100TH T10 PLENARY SPECIAL EDITION

The special edition to celebrate the 100th T11 meeting met with a strong response, possibly because the Happenings have chronicled Fibre Channel since its beginning. When discussion turned to the upcoming T10 celebration, it produced the following e-mail.

"A couple of people have asked whether you are planning to grace the 100th T10 Special Edition with some personal reminisces about the early SASI/SCSI days."
"The way these guys remember it, you were in the thick of the fray."

A deep reservoir of information is available to bolster flagging memories. 1988 to today has been recorded in the Happenings because ENDL reporters were busily banging away on their keyboards sending the Days of Our Standards drama to clients, but … There is a gap.

When SCSI first hit the boards there was no ENDL Letter, only a checkbox on our publisher's to-do list. The SCSI Odyssey obelisk may pre-date the first Happenings, but one member of the ENDL team was there: embroiled in both the politics and the technics.

The Time Machine has been dialed back over 30 years, as we relate the events which were to profoundly affect all subsequent interactions between storage devices and hosts. Hereby begins a prelude which introduces the birth of SCSI.

The second *half* of this special edition embellishes the tale by reproducing the Happenings from the first T10 meeting week in 1994 with the typesetting technology updated to please the modern eye.
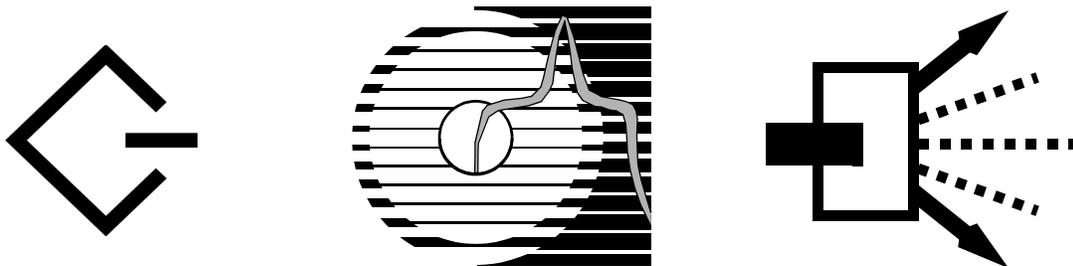
Congratulations T10 and STA

ENDL prepared this special edition of the Happenings to support the STA (SCSI Trade Association) in celebrating the 100th T10 Plenary on Thursday November 11, 2010. A PDF copy of this Special Edition is available at: http://www.endl-letter.com/se100t10.pdf.

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RECOLLECTIONS

The saga of SCSI started three years before the first ENDL Letter, and almost a decade before T10 was formed.

Until the Happenings can be poached from, this article is based on memory. The company affiliation of any individuals referred to are those of that time, not the present.

T Minus Zero

The first meeting of X3T9.3 was held in April 1977 at a hotel convenient to Orange County Airport. The GSA and NBS had been hurt by the recent failure of the IBM Block Multiplexer Channel to become a standard, and in response, they pushed for a new direction: device interfaces.

Del Shoemaker (GSA) launched into a presentation about DataPro having been paid to conduct an in-depth analysis of the device interfaces in use. The 4" thick volume was the centerpiece on the table, and the stated purpose of X3T9.3 was to standardize one of them. He touted IBM's 3330 as the highest value device market and listed multiple reasons as to why it should be the first project. No questions were allowed until Del finished.

The meeting started at 10:00, and the chairman called a lunch break before the agenda item for Discussion. I remember his irritation at my wanting to ask for a clarification before we departed for the local cafes.

"Which interface do you want to standardize?"

"I've only been talking all morning about it: the one for the 3330!"

"I know that, but you never said which one."
"The 3330 has two interfaces."

"There are two?!?!"

On that note we headed out to lunch filled with the knowledge that if this committee was left to the Federal Government all of us in the storage industry would suffer. Lunch was spent on strategizing how to steer the committee in another direction. It took 1½ days of intense lobbying before the majority voted to define the SMD industry interface as a standard.

