To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
Date: 30 December 2003
Subject: 03-344r2 SPC-3 SAM-3 Report all initiator and target ports

Revision history

Revision 0 (6 October 2003) First revision
Revision 1 (15 October 2003) Fixed a few typos.
Revision 2 (30 December 2003) Incorporated comments from November 2003 CAP WG - merged 03-353 (report initiator port identifiers) into this proposal, adding relative port identifier to SAM

Related documents

spc3r16 - SCSI Primary Commands - 3 revision 16
02-419 SPC-3 Device names and VPD data
03-342 SPC-3 Persistent reservations report full status
03-353r0 SPC-3 Report initiator port identifiers (abandoned and merged into this proposal)

Overview

1. In the INQUIRY command's VPD page 83h, device identifiers can return information about:
   a) logical unit (ASSOCIATION = 0)
   b) target port - the one being used to run this INQUIRY command (ASSOCIATION = 1)
   c) target device (ASSOCIATION = 2)

Target port device identifiers include:

a) relative target port identifier - an internal index 1 .. n of the target ports in the target device
b) target port device identifier - the target port name (e.g. FC port name), if the protocol defines port names, or the target port identifier (e.g. SAS address) if it does not

However, there is no way to retrieve information about target ports other than the one being used. There is not even a “number of target ports” field (and the relative target port identifier is 4 bytes) to indicate how many there might be. This information is useful for commands that use relative target port identifiers:

a) asymmetric logical unit access (SET/REPORT TARGET PORT GROUP commands refer to target port group members with relative target port identifiers)
b) the proposed persistent reservations report full status feature in 03-342 (reporting the T portion of each registered I_T nexus)

To fill that gap, a new VPD page is proposed to return the number of target ports and the target port device identifier for each of them.

2. A SCSI device supporting “third party” commands like EXTENDED COPY (SPC-3) and XDWRITE EXTENDED, REBUILD, and REGENERATE (SBC-2) contains both SCSI target ports and SCSI initiator ports. The initiator and target ports might be in the same or in different SCSI domains. There might be more than one initiator port available to service the command.

When sending one of these commands (to a target port), there is no way currently provided to specify which initiator port(s) to use. Such an extension will be proposed separately for EXTENDED COPY.

To enable this, a relative initiator port identifier feature is proposed, merged with the relative target port identifier feature used by asymmetric logical unit access (target port groups) and persistent reservations to identify target ports.

Notes

This page is not mandatory, and might best be implemented by a well-known logical unit.

Suggested changes

7.6 Vital product data parameters

7.6.1 Vital product data parameters overview and page codes

This subclause describes the vital product data (VPD) page structure and the VPD pages (see table 269) that are applicable to all SCSI devices. These VPD pages are optionally returned by the INQUIRY command (see 6.4) and contain vendor specific product information about a target or logical unit. The vital product data may include vendor identification, product identification, unit serial numbers, device operating definitions, manufacturing data, field replaceable unit information, and other vendor specific information. This standard defines the structure of the vital product data, but not the contents.

Table 1 — Vital product data page codes

Page code	VPD page name	Reference	Support requirements
...			
83h	Device Identification	7.6.4	Mandatory
87h	All Ports	7.6.x	Optional
~~87h~~ 88h - AFh	Reserved		
...			

7.6.x All Ports VPD page [all new - text is not highlighted in this section]

The All Ports VPD page (see table 2) provides the means to retrieve identification descriptors applying to all the SCSI ports in the SCSI target device.

Table 2 — All Target Ports VPD page

Byte\Bit	7	6	5	4	3	2	1	0
0	PERIPHERAL QUALIFIER				PERIPHERAL DEVICE TYPE			
1	PAGE CODE (87h)							
2	(MSB)			PAGE LENGTH (n - 3)				
3								(LSB)
4				Reserved				
5								
6	(MSB)			NUMBER OF PORTS				
7								(LSB)
8				All Ports identification descriptor(s)				
n								

This VPD page only reports port identifiers available to the device server. The REPORT LUNS well-known logical unit (see 8.2) may be used to return a complete list of port identifiers. The All Target Ports identification descriptors are not required to be in any particular order.

If a SCSI port is added or removed from the SCSI target device or SCSI target/initiator device and the relative port identifier list changes, the device server shall create a unit attention with an additional sense code of INQUIRY DATA HAS CHANGED.

The PERIPHERAL QUALIFIER field and the PERIPHERAL DEVICE TYPE field are as defined in 6.4.2.

The NUMBER OF PORTS field indicates how many SCSI ports are supported by the SCSI target device or SCSI target/initiator device.

NOTE 1 This is not necessarily the same as the number of All Ports identification descriptors that follow.

