

Doc. No.: X3T10/94-001

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Project:

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X3 SUBGROUP ANNUAL REPORT

Annual Report for: **X3T10 (X3T9.2 during 1993)**

Covering the Period: April 1993 to March 1994

Title of X3 Subgroup: Lower Level Interfaces

Informal

Description of Work: X3T10 develops standards and reports on I/O interfaces, particularly SCSI (Small Computer System Interface) and IDE (Integrated Drive Electronics), also known as AT Attachment.

I. Executive Summary

X3T10 was recently formed to continue the work previously assigned to X3T9.2. X3T10 has one task group, X3T10.1 (formerly X3T9.7), which is assigned the SSA-PH project. There are a total of 23 approved projects assigned to X3T10 and several more are being proposed. Most of the current projects are related to SCSI and are the result of layering the SCSI-3 architecture. There are also active projects on ATA (a.k.a., IDE) and several maintenance projects on older I/O interfaces. In spite of hard times in the industry, X3T10 remains a large committee with 60 current voting organizations.

A recent trend has been to migrate the SCSI commands and architecture to newly-emerging serial interfaces. Two mappings to Fibre Channel and IEEE 1394 are nearly completed. A project to map SCSI to the Serial Storage Architecture (SSA) has also been proposed.

II. Projects

1. Interfaces Between Flexible Disks and Their Host Controllers

- a. Project 52-M, Interfaces Between Flexible Disks and Their Host Controllers
- b. Target date for dpANS to X3:
Original target date: ?
Previous target date:
Current target date: Published

- c. Project Description: This is a maintenance project on X3.80-1988, Interfaces Between Flexible Disks and Their Host Controllers.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: X3T9.2 and X3T9 recommended that the simultaneous withdrawal of X3.80-1988 and adoption of ISO 9315:1989 as an ANSI standard. The public review passed without comment. The action is currently at X3 letter ballot, which closes April 20, 1994.
- f. Statement of Status as of This Report: X3 letter ballot closes April 20, 1994.
- g. Future Plans: none.
- h. Reasons for Delay: none.

2. Storage Module Interfaces (SMD-E)

- a. Project 53-RF, Storage Module Interfaces (SMD-E)
- b. Target date for dpANS to X3:
Original target date: ?
Previous target date:
Current target date: Published--Reaffirmed: October 12, 1992
- c. Project Description: This is a maintenance project on X3.91-1992, Storage Module Interfaces.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: none.
- f. Statement of Status as of This Report: 5-year review is due in 1996.
- g. Future Plans: none.
- h. Reasons for Delay: none.

3. Small Computer System Interface (SCSI-2)

- a. Project 375-R, Small Computer System Interface (SCSI-2)
- b. Target date for dpANS to X3:
Original target date: January 1988
Previous target date: December 1991
Current target date: none -- BSR approved 1/31/94
- c. Project Description: This project is a revision of X3.131-1990 (SCSI-2 Rev 10c), which was approved by ANSI 8/31/90, but never published at X3's request.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: Much of the year was spent incorporating ISO edits into SCSI-2. Once completed, the X3 letter ballot was issued and SCSI-2 Rev 10L was sent to BSR where it was approved January 31, 1994. ANSI is now in the process of publishing X3.131-1994.

- f. Statement of Status as of This Report: ANSI is publishing X3.131-1994.
- g. Future Plans: none.
- h. Reasons for Delay: The project was delayed because of misunderstandings between X3 and ANSI regarding the degree of changes that can be accommodated during the publication phase.

4. Device Level Interface for Streaming Cartridge and Cassette Tape Drives

- a. Project 378-M, Device Level Interface for Streaming Cartridge and Cassette Tape Drives
- b. Target date for dpANS to X3:
Original target date: ?
Previous target date: ?
Current target date: Published
- c. Project Description: This is a maintenance project on X3.146-1986 [R1992].
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: none.
- f. Statement of Status as of This Report: Due for 5-year review in 1996.
- g. Future Plans: none.
- h. Reasons for Delay: none.

