X3T9.2/91-128

ENDL

August 10, 1991

To: Disk Attach Study Group Members
X3T9.2 Members

Subject: Disk Attach Project

The attachments to this memo are:

- Letter from Dal Allan to Bill Rhinehuls, X3 SPARC Chair
- Response from Dal Allan to Clyde Camp
- Letter from Clyde Camp to Bill Rhinehuls, X3 SPARC Chair
- Letter from Dal Allan to IEEE

I believe the attached are self-explanatory, as they represent the latest information as of this date on the memory-model interface definition for disk drives.

There is an issue of charter and direction here which will affect all of us in one way or the other. That is why this is being put into the hands of the standards management committees within IEEE and X3.

I. Dal Allan

14426 Black Walnut Court, Saratoga, California 95070 (408) 867 - 6630

ENDL

August 10, 1991

Mr. William Rinehuls
ASC X3 SPARC Chair
US Department of Defense
8457 Rushing Creek Ct
Springfield
VA 22153-2532

Dear Bill,

Enclosed is a copy of my letter to Clyde Camp, which contains my comments on the record. The latter is a fine effort, but unfortunately, re-creating a historical record of events is both extremely difficult and unlikely to be totally accurate. History has to be taken with a grain of salt, because all parties involved suffer from selective recall, and less than perfect memory.

Even though it may not seem that way given the size of my response to the record, I do not think the history is particularly relevant to the subject matter at hand.

The important issue is to do the right thing for industry, and that makes input from those who will implement interfaces the critical players here. Vendors will be responsible for designing the disks and selling them, and integrators will have to design systems around the disk drives.

I hope this investigation will solicit opinions from participants as a factor in shaping any standards activity. Companies that have attended at least three meetings include Apple, DEC, IBM, Integral Peripherals, Quantum, Seagate, and Western Digital.

As an example of the considered thoughts that participants offer, I have attached a copy of a fax received from Jim McGrath. Jim is the only participant in the technical activities who is a member of X3T9.2, PCMCIA and DASG. His remarks seem to separate and clarify the issues involved here.

Yours sincerely,

I. Dal Allan

cc: C. Camp
M. Freeman
D. Hierman
D. Shoemaker

11126 Black Walnut Court, Saratoga, California 95070

Quantum

EXTERNAL MEMO

DATE: August 5, 1991

TO: Dal Allan

FROM: Jim McGrath
Quantum Corporation
408-894-4504
fax 408-894-3208

SUBJ.: IEEE Disk Attach/ANSI SD3 Charter Split

This is a draft of the proposed distinction between the two efforts that we talked about last Friday. I would appreciate your comments in preparation for the upcoming SCSI meeting.

This is an attempt to avoid overlap between the IEEE and ANSI standardization efforts involving disk devices that can be directly attached to a microprocessor bus. In brief, the IEEE effort should be focused on bus related issues and be extended to cover non-disk devices, while the ANSI effort should be focused on the disk device interface.

Non-disk devices considered would be those that, like disk, could be accessed via a memory-model interface but have performance characteristics that distinguish them from RAM. Such devices might include flash memory, tape, CD_ROM, optical paper. All devices would have a higher degree of intelligence than bare memory chips.

Bus level considerations would include: accessing memory; recognizing device performance characteristics; DMA; interfacing to specific microprocessors and buses.

The disk level interface would focus on the physical, electrical, and firmware related aspects of the drive interface. These include the precise form factor, connector issues, available signals, and signal characteristics.

Obviously there will be areas of mutual concern that will require a close liaison relationship. Converting drive level to bus level signal characteristics; byte and word sizes; and device configuration information are obvious areas of overlap. But the bulk of the two efforts should be distinct enough so that, once some boundaries are drawn, work can proceed without an undue coordination burden.

ENDL

August 10, 1991

Mr. Clyde Camp
Texas Instruments
POB 655474 MS238
Dallas
TX 75265

Dear Clyde,

As per your request to correct the record, following are my comments accompanied by explanations. In your cover letter:

para 4: "... a letter objecting to the proposed work was received from Mr. Allan."

I did not object to the work. I believe in the work. What I said was:

> The purpose of this letter is to request that there be no formal action taken on this matter until a number of technical issues have been clarified. Until some decisions are reached, it is not clear whether this is really a new project or actually an extension of an existing standards activity.
>
> Nothing causes more confusion than multiple standards bodies working on the same activity. My objective is to avoid this possibility.

Chronological Summary December 1990: Liaison was not attempted with PCMCIA (Personal Computer Memory Card International Association). Of all the organizations which should have been contacted, the most overlap was with PCMCIA because a first draft of their memory-model interface specification was already published.

Item 2: I disagree with the statement "...it seemed at the time that there was no serious overlap of effort although there was some resistance on the part of Mr. Allan to the work of the DASG."

Martin was told very clearly that there was a serious overlap of effort in our first phone conversation.

The points I made were:

- there was already an effort under way for a memory interface for disk drives at the PCMCIA,
- disk interfaces were the responsibility of X3T9,
- if PCMCIA turned out to be suitable for a standard, I expected that any extensions and changes to it for Winchesters would be handled by X3T9.

14126 Black Walnut Court, Saratoga, California 95070 (408) 867-6659

You spoke of printed records. There are some which I am sure you do not have which reference discussions regarding a memory interface for disk drives. I have attached copies of material, and following is a summary.

The first open discussion of a memory interface for disk drives occurred at the industry ad hoc held May 29-30, 1990 which pre-dated the formation of the Small Form Factor (SFF) Committee. Dave De Lauter distributed copies of an article about PCMCIA, and asked that the interface and the connector be part of any SFF activity.

