

Response to Comments
Fibre Channel Protocol for SCSI
X3T10, 993D, Revision 8
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1 Introduction

The comments in this document were received during the review process of the Fibre Channel Protocol for SCSI, Revision 8. The resolution of the comments is described in this document.

The majority of the comments are editorial and the resolutions are included in Revision 8b.

Some of the comments are technical, but have an obvious solution or a solution that was agreed upon in the FCP Review meeting of April 18, 1994. Those resolutions are included in Revision 8b.

The remaining comments are technical and, while there may still be some discussion about the resolutions, they are included in Revision 8b using the editor's judgment.

These comments will again be discussed at the working group meeting of May 18, 1994.

2 Explanation of Tables

The following section contains a list of the comments ordered by comment number, indicating the approximate location of the comment in the document and the contributor of the comment.

Section 4 of this document contains information about the resolution of comments.

2.1 List of Ballot Comments Received

Table 1: Chart of Ballot Review Comments

Submitter	Comment Number	Description	Location in Revision 8.0	Type	Resolution
FSI	1	Grammar	Foreword, 1 2	E	No change
FSI	2	Correct scope	Intro, P 1, 1 3	E	Accepted
FSI	3	Edit Introduction	Intro, P 2, 1 1	E	Accepted
FSI	4	Edit Scope (Technical)	1.0, P 1, 1 1	E	Accepted
FSI	5	Edit References	2.0	T	Rejected
FSI	6	Edit References	2.0	E	Accepted
FSI	7	Edit References	2.0	E	Accepted
FSI	8	Edit References	2.0	E	Accepted
FSI	9	Information Units	3.1.12, 1 2	E	Modified, accepted
FSI	10	Sequences	all	E	Accepted
FSI	11	Service Interface	3.1.12	T	No change
FSI	12	FCP I/O Operation	3.1.13	E	No change
FSI	13	Port names	3.1.14	T	Accepted
FSI	14	Port names	all	T	Accepted
FSI	15	FQXID	3.1.15	T	Modified, accepted
FSI	16	Information Units	3.1.16	E	Rejected
FSI	17	Logical Unit Defn	3.1.17	T	Modified, accepted
FSI	18	Initiator Identifier	3.1.13	T	Modified, accepted
FSI	19	Definition reference	3.1.22	E	Accepted
FSI	20	Port name	3.1.23	T	Accepted
FSI	21	Transfer Length	3.1.24	T	No Change
FSI	22	Command	3.1.27	T	Modified, accepted

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Submitter	Comment Number	Description	Location in Revision 8.0	Type	Resolution
FSI	23	FQXID	3.1.28	T	Modified, accepted
FSI	24	Command	3.1.29	T	Modified, accepted
FSI	25	Identifier Reference	3.1.30	E	Modified, accepted
FSI	26	FQXID and RX_ID	3.1.33	E	Modified, accepted
FSI	27	Editorial convention	3.3	E	Accepted
FSI	28	Topology definitions	4.1	E	Modified, accepted
FSI	29	Layer definition	4.1, p 3	T	Accepted
FSI	30	Layer definition	4.1, p 3	T	Accepted
FSI	31	Inclusion of frame info.	4.1, p 6	E	Accepted
FSI	32	Information Unit	T 1, 13	E	No Change
FSI	33	Resource limitations	4.1, p 7	T	Accepted
FSI	34	Informative section	4.2	E	No Change
FSI	35	FCP I/O Operation	4.2, p 1,2	E	No Change
FSI	36	Editorial 4.2	4.2, p 2, 1 1,2	E	Modified, accepted
FSI	37	Information Units	4.2, p 2, 1 6.	E	Accepted
FSI	38	Editorial 4.2	4.2, p 3, 1 3	E	Accepted
FSI	39	Editorial 4.2	4.2, p 3, 1 4	E	Accepted
FSI	40	Editorial 4.2	4.2, p 3, 1 5	E	Accepted
FSI	41	Editorial 4.2	4.2, p 3, 1 6	E	Accepted
FSI	42	Editorial 4.2	4.2, p 3, 1 6	E	Accepted
FSI	43	Editorial 4.2	4.2, p 3, 1 7	E	Accepted
FSI	44	Editorial 4.2	4.2, p 3, 1 7-8	E	Accepted
FSI	45	Editorial 4.2	4.2, p 4, 1 1	E	Modified, accepted
FSI	46	Editorial 4.2	4.2, p 4, 1 1	E	Accepted

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Submitter	Comment Number	Description	Location in Revision 8.0	Type	Resolution
FSI	47	Editorial 4.2	4.2, p 4, 12-3	E	Accepted
FSI	48	Editorial 4.2	4.2, p 4, 14	E	Modified, accepted
FSI	49	Editorial 4.2	4.2, p 5	E	Accepted
FSI	50	Editorial 4.2	4.2, p 6, 12	E	Modified, accepted
FSI	51	Concurrency limits	4.2, p 7	T	Modified, accepted
FSI	52	Editorial 4.2	4.2, p 8, 12	E	Accepted
FSI	53	Class 3 definition	4.2, p 8, 13	T	Modified, accepted
FSI	54	Concurrency limits	4.3, p 2, 13	T	Modified, accepted
FSI	55	Editorial 4.3	4.3, p 2, 13	E	Accepted
FSI	56	Editorial 4.3	4.3, T 2, 12	E	Modified, accepted
FSI	57	Mandatory/Optional	4.3, T 2, 12, 7, 8	T	No change
FSI	58	Mandatory/Optional	4.4, T 2	T	Modified, rejected
FSI	59	PRLI Image	4.4, p 1, 13	T	Modified, accepted
FSI	60	Clarify sequences	4.5, p 1, 12	E	Modified, accepted
FSI	61	Editorial 5.1	5.1, p 1, 11	E	Accepted
FSI	62	FQXID clarification	5.1, p 1, 12	T	Modified, accepted
FSI	63	Editorial 5.1	5.1, p 2, 11	E	Accepted
FSI	64	FQXID clarification		T	Modified, accepted
FSI	65	Mandatory/Optional	T 3, 1 T3	T	Rejected
FSI	66	Clarify action	T 3, 1 T5	E	Modified, accepted
FSI	67	Change reference	T 3, n 4	T	Accepted
FSI	68	SI definition	T 4, 1 I4, I6	T	Modified, accepted
FSI	69	Mandatory/Optional	T 4, 1 I5	T	Rejected
FSI	70	Move examples	5.3	E	Accepted

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Submitter	Comment Number	Description	Location in Revision 8.0	Type	Resolution
FSI	71	Editorial, Tables 5-13	T 5, I3	E	Accepted
FSI	72	Normative	5.3, p 1, 13	T	No change
FSI	73	Editorial, 5.3	5.3, p 1, 14	E	Accepted
FSI	74	Clarify Abort Task	5.3.9	T	Modified, no change
FSI	75	Class 3	5.4, p 1, 18	T	Modified, accepted
FSI	76	FQXID Clarification	5.5.2	T	No change
FSI	77	OX_ID values	5.5.9, p 1, 12	T	No change
FSI	78	Clarify base addresses	5.5.11, p 1	E	Modified, no change
FSI	79	Clarify base addresses	5.5.11, p 1, 14-5	T	No change
FSI	80	Optional function	5.5.11, p 1, 15-6	T	No change
FSI	81	Editorial, 6	6, p 2, 15	E	Accepted
FSI	82	PRLI Clarification	6.1, p 1, 12	T	Modified, accepted
FSI	83	PRLI Clarification	6.1, p 1, 13	E	Accepted
FSI	84	PRLI Clarification	6.1	T	Modified, accepted
FSI	85	Error presentation	6.1 p 5	T	Accepted
FSI	86	Unit Attention	6.1, p 5 12	T	Modified, accepted
FSI	87	PRLI Clarification		T	Modified, accepted
FSI	88	Editorial, 6.1	6.1, p 5 13	E	Accepted
FSI	89	PRLI Clarification	6.1, p 5 13	T	Accepted
FSI	90	PRLI Clarification	6.1, p 6	T	Rejected
FSI	91	PRLI Clarification		T	Modified, accepted
FSI	92	PRLI Clarification	6.1 p 7	T	Modified, accepted
FSI	93	Editorial 6.1.1	6.1.1, W 0	E	Modified, accepted
FSI	94	Correct typo, 6.1.1	6.1.1, W 0	T	Accepted

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Submitter	Comment Number	Description	Location in Revision 8.0	Type	Resolution
FSI	95	Correct typo, 6.1.1	6.1.1, W 0	T	Accepted
FSI	96	Correct typo, 6.1.1	6.1.1, W 3	T	Accepted
FSI	97	Include Reject to PRLI	6.1.1, W 3	T	Modified, accepted
FSI	98	Editorial 6.1.1	6.1.1, W 3	E	Modified, accepted
FSI	99	PRLI Clarification	6.1.1, W 3	E	Modified, accepted
FSI	100	Transfer disabled	6.1.1, W	T	Accepted
FSI	101	Editorial 6.1.1	6.1.1, W 3	E	Accepted
FSI	102	PRLI Clarification	6.1.1, W 3	E	Modified, accepted
FSI	103	Transfer disabled	6.1.1, W 3	T	No change
FSI	104	Clarify error sequences	6.1.1, W 2	T	Accepted
FSI	105	Clarify PLRO	6.2	E	Modified, rejected
FSI	106	Clarify PLRO	6.2, p 11	T	Modified, clarified
FSI	107	Editorial, 6.2.1	6.2.1	E	Accepted
FSI	108	Correct typo, 6.2.1	6.2.1 /w 0	T	Accepted
FSI	109	Clarify Category 6	7.1	E	Accepted
FSI	110	Address model	7.1.1, p 2, 13	T	Modified, accepted
FSI	111	Clarify 7.1.1	7.1.1, p 2, 11	T	No change
FSI	112	Change Abort Task	7.1.2, T 17	T	Modified, rejected
(FSI	113	Correct CLEAR ACA	7.1.2	T	Modified, accepted
FSI	114	Resource limitations	7.1.2	T	Modified, accepted
FSI	115	Correct N_Port term	7.1.2	E	Accepted
FSI	116	Correct N_Port term	7.1.2	E	Accepted
FSI	117	Mandatory/Optional	7.1.2	T	Modified, accepted
FSI	118	Correct N_Port term	7.1.2	E	Accepted

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Submitter	Comment Number	Description	Location in Revision 8.0	Type	Resolution
FSI	119	Change Abort Task	7.1.2	T	Modified, accepted
FSI	120	Editorial, 7.1.2	7.1.2	E	Accepted
FSI	121	Editorial, 7.1.2	7.1.2	E	Accepted
FSI	122	Error behavior	7.1.2	T	Modified, accepted
FSI	123	Editorial 7.1.3	7.1.3, p 2, 13	E	Accepted
FSI	124	Clarify zero data length	7.1.4	T	Modified, accepted
FSI	125	Editorial 7.2	4.2, p 1, 11	E	Accepted
FSI	126	Optional/Mandatory	7.2	E	No change
FSI	127	Length Error behavior	7.2, p 2, 13	T	Modified, accepted
FSI	128	Length behavior	7.2, p 4, 11	T	Accepted
FSI	129	Clarify Data Descriptor origin	7.2	E	Accepted
FSI	130	Maximum burst length	7.2.2, p 2	T	Accepted
FSI	131	Use of SEQ_ID	7.3, p 3, 11	T	No change
FSI	132	RO Error Behavior	7.3, p 3, 14	T	No change
FSI	133	Length Error Behavior	7.3, p 4, 12	T	Accepted
FSI	134	Overlaid Data	7.3, p 5	T	Modified, rejected
FSI	135	Data Management	7.3, p 6	T	Modified, accepted
FSI	136	Data Management	7.3, p 7	T	Modified, accepted
FSI	137	Data Management	7.3, p 8	E	Accepted
FSI	138	RO Error Behavior	7.3, p 9, 12	T	Modified, accepted
FSI	139	Editorial 7.3	7.3, p 10, 12	E	Accepted
FSI	140	Residual length	7.4, T 20	T	No change
FSI	141	Data Management	7.4.1	T	No change
FSI	142	Residual length	7.4.2, p 1, 14	T	Modified, rejected

