Date: December 27, 2003

To: T10 Committee (SCSI)

From: Jim Coomes (Seagate)

Subject:SBC 32 Byte Commands for End-to-End Data Protection

1 Revision

rev 5 - Updated per input at Nov 03 CAP meeting and implementation in SBC-2 r11.

- a) Changed the modification of footnotes "c" in SBC-2 r11 to take the "may" out of 32 byte commands providing the application information knowledge.
- b) Changed the XXPROTECT fields in all 32 byte commands to 3 bit fields.
- c) The DATA BLOCK APPLICATION VALUE field is renamed EXPECTED DATA BLOCK APPLICATION TAG.
- d) The descriptions of the new fields in the 32 byte commands are revised.

rev 4 - Added Write Same 32 byte command. Rewrite of the command field descritions to direct the checking requirements back to the 10 byte version of the commands.

rev 3- Added 32 byte Verify and Write And Verify command.

rev 2 - This revision changed text in proposal 03-176r6 for the RDPROTECT field, Table Footnote c and the WRPROTECT field, Table Footnote c. Editorial convention was corrected for "a bit set to one"

rev 1 -This revision changes the RELADR field in the proposed commands to reserved, RDPROTECT and WRPROTECT field descriptions to reference 03-176r5 and qualifies DATA BLOCK APPLICATION TAG checking with the RDPROTECT and WRPROTECT fields.

2 Overview

There is a need to provide the initial value of the DATA BLOCK REFERENCE TAG proposed in 03-365rX on a command by command basis. One use case is in a configuration where a controller (e.g., a RAID) remaps the LBA to a different LBA space on a physical LUN. By passing the initial value of the DATA BLOCK REFERENCE TAG in the command to the LUN, the original data protection block may be passed through the controller to the LUN and checked. This function provides end to end protection in the remapping case.

To provide the space for the initial DATA BLOCK REFERENCE TAG and maintain 8 byte LBA space, 32 byte formats are proposed for read and write operations.

This proposal additionally provides a mechanism to enable device server checking of the DATA BLOCK APPLICATION TAG in the protection information.

Changes to document SBC-2 r11

4.5.2 Protection information format

The LOGICAL BLOCK REFERENCE TAG field is set to the least significant four bytes of the LBA to which an incrementing value associated with the logical block is associated. For commands that do not include an INITIAL DATA BLOCK REFERENCE TAG field, the The first logical block in application client data buffer shall contain the least significant four bytes of the LBA contained in the LOGICAL BLOCK ADDRESS field of the command associated with the logical block. For commands that include an INITIAL DATA BLOCK REFERENCE TAG field, the first data block transferred shall contain the DATA BLOCK REFERENCE TAG field, the first data block transferred shall contain the DATA BLOCK REFERENCE TAG equal to the value in the command. Each logical block in the application client data buffer contains a LOGICAL BLOCK REFERENCE TAG field with the logical block reference tag of the previous logical block plus one. The contents of the LOGICAL BLOCK REFERENCE TAG field shall not be used to generate or check the CRC contained in the LOGICAL BLOCK GUARD field.

5.2.8 READ (10) command

Table 35 RDPROTECT field, Footnote c

C>The device server checks the logical block application tag only if it has knowledge of the contents of the LOGICAL BLOCK APPLICATION TAG field. A READ (32) command provides this knowledge. Otherwise, the The method for acquiring this knowledge of the contents of the LOGICAL BLOCK APPLICATION TAG field is not defined by this standard

5.2.25 VERIFY (10) command

Table 66, VRPROTECT field with BYTCHK set to zero, Footnote c

C>The device server checks the logical block application tag only if it has knowledge of the contents of the LOGICAL BLOCK APPLICATION TAG field. A VERIFY (32) command provides this knowledge. Otherwise, the The method for acquiring this knowledge of the contents of the LOGICAL BLOCK APPLICATION TAG field is not defined by this standard.

Table 68 VRPROTECT field with BYTCHK set to one - checking data from application client Footnote c

C>The device server checks the logical block application tag only if it has knowledge of the contents of the LOGICAL BLOCK APPLICATION TAG field. A VERIFY (32) command provides this knowledge. Otherwise, the The method for acquiring this knowledge of the contents of the LOGICAL BLOCK APPLICATION TAG field is not defined by this standard.

