To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
Date: 11 January 2007
Subject: 06-476r1 SAS-2 SPC-4 DISCOVER response Attached Device Name for SATA

Revision history

Revision 0 (31 October 2006) First revision
Revision 1 (11 January 2007) Incorporated comments from November SAS protocol WG.

Related documents

sas2r07 - Serial Attached SCSI - 2 (SAS-2) revision 7

Overview

When 05-309 added the DEVICE NAME field to the IDENTIFY address frame and the ATTACHED DEVICE NAME field (bytes 52-59) to the DISCOVER response in SAS-2, it left the ATTACHED DEVICE NAME field set to zero for SATA devices since they don't have IDENTIFY address frames. This field would be more useful if it contained information about SATA devices as well - specifically, information about the SATA device's identity. The SAS address provided for a SATA device by the expander to which it happens to be attached is just used as an address, and doesn't follow the SATA device if it moves. The device name should be a value that is unique to the SATA device and is the same wherever it is attached.

1. First approach (in r0):

The expander device uses SATA host capability to fetch the IDENTIFY (PACKET) DEVICE data when a SATA device is attached, and report in the DISCOVER response ATTACHED DEVICE NAME field:

a) the 8-byte Worldwide Name (words 108-111), if it is non-zero; and
b) otherwise, a hashed version of the 20-byte Serial Number (words 10-19) and 40-byte Model Number (words 27-46). The value must not collide with real NAA identifiers. Since the source fields are not guaranteed unique by ATA8-ACS, this value is not guaranteed to be unique (but if the hash algorithm is chosen well, it is very likely to be).

After a SATA device is added, this would delay the time until which the ATTACHED DEVICE TYPE field is set to 001b (as if the initial D2H Register FIS is taking longer) and connection requests are accepted.

The expander may discard all other IDENTIFY (PACKET) DEVICE data; it just needs to store 8 bytes x (number of phys).

2. Second approach (in r1):

Don't require the expander do all the work. Let any STP initiator port fetch the IDENTIFY (PACKET DEVICE) data and have its associated SMP initiator port set the ATTACHED DEVICE NAME field via the PHY CONTROL function. The expander may also fill in the field if it has SATA host capability, relieving the need for others to do so.

The expander sets the ATTACHED DEVICE NAME field to zero whenever it thinks the SATA device might have changed (e.g., based on physical presence detection if available, or on each link reset sequence if not).

This requires the expander provide 8 bytes of read/write storage per phy.

Name format for hashing

There are two NAA formats defined in FC-FS that could be used for the hash-based device name: Locally Assigned (3h) and IEEE Registered (5h).

Table 1 shows the NAA Locally Assigned format identifier.

Table 1 — NAA Locally Assigned format (3h)

Byte\Bit	7	6	5	4	3	2	1	0
0	NAA (3h)							
1	LOCALLY ADMINISTERED VALUE							
7								

Table 2 shows the NAA IEEE Registered format identifier.

Table 2 — NAA IEEE Registered format (5h)

Byte\Bit	7	6	5	4	3	2	1	0
0	NAA (5h)				(MSB)			
1	IEEE COMPANY ID							
2								
3				(LSB)				
4	VENDOR-SPECIFIC IDENTIFIER							
7								

This proposal recommends using 3h because it will not conflict with any real SAS addresses or ATA worldwide names (they all use NAA 5h).

NAA 5h can be used fairly safely by setting the UNIVERSALLY/LOCALLY ADMINISTERED bit embedded in the IEEE COMPANY ID to one (i.e., locally administered). A SAS device or ATA device would never be manufacturered with such an identifier. However, this allows the hash-based name to intrude on the namespace of the company owning the company ID.

Suggested changes to SAS-2

3.1.xx IDENTIFY (PACKET) DEVICE data: IDENTIFY DEVICE data from an ATA device, or IDENTIFY PACKET DEVICE data from an ATAPI device. See ATA8-ACS.

4.2 Names and identifiers

4.2.1 Names and identifiers overview

Device names are worldwide unique names for devices within a transport protocol. Port names are worldwide unique names for ports within a transport protocol. Port identifiers are the values by which ports are identified within a domain. Phy identifiers are the values by which phys are identified within a device.

Table 8 describes the definitions of names and identifiers for SAS.

