To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
Date: 21 June 2004
Subject: 04-172r0 SAS-1.1 More counters

Revision history
Revision 0 (21 June 2004) First revision.

Related documents
sas1r04 - Serial Attached SCSI 1.1 revision 4

Overview
Additional standard per-phy counters or maximum value registers, for both errors and non-errors, are desired to help testing and diagnosing problems, particularly in large configurations.

These counters should not be construed as required; they are all optional.

Proposed for both SSP targets (reported via the SSP log page) and expanders (reported via SMP functions):

   a)   Elasticity buffer overflow - not enough ALIGNS/NOTIFYs coming in, causing loss of a dword. This is important for checking ALIGN/NOTIFY insertion rates and performing clock frequency ppm tests.
   b)   Receive address frame error - incoming address frame has CRC or other problem (too few or too many dwords) so is ignored.
   c)   ERROR primitive received - phy receives an ERROR primitive (which is not counted as an invalid dword and may or may not have other effects)
   d)   Receive BREAK (after transmitting OPEN or during a connection)
   e)   Transmit BREAK - possibly differentiate the reasons: Open Timeout timer expires, Close Timeout Timer expires
   f)   Break Timeout timer expires. This causes the phy to assume the link is idle again (unless it chooses to start a new link reset sequence).

Proposed for both SSP target ports (reported via log page) and STP target ports (reported via a new SMP function):

   a)   Receive an abandon class OPEN_REJECT
   b)   Receive a retry class OPEN_REJECT
   c)   Transmit an abandon class OPEN_REJECT
   d)   Transmit a retry class OPEN_REJECT
   e)   Maximum ARBITRATION WAIT TIME value used in outgoing OPENs
   f)   Maximum PATHWAY BLOCKED COUNT value used in outgoing OPENs
   g)   Maximum arbitration time. How long did it take to get an OPEN_ACCEPT or OPEN_REJECT?

Proposed for SSP targets (reported via the SSP log page):

   a)   Receive SSP frame error - SSP target port receives a bad SSP frame and generates NAK (CRC ERROR)
   b)   Transmit SSP frame error - SSP target port transmits an SSP frame and receives a NAK or an ACK/NAK timeout
   c)   Receives CREDIT_BLOCKED
   d)   Transmits CREDIT_BLOCKED

Proposed for SMP target ports (reported via SMP functions):

   a)   Receive address frame error
   b)   Receive SMP frame error - SMP target port receives a bad SMP frame and generates a BREAK
   c)   Transmit BREAK
   d)   Receive BREAK
   e)   Break Timeout. Sent a BREAK and got no reply (a very bad sign).
   f)   Transmit an abandon class OPEN_REJECT
   g)   Transmit a retry class OPEN_REJECT

h) Connection count. Can use this to tell if some phys in a wide link are not being used as much as others (or at all).

i) Maximum connection time. Detect if there are any bus hogs.

Proposed counters for STP target ports (reported via SMP function):

a) STP flow control buffer overflow - received too many dwords after a HOLD, causing a dword to be lost. The cable might be too long, allowing too many dwords in flight.

In SMP, the counters wrap rather than saturate; a bit in the request can be used to query the size of the counter. This facilitates easier multi-initiator usage.

In the log page, the counters are all 32 bits. They wrap rather than saturate for better multi-initiator use.

Editor's Note 1: could add wrapping versions of the 4 existing counters, too, if the new programming model is really preferred.

Other possibilities

In a multiple initiator environment, several of the items would be more useful if recorded on a per destination address basis - maximum AWT used, maximum PBC used, and received CREDIT_BLOCKED counter. Maximum # RRDYs received per connection to the destination might also be useful.

Editor's Note 2: Add "increment this counter" rules to the appropriate state machines once the expanded list of counters is agreed upon.

10.2.7 SCSI log parameters

10.2.7.1 Protocol-Specific log page

The Protocol Specific log page for SAS defined in table 1 is used to report errors that have occurred on the SAS target device's phy(s).

Table 1 — Protocol-Specific log page for SAS

Byte\Bit	7	6	5	4	3	2	1	0
0	PAGE CODE (18h)							
1	Reserved							
2	(MSB)			PAGE LENGTH (m - 3)				
3								(LSB)
	Protocol-specific log parameters							
4	First protocol-specific log parameter							
...	...							
m	n^{th} protocol-specific log parameter							

The PAGE CODE field shall be set to 18h.