5. Enhanced Small Device Interface (ESDI)

- a. Project 587-M, Enhanced Small Device Interface (ESDI)
- b. Target date for dpANS to X3:
Original target date: ?
Previous target date: April 1989
Current target date: X3 approved ESDI 10/10/89
- c. Project Description: ESDI defines a disk interface oriented toward disk drives with transfer rates of 10 to 24 Mbit/sec. Much of the development work on ESDI was done by an industry group while this project was assigned to X3T9.3. In June 1987 this project was transferred to X3T9.2 and in January 1994 this project was transferred to X3T10.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: none.
- f. Statement of Status as of This Report: On March 17, 1994, X3T10 recommended that ESDI be reaffirmed.
- g. Future Plans: none.
- h. Reasons for Delay: none.

6. AT Attachment Interface for Disk Drives (ATA)

- a. Project 791-D, AT Attachment Interface for Disk Drives
- b. Target date for dpANS to X3:
Original target date: August 1991
Previous target date: July 1993
Current target date: End X3 LB 3/30/94
- c. Project Description: The widespread use of desktop computers with a 16-bit memory bus has led to the adoption within the industry of a disk drive which attaches via a subset of the personal computer AT bus. Because of their compatibility with existing personal computer AT hardware and software this interface quickly became a de facto industry standard. The intent of this project is to develop a standard to specify a subset of the AT bus specifically for the direct attachment of peripherals. This standard will specify the mechanical and electrical characteristics as well as the methods by which commands are directed to peripherals, the contents of registers, and the method of data transfers.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: The first public review comments were resolved and ATA passed its second public review without comments.
- f. Statement of Status as of This Report: ATA is at X3 letter ballot, which closes 3/30/94.
- g. Future Plans: none.
- h. Reasons for Delay: Public review comments.

7. SCSI Common Access Method (SCSI CAM)

- a. Project 792-D, SCSI Common Access Method
- b. Target date for dpANS to X3:
Original target date: August 1991
Previous target date: September 1993
Current target date: September 1994
- c. Project Description: This project defines a common method to access SCSI devices through a standard software interface to SCSI host adapters for several popular operating systems. This should result in simplified integration of products.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: Several ad hoc meetings were held to address the first public review comment. The largest area of change has been the target-mode operation section.
- f. Statement of Status as of This Report: Most technical issues have been resolved. The group is conducting a page-by-page review in preparation for forwarding CAM to second public review.
- g. Future Plans: X3T10 expects that the draft document will be ready to forward for second public review during summer 1994.
- h. Reasons for Delay: Public review comment.

8. SCSI Technical Information Bulletins

- a. Project 817-D, SCSI Technical Information Bulletins
- b. Target date for dpANS to X3:
Original target date: February 1991
Previous target date: none
Current target date: July 1994
- c. Project Description: To develop Technical Information Bulletins addressing X3.131-1994. The interpretations to be developed by X3T10 do not have any impact on the SCSI-2 standard but will be available as guidelines for those who request them.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: none.
- f. Statement of Status as of This Report: This project was on hold pending the approval of SCSI-2 (project 375-R). X3T10 needs to review the draft TIB to see if it is still appropriate.
- g. Future Plans: none.
- h. Reasons for Delay: SCSI-2 was being revised as described in project 375-R.