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Submitter	Comment Number	Description	Location in Revision 8.0	Type	Resolution
FSI	143	Overlapping data	7.4.2, p 2-3	T	Modified, accepted
FSI	144	Editorial 7.4.4	7.4.4, p 2, 12	E	Accepted
FSI	145a	SCSI-2	7.4.5, p1, 11	T	Modified, accepted
FSI	145b	FCP_SNS_INFO	7.4.5	T	Accepted
FSI	146	Include examples in annex		E	Accepted
FSI	147	Clarify examples	Annex A	E	Accepted
FSI	148	Addressing model	Annex B	T	No change
HP	149	Annex A typographical error	Annex A	E	Accepted
HP	150	Dual port reset		T	Deferred
HP	151	Command State after Clear ACA		T	Accepted
Unitrode	152	SAM approval		E	No change
Unitrode	153	Table reference errors	5.3.9, T 13	E	Accepted
Seagate	154	Document reference		E	Accepted
Seagate	155	Untagged operation	5.5.10	T	No change
Seagate	156	Editorial, 6.1	6.1	E	Accepted
Seagate	157	PRLI Clarification	6.1, p 5	E	Modified, accepted
Seagate	158	Error Codes	6.1	T	Accepted
Seagate	159	PRLI Clarification	6.1	T	Modified, accepted
Seagate	160	PRLI Clarification	6.1	T	Modified, accepted
Seagate	161	PRLI Clarification	6.1, p 5	T	Accepted
Seagate	162	Use of Initiator/Target bits	6.1.1	T	No change
Seagate	163	PRLO Clarification	6.2	T	Modified, accepted
Seagate	164	PRLO Clarification	6.2	E	Accepted
Seagate	165	PRLO Clarification	6.2	T	No Change

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Submitter	Comment Number	Description	Location in Revision 8.0	Type	Resolution
Seagate	166	PRLO Clarification	6.2	E	Accepted
Seagate	167	ABTS Proposal	7.1.2	E	Accepted
Seagate	168	Missing from FC-PH		T	Accepted
Seagate	169	Missing from FC-PH		T	Accepted
Seagate	170	Missing from FC-PH		T	Accepted
Editor	171	Abort	4.3, T 2	E	Modified, rejected
Editor	172	Standard capitalization	all	E	Accepted
Editor	173	command byte count	7.1.4	E	Accepted

3 Ballot Comments

The editor proposes the following responses to the ballot comments made on Revision 008 of the SCSI FCP (X3T10/993D). Change bars indicate significant modifications or additions from the copy circulated in the FCP Review Meeting of April 18, 1994.

3.1 Comments generated by FSI:

Comment 1 Grammar

Comment:

Foreword, Line 2, Change "command," to "commands,".

Response:

The text is correct as written, specifically referring to "SCSI command, data, and status information". No change will be made.

Comment 2 Correct scope

Comment:

Introduction, Para. 1, Line 3, Change "performance serial" to "performance Fibre Channel".

Response:

Accepted.

Comment 3 Edit Introduction

Comment:

Introduction, Para. 2, Line 1, Change "Sequences" to "Exchanges and Information Units".

Response:

Accepted.

Comment 4 Edit Scope (Technical)

Comment:

Section 1 Scope, Para. 1, Line 1, Change "Upper Level Protocol (ULP)" to "mapping protocol (FC-4)".

Response:

Accepted. Also affects Foreword.

Comment 5 Edit References (Technical)

Comment: Section 2 Normative References, Delete reference to SCSI-2 Standard. It does not apply to this standard. Only SAM applies.

Response: The SAM document is the standard which the FCP is architected to implement. However, since its models are in large part compatible with SAM, are architecturally well understood, and complete those parts of the SCSI-3 document series which are not yet available, it is a valid reference and will be retained. Portions referenced from SCSI-2 include the format of REQUEST SENSE information and the use of certain link signaling conventions.

Comment 6 Edit References

Comment:

Section 2 Normative References, Update Revision Level on FC-AL to 4.2.

Response:

FC-AL is at the 4.2 revision.

Comment 7 Edit References**Comment:**

Section 2, Normative References, Update Revision Level on FC-FG to 2.1.

Response:

FC-FG is at the 2.1 revision.

Comment 8 Edit References**Comment:**

Section 2 Normative References, Update Revision Level on FC-SB to proper level.

Response:

FC-SB is at the 3.0 revision.

Comment 9 Information Units**Comment:**

Section 3.1.12, Line 2, Change "a single sequence" to "an". The Fibre Channel committee has requested that FC-4s not mention sequences, except in a passing manner. Information Units are to be referenced and Exchanges.

Response:

The definition will be modified to make it more consistent with the FC-PH, specifically Annex S which clearly identifies the relationship between sequences and information units.

"FC-PH service interface: a confirmed peer to peer service requested by the upper layer protocol that requests the transfer of a single information unit. In the absence of an FC-3, the transfer of an Information Unit by an FC-4 corresponds to the transfer of a Sequence by FC-PH. The services are listed below. [FC-PH, Annex S]"

Comment 10 Sequences**Comment:**

General, as in Comment 9, Delete all references to the term Sequence unless absolutely required to explain Fibre Channel structure. The term "Information Unit" is to be used instead.

Response:

Accepted. 4.1, para 3; 4.2, para 3; 4.2, para 4; 4.2, para 7; 4.3, para 2; Table 4, title; 7.1, para 2 are effected.

Comment 11 Service Interface (Technical)**Comment:**

Section 3.1.12, Paras. 2, 3, 4, and 5. Delete. Move to an Annex or leave as a reference to FC-PH, but delete details from the Glossary of terms. The confusion about ULPs and FC-4s in Comment 4 is evident in these paragraphs as well.

Response:

This appears to be the most appropriate location for the tutorial function that points to the appropriate documentation in FC-PH. The information is used in section 5.4. The rewording of the definition (Comment 9) should correct any confusion.

Comment 12 FCP I/O Operation**Comment:**

Section 3.1.13, Delete sentence 2. The explanation in the second sentence is not part of the SAM definition. This definition needs to delete the "FCP" in its name. The definition is the SAM definition for an I/O operation and is not unique to FCP.

Response:

The SAM defines an I/O Operation as an operation defined by an unlinked SCSI command, a series of linked SCSI commands, or a task management function. Within FCP, the I/O operation takes on the additional meaning of those information unit transfers and other activities that are performed across the Fibre Channel to implement a SAM I/O Operation. A SAM I/O Operation has beginning and end conditions that are time independent and interface independent. An FCP I/O Operation has timing conditions that indicate commencement and completion of the operation. Charles Monia has discussed this with me, and we have agreed that the definition and specification are correct. No change will be made.

Comment 13 Port names (Technical)**Comment:**

Section 3.1.14, Change "L_Port" to "NL_Port". An L_Port refers to either an NL_Port or an FL_Port in the Fabric topology.

Response:

Accepted. See also comment 29.

Comment 14 Port names (Technical)**Comment:**

General, Change all other references to "L_Port" to "NL_Port" unless the definition in Comment 13 is intended by the word.

Response:

Accepted. See also comment 29.

Comment 15 FQXID (Technical)**Comment:**

Section 3.1.15, In Clause 5.1, para. 1, the Responder X_ID (RX_ID) is identified as optional. Therefore, the RX_ID field cannot be used as a reliable part of the Fully Qualified Exchange ID. The Fully Qualified Exchange ID therefore is only a 64 bit value and is selected by the Initiator when an exchange is started.

With the addition of permission to use the association header (see clause 5.5.7) the use of FQXID as a stable reference for a task identifier (see 3.1.33) is untrue. A fundamental assumption of SAM seems to be a single, unchangeable identifier for the life of a task. In Fibre Channel, FQXID is not a stable, reliable, unchangeable entity as described here. Therefore, its use as the basis for a task identifier is in doubt.

Response:

After reviewing the cases of interest, it appears that the FQXID may actually have two different formats, depending on what FC-PH functions are used. The definition will be made ambiguous to contain all the definitions and the actual formats will be provided in section 5.1.

The basic formats are:

a) Simple case

D_ID//S_ID/OX_ID/RX_ID (where RX_ID is may be "FFFF"X)

b) Case using Operation Associator and XID invalidation

D_ID/S_ID/OOA/ROA

Comment 16 Information Units

Comment:

3.1.16, Delete "as a single sequence". See Comment 9.

Response:

This is a paraphrase (naming the FC-4 and naming the FC-2 interface) of the FC-PH definition in FC-PH Clause 3.1.77. No change would be allowed by the definition.

Comment 17 Logical Unit Defn (Technical)

Comment:

Section 3.1.17, Device service requests and task management functions are handled by Logical Units in a target SCSI device. Both SAM and FCP need to be updated to reflect this. SAM identified these functions as part of the Logical Unit.

Response:

The definition is modified to reflect the definition of logical unit in SAM, revision 13.

Comment 18 Initiator Identifier (Technical)

Comment:

Section 3.1.18, Delete reference to FC-PH. This is not a definition found in FC-PH as the other references to SAM and FC-PH are.

Response:

The reference was intended to indicate where the OX_ID was found. The text is corrected to reflect this.

Comment 19 Definition reference

Comment:

Section 3.1.22, Add the source of this borrowed definition (FC-PH or FC-AL).

Response:

The reference to FC-AL is made.

Comment 20 Port name (Technical)

Comment:

Section 3.1.23, Add the definition of NL_Port.

Response:

The reference to the FC-PH definition of N_Port is made.

Comment 21 Transfer Length (Technical)

Comment:

Section 3.1.24, The definition in 3.1.7 conflicts with this definition. Each command has an explicit or implicit transfer length. However, that length is not related to the number of bytes transferred,

except that the total bytes transferred is greater than or equal to the number implied by the command. This is consistent with error recovery procedures that exists today in SCSI where the target and logical unit are responsible to see to it that a sufficient number of bytes are transferred in the correct locations to provide coverage for the implicit or explicit transfer length. However, the total number of bytes transferred by the target may exceed this explicit or implicit count. This problem occurs again in the description of the FCP_DL field and the calculation of the residual count. A target must be allowed, in a standard way to transfer more than FCP_DL bytes to satisfy its responsibility to manage each command. (See 7.1.4 and 7.4.2.)

Response:

The SAM defines the command byte count as the net number of bytes to be transferred by the I/O Operation (Revision 12A, section 2.1.1) The SAM defines the request byte count as the number of bytes to be transferred by a particular data delivery request. Overlapped data delivery requests may occur, moving more data across the interface than is necessary to satisfy the command byte count. The definitions are correct and will remain unchanged. No change is required in 3.1.24 or 3.1.7. Comment 143 will address the FCP_DL definitions.