Each All Ports identification descriptor (see table 3) contains information identifying a SCSI port.

Table 3 — All Ports identification descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	Reserved						PORT TYPE	
1	Reserved					NUMBER OF TARGET PORT DESCRIPTORS		
2	(MSB)			RELATIVE PORT				
3								(LSB)
4	Initiator port descriptor, if any							
x								
x + 1	Target port descriptor(s), if any							
y								

The PORT TYPE field is described in table 4.

Table 4 — Port types

Value	Port type	Description
00b	None	No SCSI port is present using this relative port identifier.
01b	Target port	A SCSI target port is present using this relative port identifier. One or more target port descriptors are present in this All Ports identification descriptor.
10b	Initiator port	A SCSI initiator port is present using this relative port identifier. An initiator port descriptor is present in this All Ports identification descriptor.
11	Target/initiator port	A SCSI target/initiator port is present using this relative port identifier. An initiator port descriptor is present in this All Ports identification descriptor. One or more target port descriptors are present in this All Ports identification descriptor.

The NUMBER OF TARGET PORT DESCRIPTORS field indicates the number of target port descriptors that follow. The NUMBER OF TARGET PORT DESCRIPTORS field shall be set to 00h if the PORT TYPE field is set to 00b or 10b. A

target port descriptor shall be included matching each device identifier in the Device Identification VPD page with:

a) an ASSOCIATION field set to 1h (i.e., target port); and
b) an IDENTIFIER TYPE field set to a value other than 4h (i.e., other than relative target port),

for each target port in the SCSI target device that returns such a device identifier when an INQUIRY command is processed through that target port.

The RELATIVE PORT field identifies the port relative to other ports in the device.

Table 5 — Relative port identifier values

Value	Description
0000h	Reserved
0001h	Relative port 1, historically known as port A
0002h	Relative port 2, historically known as port B
0003h - FFFFh	Relative port 3 through 65 535

The initiator port descriptor, if present, is defined by table 6.

Table 6 — Initiator port descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	Reserved							
1								
2	(MSB)							
3	TRANSPORTID LENGTH (n - 3)							(LSB)
4	TRANSPORTID							
n								

The TRANSPORTID LENGTH field contains the length of the TRANSPORTID field.

The TRANSPORTID field contains a TransportID identifying the initiator port as specified in 7.5.4.

A target port descriptor, if present, is defined by table 7.

Table 7 — Target port descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	PROTOCOL IDENTIFIER				CODE SET			
1	Reserved				IDENTIFIER TYPE			
2	Reserved							
3	IDENTIFIER LENGTH (n - 3)							
4	IDENTIFIER							
n								

The PROTOCOL IDENTIFIER, CODE SET, IDENTIFIER TYPE, IDENTIFIER LENGTH, and IDENTIFIER fields are as defined in the Device identification VPD page identification descriptor in 7.6.4.1. The PROTOCOL IDENTIFIER field shall be valid.

NOTE 2 This descriptor is similar to the Device identification VPD page identification descriptor (see 7.6.4.1), except the PIV bit is not used since the PROTOCOL IDENTIFIER field is always valid.

Editor's Note 1: End of all-new section. A few existing references to relative target port are changed to relative port. Changes are highlighted in the remainder of this proposal.

7.2.9 Protocol Specific Port log page

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The PARAMETER CODE field contains the relative ~~target~~ port identifier (see 7.6.4.6) of the SCSI target port for which the parameter data applies. ~~Protocol specific log parameters for relative target ports numbered greater than 65 535 are not supported.~~

7.5.4.3 TransportID for initiator ports using a parallel SCSI bus

A parallel SCSI bus TransportID~~s~~ (see table 261) identifies a SPI-5 initiator port based on the SCSI address of an initiator port and the ~~SCSI target device~~ relative port identifier of the SCSI target port through which the application client accesses the SCSI target device.

Table 8 — Target port descriptor

Byte\Bit	7	6	5	4	3	2	1	0
0	FORMAT CODE (00B)		Reserved		PROTOCOL IDENTIFIER			
1	Reserved							
2	(MSB)	SCSI ADDRESS						
3								(LSB)
4	(MSB)	RELATIVE TARGET PORT IDENTIFIER						
7								(LSB)
8		Reserved						
23								

The SCSI ADDRESS field specifies the SCSI address (see SPI-5) of the initiator port accessible through the specified target port.

The RELATIVE TARGET PORT IDENTIFIER field specifies the four-byte binary number identifying a specific target port in the SCSI target device relative to other ~~target~~ SCSI ports. The relative target port identifier value shall be one of the values returned in the Device Identifier VPD page relative target port identifiers (see 7.6.4.6). If the RELATIVE TARGET PORT IDENTIFIER does not reference a SCSI target port or SCSI target/initiator port in the device, the TransportID is invalid.