9. SCSI-3 Parallel Interface (SPI)

- a. Project 855-D, SCSI-3 Parallel Interface
- b. Target date for dpANS to X3:
Original target date: April 1992
Previous target date: July 1993
Current target date: July 1994
- c. Project Description: The SCSI-3 Parallel Interface standard will maintain a high degree of compatibility with SCSI-2 while providing documentation for new capabilities including an option to permit 16-bit data transfers on a single cable and expanded bus connectivity options to increase the maximum number of SCSI devices on a cable from 8 to 16 or more. This standard is not intended to address areas above the physical level (such as protocol and command sets). It is intended that this proposed standard could be used in conjunction with the command sets defined in SCSI-2 and/or subsequent versions of SCSI.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: SPI Revision 12b was forwarded by X3T9.2 and X3T9 to X3 for first public review. Only one comment was received (from X3T9.2) requesting that SCSI Configured AutoMagically (SCAM), a method for automatically assigning SCSI IDs, be incorporated into SPI.
- f. Statement of Status as of This Report: The SPI project editor is preparing a draft incorporating SCAM.
- g. Future Plans: Proposals for follow-on work to increase transfer rates and investigate alternative connectors are under consideration.
- h. Reasons for Delay: Public review comment.

10. SCSI-3 Interlocked Protocol (SIP)

- a. Project 856-D, SCSI-3 Interlocked Protocol
- b. Target date for dpANS to X3:
Original target date: April 1992
Previous target date: January 1994
Current target date: November 1994
- c. Project Description: The SCSI-3 Interlocked Protocol standard maintains a high degree of compatibility with the equivalent functions in SCSI-2 while defining several new features and functions. The candidate new features are support of more than 8 devices, dual porting, and other evolutionary features. This standard is intended to be used in conjunction with the SCSI-3 Parallel Interface standard and the SCSI-3 command set standards.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: Rev 3 of SIP began to incorporate the service interface mechanism introduced in SPI.
- f. Statement of Status as of This Report: In development.
- g. Future Plans: Now that SPI and SAM are nearing completion, more resources will be available for this project.
- h. Reasons for Delay: Delays in associated projects: SPI and SAM.

11. ATA Extensions (ATA-2)

- a. Project 948-D, ATA Extensions (ATA-2)
- b. Target date for dpANS to X3:
Original target date: December 1992
Previous target date: December 1993
Current target date: September 1994
- c. Project Description: This project is intended to develop extensions to the draft AT Attachment standard without requiring changes to presently installed devices or existing software. Candidates for features in this standard include items that were identified late in the development of the AT Attachment draft standard and other evolutionary features.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: The project editor has prepared two revisions of the working document for this project.
- f. Statement of Status as of This Report: In development.
- g. Future Plans: Several ATA-3 project proposals are being considered by X3T10 to layer this interface into physical, transport, and command set levels.
- h. Reasons for Delay: Unrealistic schedule projections.

12. Directly-Addressable Device Interface (DADI)

- a. Project 964-D, Directly-Addressable Device Interface
- b. Target date for dpANS to X3:
Original target date: December 1993
Previous target date: December 1993
Current target date: TBD
- c. Project Description: This project is intended to develop a device interface to provide an alternative means of attaching storage devices which is better suited to direct board mounting than the traditional channel model.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: Some presentations were made early in the year. No recent progress.
- f. Statement of Status as of This Report: Waiting for a bona fide proposal.
- g. Future Plans: uncertain.
- h. Reasons for Delay: Premature project; difficult to get industry attention.

13. Serial Storage Architecture - Physical Layer (SSA-PH)

- a. Project 989-D, Serial Storage Architecture - Physical Layer (SSA-PH)
- b. Target date for dpANS to X3:
Original target date: June 1994
Previous target date:
Current target date: March 1995
- c. Project Description: The SSA-PH interface proposal is a cable interface for storage products that is capable of transporting a variety of protocols. SSA-PH offers the following features: high data rate (raw 20 MB/sec signaling rate), full duplex transmission, no arbitration required, architecture independent of data rate, fast recovery time from errors and cabling changes, high data integrity, low raw error rate, architected error recovery, hot pluggable units, failure tolerance via redundant paths to devices, economical implementation (CMOS), economical use of bandwidth, small frame size (for buffer expense reduction), self-configuration capabilities, 10 meter distance per cable segment, high connectivity, small signal count, low voltage (3.3 V), extensibility (higher speeds and optical capable) and the elimination of jumpers (and extra cables) for address and spindle sync.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: The transport protocol is stable. The connectors have been selected, but need more documentation.
- f. Statement of Status as of This Report: The X3T10.1 task group is documenting the connectors.
- g. Future Plans: It is expect that a 2x data rate specification will be included in SSA-PH prior to forwarding.
- h. Reasons for Delay: Unrealistic schedule in project proposal.