Comment 22 Command (Technical)

Comment:

Section 3.1.27, Change "task" to "command". Each command has a status. Completion of task is implied by the status value, but in FCP, completion is indicated in the choice of Information Units used by the target when sending status.

Response:

"Task" will be changed to "command". The second sentence of the comment is unclear and does not change any other part of the document.

Comment 23 FQXID (Technical)

Comment:

Section 3.1.28, In FCP, the Originator Exchange ID (OX_ID) uniquely identifies a task from an initiator to a target. Unlike SIP/SPI, FCP does not permit a tag value to be reused between logical units as this definition implies. An OX_ID used for any task to any logical unit from an initiator to the same target cannot be reused for any other logical unit until the task for the original logical unit completes. Therefore, FCP limits the total number of tasks in a single target through one port to 65535 from the same initiator, not 65535 per logical unit as this definition states.

Response:

The definition will be modified to reflect this characteristic. "tag: an identifier to uniquely identify tasks when more than one task has been requested by a given initiator for a given logical unit. [SAM] FCP uses the unique value of the Originator X_ID, defined in FC-PH, as a unique identifier for each task provided to any logical unit in the target."

Comment 24 Command (Technical)

Comment:

Section 3.1.29, Change "commands" to "tasks" or "I/O operations".

Response:

The definition of target will be changed to conform to SAM: "target: an SCSI device which receives SCSI commands and directs such commands to one or more logical units for execution."

Comment 25 Identifier Reference**Comment:**

Section 3.1.30, Delete the reference to FC-PH. The choice of identifier is made by FCP and has nothing to do with FC-PH.

Response:

The reference is corrected to indicate where the definition of the Destination_ID and Exchange Originator is found.

Comment 26 FQXID and RX_ID**Comment:**

Section 3.1.33, FQXID, as defined in 3.1.15 does not require RX_ID. The Source-ID, Destination_ID and OX_ID are sufficient to uniquely identify a task. The RX_ID field is optional and should be dropped from the definition of both FQXID and task identifier.

See comment 15. The FQXID value is not a stable reliable identifier in FC-PH that can be used as an unchanging task identifier for the life of a task. The Fibre Channel Association header and the process of exchange ID reassignment can cause changes to the OX_ID, RX_ID, S_ID and D_ID fields during the life of an exchange.

Response:

The corrected definition of FQXID in 3.1.15 and the text to be added to section 5.1 will allow the task identifier definition to be used unchanged.

Comment 27 Editorial convention**Comment:**

Section 3.3, Add a paragraph similar to the one below.

"In case of a conflict between text, tables and figures, the order of precedence for resolving a conflict is text, tables, and lastly, figures."

Response:

The following text from FC-PH will be added to section 3.3.

"In case of any conflict between figure, table, and text, the text takes precedence. Exceptions to this convention are indicated in the appropriate sections."

Comment 28 Topology definitions**Comment:**

Clause 4.1. The point-to-point topology, the Fabric topology and the Arbitrated Loop topology each provide a service to N_Ports or NL_Ports. FC-PH is a common transport service that operates with any of these topologies. Delete paragraph 2 or reword it. Each SCSI device must choose from one of the three topologies to connect with another SCSI device when using FCP.

IF there is to be a topology discussion, it is best delegated to an annex if it is needed at all in FCP.

Response:

The reviewers of Revision 7 of the FCP requested that FC-AL be explicitly included in the document. The first paragraph will include a reference to a switching fabric.

Comment 29 Layer definition (Technical)**Comment:**

Clause 4.1, para. 3. A ULP uses the services of an FC-4, not FC-PH. FC-4s use the services of FC-

PH. FCP is to be described in terms of Exchanges and Information Units (not sequences). Change "L_Ports" to "NL_Ports". In line 4, change "will be" to "are".

Response:

- a) Accepted. Also effects Foreword, 3.1.12, 3.2, 4.2, 6, 6.1, 7.4.5
- b) L_Port will be changed to NL_Port where appropriate.
- c) "are" is accepted.

Comment 30 Layer definition (Technical)

Comment:

Clause 4.1, para. 4. Fibre Channel ports are assumed to have a common service interface for use by FC-4s (not ULPs) (line 2). An example of the interface from a SCSI initiator ULP is specified in CAM. There is no equivalent for the target ULP.

Response:

Accepted, See comment 29.

Comment 31 Inclusion of frame info.

Comment:

Clause 4.1, para. 6, top of page 6. Delete "and frame structures". Fibre Channel FC-4s are not to deal with frames, only information units. The term frame should not appear in any FC-4. Each action between Initiator and Target needs to be defined as an Information Unit.

Response:

Accepted for Clause 4.1, 4.5.

Comment 32 Information Unit

Comment:

Table 1, line 3, Change "sequence" to "Information Unit".

Response:

The table is drawing the analogy between SCSI Request/Response Primitives and the comparable FC-PH primitive. The comparable FC-PH primitive (not the information payload) is the sequence. No change will be made.

Comment 33. Resource limitations (Technical)

Comment:

Clause 4.1, para. 7 (after Table 1). In SCSI, today, the number of concurrent tasks has been limited by initiator and logical unit implementations, not the port implementations. FCP limits the level of concurrent tasks to attributes of the port implementations and not the Initiator or Logical Unit. That is, the two ports used between an initiator and target may limit the task concurrency to a level below that of the initiator and logical unit implementations. A physical port change, rather than a possible firmware change, maybe required to increase the amount of concurrency. This is not consistent with other SCSI mappings. This limitation must be clearly stated since it is contrary to current practice and other SCSI-3 protocols.

Response:

In SCSI, today, the number of concurrent tasks has been limited by initiator and logical unit implementations. These are the ports for SCSI today and those limitations are port limitations. In any SCSI mapping, those limitations may be formulated by the architecture, by the port hardware, or by the port firmware. For targets implementing multiple logical units, the limitation may exist at

the logical unit level or at the target level. There is nothing unique to FCP in this respect.

To more clearly define to this characteristic, the sentence will be changed to read:

"The number of Exchanges that may simultaneously be open between an initiator FCP_Port and a target FCP_Port is defined by the FC-PH implementation. The architectural limit for this value is 65535. The maximum number of active Sequences that can simultaneously be open between an initiator FCP_Port and a target FCP_Port is defined by the FC-PH Sequence_ID as 256. To allow task management exchanges to be originated, a certain number of extra Exchange IDs and at least one extra Sequence ID should always be available."

Comment 34 Informative section

Comment:

Clause 4.2. This clause needs to be marked as "Informative".

Response:

The clause is tutorial, but has normative sections. No change is required.

Comment 35 FCP I/O Operation

Comment:

Clause 4.2, paras 1, 2, The term FCP I/O Operation includes more than just commands or lists of commands. Only the term "task" is appropriate here.

Response:

The term "task" refers only to the work created in a logical unit associated with a command or group of linked commands. The correct term for this is FCP I/O Operation. No change is required.

Comment 36 Editorial 4.2

Comment:

Clause 4.2, para. 2, Lines 1-2, Change "unsolicited command" to "Unsolicited Command" (See Table 1. See earlier discussion of using FQXID as the task identifier. The RX_ID field is optional and is not available to the initiator until AFTER the first command of each task is sent to the target. Then X_ID reassignment may change the values of the FQXID over time.

Response:

- a) Capitalize "unsolicited command".
- b) Redefinition of FQXID resolves the remainder of the comment.

Comment 37 Information Units

Comment:

Clause 4.2, para 2, line 6, Change "transfers" to "TUs".

Response:

Accepted.

Comment 38 Editorial 4.2

Comment:

Clause 4.2, para. 3, line 3, Change "described" to "describes".

Response:

Accepted.

Comment 39 Editorial 4.2

Comment:

Clause 4.2, para. 3, line 4, Change "solicited data sequence" to "Solicited Data IU".

Response:

Accepted.

Comment 40 Editorial 4.2

Comment:

Clause 4.2, para. 3, line 5, Change "information" to "payload".

Response:

Accepted.

Comment 41 Editorial 4.2

Comment:

Clause 4.2, para. 3, line 6, Change "described" to "describes".

Response:

Accepted.

Comment 42 Editorial 4.2

Comment:

Clause 4.2, para. 3, line 6, Change "solicited data sequence" to "Solicited Data IU".

Response:

Accepted.

Comment 43 Editorial 4.2

Comment: Clause 4.2, para. 3, line 7, Change "information" to "payload".

Response: Accepted.

Comment 44 Editorial 4.2

Comment:

Clause 4.2, para. 3, lines 7-8, Change "Data delivery request" to "Data Delivery Requests". (See Table 1).

Response:

Accepted.

Comment 45 Editorial 4.2

Comment:

Clause 4.2, para. 4, line 1, Change "transferred" to "transferred (if any)".

Response:

A modification to line 1 of paragraph 3 is preferred: "When the device server for the command has completed the interpretation of the command, has determined that data transfer is required, and is prepared...."

Comment 46 Editorial 4.2**Comment:**

Clause 4.2, para. 4, line 1, Change "command service request" to "Command Service Request".

Response:

Accepted.

Comment 47 Editorial 4.2**Comment:**

Clause 4.2, para. 4, lines 2-3, Change "Status Byte" to "Status".

Response:

Accepted.

Comment 48 Editorial 4.2**Comment:**

Clause 4.2, para. 4, line 4, Change "command status response is the last sequence of the Exchange and terminates the FCP I/O Operation" to "Command Status IU terminates the command. The choice of Information Unit type determines whether the task ends or continues to another command."

Response:

The last sentence will be changed to: "The Command Status IU terminates the command. The SCSI logical unit determines whether additional commands will be performed in the FCP I/O Operation. If this is the last or only command executed in the FCP I/O Operation, the FCP I/O Operation and the Exchange are terminated."

Comment 49 Editorial 4.2**Comment:**

Clause 4.2, para. 5, Page 7, Change "FCP I/O Operation" to "command".

Response:

Accepted.

Comment 50 Editorial 4.2**Comment:**

Clause 4.2, para. 6, line 2, Change "FCP I/O Operation." to "task. The choice of IU from the target determines whether the task continues."

Response:

The paragraph will be rewritten to say: "If the command is linked to another command, the FCP_RSP payload shall contain the proper Status indicating that another command will be executed. The target shall present the FCP_RSP in an IU that allows command linking. The initiator shall continue the same Exchange with an FCP_CMND IU, beginning the next SCSI command. All SCSI commands linked in the FCP I/O Operation except the last are executed in the manner described above."

Comment 51 Concurrence limits (Technical)**Comment:**

Clause 4.2, para. 7. This concept of task concurrency limited by the choice of the port you buy for

FCP must be clearly stated. Those not familiar to the concepts for identifying tasks for FCP may not recognize that, unlike SCSI SBP, the queue depth is determined by hardware and not software. If this method of limiting concurrency is acceptable to the X3T10 committee, FCP must clearly state it as a limitation and warning to potential users of FCP.

Response:

As pointed out in Comment 33, this concept is well understood and is typical of all SCSI environments. In particular, SBP has an architecturally limited number of nodes and a hardware and software resource limited number of simultaneously active transactions, depending on the "port" you buy. Comment 33 resolves this problem. This paragraph will be modified to say: "The number of FCP I/O Operations that may be active at one time depends on the queuing capabilities of the particular SCSI devices and the number of concurrent Exchanges supported by the FCP_Ports."

