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07-084r1 SAS-2 Add ATTACHED REASON field

To: T10 Technical Committee  
From: Rob Elliott, HP (elliott@hp.com)  
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Subject: 07-084r1 SAS-2 Add ATTACHED REASON field

### **Revision history**

Revision 0 (26 January 2007) First revision

Revision 1 (18 March 2007) Incorporated comments from the March 2007 SAS protocol WG

### **Related documents**

sas2r08 - Serial Attached SCSI - 2 (SAS-2) revision 8

### **Overview**

A REASON field was added to the IDENTIFY address frame for a phy to indicate the reason it ran the link reset sequence.

An ATTACHED REASON field was included in the DISCOVER response (in byte 12, next to the ATTACHED DEVICE TYPE field). This should be added in several data structures to convey this information:

- a) Protocol-Specific Port mode page - Phy Control and Discover subpage, SAS phy mode descriptor
- b) Protocol-Specific Port log page, SAS phy log descriptor
- c) DISCOVER LIST function SHORT FORMAT descriptor

### **Suggested changes to SAS-2**

#### **10.2.7.2 Protocol-Specific Port mode page**

##### **10.2.7.2.3 Protocol-Specific Port mode page - Phy Control And Discover subpage**

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The NUMBER OF PHYS field contains the number of phys in the SAS target device and indicates the number of SAS phy mode descriptors that follow. This field shall not be changeable with [the](#) MODE SELECT [command](#).

The SAS phy mode descriptor list contains a SAS phy mode descriptor for each phy in the SAS target device, not just the SAS target port, starting with the lowest numbered phy and ending with the highest numbered phy.

Table 1 defines the SAS phy mode descriptor.

**Table 1 — SAS phy mode descriptor**

Byte/Bit	7	6	5	4	3	2	1	0
0	Reserved							
1	PHY IDENTIFIER							
2	Reserved							
3	Reserved							
4	Reserved	ATTACHED DEVICE TYPE			<del>Reserved</del> <a href="#">ATTACHED REASON</a>			
5	Reserved				NEGOTIATED LOGICAL LINK RATE			
6	Reserved				ATTACHED SSP INITIATOR PORT	ATTACHED STP INITIATOR PORT	ATTACHED SMP INITIATOR PORT	Reserved
7	Reserved				ATTACHED SSP TARGET PORT	ATTACHED STP TARGET PORT	ATTACHED SMP TARGET PORT	Reserved
8	SAS ADDRESS							
15	SAS ADDRESS							
16	ATTACHED SAS ADDRESS							
23	ATTACHED SAS ADDRESS							
24	ATTACHED PHY IDENTIFIER							
25	Reserved							
31	Reserved							
32	PROGRAMMED MINIMUM PHYSICAL LINK RATE				HARDWARE MINIMUM PHYSICAL LINK RATE			
33	PROGRAMMED MAXIMUM PHYSICAL LINK RATE				HARDWARE MAXIMUM PHYSICAL LINK RATE			
34	Reserved							
41	Reserved							
42	Vendor specific							
43	Vendor specific							
44	Reserved							
47	Reserved							

~~The PHY IDENTIFIER field, ATTACHED DEVICE TYPE field, ATTACHED REASON field, NEGOTIATED LOGICAL LINK RATE field, ATTACHED SSP INITIATOR PORT bit, ATTACHED STP INITIATOR PORT bit, ATTACHED SMP INITIATOR PORT bit,~~

~~ATTACHED SSP TARGET PORT bit, ATTACHED STP TARGET PORT bit, ATTACHED SMP TARGET PORT bit, SAS ADDRESS field, ATTACHED SAS ADDRESS field, ATTACHED PHY IDENTIFIER, HARDWARE MINIMUM PHYSICAL LINK RATE field, and HARDWARE MAXIMUM PHYSICAL LINK RATE field are defined in the SMP DISCOVER response (see 10.4.3.7). These fields shall not be changeable with MODE SELECT.~~

The PROGRAMMED MINIMUM PHYSICAL LINK RATE field and PROGRAMMED MAXIMUM PHYSICAL LINK RATE field are defined in the SMP PHY CONTROL function (see 10.4.3.24).

The fields in the SAS phy mode descriptor not defined in this subclause are defined in the SMP DISCOVER response (see 10.4.3.7). These fields shall not be changeable with the MODE SELECT command.

**10.2.8.1 Protocol-Specific Port log page**

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The NUMBER OF PHYS field contains the number of phys in the SAS target port (not in the entire SAS target device) and indicates the number of SAS phy log descriptors that follow.

The SAS phy log descriptor list contains SAS phy log descriptors.

Table 2 defines the SAS phy log descriptor.