The SFF Committee was formed in July, 1990 and the first formal meeting was held on August 27. More time was spent on the subject of a memory interface for small disk drives at this meeting. It was felt a standards effort would soon begin in this area, but there would be no formal activity in X3T9 until recommendations were drawn up for X3T9 to act upon.

It was agreed the charter of the SFF Committee did not include inventing new interfaces, but did include proposing that X3T9.2 begin such an activity based on SFF Committee input. I was given the action item to find out where to obtain copies of the PCMCIA specification.

There are some who place no credence in the industry committees which are not accredited standards making bodies. Specifications produced by these bodies often become de facto standards which are later formalized by a standards committee.

The PCMCIA specification is not being developed by a standards committee but it will be shipped in volume next year on a significant number of products. Although not presently compatible with P1212, disk vendors at the DASG have presented ideas on how to enhance PCMCIA, and incorporate both PCMCIA and P1212 into the same disk drive.

Item 3: I did not state that the "electrical and protocol aspects would have to be handled elsewhere," I said they belonged to X3T9. Let me quote you from the charter submitted to, and approved by, the members:

> ".... approving a new interface represents years of work which should be done in one of the X3T9 committees."

Martin attended this SFF meeting at my invitation but said nothing about his planned DASG. I thought the subject of our previous conversation was dead. It came as a shock when a second-hand copy of Martin's E-mail invitation arrived from a client asking for an opinion on the DASG meeting.

Item 5: I did not attend the February 11 meeting and do not understand the comment that "X3T9 had not been previously receptive to the idea of having the disk look like RAM memory."

I do not recollect any instance in which this subject was ever raised in an X3T9 committee. I do recall conversations in the SFF Committee on having a disk look like RAM memory, and it was agreed the responsibility was X3T9's.

Item 8: It is somewhat misleading to say that I "...introduced the idea of working with the PCMCIA" on March 18.

It is more accurate to say it was re-introduced because it had first been covered when I spoke with Martin several weeks before. What I did at the DASG was reiterate my phone conversation:

- duplicate standard efforts should not exist,
- PCMCIA had an ongoing effort,
- the charter for disk interface standards belonged at X3T9.

I invited John Reimer to attend the DASG because he knew nothing of the DASG as Martin had never contacted him. John was asked to provide some background on PCMCIA and what difficulties and opportunities might exist in working together. As John did not receive my voice mail until an hour before he arrived at the meeting, he was completely unprepared.

It was at this meeting that I agreed to the compromise that all political issues such as charter and projects would be set aside until we completed the technical issues. NOTE: When I was told in June that a decision was pending on the DASG PAR, I felt this was a political issue of charter and project responsibilities. This prompted my letter asking that a decision be delayed until all the relevant standards organizations became involved to settle the matter of charter and responsibility.

Item 11: A small correction to give credit where it is due. I did not propose the options for the DASG at the May 13 meeting, but summarized the migration ideas developed by Tom Hanan and Jim McGrath.

Item 13: The June 14 DASG meeting was unsatisfactory from my point of view.

Martin received a copy of my letter to NESCOM prior to this meeting. I took copies to serve as discussion material for the group to hear ideas for and against my content. Martin did not want the subject discussed, or my letter distributed. My letter should have been discussed and the attendees been given the opportunity to review and criticize it.

When you talk of "more heavily attended by systems oriented people" it should be made clear that the three additional attendees were employees of the host company (Apple), and no other systems manufacturers were present.

Item 15: I was surprised to read that I "had promised to attend the NESCOM meeting," because I left for Japan that week. It would have been impossible to attend, and I had no intention of doing so.

Item 19: It is no coincidence that the DASG attendance was higher than average on July 15. The SFF Committee meets in the morning and the SCSI Working Group meets the following day.

A comparison of the attendance list illustrates the dependency of DASG on X3T9.2 activities. Only one company representative attended just the DASG meeting. All other attendees were in Valley Forge for at least one or both

of the other activities held the same week.

SFF & DASG	SFF, SCSI & DASG	SCSI & DASG	DASG Only
Cirrus Logic	Apple	Adaptec	Philips Research
DuPont	CW Industries	Amphenol	
ELCO	DEC	NCR	
Hewlett Packard	ENDL	Sony	
Integral Periph'ls	IBM	Unisys	
Intel	Maxtor		
MiniStor Periph'ls	Panasonic		
Molex	Quantum		
Western Digital	Sun Microsystems		

Item 21: I prepared the SD3 for a memory interface to give X3T9.2 members the equivalent of a PAR to debate at the August plenary. It is the vehicle to respond to Del Shoemaker's request that X3T9.2 form an opinion.

In order to discuss and decide what to do, we needed an agenda item and a specific proposal. I did not have the DASG documents with me at the time as it was prepared on-line while the SCSI working group was in session.

The memory interface is but one of three project proposals that will be debated by X3T9.2 at the August plenary.

Item 25: The next meeting of the DASG on August 16 was not "re-arranged so that Mr. Allan could attend."

The recommendation to hold even-month DASG meetings on the Friday before X3T9.2 met was proposed and accepted in April, at a meeting which I did not attend. The June 14 and August 16 meeting dates were set in accordance with that decision.

There was speculation about the low attendance at June's meeting. None of the alternatives discussed (meeting earlier in the day, changing the date, etc.) were acceptable to the members present.

CONCLUSION:

I must confess to having a problem with the impression I drew from your report that it is Allan vs Freeman, and that several concessions have been made because of my attending the DASG.

I stated to you in our conversation, that my biggest issue originally was that no effort was made to check with other standards committees or industry groups before the DASG project was proposed. The SFF and PCMCIA activities were no secret, they were widely publicized in industry news magazines and press publications. Your history of events confirms that no effort was made until after Martin's November 12 submission.