Comment 52 Editorial 4.2

Comment:

Clause 4.2, para. 8, line 2, Change "sequences of FCP I/O Operations" to "IUs of FCP".

Response:

Resolved by Comment 10.

Comment 53 Class 3 definition (Technical)

Comment:

Clause 4.2, para. 8, line 3. If "interlocked IU transmission" is part of FCP then it must be described here to permit Class 3. However, the proposal to use FCP in Class 3 on the arbitrated loop does not require interlocked IU transmission. Therefore, this requirement must be removed.

Response:

The referenced sentence will be changed to read: "Class 3 service may be used. The error recovery characteristics of Class 3 may require that it be allowed only in certain operating environments to meet reliability and error detection requirements."

Comment 54 Concurrence limits (Technical)

Comment:

Clause 4.3, Page 7, para.2, line 3, Change "sequence" to "IU".

Unlike SIP/SPI, the limitations of a Fibre Channel port to start a new exchange may limit the ability of an initiator to perform task management functions in a timely manner. For example, if the limit of the number of concurrent exchanges is reached between an initiator and a target (across all logical units), the initiator is unable to start a new exchange to perform task management functions. This is a potentially serious limitation since each initiator must not attempt to use the last exchange it has available with each of N targets to be able to start the appropriate task management functions when required to each target. This operational limitation does not exist in the other protocols. If this behavior is acceptable to the X3T10 committee, this limitation must be placed in the standard as a warning to implementers. This limitation is not obvious to those who have a casual acquaintance with Fibre Channel and may cause serious implementation or operational difficulty if not fully understood and plainly stated in the FCP standard.

This problem of allocation of concurrent open exchange resources in a port also requires low level

resource allocation in the initiators and targets that is not currently required in the other SCSI mappings.

Response:

a) See Comment 10.

b) See Comment 33. Note that the architectural limitation only exists between D_ID/S_ID pairs and not among multiple targets, simplifying any required management functions. No change is required in this section.

Comment 55 Editorial 4.3

Comment:

Clause 4.3, para. 2, line 3, Change "CDB of" to "FCP_CDB field in".

Response:

Accepted.

Comment 56 Editorial 4.3

Comment:

Clause 4.3, Table 2, line 2, column 2, Change "Login/Logout" to "Process Login/Logout". Login and Logout (without the "process" adjective) has an entirely different meaning in Fibre Channel.

Response:

To correctly define all the parameters that control the operation of an FCP device, the implicit or explicit login parameters for N_Port Login/Logout, Fabric Login/Logout, and Process Login/Logout must all be known.

The line will be removed from the table, since PRLI/PRLO are contained in section 4.4.

Section 4.5 will be expanded to say:

"FC-PH allows management protocols above the FC-PH interface to perform link data functions. The standard FC-PH Primitive Sequences, link management protocols, and Basic and Extended Link Services are used as required by FCP devices. Implicit login functions are allowed."

Comment 57 Mandatory/Optional (Technical)

Comment:

Clause 4.3, Table 2, lines 2, 7, and 8. These functions should be mandatory in the FC-4. The capability to perform these actions is dependent on the SCSI ULP, especially the last two. They are discoverable attributes managed by the Inquiry data and the ACA field of the CDB. The FC be able to manage these functions when the Initiator and logical units agree to use the functions. This is the first of several instances where the FC-4 appears to be arbitrarily limited when interoperability from some profile is a logical constraint. The FCP-FC-4 must support the functions. Whether they are invoked or not is up to the ULPs and not of concern to the FCP FC-4 or the ports. As a general rule, any functions that are logically managed SHALL be supported by the FC-4. Otherwise, a SCSI device may implement a function which cannot be performed because of the choice of FC-4 or port manufacturer.

Response:

After considerable discussion, the SAM document has been modified to indicate clearly which functions are mandatory for all protocols; which functions are mandatory for a protocol to define but optional for a SAM compliant device to implement; and which functions are optional for both a

SAM compliant protocol and a SAM compliant device implementation. It is the intent of FCP to define how these functions are implemented, but allow them to be optional for compliance with FCP. This also serves as a warning to software designers that compliant ports are allowed to not implement certain functions. Software designers should use alternate mandatory mechanisms for generic drivers. No change is required in these lines.

Comment 58 Mandatory/Optional (Technical)

Comment:

Clause 4.4 and Table 2. The FC-4 must support this function if called upon to perform it. The ULP is not obliged to support it. That is, implicit process login is a function of the ULPs and not of either the FC-4 or the FCP_Ports.

Response:

The FCP document defines the mechanisms for implementing PRLI/PRLO. Compliant devices may choose to use an implicit login process and reject explicit PRLI operations. The first sentence of the text is modified to read: "The Process Login/Logout Extended Link Service is optionally used to establish the operating relationships between two FCP_Ports. Implicit Process Login/Logout parameters may be defined for FCP_Ports."

Comment 59 PRLI Image (Technical)

Comment:

Clause 4.4, para. 1, line 3, the concept of "multiple images" has been added and appears to violate the definition of unique initiator or target identification based on the S_ID or D_ID field values as specified elsewhere in FCP. Since it appears that adopting the FC-SB Process Login/Logout protocol introduces the concept of multiple images, the ULPs cannot depend on the S_ID field to unequivocally identify the initiator or the target. The process associator permitted with this type of process login and the rules for use in FC-PH adds a new identifier potentially for either the initiator or target or both which is NOT an alias of the S_ID or D_ID values. The S_ID and D_ID identify generally which initiators or target images are involved, but not exactly. An optional header is required to uniquely identify the initiator or target. This is contrary to other parts of FCP.

Response:

In all cases, the FQXID is unique as defined by comment 15. The use of images defined by the Process Associator creates logically independent targets and initiators behind an FCP_Port, but does not encroach on the information contained in the FQXID. The definition of images will be included in section 6. The addressing is also discussed in 5.1, as referenced by Comment 62.

Comment 60 Clarify sequences

Comment:

Clause 4.5, para. 1, line 2. Primitive Sequences (notice capitalization from FC-PH), are not associated with either basic or extended link services. Reword the second sentence to correct this implication. Change "frames" to "Sequences". All basic and extended link services are implemented as an exchange of Sequences.

Response:

See comment 56, which rewrites this clause.

Comment 61 Editorial 5.1

Comment:

Clause 5.1, page 9, para. 1, line 1, Change "fibre channel" to "Fibre Channel".

Response:
Accepted.

Comment 62 FQXID clarification (Technical)

Comment:

Clause 5.1, para. 1, line 2. After Process Login with Process Associator required, the FQXID no longer identifies either the initiator or the target or both. Identification depends on the contents of the optional header called the Association Header. This paragraph and the concepts of initiator and target identification in FCP require rethinking and reworking before it we have a workable set of definitions and unequivocal identification of initiators and targets.

Response:

Clause 5.1, first paragraph, is rewritten as follows:

“Addressability to each Fibre Channel FCP_Port is defined by the Source and Destination FCP_Port address identifiers. Identification of FCP I/O Operations on the Fibre Channel is achieved by using the Fully Qualified Exchange Identifier (FQXID). The FQXID is defined in the following table. The method used to identify FCP I/O Operations internal to the application client and the device server is not defined by this standard.

Table defining Fully Qualified Exchange Identifier (FQXID)

Condition	D_ID	S_ID	OX_ID	RX_ID	OOA	ROA	
Basic Operation	R	R	R				Identified by initiator
Basic Operation	R	R	R	R			Identified by target
X_ID Invalidation	R	R			R		Identified by initiator
X_ID Invalidation	R	R			R	R	Identified by target

The target is required to be cognizant of the OX_ID to perform error recovery and task management functions.”

Additional modifications are made to the paragraphs to indicate the role of the Process Associator in the FQXID. It has no role.

Comment 63 Editorial 5.1

Comment:

Clause 5.1, para. 2, line 1, Delete “SCSI Devices and”.

Response:

Accepted.

Comment 64 FQXID clarification (Technical)

Comment:

The FQXID is not a stable value when X_ID reassignment is active by either SCSI Device. A new handle to provide unequivocal identification is required.

Response:

See Comment 62

Comment 65 Mandatory/Optional (Technical)

Comment:

Table 3, page 10, Row T3, Change the M/O column value to M. The FC-4 must be capable of supporting the processes of the Initiator and Logical Units.

Response:

Command linking is a SAM option that is defined by FCP for compliance. Implementations are not required to support command linking for compliance with FCP.

Comment 66 Clarify action

Comment:

Table 3, page 10, Row T5. There must be a set of values chosen for this action. In Fibre Channel, either Sequence Initiative (SI) is transferred or it is not. The standard cannot be ambivalent. Fill in the value needed to correctly cause the processing intended.

Response:

The X value for Task Management functions will be changed to "hold".

Comment 67 Change reference (Technical)

Comment:

Table 3, page 10, Note 4, Change T10 to T11.

Response:

Accepted.

Comment 68 SI definition (Technical)

Comment:

Table 4, page 11, Rows I4 and I6, Change the SI values to acceptable values. Even though these are the last information units of an I/O process, valid sequence initiative values are required by Fibre Channel to be placed in the header fields.

Response:

Sequence Initiative will be transferred to simplify FCP_RSP generation.

Comment 69 Mandatory/Optional (Technical)

Comment:

Table 4, page 11, Row I5, Change the M/O column value to M. The FC-4 must be capable of supporting the processes of the Initiator and Logical Units.

Response:

Command linking is a SAM option that is defined by FCP for compliance. Implementations are not required to support command linking for compliance with FCP.

Comment 70 Move examples

Comment:

Clause 5.3. Move this entire clause to Annex A. It is purely exemplary material.

Response:

Accepted.

Comment 71 Editorial, Tables 5-13**Comment:**

Tables 5 - 13, Change "UT" to "IU".

Response:

Accepted.

Comment 72 Normative (Technical)**Comment:**

Section 5.3, para. 1, line 3, Move the sentence beginning "Sequence streaming...." to clause 5.2. This is an allowable option for an implementation and needs to be removed from these examples.

Response:

This case is already covered by Note 4 in Table 3 and Note 3 in Table 4. No change is required.

Comment 73 Editorial, 5.3**Comment:**

Clause 5.3, para. 1, line 4, Delete the last sentence.

Response:

Accepted.

Comment 74 Clarify Abort Task (Technical)**Comment:**

Clause 5.3.9, the Abort task function cannot be accomplished using any IU defined in the standard. An example of how it is proposed to be handled needs to be given. The ULP is not aware, or should not be aware that Fibre Channel is being used. Therefore, an FC-PH link level request is beyond its power to request. Explain the sequence of events that causes this action to be taken.

Response:

The ULP is not aware that Fibre Channel is being used. The mapping level FC-4 is certainly aware and uses link services made available to it through the FC-PH service interface as described in examples in Annex S, Clause S.3. The ABORT TASK task management function is performed using the mechanism described in section 7.1.2, page 25.

Comment 75 Class 3 (Technical)

Comment: Clause 5.4, para. 1, line 8, The concept of "interlocked IU transmission" is not defined. This concept must be defined since there is a proposal to operate FCP using class 3. This process is a required operational procedure that must appear in FCP.

Response: This was previously addressed by Comment 53 applying to Clause 4.2. The sentence should be removed from 5.4.

