memorandum

T10/06-272r0

To	From	Subject	Date
INCITS T10 Committee	Curtis Ballard, HP Michael Banther, HP	Report Element Information	27 August, 2006

Revision History

Revision 0 – Initial document. split off from 06-046r1

Related Documents

smc3r02 – SCSI Media Changer Commands - 3 revision 01
spc3r23 – SCSI Primary Commands -3 revision 23

Background

The Read Element Status command is used by applications to describe which elements of a media changer device are full and empty. Some information about the element compatibility has been added to the Read Element Status command in SMC and other information is provided using various vendor unique methods. Some of the characteristic that are currently reported in vendor unique methods are medium type, and element location which are frequently returned in a vendor specific section at the end of the Read Element Status data. Much of the information currently returned in Read Element Status is static information that does not change and does not need read every time the full/empty status needs refreshed. There are also several element characteristics that are not currently returned in Read Element Status. Further expansion of Read Element Status to include more static information would add complexity to an already complex command and increase the already large return data.

This document proposes a change to SMC-3 that creates a new media changer command, "Report Element Information". This command reports data pages containing information about the characteristics of a medium changer element. The pages describe semi-static information that will not change without a device configuration change. Using the page code mechanism to select information pages about an element allows an application client to select only the information it needs at this time and get back only that information rather than the monolithic data block used by Read Element Status. By using this command an application client can determine the type and capabilities of an element including volume types that are compatible with this element and location of this element.

The proposed command is intended to be the first of a set of commands to fully describe the elements and the media in the elements. A companion to this command for dynamic information about an element can report full/empty, exception state, accessible, magazine removed, element disabled, etc.

In the proposed changes that follow, new text appears in blue, deleted text appears in red strikeout, and editorial comments appear in green.

Proposed Changes to SMC-3

Changes to table y of proposal 06-046r6:

Table y has the following addition:

Table y – Volume type codes

Code	Description
00h	~~Reserved~~ All Types
01h – 7Fh	Vendor-specific
80h – ~~FFh~~FEh	Reserved
FFh	Unknown

If the volume type is set to All Types or Unknown, the volume qualifier shall be set to All Qualifiers.

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Changes to 6.1:

Table 3 has the following addition (the entire table is not reproduced here):

Command	Operation Code	Type	Reference
REPORT ELEMENT INFORMATION	A3h/10h ª	O	6.x

Changes to 6.3:

Table 5 has the following addition (the entire table is not reproduced here):

REPORT ELEMENT INFORMATION	Allowed	Allowed	Allowed	Allowed	Allowed	Allowed

New sub-clause 6.x:

(Note: existing subclauses 6.x and above shift to become 6.x+1 and above with the addition of this new subclause)

6.x   REPORT ELEMENT INFORMATION command

6.x.1 REPORT ELEMENT INFORMATION command introduction

The REPORT ELEMENT INFORMATION command (see table y) requests information pages that describe an element or a set of elements in a device containing at least one medium changer logical unit.

Table y – REPORT ELEMENT INFORMATION command

Bit / Byte	7	6	5	4	3	2	1	0
0	OPERATION CODE (A3h)							
1	Reserved			SERVICE ACTION (10h)				
2	(MSB) STARTING ELEMENT ADDRESS							
3								(LSB)
4	Reserved			SINGLE	ELEMENT TYPE CODE			
5	PAGE CODE							
6	(MSB) ALLOCATION LENGTH							
9								(LSB)
10	Reserved							
11	CONTROL							

See SPC-3 for the definition of the OPERATION CODE, SERVICE ACTION, ALLOCATION LENGTH, and CONTROL fields. The OPERATION CODE and SERVICE ACTION fields shall be set to the values shown in table y.

The STARTING ELEMENT ADDRESS field specifies the minimum element address to report. Only elements with an element type code permitted by the ELEMENT TYPE CODE field, and an element address greater than or equal to STARTING ELEMENT ADDRESS shall be reported. Element information descriptors shall not be generated for undefined element addresses.

A SINGLE bit of one indicates that element information descriptors shall be reported for a single element with an element type code permitted by the ELEMENT TYPE CODE field and an element address greater than or equal to STARTING ELEMENT ADDRESS. If the SINGLE bit is zero, the device server shall report information for all elements with an address greater than or equal to STARTING ELEMENT ADDRESS up to the allocation length.

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Comment: Two different approaches have been suggested for the return data. The approach used here is to return data for the first element meeting the criteria. The alternate approach is to return a Check Condition if the starting element address is not a valid element. Using the proposed method has the benefit of not requiring prior knowledge of the device architecture.

The ELEMENT TYPE CODE field specifies the particular element type(s) selected for reporting by this command. A value of zero specifies that all element types shall be reported. The element type codes are defined in 6.10.1 table 14.