Martin's first words last year accused me of not having authority to form a committee (SFF) to do work that "belonged to IEEE." We definitely started off on the wrong foot, because my reaction to this was negative. It did not improve matters that Martin dismissed the activities of SFF and PCMCIA as meaningless because they are not accredited committees.

It may surprise you, but I am in agreement with what Martin hopes to achieve when he talks of futures and applications. I disagree with him on the way to achieve it. Other devices which buses must support have characteristics that are different to DRAM, and must be considered. Flash-ROM is one, and there are likely to be others.

Your history deals heavily with my interactions with the DASG. I admit that I am the catalyst for your involvement, but there are more members on the DASG than Dal Allan who warrant mention in your report e.g. there is no mention of the letter that Tom Hanan wrote.

No effort has been made to poll the attitude of companies which would have to implement a memory disk interface. It seems to me that what they think should be more important than what either Martin Freeman or Dal Allan think.

Several manufacturers have attended the DASG meetings, and I would very much like to see their input to NESCOM and X3T9 re this subject. All those who have shown serious interest in DASG can be categorized very quickly, by counting how many meetings were attended.

I request that the opinions of individuals or companies which have attended at least three of the DASG meetings be included in your report. Dennis Pak can provide you with a more comprehensive list, but companies included in such a list are Apple, DEC, IBM, Integral Peripherals, Quantum, Seagate, and Western Digital.

In this way, the subjectivity of a "Martin & Dal" history can be balanced by objectivity. Without such input, I do not see how NESCOM or X3T9 will have the facts needed to make a balanced decision.

Yours sincerely,

I. Dal Allan

cc: M. Freeman
D. Hierman
W. Rhinehuls
D. Shoemaker

A word of explanation re the attached material extracted from the ENDL Letter.

The ENDL Letter is produced monthly for ENDL clients to keep them informed as to what is happening in storage and interface activities. It contains extensive detail on subjects which are believed to be of value and interest to clients. Though not public, they do represent a record, and a history of prior events.

The ENDL Letter does not represent the formal minutes of meetings, but I have included these extracts because they are a snapshot in time. My purpose for including them is to verify my statement that the subject of disk drives being attached in a number of ways, including memory-model, was discussed in public by a large number of storage industry participants.

To give some idea of the individuals and companies involved, I have also included a list of attendees at these meetings. All these companies were aware that there was standardization activity going on for a memory-model interface several months before the DASG proposal.

The minutes of the January 1991 Small Form Factor Committee included a copy of my proposal to re-state the charter. It was approved unanimously.

The "other contents" referred to in the last paragraph does not refer to interfaces, as interfaces were excluded from SFF documentation by the second paragraph. IDEMA (International Disk Equipment Manufacturers Association) is an industry group which has a standards activity to establish specifications for disk drive components.

ENDL Letter

Extracted from May and August Happenings

Verbatim extract from report on Small Form Factor ad hoc May 29-30

During the meeting, several different ideas on mounting and connectors had been bandied about. A letter had been received from INMOS, stating that "the suggestion of disk drives being treated like chips is in no way outlandish."

INMOS had faced a different, but similar, problem for a board standard and designed a TRAM, which was basically a 16-pin DIP.

In developing the TRAM, INMOS had "considered the problems of small size, modular size, small connectors, and mechanical fixing, all of which need to be considered by small form factor drives."

Dave De Lauter (Maxtor) had brought copies of an article which described the recent PC Card standard which used a memory-style interface for RAM and ROM cards to be plugged into portable computers. The 2" * 3" card has a straddle mounted high density 68-pin connector which Dave felt was eminently suitable for a small drive.

The other likelihood was a serialized interface so that the connector could be as small as possible. This could be SCSI or some other interface that suited the drive (it might be difficult to squeeze enough logic into a 1" drive to support the controller and its buffers).

Verbatim extract from report on Small Form Factor Committee August 27

A list of what the group wanted to discuss was laid out:

- o Size and dimensions
- o Mounting schemes
- o Connectors
- o Interfaces
- o Transputer
- o PC MCIA

.....It is expected to be a new world for interfaces as well. There are all kinds of alternatives:

- o ATA
- o SCSI
- o Serial
- o PC MCIA
- o Transputer
- o Proprietary

Expected to be highest volume is the ATA (embedded AT Bus), and every device is likely to have a SCSI variation. A serial interface is likely to appear which relies on logic on the board to which the drive is mounted. There will undoubtedly be proprietary versions, but a standard activity sometime in the next couple of years is likely.

PC MCIA defines the RAM/ROM card which is likely to be an explosive market on laptops. It seemed reasonable to expect that laptop manufacturers will want drives with the same interface as memory cards.

The transputer is an INMOS patented concept which transfers chunks of data between elements by treating them as objects. It uses a PGA (Pin Grid Array) mounting system and INMOS is looking to license its use to all comers.