**Table 2 — SAS phy log descriptor (part 1 of 2)**

Byte/Bit	7	6	5	4	3	2	1	0
0	Reserved							
1	PHY IDENTIFIER							
2	Reserved							
3	SAS PHY LOG DESCRIPTOR LENGTH (m - 3)							
4	Reserved	ATTACHED DEVICE TYPE			Reserved <a href="#">ATTACHED REASON</a>			
5	Reserved				NEGOTIATED LOGICAL LINK RATE			
6	Reserved				ATTACHED SSP INITIATOR PORT	ATTACHED STP INITIATOR PORT	ATTACHED SMP INITIATOR PORT	Reserved
7	Reserved				ATTACHED SSP TARGET PORT	ATTACHED STP TARGET PORT	ATTACHED SMP TARGET PORT	Reserved
8	SAS ADDRESS							
15	SAS ADDRESS							
16	ATTACHED SAS ADDRESS							
23	ATTACHED SAS ADDRESS							
24	ATTACHED PHY IDENTIFIER							
25	Reserved							
31	Reserved							

Table 2 — SAS phy log descriptor (part 2 of 2)

Byte/Bit	7	6	5	4	3	2	1	0	
32	(MSB)	INVALID DWORD COUNT							
35								(LSB)	
36	(MSB)	RUNNING DISPARITY ERROR COUNT							
39								(LSB)	
40	(MSB)	LOSS OF DWORD SYNCHRONIZATION							
43								(LSB)	
44	(MSB)	PHY RESET PROBLEM							
47								(LSB)	
48		Reserved							
50									
51		NUMBER OF PHY EVENT DESCRIPTORS							
Phy event descriptor list									
52		Phy event descriptor (first)(see table 254 in 10.4.3.11)							
63									
...		...							
m - 11		Phy event descriptor (last)(see table 254 in 10.4.3.11)							
m									

~~The PHY IDENTIFIER field, ATTACHED DEVICE TYPE field, ATTACHED REASON field, NEGOTIATED LOGICAL LINK RATE field, ATTACHED SSP INITIATOR PORT bit, ATTACHED STP INITIATOR PORT bit, ATTACHED SMP INITIATOR PORT bit, ATTACHED SSP TARGET PORT bit, ATTACHED STP TARGET PORT bit, ATTACHED SMP TARGET PORT bit, SAS ADDRESS field, ATTACHED SAS ADDRESS field, and ATTACHED PHY IDENTIFIER field are defined in the SMP DISCOVER response (see 10.4.3.7).~~

The SAS PHY LOG DESCRIPTOR LENGTH field indicates the number of bytes that follow in the SAS phy log descriptor. A SAS PHY LOG DESCRIPTOR LENGTH field set to zero indicates there are 44 additional bytes.

NOTE 1 - Logical units compliant with SAS and SAS-1.1 only support a 48 byte SAS phy log descriptor.

The INVALID DWORD COUNT field, RUNNING DISPARITY ERROR COUNT field, LOSS OF DWORD SYNCHRONIZATION field, and PHY RESET PROBLEM COUNT field are each defined in the SMP REPORT PHY ERROR LOG response (see 10.4.3.8).

For the INVALID DWORD COUNT field, RUNNING DISPARITY ERROR COUNT field, LOSS OF DWORD SYNCHRONIZATION COUNT field, and PHY RESET PROBLEM COUNT field, the phy may maintain any size counter but should maintain a 32-bit counter. If it reaches its maximum value, the counter shall stop and the device server shall set the field to FFFFFFFFh in the SAS phy log descriptor.

The number of phy event descriptors field indicates how many phy event descriptors follow.

Each phy event descriptor follows the format defined for the SMP REPORT PHY EVENT INFORMATION function in table 254 (see 10.4.3.11).

The fields in the SAS phy log descriptor not defined in this subclause are defined in the SMP DISCOVER response (see 10.4.3.7). These fields shall not be changeable with the LOG SELECT command.

#### 10.4.3.13.4 DISCOVER LIST response SHORT FORMAT descriptor

Table 3 defines the SHORT FORMAT descriptor.

**Table 3 — SHORT FORMAT descriptor**

Byte\Bit	7	6	5	4	3	2	1	0
0	PHY IDENTIFIER							
1	FUNCTION RESULT							
2	Restricted	ATTACHED DEVICE TYPE			<del>Restricted for DISCOVER response byte 12</del> <a href="#">ATTACHED REASON</a>			
3	Restricted for DISCOVER response byte 13			NEGOTIATED LOGICAL LINK RATE				
4	Restricted for DISCOVER response byte 14			ATTACHED SSP INITIATOR	ATTACHED STP INITIATOR	ATTACHED SMP INITIATOR	ATTACHED SATA HOST	
5	ATTACHED SATA PORT SELECTOR	Restricted for DISCOVER response byte 15			ATTACHED SSP TARGET	ATTACHED STP TARGET	ATTACHED SMP TARGET	ATTACHED SATA DEVICE
6	VIRTUAL PHY	Reserved			ROUTING ATTRIBUTE			
7	Reserved							
8	ZONE GROUP							
9	Restricted for DISCOVER response byte 60	INSIDE ZPSDS PERSISTENT	REQUESTED INSIDE ZPSDS	ZONE ADDRESS RESOLVED	ZONE GROUP PERSISTENT	INSIDE ZPSDS	Reserved	
10	ATTACHED PHY IDENTIFIER							
11	PHY CHANGE COUNT							
12	ATTACHED SAS ADDRESS							
19	_____							
20	_____							
23	Reserved _____							

The PHY IDENTIFIER field indicates the phy for which physical configuration link information is being returned.

The FUNCTION RESULT field indicates the value that is returned in the FUNCTION RESULT field in the SMP DISCOVER response for the specified phy (e.g., SMP FUNCTION ACCEPTED, PHY VACANT, or PHY DOES NOT EXIST). If the FUNCTION RESULT field is set to PHY VACANT or PHY DOES NOT EXIST, the rest of the fields in the SHORT FORMAT descriptor shall be ignored.

The fields in the SHORT FORMAT descriptor not defined in this subclause are defined in the SMP DISCOVER response (see 10.4.3.7).