7.6.4 Device Identification VPD page

7.6.4.1 Device Identification VPD page overview

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The IDENTIFIER TYPE field (see table 275) specifies the format and assignment authority for the identifier.

Table 9 — Identifier type

Value	Description	Reference
...		
4h	Relative target port	7.6.4.6
...		

...

7.6.4.6 Relative target port identifier format

If the identifier type is 4h (i.e., relative target port) and the ASSOCIATION field contains 1h (i.e. SCSI target port), the four byte fixed length IDENTIFIER field shall have the format shown in table 287. The CODE SET field shall be

set to 1h (i.e., binary) and the IDENTIFIER LENGTH field shall be set to 4h. If the ASSOCIATION field does not contain 1h, use of this identifier type is reserved.

Table 10 — Relative target port IDENTIFIER field forma

Byte\Bit	7	6	5	4	3	2	1	0
0	(MSB)			RELATIVE TARGET PORT				
3								(LSB)

The RELATIVE TARGET PORT field (see table 288) identifies the SCSI target port relative to other SCSI ~~target~~ ports in the SCSI target device or SCSI target/initiator device.

Table 11 — Relative target port identifier values

Value	Description
0h	Reserved
1h	Relative ~~target~~ port 1, historically known as port A
2h	Relative ~~target~~ port 2, historically known as port B
3h - 0000FFFFh	Relative port 3 through 65 535
00010000h - 7FFFFFFFh	Obsolete
~~3h - 7FFFFFFFh~~	~~Relative target port 3 through 2 147 483 647~~
80000000 - FFFFFFFFh	Reserved

Editor's Note 2: This proposal obsoletes 2 of the bytes in this field. 03-354 proposes adding a relative initiator port identifier to the EXTENDED COPY target descriptors; there is not room for more than 2 bytes. To keep the initiator and target spaces coherent and make the relative port numbers more usable, 2 bytes is helpful.

Editor's Note 3: 03-342 includes a relative port field in the full status descriptor for PR IN/READ FULL STATUS. If this proposal and 03-342 are both accepted, then the descriptor in 03-342 should be 2 bytes; if it is left at 4 bytes, then that proposal should use 4 bytes.

Suggested changes to SAM-3

4.7.1 SCSI initiator device

A SCSI initiator device (see figure 11) contains:

a) Zero or more initiator device names;
b) One or more SCSI initiator ports, each containing an initiator port identifier, ~~and~~ an optional initiator port name, and an optional relative port identifier; and
c) One or more application clients.

Figure 11 - SCSI initiator device model

Editor's Note 4: Add an optional relative port identifier box to figure 11

An initiator port identifier is a value that is the SCSI port identifier (see 4.7.4) for an initiator port.

An initiator device name is a name (see 3.1.65) that is a SCSI device name (see 4.7.6) for a SCSI initiator device.

For each supported SCSI transport protocol, a SCSI initiator device shall have no more than one (i.e., zero or one) SCSI initiator device name that is not in the SCSI name string format (see SPC-3). A SCSI initiator device shall have no more than one (i.e., zero or one) SCSI initiator device name in the SCSI name string format regardless of the number of SCSI transport protocols supported by the SCSI initiator device. If a SCSI initiator device has a SCSI device name in the SCSI name string format then the SCSI initiator device should have only one SCSI initiator device name. A SCSI transport protocol standard may place additional requirements on initiator device names.

An initiator port name is a name (see 3.1.65) that is the SCSI port name (see 4.7.7) for the initiator port. A SCSI transport protocol standard may place additional requirements on initiator port names.

A relative port identifier (see 4.7.x) identifies the SCSI initiator port relative to other SCSI ports in the SCSI initiator device.

Application clients are the sources of commands and task management functions.

4.7.2 SCSI target device

A SCSI target device (see figure 12) contains:

a) Zero or more target device names;
b) One or more SCSI target ports, each containing a task router, SCSI target port identifier, ~~and~~ an optional target port name, and an optional relative port identifier; and
c) One or more logical units.

Figure 12 - SCSI target device model

Editor's Note 5: Add an optional relative port identifier box to figure 12

A SCSI target port identifier is a value that is a SCSI port identifier (see 4.7.4) for a SCSI target port.

A target device name is a name (see 3.1.65) that is a SCSI device name (see 4.7.6) for a SCSI target device. For each supported SCSI transport protocol, a SCSI target device shall have no more than one (i.e., zero or one) SCSI target device name that is not in the SCSI name string format (see SPC-3). A SCSI target device shall have no more than one (i.e., zero or one) SCSI target device name in the SCSI name string format regardless of the number of SCSI transport protocols supported by the SCSI target device. If a SCSI target device has a SCSI device name in the SCSI name string format then the SCSI target device should have only one SCSI target device name. A SCSI transport protocol standard may place additional requirements on target device names.