Comment: This command would reuse the existing element type codes defined in Read Element Status. It may make sense to move that table to a model clause since several commands will use the same table.

The PAGE CODE field specifies the element information page requested (see table y+1) by the application client. If the device server detects a PAGE CODE field set to an unsupported value, it shall terminate the command with CHECK CONDTION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN CDB.

Table y+1: Element Information Page Codes

PAGE CODE	Definition
00h	Supported Element Information Pages
01h	Return All Supported Pages
02h	Supported Volume Types
03h	Element Location
04h	Element Characteristics
05h-EFh	Reserved
F0h-FFh	Vendor specific media status data

6.x.2 Supported Element Information Pages

The Supported Element Information Pages information page (see Table y+2) returns the list of element information pages implemented by the logical unit and supported by elements with an element type code permitted by the ELEMENT TYPE CODE field. Logical units that implement the report element information command shall implement this information page.

Table y+2: Supported Element Information Pages format

Bit / Byte	7	6	5	4	3	2	1	0
0	PAGE CODE (0)							
1	Reserved							
2	(MSB)			PAGE LENGTH (n-3)				
3								(LSB)
	Supported Pages							
4	First supported pages descriptor (see table y+3)							
	:							
n	Last supported pages descriptor (see table y+3)							

The PAGE CODE field contains the number of the element information page that is being transferred.

The value in the PAGE LENGTH field is the length in bytes of the supported page descriptors that follow. If the descriptors are truncated because of the allocation length, the PAGE LENGTH field shall not be affected.

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Table y+3: Supported Page Code Descriptors

Bit Byte	7	6	5	4	3	2	1	0
0	Reserved				ELEMENT TYPE CODE			
1	Reserved							
2	(MSB)		DESCRIPTOR LENGTH (n-3)					
3								(LSB)
4	Supported element information page list							
n								

The ELEMENT TYPE CODE field shall contain the element type value for the element type that supports the following list of pages. If the ELEMENT TYPE CODE field in the CDB is set to all element types then supported page descriptors shall be returned for all supported element type codes. If the ELEMENT TYPE CODE field in the CDB is not set to all element types then the supported page descriptor shall be returned for the element type allowed by the ELEMENT TYPE CODE field in the CDB. All elements with the same element type code shall support the same list of element information pages.

The value in the DESCRIPTOR LENGTH field is the length in bytes of the data that follows. If the descriptor is truncated because of the allocation length, the DESCRIPTOR LENGTH field shall not be affected.

The supported element information page list contains a list of element information page codes implemented by the logical unit for the specified element type code in ascending order beginning with page code 00h.

6.x.3 Return All Supported Pages

If the Return All Supported Pages information page code is requested the device server shall return all of the pages supported by the element specified in the starting element address field, in ascending order by page code. The SINGLE bit shall be set to one if the Return All Supported Pages page code is requested. If the SINGLE bit is set to zero and the Return All Supported Pages page code is requested the device server shall terminate the command with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN CDB. If the starting element address field does not contain a valid element address the device server shall terminate the command with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID ELEMENT ADDRESS.

6.x.4 Supported Volume Types

Table y+4 shows the format of the Supported Volume Types information page.

Table y+4: Supported Volume Types page format

Bit Byte	7	6	5	4	3	2	1	0
0	PAGE CODE (2)							
1	Reserved							
2	(MSB)		PAGE LENGTH (n-3)					
3								(LSB)
	Supported Volume Types Descriptors							
4	First supported volume types descriptor (see table y+5)							
	:							
	:							
n	Last supported volume types descriptor (see table y+5)							

The PAGE CODE field contains the number of the element information page that is being transferred.

The value in the PAGE LENGTH field is the length in bytes of the supported page descriptors that follow. If the descriptors are truncated because of the allocation length, the PAGE LENGTH field shall not be affected.

Table y+5: Supported Volume Types Descriptor

Bit / Byte	7	6	5	4	3	2	1	0
0	(MSB)			ELEMENT ADDRESS				
1								(LSB)
2	Reserved				ELEMENT TYPE CODE			
3	Reserved							
4	(MSB)			SUPPORTED VOLUME TYPES LIST LENGTH (n-3)				
5								(LSB)
	Supported Volume Types List							
6				First supported volume type				
7								
				:				
				:				
n-1				Last supported volume type				
n								

Comment: The six bytes before the volume types list combined with a single volume type will allow reporting of many elements in a 8 byte block since many medium changer elements either support all qualifiers for a type or all volumes both of which can be described with a single volume type.

The ELEMENT ADDRESS field specifies the element address of the element being described.

The ELEMENT TYPE CODE field shall contain the element type code for the element being described.