Table 69 VRPROTECT field with BYTCHK set to one - checking data on medium, Footnote c

^{<c>}The device server checks the logical block application tag only if it has knowledge of the contents of the LOGICAL BLOCK APPLICATION TAG field. A VERIFY (32) command provides this knowledge. Otherwise, the The method for acquiring this knowledge of the contents of the LOGICAL BLOCK APPLICATION TAG field is not defined by this standard.

5.2.29 WRITE (10) command

Table 74. WRPROTECT field, Footnote c

C>The device server checks the logical block application tag only if it has knowledge of the contents of the LOGICAL BLOCK APPLICATION TAG field. A WRITE (32) command provides this knowledge. Otherwise, the The method for acquiring this knowledge of the contents of the LOGICAL BLOCK APPLICATION TAG field is not defined by this standard.

Expected SBC-2 additions

5.2.<xx> READ (32) Command

The READ (32) command (see table 1) requests that the device server transfer data to the application client. The most recent data value written in the addressed logical block shall be returned

Byte\Bit	7	6	5	4	3	2	1	0		
0		OPERATION CODE (7Fh)								
1		CONTROL								
2		Reserved								
6				TCSCI VC	eu -					
7			ADE	DITIONAL CDB	LENGTH (18	Sh)				
8	(MSB)									
9			SERVICE ACTION (TDDI)							
10		RDPROTECT	PROTECT DPO FUA Reserved					1		
11			Reserved							
12	(MSB)		1							
19			L		K ADDRESS			(LSB)		
20	(MSB)									
23			INTTAL	DATA BLOCK	REFERENCE	LIAG		(LSB)		
24	(MSB)									
25			EXPECTED DATA BLOCK APPLICATION TAG							
26	(MSB)									
27			DATAT		ATION TAG			(LSB)		
28	(MSB)			TDANGEED						
31				IRANGFER				(LSB)		

Table 1 — READ (32) command

The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected on the first logical block of the range of logical blocks for this command. See the READ (10) command (see 5.2.8) for a description of the checking enables and requirements.

When checking of the DATA BLOCK APPLICATION TAG is enabled by the RDPROTECT field (see 5.2.8) and the APP_CHK bit in the Protection Information VPD page (see SPC-3), the EXPECTED DATA BLOCK APPLICATION TAG field contains a value that is expected in the DATA BLOCK APPLICATION TAG with the DATA BLOCK APPLICATION TAG MASK applied in the protection information of logical blocks for this command.

When checking of the DATA BLOCK APPLICATION TAG is enabled by the RDPROTECT field (see 5.2.8) and the APP_CHK bit in the Protection Information VPD page (see SPC-3), the DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information for each logical block of the range of logical blocks for this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the EXPECTED DATA BLOCK APPLICATION TAG field with the DATA BLOCK APPLICATION TAG.

See 4.2.1.8 for reservation requirements for this command. See the READ (10) command (see 5.2.8) for a description of the other fields in this command.

5.2.<xx> WRITE (32) command

The WRITE (32) command (see table 2) requests that the device server write the data transferred from the application client to the medium

Byte\Bit	7	6	5	4	3	2	1	0			
0	OPERATION CODE (7Fh)										
1		CONTROL									
2		Reserved									
6		Reserved									
7			ADE	DITIONAL CDB I	LENGTH (18	Bh)					
8	(MSB)	(MSB)									
9			SERVICE ACTION (TDDII)								
10	٧	/RPROTECT	RPROTECT DPO FUA Reserved								
11				Reserve	ed						
12	(MSB)										
19		_	L		ADDRESS			(LSB)			
20	(MSB)		ΙΝΙΙΤΙΛΙ								
23		_	INITIAL DATA BLOCK REFERENCE TAG (LSB)								
24	(MSB)										
25			(LSB)								
26	(MSB)										
27		_	DATA BLOCK APPLICATION TAG MASK (LSB)								
28	(MSB)			TDANSEED							
31								(LSB)			

Table 2 — WRIT	E (32) command
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The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected on the first logical block of the range of logical blocks for this command. See the WRITE (10) command (see 5.2.31) for a description of the checking enables and requirements.