Table 8 — Names and identifiers

Attribute	Format	SAS usage	Reference
Device name	NAA IEEE Registered format (see 4.2.2) for SAS devices and for SATA devices with worldwide names; NAA IEEE Locally Assigned format (see 4.2.4) for SATA devices without worldwide names	Reported in the IDENTIFY address frame (see 7.8.2) for SAS devices and expander devices and, for SSP target devices, in the Device Identification VPD page (see 10.2.11) Reported in the DISCOVER response (see 10.2.x.x) for SATA devices	4.2.6
Port name	Not defined		4.2.7
Port identifier	NAA IEEE Registered format (see 4.2.2)	Reported in the IDENTIFY address frame (see 7.8.2) for SAS ports.	4.2.8
Phy identifier	7-bit value	Phy identifier	4.2.9

[a] A phy controlled by an SMP target port reports its attached device name in the SMP DISCOVER function. The attached device name for a SATA device uses either the NAA IEEE Registered format or NAA Locally Assigned format.

Table 9 describes how various SAM-4 attributes are implemented in SSP.

Table 9 — SAM-4 attribute mapping

SAM-4 attribute	SSP implementation
Initiator port identifier	SAS address of an SSP initiator port
Initiator port name	Not defined
Target port identifier	SAS address of an SSP target port
Target port name	Not defined
SCSI device name	Device name of SAS device containing an SSP port

4.2.2 NAA IEEE Registered format identifier

Table 10 defines the NAA IEEE Registered format identifier used by device names and port identifiers. This format is the same as that defined in SPC-4.

Table 10 — NAA IEEE Registered format

Byte\Bit	7	6	5	4	3	2	1	0
0	NAA (5h)				(MSB)			
1	IEEE COMPANY ID							
2								
3				(LSB)				
4	VENDOR-SPECIFIC IDENTIFIER							
5								
6								
7								

The NAA field contains 5h.

The IEEE COMPANY ID field contains a 24-bit canonical form company identifier (i.e., organizationally unique identifier or OUI) assigned by the IEEE.

Bit 5 of byte 1, which serves as the UNIVERSALLY/LOCALLY ADMINISTERED ADDRESS bit, shall be set to zero.

Bit 4 of byte 1, which serves as the INDIVIDUAL/GROUP ADDRESS bit, shall be set to zero.

NOTE 1 - Information about IEEE company identifiers may be obtained from the IEEE Registration Authority web site at http://standards.ieee.org/regauth/oui.

The VENDOR-SPECIFIC IDENTIFIER field contains a 36-bit value that is assigned by the organization associated with the company identifier in the IEEE COMPANY ID field. The VENDOR-SPECIFIC IDENTIFIER field shall be assigned so the NAA IEEE Registered format identifier is worldwide unique.

An identifier value of 00000000_00000000h indicates an invalid identifier.

4.2.3 Device name for SATA devices with worldwide names

Table 2 defines the NAA IEEE Registered format identifier (see 4.2.3) used by device names for SATA devices that provide world wide names in their IDENTIFY (PACKET) DEVICE data.

Table 11 — Device name created from the IDENTIFY (PACKET) DEVICE World Wide Name

ATTACHED DEVICE NAME field		Contents [a]
Subformat field name (see table 9 in 4.2.2)	Specific bits in table 223	
NAA	Byte 52 bits 7:4	IDENTIFY (PACKET) DEVICE data word 108 bits 15:12 [a]
IEEE COMPANY_ID	Byte 52 bits 3:0	IDENTIFY (PACKET) DEVICE data word 108 bits 11:8
	Byte 53	IDENTIFY (PACKET) DEVICE data word 108 bits 7:0
	Byte 54	IDENTIFY (PACKET) DEVICE data word 109 bits 15:8
	Byte 55 bits 7:4	IDENTIFY (PACKET) DEVICE data word 109 bits 7:4
VENDOR SPECIFIC IDENTIFIER	Byte 55 bits 3:0	IDENTIFY (PACKET) DEVICE data word 109 bits 3:0
	Byte 56	IDENTIFY (PACKET) DEVICE data word 110 bits 15:8
	Byte 57	IDENTIFY (PACKET) DEVICE data word 110 bits 7:0
	Byte 58	IDENTIFY (PACKET) DEVICE data word 111 bits 15:8
	Byte 59	IDENTIFY (PACKET) DEVICE data word 111 bits 7:0

[a] IDENTIFY (PACKET) DEVICE data words 108-111 contain the WORLD WIDE NAME field (see ATA8-ACS).
[b] This 4-bit field is required to be set to 5h (i.e., IEEE Registered) by ATA8-ACS.

