T10/05-414r3 SMC-3 Clarification SEND VOLUME TAG command

To: T10 Technical Committee
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Subject: T10/05-414r3 SMC-3 Clarification of SEND VOLUME TAG command

Revision History
Revision 0 (03 November 2005): initial revision
Revision 1 (28 February 2006): Incorporated comments from January T10 SMC-3 WG and added REQUEST VOLUME ELEMENT ADDRESS command description.
Revision 2 (04 May 2006): Added changes to model clause regarding Volume Tag Information and added other editorial comments from March T10 SMC-3 WG.
Revision 3 (11 August 2006): Used wording 'Selected' and 'Element Descriptors' in description of SEND VOLUME TAG command plus several editorial changes as discussed in May T10 SMC-3 WG.

The changes entered in Revision 3 of this proposal are shown in green.

Related Documents
SMC3r02 - SCSI Media Changer Commands - 3 revision 2

Overview
In smc3r02, section 6.11 and 6.12 define the REQUEST VOLUME ELEMENT ADDRESS and the SEND VOLUME TAG commands. The documentation however is not always clear. This proposal tries to clarify these command descriptions.

Suggested Changes to SMC3-r2:

6.12 SEND VOLUME TAG command

6.12.1 SEND VOLUME TAG introduction

The SEND VOLUME TAG command (see table 25) ~~transfers a volume tag template to be used for a search of existing volume tag information~~is used to select volumes, to associate new volume tag information with a volume, or to clear volume tag information for a volume~~one media changer element address~~. The function of the command is conveyed by the SEND ACTION CODE field value. The REQUEST VOLUME ELEMENT ADDRESS command may be used to transfer the results of a ~~translate search operation~~ select function.

Device servers that implement the REQUEST VOLUME ELEMENT ADDRESS command shall also implement the SEND VOLUME TAG command. ~~Support for this command is optional for media changers.~~

Table 25 — SEND VOLUME TAG command

Bit / Byte	7	6	5	4	3	2	1	0
0	OPERATION CODE (B6h)							
1	Reserved				ELEMENT TYPE CODE			
2	(MSB)	ELEMENT ADDRESS						
3								(LSB)
4	Reserved							
5	Reserved			SEND ACTION CODE				
6	Reserved							

7	Reserved		
8	(MSB)	PARAMETER LIST LENGTH	
9			(LSB)
10	Reserved		
11	CONTROL		

The ELEMENT TYPE CODE field specifies an element type specification as defined in the READ ELEMENT STATUS command (see table 14). If the SEND ACTION CODE field indicates a ~~translate~~select ~~operation~~function, this field indicates the element type~~s~~ to be searched. If the value is zero, all element types are candidates for a ~~translate~~select ~~operation~~function. If the SEND ACTION CODE field does not indicate a ~~translate~~ select function, this field shall be treated as reserved.

The ELEMENT ADDRESS field ~~gives~~ specifies an ~~media changer~~ element address whose interpretation depends on the SEND ACTION CODE field. When the SEND ACTION CODE field is a ~~translate~~ select function, the ELEMENT ADDRESS field ~~gives~~ specifies the starting element to be examined for satisfaction of the ~~search~~ select criteria. When the SEND ACTION CODE field is an assert, replace, or undefine function, the ELEMENT ADDRESS field ~~gives~~ specifies the specific element address where volume tag information for a volume is to be modified.

The PARAMETER LIST LENGTH field specifies the length in bytes of the parameter list that shall be located in the Data-Out Buffer.

6.12.2 Send action codes

The SEND ACTION CODE field ~~gives~~ specifies the function to be performed by the~~is~~ SEND VOLUME TAG command. The supported send action codes are ~~as~~ listed in table 26.

Table 26 — Send action codes

Code	Description
0h	~~Translate~~ Select - search all defined volume tags - including sequence numbers
1h	~~Translate~~ Select - search only primary volume tags - including sequence numbers
2h	~~Translate~~ Select - search only alternate volume tags - including sequence numbers
3h	Reserved
4h	~~Translate~~ Select - search all defined volume tags ~~–~~ ignore sequence numbers
5h	~~Translate~~ Select - search primary volume tags ~~–~~ ignore sequence numbers
6h	~~Translate~~ Select - search alternate volume tags - ignore sequence numbers
7h	Reserved
8h	Assert - as the primary volume tag - if tag now undefined
9h	Assert - as the alternate volume tag - if tag now undefined
Ah	Replace - the primary volume tag – current tag ignored
Bh	Replace - the alternate volume tag – current tag ignored
Ch	Undefine – the primary volume tag - current tag ignored
Dh	Undefine – the alternate volume tag – current tag ignored
Eh – 1Bh	Reserved
1Ch – 1Fh	Vendor-specific

~~Translate~~Select ~~operations~~ functions request that the logical unit search the volume tag information available for volumes at defined element addresses for volume tag information that matches the volume identifier template given by the command parameter data. Only volumes residing in elements with the same element type as defined by the ELEMENT TYPE CODE field and with element addresses starting from the element address as defined by the ELEMENT ADDRESS field are searched. When the ~~translate~~select function requires checking sequence numbers, only volume tag information with sequence numbers in the range between the minumum and maximum volume sequence numbers given by the command parameter data (see table 28) are searched. The resulting information may be reported via the REQUEST VOLUME ELEMENT ADDRESS command.

