To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
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Subject: 04-218r0 SAT INQUIRY contents

Revision history
Revision 0 (8 July 2004) First revision

Related documents
T10/04-196r0 - SCSI to ATA Translation (SAT) revision 0.0 (Bob Sheffield, Intel)
T10/04-219r0 - SAT SPC-3 ATA information VPD page (Rob Elliott, HP)
T13/ata7v1r4b - ATA/ATAPI-7 volume 1 revision 4b

Overview
The INQUIRY command should return VENDOR IDENTIFICATION (8 bytes), PRODUCT IDENTIFICATION (16 bytes), and PRODUCT REVISION LEVEL (4 bytes) field values pertaining to the SCSI to ATA translator, rather than try to munge the ATA IDENTIFY DEVICE data.

The fields in IDENTIFY DEVICE that are possibly related are SERIAL NUMBER (20 bytes), FIRMWARE REVISION (8 bytes), and MODEL NUMBER (40 bytes). These 68 bytes does not fit into the 30 bytes of ASCII strings available in Standard INQUIRY data.

 a) There is no SERIAL NUMBER field in SCSI (although this can be mapped into a VPD page, as already described by 04-196r0 and expanded upon in this proposal).
 b) The FIRMWARE REVISION field is twice as big as SCSI's PRODUCT REVISION LEVEL field.
 c) Although there is no VENDOR IDENTIFICATION field in ATA, the ATA model number often starts with a vendor name. There's no guarantee that it complies with a T10 vendor ID, though, which sometimes have to be abbreviated due to the 8 byte length.

If the ATA device returns a valid WWN, it should be translated into the Device Identification VPD page 83h.

Suggested changes to SAT

8 SCSI Primary Commands (SPC) Mapping

8.1 INQUIRY command (12h)

The SCSI INQUIRY command requests general information about a target or component LUN. INQUIRY and certain vital product data pages have translations.

8.1.1 Command Summary

For ATAPI devices, INQUIRY is intercepted by the SAT translator to add the ATA Information VPD page. Standard INQUIRY data and VPD pages other than the Supported VPD Pages VPD page and ATA Information VPD page are passed through unaltered.

For ATA devices, INQUIRY is translated. Table 1 summarizes how the INQUIRY command is translated.

Table 1 — INQUIRY cCommand summary

Support Method	Emulated
ATA Opcodes	~~ECh, ATA Identify Device Command~~ ECh, ATA IDENTIFY DEVICE command A1h, ATA IDENTIFY PACKET DEVICE command
Supported Vital Product Data pages	00h, Supported VPD pages 80h, Unit Sserial Nnumber VPD page 83h, Device Identification VPD page 89h, ATA Information VPD page

8.1.2 SCSI INQUIRY CDB format and supported fields

A) CMDDT

This bit is now obsolete and is not supported. If set to one, return a CHECK CONDITION with SENSE KEY set to ILLEGAL REQUEST and ADDITIONAL SENSE CODE set to INVALID FIELD IN CDB.

B) EVPD

This bit must be set to <u>one to</u> request vital product data pages and the Page Code should indicate the page requested. ~~Only two pages are supported currently: Supported VPD pages (00h) and Unit serial number (80h).~~

8.1.3 Data Returned

Standard inquiry data or vital product pages shall be returned depending on the request.

8.1.3.1 Standard INQUIRY data

...

D) VERSION

~~This field is set to 03h to indicate that is supports SCSI 3 SPC specification.~~

<u>The VERSION field indicates the version of SPC to which the SAT translator complies (see SPC-3) (e.g., 05h for SPC-3).</u>

W) VENDOR ID<u>ENTIFICATION</u>

~~This 8 bytes field is created using the first 8 bytes of the 40 byte Model Number field from the device identify data retrieved from the device. Endianness is swapped to match the SCSI format.~~

<u>The VENDOR IDENTIFICATION field identifies the vendor of the SAT translator.</u>

X) PRODUCT ID<u>ENTIFICATION</u>

~~This 16 bytes field is created using the bytes 8 though 23 of the 40 byte Model Number field from the identify data. Endianness is swapped to match the SCSI format.~~

<u>The PRODUCT IDENTIFICATION field identifies the SAT translator product, and shall start with the string "SAT: ".</u>

Y) PRODUCT REVISION <u>LEVEL</u>

~~This field is created using the 8 byte firmware revision field of the device Identify data. The lower 4 bytes are used and the upper 4 bytes are lost since SCSI supports only 4 bytes for revision number. Endianness is swapped to match the SCSI format.~~

<u>The PRODUCT REVISION LEVEL field identifies the revision level of the SAT translator.</u>

z) IUS/QAS/CLOCKING~~/Vendor descriptors/ and vendor specific parameters of standard inquiry INQUIRY data~~ <u>fields</u> are not supported.

aa) Version descriptors

<u>Version descriptors shall be included for:</u>

- a) <u>SAM-3;</u>
- b) <u>SAS-1.1, if the ATA commands are transported over SAS STP;</u>
- c) <u>ATA/ATAPI-7;</u>
- d) <u>SPC-3; and</u>
- e) <u>SBC-2.</u>

...

8.1.3.2 Vital Product data - Supported VPD pages

A) PERIPHERAL DEVICE TYPE

This bit field is set to 0 to indicate that a direct access device is connected.

B) PERIPHERAL QUALIFIER

This bit field is set to 0 to indicate that the specified peripheral device is currently attached to this logical unit.

C) PAGE CODE

This field is set to 0 to indicate 'supported VPD' pages page.

D) PAGE LENGTH

This field indicates the length of the supported VPD page list returned in number of bytes.