The PAGE LENGTH field shall be set to the total length in bytes of the log parameters.

Table 2 defines the format for a SAS log parameter.

Table 2 — Protocol-Specific log parameter format for SAS

Byte\Bit	7	6	5	4	3	2	1	0
0	(MSB)			PARAMETER CODE (relative target port identifier)				
1								(LSB)
2	DU	DS	TSD	ETC	TMC		LBIN	LP
3	PARAMETER LENGTH (y - 3)							
4	Reserved				PROTOCOL IDENTIFIER (6h)			
5	Reserved							
6								
7	NUMBER OF PHYS							
SAS phy log descriptors								
8	First SAS phy log descriptor							
	...							
	Last SAS phy log descriptor							
y								

The PARAMETER CODE field contains the relative target port identifier (see SPC-3) of the SSP target port that this log parameter describes.

Table 3 defines the values for the log parameter control bits for this log parameter.

Table 3 — Parameter control bits for SAS log parameters

Bit	Value	Description
DU	0	The value is provided by the device server.
DS	0	The device server supports saving of the parameter.
TSD	0	The device server manages saving of the parameter.
ETC	0	No threshold comparison is made on this value.
TMC	any	This field is ignored when the ETC bit is 0.
LBIN	1	The parameter is in binary format.
LP	1	The parameter is a list parameter.

The PARAMETER LENGTH field is set to the length of the log parameter minus three.

The PROTOCOL IDENTIFIER field is set to 6h.

The NUMBER OF PHYS field contains the number of SAS phy log descriptors that follow.

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Table 4 defines the SAS phy log descriptor. Each SAS phy log descriptor is the same length.

Table 4 — 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								
4	Reserved	ATTACHED DEVICE TYPE			Reserved			
5	Reserved				NEGOTIATED PHYSICAL 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								
16	ATTACHED SAS ADDRESS							
23								
24	ATTACHED PHY IDENTIFIER							
25	Reserved							
31								

Table 4 — SAS phy log descriptor (part 2 of 2)

Byte\Bit	7	6	5	4	3	2	1	0
32	(MSB)							
35				INVALID DWORD COUNT				(LSB)
36	(MSB)							
39				RUNNING DISPARITY ERROR COUNT				(LSB)
40	(MSB)							
43				LOSS OF DWORD SYNCHRONIZATION COUNT				(LSB)
44	(MSB)							
47				PHY RESET PROBLEM COUNT				(LSB)
48	(MSB)							
51				Reserved				(LSB)
52				NUMBER OF PHY EVENT DESCRIPTORS				
53								
m				Phy event descriptor(s)				

NOTE 1 Logical units compliant with the original version of SAS only support a 48 byte SAS phy log descriptor. To determine the size of each SAS phy log descriptor, use:

Phy log descriptor length = (parameter length - 4) / number of phys).

The PHY IDENTIFIER field, ATTACHED DEVICE TYPE field, NEGOTIATED PHYSICAL 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 function (see 10.4.3.5).

~~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 data (see 10.4.3.6).~~

The INVALID DWORD COUNT field indicates the number of invalid dwords (see 3.1.66) that have been received outside of phy reset sequences (i.e., between when the SP_DWS state machine (see 6.8) sends a Phy Layer Ready (SAS) confirmation and when it sends a Phy Layer Not Ready confirmation to the link layer).

The RUNNING DISPARITY ERROR COUNT field indicates the number of dwords containing running disparity errors (see 6.2) that have been received outside of phy reset sequences.

The LOSS OF DWORD SYNCHRONIZATION COUNT field indicates the number of times the phy has lost dword synchronization and restarted the link reset sequence (see 6.7) of phy reset sequences.

The PHY RESET PROBLEM COUNT field indicates the number of times the phy reset sequence has failed (see 6.6.4.2).

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 count shall stop and a value of FFFFFFFFh shall be returned.

The NUMBER OF PHY EVENT DESCRIPTORS field indicates how many phy event descriptors follow.

Each phy event descriptor is 8 bytes long and follows the format defined in table 5.

Table 5 — Phy event descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0				Reserved				
2								
3				PHY EVENT CODE				
4	(MSB)							
7				PHY EVENT INFORMATION				(LSB)

The PHY EVENT CODE field, defined in table 6, indicates the type of phy event information being reported in the PHY EVENT INFORMATION field.