14. Common Access Method - 2 (CAM-2)

- a. Project 990-D, Common Access Method - 2 (CAM-2)
- b. Target date for dpANS to X3:
Original target date: July 1994
Previous target date: none.
Current target date: January 1995
- c. Project Description: This project is intended to revise and enhance the SCSI Common Access Method (CAM) such as adding 64-bit addressing and additional queuing modes.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: There were some early discussions, but the project was placed on hold until the CAM-1 is ready to forward for second public review.
- f. Statement of Status as of This Report: Waiting for to forward CAM-1.
- g. Future Plans: none.
- h. Reasons for Delay: Unexpected workload on CAM-1.

15. SCSI-3 Generic Packetized Protocol (GPP)

- a. Project 991-D, SCSI-3 Generic Packetized Protocol (GPP)
- b. Target date for dpANS to X3:
Original target date: June 1993
Previous target date: none.
Current target date: ?
- c. Project Description: The Generic Packetized Protocol is intended to provide a protocol that can take advantage of multiple physical interfaces in a length-independent manner (i.e., a minimum number of packets per I/O Process). The Generic Packetized Protocol encapsulates the SCSI protocol, functions, commands, status, and data requiring minimal services from the physical interface.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: There has been a large amount of work from a relatively small number of people. However, there is a lot of controversy surrounding GPP. The project editor has focused the document as an alternative protocol to FCP for FC-PH and as an alternative protocol to SIP for SPI. This resulted in a vote in January 1994 to re-direct this project as a Technical Report instead of a standard. Further X3T10 action is needed to resolve the GPP controversy.
- f. Statement of Status as of This Report: Waiting to either reconsider the January motion or to forward a revised project proposal.
- g. Future Plans: none.
- h. Reasons for Delay: Unrealistic target date in project proposal and controversy over overlaps with FCP and SIP.

16. SCSI-3 Serial Bus Protocol (SBP)

- a. Project 992-D, SCSI-3 Serial Bus Protocol (SBP)
- b. Target date for dpANS to X3:
Original target date: February 1994
Previous target date: none.
Current target date: May 1994
- c. Project Description: The Serial Bus Protocol is intended to provide a protocol that can take advantage of the capabilities provided by the High Performance Serial Bus (IEEE 1394) to support an efficient transport service for SCSI products.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: Work on SBP is nearly complete.
- f. Statement of Status as of This Report: An X3T10 letter ballot for forwarding SBP is expected in April 1994.
- g. Future Plans: none.
- h. Reasons for Delay: none.

17. SCSI-3 Fibre Channel Protocol (FCP)

- a. Project 993-D, SCSI-3 Fibre Channel Protocol (FCP)
- b. Target date for dpANS to X3:
Original target date: February 1994
Previous target date: none.
Current target date: May 1994
- c. Project Description: The SCSI-3 Fibre Channel Protocol is intended to provide a protocol that can take advantage of the capabilities provided by the Fibre Channel physical layer to support an efficient, low-overhead transport service for SCSI products. The FCP is one of the protocols used in the FC-4 layer of Fibre Channel.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: FCP development is nearly complete.
- f. Statement of Status as of This Report: In March 1994, X3T10 voted 47:2:0:11 to forward FCP to X3 for first public review. X3T10 is now attempting to resolve the 2 negatives.
- g. Future Plans: It is expected that X3T10 will send FCP to X3 in May 1994.
- h. Reasons for Delay: Negatives to resolve.