The first working document submitted was the Ampex product specification: a copy of the CDC/MPI manual which had the name blacked out everywhere it appeared in the text and figures.

SMD was a successful project, and it was followed by the 8" RDI. In 1980 came the highly ambitious IPI proposal based on an interface ISS-Univac had developed for its new-generation IBM-compatible controllers and disk drives. Guess who worked for ISS at the time?

The objective of IPI was hardware commonality for both device level and intelligent interfaces. Cost targets at the low end were to be met with an 8-bit subset of the high end 16-bit physical interface.

The best laid plans syndrome went into effect in the fall of 1981.

In the Beginning

A search of the web to confirm dates uncovered some things that did not correlate with personal recall. A good way to start this review is by considering the line items at: http://www.connectworld.net/cables/scsifaq.html#3.

1979   *The disk drive manufacturer Shugart begin working on a new drive interface with logical rather then physical addressing. It used 6 byte commands. Shugart Associates Systems Interface (20 pages long) made public. A few SASI drives are developed.*

All but the last sentence is accurate, it should read that a few HBAs were developed.

Note: The first embedded SASI drive did not arrive until mid-1984, and it was also the first embedded SCSI drive. The default configuration of the Priam 8" disk complied with the near-standard and it had three jumpers to run in SASI mode: one each for the DTC, OMTI and Xebec variations. Guess who worked for Priam at the time? In late 1984 Xebec introduced a far more successful product, the 5 1/4" Owl.

Shugart's SA1000 hard drive had been developed to the form factor of the 8" floppy, used the same kind of stepper motor actuator, and unlike SMD disk drives did not incorporate a data separator in the interface. OEMs were at a loss when it came to integrating with an analog interface, they were used to dealing with a stream of zeros and ones, not wavy signals.

Shugart recognized this, but instead of incorporating a data separator the company made a great leap forward towards a generic interface with the macro functionality of high level commands. Shugart contracted with startup DTC to develop a SASI bus adapter for the 8" SA1000 drive series, and thereby hangs another tale.

When David Tsang (the DT of DTC) and Lloyd Ebisu left Microcomputer Systems Corporation (later Xebec) they initiated one of the earliest lawsuits celebre in the valley. MSC President Jim Toreson filed suit for theft of trade secrets, and after a lengthy trial won a judgment and hefty settlement for damages.

1980   *Attempt to make SASI an ANSI standard failed.*

What attempt? Nothing surfaced in 1980, a time when X3T9.3 efforts were focused on completing the 8" RDI and starting IPI. RDI was the first device interface to incorporate a level of intelligence that could be used for purposes of self-configuration at power on.

1981 *Shugart and NCR request an ANSI committee be formed for SASI*

Not exactly… The X3T9.3 Indian Summer meeting in downtown Minneapolis was held at the Radisson Hotel, the week before demolition was to begin a total destruction and reconstruction. Members were not only a little frayed because of the noise, discomfort, and lack of air conditioning, they had to suffer the somewhat surly attitude of employees who were faced with being out of work in a week.

Hank Meyer (Shugart Associates) did not use his agenda time to ask for a new committee, he made a sales pitch about SASI to replace IPI. The lightweight content did not appeal to the room of mainframe and minicomputer engineers. It was little more than what had been released to the press a couple of weeks earlier. No one in X3T9.3 could see any merit to 8-bit SASI since IPI already had provision for an 8-bit subset.

1982 *ANSI committee X3T9.2 is formed.*

Hank returned in the new year with reinforcements. NCR had decided to drop development on its own byte-wide BYSE interface and join forces with Shugart. The functionality of SASI had been upgraded to satisfy NCR, which had made the major commitment of developing silicon. NCR considered parity and arbitration to be non-negotiable new requirements, and wanted a differential signaling mode and 32-bit LBAs as extensions.

On this occasion the presentation was filled with technical details and even arrived with testimonials of support. John Lohmeyer (NCR) had come well-prepared with what seemed to be an overwhelming reason to accept SASI.