Table 6 — Phy event information codes

Code	Name	Description
00h	Elasticity buffer overflow count	Number of times the phy's receive elasticity buffer (see 7.3) has overflowed (e.g., because it did receive a sufficient number of ALIGNs and/or NOTIFYs)
01h	Received address frame error count	Number of times the phy detected an invalid address frame (e.g., because of a CRC error)
02h	Received ERROR count	Number of times the phy received an ERROR primitive
03h	Received SSP frame error count	Number of times the phy was used in a connection involving the SSP target port, detected an invalid frame, and transmitted a NAK (CRC ERROR) (e.g., because of a CRC error)
04h	Transmitted SSP frame error count	Number of times the phy was used in a connection involving the SSP target port, transmitted a frame, and received a NAK or an ACK/NAK timeout
05h	Received OPEN_REJECT abandon count	Number of times the phy transmitted an OPEN address frame and received an abandon-class OPEN_REJECT (see 7.2.5.11)
06h	Received OPEN_REJECT retry count	Number of times the phy transmitted an OPEN address frame and received a retry-class OPEN_REJECT (see 7.2.5.11)
07h	Transmitted OPEN_REJECT abandon count	Number of times the phy received an OPEN address frame and transmitted an abandon-class OPEN_REJECT (see 7.2.5.11)

Table 6 — Phy event information codes

Code	Name	Description
08h	Transmitted OPEN_REJECT retry count	Number of times the phy received an OPEN address frame and transmitted a retry-class OPEN_REJECT (see 7.2.5.11)
09h	Received CREDIT_BLOCKED count	Number of times the phy received a CREDIT_BLOCKED
0Ah	Transmitted CREDIT_BLOCKED count	Number of times the phy transmitted a CREDIT_BLOCKED
0Bh	Received AIP (WAITING ON PARTIAL) count	Number of times the phy received an AIP (WAITING ON PARTIAL) or AIP (RESERVED WAITING ON PARTIAL)
0Ch	Received AIP (WAITING ON CONNECTION) count	Number of times the phy received an AIP (WAITING ON CONNECTION)
0Dh	Maximum transmitted pathway blocked count	Maximum value of a PATHWAY BLOCKED field in an OPEN address frame transmitted by the phy. Since the maximum value is FFh, only byte 3 is used.
0Eh	Maximum transmitted arbitration wait time	Maximum value of an ARBITRATION WAIT TIME field in an OPEN address frame transmitted by the phy. Since the maximum value is FFFFh, only bytes 2 and 3 are used.
0Fh	Maximum arbitration time	Maximum time in microseconds after transmitting an OPEN address frame that the phy has waited for connection response (e.g., OPEN_ACCEPT or OPEN_REJECT).
10h - EFh	Reserved	
F0h - FFh	Vendor specific	

10.4.3 SMP functions

10.4.3.1 SMP function request frame format

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Editor's Note 3: could adopt the variable format structure like the log page or use a fixed structure as shown here.

The FUNCTION field specifies which SMP function is being requested and is defined in table 7. 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 148.

Table 7 — SMP functions

Code	SMP function	Description	Request frame size (in bytes)	Response frame size (in bytes)	Reference
00h	REPORT GENERAL	Return general information about the device	8	32	10.4.3.3
01h	REPORT MANUFACTURER INFORMATION	Return vendor and product identification	8	64	10.4.3.4
02h - 0Fh	Reserved for general SMP input functions				
10h	DISCOVER	Return information about the specified phy	16	56	10.4.3.5
11h	REPORT PHY ERROR LOG	Return error logging information about the specified phy	16	32	10.4.3.6
12h	REPORT PHY SATA	Return information about a phy currently attached to a SATA device	16	60	10.4.3.7
13h	REPORT ROUTE INFORMATION	Return route table information	16	44	10.4.3.8
14h	REPORT PHY LAYER EVENTS	Return phy layer events for the specified phy	16		10.4.3.xx
15h	REPORT LINK LAYER EVENTS	Return link layer events for the specified phy	16		10.4.3.xx
16h	REPORT STP LINK LAYER EVENTS	Return STP link layer events for the specified phy	16		10.4.3.xx
~~14h~~ 17h - 1Fh	Reserved for phy-based SMP input functions				
20h - 3Fh	Reserved for SMP input functions				
40h - 7Fh	Vendor specific				
80h - 8Fh	Reserved for general SMP output functions				
90h	CONFIGURE ROUTE INFORMATION	Change route table information	44	8	10.4.3.9
91h	PHY CONTROL	Request actions by the specified phy	44	8	10.4.3.10
92h - 9Fh	Reserved for phy-based SMP output functions				
A0h - BFh	Reserved for SMP output functions				
C0h - FFh	Vendor specific				