Assert ~~operations~~ functions define volume tag information for a single volume at an element address that does not currently have defined volume tag information. If the volume at the selected element address already has defined volume tag information, CHECK CONDITION status shall be returned. The sense key shall be set to ILLEGAL REQUEST and the additional sense code set to INVALID FIELD IN CDB. In this case, the original volume tag information shall not be changed. ~~Support for this field set to an assert function value is optional.~~

Replace ~~operations~~ functions define or overwrite volume tag information for a single volume at ~~one~~ an element address. Any previously defined volume tag information is overwritten. ~~Support for this field set to a replace function value is optional.~~

Undefine ~~operations~~ functions cause any previously defined volume tag information for the volume at the specified element address to be cleared. It shall not be considered an error to undefine volume tag information that was not previously defined. For undefine functions the PARAMETER LIST LENGTH field shall be set to zero. ~~Support for this field set to an undefine function value is optional.~~

If a logical unit implements volume tag information, it may choose to not implement the functions that modify volume tag information. For such an implementation a request for any assert, replace or undefine function shall cause the SEND VOLUME TAG command to be terminated with CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code set to INVALID FIELD IN CDB.

6.12.3 SEND VOLUME TAG parameter data

~~The PARAMETER LIST LENGTH field shall be zero for undefine functions.~~ The volume ~~tag information~~identifier template and the minimum and maximum volume sequence nummers sent as command parameter data for the ~~translate~~select, assert and replace functions ~~is~~ are defined in table 27.

Table 27 — Send volume tag parameters format

Bit / Byte	7	6	5	4	3	2	1	0
0	(MSB)			VOLUME IDENTIFIER TEMPLATE				
31								(LSB)
32	Reserved							
33								
34	(MSB)			MINIMUM VOLUME SEQUENCE NUMBER				
35								(LSB)
36	Reserved							
37								
38	(MSB)			MAXIMUM VOLUME SEQUENCE NUMBER				
39								(LSB)

When the SEND ACTION CODE field is set to a ~~translate~~select function t~~T~~he VOLUME IDENTIFIER TEMPLATE field specifies a search template.

As a search template, this field may contain the wildcard characters '?' and '*' (3Fh and 2Ah).

a) '?' shall match any single character;

b) '*' shall match any string of characters. When it appears in a template the remainder of the template at higher offsets in the field is not used.

When the SEND ACTION CODE field is set to an assert or replace function the VOLUME IDENTIFIER TEMPLATE field specifies ~~or~~ the ~~exact~~ value of the new volume identifier for ~~other SEND VOLUME TAG command functions~~ the volume currently residing at the specified element address.

For an assert~~,~~ or replace~~, or undefine~~ function, if the VOLUME IDENTIFIER TEMPLATE field contains the '?' or '*' wildcard characters, the device server shall return CHECK CONDITION status. The sense key shall be ILLEGAL REQUEST and the additional sense code INVALID FIELD IN PARAMETER LIST.

The MINIMUM VOLUME SEQUENCE NUMBER field specifies the new sequence number for the assert and replace functions. For a ~~translate~~ select function, this field specifies the least value in the volume sequence number field of the volume tag information that meets the search specification.

The MAXIMUM VOLUME SEQUENCE NUMBER field specifies the maximum value in a volume sequence number field of the volume tag information that meets the search specification. This field is ignored for assert~~,~~ and replace ~~and undefine~~ functions.

6.11 REQUEST VOLUME ELEMENT ADDRESS command

The REQUEST VOLUME ELEMENT ADDRESS command (see table 23) is used to transfer the results of a previously processed SEND VOLUME TAG command with the send action code set to a select function. Multiple REQUEST VOLUME ELEMENT ADDRESS commands may be used to retrieve the results of a single SEND VOLUME TAG command ~~with the translate option~~.