> "I have here a letter signed by the Vice President of NCR Engineering, as a commitment to make SASI an American National Standard."

Gene Milligan (CDC MPI) was not impressed.

> "NCR is not a member of this committee, is it?"

> "No."

> "His opinion does not count for much then …"

This is but one example of the hostility to the strategy that had Hank attacking IPI and lauding SASI. Gene was no fan of IPI as CDC/MPI was promoting its own ISI (Intelligent Systems Interface), but he saw no reason to encourage another entrant in the fray. His view changed when ISI lost out to IPI, and CDC/MPI became a strong supporter of SCSI.

The rule of thumb was one active interface project per committee, so for SASI to become a project it looked like IPI had to go. However, since every voting member in the room had been involved for months in developing IPI, this was not a politically achievable objective.

Chairman Gary Robinson avoided a vote on what to do by calling for an early lunch break. We headed off to caucus privately about a way to resolve the situation. The SASI supporters were clearly committed, and unless they had another avenue they would become disruptive elements that interfered with IPI development.

There were three overriding factors:

o IPI could not be displaced in X3T9.3
o There was no other X3T9 sub committee that could work on SASI
o Something had to be done in the short term to prevent dissension

Gary suggested short-circuiting the procedures, and have the two groups meet under the same X3T9.3 umbrella. We only had to get away with it for a couple of meeting cycles, to gain enough time to resuscitate one of the dormant X3T9 sub-committees.

Convincing Shugart and NCR that this was a good plan before unveiling it to the members was key to its success. If there was any committee debate we ran the risk of having the plan derailed before it got underway.

What seemed like a good idea took on a decidedly different hue when Gary declared his intention of leaving on a mid-afternoon flight. As leaders of the attack and defense respectively, Hank and I had been butting heads all morning. Detente was out of the question.

John accepted my invitation to dine at Anthony's on the Wharf that evening (the afternoon agenda dealt with IPI). Hank was less than enthusiastic about breaking bread together and he did not trust the offer of a parallel group. John prevailed, and with the primaries in favor of parallel gatherings, the working group agreed next day to meet as X3T9.3A and X3T9.3B for the next two meeting cycles.

First Offering

Readers who have always understood that SCSI originated in X3T9.2 will be surprised to learn that it was X3T9.3 which accepted the first working draft. At tinyurl.com/2587vod is a copy of document #185 of the X3T9.3 committee titled "SASI/Shugart Associates System Interface)" Rev E 4/2/82. Page 3 of contains the revision history (those are not my spelling errors of the company names in Rev B).

Revision Letter	Description	Date
—	First presentation to ANSI Committee X3T9.3 (2 weeks following announcement in Electronic Design)	9–15–81
A	Revised to reflect changes to meet NCR requirements	1–05–82
	Further revised to add description of commands	1–12–82

continued

Revision Letter	Description	Date
B	Edited and improved for working meeting with NCR, Adoptec and Optimum in Sunnyvale	1–25–82
C	Rewritten in preparation for presentation to ANSI	1–29–82
D	Revised to make all known corrections in preparation for "working session" in Sunnyvale on March 3 and 4	2–19–82
E	Revised to incorporate changes resulting from "working session" in Sunnyvale in preparation for April 26 and 27 meeting in Phoenix.	4–01–82

The San Diego plan worked. X3T9.3 opened as a single meeting, separated into A and B groups, and reunited to share results on the progress made.

In the meantime, Gary was working with CBEMA in Washington DC to rekindle a committee.

The standards process was dominated by GSA and employee Del Shoemaker chaired X3T9. When Del started X3T9.3 in 1977, the chairman was from NBS. His tenure was short when he was diagnosed with cancer, and Gary Robinson (Honeywell) had been co-opted to take over. That is why Gary canvassed NBS to come up with a suitable candidate to lead X3T9.2, and this was how Bill Burr became Chairman of the resurrected committee.

