To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
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Subject: 03-034r0 SAS SMP General Control function

Revision history
Revision 0 (17 December 2002) First revision

Related documents
sas-r03 - Serial Attached SCSI revision 3

Overview
Expanders may contain internal initiator and target ports (one of each per protocol) using the same SAS address as the expander device itself.

REPORT GENERAL needs to return some information about these internal ports. Although this information is returned to each attached device via IDENTIFY address frame, the recipient may not provide easy access to the information to software (e.g. where does an HBA store received IDENTIFY information? There is no standard API for software using that HBA to retrieve it). Bits from IDENTIFY are proposed for REPORT GENERAL to provide this information.

Also, a way is needed to control resets and STP affiliation clearing to these internal ports. The functions available through PHY CONTROL for an attached device are not available, since there is no phy number associated with these internal functions. If a fake phy number were assigned, some of the fields wouldn't make sense. A GENERAL CONTROL function is proposed to handle these controls.

Also, standalone STP targets need ways to report their STP affiliations. Affiliation valid and Affiliated STP initiator address fields are proposed for REPORT GENERAL (another approach would be to restore the REPORT SATA function and put the fields there).

Suggested changes to SAS

0.0.0.1 REPORT GENERAL function

The REPORT GENERAL function returns general information about the device. This function may implemented by any type of device and should be implemented by expander devices.

Table 1 defines the request format.

Table 1 — REPORT GENERAL request

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

The CRC field is defined in 9.4.2.

Table 2 defines the response format.

Table 2 — REPORT GENERAL response

Bit Byte	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (00h)							
2	FUNCTION RESULT							
3	Reserved							
4	(MSB)	EXPANDER CHANGE COUNT						
5								(LSB)
6	(MSB)	EXPANDER ROUTE INDEXES						
7								(LSB)
8	Reserved							
9	NUMBER OF PHYS							
10	Reserved							CONFIGURABLE ROUTE TABLE
11	Reserved							AFFILIATION VALID
12	Ignored	DEVICE TYPE		Reserved				
13	Reserved							
14	Reserved				SSP INITIATOR	STP INITIATOR	SMP INITIATOR	Reserved
15	Reserved				SSP TARGET	STP TARGET	SMP TARGET	Reserved
16	AFFILIATED STP INITIATOR SAS ADDRESS							
23								
24	Reserved							
27								
28	(MSB)	CRC						
31								(LSB)

The FUNCTION RESULT field is defined in 9.4.3. There are no FUNCTION RESULT values specific to this function.

The EXPANDER CHANGE COUNT field counts the number of BROADCAST (CHANGE)s originated by an expander device. Expander devices shall support this field. Other device types shall not support this field. This

field shall be set to zero at power on. The expander device shall increment this field at least once when it transmits a BROADCAST (CHANGE) for either of the following reasons:

a) after an expander phy has lost dword synchronization; or
b) after the link reset sequence completes.

The expander device need not increment this field again unless a REPORT GENERAL response is transmitted. This field shall not be incremented when forwarding a BROADCAST (CHANGE) from another expander device. The EXPANDER CHANGE COUNT field shall wrap to zero after the maximum value (i.e., FFFFh) has been reached.

NOTE 1 Application clients that use the EXPANDER CHANGE COUNT field should read it often enough to ensure that it does not increment a multiple of 65 536 times between reading the field.

The EXPANDER ROUTE INDEXES field contains the maximum number of route indexes for the expander device. Expander devices shall support this field. Other device types shall not support this field.

If an edge expander device supports an expander route table, then the number of expander route indexes for each phy identifier shall be greater than or equal to the number of phys downstream from the edge expander phy.

If a fanout expander device supports an expander route table, then the number of expander route indexes shall be 64.

The NUMBER OF PHYS field contains the number of phys in the device.

The CONFIGURABLE ROUTE TABLE bit indicates whether the expander device has an expander route table that shall be configured. An expander device with a configurable route table shall have the CONFIGURABLE ROUTE TABLE bit set to one. An expander device without a configurable route table shall have the CONFIGURABLE ROUTE TABLE bit set to zero.

The AFFILIATION VALID bit shall be set to one when the AFFILIATED STP INITIATOR SAS ADDRESS field is valid and the device is maintaining an active affiliation between an STP initiator port and an internal STP target port. The AFFILIATION VALID bit shall be set to zero when no STP initiator has an affiliation with the specified phy.

The DEVICE TYPE field indicates the DEVICE TYPE reported by this device in its IDENTIFY address frame during the link reset sequence (see 7.7.2). Table 73 defines the values for the DEVICE TYPE field.

The SSP INITIATOR bit, STP INITIATOR bit, SMP INITIATOR bit, SSP TARGET bit, STP TARGET bit, and SMP TARGET bit each indicate the corresponding values reported by this device in its IDENTIFY address frame during the link reset sequence (see 7.7.2).

The AFFILIATED STP INITIATOR SAS ADDRESS field contains the SAS address of the STP initiator port that currently has an affiliation to an internal STP port. This field is only valid if the AFFILIATION VALID bit is set to one.

The CRC field is defined in 9.4.3.

0.0.0.2 GENERAL CONTROL function [new]

The GENERAL CONTROL control phy-independent functionality. This function may implemented by any type of device.

Table 3 defines the request format.

Table 3 — GENERAL CONTROL request

Bit Byte	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (80h)							
2	Reserved							
3								
4	Ignored							
7								
8	Reserved							
9	Reserved							
10	Ignored							
11	Reserved							CLEAR AFFILIATION
12	Reserved							
13								
14	Reserved				RESET SSP INITIATOR	RESET STP INITIATOR	RESET SMP INITIATOR	Reserved
15	Reserved				RESET SSP TARGET	RESET STP TARGET	RESET SMP TARGET	Reserved
16	Reserved							
27								
28	(MSB) CRC							
31								(LSB)

The CLEAR AFFILIATION bit requests that an active affiliation (see 9.3.2) be cleared from the STP initiator port with the same SAS address as the SMP initiator port that opened this SMP connection. If there is no such affiliation, the target port shall return a FUNCTION RESULT of NO SUCH AFFILIATION in the response frame.

The RESET SSP INITIATOR bit, RESET STP INITIATOR bit, RESET SMP INITIATOR bit, RESET SSP TARGET bit, RESET STP TARGET bit, and RESET SMP TARGET bit each cause a hard reset event for the specified internal port, if present.

The CRC field is defined in 9.4.2.

Table 4 defines the response format.

Table 4 — GENERAL CONTROL response

Bit Byte	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (80h)							
2	FUNCTION RESULT							
3	Reserved							
4	(MSB)			CRC				
7								(LSB)

The FUNCTION RESULT field is defined in 9.4.3. The FUNCTION RESULT field values specific to this function are defined in table 5.

Table 5 — Function results for GENERAL CONTROL

Code	Name	Description
10h	NO SUCH AFFILIATION	The clear affiliation was requested but there is no affiliation to clear.
All others	Reserved.	

The CRC field is defined in 9.4.3.