To: Membership of X3T10

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Subject: Enhancements for READ BUFFER command

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1. Background

A new proposal to enhance the WRITE BUFFER command for codeloads (X3T10/94-104R0) has recently been introduced. 94-104 allows for segmenting a codeload into parts. However, it does not address the determination of which buffer IDs are available for download.

To aid in this determination, I propose an addition to the READ BUFFER command.

2. Proposal

The following CDB is the same as the READ BUFFER CDB described in SCSI-2 rev 10L. A new mode is added to the existing modes.

Bit / Byte	7	6	5	4	3	2	1	0
0	Operation Code (3Ch)							
1	Reserved					**Mode**		
2	Buffer ID							
3	(MSB)	Buffer Offset						
4								
5								(LSB)
6	(MSB)	Allocation Length						
7								
8								(LSB)
9	Control							

The READ BUFFER mode field table (table 59 in SCSI-2, rev 10L) is modified to add mode 100b as follows:

Mode	Description	Type
000b	Combined header and data	Optional
001b	Vendor-specific	Vendor-specific
010b	Data	Optional
011b	Descriptor	Optional
100b	**Long Descriptor List**	**Optional**
101b	Reserved	Reserved
110b	Reserved	Reserved
111b	Reserved	Reserved

Long Descriptor List (100b)

In this mode, a descriptor list header followed by a list of long descriptors is returned. The buffer ID identifies the first buffer within the logical unit from which the first long descriptor is returned. The logical unit shall return a descriptor list header followed by zero or more long descriptors. The logical unit shall return one long descriptor for each supported logical unit buffer ID, in ascending buffer ID order, starting at the first buffer ID specified. If no logical unit buffers exist with an buffer ID greater than or equal to the buffer ID specified in the CDB, the logical unit shall return only the descriptor list header. If the buffer offset field of the CDB is non-zero, the logical unit shall return CHECK CONDITION status, shall set the sense key to ILLEGAL REQUEST, and set the additional sense code to ILLEGAL FIELD IN CDB. The logical unit terminates the DATA IN phase when allocation length bytes have been transferred or when all of the long descriptors have been sent, whichever amount is less. The descriptor list header is defined as shown in table 60A. A long descriptor is defined as shown in table 60B.

Table 60A - Descriptor List Header

Bit / Byte	7	6	5	4	3	2	1	0
0	Reserved							
1	Reserved							
2	(MSB)	**Long Descriptor Data Length**						
3								(LSB)

The **Long Descriptor Data Length** field specifies the length in bytes of the following data that is available to be transferred. The Long Descriptor Data Length does not include itself.

Table 60B - Long Descriptor

Bit / Byte	7	6	5	4	3	2	1	0
0	**Buffer ID**							
1	**Read 7**	**Read 6**	**Read 5**	**Read 4**	**Read 3**	**Read 2**	**Read 1**	**Read 0**
2	**Write 15**	**Write 14**	**Write 13**	**Write 12**	**Write 11**	**Write 10**	**Write 9**	**Write 8**
3	**Write 7**	**Write 6**	**Write 5**	**Write 4**	**Write 3**	**Write 2**	**Write 1**	**Write 0**
4	**Offset Boundary**							
5	(MSB)							
6	**Buffer Capacity**							
7								(LSB)

The **Buffer ID** field returns the ID of the buffer associated with this descriptor.

The bits **Read 0 through Read 7** indicate which modes of the READ BUFFER command are supported for this buffer ID. Table 60C matches the **Read** bit with the READ BUFFER mode. Some of these bits refer to modes which are reserved in SCSI-3. The logical unit shall return zero for all modes not supported by the READ BUFFER command. The logical unit shall return one for the appropriate bit in byte 1 of the Long Descriptor if the READ BUFFER command supports the associated mode for the logical unit buffer specified by the returned buffer ID. The logical unit shall return zero if the READ BUFFER command does not support the associated mode for the logical unit buffer.

Table 60C - Mapping of Long Descriptor Bit to READ BUFFER mode

Bit	READ BUFFER Mode
Read 0	000b
Read 1	001b
Read 2	010b
Read 3	011b
Read 4	Reserved
Read 5	Reserved
Read 6	Reserved
Read 7	Reserved

The bits WRITE 0 through WRITE 15 indicate which modes of the WRITE BUFFER command are supported for this buffer ID. Table 60D matches the Write bit with the WRITE BUFFER mode. Some of these bits refer to modes which are reserved in SCSI-3. The logical unit shall return zero for all modes not supported by the WRITE BUFFER command. The logical unit shall return one for the appropriate bit in bytes 2 and 3 of the Long Descriptor if the WRITE BUFFER

command supports the associated mode for the logical unit buffer specified by the returned buffer ID. The logical unit shall return zero if the WRITE BUFFER command does not support the associated mode for the logical unit buffer.

Table 60D - Mapping of Long Descriptor Bit to WRITE BUFFER mode

Bit	WRITE BUFFER Mode
Write 0	000b
Write 1	001b
Write 2	010b
Write 3	Reserved
Write 4	100b
Write 5	101b
Write 6	110b
Write 7	Reserved
Write 8	Reserved
Write 9	Reserved
Write 10	Reserved
Write 11	Reserved
Write 12	Reserved
Write 13	Reserved
Write 14	Reserved
Write 15	Reserved

Note: The intent is to assign new modes to a bit with the mode number in decimal. Thus, if a new WRITE BUFFER mode of 1100b is added, bit Write 12 would represent that mode. However, it is not required that this assignment method be followed in the future.

Note: If in the future more modes exist than bits, it is possible that a buffer ID would have no bits set in bytes 1 through 3 of the Long Descriptor for a given buffer ID. However, currently no modes are defined which cannot be mapped to one of the defined bits. Therefore, at least one bit of bytes 1 through 3 should be set. Otherwise, no READ BUFFER or WRITE BUFFER commands would be associated with the buffer in question.

The **Offset Boundary** field returns the boundary alignment within the selected buffer for subsequent WRITE BUFFER and READ BUFFER commands. The value contained in the offset boundary field shall be interpreted as a power of two.

The value contained in the buffer offset field of subsequent WRITE BUFFER and READ BUFFER commands shall be a multiple of $2^{\text{offset boundary}}$ as shown in table 62 [table in SCSI-2, rev 10L].

The buffer capacity field shall return the size of the selected buffer in bytes.

Note: There is no requirement that a WRITE BUFFER codeload use all of the selected buffer. A logical unit may determine, based on data received, that the codeload has completed before filling the associated buffer.