Device servers that implement the REQUEST VOLUME ELEMENT ADDRESS command shall also implement the SEND VOLUME TAG command. ~~Support for this command is optional for media changers. This command has no command parameter data. This command returns command response data.~~

Table 23 — REQUEST VOLUME ELEMENT ADDRESS command

Bit Byte	7	6	5	4	3	2	1	0
0	OPERATION CODE (B5h)							
1	Reserved			VOLTAG	Obsolete			
2	(MSB)	STARTING ELEMENT ADDRESS						
3								(LSB)
4	(MSB)	NUMBER OF ELEMENTS TO REPORT						
5								(LSB)
6	RESERVED							
7	(MSB)	ALLOCATION LENGTH						
8								
9								(LSB)

10	RESERVED
11	CONTROL

A volume tag (VOLTAG)– bit set to~~of~~ one indicates that the ~~logical unit~~device server shall report volume tag information~~, if implemented by the logical unit~~ in the element descriptors (see 6.10). A **VOLTAG** bit set to ~~value of~~ zero indicates that the device server shall not return volume tag information in the element descriptors.~~shall not be reported~~. ~~Support for this bit set to one is optional.~~

The STARTING ELEMENT ADDRESS field specifies ~~a media changer~~ the lowest element address to report. Only elements with elements addresses greater than or equal to the value specified in the STARTING ELEMENT ADDRESS field and selected by the last successful SEND VOLUME TAG command shall be reported. ~~whose interpretation depends on the send action code field (see table 27) of the last successful SEND VOLUME TAG command. The send action code is returned in the volume element address header. When the last send action code was a translate, the element address field gives the minimum element address to be reported by this command. When the send action code is assert, replace, or undefine, the element address field gives the particular element whose volume tag information was modified.~~

The NUMBER OF ELEMENTS TO REPORT field specifies the maximum number of selected elements to be reported by the device server for this command. ~~The value specified in this field is the number of elements to report of those that match the last SEND VOLUME TAG command translate template.~~ If the value in the ALLOCATION LENGTH field is not sufficient to transfer all the element descriptors, the device server shall return all those descriptors whose complete contents fit within the allocation length and this shall not be considered an error.

~~For fields not defined in this subclause, see the READ ELEMENT STATUS command description in 6.11.~~

The command response data returned by the~~is~~ REQUEST VOLUME ELEMENT ADDRESS command consists of a header as defined by table 24, plus zero or more element ~~type specific~~status pages in the same format as defined by the READ ELEMENT STATUS command (see 6.10).

Table 24 — Request v~~V~~olume element address ~~header~~data

BIT / BYTE	7	6	5	4	3	2	1	0
0	(MSB)			FIRST ELEMENT ADDRESS REPORTED				
1								(LSB)
2	(MSB)			NUMBER OF ELEMENTS SELECTED~~REPORTED~~				
3								(LSB)
4	RESERVED				SEND ACTION CODE			
5	(MSB)			BYTE COUNT OF REPORT AVAILABLE (ALL PAGES, X – 7)				
6								
7								(LSB)
8	ELEMENT STATUS PAGE(S)							
X								

The FIRST ELEMENT ADDRESS REPORTED field indicates the lowest element address found of the remaining selected elements meeting the request of the last successful SEND VOLUME TAG command.

The NUMBER OF ELEMENTS SELECTED field indicates the remaining number of selected elements meeting the request of the last successful SEND VOLUME TAG command. The status for these elements is returned if sufficient allocation length was specified.

The SEND ACTION CODE field in the request volume element address header~~(see table 27)~~ reports the function performed by the last successful SEND VOLUME TAG command.

The BYTE COUNT OF REPORT AVAILABLE field indicates the number of bytes of element status page data available of the remaining selected element descriptors meeting the request of the last successful SEND VOLUME TAG command. This value shall not be adjusted to match the allocation length available.

~~For each SEND VOLUME TAG command, the logical unit shall report i~~In response to a REQUEST VOLUME ELEMENT ADDRESS command, the device server shall report zero or more element~~s~~ status pages ~~that match a volume tag template~~in which the selected element descriptors are reported in element address order. ~~Once information for a given element address has been reported, only higher element addresses shall be reported by subsequent REQUEST VOLUME ELEMENT ADDRESS commands.~~

~~Once information for an element address has been reported following a SEND VOLUME TAG command, another SEND VOLUME TAG command is required before reporting that element address again.~~Once an selected element descriptor has been reported it is no longer selected, and shall not be reported with the REQUEST VOLUME ELEMENT ADDRESS command until selected by a subsequent SEND VOLUME TAG command.

If a REQUEST VOLUME ELEMENT ADDRESS command is received and no ~~prior~~ elements have been selected with the SEND VOLUME TAG command ~~has been executed~~ or the element list has been completely reported for the most recent successful SEND VOLUME TAG command, the logical unit shall return command response data consisting of only the request volume element address header. The fields FIRST ELEMENT ADDRESS REPORTED, NUMBER OF ELEMENTS SELECTED, and the BYTE COUNT OF REPORT AVAILABLE in the request volume element address header shall be set to zero.