14426 Black Walnut Court, Saratoga, California 95070 (408) 867-6630

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ENDL Letter

Extracted from May and August Happenings

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In attendance at the May 29-30 ad hoc were:

3M	M. Ignasik	Methode	B. Masterson
	G. Piserchis	Miniscribe	S. Cowen
Adaptec	T. Newman		D. Perry
	S. Von der Haar	Olivetti	D. Trupski
AMP	C. Brill	PrairieTek	J. Blagaila
	E. Gorman		T. Klein
	B. Whiteman	Quantum	K. Cocksedge
Areal Technology	E. Bush		R. Yadava
	I. Roth	Rodime	C. Jarboe
Cinch Connectors	G. Whetstone	Seagate	J. Fife
Cirrus Logic	J. Chen		R. Hoehnle
Conner Peripherals	L. Fujitani		C. Latourette
DuPont	K. Fukuhashi		G. Milligan
	D. Georges		P. Wassenberg
	G. Oleynick		F. Willems
	J. Sarricks	Sun Microsystems	S. Doherty
	S. Teng		P. Rikkonen
	D. Wagner		B. Snively
ENDL	D. Allan		M. Webb
IBM	J. Fasig	Sundisk	R. Miller
	G. Penokie		B. Norman
Intellistor	C. Fernalld	Syquest Technology	H. Yang
	B. Schulwitz	Toshiba America	B. Lawrence
	W. Soderfelt		S. Lerch
JVC	K. Tomoda	Visqus	J. Patton
Maxtor	D. De Lauter	Western Digital	C. Bonke
	L. Lamers	Zenith	A. Walten

In attendance at the August 27 SFF Committee meeting were:

3M	B. Herron	Maxtor	L. Lamers
	G. Piserchis	Maxtor Colorado	R. Bonner
Adaptec	T. Newman		D. Perry
AMP	C. Brill	Methode Elect	B. Masterson
	B. Hurdle	NCR	T. Kozlowski
	E. Marsh	Quantum	R. Yadava
	B. Whiteman	Rodime	C. Jarboe
Apple	D. Turnbull		B. Serpa
Areal Technology	E. Bush	Seagate	C. Latourette
	I. Roth		P. Wassenberg
Cinch Connectors	G. Whetstone	Sun Microsystems	S. Doherty
Conner Peripherals	B. Klevesahl		V. Garcia
	C. Naylor		F. Ng
DuPont	D. Wagner		P. Rikkonen
ENDL	D. Allan	TEAC America	M. Helsel
IBM	G. Penokie	Texas Instruments	R. Dominguez
JVC	K. Tomoda	Western Digital	T. Hanan

14426 Black Walnut Court, Saratoga, California 95070 (408) 867-6630

ENDL

January 13, 1991

To: Small Form Factor Committee
Subject: New Interfaces

Some of the phone calls taken over the last few weeks have assumed that the SFF Committee is going to invent or bless at least one new interface.

My response has been that this is not the purpose of the SFF Committee, as approving a new interface represents years of work which should be done in one of the X3T9 committees.

To this, I have sometimes added that it is possible the SFF Committee may hear about new interfaces before X3T9.*, and that the SFF Committee may wind up being a catalyst in recommending that a new interface project be started.

I see the role of the SFF Committee as being to define the critical factors required for the packaging and intermatability of new generation drives in constrained applications. The list of activities includes:

- physical dimensions
- connector alternatives
- connector pinouts for interface standards where the existing pinouts are not suited.

Once we reach agreement on the interface pinouts, I expect the SFF Committee to propose these pinouts to X3T9.* for inclusion in a future revision of the standards.

At this time, I am not sure which organization should standardize the other contents of a Small Form Factor document. It may be X3T9.*, it may be IDEMA, it may be IEEE, it may be nobody and we let it ride as a de facto. These are political issues that should not take up much time until we are finished our technical job.

11126 Black Walnut Court, Saratoga, California 95070 (408) [illegible]

SFF Committee

Members: 3M, AMP, Conner, ENDL, Peripherals, IBM, Intellistor, JVC, Maxtor, Methode, Electronics, PraireTek, Quantum, Seagate, Sun Microsystems, TEAC America, Western Digital

September 1, 1990

The SFF (Small Form Factor) Committee meeting of August 27 was hosted by Sun Microsystems at the Red Lion Hotel in San Jose. The following were present:

D. Allan	ENDL	B. Masterson	METHODE ELECTRONICS
R. Borner	MAXTOR COLORADO	C. Naylor	CONNER PERIPHERALS
C. Brill	AMP	T. Newman	ADAPTEC
E. Bush	AREAL TECHNOLOGY	F. Ng	SUN MICROSYSTEMS
S. Doherty	SUN MICROSYSTEMS	G. Penokie	IBM
R. Dominguez	TEXAS INSTRUMENTS	D. Perry	MAXTOR COLORADO
V. Garcia	SUN MICROSYSTEMS	G. Piserchia	3M
T. Hanan	WESTERN DIGITAL	P. Rikkonen	SUN MICROSYSTEMS
M. Helsel	TEAC AMERICA	I. Roth	AREAL TECHNOLOGY
B. Herron	3M	B. Serpa	RODIME
B. Hirdle	AMP	K. Tomoda	JVC
C. Jarboe	RODIME	D. Turnbull	APPLE
B. Klevesahl	CONNER PERIPHERALS	D. Wagner	DUPONT
T. Kozlowski	NCR	P. Wassenberg	SEAGATE
D. Lamers	MAXTOR	G. Whetstone	CINCH CONNECTORS
C. Latourette	SEAGATE	B. Whiteman	AMP
E. Marsh	AMP	R. Yadava	QUANTUM

Steve Doherty described the recommended layout for a 2 1/2" drive which was designed for board-board interconnect with the option of cabling. The proposal avoids the possibility of grounding signal lines and keeps close to the SCSI pinout by using the Reserved lines for power and test points.

George Penokie pushed for a 68-pin connector, as Steve's pinout used lines that were assigned to TERMPWR by SCSI-2.

The connector recommended was a straddle mount AMP ribbon style plug with the receptacle on the cable. Ed Marsh presented information on the connector and agreed that it was possible to fit a 68 pin version on the end of the circuit board if the there were no cutouts in the corners for the rear mounting holes. As these had been discarded at the ad hoc meeting, there was no debate on this deletion.

As the product that would use this style of connector is not for laptops but high capacity drives, it was agreed that the height restriction of 19mm would be expanded to cover 25.4mm (1") high drives as well.

