

memorandum



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To INCITS T10 Committee
From Curtis Ballard, HP
Subject SPC-4 Common Definition for CODE SET

Date
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Revision History

Revision 0 – Initial document.

Revision 1 – [Changes from May 2008 San Jose, CA](#)
[Code set renamed to code set enumeration](#)
[Wording changes as requested by the working group](#)

Related Documents

spc4r14 – SCSI Primary Commands

Background

SPC4r14 has several different locations where a field named CODE SET is used.

- Section 6.3.6.2, table 96, the EXTENDED COPY identification descriptor target descriptor format which references a definition in the Vital Product Data parameters;
- Section 6.38.14, table 252, the download application client error history mode of the WRITE BUFFER command; and
- Section 7.7.3.1, table 422, the designation descriptor for Vital Product Data descriptors.

There is also a field called CODE SET used in ADC-2 which references back to SPC-3 which leaves it unclear which SPC-3 definition to use. SMC-3 uses a field called CODE SET in descriptors for two different commands one of which is a Vital Product Data descriptor and references SPC-3 and the other use is for a different descriptor which has its own definition. All of these locations are used to describe the type of data that will be returned in a field (ASCII, Binary, UTF-8). Several other locations in the standards have fields that could benefit from using a code set concept to indicate what type of data will be returned in the field but instead use other methods such as the FORMAT field in the MAM ATTRIBUTE format in SPC-4 table 310.

The existing definitions of CODE SET are all slightly different but consistent.

This proposal recommends a change to SPC-4 to create a new clause in the General Concepts section for a command definition of CODE SET.

In the proposed changes that follow, new text appears in [blue](#), deleted text appears in ~~red-strikeout~~ comments appear in [green](#).



PROPOSED CHANGES TO SPC-4

Proposed Changes to Section 3

New definition

3.1.X code set enumeration: A coded value used in one field to indicate the format of data in other fields or descriptors. See 4.4.3

Proposed Changes to Section 4

New Data Field Requirements sub-clause

4.4 Data field requirements

4.4.1 ASCII data field requirements

No changes are proposed to this section so it is not repeated here.

4.4.2 Null data field termination and zero padding requirements

No changes are proposed to this section so it is not repeated here.

4.4.3 Variable type data field requirements

Parameter lists may contain fields or descriptors in which data may be represented in different formats. To indicate which format is being used a field may be defined that contains a code set enumeration (see table y).

Table y – code set enumeration

Value	Description
0h	Reserved
1h	The <u>associated fields or descriptors contain binary values</u>
2h	The <u>associated fields or descriptors contain ASCII printable characters (i.e., code values 20h through 7Eh)</u>
3h	The <u>associated fields or descriptors contain UTF-8 (see 3.1.173) characters</u>
4h – Fh	Reserved



Proposed Changes to Section 6.3

6.3 EXTENDED COPY command

No changes are proposed to sub-sections 6.3.1 through 6.3.5 so those sub-sections are not repeated here.

6.3.6 Target descriptors

6.3.6.1 Target descriptors introduction

No changes are proposed to this section so it is not repeated here.

6.3.6.2 Identification descriptor target descriptor format

The target descriptor format shown in table 96 instructs the copy manager to locate a SCSI target device and logical unit that returns a Device Identification VPD page (see 7.7.3) containing an Identification descriptor having the specified CODE SET, ASSOCIATION, DESIGNATOR TYPE, IDENTIFIER LENGTH, and IDENTIFIER field values. The copy manager may use any N_Port, target port identifier and logical unit number values that result in matching VPD field values to address the logical unit. If multiple target port identifiers and logical unit number combinations access matching VPD field values, the copy manager may use any combination to address the logical unit and shall try other combinations in the event that one combination becomes non-operational during the processing of an EXTENDED COPY command.

