memorandum

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T10/06-046r1

To	From	Subject	Date
INCITS T10 Committee	Curtis Ballard, HP Michael Banther, HP	Report Supported Medium Types	5 January 2006

Revision History

Revision 0 – Initial document.

Revision 1 – Changes from Jan 06 T10
Changed to identifier form for return data

Related Documents

smc3r01 – 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 the contents of all elements within a media changer device. Information about the element compatibility and type of medium in the elements is not currently captured and media changer vendors have implemented several vendor unique methods for reporting those attributes. Most media changer vendors report media type information using two vendor unique values for medium domain which is the physical shape and medium type which is the particular media generation or variant within that domain.

A new command is proposed that provides a way for media changers to report what values will be used to describe the medium supported by the media changer and report which data transfer devices support that medium type.

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

6.x REPORT MEDIUM TYPES SUPPORTED command

The REPORT MEDIUM TYPES SUPPORTED command (see table y) requests that information regarding the supported medium types for the logical unit be sent to the application client.

Table y – REPORT MEDIUM TYPES SUPPORTED command

Bit / Byte	7	6	5	4	3	2	1	0
0	OPERATION CODE (44h)							
1	Reserved						ELEM	SUPPORTED
2	Reserved							
3	Reserved							
4	Reserved							
5	(MSB)			ADDRESS				
6								(LSB)
7	(MSB)			ALLOCATION LENGTH				
8								(LSB)
9	CONTROL							

See SPC-3 for the definition of the OPERATION CODE, ALLOCATION LENGTH, and CONTROL fields.

An ELEM bit set to one specifies that the device server shall return medium type supported descriptors for the element specified in the ELEMENT ADDRESS field. If the ELEM bit is set to one the ELEMENT ADDRESS field shall be set to 0.

A SUPPORTED bit set to one specifies that the device server shall return medium type supported descriptors for all medium types supported by the logical unit or address even if the current hardware configuration of the logical unit does not support all of these medium types. The logical unit must be able to support all reported values with field installable hardware changes. A SUPPORTED bit set to zero specifies the device server shall return medium type supported descriptors for medium types supported by the current hardware configuration. If the SUPPORTED bit is set to one and the logical unit is not able to determine the supported medium types

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(e.g. during power on when the media changer has not yet determined the data transfer device type), the device server shall return CHECK CONDITION status and shall set the sense key to NOT READY.

The ELEMENT ADDRESS field shall contain an element number for a data transfer device if the ELEM bit is set to one and shall be set to zero if the ELEM bit is set to zero. If the ELEMENT ADDRESS field does not contain a valid element address and the SINGLE bit is set to one 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.

Comment: The ELEM bit and the element address field allow an application to request information for an element that has been selected for a job without having to parse through the support information for all elements in the media changer.

The REPORT MEDIUM TYPES SUPPORTED command returns a medium types supported header (see table y+1) followed by one of more identifiers (see table y+2).

Table y+1: Medium types supported header

Bit / Byte	7	6	5	4	3	2	1	0
(1 Byte)	Reserved				ELEMENT TYPE CODE			
(1 Byte)	IDENTIFIERS COUNT							
(1 Byte)	(MSB)			IDENTIFIERS LENGTH				
(1 Byte)								(LSB)
(x Bytes)	IDENTIFIERS							

See section 6.11.3 for the definition of the ELEMENT TYPE CODE field.

The IDENTIFIER COUNT field contains a count of the total number of identifiers to follow. If the identifiers field is truncated because of the allocation length, the IDENTIFIER COUNT field shall not be affected.

The IDENTIFIERS LENGTH field contains the total length in bytes of the-identifiers to follow. If the identifiers are truncated because of the allocation length, the IDENTIFIERS LENGTH field shall not be affected.

6.x.1 Identification descriptor

Table y+2 defines the identification descriptor.

Table y+2: Identification descriptor

Bit / Byte	7	6	5	4	3	2	1	0
(1 Byte)	PROTOCOL IDENTIFIER				CODE SET			
(1 Byte)	PIV	Reserved		ASSOCIATION	IDENTIFIER TYPE			
(1 Byte)	Reserved				COMMAND SET SPECIFIC TYPE			
(1 Byte)	IDENTIFIER LENGTH (x)							
(x Bytes)	IDENTIFIER							

The CODE SET, PROTOCOL IDENTIFIER, PIV, IDENTIFIER LENGTH and IDENTIFIER fields are defined by the device identification page in SPC-3.

For a data transfer element, the IDENTIFIER field returns a device identifier from the data transfer device (e.g. disk or tape drive) associated with this element. If the COMMAND SET SPECIFIC TYPE field is set to zero, the same CODE SET, PROTOCOL IDENTIFIER, IDENTIFIER TYPE, ASSOCIATION, PIV, IDENTIFIER LENGTH and IDENTIFIER fields should be data that could be returned in response to an INQUIRY command (see SPC-3) addressed to a logical unit in the data transfer device. The SMC device server may provide identifiers that are not reported by the data transfer device.