4.2.4 NAA Locally Assigned format identifier

Table 2 defines the NAA Locally Assigned format identifier used by device names for SATA devices that do not provide world wide names in their IDENTIFY (PACKET) DEVICE data. This format is the compatible with that defined in SPC-4.

Table 12 — NAA Locally Assigned format containing a hashed SATA device name

Byte\Bit	7	6	5	4	3	2	1	0
0	NAA (3h)				(MSB)			
1	HASHED MODEL NUMBER							(LSB)
2	(MSB)							
	HASHED SERIAL NUMBER							
7								(LSB)

The NAA field contains 3h.

The HASHED MODEL NUMBER field is part of the LOCALLY ASSIGNED VALUE field defined in SPC-4 and shall be set to the hash of the IDENTIFY (PACKET) DEVICE data words 27-46.

Editor's Note 1: Insert hash algorithm here. Input 40 bytes, output 12 bits.

The HASHED SERIAL NUMBER NUMBER field is part of the LOCALLY ASSIGNED VALUE field defined in SPC-4 and shall be set to the hash of the IDENTIFY (PACKET) DEVICE data words 10-19.

Editor's Note 2: Insert hash algorithm here. Input 20 bytes, output 48 bits.

Annex NN contains additional information on hashing for creating SATA device names.

4.2.5 Hashed SAS addresses

SSP frames include hashed versions of SAS addresses of SAS ports (i.e., NAA IEEE Registered format identifiers for SAS ports) to provide an additional level of verification of proper frame routing.

The code used for the hashing algorithm is a cyclic binary Bose, Chaudhuri, and Hocquenghem (BCH) (63, 39, 9) code. Table 13 lists the parameters for the code.

Table 13 — Hashed SAS address code parameter

Parameter	Value
Number of bits per codeword	63
Number of data bits	39
Number of redundant bits	24
Minimum distance of the code	9

The generator polynomial for this code is:

$$G(x) = (x^6 + x + 1)\ (x^6 + x^4 + x^2 + x + 1)\ (x^6 + x^5 + x^2 + x + 1)\ (x^6 + x^3 + 1)$$

After multiplication of the factors, the generator polynomial is:

$$G(x) = x^{24} + x^{23} + x^{22} + x^{20} + x^{19} + x^{17} + x^{16} + x^{13} + x^{10} + x^9 + x^8 + x^6 + x^5 + x^4 + x^2 + x + 1$$

Annex E contains additional information on SAS address hashing.

4.2.6 Device names and expander device SAS addresses

Each expander device, SAS initiator device, SAS target device, and SAS target/initiator device shall include an IEEE Registered format identifier (see 4.2.2) as its device name. The device name of an expander device is called its SAS address. An IEEE Registered format identifier used as a device name shall not be used as any other name or identifier (e.g., a device name, port name, port identifier, or logical unit name (see SAM-4)).

SAS devices and expander devices report their device names in the IDENTIFY address frame (see 7.8.2).

NOTE 2 - When a set of expander phys transmit the same SAS address in the identification sequence but receive different SAS addresses, indicating they are attached to separate SAS ports or expander ports, they become part of separate expander ports in the same domain.

Logical units accessed through SSP target ports report SAS target device names through SCSI vital product data (see 10.2.11).

4.2.7 Port names

Port names are not defined in SAS.

NOTE 3 - The SAS addresses used by SAS ports in different SAS domains may be the same (e.g., when a set of phys transmit the same SAS address in the identification sequence but receive different SAS addresses, indicating they are attached to two separate SAS domains) so the SAS address serves as a port identifier (see 4.2.8) rather than a port name.

4.2.8 Port identifiers and SAS port SAS addresses

Each SAS initiator port, SAS target port (e.g., including the STP target port in each STP/SATA bridge), and SAS target/initiator port shall include an IEEE Registered format identifier (see 4.2.2) as its port identifier. The port identifier of a SAS port is called its SAS address. An IEEE Registered format identifier used as a port identifier shall not be used as any other name or identifier (e.g., a device name, port name, or logical unit name (see SAM-4)) except as a port identifier in one or more other SAS domains (see 4.1.4).