Consequences

An unfortunate side effect to the San Diego dinner was Hank's feeling that if one standard was good then two would be even better. The acceptance of SASI by ECMA proved to be an anchor, for reasons such as those described in the June 1985 Happenings.

The delegation came well prepared with documented items to be covered that were either of general interest to the committee or of specific interest to ECMA.

The ECMA goal is to define a standard which requires conformance.

Conformance is a concept not generally practised in the U.S. where the FIPS (Federal Processing Information Standards) is probably most similar. The FIPS influence extends beyond the federal government to state agencies, and even some major corporations which do a lot of federal business.

The situation is different in Europe where a standard can be legislated, and become a requirement on private industry as well as the federal and state governments. Essential to a legislated standard is that there has to be some method of defining conformance.

The July 1985 Happenings included an interesting description that had bearing on whether the X3T9.2 version or the ECMA version of SCSI would become the ISO standard.

> SCSI appears to be the first interface standard that ECMA (European Computer Manufacturers Association) has ever worked on. From comments made by Mr. Hekimi during the Washington meeting, it seems unlikely that ECMA will ever work on another one.
>
> The statement made was that most ECMA standards have not had the same degree of complexity and subtlety that is part of an interface. Typically, the work of defining an ECMA standard is done by a core group of 12-15 participants. On the SCSI there was an active group of only 3-4 (basically those who came to Washington).
>
> Part of the problem was communication. John Lohmeyer (NCR) and others attended the ECMA effort only in the beginning, and due to the long distances involved dropped out relatively quickly. It was very difficult to define the ECMA standard with so little participation from the original designers.
>
> Interestingly enough, the ECMA version of SCSI is much more likely to become the ISO standard than is the ANSI version. Firstly, it has less in the way of options. Secondly, the ISO secretariat is in West Germany and there is the advantage of proximity. Thirdly, the new fast path method which ISO has adopted permits an existing standard to become an ISO standard without going through an ISO development cycle.
>
> In the event that ECMA approves SCSI prior to the coming meeting in West Berlin in November it would be submitted for fast path processing. The ANSI SCSI document as submitted by the American delegation would only be considered a proposal document, and need an ISO task effort. No bets will be taken on the outcome of that situation.

At Last

Nobody anticipated that it would take almost four years to complete the first standard. ECMA was but one of many obstacles, the primary hurdle was the difficulty of X3T9.2 reining itself in from adding functionality. As described in the December 1985 Happenings, the final forwarding event was not without drama.

> The meeting continued through lunch because Chairman Bill Burr (NBS) was determined to bring the group to a satisfactory conclusion. When it came voting time he made an impassioned speech before tallying a roll call vote. The tenet of Bill's speech was that unanimous votes were influential in the ANSI process, especially when changes were made to a document about to be forwarded for Public Review (to be distributed January 3, 1986).

Bill effectively left attendees with the impression that, if not death and destruction, at least the wrath of other attendees would fall upon any who were so foolish as to vote negatively on approving the changes.

There were some pointed glances in the direction of Arnold Roccati (EG&G) before the roll was called. The vote was unanimous, not because of Bill's speech but because it was the right thing to do.

Revision 17B was approved for distribution, and as a result the document to be distributed for Public Review is essentially the same as that which was approved as Revision 2 at the Munich ISO meeting [in November]. The meeting broke for a late lunch …

A Rose is a Rose

My recollection of how SCSI was named does not correspond to the paragraph at http://en.wikipedia.org/wiki/SCSI.

> "*Almost a full day was devoted to agreeing to name the standard 'Small Computer System Interface,' which Boucher intended to be pronounced 'sexy', but ENDL's Dal Allan pronounced the new acronym as 'scuzzy' and that stuck.*"

X3T9.2 could not be titled with a project that used a company name, Gary needed something neutral. The discussion of what it should be took place in the April X3T9.3B group meeting, and when we reunited to meet as X3T9.3 it was reported that the new name was 'Small Computer Systems Interface'.

My immediate reaction was dismay.

> "Did you guys consider what kind of acronym that will have?"
> "The initials will be pronounced as SuCSI."