Debate on the plug led to the idea of removing the plug on the drive and using an edge connector. A cabled receptacle would be able to mate to either a plug on the board or the board itself.

Moving to smaller form factors than 2 1/2" found nobody with strong feelings about what should be done. The biggest problem is retention; the connector companies present were invited to investigate and make proposals on suitable retention mechanisms.

Interfaces are likely to change also. There was no decision on directions they might take but discussion ranged from serialized simple interfaces a la

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ST412 (with control logic on the board), to Transputer applications.

Action items assigned:

- o Steve Doherty to prepare new drawings for 2 1/2" with offset connector and provision for 68-pins, with a consistent pin 1 position between both.
- o Rod Marsh to provide supporting connector documents to Steve.
- o Ed Marsh to prepare board edge proposal covering:
  - PCB pattern
  - Dimensions (beveling etc)
  - Degree of angular insertion without damage
  - PCB thickness
  - Keying
- o Ed Marsh to supply maximum current carrying capabilities of connectors.
- o George Penokie to propose pinouts for 68-pin connector.
- o George Penokie to scale down dimensions of 2 1/2" to 1.8" form factor.
- o Dal Allan to find out how to order PCMCIA documentation.
- o All connector manufacturers to investigate ideas for:
  - mounting pylons
  - retention schema in non-cabled environment

Future Meetings:

Be sure to mention the host when you make your hotel reservations.

Date	Host	City	Hotel	Hotel Phone
10/5/90	1 AMP	Harrisburg	Sheraton	717-561-1800

As Western attendees will be winging their way home after the meeting, the day will start at 8:30am and end at 4:00pm.

I, Dal Allan

14426 Black Walnut Court • Saratoga, California 95070 Ph: (408) 867-6630 Fx: (408) 867-2115

MICROPROCESSOR STANDARDS COMMITTEE

The Executive Committee of
The Microprocessor and Microcomputer Standards Subcommittee of
The IEEE Computer Society

CHAIR	SECRETARY	VICE-CHAIR
Clyde R. Camp	Fritz Whittington	Fritz Whittington
Texas Instruments Incorporated	Texas Instruments Incorporated	(Acting)
P.O. Box 655474 M/S 238	520 Parkview	
Dallas, TX 75265	Richardson, TX 75080	
(O) 214/995 0407	(O) 214/997-6307	
(H) 214/867-6642	(H) 214/238 0883	
(F) 214/995-0304	(F) 214/997-6301	
COMPMAIL: C CAMP	COMPMAIL:	
NET: CAMP@CSC.TI.COM	NET: FRITZ@m2.TI.COM	

August 8, 1991

Mr. William Rinehuls
ASC X3 SPARC Chair
US Department of Defense
8457 Rushing Creek Court
Springfield, VA 22153-2532

Dear Bill,

I am forwarding this to you (as X3 SPARC Chair) for your information and action (if appropriate). At issue is whether or not a proposed MSC program is significantly overlapping in scope with anything that X3T9 is doing.

Briefly, the MSC has proposed a standard to allow extremely small disk drives, mounted directly on circuit boards, to in effect emulate physical semiconductor memory. This is not just a simple extension of existing methods which treat disks as archival storage separate from main memory. Rather, it is to develop techniques for fully integrating disk drives into the physical or logical memory space of the system in which they are installed. The Disk Attach Study Group (DASG) has been looking at this since November, 1990.

Because this work might have conflicted with the work of X3T9.2, the DASG Chair contacted John Lohmeyer (X3T9.2 Chair) via e-mail. John stated that, although he knew of no X3 project similar to the proposed project, an industry committee known as the Small Form Factor Committee (SFFC) might be working in this area. When contacted, the SFFC's chair (Dal Allan, who is also vice-chair of X3T9.2) indicated that the SFFC was involved only in the mechanical and connector aspects.

Based on this assessment, the project was approved by the MSC and submitted to the June IEEE NESCOM for approval as P1261. Two weeks prior to NESCOM, a letter objecting to the proposed work was received from Mr. Allan. It was unclear at the time whether or not the letter represented a personal opinion of Mr. Allan's (which in fact it did), a position of the SFFC or a position of X3. Because of the short notice and uncertainty, and because Mr. Allan did not attend NESCOM to clarify his objections, NESCOM postponed action on the request for PAR until its September meeting.

I have since been assigned the task of investigating the matter further and generating a report and recommendation for that meeting. The next DASG meeting is August 16 and the next X3T9 meeting is the week of August 19. Both will be addressing the issue and may develop a recommendation of some sort. Based on these inputs plus phone interviews through August 28th I will submit a final report and recommendation to NESCOM on the first week in September.

NESCOM will approve or disapprove the P1261 PAR submission at its September 25 meeting. Representatives from X3T9 or other affected parties are again invited to attend that meeting if they so desire. Note that the final decision on this matter does lie with the IEEE Standards Board, which usually follows NESCOM's recommendation.

The remainder of this mailing is a detailed chronological history of pertinent events as I know them, but I have no conclusions at this point.

