PROPOSED RESPONSES TO COMMENTS FOR FCP (X3T9.2/993D)

   ROBERT SNIVELY,   NOVEMBER 22, 1993

1.0 INTRODUCTION

I have received the following comments on FCP, revision 007 in electronic
format during the X3T9.2 review. As I indicated I would in the last meeting,
I have analysed those comments for technical and editorial content. For all
those editorial comments and for all the technical comments that appear
non-controversial, I have described a proposed solution.

For those comments that appear technical and appear
to have some controversial content, I have prepared a separate mail that
extracts the comments, analysis, and proposed solution from this
document to make them easier to consider. Those comments that
are discussed in the separate mail are clearly noted in this document.

I assume that all other resolutions that I have suggested are appropriate
and will adopt them in the next revision of the FCP document. Notify
me as soon as possible if any of these proposed solutions to
items that I consider non-controversial are incorrect or controversial, so
that I can add them to the separate mail for consideration. Thank you
very much for your prompt consideration.

The comments retain their original numbering and are identified by the
source of the comments.

   ***   indicates that the comment is technical, but
      probably not controversial. Please review such
      comments carefully, since they will not be
      included in the separate document.

2.0 COMMENTS FROM SUN MICROSYSTEMS

Representative: Robert Snively

Date: November 5, 1993

E 001   Cover:

  Is "editors", s/b "editor"

  Action:

  Accepted

E 002 Page i

  Is "596-3362", s/b "573-3362"

  Action:

  Accepted

E 003 Page 2, Section 3.1.5

Is "indicates a displacement", s/b "indicates the displacement"

Action:

Accepted

E 004 Page 2, Sections 3.1.9, 3.1.11, 3.1.14

These sections should be deleted because they are not used
by the document.

Action:

Accepted

E 005 Page 2, Sections 3.1.16-3.1.19

These sections should be placed as subsections under 3.1.15
in the same order.

Action:

Accepted

E 006 Page 3

The following terms should be defined on page 3, using definitions
paraphrased from SAM:

initiator: an SCSI device containing application clients which
    originate device service requests and task
    management functions to be processed by a
    target SCSI device.

SCSI device: a device that originates or services SCSI commands.

target: an SCSI device containing logical units which receive
    and execute commands from an initiator.

task: an object within the logical unit representing the
    work associated with a command or group of
    linked commands.

Action:

Accepted

E 007 Page 3, Section 3.1.24

The logical unit should be redefined as:

an externally addressable entity within a target that implements
an SCSI device model.

Action:

Accepted

E 008 Page 3, Section 3.1.26

The logical unit number should be redefined as:

An encoded 64-bit identifier for a logical unit. [SAM] The logical
unit...Address (see section 7.1.1).

Action:

Accepted

E 009 Page 3, Section 3.1.31

The target identifier should be redefined as:

address of up to 64-bits by which a target is identified. [SAM] The
target identifier is equivalent to the 24-bit Destination_ID used by
the Exchange Originator. [FC-PH]

Action:

Accepted

E 010 Page 3, Section 3.1.33

The task identifier should be redefined as:

the information uniquely identifying a task. The identifier
contains the initiator identifier, the logical unit identifier, and
(optionally) the tag. [SAM] The Fully Qualified Exchange Identifier
(FQXID) is the task identifier for the FCP.

Action:

Accepted

E 011 Page 3, Section 3.1.34

task management function should be redefined as:

a peer-to-peer confirmed service provided by a task manager that can
be invoked by an application client to affect the execution of one
or more tasks. The service consists of a request to manage a task
in the logical unit. The response......

Action:

Accepted

E 012 Page 4, Section 4.2

Third paragraph, is "continue to be transferred until all" s/b
"continue until all".

Action:

Accepted

E 013 Page 5, Section 4.2

First paragraph, is "or from the SCSI initiator's memory." s/b
"or from the SCSI initiator."

Action:

Accepted

E 014 Page 6, Section 5, Table 1

  is "Data Delivery Response" s/b "Data Delivery Action".

  Action:

  Accepted

E 015 Page 6, Section 5

  is "maximum burst length by the FCP using the parameters" s/b
  "maximum burst length defined by the parameters".

  Action:

  Accepted

E 016 Page 6, Section 5

  fourth paragraph should be:

  If required by the FCP Process Login parameters, each inbound
  and/or outbound FCP_DATA IU shall be preceeded by an FCP_XFER_RDY
  sequence containing a standard Data Descriptor payload that
  indicates the exact length of the data delivery. If the FCP Process
  Login specifies Read XFER_RDY Disabled and/or Write XFER_RDY Disabled.
  The corresponding FCP_DATA IU's are transmitted without a
  preceeding FCP_XFER_RDY IU.

