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FROM: Peter Johansson

TO: NCITS T10

DATE: May 23, 1998

RE: SBP-2 Revision History

This memorandum contains the revision history of the SBP-2 drafts from inception to date. By custom, the history is not included in the draft used by NCITS in the public review process.

Revision 1 (July 17, 1996)

First release of working draft.

Revision 1a (August 13, 1996)

Changes were incorporated from *ad hoc* discussions with diverse participants. These were presented at the Redmond, WA, SBP-2 working group meeting for discussion.

Data structure locations have been constrained to enable cost-reductions in target silicon. ORB's and associated parameter and response buffers shall be in the same node as the initiator that logged-in to the target. The same restriction shall also apply to the status FIFO. In a similar fashion, the data buffer and the page table that describe it shall reside both in the same node—although this node does not have to be the same as the initiator's.

The ORB fields that describe the data buffer and page table were enhanced to permit the description of data transfer alignment requirements in the case where the data buffer is directly addressable as a contiguous range of Serial Bus addresses.

Interrupt notification was modified to permit the return of status to be optional. An error condition overrides this parameter; a status block shall always be stored in the event of an error.

The ORB data structures were modified to compact the stream CDB and stream control ORB's to 32 bytes from 64 bytes.

New management ORB's have been defined for security management and access control. The accompanying work in section 8 still remains to be completed.

The status block has been expanded to permit the return of autosense data when appropriate to the device class. Targets are permitted to return portions of the status block when appropriate.

Unsolicited status was added as a feature, along with an interlock through a new register, STATUS_ACKNOWLEDGE, to let the initiator pace the receipt of unsolicited status reports.

The login and management agents have been collapsed into one agent, the management agent. Requests are signaled to the management agent *via* a new register, the MANAGEMENT_AGENT register, whose address is obtained from configuration ROM.

The target fetch agent (for normal CDB, stream CDB and stream control requests) has been enhanced to permit its reactivation from a SUSPENDED state by a single write to the ORB_POINTER register. This is an improvement over the previous approach where a write to the DOORBELL register would cause the fetch agent to refetch the *next_ORB* address before fetching the new request. A Serial Bus transaction is eliminated and the restart latency is significantly improved.

A new configuration ROM entry, Unit_Unique_ID was defined to support SBP-2 devices that have multiple Serial Bus connections.

The basic task management model, discussed by the T10 SCSI-3 working group in Colorado Springs, CO, July 17, 1996, is now part of the draft.

Revision 1b (September 9, 1996)

Changes were incorporated as a result of working group discussions in Redmond, WA and were subsequently presented in Natick, MA.

The definition of a logical unit has been expanded. A target shall always implement logical unit zero.

Alignment restrictions on SBP-2 data structures (*i.e.*, anything referenced by an address pointer in an ORB other than the data buffer itself) have been relaxed from 16- to 4-byte alignment.

The normal and stream CDB ORB's have been simplified to permit a variable length CDB to follow the first five quadlets of the ORB, whose definition remains constant. This eliminated the need for both a 32- and 64-byte ORB.

The names *page_table* and *page_table_elements* have been changed throughout the document to *data_descriptor* and *data_size*, respectively. The meaning and usage of these fields has not changed. These global changes are not marked with change bars.

Block read transactions used to access page tables shall not cross page alignment boundaries expressed as $2^{page\_size + 8}$ bytes.

SBP-2 status has been redefined into two parts, one dependent upon the command set of the device and another used to present transport protocol status common to all devices.

As a result of discussions in Redmond, the fetch agent CSR's have been simplified and mistakes in the fetch agent state machine corrected. The figure that illustrates the fetch agent state machine and the accompanying text have been relocated to be closer to the descriptions of the usage of target fetch agents by initiators.

Section 8 has been expanded to document the usage of the login and security ORB's defined in 5.1.4.

Revision 1c (September 18, 1996)

Changes made *per* working group discussions in Natick, MA.

