To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
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Subject: 03-214r0 SES-2 Update to SAS Device Element Status descriptor

Revision history
Revision 0 (23 June 2003) First revision

Related documents
ses2r03 - SCSI Enclosure Services - 2 revision 3
sas-r04 - Serial Attached SCSI revision 4

Overview
Now that SAS-1 is completed, some tweaks are needed to the SES-2 data structure that ties a Device element to a SCSI port identifier - the Device Element Status descriptor. All the fields from the IDENTIFY address frame should be available to the enclosure services process (including the SAS address and the phy identifier sending the IDENTIFY). It does not, however, know the total number of phys on the device (which the current data structure assumes is available).

Enclosure services process manages these device elements, one per physical slot in the enclosure:

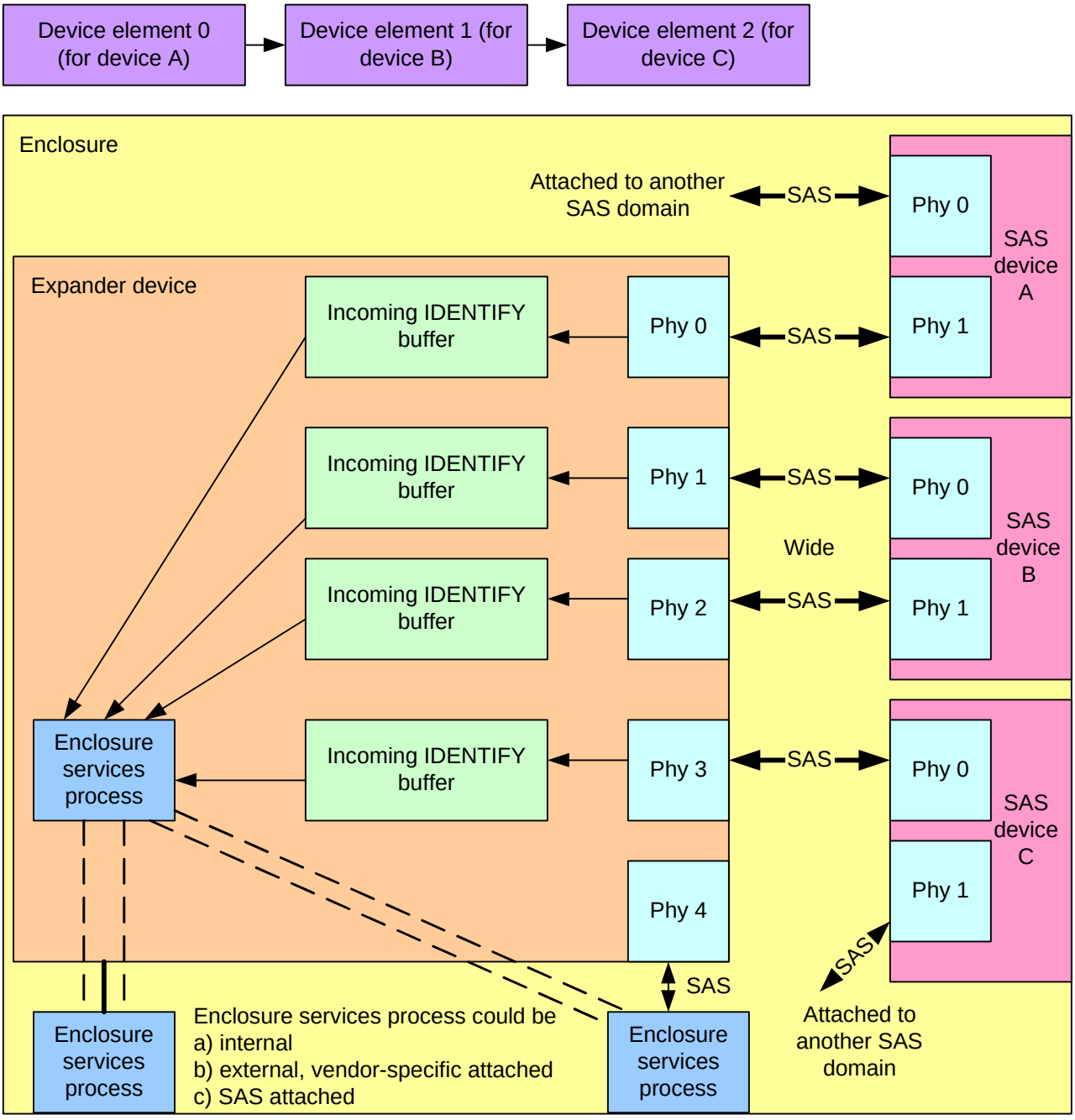

Figure 1 — Filling in the Device Element Status descriptors

In this example, the enclosure services process knows there are 3 slots for SAS devices (based on the design of this enclosure), so it provides 3 Device elements (for A, B, and C). The slot for B uses a 2-wide physical link, showing that the element is for the device, not the port. The enclosure services process knows about phy 1 in SAS device A but not phy 0, since phy 0 is in another SAS domain, so the Device Element Status descriptor cannot include any details about phy 0. It knows about both phys in SAS device B, so can fill in information about them. It only knows about phy 0 in SAS device C.

If the enclosure service process has access to both domains (e.g. it is itself a dual-port SAS device attached to both expanders), it might know about phy 0 of device A and phy 1 of device C and be able to report more information.

The proposed descriptor allows the enclosure process to report any phys it knows about regardless of domain. The NUMBER OF PHYS field is replaced by NUMBER OFPHY DESCRIPTORS, and the phy identifier is included in the descriptor, so all phys need not be reported. The protocol bits are included to help figure out if it is a SCSI or ATA device; the attached SAS address is included to determine which domain each phy is in.

Suggested changes

0.0.0.1 Serial Attached SCSI Device Element Status descriptor [current]

The format of the Device Element Status descriptor for Serial Attached SCSI devices is shown in table 2.