Table 96 – Identification descriptor target descriptor format

Bit Byte	7	6	5	4	3	2	1	0	
0	DESCRIPTOR TYPE CODE (E4h)								
1	LU ID TYPE		NUL	PERIPHERAL DEVICE TYPE					
2	(MSB)		RELATIVE INITIATOR PORT IDENTIFIER					(LSB)	
3									
4	Reserved				CODE SET				
5	Reserved		ASSOCIATION		DESIGNATOR TYPE				
6	Reserved								
7	DESIGNATOR LENGTH (n-7)								
8									
n	DESIGNATOR								
n+1	Reserved								
27									
28									
31	Device type specific parameters								

The DESCRIPTOR TYPE CODE field, PERIPHERAL DEVICE TYPE field, NUL bit, RELATIVE INITIATOR PORT IDENTIFIER field, and the device type specific parameters are described in 6.3.6.1.

The LU ID TYPE field is reserved for this target descriptor.

The CODE SET field [contains a code set enumeration \(see 4.4.3\) that indicates the format of the DESIGNATOR field.](#)

The contents of the ~~CODE SET~~, ASSOCIATION, DESIGNATOR TYPE, DESIGNATOR LENGTH, and DESIGNATOR fields are specified in 7.7.3.

No further changes are proposed for this section.



Proposed Changes to Section 6.38

6.38 WRITE BUFFER command

No changes are proposed to sub-sections 6.38.1 through 6.38.14 so those sub-sections are not repeated here.

6.38.14 Download application client error history mode (1Ch)

In this mode the device server transfers application client error history from the application client and stores it in the error history (see 5.11). The format of the application client error history parameter list is defined in table 252.

The BUFFER ID field and BUFFER OFFSET field shall be ignored in this mode.

Upon successful completion of a WRITE BUFFER command, the information contained in the application client error history parameter list shall be appended to the application client error history in a format determined by the logical unit.

The PARAMETER LIST LENGTH field specifies the length in bytes of the application client error history parameter list that shall be transferred from the application client to the device server. If the PARAMETER LIST LENGTH field specifies a transfer that exceeds the error history capacity, the command shall be terminated with CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST, and the additional sense code set to INVALID FIELD IN CDB.

The device server shall not return an error based on the contents of any of the field values defined in table 252 except:

- a) The CLR bit;
- b) The ERROR LOCATION LENGTH field; and
- c) the APPLICATION CLIENT ERROR HISTORY LENGTH field.



Table 252 – Application client error history parameter list format

Bit Byte	7	6	5	4	3	2	1	0
0	(MSB) T10 VENDOR IDENTIFICATION (LSB)							
7								
8	(MSB) ERROR TYPE (LSB)							
9								
10	Reserved							
11	Reserved							
12	(MSB) TIMESTAMP (LSB)							
17								
18	Reserved							
19								
20	Reserved				CODE SET			
21	ERROR LOCATION FORMAT							
22	(MSB) ERROR LOCATION LENGTH (m-25) (LSB)							
23								
24	(MSB) APPLICATION CLIENT ERROR HISTORY LENGTH (n-m) (LSB)							
25								
26	(MSB) ERROR LOCATION (LSB)							
m								
m+1								
n	APPLICATION CLIENT ERROR HISTORY							

The T10 VENDOR IDENTIFICATION field contains eight bytes of left-aligned ASCII data (see 4.4.1) identifying the vendor providing the application client error history. The T10 vendor identification shall be one assigned by INCITS. A list of assigned T10 vendor identifications is in Annex E and on the T10 web site (<http://www.t10.org>).

The ERROR TYPE field (see table 253) specifies the error detected by the application client.

Table 253 – ERROR TYPE field

Code	Description
0000h	No error specified by the application client
0001h	An unknown error was detected by the application client
0002h	The application client detected corrupted data
0003h	The application client detected a permanent error
0004h	The application client detected a service response of SERVICE DELIVERY OR TARGET FAILURE (see SAM-4)
0005h – 7FFFh	Reserved
8000h – FFFFh	Vendor specific

If the CLR_SUP bit is set to one in the error history directory parameter data (see 6.16.9.2), a CLR bit set to one specifies that the device server shall:

- a) Clear the portions of the error history that the device server allows to be cleared; and
- b) Ignore any application client error history specified in the parameter list.

If the CLR_SUP bit is set to one in the error history directory parameter data, a CLR bit set to zero specifies that the device server shall not ignore the CLR bit.

If the CLR_SUP bit is set to one in the error history directory parameter data, a CLR bit set to zero specifies that the device server shall:



- a) Not clear the error history; and
- b) Process all application client error history specified in the parameter list.