Comment 76 FQXID Clarification (Technical)**Comment:**

Clause 5.5.2 and 5.5.3, The FQXID is improperly defined when the FC- 4 login indicated that process associators are to be used. The D_ID and S_ID fields do not correctly define the initiator or target in this case. Since the FC-4 login is required, the proper identifiers must be made clear in all circumstances and not left out of the standard. When process associators are being used, the S_ID and D_ID values may change over the course of a task and still the integrity of the task between an

initiator and a logical unit is correctly maintained. I realize that in one of the industry group profiles that process associators are not permitted, but this is the FCP standard and not that profile. The standard must reflect the true power and flexibility permitted by the tools in FC-PH. The FC-4 login/logout process adds a new dimension to naming initiators and targets. The name is loosely coupled to a SET OF PORTS and not to a single port as occurs in SIP/SPI. Refer to Annex R in FC-PH for managing exchanges with association headers. This area is not complete in FCP.

Response:

The Process Associator is not the identifier of the Exchange during XID Invalidation. The Operation Associator is the required parameter and is not part of the PRLI definition. The expansion of the FQXID definition in comments 5 and 62 will resolve this problem. No change is required in 5.5.2 or 5.5.3 to be compliant with the change.

Comment 77 OX_ID values (Technical)

Comment:

Clause 5.5.9, para. 1, line 2. This restriction on not being allowed to use an OX_ID of "FFFF" is unnecessary. FC-PH permits this value which allows only one exchange between a port pair. This is very similar to the "untagged I/O process mode" in SCSI-2 and untagged tasks in SAM. This value should be allowed. A note about the effect might be appropriate, but the value should not be prohibited. In simple systems only one resource may be all that is needed and FC-PH permits such a simple implementation. FCP is not reduced in any way or otherwise incorrect if this value is permitted.

Response:

FC-PH Revision 18.9 indicates that if OX_ID is allowed to be hexadecimal 'FFFF' for all exchanges, that the originator is using an alternate sequence tracking mechanism. At present, no such mechanism is defined for FCP and the requirement for a separate exchange for some task management functions requires that more than one exchange per S_ID/D_ID pair be allowed. As a result, it is appropriate for the FC-4 to prohibit the use of an OX_ID of 'FFFF'. No change is required.

Comment 78 Clarify base addresses

Comment:

Clause 5.5.11, para. 1, First, both the initiator and target have base addresses. This is not exclusively a property of an initiator. Second, the base address inside either SCSI device is never exchanged with the other in FCP so a long discussion is of little value. Relative offset requires more work since the casual reader may have no idea about the management of relative offset in FC-PH. Therefore a discussion is warranted and the rules should be very clear. Relating the relative offset use to IUs by name is a way to simplify this problem.

Response:

The target does not define a base address for data transfers in SAM. The SAM uses words that mean "base address", specifically "start of the buffer" and applies them only to buffers in the application client. It is the responsibility of the SCSI target to understand the meaning of each segment of data in the context of the particular command being executed. The definition of Base Address is taken from FC-PH, section 18.11, which indicates that it is the responsibility of the ULP/FC-4 to define the meaning. The concept is clearly defined in 3.1.5. The IUs that use the Solicited Data Category will be listed in the text.

Comment 79 Clarify base addresses (Technical)**Comment:**

Clause 5.5.11, Para. 1, lines 4-5. The base address does not refer to the first byte of any IU. In category 5, there is a header of 12 bytes in front of the data bytes of interest to the SCSI device. This error must be corrected.

Response:

Section 18.2, tables 30-32 of FC-PH indicate that the original text of 5.5.11 is correct. No change is required.

Comment 80 Optional function (Technical)**Comment:**

Clause 5.5.11, para. 1, lines 5-6. An option is given without a definition of the means to decide when and if it can be used by an initiator and a target. This means must be specified.

Response:

FC-PH indicates that F_CTL bit 3, together with the LOGI service parameters is used to indicate whether or not an RO is required and present. It does not appear necessary to duplicate this clause (18.11) of FC-PH in the FCP document. No change is required.

Comment 81 Editorial, 6**Comment:**

Clause 6, para 2, line 5, Change "acceptance" to "acceptance or rejection". On the same line, change "acceptance or rejection to" to "response to".

Response:

Accepted.

Comment 82 PRLI Clarification (Technical)**Comment:**

Clause 6.1, para. 1, line 2. The concept of "process images" is unknown in SCSI and requires development and explanation on its function and use in SCSI-3 since the text permits use of this function of FC-PH by initiators and targets. A reference to FC-SB is insufficient. Paragraph 2 also has text about multiple images that must be corrected, if required. The SCSI-3 actions specified for receipt of a PRLI seem to indicate that only one at a time is valid. Is something missing?

Response:

The following text will be added to indicate the effect of creating image pairs and assigning them properties. The text is added as a new paragraph after paragraph 2.

"The effect of the creation of image pairs is to create one or more virtual initiators or virtual targets behind each FCP_Port. As an example, an FCP_Port can identify itself to another FCP_Port as having one or more logically separate SCSI FCP initiators, one or more logically separate SCSI FCP targets, and a number of logically separated processes performing other FC-4 mappings. The FCP_Port receiving the PRLI can reject it, indicating that it cannot support the required functions, or accept it."

Comment 83 PRLI Clarification**Comment:**

Clause 6.1, para. 1, line 3, last sentence. It is not obvious that Table 14 permits more than one process

associator in each direction. Please explain the mechanism or delete the sentence or indicate that the login may be used more than one time, if that is the case.

Response:

Accepted

Comment 84 PRLI Clarification (Technical)

Comment:

Clause 6.1, Since the PRLI is like an IU, it must be described as such with all of the values for the header fields clearly stated in the standard. The accept is not a normal frame so that must be explained and the frame header contents also specified.

Response:

The sequences follow standard FC-PH behavior for extended link services. No information other than a reference to FC-PH is necessary in FCP.

Comment 85 Error presentation (Technical)

Comment:

Clause 6.1, para. 5, The contents of the SENSE KEY and ASC and ASCQ fields are not specified. If existing values are to be used, they must be specified. If new values are required, a proposal must accompany specification of this behavior specifically for the FCP standard.

Response:

The text (now moved) will indicate that the 29-00 Reset Occurred ASC will be presented with the Unit Attention condition.

Comment 86 Unit Attention (Technical)

Comment:

Clause 6.1, para. 5, line 2, the Unit Attention is "reported" not transmitted. Since asynchronous event reporting is optional, the Unit Attention must be queued until the initiator starts a task, and then only reported for certain commands.

Response:

Corrected by rewrite.

Comment 87 PRLI Clarification (Technical)

Comment:

When a new initiator logs in with a target, it should not cause the equivalent of a Target Reset, which is the reaction specified. There seems to be no need to report that a new initiator has logged in with a target. There is no such behavior in SCSI-2 or in any of the other protocols. This specification seems to create an undue instability in the system. Note also that since targets can login to initiators, an intermittent use device, like a scanner, can totally destroy a system environment by the simple act of logging in. This action must be altered to not be so disruptive.

Also, since the login procedure is symmetrical, what is the reaction of an initiator that is logged in to by a target. That is, if the target sends the PRLI, is the initiator reset. I believe that it must be to be consistent with the behavior required of targets when they receive a login.

Response:

The PRLI description is corrected to show that it is only for the newly established image pair that the newly Reset condition appears to be present.

Comment 88 Editorial, 6.1**Comment:**

Clause 6.1, para. 5, line 3, Change "sate" to "state".

Response:

Corrected by rewrite.

Comment 89 PRLI Clarification (Technical)**Comment:**

Clause 6.1, para. 5, line 3, Reword the sentence beginning "No tasks...." to state that all tasks shall be aborted, no status is returned for any task, and all reservations are released by the affected SCSI device. See comment 87 for symmetrical behavior requirements in this area for initiators.

Response:

Accepted.

Comment 90 PRLI Clarification (Technical)**Comment:**

Clause 6.1, para. 6. Every device must have some default PRLI payload values. What it does not know is the default of the other SCSI devices with which it communicates. Storing information by S_ID or D_ID is not acceptable. The Fabric or arbitrated loop may cause the physical addresses of the ports to be reassigned.

Therefore, it seems that PRLI is explicitly required between any two SCSI devices before they can communicate using I/O Operations. That is, one device may have its defaults set to Command/Data Mixed Allowed and the other one have that attribute prohibited. These two SCSI devices will not communicate effectively.

Response:

For configurations that have been established by user modification of configuration information, there may be no requirement to determine the capabilities and requirements of a set of devices. In those cases, PRLI is explicitly optional.

Comment 91 PRLI Clarification (Technical)**Comment:**

General, As noted in the comment 90 above, since the S_ID is probably more unstable a value than a SPI SCSI device address, how is MODE/SELECT-SENSE parameter saving managed with FCP?

Response:

The S_ID can be modified only with the explicit knowledge of key components of the system. As an example, changes are known to the fabric in a fabric based system or to all devices in a loop based system. When PRLI is optional, PLOGI will establish the same state as a PRLI would normally, including the establishment of a Unit Attention condition and all reset states.

Comment 92 PRLI Clarification (Technical)**Comment:**

Clause 6.1, para. 7, Receipt of a new PRLI is not so much a request to modify as it is to perform an implicit logout and a new login. It should be stated as such and the rules for behavior then restated in this light.

Response:
Accepted. Included in rewrite.

Comment 93 Editorial 6.1.1

Comment:
Clause 6.1.1, Word 0, Bits 3-24, para. 1, line 1, Change "16-byte set" to "PRLI".

Response:
The word "Service Parameter page" will be used. Accepted.

Comment 94 Correct typo, 6.1.1 (Technical)

Comment:
Clause 6.1.1, Word 0, Bit 15, paras. 1-2, Change "word 2" to "word 1".

Response:
Accepted

Comment 95 Correct typo, 6.1.1 (Technical)

Comment:
Clause 6.1.1, Word 0, Bit 14, paras. 1-2, Change "word 3" to "word 2".

Response:
Accepted.

Comment 96 Correct typo, 6.1.1 (Technical)

Comment:
Clause 6.1.1, Word 3, Bit 4, para 1, line 2, Change "2 and 3" to "5 and 4".

Response:
Accepted.

Comment 97 Include Reject to PRLI (Technical)

Comment:
Clause 6.1.1, Word 3, Bit 4, para. 1, top of page 20, Define a response of FCP_RJT.

Response:
This should really cause the presentation of a new Response Code. I have requested that for FC-SB and have included it in the document.

Comment 98 Editorial 6.1.1

Comment:
Clause 6.1.1, Word 3, Bit 3, para. 1, line 2, Change "data are" to "data shall be".

Response:
Accepted.

Comment 99 PRLI Clarification

Comment:
Clause 6.1.1, Word 3, Bit 3, para. 1, last sentence. The only time these parameters are exchanges is during a PRLI exchange. This sentence does not make sense. Perhaps it should be deleted.

Response:

This invalid combination is really another case where the new FC-SB Response Code should be used. See comment 97.

Comment 100 Transfer disabled (Technical)**Comment:**

Clause 6.1.1, Word 3, Bit 3, para. 2, The relationship between Word 3, Bit 3 and Word 3, Bit 0 must be stated in a table. There are at least two valid combinations acceptable. Paragraph 2 states one rule. The term "write operation" is undefined.

Response:

Accepted.

Comment 101 Editorial 6.1.1**Comment:**

Clause 6.1.1, Word 3, Bit 2, para. 1, line 2, Change "data are" to "data shall be".

Response:

Accepted.