18. SCSI-3 Architecture Model (SAM)

- a. Project 994-D, SCSI-3 Architecture Model (SAM)
- b. Target date for dpANS to X3:
Original target date: February 1994
Previous target date: none.

Current target date: May 1994

- c. Project Description: The SCSI-3 Architecture Model defines the architecture of SCSI and provides a model for implementing several protocols on a variety of transport mechanisms. This standard will define a unifying framework for the implementation of SCSI.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: Several key technical issues were resolved and the document is nearing completion.
- f. Statement of Status as of This Report: Development work on SAM is nearly complete.
- g. Future Plans: An X3T10 letter ballot for forwarding SAM is expected in April 1994.
- h. Reasons for Delay: none.

19. SCSI-3 Primary Commands (SPC)

- a. Project 995-D, SCSI-3 Primary Commands (SPC)
- b. Target date for dpANS to X3:
Original target date: June 1994
Previous target date: none.
Current target date: November 1994
- c. Project Description: The SPC is intended to provide a definition of those commands absolutely necessary to function in an SCSI environment plus those commands that are defined consistently for more than one command set. This command set will provide the means to identify the device type and hence identify which command set is appropriate for the device.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: The SPC project editor has developed several proposals to deal with the expanded addressing in SAM for the copy commands and third-party reservations. A proposed SPC outline was reviewed.
- f. Statement of Status as of This Report: Initial work on SPC has begun.
- g. Future Plans: The SPC project editor expects to distribute a full first draft soon.
- h. Reasons for Delay: Committee work has been focused on the protocol and transport documents since there has not been extensive changes in the command sets since SCSI-2.

20. SCSI-3 Block Commands (SBC)

- a. Project 996-D, SCSI-3 Block Commands (SBC)
- b. Target date for dpANS to X3:
Original target date: June 1994
Previous target date: none.
Current target date: November 1994
- c. Project Description: The SCSI-3 Block Commands is intended to provide a complete set of commands to complement the SCSI-3 Primary Commands, and will be applicable to devices which transfer data in fixed block sizes (e.g., disk drives).

- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: Some proposals have been accepted as inputs for the eventual SBC draft document, however no draft document has been prepared.
- f. Statement of Status as of This Report: Work on this project is stalled waiting for a volunteer to act as project editor.
- g. Future Plans: Find a volunteer to be the project editor.
- h. Reasons for Delay: Committee work has been focused on the protocol and transport documents. We need a volunteer for project editor.

21. **SCSI-3 Stream Commands (SSC)**

- a. Project 997-D, SCSI-3 Stream Commands (SSC)
- b. Target date for dpANS to X3:
Original target date: June 1994
Previous target date: none.
Current target date: November 1994
- c. Project Description: The SCSI-3 Stream Commands is intended to provide a complete set of commands to complement the SCSI-3 Primary Commands, and be applicable to devices which transfer data in a streaming manner (e.g., tape drives).
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: Some proposals have been accepted and a first draft document has been prepared.
- f. Statement of Status as of This Report: Work on this project was stalled until recently. We now have a volunteer to act as project editor.
- g. Future Plans: Finish development.
- h. Reasons for Delay: Committee work has been focused on the protocol and transport documents.

22. **SCSI-3 Graphic Commands (SGC)**

- a. Project 998-D, SCSI-3 Graphic Commands (SGC)
- b. Target date for dpANS to X3:
Original target date: June 1994
Previous target date: none.
Current target date: November 1994
- c. Project Description: The SCSI-3 Graphic Commands is intended to provide a complete set of commands to complement the SCSI-3 Primary Commands, and be applicable to devices which transfer data from/to a visual representation to/from a computer.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: none.

- f. Statement of Status as of This Report: There has been no activity on this project. We need a volunteer to act as project editor.
- g. Future Plans: Find a volunteer to be the project editor.
- h. Reasons for Delay: Committee work has been focused on the protocol and transport documents.