Regards and Thanks,

Clyde R. Camp
Chair, Microprocessor and Microcomputer Standards Subcommittee

encl:
Chronological Summary
Detailed Chronological History

CC: Martin Freeman
DASG Chair
Philips Research
4005 Miranda Ave. #175
Palo Alto, CA 94306

Dal Allan
SFFC Chair
ENDL
74426 Black Walnut Ct.
Saratoga, CA 95070

Dellert Shoemaker
X3T9 Chair
Digital Equipment Corporation
1331 Pennsylvania Ave, NW
Suite 6000
Washington, D.C. 20004

Don Heirman
IEEE NESCOM Chair
143 Jumping Brook Rd.
Lincroft, NJ 07738-1442

Chronological Summary

1. November, 1990 - Disk Attach Study Group Formed by MSC
2. December, 1990 - Liaisons with interested parties set up. Verification from X3T9.2 Chair that X3 had no directly related projects. Verification from SFFC Chair that SFFC was concerned only with mechanical aspects of disk attach.
3. February, 1991 - First Disk Attach committee meeting (have occurred monthly since then)
4. March, 1991 - Disk Attach PAR approved by MSC
5. April, 1991 - Disk Attach PAR submitted to NESCOM
6. May, 1991 - Strawman proposal developed by DASG
7. June, 1991 - Dal Allan sends letter to NESCOM opposing P1261
8. June, 1991 - NESCOM, lacking any further X3T9 input, postpones approval until September and appoints Dr. Borrill to look into possible overlapping scopes between X3T9 and DASG.
9. July, 1991 - Dr. Borrill writes letter to X3T9 Chair asking for clarification on X3T9 and X3T9.2 charter.
10. July, 1991 - X3T9.2 proposal similar to DASG strawman appears on electronic bulletin board and agenda for August X3T9.2 meeting.
11. August, 1991 - NESCOM Chair reassigns authority to investigate matter from Dr. Borrill to Clyde Camp.

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Detailed Chronological History

Note: The following is correct as far as I have been able to ascertain from printed records and direct interviews with the parties concerned. If there is anything anyone believes to be incorrectly stated or otherwise in error, please contact me immediately. Otherwise the record will be assumed correct as stated.

1. November 12, 1990
   Dr. Martin Freeman proposed a project to the Microprocessor Standards Committee (MSC) which would allow extremely small disk drives, mounted directly on circuit boards, to in effect emulate physical semiconductor memory. This was not just a simple extension of existing methods which treat disks as special archival storage. Rather, it was to develop techniques for fully integrating disk drives into the physical or logical memory space of the system in which they were installed.

   After discussion, the Disk Attach Study Group (DASG) was authorized to further research the industry interest and related projects and to report back to the January meeting of the MSC.

2. November/December, 1990
   By telephone conversations, e-mail and FAX, various discussions were held between Dr. Freeman, John Lohmeyer (X3T9.2 Chair) and Mr. Dal Allan (Organizer of the industry Small Form Factor Committee (SFFC) and X3T9.2 vice chair) to determine exactly what the scope and purpose of X3T9.2 and SFFC entailed since they appeared to address similar topics as the DASG.

   According to John Lohmeyer, there was no X3 committee engaged in work similar to that proposed by the DASG. According published charter of the SFFC, it limited its activity to the mechanical and connector aspects of small form factor disk drives.

   Since the DASG was primarily interested in high efficiency transfer mechanisms, protocols and electrical aspects as opposed to the mechanical aspects (although they certainly play a part) it seemed at the time that there was no serious overlap of effort although there was some resistance on the part of Mr. Allan to the work of the DASG.

3. January 14, 1990
   Dr. Freeman attended the January 14 meeting of the SFFC. At that time, Mr. Allan once again stated that the SFFC was only interested in the mechanical and connector aspects and that the electrical and protocol aspects would have to be handled elsewhere.

4. January 14, 1990
   Dr. Freeman gave a report to the MSC on the progress to date and indicated that he was going to start scheduled meetings. During the remainder of January he contacted a number of disk manufacturers soliciting support for the proposed DASG project.

5. February 11, 1991
The first DASG meeting was held on Febuary 11, 1991 and was reasonably well attended (10). Some of the companies represented were AMP, Apple, National, Censtor and Quantum. At that meeting, one of the other attendees raised the point that X3T9 had not previously been receptive to the idea of having the disk drive look like RAM memory to the rest of the system. Each participant was invited to prepare a position paper which would be addressed at the next meeting and used to prepare a Project Authorization Request (PAR) for submission to the Sponsor and then to the IEEE Standards Board.

6. March 8, 1991
The Second DASG meeting was also well attended (12) but with a slightly different mix of people. There were three major decisions made:

(a) To forward the PAR developed at the meeting on the the MSC for submission to the June IEEE Standards Board.

(b) To have a joint meeting with the SFFC on the 18th.

(c) To more explicitly define a charter/scope for the DASG.

7. March 11, 1991
The proposed PAR was approved by the MSC with X3T9.2 being on the coordination list.

8. March 18, 1991
The third DASG meeting (attendance 15) was in conjunction with an SFFC meeting chaired by Mr. Allan. John Reimer, from the Personal Computer Memory Card International Association (PCMCIA) also attended. PCMCIA is trying to produce standards for RAM cards. Mr. Allan reiterated his opposition to any new standards effort in this area and then introduced the idea of working with the PCMCIA.

It was pointed out that previous efforts by one of the other DASG members to interest PCMCIA in using disks-on-a-card as RAM had been unsuccessful; Mr. Reimer appeared to not be all that much interested in it personally and stated that it would have to be first approved by the PCMCIA Marketing Committee.

The remainder of the meeting was devoted to developing the charter proposal for the DASG. Mr. Allan made significant contributions to the charter. However when Dr. Freeman offered the possibility of a joint X3T9.2 and IEEE project, Mr. Allan replied to the effect that the committee should worry about the technical aspects and not worry about politics – the standards organizations would handle the politics.

In order to foster participation from the disk drive manufacturers, Dr. Freeman proposed that future DASG meetings alternate in the Bay area (for the systems expertise) and in conjunction with X3T9.2 (for the drive expertise.) This would cut down on travel to some extent.