Expander ports do not have port identifiers.

SAS ports in end devices report their port identifiers in the IDENTIFY address frame (see 7.8.2). Expander devices containing SAS ports (e.g., SAS ports attached to virtual phys, or STP target ports in STP/SATA bridges) report the port identifiers of those SAS ports in the SMP DISCOVER response (see 10.4.3.7) and the SMP DISCOVER LIST response (see 10.4.3.13.3).

NOTE 4 - When a set of SAS phys transmit the same SAS address in the identification sequence but receive different SAS addresses, indicating they are attached to more than one SAS domain, they become part of separate SAS ports in separate domains. Each SAS port shares the same SAS address.

Port identifiers are used as source and destination SAS addresses in the OPEN address frame (see 7.8.3).

Logical units accessed through SSP target ports report SAS target port identifiers through SCSI vital product data (see 10.2.11).

4.2.9 Phy identifiers

Each SAS phy and expander phy shall be assigned an identifier called a phy identifier that is unique within the SAS device and/or expander device. Each SAS logical phys within a SAS phy shall use the same phy identifier. Each expander logical phy withini an expander phy shall use the same phy identifier. The phy identifier is used for management functions (see 10.4).

Phy identifiers shall be greater than or equal to 00h and less than 80h, and should be numbered starting with 00h. In an expander device or in a SAS device containing an SMP target port, phy identifiers shall be less than the value of the NUMBER OF PHYS field in the SMP REPORT GENERAL response (see 10.4.3.3). In a SAS device containing an SSP target port, phy identifiers shall be less than the value of the NUMBER OF PHYS field in the Protocol-Specific Port mode page for SAS SSP - Phy Control And Discover subpage (see 10.2.7.2.3).

7.17.5 Opening an STP connection

If no STP connection exists when the SATA host port in an STP/SATA bridge receives a SATA_X_RDY from the attached SATA device, the STP target port in the STP/SATA bridge shall establish an STP connection to the appropriate STP initiator port before it transmits a SATA_R_RDY to the SATA device.

Editor's Note 3: The following paragraph and note are moved here from the REPORT PHY SATA section 10.4.3.9, where it should not be hidden.

If an ~~An~~ STP/SATA bridge ~~that~~ receives a connection request for a SATA device that has not successfully delivered the initial Register – Device to Host FIS, it shall return an OPEN_REJECT (NO DESTINATION).

NOTE 5 - If there is a problem receiving the expected initial Register - Device to Host FIS, the STP/SATA bridge should use SATA_R_ERR to retry until it succeeds. In the DISCOVER response, the ATTACHED SATA DEVICE bit is set to one and the ATTACHED SAS ADDRESS field is valid, but the ATTACHED DEVICE TYPE field is set to 000b (i.e., no device attached) during this time.

If an STP/SATA bridge that retrieves IDENTIFY (PACKET) DEVICE data receives a connection request for a SATA device before it has retrieved the IDENTIFY (PACKET) DEVICE data, it shall return an OPEN_REJECT (NO DESTINATION). If it has a problem retrieving the IDENTIFY (PACKET) DEVICE data (e.g., word 255 (i.e., the Integrity Word) is not correct), the STP/SATA bridge shall set the ATTACHED DEVICE NAME field to zero, set the ATTACHED DEVICE TYPE field to 001b (i.e, end device), and start accepting connections.

A wide STP initiator port shall not request more than one connection at a time to a specific STP target port.

While a wide STP initiator port is waiting for a response to a connection request to an STP target port, it shall not reject an incoming connection request from that STP target port because of its outgoing connection request. It may reject incoming connection requests for other reasons (see 7.2.5.12).

If a wide STP initiator port receives an incoming connection request from an STP target port while it has a connection established with that STP target port, it shall reject the request with OPEN_REJECT (RETRY).

A wide STP target port shall not request more than one connection at a time to a specific STP initiator port.