Comment 102 PRLI Clarification**Comment:**

Clause 6.1.1, Word 3, Bit 2, para. 1, last sentence, The only time these parameters are exchanges is during a PRLI exchange. This sentence does not make sense. Perhaps it should be deleted.

Response:

The wording is corrected to explain this case.

Comment 103 Transfer disabled (Technical)**Comment:**

Clause 6.1.1, Word 3, Bit 2, para. 1, The relationship between Word 3, Bit 2 and Word 3, Bit 1 must be stated in a table. There are at least two valid combinations acceptable. The term "read operation" is undefined.

Response:

Since the relationship does not depend on proper transfer of initiative, there is no mandatory relationships between bits 2 and 1. No change is required.

Comment 104 Clarify error sequences (Technical)**Comment:**

Clause 6.1.1, Word 2, Bit 2, para. 1, There seems to be no rationale for unconditionally using I6 or I7 as the only response when data and response may be combined in one IU. A check condition between bursts can cause the last response for a command to be I4 which violates the "shall" in this paragraph. Also, a Terminate Task message can cause the same behavior. Therefore, a target is granted PERMISSION to use IUs I6 and I7, but it shall not be required to use them as the only means of response.

Response:

Accepted

Comment 105 Clarify PLRO**Comment:**

Clause 6.2, para. 1, line 2, Change "pairs" to "pair. No case for sending multiple pairs has been established.

Response:

FC-SB allows multiple pages of PRLO information to be transmitted. This section was clarified by the rewrite.

Comment 106 Clarify PLRO (Technical)**Comment:**

Clause 6.2, para. 1, Since either SCSI device may logout, the behavior for initiators receiving the logout must be specified. It appears that both devices are forced into reset when either logs out or logs in. This is extreme behavior and probably should be rewritten. The dynamic behavior of systems means that a lot of disruption occurs for no valid reason. Such behavior has not been part of SCSI in the past and it does not appear in other protocols. Perhaps it is overkill here, too.

Response:

The text is clarified to indicate that only the two images and their communications are reset. Other image pairs, even those using the same PA and FC-4, are not affected by the PRLO.

Comment 107 Editorial, 6.2.1**Comment:**

Clause 6.2.1, Word 0, Bits 31-24, Change "16 byte set" to "PRLO".

Response:

Accepted. Text was removed during rewrite.

Comment 108 Correct typo, 6.2.1 (Technical)**Comment:**

Clause 6.2.1, Word 0, correct all word references for words 1 and 2.

Response:

Accepted. Text was removed during rewrite.

Comment 109 Clarify Category 6**Comment:**

Clause 7.1, It should be clearly stated that the first 8 bytes of the FCP_CMND IU are controlled by FC-PH and not subject to change. This is a side effect of using category 6.

Response:

In section 7.1.1, the first paragraph will have a second sentence added indicating: "The FCP_LUN field is specified by FC-PH for all IUs of Category 6."

Comment 110 Address model (Technical)**Comment:**

Clause 7.1.1, para. 2, line 3, Change "device at the FCP_Port" to "Logical Unit". SAM has no assumption that one logical unit in a target has any cognizance of or information about the next Logical Unit if any. The behavior identified in this paragraph is contrary to both SAM and historical SCSI target operation. Therefore, one Logical Unit is to be considered totally independent from the

next. The only thing in common may be sharing a common access port to the service delivery subsystem. Therefore, no hint about internal address structure or other information can be guaranteed to be available from or desirable from Logical Unit 0.

The wording in this paragraph has not been accepted by the X3T10 as acceptable standard behavior. We deleted the concept of a target routine which is a more likely spot to find such information since it must route information to the Logical Units, but that still means that the Logical Units are independent. I realize that the 64-bit address space used with FCP is too large to poll, but Logical Unit 0 has been allowed to be and should remain an independent entity as it historically has been.

Find some other mechanism for determining the Logical Units that exist in a Target than the one specified here. Also, this text seems to assume a homogeneous set of Logical Units per target - that too is not an acceptable assumption.

Is the address structure in Annex B the one accepted by X3T10 for SCC model devices? Since the project is just in the approval process, this assumption in FCP seems to be in error. If it were worded as one way to approach the problem that might be instructive, but I don't think it is necessarily THE way.

Response:

The text will be modified to indicate that other logical units can be identified only for those SCSI device models that define an address structure. The last sentence will be changed to read: "An example of a four-layer hierarchical address structure suitable for use by a SCSI RAID device model is given in Annex B."

Comment 111 Clarify 7.1.1 (Technical)

Comment:

Clause 7.1.1, para. 2, line 1, Change "command" to "I/O operation". Delete the second sentence. In the INQUIRY command, if the command is sent to an invalid logical unit, a response is generated. There has been no proposal to change that behavior in SPC. Therefore, some commands may respond with invalid logical unit selection, but at least one command has an alternative behavior. If the behavior as stated is accepted, all targets on all protocols require the same response and some of the values in the Qualifier field, or the entire Qualifier field may be eliminated from the INQUIRY response. With the behavior specified, no information about potential logical units is available.

Response:

- a) Command is the proper word in this context.
- b) The second sentence is modified according to Comment 110.
- c) SAM requires that LUN 0 exist.

No change is required by this comment.

Comment 112 Change Abort Task (Technical)

Comment:

Clause 7.1.2, Table 17. If the terminate task function can be accomplished by an IU, then the Abort Task function can also be accomplished by an IU. If this is not true, then the Terminate Task function must follow the model of the Abort Task function. The constraints on access to the logical unit are the same when either task management function is required. They should be handled in a similar fashion. The single exception for handling the Abort Task function is curious. If sequence initiative

is not available, as it may not be in either case, use the request sequence initiative protocol and then send a common IU. Define Byte 2, bits 4, 3, or 0 as the Abort Task function. See the definition of Terminate Task on page 24. Abort Task should behave in a similar consistent fashion.

Response:

Terminate Task and Abort Task are two quite different functions.

The only promise of Terminate Task is that the device will try to terminate an operation early if possible. The task must be terminated normally in every respect except possibly for a reduced amount of data transferred. The Terminate Task can be ignored at every state of its execution. Because of these characteristics, Terminate Task must be offered to the target in a manner that will not disrupt the devices ability to properly complete the command.

The promise of Abort Task is that, when performed, the device will immediately stop all efforts to complete the operation. No notification about the completion state of the task is required. Abort Task need not be concerned about disrupting the device and should have a high probability of correct delivery, even when the FCP protocol would not normally allow its transmission. The Recovery Abort protocol meets these requirements.

Recovery Abort should probably be defined separately for use by the Abort Task task management function. See comment 117.

Comment 113 Correct CLEAR ACA (Technical)

Comment:

Clause 7.1.2, page 24, CLEAR ACA, Delete the last two sentences. This behavior has no business in FCP or in any other protocol.

Response:

The sentences are changed to paraphrase SAM: "All subsequent... resume execution" is changed to: "When the task manager clears the auto contingent allegiance condition, any task within that task set may be completed subject to the rules for task management specified by SAM."

Comment 114 Resource limitations (Technical)

Comment:

Clause 7.1.2, General, Since a new exchange is required to perform several of these functions, the Initiator and Target must never use their last exchange resource for a normal task. Unlike SIP/SPI, the maximum number of tasks that can be outstanding is as much a function of the port you buy as the firmware you use. This restriction must be clearly stated each time the problem arises. In SIP/SPI the maximum number of concurrent tasks is controlled strictly by firmware and the protocol is not involved. With FCP, the FC-PH protocol can be a major limiting factor on the ability to start concurrent tasks.

Response:

This comment is completely addressed by the resolution to Comment 33.

Comment 115 Correct N_Port term

Comment:

Clause 7.1.2, pages 24-25, Target Reset, para. 3, Change "N_Port" to "FCP_Port" in 5 places.

Response:

Accepted.

Comment 116 Correct N_Port term

Comment:

Clause 7.1.2, page 25, Clear Task Set, para. 3, Change "N_Port" to "FCP_Port" in 6 places.

Response:

Accepted.

Comment 117 Mandatory/Optional (Technical)

Comment:

Clause 7.1.2, page 25, Abort Task Set, para 1, Delete the two sentences starting at "The bit is optional in FCP.". FCP cannot restrict those functions delegated to Initiators. Therefore, it shall be permitted otherwise, incompatible FCP devices result. That is, one device uses the Abort Task Set request and the other does not. This incompatibility is not acceptable. Neither should FCP presume to know the protocol and content of the requests since these are ULP functions and not FC-4 functions. Substitution of one action for the other violates the layering rules we are trying to establish in SCSI-3.

Response:

Abort Task Set is made mandatory. The Recovery Abort function is defined as a mechanism that is used for Abort Task and to assist in Abort Task Set, Clear Task Set, and Target Reset.

Comment 118 Correct N_Port term

Comment:

Clause 7.1.2, page 25, Abort Task Set, para. 3, Change "N_Port" to "FCP_Port" in 3 places.

Response:

Accepted.

Comment 119 Change Abort Task (Technical)

Comment:

Clause 7.1.2, page 25-26, Abort Task, Implement it in the same way as Terminate Task. They are similar. The procedure for terminating a task and aborting a task are similar and are logical functions, not FC-4 functions. Handle them using a similar protocol.

Response:

See Comment 112. No change other than that proposed by Comment 117 is required.

Comment 120 Editorial, 7.1.2

Comment:

Clause 7.1.2, page 25, Abort Task, para. 1, line 6, Delete "switching". Change N_Port to FCP_Port in para 3 also.

Response:

Accepted

Comment 121 Editorial, 7.1.2

Comment:

Clause 7.1.2, page 26, Execution Management Codes, add "Byte 3" to the end of the topic label.

Response:

Accepted.

Comment 122 Error behavior (Technical)

Comment:

Clause 7.1.2, page 26, Write Data. FCP must specify the behavior should an initiator set both the read and write data fields to 1b. No behavior is specified. It is insufficient to prohibit initiators from doing this.

Response:

Since this is a perfectly controlled bit by a trusted source of information, the text of FC-PH with respect to the violation of mandatory restrictions should be applied. The text should be placed in section 3.3.

"The term "shall" is used to indicate a mandatory rule. If such a rule is not followed, the results are unpredictable unless indicated otherwise."

Comment 123 Editorial 7.1.3

Comment:

Clause 7.1.3, para. 2, line 3, Change "nor examined by the Target" to "and shall be ignored by the Target. The shall is needed here.

Response:

Accepted.

Comment 124 Clarify zero data length (Technical)

Comment:

Clause 7.1.4, Specify the relationship between zero and non-zero values in this field and the Execution Management Codes in Byte 3.

Response:

The text is clarified that:

a) If Read Data and Write Data are both zero, FCP_DL shall be zero.

b) If FCP_DL is zero, no data is expected to be transferred regardless of the state of the Read Data and Write Data bits.

Comment 125 Editorial 7.2

Comment:

Clause 7.2, para. 1, line 1, Change "responder" to "Target".

Response:

Accepted.

Comment 126 Optional/Mandatory

Comment:

Clause 7.2, That this is an optional function is never stated. If required, it shall be used, but it is also permitted to not use this IU with agreement from the other SCSI device. This needs to be stated in the text.

Response:

This is indicated in the second paragraph of the section. No change is required.

Comment 127 Length Error behavior (Technical)**Comment:**

Clause 7.2, para. 3, line 3, Change "is required to" to "shall". Delete the last sentence in this paragraph since it is implied by the shall added here. If the initiator cannot supply the entire length, what behavior does it do to inform the Target and what is the target's behavior in return?