9. April 19, 1991
The Disk Attach project PAR approved by the MSC was submitted to the IEEE Standards Board NESCOM meeting for its June 25 meeting. The Study Group was upgraded to Working Group status (DAWG.)

10. April 24, 1991
The DAWG met again, defining potential applications and reiterating that the motivation behind a new interface is to develop a logical layer for direct connection of small form factor drives into the system memory model. While current disk drive interfaces (as evolved from existing X3T9 standards) were adequate and appropriate for the nearterm, a more revolutionary approach was needed for the longterm. It was also felt that although the PCMCIA was not the most desirable disk interface, its memory model might be suited to the DAWG needs and could be easily adapted with minor modifications. An alternative and perhaps better long term memory model might be to use the IEEE P1212 standard. Both approaches have drawbacks and advantages.

11. May 13, 1991
A strawman draft was developed by the Disk Attach Working Group addressing software, protocol, electrical and mechanical level requirements to meet long term needs. Also discussed was that PCMCIA might be changing its mind about supporting disk drives on cards but using current interface technology (ATA) and that this evolutionary approach might be more suitable for X3T9 while the DAWG addressed longer term technologies. A number of proposed options for the DAWG were presented by Mr. Allan which emphasized the PCMCIA approach, including possible modifications to it.

12. June 12, 1991
Mr. Allan wrote a letter to the NESCOM Chair in opposition to the proposed project on the grounds that it was duplicative and requested that no formal action be taken until "a number of technical issues have been clarified."

13. June 14, 1991
The DAWG met in the Bay area and was more heavily attended by systems oriented people who preferred the P1212 approach for reasons of scalability and flexibility. A proposal for connecting PCMCIA and ATA drives was also discussed. It was decided that Dr. Freeman and two others would attend the upcoming PCMCIA meeting in Seattle. Mr. Allan mentioned that he would be unable to attend the PCMCIA meeting because he would be in Japan for several weeks around that time.

A preliminary press release previously prepared by Dr. Freeman was modified and edited by the committee with the concurrance and help of Mr. Allan, describing the DAWG and its coordination with the SFFC.

14. June 24, 1991
Dr. Freeman attended the PCMCIA meeting in Seattle which had mixed results. While the PCMCIA technical committee was in favor of putting disk drives on PCMCIA boards, the Chair of marketing committee was adamently opposed on the grounds that disk drives were competition to RAMs and that the PCMCIA

should not sanction disk drives. It is not known at this time what PCMCIA's final position will be.

15. June 25, 1991
Dr. Freeman flew to New York at his own expense to be present at NESCOM to answer any questions that may have arisen as a result of Mr. Allan's objection. Dr. Paul Borrill reported that he had spoken to Mr. Allan and that he (Mr Allen) had promised to attend the NESCOM meeting.

Lacking input from both sides, NESCOM accepted Dr. Borrill's offer to look further into the matter and report back to the September NESCOM.

16. July 1, 1991
Dr. Borrill asked the DAWG Chair not to contact the X3 SPARC committee since he had already discussed matters with the X3T9 Chair by by phone.

17. July 8, 1991
The MSC reviewed the situation and directed Dr. Freeman to continue with the technical development of the proposed standard as an IEEE project until such time as NESCOM made its final decision. He was also directed to continue his coordination with X3T9.2 and the SFFC.

18. July 8, 1991
Dr. Borrill wrote to Del Shoemaker (X3T9 Chair) regarding the issue and asking if:

(a) The proposed IEEE standards project would normally come under the charter of the X3T9.2 committee, and

(b) if the X3T9 committee had plans to develop a standard with substantial similarities to the NESCOM proposal.

In this letter he included a copy of the PAR, DAWG presentation foils and the DAWG mailing list.

19. July 15, 1991
DAWG met again with membership from 24 companies representing system houses, connector manufacturers and disk drive manufacturers. Mr. Allan discussed a proposed X3T9.2 project submission for a PCMCIA connection to ATA drives; the proposal was couched as an extension to the ATA interface specification (a channel model interface.)

20. July 18, 1991
Del Shoemaker replied to Dr. Borrill's letter deferring the decision to the X3T9.2 committee, and informed Dr. Borrill that it would be discussed at the next X3T9.2 meeting on August 19.

21. July 27, 1991
An X3T9.2 Project Proposal was posted on an e-mail bulletin board and announced

to be discussed at the August 19 X3T9.2 meeting. The proposal is virtually identical to the one submitted to NESCOM a month earlier and contains much of the phraseology from DAWG minutes and the DAWG strawman proposal.

22. July 31, 1991
Due to the urgency of resolving the issue in some fashion and because Dr. Borrill was on vacation and because the responsibility is ultimately the sponsor's, the NESCOM chair reassigned the job of developing a report to Clyde Camp, the MSC Chair, relieving Dr. Borrill of the responsibility and authority.

23. August 5, 1991
Clyde Camp discussed the of change of responsibility and confirmed timetable of upcoming events with Del Shoemaker by phone.

24. August 9, 1991 (week of)
Mr. Camp reviewed documentation and correspondence and conducted phone interviews with most of the concerned parties. A preliminary report to NESCOM and X3 was prepared (this summary without conclusions.)

Upcoming Events

25. August 16, 1991
Next meeting of the DAWG. This date was rearranged so that Mr. Allan could attend.

26. August 19, 1991
Next meeting of the X3T9.2 committee.

27. August 26, 1991
Del Shoemaker and Martin Freeman send Clyde Camp the recommendations from the latest X3T9 and DAWG committee meetings.

28. August 30, 1991
Final report and recommendation on P1261 sent to NESCOM by Clyde Camp.

29. September 25/26, 1991
Approval/disapproval of P1261 *Disk Attach Interface* by NESCOM/IEEE Standards board after consideration of Camp recommendation and opposing viewpoints (if there are any.)