While a wide STP target port is waiting for a response to a connection request or has established a connection to an STP initiator port, it shall:

a) reject incoming connection requests from that STP initiator port with OPEN_REJECT (RETRY); and
b) if affiliations are supported, reject incoming connection requests from other STP initiator ports with OPEN_REJECT (STP RESOURCES BUSY).

An expander device should not allow its STP ports (e.g., the STP target ports in STP/SATA bridges and any STP initiator ports in the expander device) to attempt to establish more connections to a specific destination port than the destination port width or the width of the narrowest physical link on the pathway to the destination port. This does not apply to connection requests being forwarded by the expander device.

An expander device should not allow its STP ports (e.g., the STP target ports in STP/SATA bridges and any STP initiator ports in the expander device) to attempt to establish more connections than the width of the narrowest common physical link on the pathways to the destination ports of those connections. This does not apply to connection requests being forwarded by the expander device.

10.4.3.2 SMP function response frame format

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The FUNCTION RESULT field is defined in table 14.

Table 14 — FUNCTION RESULT **field**

Code	Name	SMP function(s)	Description
12h	PHY DOES NOT SUPPORT SATA	REPORT PHY SATA and PHY CONTROL (TRANSMIT SATA PORT SELECTION SIGNAL) and PHY CONTROL (SET ATTACHED DEVICE NAME)	The phy specified by the PHY IDENTIFIER field in the SMP request frame is not part of an STP target port. The ADDITIONAL RESPONSE BYTES field may be present but shall be ignored.
...	...		

10.4.3.7 DISCOVER function

...

The ATTACHED DEVICE TYPE field indicates the DEVICE TYPE value received during the link reset sequence and is defined in table 15.

Table 15 — ATTACHED DEVICE TYPE field

Code	Description
000b	No device attached
001b	End device
010b	Expander device
011b	Expander device compliant with a previous version of this standard
All others	Reserved

~~The ATTACHED DEVICE TYPE field shall only be set to a value other than 000b after:~~

~~a) the identification sequence is complete if a SAS device or expander device is attached; or~~
~~b) the initial Register - Device to Host FIS has been received if a SATA phy is attached.~~

The ATTACHED DEVICE TYPE field shall only be set to a value other than 000b:

a) if a SAS device or expander device is attached, after the identification sequence is complete; or
b) if a SATA phy is attached and the STP/SATA bridge does not retrieve IDENTIFY (PACKET) DEVICE data, after the STP/SATA bridge receives the initial Register - Device to Host FIS; and
c) if a SATA phy is attached and the STP/SATA bridge retrieves IDENTIFY (PACKET) DEVICE data, after the STP/SATA bridge receives IDENTIFY (PACKET) DEVICE data or it encounters a failure retrieving that data.

...

~~The ATTACHED DEVICE NAME field contains the value of the device name received in the IDENTIFY address frame during the identification sequence. If the attached port is an expander port or a SAS port, the ATTACHED DEVICE NAME field contains the device name of the attached expander device or SAS device (see 4.2.4). If the attached port is a SATA device port, the attached device name field contains 00000000 00000000h.~~

~~The ATTACHED DEVICE NAME field shall be updated:~~

~~a) after the identification sequence completes, if a SAS phy or expander phy is attached; or~~
~~b) after the COMSAS Detect Timeout timer expires (see 6.8.3.9), if a SATA phy is attached.~~

Table 16 defines the ATTACHED DEVICE NAME field.

Table 16 — ATTACHED DEVICE NAME field

Condition	Update time	Value
A SAS phy or expander phy is attached	Completion of the identification sequence	The DEVICE NAME field in the incoming IDENTIFY address frame (i.e., the attached expander device name or attached SAS device name (see 4.2.4))
A SATA phy is attached	Expiration of the COMSAS Detect Timeout timer (see 6.8.3.9)	00000000 00000000h
	Reception of IDENTIFY (PACKET) DEVICE data from the SATA device	If IDENTIFY (PACKET) DEVICE data word 255 (i.e., the Integrity word) is correct and words 108-111 (i.e., the World Wide Name) are set to zero, a hash of the IDENTIFY (PACKET) DEVICE data words 27-46 (i.e., the Model Number) and words 10-19 (i.e., the Serial Number) (see 4.2.4). If IDENTIFY (PACKET) DEVICE data word 255 (i.e., the Integrity word) is correct and words 108-111 (i.e., the World Wide Name field) are not set to zero, set this field to the world wide name indicated by words 108-111 according to table xx in 4.2.3. If IDENTIFY (PACKET) DEVICE data word 255 (i.e., the Integrity word) is not correct, set this field to 00000000 00000000h.
	Processing a PHY CONTROL function SET ATTACHED DEVICE NAME phy operation	The value specified in the ATTACHED DEVICE NAME field in the PHY CONTROL request (see 10.x.x).