  Action:

  Accepted

E 017 Page 6, Section 5

  is "Some SCSI reset functions are.." s/b "Some SCSI Task Management
  functions are..."

  Action:

  Accepted

E 018 Page 6, Section 5, Table 2

  Add text to indicate that the Task Management Functions are
  required to be executed in a new Exchange.

  Action:

  Accepted

T 019 Page 6, Section 5

*** Add text to indicate that the CDB is ignored when Task Management
  functions are executed.

*** Action:

*** This technical change is not considered controversial and is
   accepted.

E 020 Page 7, Section 5, first paragraph

   is "..and the Responder X_ID" s/b "...and optionally the Responder
   X_ID".

   Action:

   Accepted

E 021 Page 7, Section 5, last paragraph

   is "...managed by the completion of individual Sequences" s/b
   "...managed by the transfer of individual IU's"

   Action:

   Accepted

E 022 Page 7, Section 5.1

   last note:

   s/b "..optional sequence streaming during Write operations."

   Action:

   Accepted

E 033 Page 9, Section 5.2

   correct minor typos and stylistic errors.

   Action:

   Accepted

E 034 Page 9, Section 5.2

*** Add a new sentence, next to the last:

   Class 3 service is allowed if the management of the FCP ULP is
   performed using interlocked IU transmissions.

*** Action:

*** Accepted. This comment, while having some technical content, is
   considered not controversial.

E 035 Page 10, Section 5.3.2 and 5.3.3

   Last sentence, is "or striping", s/b "or data striping"

   Action:

   Accepted

E 036 Page 10, Section 5.3.10

Second and third sentence s/b "The RX_ID shall be assigned
by the Exchange Responder and may have any value, including the
unassigned value of hexadecimal 'FFFF'. The RX_ID allows the
Exchange Responder to optionally create a private version of the
SAM tag."

Action:

Accepted

E 037   Page 10, Section 5.3.11

Next to last, last, and new last sentece s/b "For the
Solicited Data Category, the Relative Offset is the SAM
application client buffer offset and the Base Address is the
beginning address of the application client's buffer, as
described by SAM. For all other ... byte of the IU. The
Relative_Offset is not required if both N_Ports can
unambiguously reassemble the transmitted IU's using other
FC-PH information and the FCP_XFER_RDY IU."

Action:

Accepted

E 038 Page 11, Section 6

First sentence, second paragraph is "defined as a normative annex"
s/b "defined in a normative annex"

Action:

Accepted

E 039 Page 11, Section 6.1

First sentence, first paragraph is "to indicate to" s/b "to identify to"

Fifth paragraph is "for all targets" s/b "for any target"

Last sentence is "from all targets" s/b "from any target"

Action:

Accepted

E 040 Page 12, Table 5

Correct column widths

Action:

Accepted

E 041 Page 13, Section 6.1.1

The word "sequence" should normally be "IU". Correct as appropriate.

The word "will" should normally be "shall". Correct as appropriate.

Action:

Accepted

E 042 Page 13, Section 6.1.1

   In both Xfer Rdy Disabled paragraphs, is "FCP_XFER_RDY
   Sequences will not be used.." s/b FCP_XFER_RDY IU's may be not used..."

   Action:

   Accepted

E 043   Page 13, Section 6.2

   is "process images specified", s/b "process image pairs specified"

   Action:

   Accepted

E 044 Page 15, Secton 7.1

   The FCP_CMND IU is actually used for two functions:

   a) Carrying the SCSI command, if and only if no task management
       function is being requested.

   b) Carrying task management requests, leaving CDB invalid

   The text should be clarified to indicate this.

   Action:

   Accepted

E 044 Page 16, Section 7.1.1

   Last sentence should become: "An example of the four-layer
   hierarchical address structure defined for SCSI RAID systems
   is given in Annex B."

   Action:

   Accepted

T 045 Page 17, Section 7.1.2

   Should an untagged case be explicitly allowed? SAM defines the
   untagged case as identical in handling to the Simple_Q case.

   Proposed Action [See separate mail]:

   Rejected. Since the SAM untagged case is indistinguishable from the
   SIMPLE case, only the SIMPLE attribute will be used in FCP.
   Note that SCSI-2 drivers will be responsible for managing the
   proper ordering of untagged operations by awaiting the termination
   of the requested operation, just as they are today. At the same
   time, tagged operations can flow smoothly in and around the
   untagged operations, just as in the Queueing Model document.

E 046 Page 17, Section 7.1.2

Clear ACA, third paragraph:

The Clear ACA Task Management function should not be associated
with a CDB and is executed in a separate exchange.