ENDL

June 12, 1991

Chairman IEEE Standards Committee
IEEE STANDARDS OFFICE
445 Hoes Lane
Piscataway
NJ 08855-1331

Dear Sir,

I understand that in the near future, there is a possibility of a project officially being started as an activity under the Disk Attach Study Group.

The purpose of this letter is to request that there be no formal action taken on this matter until a number of technical issues have been clarified. Until some decisions are reached, it is not clear whether this is really a new project or actually an extension of an existing standards activity.

Nothing causes more confusion than multiple standards bodies working on the same activity. My objective is to avoid this possibility.

Background:

Magnetic disk drives are becoming so small in size that it is feasible to consider mounting them directly on a Printed Circuit Board. This possibility changes the whole environment for disk drives and a comprehensive set of new characteristics must be met by drive manufacturers.

Semiconductor manufacturers supply components which comply with standard physical sizes and pin layouts. Disk drives have traditionally been cabled into a system, and manufacturers have had the leeway to mount signal and power connectors in locations which suited their own mechanical design.

Disk drives are not passive devices, and this creates a new problem for retention in a socket. Connector designs to date have dealt with external motion, not internally generated motion. Physical attachment to the PCB will have to be done using connector sockets that are not yet designed.

To address these and other issues, an industry ad hoc committee named the Small Form Factor (SFF) Committee, of which I am Chairman, was created to provide a forum within which these and other issues could be addressed. The SFF Committee is not a standards body, but will address the issues involved. The documented solutions will be submitted to the appropriate standards bodies for processing to become standards.

Work done to date makes it likely that submittals will be made to ASC X3T9.2 for recommended pinout changes and new connectors to both the SCSI-3 and ATA interface standards. Work on connector sockets which incorporate retention mechanisms is expected to be submitted to the EIA or IEC.

14426 Black Walnut Court, San Diego, California 92070 (408) 867-6630

The scope of the SFF Committee includes recommending changes to existing disk drive interfaces, defining the physical characteristics for other interfaces, and promoting the development of suitable connectors.

Problem:

One of the identified desires that accompanies the SFF activities is for a new interface which treats disk like semiconductor random access memory.

This is the stated purpose of the project requested by Mr. Martin Freeman of Philips Research under the Disk Attach Study Group (DASG).

The SFF Committee and the DASG are working together. The last meeting was held in Harrisburg on May 13, with SFF in the morning and DASG in the afternoon.

The technical program discussed at that meeting involves co-operating and working with several standards bodies:

- ASC X3T9.2 has the Small Computer Systems Interface (SCSI) and AT Attachment (ATA) Interface activities (ATA which embeds part of the IBM PC AT bus in a drive). Extensions to ATA and SCSI are clearly in the X3T9.2 charter.
- PCMCIA (Personal Computer Memory Card International Association) has defined a memory interface for credit-sized cards which contain semiconductor memory. PCMCIA has participation from a significant number of both hardware and software suppliers, and has agreed to consider proposals that define the attachment of disk drives using the PCMCIA interface. The present interface is limited to 68 pins for removable media and there is a likelihood that this will be extended to 100 pins to support memory sizes beyond 64 MB, and provides more functions.
- IEEE Disk Attach Study Group has proposed developing a memory interface for disk drives.

At this time, the technical issues involved in developing a memory interface for disk drives are unclear. The plan recommended at Harrisburg has multiple steps:

1. Extend ATA by adopting the PCMCIA physical interface as is and take it to X3T9.2.
2. Work on the PCMCIA memory model to get Winchester support added to the removable interface, and accept the 64 MB limitation.
3. Add pins to extend the addressability and provide additional functions such as third party DMA for non-removable Winchesters with capacities far above 64 MB.

There is a fourth option, and that is to do something new and different with no compatibility to existing interfaces. This approach was discouraged by the disk drive manufacturers present because it involves a lengthy and uncertain integration cycle. The above plan allows manufacturers to migrate

from existing interfaces to a memory interface in a more gradual manner.

One of the difficulties faced in developing a suitable standard is the lack of continuity in attendance between meetings. Meetings which coincide with X3T9.2 are well-attended by disk drive manufacturers (which are heavily involved with SCSI and ATA). Meetings in Sunnyvale have participation from interested parties but have had poor disk drive manufacturer representation and the number of systems integrators involved has been small.

For this reason, the upcoming meeting schedules are going to try and alternate between X3T9.2 and PCMCIA venues in the even months, and in Sunnyvale during the odd months.

Request:

It is uncertain what technical solution is going to be pursued for a memory interface, but it is clear three standards organizations are involved.

More time has to be spent on this matter to establish technical direction.

Based on the last meeting, there is a strong possibility that a new memory interface for disk drives will be closely allied to the PCMCIA activities.

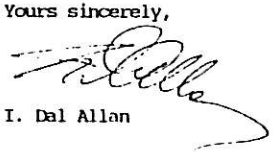
This does not mean that there is no market for a second, and different, type of memory interface. We simply do not know how it would be different and whether it would be of value to systems integrators.

The participants in the SFF and DASG activities are interested in having as few solutions to integrating disk drives on PCBs as possible.

I request that the IEEE delay a formal project approval until the direction a memory interface for disk drives should take becomes clearer.

Hopefully, the answers to direction will become clearer as time goes on, and we can avoid overlapping the various standards activities.

Yours sincerely,



I. Dal Allan

cc: John Reimer (PCMCIA Chairman)
Del Shoemaker (X3T9 Chairman)
Paul Borrill (IEEE Standards Program)
Martin Freeman (Disk Attach Study Group)

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