Table 1 — Serial Attached SCSI Device Element Status descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	Reserved				PROTOCOL IDENTIFIER (6h)			
1	DEVICE ELEMENT STATUS DESCRIPTOR LENGTH (n - 2)							
2	NUMBER OF PHYS							
3	Reserved							
One phy descriptor for each phy								
4	Reserved							
5	Reserved							
6	Reserved							
7	Reserved							
8	(MSB)			PHY SAS ADDRESS				
15								(LSB)
16 - n	...							

The PROTOCOL IDENTIFIER field of 6h indicates the descriptor is describing a Serial Attached SCSI (SAS) device.

The DEVICE ELEMENT STATUS DESCRIPTOR LENGTH field indicates the length of the Device Element Status descriptor.

The PHY SAS ADDRESS field contains the SAS address used by the corresponding phy.

0.0.0.2 Serial Attached SCSI Device Element Status descriptor [new]

The format of the Device Element Status descriptor for Serial Attached SCSI (SAS) devices is shown in table 2.

Table 2 — Serial Attached SCSI Device Element Status descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	Reserved				protocol identifier (6h)			
1	DEVICE ELEMENT STATUS DESCRIPTOR LENGTH (n - 2)							
2	NUMBER OFPHY DESCRIPTORS							
3	Reserved							
Phy descriptor								
4	Reserved	DEVICE TYPE			Reserved			
5	Reserved							
6	Reserved				SSP INITIATOR PORT	STP INITIATOR PORT	SMP INITIATOR PORT	Reserved
7	Reserved				SSP TARGET PORT	STP TARGET PORT	SMP TARGET PORT	Reserved
8	ATTACHED SAS ADDRESS							
15								
16	SAS ADDRESS							
23								
24	PHY IDENTIFIER							
25	Reserved							
31								
32 - n	...							

The PROTOCOL IDENTIFIER field of 6h indicates the descriptor is describing a phy in a SAS device.

The DEVICE ELEMENT STATUS DESCRIPTOR LENGTH field indicates the length of the Device Element Status descriptor.

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 (see SAS).

NOTE 1 The phy transmits these fields in the IDENTIFY address frame to the attached phy (usually an expander device). The enclosure process may retrieve the values from the attached phy (e.g., an enclosure process built into an expander device has direct access).

The ATTACHED SAS ADDRESS field contains the SAS address of the attached phy (e.g., the expander phy)(see SAS).

NOTE 2 All the fields are from the perspective of the SAS device associated with the 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 indicate if a SAS device is attached to more than one SAS domain.