Action:

Accepted

T 047 Page 17, Section 7.1.2

Target Reset:

The text should indicate that Target Reset terminates and aborts
all outstanding exchanges between the requesting initiator and
the receiving target. These events are performed without
any FC-PH protocol requirements.

Proposed Action [See separate mail]:

Rejected. The Target Reset does indeed terminate and abort
all outstanding exchanges between the requesting initiator and
the receiving target. The initiator and target should quit
any exchanges that they are aware of and that the other
entity has no record of. For those exchanges that are outstanding
that must be cleared for proper FC-PH behavior, a sequence
using ABTS (last sequence) shall be generated to abort the
exchange.

T 048 Page 17, Section 7.1.3

*** The text should clarify that the CDB is null if a task management
    function is requested.

*** Action:

*** This technical change is not considered controversial and is
    accepted.

T 049 Page 17, Section 7.1.4

The incorrect length cases should be explained. Only the
highest addressed burst of data may be truncated to a length
other than the specified burst length. Such truncation will
always set the FCP_RESID residual count and will always
set an appropriate FCP_RESP code. Any bursts of read data beyond the
truncated burst will not be transferred. Write operations may
not be truncated by the initiator to less than the FCP_DL.

Proposed Action [See separate mail]:

Accepted. The philosophy is that holes in the data transfer
should not be allowed. The additional philosophy is that
hosts that are transferring data out from an initiator with a
specified data length should have all of that data available
to the target if the target wants it all.

E 050 Page 18, Section 7.2

Specifications of transfer size redundant with 7.2.2 or other

sections should be deleted, including first paragraph second sentence and second paragraph first sentence.

Action:

Accepted

E 051 Page 22, Table 14

Correct column widths.

Action:

Accepted

T 052 Page 27 - 29, Annex B

*** This section should be rewritten to use the RAID addressing example.

*** Action:

*** Accepted

3.0 QUANTUM

Representative: Jim McGrath

Date: November 5, 1993

E 001 All pages

Quantum is voting NO on forwarding GPP, FCP, and SBP due to the inability to vote YES on SAM. Since these standards must be in compliance with SAM, we do not think it would be consistent to vote to forward these standards without voting to forward SAM.

As a comment, we find the serial protocol documents to have fewer technical issues than SAM, leading us to believe that it might be possible to vote in favor of some or all of them if the SAM issues could be resolved. It is also our understanding that any vote to forward at this point might be ineffective in any event given the pending committee reorganization.

We regret these NO votes, and hope the committee can resolve the outstanding SAM issues as soon as possible.

Action:

None.

4.0 NCR

Representative: John Lohmeyer

Date: November 8, 1993

E 001 All Pages

I commend the SAM, SBP, FCP, and GPP document editors on very
good draft documents. However, the documents are not yet ready
to forward for public review. I feel that it is unfortunate
that the committee succumbed to market pressures to issue
premature letter ballots on these documents.

I offer the following 6 comments on SAM, with #4 being my reason
for voting no. Since SAM is not ready for forwarding yet, I
feel compelled to vote no on SBP, FCP, and GPP; it is not
appropriate to forward any protocol documents until all the
serious issues in SAM are resolved.

Action:

None.

5.0 HEWLETT PACKARD

Representative: Jeff Williams

Date: October 15, 1993, modified November 5, 1993

#001 (E) Page 1, Section 2

   Add FC-AL to the list of documents referenced.

   Action:

   Accepted

#002 (E) Page 4, Section 4.1

   Add a comment on the ability to connect multiple SCSI devices on
   an arbitrated loop. I feel that this is an important item for
   potential implementors of the FCP to understand. SCSI on a
   peripheral device should be a low cost option which is enabled by
   the loop topology.

   Action:

   Accepted

#003 (E) Page 4, Section 4.2

   What is an FCP I/O Operation? Is this the same as an I/O Process
   in the SAM venacular? If so, please eliminate the use of the term
   in favor of the SAM wording.

   Action:

   After consulting with the editor of the SAM document, it had been
   decided that an I/O Process was peculiar to the SAM concepts and
   did not correctly represent the resources tied to a SCSI command.
   The term decided upon was an FCP I/O Operation. The intent is to
   include not only the Command and Task concepts of SAM, but also
   the Fibre Channel Exchange and all resources associated with it.
   The editor believes this concept is clear and should not be

changed, but is willing to consider alternative wording.

#004 (E) Page 4, Section 4.2, Para 2

  "... and is only used for the transfers associated with that FCP
  I/O Operation and any commands linked to that command." Drop the
  "and any commands linked to that command." part. This blurs the
  definition of the I/O Operation. Is the I/O Operation a single
  command or a group of linked commands? See the confusion? The
  definition listed states it is the series of linked commands.