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10.4.3.9 REPORT PHY SATA function

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The REGISTER DEVICE TO HOST FIS field contains the contents of the initial Register - Device to Host FIS. For an STP/SATA bridge, this is delivered by the attached SATA device after a link reset sequence (see ATA/ATAPI-7 V3 and SATAII-EXT). For a native STP target port in an end device, this is directly provided.

The FIS contents shall be stored with little-endian byte ordering (i.e., the first byte, byte 24, contains the FIS Type).

For an STP/SATA bridge, the first byte of the field (i.e., the FIS Type) shall be initialized to zero on power on and whenever the phy has restarted the link reset sequence after losing dword synchronization (see 6.9)(i.e., the SP state machine transitioned from SP22:SATA_PHY_Ready to SP0:OOB_COMINIT (see 6.8)) to indicate the field is invalid and the attached SATA device has not delivered a Register – Device to Host FIS. The first byte of the field shall be set to 34h when the attached SATA device has delivered the initial Register – Device to Host FIS. The remaining contents of the REGISTER DEVICE TO HOST FIS field shall remain constant until a link reset sequence causes the attached SATA device to deliver another initial Register – Device to Host FIS.

~~An STP/SATA bridge that receives a connection request for a SATA device that has not successfully delivered the initial Register – Device to Host FIS shall return an OPEN_REJECT (NO DESTINATION).~~

~~NOTE 6 - If there is a problem receiving the expected initial Register - Device to Host FIS, the STP/SATA bridge should use SATA_R_ERR to retry until it succeeds. In the DISCOVER response, the attached sata device bit is set to one and the attached sas address field is valid, but the attached device type field is set to 000b (i.e., no device attached) during this time.~~

Editor's Note 4: the above paragraphs are moved to 7.17.5, not deleted

10.4.3.10 PHY CONTROL function

The PHY CONTROL function requests actions by the specified phy. This SMP function may be implemented by any management device server. In zoning expander devices, if zoning is enabled then this function shall only be processed from SMP initiator ports that have access to zone group 2 or the zone group of the specified phy (see 4.9.3.2).

Table 17 defines the request format.

Table 17 — PHY CONTROL request

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (40h)							
1	FUNCTION (91h)							
2	Reserved							
3	REQUEST LENGTH (09h)							
4	(MSB)			EXPECTED EXPANDER CHANGE COUNT				
5								(LSB)
6				Reserved				
8								
9	PHY IDENTIFIER							
10	PHY OPERATION							
11	Reserved							UPDATE PARTIAL PATHWAY TIMEOUT VALUE
12				Reserved				
23								
24				ATTACHED DEVICE NAME				
31								
32	PROGRAMMED MINIMUM PHYSICAL LINK RATE				Reserved			
33	PROGRAMMED MAXIMUM PHYSICAL LINK RATE				Reserved			
34				Reserved				
35								
36	Reserved				PARTIAL PATHWAY TIMEOUT VALUE			
37				Reserved				
39								
40	(MSB)			CRC				
43								(LSB)

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

The FUNCTION field shall be set to 91h.

The REQUEST LENGTH field shall be set to 09h. For compatibility with previous versions of this standard, a REQUEST LENGTH field set to 00h specifies that there are 9 dwords before the CRC field.

The EXPECTED EXPANDER CHANGE COUNT field is defined in the SMP CONFIGURE GENERAL request (see 10.4.3.15).

The PHY IDENTIFIER field specifies the phy (see 4.2.7) to which the SMP PHY CONTROL request applies.

Table 18 defines the PHY OPERATION field.

Table 18 — PHY OPERATION field

Code	Operation	Description
09h	SET ATTACHED DEVICE NAME	If the expander phy is attached to a SATA phy, set the ATTACHED DEVICE NAME field in the DISCOVER function to the value of the ATTACHED DEVICE NAME field in the DISCOVER request.
...	...	