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10.4.3.6 REPORT PHY LAYER EVENTS function

The REPORT PHY LAYER EVENTS function returns information about the specified phy detected by the phy layer (e.g., the SP or SP_DWS state machines). This SMP function may implemented by any SMP target port.

Table 6 defines the request format.

Table 8 — REPORT PHY LAYER EVENTS request

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (14h)							
2	Reserved							
3	Reserved							REPORT MAXIMUMS
4	Ignored							
7								
8	Reserved							
9	PHY IDENTIFIER							
10	Ignored							
11	Reserved							
12	(MSB)							
15	CRC							(LSB)

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

The FUNCTION field shall be set to 14h.

A REPORT MAXIMUMS field set to one specifies that the maximum value of each field in the response frame be returned. A REPORT MAXIMUMS field set to zero specifies that the current value of each field in the response frame be returned.

The PHY IDENTIFIER field specifies the phy (see 4.2.7) for which information shall be reported.

The CRC field is defined in 10.4.3.1.

Table 7 defines the response format.

Table 9 — REPORT PHY LAYER EVENTS response

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (14h)							
2	FUNCTION RESULT							
3	Reserved							REPORT MAXIMUMS
4	Ignored							
7								
8	Reserved							
9	PHY IDENTIFIER							
10	Ignored							
11	Reserved							
12	(MSB) ELASTICITY BUFFER OVERFLOW COUNT							
15								(LSB)
16	(MSB) RECEIVE ERROR PRIMITIVE COUNT							
19								(LSB)
20	(MSB) TRANSMIT DATA DWORD COUNT							
23								(LSB)
24	(MSB) RECEIVE DATA DWORD COUNT							
27								(LSB)
28	(MSB) CRC							
31								(LSB)

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

The FUNCTION field shall be set to 14h.

The FUNCTION RESULT field is defined in 10.4.3.2.

The REPORT MAXIMUMS field indicates the value of the REPORT MAXIMUMS field in the request.

The PHY IDENTIFIER field indicates the phy (see 4.2.7) for which information is being reported.

For each of the COUNT fields in this function, the phy may maintain any size counter. If it reaches its maximum value, the count shall continue from a value of zero.

The ELASTICITY BUFFER OVERFLOW COUNT field indicates the number of times the phy's receive elasticity buffer (see 7.3) has overflowed (e.g., because it did receive a sufficient number of ALIGNs and/or NOTIFYs).

The RECEIVE ERROR PRIMITIVE COUNT field indicates the number of times the phy received an ERROR primitive.

The TRANSMIT DATA DWORD COUNT field indicates the number of data dwords the phy has transmitted inside a connection after an SOF or SATA_SOF and before an EOF or SATA_EOF.

The RECEIVE DATA DWORD COUNT field indicates the number of data dwords the phy has received inside a connection after an SOF or SATA_SOF and before an EOF or SATA_EOF.

The CRC field is defined in 10.4.3.2.

10.4.3.xx REPORT LINK LAYER EVENTS function

The REPORT LINK LAYER EVENTS function returns error logging information about the specified phy detected by the link layer (e.g., the XL state machine, and/or the SL state machine interfacing to the SMP target port). This SMP function may implemented by any SMP target port.

Table 6 defines the request format.

Table 10 — REPORT LINK LAYER EVENTS request

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (15h)							
2	Reserved							
3	Reserved							REPORT MAXIMUMS
4	Ignored							
7								
8	Reserved							
9	PHY IDENTIFIER							
10	Ignored							
11	Reserved							
12	(MSB)							
15	CRC							(LSB)

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

The FUNCTION field shall be set to 15h.

A REPORT MAXIMUMS field set to one specifies that the maximum value of each field in the response frame be returned. A REPORT MAXIMUMS field set to zero specifies that the current value of each field in the response frame be returned.

The PHY IDENTIFIER field specifies the phy (see 4.2.7) for which information shall be reported.