  Action:

  Accepted

#005 (T) Page 4, Section 4.2, Para 3

  You state that the data transfer occurs with a XFER_RDY IU followed
  by a single FCP_DATA IU. Does this have to be the case, or can a
  target or initiator split the FCP_DATA IU into two or more IUs for
  the data described in the XFER_RDY? For example, I get a XFER_RDY
  IU for 8k of data, but I send two 4k FCP_DATA sequences.

  Action:

  As defined, the protocol requires and is intended to require that
  one FCP_XFER_RDY IU is followed by one and only one FCP_DATA IU.
  The text will be reviewed and modified if necessary to make sure
  the idea is clearly expressed.

#006 (E) Page 4, Section 4.2

  You may want to state that this is a non-linked I/O process with
  data descriptors enabled. As I read this section, I keep saying,
  "Sure, but what if the command is linked? Then you won't send
  this sequence."

  Action:

  The text in paragraph 4 will be extended and clarified to indicate
  that a subsequent FCP_CMND IU may be accepted after the
  FCP_RSP IU if all the normal linking conditions are met.

#007 (E) Page 5, Section 4.2, Para 3

  List FC-AL as another supported option. You list classes and
  fabric stuff, so listing loop may be appropriate.

  Action:

  The text will be modified as appropriate to indicate that
  FC-AL is an allowable option. See comments 001 and 002.

#008 (E) Page 6, Section 5, Para 3

  "SCSI data transfers may be performed by one or more data delivery
  requests, each one limited to a length no longer than..." This
  implies that the length of the data delivery request is limited

when you meant that the data delivery length is limited. I would
suggest the following wording. "SCSI data transfers may be
initiated by one or more Data Delivery Requests, each one limiting
the subsequent Data Delivery Responses to a length no longer..."

   Action:

   Text will be corrected to clarify this point.

#009 (E) Page 6, Section 5, Para 3

   Last sentence should state, "... using the parameters in the
   Disconnect/Reconnect Mode Page."

   Action:

   The text will be clarified, but it should be made clear that
   it is the Disconnect-reconnect page of the MODE SELECT command,
   as specified in 8.2.8, 8.3.3, and 8.3.3.2 of the SCSI-2 document.

#010 (E) Page 6, Section 5, Para 5

   "Some SCSI reset functions..." should be "Some SCSI task management
   functions..." to be consistent with SAM.

   Action:

   Accepted

#011 (E) Page 7, Section 5, Para 2 (last sentence)

   What does this sentence mean? How is the performance of the SCSI
   command service primitives managed by completion of the individual
   sequences?

   Action:

   The wording will be changed to "execution" is "managed by the
   transfer" of individual IUs.

#012 (E) Page 7, Table 3

   Sequences T3, T9 and T10 should have a note that a previous sequence
   T1, T2, T7 or T8 had to be sent prior to this sequence with the link
   bit set in the control byte of the CDB. I understand what the
   intent of these sequences are, but I do not think it is clear to
   the first time reader.

   Action:

   A new section between 5.2 and 5.3, entitled "Examples of FCP
   Sequences" will be created to show how different functions can
   be supported. Reference to the more detailed examples in Annex A
   will be included in the section.

#013 (E) Page 7, Table 3, Note 1

   IUS should be IUs.

   Action:

Accepted

#014 (E)   Page 7, Table 3, Note 4

  Should this really say T2, T4, T6, T8, and T9 are for streaming?
  Do I still have to wait for the the ACK on the command prior to
  the sending of data? If not, I guess I can QUEUE FULL status any
  command even though the data is received via streaming.

  Action:

  The examples in the new section, "Examples of FCP Sequences" will
  demonstrate these possibilities. T2 is only used when initiative
  is held to perform a subsequent write transfer without FCP_XFER_RDY
  using IU T5 or one or more T6 followed by a T5. Streaming is not
  allowed for the cases where initiative is transferred, but streaming
  would be allowed for these cases. This and other examples will be
  given.

#015 (E)   Page 8, Table 4

  Are sequences that terminate the exchange (I4 and I6) really doing
  a transfer of initiative or is this field a "don't care" for last
  sequences in an exchange? My guess is that we don't care since the
  exchange has ended.

  Action:

  The editor sees no guidance in the FC-PH document about this
  subject. The fields will be changed to X (don't care).

#016 (E)   Page 10, Section 5.3.6

  Isn't the SEQ_ID a unique identifier for the sequence so that
  multiple frames in that sequence can be associated with each other?
  This states that it is more like the SEQ_CNT indicating an order
  to the frames within a sequence.