A target port name is a name (see 3.1.65) that is the SCSI port name (see 4.7.7) for the target port. A SCSI transport protocol standard may place additional requirements on target port names.

A relative port identifier (see 4.7.x) identifies the SCSI target port relative to other SCSI ports in the SCSI target device.

A task router routes commands and task management functions between the service delivery subsystem and the appropriate logical unit's task manager (see 4.7.5).

A logical unit is the object to which SCSI commands are addressed. One of the logical units within the SCSI target device shall be accessed using the logical unit number zero. See 4.8 for a description of the logical unit.

4.7.3 SCSI target/initiator device

A SCSI target/initiator device (see figure 13) contains:

a) Zero or more target/initiator device names;
~~b) SCSI target/initiator ports, each containing a task router, target port identifier, an initiator port identifier, an optional target port name, and an optional initiator port name;~~
c) One or more logical units; and
d) One or more application clients.

A SCSI target/initiator device also contains either:

a) this combination of SCSI ports:
   A) one or more SCSI target/initiator ports;
   B) zero or more SCSI target ports; and
   C) zero or more SCSI initiator ports;

   or

b) this combination of SCSI ports:
   A) zero SCSI target/initiator ports;
   B) one or more SCSI target ports; and
   C) one or more SCSI initiator ports.

SCSI target/initiator ports each contain a task router, target port identifier, an initiator port identifier, an optional target port name, an optional initiator port name, and an optional relative port identifer.

SCSI target ports each contain a task router, SCSI target port identifier, an optional target port name, and an optional relative port identifer.

SCSI initiator ports each contain an initiator port identifier, an optional initiator port name, and an optional relative port identifier.

Figure 13 - SCSI target/initiator device model

Editor's Note 6: modify figure 13 to reflect that target/initiator devices can contain initiator-only ports and target-only ports too

Editor's Note 7: Add three optional relative port identifier boxes to figure 13

The target port identifier and the initiator port identifier are values containing a SCSI port identifier (see 4.7.4) for a SCSI target/initiator port. The target port identifier and the initiator port identifier may or may not be identical.

A target/initiator device name is a name (see 3.1.65) that is a SCSI device name (see 4.7.6) for a SCSI target/initiator device. For each supported SCSI transport protocol, a SCSI target/initiator device shall have no more than one (i.e., zero or one) SCSI target/initiator device name that is not in the SCSI name string format (see SPC-3). A SCSI target/initiator device shall have no more than one (i.e., zero or one) SCSI target/initiator device name in the SCSI name string format regardless of the number of SCSI transport protocols supported by the SCSI target/initiator device. If a SCSI target/initiator device has a SCSI device name in the SCSI name string format then the SCSI target/initiator device should have only one SCSI target/initiator device name. A SCSI transport protocol standard may place additional requirements on target/initiator device names.

The target port name and initiator port name are names (see 3.1.65) that are the SCSI port name (see 4.7.7) for the target/initiator port when operating as a target port and initiator port, respectively. The target port name and the initiator port name may or may not be identical. A SCSI transport protocol standard may place additional requirements on target port names and initiator port names.

A relative port identifier (see 4.7.x) identifies the SCSI port relative to other SCSI ports in the SCSI target/initiator device.

When the SCSI target/initiator device is operating as a SCSI target device a task router routes the commands and task management functions between the service delivery subsystem and the appropriate logical unit (see 4.7.5).

A logical unit is the object to which SCSI commands are sent. One of the logical units within the SCSI target/initiator device shall be accessed using the logical unit number zero. See 4.8 for a description of the logical unit.

When the SCSI target/initiator device is operating as a SCSI initiator device an application client is the source of commands and task management functions.

4.7.4 SCSI port identifier

The SCSI port identifier is equivalent to SCSI identifier. The SCSI port identifier object represents either an initiator port identifier for a SCSI initiator port, or a target port identifier for a SCSI target port. SCSI port identifier is used when either a SCSI initiator port or SCSI target port is applicable or when other context in the description identifies the SCSI initiator port or SCSI target port usage.

4.7.x Relative port identifier

A SCSI device may assign each of its SCSI ports a relative port identifier from 1 to 65 535. SCSI initiator ports, SCSI target ports, and SCSI target/initiator ports share the same number space.

Relative port identifiers may be read through the Device identification VPD page identification descriptor (see SPC-3) and the All Ports identification descriptor (see SPC3).

The relative port identifiers are not required to be contiguous. The relative target port identifier for a SCSI port should not be changed once assigned.