Response:

- a) Accept the change to use shall.
- b) The next sentence indicates that the initiator is expected to be able to supply all data within the limits of FCP_DL. This is changed to a "shall" to answer the question.

Comment 128 Length behavior (Technical)**Comment:**

Clause 7.2, para. 4, line 1, Change "target transfers to the initiator" to "target shall transfer to the initiator in the next IU". If the target does not transfer the stated amount, what is the initiator behavior?

Response:

Accept the change to use shall. Comment 122 defines the behavior of the system when "shall" rules are violated.

Comment 129 Clarify Data Descriptor origin**Comment:**

Clause 7.2, It should be stated that the contents of the first 12 bytes of Table 19 are controlled by FC-PH and not subject to change. This is a side effect of using category 5.

Response:

The first line on page 27 will be modified to read: "The first 8 bytes FCP_XFER_RDY payload are defined by FC-PH for all Sequences of category 5. The format of the payload is shown in table 19."

Comment 130 Maximum burst length (Technical)**Comment:**

Clause 7.2.2, para. 2, Add "The value in this field shall not exceed the maximum burst length defined by the Disconnect-Reconnect Page of MODE SELECT/MODE SENSE. (See 7.3, para. 2.)"

Response:

Accepted.

Comment 131 Use of SEQ_ID (Technical)**Comment:**

Clause 7.3, para. 3, line 1, The lowest relative offset field value of an FCP_DATA IU is all that is required to reassemble. The SEQ_ID is only useful in an FCP_Port within an IU.

Response:

The SEQ_ID is used to verify that only one sequence is being transferred within the exchange during streamed sequences. No change is required.

Comment 132 RO Error Behavior (Technical)**Comment:**

Clause 7.3, para. 3, line 4, What shall an initiator do if the RO mismatch occurs on its end of the link?

Response:

This error and any other protocol verifications that the Exchange Originator chooses to perform are outside the scope of the standard.

Comment 133 Length Error Behavior (Technical)**Comment:**

Clause 7.3, para. 4, lines 2-3, Change "exact length" to "exact location and length".

Response:

Accepted.

Comment 134 Overlaid Data (Technical)**Comment:**

Clause 7.3, para. 5, The total amount of data transferred, at least in SCSI-2 and SIP/SPI, represents only the maximum displacement from the base address that any byte may be placed by a target. In SIP/SPI, a target is permitted to retry, resend, and overlay data as long as this maximum displacement is not violated and no unfilled displacements are present.

This rule should apply to FCP as well. It is the target's responsibility to get the data any way it can to the initiator. The major difficulty in SCSI-2 was that Modify Data Pointer was optional and often not implemented by initiators. That function has been made mandatory by the targets ability to use any offset it desires in a FCP_XFER_RDY IU.

Therefore, a target should only be limited by the prevailing rule and not some artificial limitation. The value in this field is similar to the value a device driver gives to a Host Adapter. However, that value does not affect Target behavior. Obviously, if the displacement range were to be violated, the initiator has many tools to stop the Target. These should not be blind transfers and overlapped transfers have been permitted and should be allowed to continue. Certainly, the mechanism for setting and adjusting either the initiator or target addresses is platform dependent and therefore under control at all times.

If the target executed a command and needs to transfer more data than is allowed by the FCP_DL field, the command cannot end normally. It must end with more than just an indication in an FCP dependent field.

This function should not be exported to the opposite end of the link.

Response:

Clause 7.3, paragraph 5, sentences "The target shall never... FCP_RESID_OVER bit." will be changed to read:

"The target shall never request or deliver data outside the buffer length defined by FCP_DL. If the command requested that data beyond FCP_DL be transferred, the FCP_Status field shall contain the FCP_RESID_OVER bit."

The corresponding sentences in paragraph 6 are modified in a similar manner.

These phrases together with the context resolve the comment.

The function is useful at the target end of the link, since many host adapter structures do not have memory protection or memory mapping mechanisms that can operate at Gbit data rates.

Comment 135 Data Management (Technical)

Comment:

Clause 7.3, para. 6, page 28, The last transfer is signaled by selecting a different IU. the technical FC-PH text needs to be changed to reflect IU choices. The same argument about FCP_DL applies to write operations. The target is responsible for its own internal operation. If it has an internal memory failure it should be allowed to retransmit information.

The only limitation is that it not be allowed to violate the maximum displacement rule in the comment above. The initiator should not care whether multiple transfers occur. the target is ultimately responsible to transfer all of the correct bytes from displacement 0 to the maximum it determines from the CDB, not the FCP_DL field. If the initiator disagrees, it has the tools to stop the target. This is an unnecessary rule and very limiting compared to the other protocols.

The target should never transfer excess bytes and therefore it should not have excess bytes to discard. Clause 7.1.4 says that it is the expected number of bytes. It is probably better worded as the maximum displacement to be transferred from a base address. This is consistent with how it has worked in the past. Only the displacement is tested for error, not multiple transfers of the same data.

Response:

By choosing not to use the FCP_XFER_RDY IUs, the target forgoes the opportunity of directing the initiator to retransmit write data from the same location. The initiator still has the option to pass data redundantly, but this can result in exceedingly bad bus citizenship and should be managed very carefully or avoided. The corrections of comments 130 and 134 address these questions.

Comment 136 Data Management (Technical)

Comment:

Clause 7.3, para. 7, page 28. This paragraph is totally inconsistent with the previous two paragraphs. A Target cannot both be allowed to overlay data and not exceed the FCP_DL count. There is a basic problem here. If the target is capable of selecting any relative offset within the valid displacement range, an initiator is already prepared to put data anywhere. In case of a link error and overlay is not permitted, a command must be aborted according to the present rules since some of the data would be transmitted twice. This seems too rigid to leave in FCP. Since SIP/SPI initiators are required to permit some overlay, then FCP initiators should be required to support overlay.

Further, FCP is not complete if the text must depend on a vendor unique response when an overlay occurs. If overlay is or is not to be permitted, just add it to the PRLI where the other negotiations seems to occur. A vendor unique response is unacceptable a standard solution if it is needed is required.

Response:

The corrections provided for comments 130 and 134 bring this paragraph into consistency with no additional changes.

While SIP architecturally allows overlay, SIP implementations do not necessarily support it. SAM states in section 2.1.1 that: "If an SCSI-3 protocol supports random buffer access, as described below, the offset and byte count specified for each data segment to be transferred may overlap." This

statement clearly indicates that there is no necessary requirement to support that. SAM does not require any indication of whether or not overlay is allowed. FCP implementations have the same characteristics in this respect as SIP implementations.

Comment 137 Data Management

Comment:

Clause 7.3, para. 8, page 28, line 2, Change "been transferred" to "been transferred at least once". This is consistent with SIP/SPI behavior and other protocols. Then the rule about unused displacement ranges is totally correct. If it cannot be transferred error free, at least once, the command does not report that data above the hole has been transferred. This is also totally consistent with the notion that the data is not valid until after good status has been transferred throughout SCSI.

There really seem no reason to have the FCP_DL value sent to the Target at all. If there is an error, the initiator must stop the target with the tools it has. Data overlay of all or part of the data should not be a problem for either a target or an initiator since it has been required of initiators and permitted by targets since they SCSI targets to disconnect in SCSI-1.

Response:

The second sentence of paragraph 8 will be modified to read: "By the time data transfer has been terminated, all data between the offset of zero and the highest offset shall have been transferred."

The FCP_DL is a mechanism that provides useful data transfer management information.

Comment 138 RO Error Behavior (Technical)

Comment:

Clause 7.3, para. 9, line 2, Change "is" to "shall be". Add a set of rules about initiator and target behavior if the relative offset is incorrect.

Response:

The entire paragraph should be deleted, since it is redundant with information provided in 7.3 paragraph 3.

Comment 139 Editorial 7.3

Comment:

Clause 7.3, para 10, line 2, Change "effective" to "in effect".

Response:

Accepted.

Comment 140 Residual length (Technical)

Comment:

Clause 7.4, Table 20, FCP_RESID field and accompanying text. Delete this field. This field is a function of the initiators internal workings and should not be exported for target control. It is double work for some logical units since a residual is reported in the Information Bytes of the sense data. Since the sense data is in the form of Autosense, there is no reason to duplicate functions.

Response:

This field is exported to facilitate FC-PH management of the data transfer, independent of the actual nature of the SCSI command. No change is required for this comment.

Comment 141 Data Management (Technical)**Comment:**

Clause 7.4.1, Byte 2, Bits 3-2, These fields are not really needed as stated above. The basis for any calculation is an estimated value. The real value for the data length only comes from the CDB itself and other attributes known to the Logical Unit. Therefore, if the initiator sets its FCP_DL value on platform boundaries of 4 or 8 bytes, almost every command could end with a FCP_RESID_UNDER indication with no real errors in the system. For device classes other than disk this could be a common occurrence. But those device classes already have the mechanisms to report residual counts. This is redundant and not properly a logical unit function to report in this manner since both the source and reporting are outside the bounds of the command structure of SCSI. If we need to invent new commands for some reason then lets do that, but not invent a protocol specific command subset.

Response:

The estimated value is a value explicitly calculated as part of the buffer allocation structure of the initiator. The data management is overseen by command independent layers of the SCSI function. This provides the proper limiting information and error reporting for these sublayers. No change is required because of this comment.

Comment 142 Residual length (Technical)**Comment:**

Clause 7.4.2, para. 1, line 4, Change "value is not be valid" to "value is not valid". Note that for the sequential device class, the control of the residual counts is fully architected within the command set. The presence of the FCP_RESID requires reporting items in a mandatory fashion that have been eliminated by agreements between the involved parties. This field should also be deleted. This becomes a performance issue once again where it was fixed in SCSI-2. Any non-zero value in FCP_STATUS requires analysis even when the status is GOOD as it is with may tape operations where the lengths would not match under this scheme.

Response:

- a) Accepted.
- b) See comment 141. No change is required because of this comment.

Comment 143 Overlapping data (Technical)**Comment:**

Clause 7.4.2, paras. 2-3, The calculation of FCP_DL does not permit overlaying of data as permitted in clause 7.3. This discrepancy and inconsistency must be corrected.

Response:

Paragraph 2, first sentence will be corrected to say: "If the FCP_RESID_UNDER bit is set, a transfer that did not fill the buffer to the expected displacement FCP_DL was performed and the value of FCP_RESID is a number equal to..." Paragraph 3, first sentence will be corrected to say: "If the FCP_RESID_OVER bit is set, the transfer was truncated because the data transfer required by the SCSI command extended beyond the displacement value of FCP_DL."

Comment 144 Editorial 7.4.4**Comment:**

Clause 7.4.4, para. 2, line 2, Add a period at the end of the sentence.

Response:

Accepted.

Comment 145a SCSI-2 (Technical)

Comment:

Clause 7.4.5, para. 1, line 1, There should be no reference to SCSI- 2 sense data, SPC is the only valid reference point for this information. The rules about minimums and maximums and presentation should be deferred to SPC and the text removed from FCP.

Response:

- a) It is assumed that this actually references 7.4.6. In the absence of any drafts of SPC, SCSI-2 is a valid and useful reference. This is especially true, since SPC will be faithfully reflecting SCSI-2.
- b) The sentence reflecting minimums will be removed.
- c) SAM has been modified to allow FCP_SNS_INFO only with Check Condition or Command Terminated Status. The text will be modified to reflect this change.

