARGET PORT	SMP TARGET PORT	SATA DEVICE
4	ATTACHED SAS ADDRESS							
11								
12	SAS ADDRESS							
19								
20	PHY IDENTIFIER							
21	Reserved							
27								

If the device currently associated with the Device element or Array Device element is a SAS device:

a) the DEVICE TYPE field, SSP INITIATOR PORT bit, STP INITIATOR PORT bit, SMP INITIATOR PORT bit, SSP TARGET PORT bit, STP TARGET PORT bit, SMP TARGET PORT bit, SAS ADDRESS field, and PHY IDENTIFIER field contain the values of the fields in the IDENTIFY address frame transmitted by the phy;
b) the SATA PORT SELECTOR bit shall be set to zero; and
c) the SATA DEVICE bit shall be set to zero.

NOTE 2 - The phy transmits these fields in the IDENTIFY address frame to the attached phy (usually an expander phy in an expander device). The enclosure services process may retrieve the values from the attached phy (e.g., an enclosure process built into an expander device has direct access to the values received by the expander phy).

If the device currently associated with the Device element or Array Device element is a SATA device:

a) the DEVICE TYPE field shall be set to 000b;
b) the SSP INITIATOR PORT bit shall be set to zero;
c) the STP INITIATOR PORT bit shall be set to zero;
d) the SMP INITIATOR PORT bit shall be set to zero;
e) the SSP TARGET PORT bit shall be set to zero;
f) the STP TARGET PORT bit shall be set to zero;
g) the SMP TARGET PORT bit shall be set to zero;
h) the SATA PORT SELECTOR bit shall be set to one if the SATA device is attached to a SATA port selector and the SATA PORT SELECTOR bit shall be set to zero if it is not;
i) the SATA DEVICE bit shall be set to one;
j) the SAS ADDRESS field shall be set to the SAS address of the STP target port of the STP/SATA bridge, and
k) the PHY IDENTIFIER field shall be set to 00h.

The ATTACHED SAS ADDRESS field contains the SAS address of the attached phy (e.g., the SAS address of the expander phy to which the SAS device or SATA device is attached).

NOTE 3 - All the fields are from the perspective of the SAS device or SATA device associated with the Device element or Array Device element (e.g., the disk drive), not the device (e.g., the expander device) which receives the IDENTIFY address frame. The ATTACHED SAS ADDRESS fields for multiple phys in the same SAS device or SATA device differ if it is attached to more than one SAS domain.

NOTE 4 - A SATA device may be attached to more than one SAS domain using a SATA port selector.

6.1.13.2.3 Additional Element Status descriptor protocol-specific information for SAS Expander elements

Table 8 defines the Additional Element Status descriptor protocol-specific information for SAS Expander elements (see SAS-1.1).

Table 6 — Additional Element Status descriptor protocol-specific information for SAS Expander elements

Byte\Bit	7	6	5	4	3	2	1	0
0	NUMBER OF EXPANDER PHY DESCRIPTORS							
1	DESCRIPTOR TYPE (01b)		Reserved					
2	Reserved							
3								
4	SAS ADDRESS							
11								
Expander phy descriptor list								
12	Expander phy descriptor (first)(see table 9)							
13								
	...							
y - 1	Expander phy descriptor (last)(see table 9)							
y								

The DESCRIPTOR TYPE field set to 01b indicates the descriptor is ~~describing a SAS Expander element~~ not describing a Device element or an Array Device element.

The NUMBER OF EXPANDER PHY DESCRIPTORS field indicates how many expander phy descriptors are in the expander phy descriptor list.

The SAS ADDRESS field indicates for SAS Expander elements, the SAS address of the expander device.

Table 9 defines the expander phy descriptor.

Table 7 — Expander phy descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	CONNECTOR ELEMENT INDEX							
1	OTHER ELEMENT INDEX							

The CONNECTOR ELEMENT INDEX field indicates the index of a SAS Connector element (see 7.3.26) to which the expander phy is attached. If the expander phy is not attached to a connector represented by a SAS Connector element, this field shall be set to FFh.

The OTHER ELEMENT INDEX field indicates the index of a Device element (see 7.3.2), Array Device element (see 7.3.3), or SAS Expander element (see 7.3.25) to which the expander phy is attached. If the expander phy is not attached to one of those elements, this field shall be set to FFh.