Daniel Loski (SMS) was aghast.

> "No, no!"
> "It should be 'e', 'e', SeCSI, SeCSI."

Gene Milligan was less than thrilled with the exchange.

> "It looks more like a SCuSI situation to me."

Within weeks the preferred term of reference had become Scuzzy.

Decades later, the Scuzzy is almost a household term, but the preference was not universal way back then. There were some who fought tooth and nail to come up with a term which was less offensive to delicate sensibilities.

Skewzy had its adherents for many moons, and according to the September 1985 Happenings there were still recalcitrants 18 months later.

> … as an example of one of the names, AT&T has distributed an RFP (Request For Price) for SCSI controllers which conform to "SECSI," a term used by Daniel Loski (a Frenchman by birth) to try and reduce the industry preference of referring to SCSI as "Scuzzy."

Early Days

April was a good month for SCSI. In 1982 X3T9.2 met, in April 1983 NCR announced the 5385, and in April 1984 followed that up with the 5380.

The NCR 5380 was a primary catalyst behind SCSI's market growth, as a chip it set the bar very high. Although it was cheap it had arbitration and reselection in hardware, was multi-sourced, and even used by competitors (Xebec S1410 adapter).

Silicon competition was intense, SCSI chip vendors held design seminars all around the country. These were not lightweight affairs. They were serious engineering sessions which usually began with a keynote delivered by an industry pundit, followed by a review of SCSI technology, and rounded out with a deep-throat design dissection of the hottest new chip.

Since attracting attendance was equated to design wins, events were held in areas where OEMs were concentrated (especially New England). Fujitsu picked performance as the market niche in which to make its reputation, and to that end was a sponsor of Mario Andretti. If you want to fill a seminar, advertise Mario Andretti as your luncheon speaker and it will be standing room only (probably still as true today as it was then).

A Tough Row to Hoe

The early days of SASI in X3T9.2 were not as progressive as one would have hoped. The problem was a committee stalemate caused by three manufacturers of SASI host adapters who were less than enthusiastic to the point of being obstructionist: DTC, OMTI and Xebec (formerly Microcomputer Systems). The origin of the company names are interesting.

DTC	Data Technology Corporation aka Dave Tsang Corporation
OMTI	One More Time Inc.
Xebec	A ship favored by Mediterranean pirates. Jim Toreson was in an aggressive mood after the DTC suit and felt "a fast, sleek killer, the mere sight of which struck fear into the hearts of merchants" was apropos.

The adapters from each company were not compatible between themselves, so OEMs were effectively single-sourced as soon as a decision was made to use one of them.

Adaptec was focused on building SCSI as per the emerging standard and the installed SASI vendors were a pain in the side of progress. Each was fighting to have the quirks of their SASI implementations included in the draft, and progress was being stalled by self-interest.

The marketing directors were invited to meet in neutral surroundings: lunch at a restaurant in the Pruneyard complex. We agreed that something had to be done to protect the investment in their current products, but pursuing representation in the draft was not working.

It was not only thwarting progress, it was raising hackles amongst the members.

A way had to be found around the problem that none of their adapters were SCSI-capable. This was finessed by an offer to include each company's product manual in the draft as an Information Annex, the sales forces could then boast that their products were recognized by the emerging standard.

The bargain did not please everybody, Larry Boucher (Adaptec) for one was less than enchanted at competitor specs being in the draft. The annexes were only attached to the draft for a few revisions. Once the SASI trio had SCSI-compatible designs under way, there was no reason to continue carrying the vendor specifications and the annexes were nuked.

Single vs Multiple

To set the stage, herewith is an excerpt from the Happenings.