Editor's Note 5: If the device name is non-zero, return an error, do nothing, or overwrite?

Editor's Note 6: If it is not SATA phy, return an error, or do nothing?

If the PHY IDENTIFIER field specifies the phy which is being used for the SMP connection and a phy operation of LINK RESET, HARD RESET, or DISABLE is requested, the management device server shall not perform the requested operation and shall return a function result of SMP FUNCTION FAILED in the response frame.

An UPDATE PARTIAL PATHWAY TIMEOUT VALUE bit set to one specifies that the PARTIAL PATHWAY TIMEOUT VALUE field shall be honored. An UPDATE PARTIAL PATHWAY TIMEOUT VALUE bit set to zero specifies that the PARTIAL PATHWAY TIMEOUT VALUE field shall be ignored.

The ATTACHED DEVICE NAME field is used by the SET ATTACHED DEVICE NAME phy operation (see table xx) and is reserved for all other phy operations.

If a management application client detects the ATTACHED DEVICE NAME field set to zero in the DISCOVER response, it shall set the ATTACHED DEVICE NAME field based on the IDENTIFY (PACKET) DEVICE data retrieved by an ATA application client in the same SAS initiator device as follows.

a) if IDENTIFY (PACKET) DEVICE data word 255 (i.e., the Integrity word) is correct and words 108-111 (i.e., the World Wide Name field) are not set to zero, set this field to the world wide name indicated by words 108-111 according to table 17 in 4.2.3;
b) if IDENTIFY (PACKET) DEVICE data word 255 (i.e., the Integrity word) is correct and words 108-111 (i.e., the World Wide Name) are set to zero, set this field to a hash of the IDENTIFY (PACKET) DEVICE data words 27-46 (i.e., the Model Number) and words 10-19 (i.e., the Serial Number) accordign to 4.2.4; and
c) if IDENTIFY (PACKET) DEVICE data word 255 (i.e., the Integrity word) is not correct, set this field to 00000000 00000000h.

When based on IDENTIFY DEVICE data words 108-111, the ATTACHED DEVICE NAME field shall be based on the IDENTIFY (PACKET) DEVICE data WORLD WIDE NAME field as described in table 19.

Table 19 — ATTACHED DEVICE NAME field created from the IDENTIFY (PACKET) DEVICE World Wide Name

ATTACHED DEVICE NAME field		Contents
Subformat field name (see table 9 in 4.2.2)	Specific bits in table 223	
NAA	Byte 52 bits 7:4	IDENTIFY (PACKET) DEVICE data word 108 bits 15:12 [a]
IEEE COMPANY_ID	Byte 52 bits 3:0	IDENTIFY (PACKET) DEVICE data word 108 bits 11:8
	Byte 53	IDENTIFY (PACKET) DEVICE data word 108 bits 7:0
	Byte 54	IDENTIFY (PACKET) DEVICE data word 109 bits 15:8
	Byte 55 bits 7:4	IDENTIFY (PACKET) DEVICE data word 109 bits 7:4
VENDOR SPECIFIC IDENTIFIER	Byte 55 bits 3:0	IDENTIFY (PACKET) DEVICE data word 109 bits 3:0
	Byte 56	IDENTIFY (PACKET) DEVICE data word 110 bits 15:8
	Byte 57	IDENTIFY (PACKET) DEVICE data word 110 bits 7:0
	Byte 58	IDENTIFY (PACKET) DEVICE data word 111 bits 15:8
	Byte 59	IDENTIFY (PACKET) DEVICE data word 111 bits 7:0

[a] This 4-bit field is required to be set to 5h (i.e., IEEE Registered) by ATA8-ACS.

When based on a hash, the ATTACHED DEVICE NAME field shall be based on the IDENTIFY (PACKET) DEVICE data WORLD WIDE NAME field as described in 4.2.3.

The PROGRAMMED MINIMUM PHYSICAL LINK RATE field specifies the minimum physical link rate the phy shall support during a link reset sequence (see 4.4.1). Table 20 defines the values for this field. If this field is changed along with a phy operation of LINK RESET or HARD RESET, that phy operation shall utilize the new value for this field. This value is reported in the DISCOVER response (see 10.4.3.7).