The CRC field is defined in 10.4.3.1.

Table 7 defines the response format.

Table 11 — REPORT LINK LAYER EVENTS response

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (15h)							
2	FUNCTION RESULT							
3	Reserved							REPORT MAXIMUMS
4 7	Ignored							
8	Reserved							
9	PHY IDENTIFIER							
10	Ignored							
11	Reserved							
20	(MSB)			RECEIVE ADDRESS FRAME ERROR COUNT				
23								(LSB)
24	(MSB)			RECEIVE SMP FRAME ERROR COUNT				
27								(LSB)
28	(MSB)			RECEIVE BREAK COUNT				
31								(LSB)
32	(MSB)			TRANSMIT BREAK COUNT				
35								(LSB)
36	(MSB)			BREAK TIMEOUT COUNT				
39								(LSB)

Table 11 — REPORT LINK LAYER EVENTS response

Byte\Bit	7	6	5	4	3	2	1	0
40	(MSB)							
43			TRANSMIT OPEN REJECT ABANDON COUNT					(LSB)
44	(MSB)							
47			TRANSMIT OPEN REJECT RETRY COUNT					(LSB)
48	(MSB)							
51			CONNECTION COUNT					(LSB)
52	(MSB)							
55			MAXIMUM CONNECTION TIME					(LSB)
56	(MSB)							
59			CRC					(LSB)

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

The FUNCTION field shall be set to 15h.

The FUNCTION RESULT field is defined in 10.4.3.2.

The REPORT MAXIMUMS field indicates the value of the REPORT MAXIMUMS field in the request.

The PHY IDENTIFIER field indicates the phy (see 4.2.7) for which information is being reported.

For each of the COUNT fields in this function, the phy may maintain any size counter. If it reaches its maximum value, the count shall continue from a value of zero.

The RECEIVE ADDRESS FRAME ERROR COUNT field indicates the number of times the phy detected an invalid address frame (e.g., because of a CRC error).

The RECEIVE SMP FRAME ERROR COUNT field indicates the number of times the phy was used for to access the SMP target port and the SMP target port detected an invalid frame and transmitted a BREAK (e.g., because of a CRC error).

The RECEIVE BREAK COUNT field indicates the number of times the phy received a BREAK that was not a response to a BREAK it transmitted.

The TRANSMIT BREAK COUNT field indicates the number of times the phy transmitted a BREAK that was not a response to a BREAK it received (e.g., a Close Timeout was detected by the SL state machine interfacing to the SMP target port).

The BREAK TIMEOUT COUNT field indicates the number of times the phy transmitted a BREAK and did not receive a BREAK in response (e.g., as detected by the XL state machine and/or the SL state machine interfacing to the SMP target port).

The TRANSMIT OPEN REJECT ABANDON COUNT field indicates the number of times the phy received an OPEN address frame and its XL state machine transmitted an abandon-class OPEN_REJECT (see 7.2.5.11). Forwarded OPEN_REJECTs shall not be included in the count.

The TRANSMIT OPEN REJECT RETRY COUNT field indicates the number of times the phy received an OPEN address frame and its XL state machine transmitted an retry-class OPEN_REJECT (see 7.2.5.11). Forwarded OPEN_REJECTs shall not be included in the count.

The CONNECTION COUNT field indicates the number of connections in which the phy was involved.

The MAXIMUM CONNECTION TIME field indicates, in microseconds, the maximum duration of any connection in which the phy was involved.

> Editor's Note 5: This purposely has finer resolution (1μs) than the 100 μs increments used in the SSP mode page.

The CRC field is defined in 10.4.3.2.

10.4.3.xx REPORT STP LINK LAYER EVENTS function

The REPORT STP LINK LAYER EVENTS function returns miscellaneous logging information about the specified phy detected by the STP link layer. This SMP function may implemented by any SMP target port.

Table 6 defines the request format.

Table 12 — REPORT STP LINK LAYER EVENTS request

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (16h)							
2	Reserved							
3	Reserved							REPORT MAXIMUMS
4	Ignored							
7								
8	Reserved							
9	PHY IDENTIFIER							
10	Ignored							
11	Reserved							
12	(MSB)							
15				CRC				(LSB)

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

The FUNCTION field shall be set to 16h.