  Action:

  Accepted. The section will be updated to conform to FC-PH

#017 (E)   Page 11, Section 6.1, Para Last

  In the case of a PRLI when one is in effect, what happens to any
  tasks which are in the device at the time? Are they terminated?
  Also, I assume that if this affects an initiator/target relationship,
  that a Unit Attention Condition is created? Please state whether or
  not this is the case.

  Action:

  Accepted. Any tasks in the device for the corresponding
  initiator of the image are removed, as indicated in the paragraph.
  A Unit Attention Condition may be created if other initiators
  are effected by the request, but not created if no other initiator
  is effected. The text will clarify this.

#018 (T) Page 13, Section 6.1, Para 3

*** For command and data mixed, you state, "If either the originator or
    the responder do not allow the Command and Data to be combined, then
    all FCP I/O Operations between them shall be performed using only
    one Category in each Sequence." I do not agree with this since it
    also restricts the use of Data/Status combined sequences. This
    should state that all command and data transfers shall be performed
    in separate sequences.

*** Action:

*** Accepted, ss item 20.

#019 (E) Page 13, Section 6.1, Para 4

  "Any other combinations of these bits is invalid and will be
  rejected." Should say "shall be rejected.".

  Action:

  Accepted

#020 (E) Page 13, Section 6.1, Para 6

  See #018. For Read/Status, we should not limit all uses of multiple
  information categories per sequence.

  Action:

  Accepted

#021 (E) Page 13, Section 6.1, Para 8 and 10

  Replace "wills" with "shalls".

  Action:

  Accepted

#022 (T) Page 15, Section 7.1, Para 2

*** This paragraph should be replaced with something like,
    "If XFER_RDY IUs are disabled and Command/Data Mixed is allowed,
    the Sequence carrying the FCP_CMND IU shall contain FCP_DATA IU
    frames following the FCP_CMND IU. If XFER_RDY IUs are disabled
    but Command Data Mixed is not allowed, sequence initiative may be
    transfered."

*** Action:

*** The requested change is specific, but incomplete, since it
    does not specify that the behavior is during write operations
    only. The paragraph will be clarified.

#023 (I) Page 17, Section 7.1.2, Para 5

  Terminate Task presents the same problem that Abort Task presented
  in that the OXID is a duplicate of one that exists. This means that

the interface chip cannot detect duplicate XID creation. Is this
an issue that we want to address.

Proposed Action: [See Separate Mail].

Yes, this action clearly needs to be addressed.

Abort Task is managed by the ABTX action or by performing
an ABTS with the last sequence bit set.

Terminate Task is managed by the Exchange Originator (Initiator),
which performs a Request Sequence Initiative link service
request. After the Initiator has gained sequence initiative,
it transmits the Terminate Task code in a standard
command/task management IU. The task is then terminated
according to the SAM rules, requiring at least the
presentation of status and sense information describing
the completion state of the task.

#024 (I) Page 17, Section 7.1.2, Para 6

Clear ACA also presents a problem. If I want to just clear the ACA
and do nothing else, I can't since the command gets executed. I think
that this type of operation should state that the CDB payload is
considered invalid in some manner. Perhaps this should be done for
all task management functions.

Proposed Action: [See Separate Mail].

Accepted. The CDB shall be null for Task Management functions.

#025 (E) Page 17, Section 7.1.2, Para 14

Abort Task is no longer defined. This paragraph should be deleted.

Proposed Action: [See Separate Mail]

The paragraph should be modified to reflect item #023 and included
in an explanation of the use of the FCP_CMND to carry either
SAM SCSI service requests or SAM SCSI Task Management functions.
It should be treated as a special task management function.

Note that the other task management functions may also require
the execution of ABTX or ABTS with last sequence bit set to
clear FC-2 activities being carried on for the aborted tasks.

#026 (E) Page 17, Section 7.1.4, Para 1

The FCP_DL is actually a count of the number of bytes to be
transferred for the SCSI CDB, not the I/O Operation
(which I don't think we define).

Action:

Accepted

#027 (E) Page 18, Section 7.2, Para 3

The last sentence has some gramatical problems. "...is expected
to have be ready to transmit...".

Action:

Accepted

#028 (E) Page 18, Sections 7.2.1 and 7.2.2

Last sentences need periods at the end

Action:

Accepted

#029 (E) Page 17, Section 7.1.4

Add some wording that indicates that insufficient FCP_DL will cause
a command to be stopped in progress. That is, if a write command
for 8k were requested, but the FCP_DL was set to 7k, the command
would not complete. Also, what is the expected behavior? Do I
write 7k and terminate or just terminate? What about the converse
where I have a read for 8k and a FCP_DL of 7k?