The acronym CDB has been changed throughout to command block or *command_block*, as appropriate. This global change is not marked by change bars.

The conformance glossary has been expanded to define the terms "reserved" and "ignored" and to clarify the implications of "shall."

A note has been added to emphasize that device designers are encouraged to use 32-byte ORB's.

The *fetchable* bit in the status block has been renamed *end_of_list* and its meaning has been redefined. The status block has been modified to permit SBP-2 errors to be reported concurrently with command set errors. The *sense_key*, *asc* and *ascq* fields have been deleted and redefined as command set-dependent.

The MANAGEMENT_AGENT register has been redefined so that a write transaction, rather than a lock, is used to signal a request to the target.

The *doorbell*, *fetched* and *status_acknowledge* bits have been removed from AGENT_STATE register.

Configuration ROM definitions in the unit directory have been modified and a logical unit directory added to permit greater flexibility in the specification of targets that implement multiple logical units. The sample configuration ROM in the informative annex reflects the changes.

A new clause has been added to section 9 to describe the expected use of a target fetch agent by the BIOS or similar single-threaded application at an initiator.

The section on task management has been updated to improve clarity and to indicate that support for task management ORB's with a *function* of ABORT TASK is optional. Targets are still required to recognize an abort task request when the initiator sets the value of *rq_fmt* to three.

A normative annex has been added to specify the minimum Serial Bus requirements for both initiators and targets.

Revision 1d (October 5, 1996)

Editorial comments discussed in Irvine, CA, have been incorporated in this revision.

The definition of "reserved" has been changed so that a target shall not check the values of reserved fields.

The *notify* bit is advisory. That is, a target may return status even if *notify* is zero.

The initiator shall insure that *max_payload* does not specify a maximum data transfer larger than the speed code permits.

The circumstances under which a target may retry a block write transaction to an initiator's *status_FIFO* have been clarified.

The requirement for targets to implement the STATE_CLEAR.*dreq* bit has been stated in Annex A.

Revision 1e (November 9, 1996)

Minor editorial changes throughout, *per* discussions in Redmond, WA. The name of the CURRENT_ORB register has been changed to ORB_POINTER; this global change is unmarked by change bars.

After substantial discussion, the *ad hoc* working group concluded that security issues are best handled at the command set level. SBP-2 need provide only an access control mechanism that is sufficient to validate the actual identity of the initiator, EUI-64, and to provide a means whereby an initiator that had access rights before a Serial Bus reset has priority to reestablish the same access rights ahead of other, competing initiators. As a consequence, section 8 has been substantially revised and corresponding changes made to the data structure and configuration ROM descriptions in 5.1.3 and 7.4.8 respectively.

The fetch agent state machine diagram has been updated to simplify the actions a target shall take upon a write to the DOORBELL register.

The error conditions under which a target shall not attempt a retry of a block write transaction to store completion status have been clarified.

In Annex A, the target is required to support 8-byte block read and block write requests only for the MANAGEMENT_AGENT or ORB_POINTER register.

Former Annex B, “SCSI-3 Architecture Model compliance," has been removed to a separate document under development by T10 that includes a description of the use of SBP-2 facilities to implement SCSI devices.

Revision 1f (November 14, 1996)

The definition of “reserved” has been updated to bring it into conformance with contemporaneous standards such as T10 Project 1048D, SCSI-3 Multimedia Commands.

A *function* value for management ORB’s has been set aside for command set-dependent use.

New *password* and *password_length* fields have been defined in the login ORB. The usage of these fields is command set-dependent but is intended to permit additional validation of the login ORB by a target.

An *exclusive* bit has been defined in the login ORB. When *exclusive* is set to one it causes multiple initiator targets to behave as if they supported only one login at a time.

In order to enable lower cost target hardware implementations, the format of the page table has been expanded and redundant information has been added. The net result is that the parsing of page tables may be normalized by target hardware. A requirement for octlet alignment of the page table elements was also added.