When checking of the DATA BLOCK APPLICATION TAG is enabled by the WRPROTECT field (see 5.2.31) and the APP_CHK bit in the Protection Information VPD page (see SPC-3), the EXPECTED DATA BLOCK APPLICATION TAG field contains a value that is expected in the DATA BLOCK APPLICATION TAG with the DATA BLOCK APPLICATION TAG MASK applied in the protection information of logical blocks for this command.

When checking of the DATA BLOCK APPLICATION TAG is enabled by the WRPROTECT field (see 5.2.31) and the APP_CHK bit in the Protection Information VPD page (see SPC-3), the DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information for each logical block of the range of logical blocks for this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the EXPECTED DATA BLOCK APPLICATION TAG field with the DATA BLOCK APPLICATION TAG.

See 4.2.1.8 for reservation requirements for this command. See the WRITE (10) command (see 5.2.31) for a description of the other fields in this command.

5.2.<xx> WRITE AND VERIFY (32) Command

The WRITE AND VERIFY (32) command (see table 3) requests that the device server write the data transferred from the application client to the medium and then verify that the data and protection information, if any, is correctly written. The data is only transferred once from the application client to the device server.

Byte\Bit	7	6	5	4	3	2	1	0		
0		OPERATION CODE (7Fh)								
1		CONTROL								
2		Reserved								
6										
7		ADDITIONAL CDB LENGTH (18h)								
8	(MSB)		SEDVICE ACTION (TRDb)							
9			- SERVICE ACTION (TDDI)							
10		WRPROTECT		DPO	Reserved	EBP	ВҮТСНК	Reserved		
11				Rese	erved					
12	(MSB)									
19		-		LUGIOAL DEC				(LSB)		
20	(MSB)					ETAG				
23		-	11 11 17			_ 170		(LSB)		
24	(MSB)		- EXPECTED DATA BLOCK APPLICATION TAG							
25		-								
26	(MSB)					MASK				
27		-				MAGIN		(LSB)		
28	(MSB)			TRANSEE						
31		-			A LENGTH			(LSB)		

Table 3 —	WRITE	AND	VERIFY	(32)	command
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The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected on the first logical block of the range of logical blocks for this command. See the WRITE AND VERIFY(10) command (see 5.2.34) for a description of the checking enables and requirements.

When checking of the DATA BLOCK APPLICATION TAG is enabled by the WRPROTECT field (see 5.2.31) and the APP_CHK bit in the Protection Information VPD page (see SPC-3), the EXPECTED DATA BLOCK APPLICATION TAG field contains a value that is expected in the DATA BLOCK APPLICATION TAG with the DATA BLOCK APPLICATION TAG MASK applied in the protection information of logical blocks for this command.

When checking of the DATA BLOCK APPLICATION TAG is enabled by the WRPROTECT field (see 5.2.31) and the APP_CHK bit in the Protection Information VPD page (see SPC-3), the DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information for each logical block of the range of logical blocks for this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the EXPECTED DATA BLOCK APPLICATION TAG field with the DATA BLOCK APPLICATION TAG.

See 4.2.1.8 for reservation requirements for this command. See the WRITE AND VERIFY(10) command (see 5.2.34) for a description of the other fields in this command.

5.2.<xx> VERIFY (32) Command

The VERIFY (32) command (see table 4) requests that the device server verify the data on the medium.