Proposed Action: [See separate mail]

These are all standard incorrect length cases which should be
explained in 7.1.4. The following behavior is expected.

A command will begin execution regardless of the FCP_DL unless
the FCP_DL is zero for a command that requires data transfer.

An incorrect length indication will be presented as
described in section 7.4.2 in each of these two cases. If
the FCP_RESID_UNDER bit is set, the complete data will be
transmitted, but the count will be larger than the number of
data bytes transmitted. If the FCP_RESID_OVER bit is set, the
count will be smaller than the number of data bytes that would
have been transmitted, but the number of bytes specified by
FCP_DL will be transmitted. The effect on the media depends
on the device model being addressed.

#030 (E) Page 21, Section 7.4.3, Para 1

Remove the sentence, "The value is specified in SCSI-2". It has
no meaning.

Action:

Accepted

#031 (E) Page 21, Section 7.4.3

Add a sentence that states that the length of this field must be
padded to a four byte length due to the restrictions of FC-PH.

Action:

There is no requirement to padd this data to a four byte length.
The framing performed by the FC-2 automatically performs this
padding for any length.

#032 (T)   Page 22, Section 7.4.5

   What is the purpose of the FCP_RSP fields? I see them as additional
   sense information. Are they considered "soft" error information that
   presents no reason to retry the command or think that it failed, but
   gives information useful to the ULP. I see them as a duplication of
   something already available, namely the sense data.

   Proposed Action: [See separate mail]

   The FCP_RSP fields are designed to provide error or status
   information about the behavior of the ULP, as distinguished
   from the SCSI task or the FC-2 link errors. The text will
   be modified to clarify this.

#033 (E)   Page 22, Section 7.4.6

*** Remove references to SCSI-2. I think that we can just say that there
    may be sense data at any time and that it is in the format shown in
    the Request Sense command. There is no reason why I can't give sense
    data on every command.

*** Action:

*** Upon re-reading the text, I think it correctly expresses the
    above concept.

#034a (E)   Annex B

   Not to throw a monkey wrench into this, but what about a RAID
   controller attached to a RAID controller, attached to a RAID
   controller.....

   I think this a specific example of something that you would like to
   do, which is valid, but may not be appropriate for an annex.
   Find out what the RAID guys have to say and update accordingly.

   Action:

   Accepted. See Sun comment 052.

#034b (E)   Page 4, Section 4.2

   The 3rd paragraph under Device management seems awkward. We suggest:

      When the device server for a Data-In or Data-Out task has
      completed the interpretation of the command and is prepared to
      transmit or receive some or all of the Data associated with the
      task, it:

      1. optionally sends a Data Descriptor IU containing the
         FCP_XFER_RDY payload to the SCSI Initiator to indicate which
         portion of the data is to follow.

      2. sends or receives the solicited data sequence containing the
         FCP_DATA payload

      Steps 1 and 2 are repeated until all data described by the SCSI
      command transferred.

Action:

Accepted. The text will be clarified in a manner similar to that
requested.

#035 (I) Page 5, Section 4.2

*** The 2nd to last paragraph has problems:

The design basis for FCP isn't relevent or helpful. The first
sentence which describes the wonderful match between FCP and class 2
should be struck. We also believe that class 3 DOES support the FCP
with only one possible exception: support of delivery of commands in
the order transmitted. Class 3 doesn't exhibit a lack of "confirmed
service" support: the passing of Sequence Initiative may count as
confirmation for most, if not all of the delivery services.

The paragraph should either be deleted or re-written to say that FCP
may be run: class 2-only, mixed class2/class1, or class 3: as
determined in a way beyond the scope of this standard (unless you want
to suggest that if command comes in class 3, the entire Exchange
shall be run in class 3, etc).

If there are specific cases where class 3 does not provide enough
confirmation as required by SAM, they should be listed.

*** Action:

*** Accepted

#036 (E) Page 6, Section 5

Seems like 4.2 on is the overview. And all of 5 is more detail than
overview. Please consider re-titling the section (possibly merge
5 and 6 under 6's title).

Action:

Accepted. Text will be modified to meet the intent of the
suggestion.

#037a (T) Page 16, Section 7.1.2

The "Task Identifier" of SAM is missing, and thus untagged commands
can't be issued. This breaks the leverage of existing CAM interfaces
unless the FCP SIM does some sort of extra management to synthesize
untagged behavior on an otherwise tagged-only FCP. The correct
solution seems to be to preserve the ability to passed untagged
commands. All that is needed technically is to add the "Task
Identifier" bit in the command payload; editorial additions clarifying
that an OX_ID tag isn't really a tag if "Task Identifier = Untagged
Task Identifier",may also be necessary.