If the CLR_SUP bit is set to zero in the error history directory parameter data, the device server shall ignore the CLR bit.

The TIMESTAMP field shall contain:

- a) A time based on the timestamp reported by the REPORT TIMESTAMP command, if the device server supports a device clock (see 5.12),
- b) The number of milliseconds that have elapsed since midnight, 1 January 1970 UT (see 3.1.171); or
- c) Zero, if the application client is not able to determine the UT of the log entry.

The CODE SET field (see 4.4.3) indicates the code set used for the APPLICATION CLIENT ERROR HISTORY field.

The CODE SET field contains a code set enumeration (see 4.4.3 ~~table 254~~) that indicates the format of the APPLICATION CLIENT ERROR HISTORY field. ~~specifies the code set used for the application client error history and shall only apply to information contained in the APPLICATION CLIENT ERROR HISTORY field.~~

~~NOTE 42—The CODE SET field is intended to be an aid to software that displays the application client error history.~~

~~Table 254—CODE SET field~~

Code	Description
0h	Reserved
1h	The application client error history is binary
2h	The application client error history is ASCII printable characters (i.e., code values 20h through 7Eh)
3h	The application client error history is ISO/IEC 10646-1 (UTF-8) codes
4h—Fh	Reserved

No further changes are proposed for this section.

Proposed Changes to Section 7.7

7.7 Vital product data parameters

No changes are proposed to sub-sections 7.7.1 through 7.7.3 so those sub-sections are not repeated here.

7.7.3 Device Identification VPD page

7.7.3.1 Device Identification VPD page overview

The Device Identification VPD page (see table 421) provides the means to retrieve designation descriptors applying to the logical unit. Logical units may have more than one designation descriptor (e.g., if several types or associations of designator are supported). Designators consist of one or more of the following:

- a) Logical unit names;
- b) SCSI target port identifiers;
- c) SCSI target port names;
- d) SCSI target device names;
- e) Relative target port identifiers;
- f) Primary target port group number; or
- g) Logical unit group number.



Designation descriptors shall be assigned to the peripheral device (e.g., a disk drive) and not to the currently mounted media, in the case of removable media devices. Operating systems are expected to use the designation descriptors during system configuration activities to determine whether alternate paths exist for the same peripheral device.

Table 421 – Device Identification VPD page

Bit Byte	7	6	5	4	3	2	1	0
0	PERIPHERAL QUALIFIER			PERIPHERAL DEVICE TYPE				
1	PAGE CODE (83h)							
2	(MSB)		PAGE LENGTH (n-3)				(LSB)	
3								
Designation descriptor list								
4	Designation descriptor [first]							
	:							
	:							
n	Designation descriptor [last]							

The PERIPHERAL QUALIFIER field and the PERIPHERAL DEVICE TYPE field in table 421 are as defined in 6.4.2.

The PAGE LENGTH field indicates the length of the designation descriptor list. The relationship between the PAGE LENGTH field and the CDB ALLOCATION LENGTH field is defined in 4.3.5.6.

Each designation descriptor (see table 422) contains information identifying the logical unit, SCSI target device containing the logical unit, or access path (i.e., target port) used by the command and returned parameter data. The Device Identification VPD page shall contain the designation descriptors enumerated in 7.7.3.2.

Table 422 – Designation descriptor

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

The PROTOCOL IDENTIFIER field may indicate the SCSI transport protocol to which the designation descriptor applies. If the ASSOCIATION field contains a value other than 01b (i.e., target port) or 10b (i.e., SCSI target device) or the PIV bit is set to zero, then the PROTOCOL IDENTIFIER field contents are reserved. If the ASSOCIATION field contains a value of 01b or 10b and the PIV bit is set to one, then the PROTOCOL IDENTIFIER field shall contain one of the values shown in table 345 (see 7.5.1) to indicate the SCSI transport protocol to which the designation descriptor applies.



The CODE SET field [contains a code set enumeration \(see 4.4.3\) that](#) indicates the ~~code set used for~~ [format of](#) the DESIGNATOR field, ~~as described in table 423. This field is intended to be an aid to software that displays the DESIGNATOR field.~~

Table 423—CODE SET field

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

No further changes are proposed for this section.