The SUPPORTED VOLUME TYPES LIST LENGTH field is the length in bytes of the data to follow. If the data is truncated because of the allocation length, the SUPPORTED VOLUME TYPES LIST LENGTH field shall not be affected.

The supported volume types list contains a list of volume types that may be moved to or from the element specified in the ELEMENT ADDRESS field, returned in order of most preferred volume type to least preferred volume type. See section 5.3.2 for the definition of the volume type. If the device server is unable to determine the volume types supported by the element specified in the ELEMENT ADDRESS field, the Unknown medium type shall be returned. If all volume types supported by the device may be moved to or from the element described, the device server may return All Types. If all volume qualifiers for a volume type supported by the device may be moved to or from the element described, the device server may return the All Qualifiers qualifier for that volume type.

6.x.4 Element Location

Table y+6 shows the format of the Element Location page.

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Table y+6: Element Location page format

Bit Byte	7	6	5	4	3	2	1	0
0	PAGE CODE (3)							
1	Reserved							
2	(MSB)			PAGE LENGTH (n-3)				
3								(LSB)
	Supported Volume Types Descriptors							
4				First element location descriptor (see table y+7)				
				:				
				:				
n	Last element location descriptor (see table y+7)							

The PAGE CODE field contains the number of the element information page that is being transferred.

The value in the PAGE LENGTH field is the length in bytes of the element location descriptors that follow. If the descriptors are truncated because of the allocation length, the PAGE LENGTH field shall not be affected.

Table y+7: Element Location Descriptor format

Bit Byte	7	6	5	4	3	2	1	0
0	(MSB)			ELEMENT ADDRESS				
1								(LSB)
2	Reserved				ELEMENT TYPE CODE			
3	Reserved							
4	(MSB)			PARAMETERS LENGTH (n -3)				
5								(LSB)
6	Reserved				LOCATION PARAMETERS COUNT			
7	Reserved							
	Location parameters							
4				First element location parameter (see table y+8)				
				:				
				:				
n	Last element location parameter (see table y+8)							

Comment: A proposal for describing a medium changer is pending and may provide a more universal location description which could replace the one proposed here or could be put in a new page code.

The ELEMENT ADDRESS field specifies the element address of the element being described.

The ELEMENT TYPE CODE field shall contain the element type code for the element being described.

The PARAMETERS LIST LENGTH field is the length in bytes of the data to follow. If the data is truncated because of the allocation length, the PARAMETERS LIST LENGTH field shall not be affected.

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The location parameters list contains a list of location parameters implemented by the logical unit for the specified element type code in a vendor specified order.

Table y+8 shows the element location parameter format.

Table y+8: Element location parameter format

Bit Byte	7	6	5	4	3	2	1	0
0	(MSB)			ELEMENT LOCATION LENGTH (w+4)				
1								(LSB)
2	Reserved				CODE SET			
3	LOCATION TYPE CODE							
w bytes	LOCATION							

The ELEMENT LOCATION LENGTH field indicates the length in bytes of the element location data to follow.

The CODE SET field indicates the code set used for the LOCATION field in the element location descriptor. The CODE SET is described in table y+9. This field is intended to be an aid to software that displays the IDENTIFIER field.

Table y+9 – CODE SET field

Code	Description
0h	Reserved
1h	The LOCATION field shall contain binary values.
2h	The LOCATION field shall contain ASCII printable characters (i.e., code values 20h through 7Eh)
3h	The LOCATION field contains ISO/IEC 10646-1 (UTF-8) codes
4h-Fh	Reserved

Comment: for coordinate style locations it could be useful to return numeric or floating point values. Those could be returned as binary data but an application could use those values if there were code set codes defined for decimal and floating point.

The LOCATION TYPE CODE field indicates which type of location value the device server returns in the LOCATION field. Table y+10 defines the location type codes.

Table y+10 – LOCATION TYPE CODE values

LOCATION TYPE CODE	Description
00h	X Coordinate
01h	Y Coordinate
02h	Z Coordinate
03h	D Coordinate
04h	E Coordinate
05h	F Coordinate
06h	G Coordinate
07h-0Fh	Reserved
10h	Absolute address
10h-EFh	Reserved
F0h-FFh	Vendor specific

The D Coordinate through G Coordinate values may be assigned by the vendor to coordinate systems appropriate for the device server (e.g. D may be a rotation value).

The LOCATION field reports a vendor specified location value of the type specified in the LOCATION TYPE CODE field using the CODE SET specified in the Element Location Identifier header.

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6.x.5 Element Characteristics

Comment: this page is intended to be used for reporting values like element is removable, element can be disabled, element moves during normal operation, element is a virtual device, etc. Format will be specified later after discussion of basic command structure.