Proposed Action: [See separate mail]

The command queueing annex of SAM states that untagged commands
will be treated as if they had the SIMPLE attribute. Since
the Fully Qualified Exchange ID is a valid identifier of a
task, it should be adequate to map CAM requests for untagged
and SIMPLE commands to the SIMPLE attribute as far as

FCP is concerned. The text will be clarified to indicate that.

#037b (T) Page 16, Section 7.1.2

*** Which of the Task Management Flags should be allowed to be executed
    concurrently? Our understanding is that SAM presents a single Task
    Management function per service call paradigm. We suggest that
    the "flags" should be changed to "functions."

*** Action:

*** Accepted. The text will be clarified to indicate that no
    concurrent Task Management functions can be requested.

#037c (T) Page 16, Section 7.1.2

  Also, since SCSI NOP isn't mandatory, we suggest there be a bit that
  says whether a command is valid. Since it isn't always possible to
  send Terminate Task, or Abort Task, at least these two must be sent
  using an FCP Link_Application look-alike to ABTX: I.e., the OX_ID
  must be used to identify the task. However, it must be done on a
  separate Exchange in order to be able to send it asynchronously. We
  recommend putting all these functions in a separate Exchange and
  remove the bits from "normal" commands (except that Clear ACA will
  appear in both normal commands with ACA_Q and as an FC4 FCP extended
  link application):

              Task Management flags -> functions (encoding)

              reserved   0
              Terminate Task bit 7   1
              Clear ACA   bit 6   2
              Target Reset   bit 5   3
              Clear Task Set bit 2   4
              Abort Task Set bit 1   5
              reserved   :

In summary, we propose the following re-structuring of the FCP_CNTL field:

             bits
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Tid   Task Attributes
+---+---+---+---+---+---+---+---+   ----------   ---------------
| MSByte command serial# / res. | 0 Untagged   0 Simple_Q
+---+---+---+---+---+---+---+---+   1 Tagged   1 Head_of_Q
| LSByte command serial# / res. | 2 Ordered_Q
+---+---+---+---+---+---+---+---+   3 ACA_Q
| reserved | R/W   : reserved
+---+---+---+---+---+---+---+---+   ----------
|ACA|Task Attribute |Tid| R/W | 0 reserved
+---+---+---+---+---+---+---+---+   1 Read   ACA
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | 2 Write   ----
                                     3 reserved   0 = Clear ACA
                                                       1 = ACA unchanged

FCP Link Applications:

    Terminate Task
    Clear ACA
    Target Reset

Clear Task Set
         Abort Task Set

      Proposed Action: [See separate mail]

      SAM presently defines Clear ACA as a Task Management Function,
      sent independently of a command. I believe that this is correct
      and that therefore Clear ACA does not appear in "normal" commands.

      Comment 37a separately addresses the Tagged/Untagged question.

      Comment 37b separately addresses the mutually exclusive nature
      of the Task Management functions.

      In addition, the text should clarify that the presence of any of the
      Task Management functions should indicate that the CDB is not valid.

      The present agreement about the FCP_CNTL field was reached by
      negotiation with the SBP editors. There is no strong reason to
      change it, considering the other solutions.

#038 (T) Page 17, Section 7.1.2 (FCP_CNTL: Ordered_Q)

      The second sentence describes a procedure which is insufficient to
      guarantee SAM requirements that commands to a target identifier be
      received in the order sent. Merely requesting in-order delivery is
      not sufficient, since guaranteeing in-order delivery involves much
      more than setting and recognizing the Fabric Login in-order delivery
      bit.

      An alternative is to introduce a serial number in the command: this
      number would be used to order all commands as appropriate at the
      device. Such a scheme may require new SCSI errors codes: We haven't
      researched it (something to indicate: timed-out-waiting for missing
      command to arrive). For a random access device like a disk, this
      serial number can probably be ignored unless Ordered_Q is supported.
      For sequential access devices, explicit link-independent ordering of
      commands may be more useful.

      The alternative is waiting for some indication of command
      confirmation. Class 1 and Class 2 offer ACK as a notification that
      the command was received with good CRC. Although the ACK, doesn't
      guarantee that the command will be delivered, it is a reasonably
      reliable confirmation for practical purposes. Class 3 has no such
      acknowledgment. The command serial number would improve robustness
      for class 1 & 2 and enable all classes of services to follow the SAM
      model.