Targets shall not support broadcast write requests except as already required by IEEE Std 1394-1995 or future standards.

Logout requests are to be rejected if the *source_ID* does not match that of the currently logged-in initiator.

Revision 1g (December 4, 1996)

The response status returned by a target when an ORB with *rq_fmt* equal to three is processed (also known as a dummy ORB) is REQUEST ABORTED.

The previous revision had errors in the description of constraints that apply to page table elements, dependent upon their position within the page table. These errors have been corrected.

The descriptions of login and logout in section 8 have been clarified.

Portions of 10.4.1 have been rewritten in a simpler fashion that also permits greater target implementation flexibility in response to a task management ORB with the ABORT TASK *function*.

Revision 2 (January 9, 1997)

Subsequent to a vote by the T10 plenary to stabilize portions of SBP-2, this revision has been prepared; it is essentially identical to Revision 1g but without the change bars.

The sections stabilized by the plenary *exclude* the portions of SBP-2 concerned with isochronous data streams. The stabilized sections are enumerated below:

Section	Description
1	Scope and purpose
2	Normative references
3	Definitions and notation
4	Model (with the exception of 4.5)
5	Data structures (with the exception of 5.1.2.2 and 5.1.3)
6	Control and status registers (with the exception of 6.5)
7	Configuration ROM
8	Access (with the exception of 8.2.2)
9	Command execution
10	Task management
Annex A	Minimum Serial Bus node capabilities
Annex B	Sample configuration ROM

For readers unfamiliar with T10 process, stabilization is a significant milestone in the development of a standard. Once a document or portions thereof are stabilized they are not to be modified unless either a) there is a demonstrable flaw in the draft standard or b) the changes are agreed to by a two-thirds vote of the T10 plenary in which at least half of the membership votes.

Revision 2a (February 10, 1997)

Accredited Standards Committee X3 – Information Technology has changed its name to the National Committee for Information Technology Standardization (NCITS). The global changes are not marked by change bars.

Various typographical errors noted by reviewers have been corrected and marked with change bars.

The model of a target has been enhanced by a new clause that describes both direct and indirect access to the data buffer and by new material in the isochronous sections. As part of this, the name “isochronous login” has been changed to “create stream.”

The MANAGEMENT_AGENT and ORB_POINTER registers are required to support both block reads and block writes.

The numeric values used to encode data type in the common format for recorded isochronous data have been changed to align them with *tcode* values used by Serial Bus.

The stream control function, SET CHANNEL MASK, is restricted to only those times when an isochronous stream is paused or stopped.

Error reporting for isochronous streams has been simplified. Instead of an error log accumulated in initiator memory, unsolicited status is stored each time an error occurs.

Annex B (informative), “Status block for sense data”, has been added. Although this annex is informative within the context of SBP-2 its purpose is to provide material that may be normatively referenced from other command set standards, such as ATAPI, MMC-2 or SCSI.

Revision 2b (February 27, 1997)

The plug control registers (PCR’s) and the procedures for their use have been removed because they do not add to the functionality already provided by SBP-2 stream control requests.

The model of the stream engine has been enhanced to show a functional component that filters channels from previously recorded isochronous data before it is made available to the Serial Bus LINK.

Fields in the stream command block ORB have been modified to permit cycle mark synchronization locations to be specified. This has utility when an SBP-2 device has lost current position information within an isochronous stream as a result of command block error(s).

Channel configuration information is conveyed as a single, 64-entry channel map instead of the previous method that required a stream control ORB to configure each channel.

A new field, *delta_time*, has been added to the CREATE STREAM request. Upon playback, *delta_time* is used to shift the time-stamps of certain isochronous data formats into the future.

A note has been added to recommend that writes to the target's RESET_START register be qualified by the *source_ID* of the write in order to restrict access to currently logged-in initiators.