E) SUPPORTED VPD LIST

This list contains the page codes of the pages supported and is implemented in ascending order of page codes beginning with page code 00h.

For ATAPI devices, the SAT translator shall modify the Supported VPD Pages VPD page data to including any pages it adds (e.g., the ATA Information VPD page).

8.1.3.3 ~~Vital Product data~~ Unit S~~s~~erial N~~n~~umber VPD page

A) ~~PERIPHERAL DEVICE TYPE~~

~~This bit field is set to 0 to indicate that a direct access device is connected.~~

B) ~~PERIPHERAL QUALIFIER~~

~~This bit field is set to 0 to indicate that the specified peripheral device is currently attached to this logical unit.~~

C) ~~PAGE CODE~~

~~This field is set to 80h to indicate 'supported VPD' pages page.~~

D) ~~PAGE LENGTH~~

~~This field indicates the length of the product serial number. Currently a 20-byte product serial number is being returned; hence the length is set to 20 bytes.~~

E) ~~PRODUCT SERIAL NUMBER~~

~~The 20-byte field, serial number, found in the device identify data retrieved from the device shall be returned in this field. The serial number field shall be byte swapped to match the SCSI data format.~~

[All text that follows is new:]

Table 2 defines the Unit Serial Number VPD page (see SPC-3) returned by a SAT translator for a non-ATAPI device.

Table 2 — Unit Serial Number VPD page for SAT

Byte\Bit	7	6	5	4	3	2	1	0
0	PERIPHERAL QUALIFIER			PERIPHERAL DEVICE TYPE				
1	PAGE CODE (80h)							
2	Reserved							
3	PAGE LENGTH (n - 3)							
4 23	PRODUCT SERIAL NUMBER							

The PRODUCT SERIAL NUMBER field contains a representation of the SERIAL NUMBER field in the ATA IDENTIFY DEVICE data last retrieved from the ATA device. Each byte in the SERIAL NUMBER field set to 00h shall be

converted to an ASCII space (20h). Each pair of bytes in the SERIAL NUMBER field shall be swapped to create a valid ASCII string format in the PRODUCT SERIAL NUMBER field as described in table 3.

Table 3 — PRODUCT SERIAL NUMBER field

Byte	Contents
0	IDENTIFY DEVICE word 10 bits 15:8 (i.e., byte 1)
1	IDENTIFY DEVICE word 10 bits 7:0 (i.e., byte 0)
2	IDENTIFY DEVICE word 11 bits 15:8 (i.e., byte 3)
3	IDENTIFY DEVICE word 11 bits 7:0 (i.e., byte 2)
...	...
18	IDENTIFY DEVICE word 19 bits 15:8 (i.e., byte 19)
19	IDENTIFY DEVICE word 19 bits 7:0 (i.e., byte 18)

8.1.3.4 Device Identification VPD page

If the device is non-ATAPI and the ATA device returns a worldwide name in words 108 to 111 of its IDENTIFY DEVICE data with its NAA field set to 5h, the Device Identification VPD page (see SPC-3) shall be returned by the SAT translator as defined in table 4.

Table 4 — Device Identification VPD page for SAT

Byte\Bit	7	6	5	4	3	2	1	0
0	PERIPHERAL QUALIFIER			PERIPHERAL DEVICE TYPE				
1	PAGE CODE (83h)							
2	Reserved							
3	PAGE LENGTH (n - 3)							
4	PROTOCOL IDENTIFIER (8h)				CODE SET (1h)			
5	PIV (1b)	Reserved	ASSOCIATION (0h)		IDENTIFIER TYPE (3h)			
6	NAA			(MSB)				
7	IEEE COMPANY_ID							
8								
9			(LSB)	(MSB)				
10	VENDOR SPECIFIC IDENTIFIER							
13								(LSB)

The PROTOCOL IDENTIFIER field shall be set to 8h (i.e., ATAPI).

Editor's Note 1: To use 8h here, must also change the description of 8h from ATAPI to ATA/ATAPI in SPC-3 so this makes sense. Alternatively, define a new protocol identifier for translated ATA devices to differentiate them from ATAPI devices.

The CODE SET field shall be set to 1h (i.e., binary).

The PIV bit shall be set to 1b.

The ASSOCIATION field shall be set to 0h (i.e., logical unit).

The IDENTIFIER TYPE field shall be set to 3h (i.e., NAA).

The NAA field, IEEE COMPANY_ID field, and VENDOR SPECIFIC IDENTIFIER field shall be set as described in table 5.

Table 5 — ɪField in the Device Identification VPD page

Field	Specific bits	Contents
NAA	Byte 6 bits 7:4	IDENTIFY DEVICE word 108 bits 15:8 [A]
IEEE COMPANY_ID	Byte 6 bits 3:0	IDENTIFY DEVICE word 108 bits 11:8
	Byte 7	IDENTIFY DEVICE word 108 bits 7:0
	Byte 8	IDENTIFY DEVICE word 109 bits 15:8
	Byte 9 bits 7:4	IDENTIFY DEVICE word 109 bits 7:4
VENDOR SPECIFIC IDENTIFIER	Byte 9 bits 3:0	IDENTIFY DEVICE word 109 bits 3:0
	Byte 10	IDENTIFY DEVICE word 110 bits 15:8
	Byte 11	IDENTIFY DEVICE word 110 bits 7:0
	Byte 12	IDENTIFY DEVICE word 111 bits 15:8
	Byte 13	IDENTIFY DEVICE word 111 bits 7:0
[a] This field is required to be set to 5h by ATA/ATAPI-7 V1		