      An unpleasant alternative is to wait for confirmation of command
      received by the target before sending subsequent commands: this
      requires some sort of polling and/or notification when a command is
      acknowledged. I.e., subsequent commands to the same LU and/or device
      will be blocked until each command is acknowledged.

      Proposed Action: [See separate mail]

      In the case of a well designed fabric that throttles the
      receipt of frames using BB credit such that F_BSY never
      occurs except as a catastrophic error condition, the in-order
      delivery request is sufficient to make the indicated guarantee.

Therefore the alternative is not necessary.

The command serial number would increase the complexity for
no measurable gain. The serial numbers would have to be
managed for a very large number of LUN's for commands sourced
from a large number of threads, and in the case of hunt groups,
across initiator ports. The use of Task Management functions
would render the serial numbers non-consecutive, and therefore
not useful in managing order. The presence of errors would
further complicate the serial number management.

The "unpleasant alternative" cited above is the mechanism used by
every operating system that really cares about the ordering of
a particular set of operations. The notification function is
routinely employed by CAM and potentially has very low overhead.

The suggestion is not accepted.

#039 General

  We didn't find anywhere that says under what conditions (if any) a
  Target may provide the FCP_RSP IU "early". For example, if queue
  space is limited a Target may choose to go directly to RSP with "Task
  Set Full" status.

  Are there any other restrictions to doing this besides requiring
  Sequence Initiative? I.e., can it send FCP_RSP immediately after an
  FCP_XFER_RDY (for a non-zero number of Data-In bytes)?

  Action:

  These conditions are specified by SAM and needn't be specified
  in FCP.

6.0 AMDAHL

Representative: Neil T Wanamaker

Date: Nove 5, 1993

001 E Sections 3.1.10, 3.1.12, 3.1.15, 3.1.28

  SAM does not appear to require confirmed service here.
  I agree that it is appropriate to use confirmed service here.

  Action:

  SAM indicates that these are confirmed services, although the
  confirmation may be no more than the REQ/ACK sequence on a byte by
  byte basis. No action is required.

002 E 3.1.15.
  This refers to the FC_PH service interface, rather than
  FC_PH services.

  Action:

Accepted

003 E 4.2., par. 7:

   intermix should replace mixed.

   Action:

   Accepted.   The text will be clarified

004 E 5., par.2:

   The number of open exchanges is not defined by FC-PH characteristics,
   but rather negotiated at login as defined in FC-PH. The number of
   exchanges is for the pair of N_Ports, not qualified by FC-4 type.

   Action:

   Accepted.   The text will be clarified

005 E 5., Table 2:

   Functional negotiation isn't in SAM. Login/Logout isn't optional.
   (note typo in header).

   Action:

   The observation is correct.   The text will be modified to
   separate link level functions from the SAM functions.

   Login/Logout need not be performed for those systems using
   implicit login techniques.

006 E 6.2.1

   First sentence should refer to "Logout".

   Action:

   Accepted

007 E 7.1

   second sentence: "..an.. frames..."

   Action:

   Accepted

008 E 7.2

   last sentence of par.3: "..have be ready"

   Action:

   Accepted

009 E 7.2.1.

*** What is the initiator to do if the relative offset of the data frame
   doesn't match the Transfer Ready?

*** Action:

*** This is an FCP ULP error and, if detected, should be posted as a new
   response code in Table 14, "ULP Data Transfer violation".

7.0 IBM

Representative: George Penokie

Date: November 7, 1993

001 E   Section 4.2 paragraph 2,

  change UI to IU.

  Action:

  Accepted

002 E Section 6.1 paragraph 1:

  I believe should not refer to a "command
  pair." I think this should just say "command."

  Action:

  The request/response pair for PRLI requires IUs from each
  of the two devices creating an image pair. The text will
  be clarified to indicate this behavior.

003 E Section 6.1 paragraph 7

  This section refers to a PRLI to an "image pair," while
  paragraph 1 indicates PRLI goes from an originator N_Port to a
  Responder N_Port--not an image pair. Perhaps what is said is correct
  but I think it needs clarification.

  Action:

  Accepted

004 T Section 6.1

  This section should probably state that all SCSI commands associated
  with a process which logs out are aborted. It seems unclear from
  reading the document whether SCSI commands are able to span process
  logout/login cycles.

  Action:

  Accepted. Note that the other task management functions may also require
  the execution of ABTX or ABTS with last sequence bit set to
  clear FC-2 activities being carried on for the aborted tasks.

005 7.1.1

  This section states that the entity address is vendor unique. If

possible it would be better to refer to the RAID document on addressing, X3T9/93-161. Annex B, although informative, should also be updated to conform to that document.

Action:

Accepted. See Sun Comment 52.