Behavioral differences between normal command block agents and the pairs of stream command block and stream control agents allocated by a create stream request have been clarified. This includes a redefinition of ORB_POINTER behavior such that its contents are unchanged by a bus reset. Stream task sets are not aborted by a bus reset—they continue to execute but retain completion status until a reconnect by the initiator.

Support for abort task by means of task management ORB's with a *function* of ABORT TASK is mandatory for stream command block and stream control fetch agents.

While recording isochronous data, the target shall detect missed isochronous cycle(s) and synthesize a CYCLE MARK packet to record on the medium.

Errors in the description of the isochronous data interchange format that are not consonant with the CIP format specified by IEC 61883-1/FDIS have been corrected.

Revision 2c (March 26, 1997)

The name Command_Set_Version has been changed, globally, to Command_Set; the changes are not marked.

References to REQUEST ABORTED have been remove since this response code has never been defined. In conjunction, the description of abort task processing in 10.4.1 has been clarified to distinguish between dummy ORB completed and request aborted status.

The code values defined for the status block have been expanded to permit more accurate description of Serial Bus transport errors. Errors detected by a stream controller may also be reported by the use of unsolicited status.

A target's permission to store unsolicited status has been modified so that it is initially disabled at the time of a login or create stream request. Initiators that wish to accept unsolicited status may subsequently write to the UNSOLICITED_STATUS_ENABLE register each time a single instance of unsolicited status may be stored.

A description of the optional LOGICAL UNIT RESET function has been added to the task management section.

A tabular summary of fetch agent and task set states has been added to the section on task management. The table collects in one place target state information related to significant events such as power reset, bus reset or task management functions.

All of the above technical changes to stabilized portions of the draft standard were approved by the T10 plenary March 13, 1997, in San Diego, CA.

Revision 2d (June 10, 1997)

This draft reflects editorial changes proposed by both the *ad hoc* and editors' working groups in Natick, MA.

The model for isochronous targets is changed to make the stream control agent optional. Targets may provide the same facilities by other methods, such as plug control registers or commands served by the stream command block agent.

The relationship between status FIFO addresses explicitly specified by management ORB's and those implicitly associated with other ORB's has been clarified; there has been no technical change from the original intent of the working group.

The optional cycle mark index is described in the section on isochronous data interchange format.

The isochronous data transformation procedures specified in 12.2.3 have been corrected.

Revision 2e (July 23, 1997)

In addition to the technical changes described below, this draft incorporates editorial changes and typographical corrections from the *ad hoc* working group meeting in San Jose, CA.

The definition of the *data_descriptor* field in the normal command block ORB has been clarified to show that a directly addressed data buffer can start at any byte address.

Page table formats have been extended from the original (normalized) format to include a less restrictive format.

Additional information was added to the section on configuration ROM to clarify target behavior at the time of a power reset. References to the node unique ID leaf have been removed here and elsewhere in anticipation of P1394a changes that make this ROM information optional. A new entry, Firmware_Revision, has been added for use by manufacturers.

Target behavior after power reset is also specified more precisely in Annex A. Security requirements for the target have been added to this annex.

All of the above changes to stabilized portions of the draft standard were approved by the T10 plenary July 17, 1997, in Colorado Springs, CO.

The *idf* field was added to the CREATE STREAM request to control the format of recorded isochronous data.

Time stamp transformations for CIP format isochronous data were corrected to reflect the fact that the *cycle_offset* never requires transformation.

Annex D (informative) was added to create a location for advice to implementers about Serial Bus errors for which the error recovery strategy may not be obvious.

Revision 2f (September 7, 1997)

In addition to the technical changes described below, this draft incorporates editorial changes and typographical corrections from the *ad hoc* working group meeting in Longmont, CO.

The extent of configuration ROM covered by the CRC in the first quadlet is not specified by this standard; see instead IEEE Std 1394-1995.

Former Annex B (informative), " Status block for sense data ", has been removed since it is substantially replicated by the new B.2 (see below).