The PROGRAMMED MAXIMUM PHYSICAL LINK RATE field specifies the maximum physical link rates the phy shall support during a link reset sequence (see 4.4.1).Table 20 defines the values for this field. If this field is changed along with a phy operation of LINK RESET or HARD RESET, that phy operation shall utilize the new value for this field. This value is reported in the DISCOVER response (see 10.4.3.7).

Table 20 — PROGRAMMED MINIMUM PHYSICAL LINK RATE and PROGRAMMED MAXIMUM PHYSICAL LINK RATE fields

Code	Description
0h	Do not change current value
1h - 7h	Reserved
8h	1,5 Gbps
9h	3 Gbps
Ah	6 Gbps
Bh - Fh	Reserved for future physical link rates

If the PROGRAMMED MINIMUM PHYSICAL LINK RATE field or the PROGRAMMED MAXIMUM PHYSICAL LINK RATE field is set to an unsupported or reserved value, or the PROGRAMMED MINIMUM PHYSICAL LINK RATE field and PROGRAMMED MAXIMUM PHYSICAL LINK RATE field are set to an invalid combination of values (e.g., the minimum is greater than the maximum), the management device server shall not change either of their values and may

return a function result of SMP FUNCTION FAILED in the response frame. If it returns a function result of SMP FUNCTION FAILED, it shall not perform the requested phy operation.

The PARTIAL PATHWAY TIMEOUT VALUE field specifies the amount of time in microseconds the expander phy shall wait after receiving an Arbitrating (Blocked On Partial) confirmation from the ECM before requesting that the ECM resolve pathway blockage (see 7.12.4.5). A PARTIAL PATHWAY TIMEOUT VALUE field value of zero (i.e., 0 µs) specifies that partial pathway resolution shall be requested by the expander phy immediately upon reception of an Arbitrating (Blocked On Partial) confirmation from the ECM. The PARTIAL PATHWAY TIMEOUT VALUE field is only honored when the UPDATE PARTIAL PATHWAY TIMEOUT VALUE bit is set to one. This value is reported in the DISCOVER response (see 10.4.3.7).

The CRC field is defined in 10.4.3.1.

Table 21 defines the response format.

Table 21 — PHY CONTROL response

Byte\Bit	7	6	5	4	3	2	1	0
0	SMP FRAME TYPE (41h)							
1	FUNCTION (91h)							
2	FUNCTION RESULT							
3	RESPONSE LENGTH (00h)							
4	(MSB)	CRC						
7								(LSB)

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

The FUNCTION field shall be set to 91h.

The FUNCTION RESULT field is defined in .

The RESPONSE LENGTH field shall be set to 00h.

The CRC field is defined in .

Annex NN Hashed-based device name for SATA devices without worldwide names

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Editor's Note 7: Include an annex with C code and XORs for generating the hash-based device name.

Suggested changes to SPC-4

7.6.3.6 NAA designator format

7.6.3.6.1 NAA identifier basic format

If the designator type is 3h (i.e., NAA identifier), the DESIGNATOR field has the format shown in table 339. This format is compatible with the Name_Identifier format defined in FC-FS.

The Name Address Authority (NAA) field (see table 340) defines the format of the NAA specific data in the designator.

Table 22 — Name Address Authority (NAA) field

Code	Description	Reference
2h	IEEE Extended	7.6.3.6.3
3h	Locally Assigned	7.6.3.6.new
5h	IEEE Registered	7.6.3.6.3
6h	IEEE Registered Extended	7.6.3.6.4
0h - 1h	Reserved	
~~3h -~~ 4h	Reserved	
7h - Fh	Reserved	

7.6.3.6.new NAA Locally Assigned designator format

If NAA is 3h (i.e., Locally Assigned), the eight byte fixed length DESIGNATOR field shall have the format shown in table 341. The CODE SET field shall be set to 1h (i.e., binary) and the DESIGNATOR LENGTH field shall be set to 08h.

Table 23 — NAA Locally Assigned DESIGNATOR field format

Byte\Bit	7	6	5	4	3	2	1	0
0	NAA (3h)							
1	LOCALLY ADMINISTERED VALUE							
7								

The LOCALLY ADMINISTERED VALUE field contains a 60 bit value that is assigned by the administrator of the SCSI domain in which it is used.