Byte\Bit	7	6	5	4	3	2	1	0		
0		OPERATION CODE (7Fh)								
1		CONTROL								
2										
6										
7		ADDITIONAL CDB LENGTH (18h)								
8	(MSB)									
9								(LSB)		
10		VRPROTECT		DPO	Reserved	EBP	ВҮТСНК	Reserved		
11				Rese	erved					
12	(MSB)									
19		-		LOOICAL BEC	JOIN ADDINESS			(LSB)		
20	(MSB)									
23		-	INITIAL DATA BLOCK REFERENCE TAG							
24	(MSB)		- EXPECTED DATA BLOCK APPLICATION TAG							
25		-								
26	(MSB)					MASK				
27		-				MAGIC		(LSB)		
28	(MSB)			TDANSEE						
31		-		TRANSIL	K LLINGTT			(LSB)		

Fable 4 —	- VERIFY (32)	command
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The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected on the first logical block of the range of logical blocks for this command. See the VERIFY (10) command (see 5.2.27) for a description of the checking enables and requirements.

When checking of the DATA BLOCK APPLICATION TAG is enabled by the VRPROTECT field (see 5.2.27) and the APP_CHK bit in the Protection Information VPD page (see SPC-3), the EXPECTED DATA BLOCK APPLICATION TAG field contains a value that is expected in the DATA BLOCK APPLICATION TAG with the DATA BLOCK APPLICATION TAG MASK applied in the protection information of logical blocks for this command.

When checking of the DATA BLOCK APPLICATION TAG is enabled by the VRPROTECT field (see 5.2.27) and the APP_CHK bit in the Protection Information VPD page (see SPC-3), the DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information for each logical block of the range of logical blocks for this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the EXPECTED DATA BLOCK APPLICATION TAG field with the DATA BLOCK APPLICATION TAG.

See 4.2.1.8 for reservation requirements for this command. See the VERIFY (10) command (see 5.2.27) for a description of the other fields in this command.

5.2.<xx> WRITE SAME (32) Command

The WRITE SAME (32) command (see table 5) requests that the device server write the single block of data transferred by the application client to the medium multiple times to consecutive multiple logical blocks.

Byte\Bit	7	6	5	4	3	2	1	0			
0	OPERATION CODE (7Fh)										
1				CON	TROL						
2	Reserved										
6		i vesei veu									
7			AE	DITIONAL CDI	b length (18	Bh)					
8	(MSB)										
9			SERVICE ACTION (TDD)								
10		WRPROTECT	WRPROTECT Reserved PBDATA LBDATA					Reserved			
11				Rese	erved						
12	(MSB)										
19				LOGIOAL DEC	ON ADDITEOU			(LSB)			
20	(MSB)										
23		-	111117	LE DATA BLOC				(LSB)			
24	(MSB)										
25		EXPECTED DATA BLOCK APPLICATION TAG						(LSB)			
26	(MSB)		Decerved								
27		1	Keserved								
28	(MSB)			TRANSEE							
31				TRANSFE				(LSB)			

Table 5 — WRITE SAME (32) command

The INITIAL DATA BLOCK REFERENCE TAG field contains the value of the DATA BLOCK REFERENCE TAG expected in the block of data transferred by the application client first logical block of the range of logical blocks for this command and the DATA BLOCK REFERENCE TAG for the first logical block written to the medium. See the WRITE SAME (10) command (see 5.2.38) for a description of the checking enables and requirements.

When checking of the DATA BLOCK APPLICATION TAG is enabled by the WRPROTECT field (see 5.2.31) and the APP_CHK bit in the Protection Information VPD page (see SPC-3), the EXPECTED DATA BLOCK APPLICATION TAG field contains a value that is expected in the DATA BLOCK APPLICATION TAG with the DATA BLOCK APPLICATION TAG MASK applied in the protection information of the block of data transferred by the application client for this command.

When checking of the DATA BLOCK APPLICATION TAG is enabled by the WRPROTECT field (see 5.2.31) and the APP_CHK bit in the Protection Information VPD page (see SPC-3), the DATA BLOCK APPLICATION MASK field contains a value that is a bit mask for enabling the checking of the DATA BLOCK APPLICATION TAG in the protection information of the block of data transferred by the application client for this command. A DATA BLOCK APPLICATION TAG MASK bit set to one enables the checking of the corresponding bit in the EXPECTED DATA BLOCK APPLICATION TAG field with the DATA BLOCK APPLICATION TAG.

See 4.2.1.8 for reservation requirements for this command. See the WRITE SAME (10) command (see 5.2.38) for a description of the other fields in this command.