6.1.13.2.x Additional Element Status descriptor protocol-specific information for SCSI Initiator Port and SCSI Target Port elements for SAS [new]

Table 8 defines the Additional Element Status descriptor protocol-specific information for SCSI Initiator Port and SCSI Target Port elements representing SCSI initiator ports and SCSI target ports with SAS phys.

Table 8 — Additional Element Status descriptor protocol-specific information for SCSI Initiator Port and SCSI Target Port elements for SAS

Byte\Bit	7	6	5	4	3	2	1	0
0	NUMBER OF PHY DESCRIPTORS							
1	DESCRIPTOR TYPE (01b)		Reserved					
2	Reserved							
3								
Phy descriptor list								
4	Phy descriptor (first)(see table 9)							
15								
	...							
y - 1	Phy descriptor (last)(see table 9)							
y								

The DESCRIPTOR TYPE field set to 10b indicates the descriptor is not describing a Device element or an Array Device element.

The NUMBER OF PHY DESCRIPTORS field indicates how many phy descriptors are in the phy descriptor list.

Table 9 defines the phy descriptor.

Table 9 — Phy descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	PHY IDENTIFIER							
1	Reserved							
2	CONNECTOR ELEMENT INDEX							
3	OTHER ELEMENT INDEX							
4	SAS ADDRESS							
11								

The PHY IDENTIFIER field indicates the phy identifer (see SAS-1.1) of the phy.

The CONNECTOR ELEMENT INDEX field indicates the index of a SAS Connector element (see 7.3.26) to which the phy is attached. If the phy is not attached to a connector represented by a SAS Connector element, this field shall be set to FFh.

The OTHER ELEMENT INDEX field indicates the index of a Device element (see 7.3.2), Array Device element (see 7.3.3), or SAS Expander element (see 7.3.25) to which the expander phy is attached. If the phy is not attached to one of those elements, this field shall be set to FFh.

The SAS ADDRESS field indicates the SAS address of the phy. If the enclosure services process does not know the SAS address (e.g., the enclosure services process is in an expander on the back-side of an SCC controller, and this is a phy in a SCSI target port on the front-side of the SCC controller), this field shall be set to zero.

7.3.2 Device element

The Device element manages a SCSI device (e.g., a disk drive) in the enclosure.

Additional information about the Device element may be reported in the Additional Element Status diagnostic page (see 6.1.13).

...

7.3.3 Array Device element

The Array Device element manages a SCSI device (e.g., a disk drive) in an enclosure that is being used in a storage array (e.g., a RAID controller). The mapping between the visual indicators associated with the Array Device element and the requests to set those indicators is vendor specific.

Additional information about the Array Device element may be reported in the Additional Element Status diagnostic page (see 6.1.13).

...

7.3.10 SCC Controller Electronics element

The SCC Controller Electronics element manages the processor circuitry used by a SCSI Controller Commands (SCC) device server (e.g., in a RAID controller, the RAID controller processor).

...

7.3.22 SCSI Target Port element

The SCSI Target Port element manages a SCSI target port ~~(e.g., the target port providing for external access to a RAID controller)~~.

If a SCSI target/initiator port is represented by a SCSI Target Port element or a SCSI Initiator Port element, it shall be represented by only one of those elements. It should be represented by the element that most reflects its functionality (e.g., in an SCC controller, a front-side SCSI port should be represented by a SCSI Target Port element even if the SCSI port also has SCSI initiator port functionality and a back-side SCSI port should be represented by a SCSI Initiator Port element even if the SCSI port also has SCSI target port functionality).

Additional information about the SCSI Target Port element may be reported in the Additional Element Status diagnostic page (see 6.1.13).

...

7.3.23 SCSI Initiator Port element

The SCSI Initiator Port element manages a SCSI initiator port (e.g., the initiator port used by a RAID controller to access disk drives).

See 7.3.22 for requirements for SCSI target/initiator ports.

Additional information about the SCSI Initiator Port element may be reported in the Additional Element Status diagnostic page (see 6.1.13).

...

7.3.25 SAS Expander element

The SAS Expander element manages a SAS expander device.

Additional information about the SAS Expander element may be reported in the Additional Element Status diagnostic page (see 6.1.13).

...

7.3.26 SAS Connector element

...

The CONNECTOR PHYSICAL LINK field indicates the physical link in the connector represented by this element. A CONNECTOR PHYSICAL LINK field set to FFh indicates that the element represents the entire connector, not just

one physical link in the connector. Physical links in a connector shall be numbered starting with zero. If a connector has only one physical link, the CONNECTOR PHYSICAL LINK field should be set to ~~01h~~00h rather than FFh.