NOTE 10 — In order to ensure the successful completion of a SEND VOLUME TAG, REQUEST VOLUME ELEMENT ADDRESS command sequence in a configuration with multiple SCSI initiator devices, it may be necessary to reserve the logical unit to the SCSI initiator port prior to sending the SEND VOLUME TAG command and release the logical unit after the last REQUEST VOLUME ELEMENT ADDRESS command has completed.

Changes to text in media changer model clause Volume tag overview:

5.3 Volume tag information

5.3.1 Volume tag overview

The ~~READ ELEMENT STATUS~~ command response data of the READ ELEMENT STATUS command and the REQUEST VOLUME ELEMENT ADDRESS command include element descriptors ~~format for all element types includes fields~~ that contain ~~volume tag information~~the VOLUME TAG INFORMATION field. ~~These~~This optional ~~fields are~~ field is used to report volume identification information that the media changer ~~has~~ acquired by one of the following methods:

c) reading an external label (e.g., bar code labels);~~,~~

d) processing a SEND VOLUME TAG command with the assign or replace function;~~,~~

e) reading MAM; or

f) by other means that may be vendor-specific~~.~~

The same volume tag information shall be available to all SCSI initiator ports regardless of whether the volume tag information was assigned by that SCSI initiator, by some other SCSI initiator, or by the media changer.

The volume tag information field values may be independent of any volume identification information recorded on the medium or a volume.

This standard does not impose any requirement that volume tag information be unique for all volumes within a media changer. However the VOLUME SEQUENCE NUMBER field in the volume tag information may be used by the media changer to create uniqueness of the volume tag information.

If volume tag information is implemented, the media changer shall retain the association between volume tag information and a volume as the volume is moved from element address to element address.

Volume tag information provides a means to confirm the identity of a volume that is stored at a media changer element address. When volume tag information is implemented, this standard does not specify any direct addressing of volumes based on the values in these fields. Optional commands are defined that provide translation between volume tag information and the element addresses~~ of zero or more volumes with matching volume tags information~~.

The following commands support the optional volume tag functionality:

a) SEND VOLUME TAG – used ~~either as a translation request~~to select volumes for the REQUEST VOLUME ELEMENT ADDRESS command, ~~or~~ to associate ~~a~~ new volume tag information with ~~the~~ a volume~~ currently residing at an element address~~, or to clear volume tag information for a volume~~. This is an optional command for media changers~~;

b) REQUEST VOLUME ELEMENT ADDRESS – returns ~~the~~ element status data of the selected volumes ~~address currently associated with the volume tag information transferred~~ with the last successful SEND VOLUME TAG command~~. This is an optional command for media changers~~;

c) READ ELEMENT STATUS – returns element status data which contain element descriptors. The element descriptors optionally report~~s~~ volume tag information for all element types. ~~Volume tag information is an optional function of a media changer.~~

The SEND VOLUME TAG and the REQUEST VOLUME ELEMENT ADDRESS commands provide a means for the application client to translate volume tag information into element addresses. Application clients issue a SEND VOLUME TAG command with the send action code set to a search function to specify search parameters about the requested volume tag information. Subsequent REQUEST VOLUME ELEMENT ADDRESS commands return descriptors for the selected volumes that match the previously specified volume tag information. Once an element descriptor has been reported it is no longer selected, and shall not be reported with the REQUEST VOLUME ELEMENT ADDRESS command until selected by a subsequent SEND VOLUME TAG command.

SEND VOLUME TAG requests shall not persist across logical unit resets or another SEND VOLUME TAG command. And may not persist across events that change element status (e.g. opening the door).

Add chapter:

5.3.3 Volume tag assignments

Volume tag information may be assigned to a volume by means of the SEND VOLUME TAG command with the SEND ACTION CODE field set to an assert function or replace function.

Once assigned volume tag information shall not be affected by the following:

a) INITIALIZE ELEMENT STATUS command;
b) INITIALIZE ELEMENT STATUS WITH RANGE command;
c) READ ELEMENT STATUS command; and
d) logical unit resets.

Assigned volume tag information shall be cleared when:

a) when it is undefined by the SEND VOLUME TAG command with the undefine function; and
b) when the volume is removed from the media changer;

Assigned volume tag information may be cleared on a hard reset;

Changes to text in chapter 5.3.3:

The optional VOLUME SEQUENCE NUMBER ~~is a 2-byte integer~~ field returns a unique number for every volume in the media changer. If the media changer does not support the volume sequence number ~~is not used~~, this field shall be set to zero.

If used, the value in the VOLUME SEQUENCE NUMBER field should be unique for every volume and in combination with the VOLUME IDENTIFIER shall be unique for every volume.

Note: Application clients may use the value returned in the VOLUME SEQUENCE NUMBER field to distinguish between volumes having the same value in the VOLUME IDENTIFIER field.