A REPORT MAXIMUMS field set to one specifies that the maximum value of each field in the response frame be returned. A REPORT MAXIMUMS field set to zero specifies that the current value of each field in the response frame be returned.

The PHY IDENTIFIER field specifies the phy (see 4.2.7) for which information shall be reported.

The CRC field is defined in 10.4.3.1.

Table 7 defines the response format.

Table 13 — REPORT STP LINK LAYER EVENTS response

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (16h)							
2	FUNCTION RESULT							
3	Reserved							REPORT MAXIMUMS
4	Ignored							
7								
8	Reserved							
9	PHY IDENTIFIER							
10	Ignored							
11	Reserved							
12	(MSB)							
15	SATA FLOW CONTROL BUFFER OVERFLOW COUNT							(LSB)
16	(MSB)							
19	RECEIVE OPEN REJECT ABANDON COUNT							(LSB)
20	(MSB)							
23	RECEIVE OPEN REJECT RETRY COUNT							(LSB)
24	(MSB)							
27	TRANSMIT OPEN REJECT ABANDON COUNT							(LSB)
28	(MSB)							
31	TRANSMIT OPEN REJECT RETRY COUNT							(LSB)
32	(MSB)							
35	RECEIVE AIP WAITING ON PARTIAL							(LSB)

Table 13 — REPORT STP LINK LAYER EVENTS response

Byte\Bit	7	6	5	4	3	2	1	0
36	(MSB)							
39			RECEIVE AIP WAITING ON CONNECTION					(LSB)
40	Reserved							
41	MAXIMUM PATHWAY BLOCKED COUNT							
42	(MSB)							
43			MAXIMUM ARBITRATION WAIT TIME					(LSB)
44	(MSB)							
47			MAXIMUM ARBITRATION TIME					(LSB)
48	(MSB)							
51			CRC					(LSB)

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

The FUNCTION field shall be set to 16h.

The FUNCTION RESULT field is defined in 10.4.3.2.

The REPORT MAXIMUMS field indicates the value of the REPORT MAXIMUMS field in the request.

The PHY IDENTIFIER field indicates the phy (see 4.2.7) for which information is being reported.

For each of the COUNT fields in this function, the phy may maintain any size counter. If it reaches its maximum value, the count shall stop and a value of FFFFFFFFh shall be returned.

The SATA FLOW CONTROL BUFFER OVERFLOW COUNT field indicates the number of times the phy's STP flow control buffer (see 7.17.3) has overflowed (e.g., because it received more data dwords than allowed after transmitting HOLD during an STP connection). This count should be maintained in the phy transmitting the HOLD and receiving the data dwords, but may be maintained in the phy receiving the HOLD and transmitting the data dwords.

The RECEIVE OPEN REJECT ABANDON COUNT field indicates the number of times the phy transmitted an OPEN address frame and received an abandon-class OPEN_REJECT (see 7.2.5.11).

The RECEIVE OPEN REJECT RETRY COUNT field indicates the number of times the phy transmitted an OPEN address frame and received an retry-class OPEN_REJECT (see 7.2.5.11).

The TRANSMIT OPEN REJECT ABANDON COUNT field indicates the number of times the phy received an OPEN address frame and transmitted an abandon-class OPEN_REJECT (see 7.2.5.11).

The TRANSMIT OPEN REJECT RETRY COUNT field indicates the number of times the phy received an OPEN address frame and transmitted an retry-class OPEN_REJECT (see 7.2.5.11).

The RECEIVE AIP WAITING ON PARTIAL COUNT field indicates the number of times the phy received an AIP (WAITING ON PARTIAL) or AIP (RESERVED WAITING ON PARTIAL).

The RECEIVE AIP WAITING ON CONNECTION COUNT field indicates the number of times the phy received an AIP (WAITING ON CONNECTION).

The MAXIMUM PATHWAY BLOCKED COUNT field indicates the maximum value of a PATHWAY BLOCKED field in an OPEN address frame transmitted by the phy.

The MAXIMUM ARBITRATION WAIT TIME field indicates the maximum value of an ARBITRATION WAIT TIME field in an OPEN address frame transmitted by the phy.

The MAXIMUM ARBITRATION TIME field indicates the maximum time after the phy transmitted an OPEN address frame until it received a connection response (e.g., OPEN_ACCEPT or OPEN_REJECT).

The CRC field is defined in 10.4.3.2.

Editor's Note 6: end of all-new section