Comment 145b FCP_SNS_INFO (Technical)

Comment:

In Clause 7.4.5 or related clauses, there is no requirement that I can determine that FCP_SNS_INFO must be used at all times. That is, if a CHECK CONDITION or COMMAND TERMINATED status occurs, the logical unit could revert to waiting for the Initiator to request the sense data. That option should be available to logical units and FCP should not force a behavior. It can provide a note that sending Autosense data is encouraged, but it has not right to demand it.

Response:

FCP devices should use autosense. This will be indicated in section 7.4.6.

Comment 146 Include examples in annex

Comment:

Annex A. This should have clause 5.3 incorporated into it and the examples removed from the main body of the standard.

Response:

An annex (possibly not Annex A) will be prepared to receive clause 5.3.

Comment 147 Clarify examples

Comment:

Annex A. This Annex should indicate that its examples are for Class 2 only.

Response:

Accepted. The titles of the figures will be modified to indicate that this represents class 2 behavior.

Comment 148 Addressing model (Technical)

Comment:

Annex B. Delete this annex. Any discussion about logical unit addressing belongs in SAM, not here. FCP is required to provide a field up to 64 bits long. It has provided the maximum length field. Any discussion about the structure of the field is inappropriate in any of the protocol standards. If a proposal is required for SAM, then this may be a basis for that. However, this structure is not generally applicable and may be best delegated to SAM or even SCC.

Response:

This annex has proven useful to many implementers. Since it is informative and given as an example, it should not be removed. No change is required. The normative specification of a model like this will be contained in SCC.

3.2 Comments generated by Hewlett Packard**Comment 149 Annex A typographical error****Comment:**

The examples in Annex A shows class 2 examples using the FCP protocol to perform reads and writes. These examples have an incorrect usage of the EOF delimiter. The examples currently indicate that the EOFt delimiter is used on the last frame of a sequence. EOFn should be used when sending the last frame of a sequence, EOFt should be used when sending the ACK for the last frame of the sequence.

Response:

The error will be corrected.

3.3 Comments generated by IBM**Comment 150 Dual port reset (Technical)****Comment:**

FCP has no method of resetting an alternate port of a dual port SCSI device without affecting the port being used. Since Parallel SCSI has this capability (using a message), FCP should also. A currently reserved bit of the Task Management Flags field (Byte 2 of FCP_CNTL, p. 23) could be used for this task. The function should reset all other ports of a multiport device.

Response:

SAM does not presently specify the "Bus Device Reset Other Port" function. I would assume that is a "Target Reset Other Port" function in SAM terms. Since FCP is likely to have multi-port capability, either the FCP_CDB field or the FCP_DL field should be used to specify some identifier for the other port. The identifier should probably be the 64-bit WWN for the port.

Since the specification of this function is so incomplete in the defining documents, I would prefer to put this in either an informative annex or a later edition of the FCP.

Comment 151 Command State after Clear ACA (Technical)**Comment:**

FCP states that ALL commands are resumed after a Clear ACA task management function is received. The SCSI Architecture Model (SAM) states that only non-ACA tagged commands should be resumed and ACA tagged commands should be aborted. FCP should be consistent with SAM. (Please see p. 24, Clear ACA.)

Response:

Accepted. The paragraphs will be corrected to reflect these concepts.

3.4 Comments generated by Unitrode**Comment 152 SAM approval****Comment:**

We would still like to have SAM approved first.

Response:

It would be nice. No change is required in the FCP to address this comment.

Comment 153 Table reference errors

Comment:

5.3.9 Table 13 is referenced as table 12 6.2.1 Table 15 is referenced as table 14 7.4.1 There is no reference to table 21 as in all other sections.

Response:

Accepted.

3.5 Comments generated by Seagate**Comment 154 Document reference**

Comment:

The referenced document should be rev 8 rather than 7.

In this instance my vote is an organizational one since the balance of the comments were provided by engineers developing our FCP design. Resolution of the following comments would allow my vote to be changed to yes.

Response:

Accepted.

Comment 155 Untagged operation (Technical)

Comment:

Page 17, Section 5.5.10, Use OX_ID=FFFF to indicate an untagged command, and drop the "untagged" task management bit (page 24, section 7.1.2). Such usage is consistent with FC-PH section 18.9.

Response:

If the OX_ID is unassigned as specified in FC-PH 18.9, then no Recovery Abort can be successfully associated with the untagged command. The use of a defined OX_ID and an untagged indication in the FCP_CNTRL field is probably safer for generic error recovery. No change is required for this comment.

Comment 156 Editorial, 6.1

Comment:

Page 18, Section 6.1, Para 5 "sate" s/b "state" "effected" s/b "affected"

Response:

Accepted.

Comment 157 PRLI Clarification

Comment:

Page 18, Section 6.1, Para 5 Needs clarification: by stating that "Mode Select parameters will assume their default or saved states for that image pair" it is implied that other image pairs are unaffected, but this is inconsistent with the target being in "the same state as after a power-on or hard reset." Also, it is not true that the target will be in the same state as after a power-on since login sessions with other initiators must survive.

Response:

The text is modified to indicate that it is not the whole target that is in the reset state, but only the components of the particular image pair and only with respect to each other.

Comment 158 Error Codes (Technical)**Comment:**

Page 18, Section 6.1, Para 5 What Additional Sense Code should be returned with the Unit Attention?

Response:

See comment 85. Accepted

Comment 159 PRLI Clarification (Technical)**Comment:**

Page 18, Section 6.1 If targets must dump tasks for other initiators on PRLI, they should be aborted with ABTS-LS as required for Target Reset and PRLO, rather than just being cleared.

Response:

The requirement to dump tasks for other initiators is not correct and has been removed.

Comment 160 PRLI Clarification (Technical)**Comment:**

Page 18, Section 6.1 Having the target dump all tasks and reservations for all initiators when an initiator does a PRLI accomplishes nothing and wastes time. The new initiator can issue a Target Reset after PRLI if it wants the target in this state. The appropriate place to behave this way, and this should be specified in FCP, is after a target NL_Port engages in loop re-initialization, or a target FCP ports participates in the Link Reset protocol.

Response:

The requirement to dump tasks for other initiators is not correct and has been removed.

Comment 161 PRLI Clarification (Technical)**Comment:**

Page 18, Section 6.1, Para 5 To summarize comments on this section, suggest wording paragraph 5 to have the following meaning:

Immediately after the execution of a PRLI, a target will have no tasks, reservations, or status present for the other port involved in the PRLI. Mode Select parameters will assume their default or saved states for that image pair. Tasks, reservations, status, and Mode Select parameters for other initiators are not affected. A unit attention condition as defined in the SAM is generated by the target port for the initiator port with Additional Sense Code indicating power-on reset or hard reset. A target port shall not generate a unit attention condition for initiators which are already logged in.

Response:

Accepted.

Comment 162 Use of Initiator/Target bits (Technical)**Comment:**

Page 19, Section 6.1.1 Unclear whether usage of AEN or other role-reversals would require both bits to be set by both targets and initiators. Information is lost if so: a host is interested in who is primarily

an target, not in who is a target only for the purposes of AEN. Could define new bit flags to indicate whether limited role reversals appropriate to their primary functions are supported. Better yet, reword as follows:

Word 3, Bit 5: Initiator Function

When this bit is set to 1, the process is indicating that it operates as a SCSI Initiator.... Initiators may implement some target functions without setting the Target Function bit; the use of these capabilities by a target is defined by Mode Select parameters.

Word 3, Bit 4: Target Function

When this bit is set to 1, the process is indicating that it operates as a SCSI target.... Targets may implement some initiator functions without setting the Initiator Function bit; the use of these capabilities by a target is defined by Mode Select parameters.

Response:

The intent of this is that any target or initiator capability at all is indicated by these bits. The nature of the initiator or target capability is established in the ordinary way by SCSI command sequences. This is necessary because FCP does not have any other function performing the "selection time-out" sequence, which clearly indicates the lack of a target capability. No change is required.

Comment 163 PRLO Clarification (Technical)

Comment:

Page 20, Section 6.2 (PRLO) The state after a PRLO is NOT equivalent to a power-on or hard reset, as other ports are not logged out.

Response:

Clarified by rewrite. Accepted

Comment 164 PRLO Clarification

Comment:

Page 20, Section 6.2 The effect on Mode Select parameters for other initiators is not clear. Should behave in same manner as PRLI.

Response:

Accepted.

Comment 165 PRLO Clarification (Technical)

Comment:

Page 20, Section 6.2 No reason to abort all tasks from all initiators, just the one which is logging out. There is no need to use ABTS on these; they may simply be cleared.

Response:

The ABTS/LS sequence (Recovery Abort) is used to recover FC-PH resources that may not be known to the FCP host adapter functionality. No change is required other than those made during the rewrite of section 6.

Comment 166 PRLO Clarification

Comment:

Page 20, Section 6.2 If all tasks from all initiators are to be aborted, reference should be made to 7.1.2. This is a better description of using ABTS than is given in this paragraph.

Response:

An appropriate cross reference is installed and the offending text was removed during the rewrite.

Comment 167 ABTS Proposal**Comment:**

Page 25, Section 7.1.2, ABTS protocol FCP requires the use of the ABTS-LS protocol, but it is not fully described in any standards document. This really belongs in FC-PH, but for now perhaps it would be appropriate as an Annex in FCP.

Response:

This has been rewritten in the manner described by Comment 117.

Comment 168 Missing from FC-PH (Technical)**Comment:**

The following feature is not currently specified in FC-PH but is advocated by FCSI-101 ("FCSI Common FC-PH Feature Sets Used in Multiple Profiles", page 10): ABTS may be sent at any time by either side, regardless of Sequence Initiative or Credit.

Response:

This has been rewritten in the manner described by Comment 117.

Comment 169 Missing from FC-PH (Technical)**Comment:**

The following feature is not currently specified in FC-PH but is advocated by FCSI-101 ("FCSI Common FC-PH Feature Sets Used in Multiple Profiles", page 10): rules for setting SEQ_ID and SEQ_CNT by a port which has not yet sent a sequence in the Exchange to be aborted.

Response:

This has been rewritten in the manner described by Comment 117.

Comment 170 Missing from FC-PH (Technical)**Comment:**

The following feature is not currently specified in FC-PH but is advocated by FCSI-101 ("FCSI Common FC-PH Feature Sets Used in Multiple Profiles", page 10): BA_ACC frame should set SEQ_CNT_LO to 0 and SET_CNT_HI to FFFF.

Response:

This has been rewritten in the manner described by Comment 117.

3.6 Comments Identified by Editor during analysis of review questions**Comment 171 Abort****Comment:**

Table 2 of section 4.3 shows ABORT TASK SET as a Required or Mandatory function. The text correctly presently indicates that it is an Optional function. In fact, to be consistent with historical SCSI usage, it must be mandatory.

Response:

ABORT TASK SET will be specified as Mandatory in Table 2 and in the text of section 7.1.2.2.

Comment 172 Standard capitalization

Comment:

SAM has determined that the words "target", "initiator", and "logical unit" are not capitalized except in titles and at the beginning of sentences.

Response:

Accepted. Numerous changes required.

Comment 173 command byte count

Comment:

Text should be placed in 7.1.4 to indicate that the FCP_DL (which is the SAM command byte count) contains a count of the greatest number of data bytes expected to be transferred to or from the application client data buffer by the SCSI CDB.

Response:

Accepted.