New Annex B (normative) has been added to specify how devices that utilize the SCSI command set(s), status and sense data are to be implemented within SBP-2. Annex C (informative), which includes an example of SBP-2 configuration ROM, has been expanded to include examples specific to SCSI devices. Annex D (informative) explains how SCSI Architecture Model concepts are expressed within SBP-2.

New Annex E (informative) describes how AV/C command and response frames may be transported by SBP-2 instead of Function Control Protocol (FCP).

Revision 2g (September 15, 1997)

In addition to the technical changes described below, this draft incorporates editorial changes and typographical corrections from the editorial session and *ad hoc* working group meeting in Nashua, NH.

Contradictory descriptions of *ack_tardy* in 7.1 have been corrected.

The configuration ROM definition of *login_timeout* has been extended to all task management requests and the field renamed to *mgt_ORB_timeout*.

The above changes to stabilized portions of the draft standard were approved by the T10 plenary September 11, 1997, in Nashua, NH.

If unsolicited status is used to report the progress of commands, implementers are advised to pick reporting intervals that balance Serial Bus utilization against the usefulness of the information.

A definition of "working set," part of the task set kept in a target's local storage, has been added to the glossary.

Revision 2h (November 10, 1997)

A new annex, “Security extensions,” provides a normative, but optional, method to add password protection to the SBP-2 access protocols. A change was also required to add a new management ORB function code in a stabilized portion of the draft standard. These changes were approved by the T10 plenary November 6, 1997, in Palm Springs, CA.

Editorial changes to sections 11 and 12 as a result of the SBP-2 *ad hoc* meeting in Palm Springs as well as to A.3, "Target security," to match the language in IEEE P1394a Draft 1.1.

Revision 3 (November 10, 1997)

This revision has been prepared for ballot by T10 to approve or disapprove its forwarding to NCITS for further standards processing; it is essentially identical to Revision 2h but without the change bars.

Revision 3a (January 23, 1998)

This draft contains only editorial changes from Revision 3, marked by change bars, and purports to resolve editorial comments submitted with T10 ballots. Technical changes in resolution of other comments will be reflected in a subsequent draft.

Revision 3b (March 21, 1998)

Incorporated responses to T10 ballot comments approved by the plenary March 19, 1998 in San Diego, CA. Minor editorial corrections also included.

Revision 3c (March 21, 1998)

This revision is identical to Revision 3b except that the change bars have been removed.

Revision 3d (March 21, 1998)

As approved by the T10 plenary March 19, 1998 in San Diego, CA, all isochronous material has been removed from this draft, which, less the revision history and change bars, is proposed as a candidate to be forwarded to NCITS for further processing. The next action on this document is scheduled at the T10 plenary May 6, 1998 in Colorado Springs, CA.

The isochronous sections and clauses removed in their entirety are not marked by change bars but listed in the table below.

Section or clause	Description
4.7	Streams
5.1.2.2	Stream command block ORB
5.1.3	Stream control ORB
5.1.4.3	Create stream ORB
5.3.3	Unsolicited isochronous error report
8.2.2	Create stream
11	Isochronous data interchange format
12	Isochronous operations
Annex G	Common isochronous packet (CIP) format
Annex H	AV/C Encapsulation

The removal of other isochronous material intertwined with what remains has been indicated by change bars.

Revision 3e (May 8, 1998)

The recommendations of T10/98-121r2, which permit a target to retain target resources for more than one second after a bus reset, have been incorporated.

In resolution of comments submitted during the T10 letter ballot, the CLEAR TASK SET and TERMINATE TASK functions have been removed and the definition of the *q* bit in the Logical_Unit_Number entry has been deleted.

Minor editorial corrections throughout.

Revision 4 (May 23, 1998)

This draft is essentially identical to Revision 3e but without change bars and with the removal of the document history to a separate document, T10/98-171r0. It has been approved by the T10 plenary for public review to be conducted by NCITS.