For a storage, import/export or medium transport element the CODE SET, PROTOCOL IDENTIFIER, IDENTIFIER TYPE, ASSOCIATION, PIV, IDENTIFIER LENGTH and IDENTIFIER fields refer to the element, and are not an identifier for a volume stored in this location.

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The device server may report any of the device identifier types defined in SPC-3. In addition the device server may report command set specific identification descriptors:

a) Medium type
b) Compatible Medium List
c) Element location

For a data transfer element the first identifiers shall be a IDENTIFIER TYPE 1h, T10 vendor ID based, identifier with the with the IDENTIFIER field created by concatenating the PRODUCT IDENTIFICATION field from the standard INQUIRY data (see SPC-3) and the PRODUCT SERIAL NUMBER field from the Unit Serial Number VPD page (see SPC-3). The identifiers should include one identification descriptor in which the target port name or identifier (see SAM-3) is indicated and the IDENTIFIER TYPE field set to:

a) 2h (i.e., EUI-64-based):
b) 3h (i.e., NAA): or
c) 8h (i.e., SCSI name string).

Comment: The T10 format identifier is important for indicating not only how to identify which device you are talking to, but also describe what it is and is required for that reason. The T10 identifier may not be reported by the data transfer device or the data transfer device may not be a SCSI device so it is necessary to allow identifiers to be returned that may not be reported in the VPD page. The identifier reported by the SMC device will be one that a SCSI data transfer device could report.

If the ELEM bit is not set, one set of identifiers for each drive installed shall be returned. The drive identifier sets shall be returned in element order and each T10 identifier shall designate the start of a new identifier set.

If the SUPPORTED bit is set a T10 identifier for drives not installed shall be created by concatenating the PRODUCT IDENTIFICATION field from the standard INQUIRY data for that drive type (see SPC-3) and a description for that drive type. (e.g. an orderable part number)

The ASSOCIATION field for data transfer devices shall be the same as the association value returned by the drive over the primary interface port. For all other device types the association field shall be set to 00b, associated with the addressed logical unit (see SPC-3).

The IDENTIFIER TYPE field is defined by the device identification VPD page in SPC-3. If the COMMAND SET SPECIFIC IDENTIFIER TYPE field is set to a value other than zero, the IDENTIFIER TYPE field contents are reserved.

The COMMAND SET SPECIFIC TYPE field (see table y+2) indicates the format for the identifier for those identifier formats specific to this standard.

Table y+3: COMMAND SET SPECIFIC TYPE field

Code	Identifier Type
0h	Device identifier (see SPC-3)
1h	Compatible Medium List
2h	Compatible Medium
3h	Element location
3h – Fh	Reserved

If the COMMAND SET SPECIFIC TYPE field is set to 1h, the identifier has the format shown in table y+4.

Table y+4: Compatible Medium List identifier field format

Bit / Byte	7	6	5	4	3	2	1	0
1	COMPATIBLE MEDIUM COUNT							
2	Reserved							
3	First COMPATIBLE PRIMARY MEDIUM TYPE CODE							
4	First COMPATIBLE SECONDARY MEDIUM TYPE CODE							
:	:							
w-1	Last COMPATIBLE PRIMARY MEDIUM TYPE CODE							
W	Last COMPATIBLE SECONDARY MEDIUM TYPE CODE							

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The COMPATIBLE PRIMARY MEDIUM TYPE CODE and the COMPATIBLE SECONDARY MEDIUM TYPE CODE fields contain vendor defined values (see table y+5) for the medium type described by the remainder of this descriptor.

The PRIMARY MEDIUM TYPE CODE shall be the same for all medium with the same external mechanical specifications.

Comment: There has been some disagreement among vendors whether "almost compatible" medium needs to have a different PRIMARY MEDIUM TYPE CODE. Some medium families have added minor physical features to prevent loading a new medium type into an older drive. Under this definition the new medium must have a different PRIMARY MEDIUM TYPE CODE.

Each medium type in a RIMARY MEDIUM TYPE CODES family shall be given a different SECONDARY MEDIUM TYPE CODE if there is a difference that would affect the compatibility with any element in the device server. Different SECONDARY MEDIUM TYPE CODE values may be assigned for other media differences that are detectable by the device server.

If the device server is capable of supporting all secondary medium types for a reported primary type code it may report the "Secondary medium type universal" code.

If the ELEM bit is set and the element being described is compatible with all primary and secondary medium types supported by the device server the "Universal medium type" may be reported.

If the ELEM bit is set and the device server is not able to detect which medium types are supported by the addressed element the unknown medium type codes may be returned.

Table y+5 – PRIMARY MEDIUM TYPE CODE AND SECONDARY MEDIUM TYPE CODE values

PRIMARY MEDIUM TYPE CODE	SECONDARY MEDIUM TYPE CODE	Description
00h	00h	Universal medium type
01h – FEh	00h	Primary medium type vendor-specific Secondary medium type universal
01h – FEh	01h – Feh	Vendor-specific
01h – FEh	FFh	Primary medium type vendor-specific; Secondary medium type unknown
FFh	FFh	Unknown medium type

If the COMMAND SET SPECIFIC TYPE field is set to 2h, the identifier has the format shown in table y+6. This identifier is only valid for data transfer devices. Each data transfer device shall return a compatible medium identifier for each PRIMARY MEDIUM TYPE CODE and SECONDARY MEDIUM TYPE CODE that is compatible with the data transfer device and is supported by the device server.