23. SCSI-3 Medium Changer Commands (SMC)

- a. Project 999-D, SCSI-3 Medium Changer Commands (SMC)
- b. Target date for dpANS to X3:
Original target date: June 1994
Previous target date: none.
Current target date: November 1994
- c. Project Description: The SCSI-3 Medium Changer Commands is intended to provide a complete set of commands to complement the SCSI-3 Primary Commands, and be applicable to devices which can relocate data from an inventory location to and from a device.
- d. Publications During Past Year: none.
- e. Statement of Progress or Accomplishments During Year: A first draft document was prepared.
- f. Statement of Status as of This Report: Work on this project has stalled due to the project editor changing jobs and being unable to continue as project editor.
- g. Future Plans: Find a volunteer to be the project editor.
- h. Reasons for Delay: Committee work has been focused on the protocol and transport documents.

III. Committee Activities

- a. Previous Year's Meetings:

February 15-16, 1993; Austin, TX
April 19-20, 1993; St. Petersburg Beach, FL
July 22-23, 1993; Manchester, NH
September 16, 1993; Poughkeepsie, NY
November 11, 1993; Colorado Springs, CO
- b. Next Year's Planned Meetings:

January 13, 1994; San Diego, CA
March 17, 1994; Newport Beach, CA
May 19-20, 1994; Harrisburg, PA
July 21-22, 1994; Manchester, NH
September 15-16, 1994; Houston, TX
November 10-11, 1994; Palm Springs, CA
- c. X3T9.2 Officers: (X3T10 and X3T10.1 officers not appointed yet.)

Chairman: John B. Lohmeyer
Vice Chairman: I. Dal Allan
Secretary: Lawrence J. Lamers

- d. Membership: The current X3T10 and X3T10.1 membership lists are attached.
- e. Liaison Activities: X3T11, ISO/IEC JTC1/SC25/WG4, IT8, IEEE P1394, IEEE P1285.
- f. Administrative Matters of Note:

X3T10 has carried over the X3T9.2 program to pay for professional editing services through a surcharge to the committee's mailing subscription fee. The surcharge remains \$50/year.

- g. Procedural Matters of Note:

Due to the quick product cycles in the disk drive and I/O interface industries, 'quick out' specifications of some kind are required to address specific issues (e.g., Queuing Model, RAID Model, Transfer Rate Enhancement Protocol, etc.). These specifications need not become ANSI standards, but some expedited procedures are needed to approve and publish these documents so that the industry has so due process and easy access to the information. There is an industry perception that X3 and its subgroups take too long to address such specifications. Consequently, many 'industry' groups, trade associations, etc. have formed to do this work.

X3T10 is looking for guidance on working within X3 rules to prepare more-timely specifications.

- h. Recommendations: none.

IV. Anticipated Projects

Project proposals on Serial Storage Protocol (SCSI-3 mapping to SSA), Multi-Media Commands (a SCSI-3 CD command set), and SCSI-3 Controller Commands (command set for RAID controllers) have been forwarded to X3/OMC. It is anticipated that the ATA-3 architecture will be divided into a layered structure similar to the SCSI-3 structure; Project proposals have been prepared for X3T10 balloting.

V. Future Trends in this Technical Area

The lower-level I/O interface market is in a state of transition. This is largely the result of technological advances that permit physically smaller disk drives. These drives will trend toward I/O interfaces that directly attach to host system circuit cards without an interface cable. This has resulted in less emphasis on interfaces employing a cable and more emphasis on interfaces that can either plug directly into a processor card or into a device connector such as the PCMCIA.

Meanwhile, other I/O interface applications such as magnetic tape, printers, and optical devices are trending toward serial interfaces to reduce cabling costs. A key enabling technology for these applications is the higher clock rates now available in CMOS and other circuit technologies.

Attachment 1 Committee Projects: SD-4 Data

Attachment 2 Internal Procedures

X3T10 has no current internal procedures.

Attachment 3 X3T10 Current Membership List

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