Table y+6: Compatible Medium identifier field format

Byte \ Bit	7	6	5	4	3	2	1	0
0	PRIMARY MEDIUM TYPE CODE							
1	SECONDARY MEDIUM TYPE CODE							
2	WRTOK	MAM	NATIVE	MSMTOK	MSDCOK	Reserved		
3	Reserved					MEDIUM TYPE		
4	MODE SENSE MEDIUM TYPE							
5	MODE SENSE DENSITY CODE							
6	Reserved							
7	Reserved							

A WRTOK bit set to zero specifies that the described data transfer device does not support writing to this medium type. A WRTOK bit set to one specifies that the described data transfer device supports writing to this medium type. The described data transfer device shall support reading from the media at this density.

A MAM bit set to zero specifies that the medium type does not support Medium Auxiliary Memory (MAM, see SPC-3) when used with this data transfer device type. A MAM bit set to one specifies that the medium type, when used with the described data transfer device type, supports MAM.

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A NATIVE bit set to zero specifies that this medium type is not the default medium type of the described data transfer device. A NATIVE bit set to one specifies that this medium type is the default medium type of the described data transfer device. More than one medium type may be reported with the NATIVE bit set to one.

The MSMTOK bit shall be set to one if the MODE SENSE MEDIUM TYPE field is set.

The MSDCOK bit shall be set to one if the MODE SENSE DENSITY CODE field is set.

Comment: Both the mode sense medium type and mode sense density code values are vendor unique and are they are used differently by different data transfer devices. Some data transfer devices use the density code field to designate a data transfer device type while other data transfer devices support multiple density codes in the same data transfer device type. Having valid bits on both of these fields lets the media changer use the values that are appropriate for the referenced data transfer device and not set values if they are not used by that data transfer device type.

The MEDIUM TYPE field specifies the type of medium for this combination of PRIMARY MEDIUM TYPE CODE and SECONDARY MEDIUM TYPE CODE values. Table 17 describes the values for the MEDIUM TYPE field.

If the MSMTOK bit is set to one, the MODE SENSE MEDIUM TYPE field shall be the MEDIUM TYPE value reported by the data transfer device in the mode sense header when this medium type is loaded (see SPC-3). If the MSMTOK bit is set to zero, the MODE SENSE MEDIUM TYPE field shall be set to zero.

If the MSDCOK bit is set to one, the MODE SENSE DENSITY CODE field shall be the DENSITY CODE value reported by the data transfer device in the mode sense block descriptor when this medium type is loaded(see SPC-3). If the MSDCOK bit is set to zero, the MODE SENSE DENSITY CODE field shall be set to zero.

If the COMMAND SET SPECIFIC TYPE field is set to 3h, the identifier has the format shown in table y+5.

Table y+7: Element Location identifier field format

Bit / Byte	7	6	5	4	3	2	1	0
0	ELEMENT LOCATION DESCRIPTOR COUNT				CODE SET			
1	Reserved							
2	(MSB)			ELEMENT LOCATION IDENTIFIER LENGTH (x-4)				
3								(LSB)
x bytes	Element location descriptors							

COMMENT: Management and ISV software need a method to indicate the physical location of a logical element reported over SCSI. This proposal allows multiple fields to support coordinate-style location information or a single field if the device does not use coordinate-style location information. Applications may report the location information in a human readable format without any interpretation or may provide device specific interpretation for supported devices.

The ELEMENT LOCATION DESCRIPTOR COUNT field specifies the number of element location descriptors that describe the element location.

The CODE SET field indicates the code set used for the LOCATION field(s). The CODE SET field is defined in the Device Identification VPD page in SPC-3.

The ELEMENT LOCATION IDENTIFIER LENGTH field indicates the length in bytes of the element location descriptors, as described in table y+6.

Table y+7: Element location descriptor format

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

The ELEMENT LOCATION LENGTH field indicates the length in bytes of the element location descriptor.

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Comment: The ELEMENT LOCATION IDENTIFIER LENGTH field is required to allow for different length coordinate fields.

The LOCATION TYPE field indicates which type of location value will be returned in the LOCATION field. Table y+8 shows the available location types.

Table y+8 – LOCATION TYPE CODE values

LOCATION TYPE CODE	Description
00h	Coordinate A
01h	Coordinate B
02h	Coordinate C
03h	Coordinate D
04h	Coordinate E
05h	Coordinate F
06h	Coordinate G
07h-0Fh	Reserved
10h	Absolute Address
10h-EFh	Reserved
F0h-FFh	Vendor Unique

The coordinate A through coordinate G values may be assigned by the vendor to coordinate types appropriate for the device server.

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