> *Once upon a time there was a controller company called ADES (Adaptive Data Engineering Systems) that later changed its name to ADSI (Adaptive Data Systems Inc.). No prizes go to those who can figure out from the phonetics why the name was changed.*
>
> *ADES was in on the intelligent interface game very early, with Priam SMART compatibles on the market in the era before SASI. Priam SMART was a very successful intelligent interface but it was kept proprietary, so it had a limited market. When Shugart published the specifications to SASI, ADES saw the light and got into the SASI game, switching its SMART controllers over to become SASI-compatible.*

The SASI name changed to SCSI, and ADES became ADSI. To give some idea of how influential ADES/ADSI was in those early times, ADSI sponsored the inaugural SCSI Forum in Palm Springs.

The most spirited debate did not occur between panelists, but between the podium and the floor. Speaker Phil Devin (Xebec) criticized the development of multi-tasking SCSI cards because the primary market consisted of single device attachments. Daniel Loski (SMS) was quietly having an apoplectic fit that ramped higher with every ensuing slide. When his Gallic nature could stand it no longer, Daniel jumped up to interrupt Phil.

ENDL Letter

Unfortunately, Daniel was so excited that his tirade in Frenchlish left everybody wondering. Yours truly wound up translating between explosive Daniel and defensive Phil. It was an easy task because Daniel was right. We both felt the future growth of HBAs lay in multi-tasking SCSI, and that the market was moving away from single device attachment via SCSI to embedded SCSI.

Although the Forum was an outstanding success, ADSI took a financial bath. President Richard Barrett supported the decision of his marketing director Joe Molina to leave ADES and found the SCSI Forum as a separate entity.

In order to offset the financial burden, membership in the Advisory Board was priced at several thousand dollars a year. All the major players which wanted SCSI to succeed became members, and the Forum became a significant force in the campaign to educate the world about SCSI.

The second SCSI Forum was held less than a year later, February 10-13 1985, and the ground shift in industry attitudes was described in the Happenings.

> *The SCSI Forum was held at Palm Springs and there was criticism about it being held in a remote location. Some delegates had difficulty in obtaining approval to attend a four day session in Palm Springs because it had too much of the connotation of a boondoggle. Future SCSI Forums will be held in major centers on the east coast and the west coast, so that the opportunity to visit vendors or customers can be combined with attending the Forum.*
>
> *It is unfortunate more did not attend because the content was far superior to last year, and overall it was an excellent conference. There was a real interchange between vendors and users and the material presented was of high calibre. Last year's Forum was marked by acrimony between SASI zealots and SCSI. SASI hardly rated a mention this year, and the Forum benefited by it.*
>
> ### Which SCSI?
>
> *Jim Toreson of Xebec was a luncheon speaker on the second day. Although his presentation had been prepared previously it was very apropos, since it unintentionally crystallized much of the discussions of the prior two days. His pitch "Is There A Universal SCSI Solution?" posed the question that a universal solution was not feasible, and this represented a marketing identity problem for SCSI.*
>
> *It is not obvious exactly what SCSI is, and this has caused confusion in the market place. However, there seemed to be general agreement at the Forum that there are three primary implementations of SCSI controllers:*
>
> 1. *Kentucky Fried SCSI (cheep, cheep, cheep)*
> 2. *SCSI-S (single task)*
> 3. *SCSI-M (multi task)*

The low end of the SCSI market place is defined by the need for a cheap general purpose way of attaching peripherals on small computer systems. The performance and functionality of a product is not nearly as important as its low product cost.

In many respects this application is the same as the original implementation of SASI, single purpose/single tasking without the ability to disconnect/reconnect, thus the host is locked to the controller.

The SCSI-S is single tasking but is differentiated by being able to disconnect and reconnect to the bus. This allows the host adapter to overlap functionality, because it can have multiple SCSI peripherals on the bus, and not be tied to any one.

The most likely, but certainly not the only, implementation of the SCSI-S is embedded within a device.

SCSI-M defines highly functional controllers which are capable of multi-tasking activities between multiple attached devices. SCSI-M provides overlapped I/O, and extensive performance characteristics well above those of the other two categories.

There is price discrimination between the three as Kentucky Fried SCSI with no arbitration is available for approximately $100, and SCSI-S with arbitration starting at $200. The SCSI-M obtains a premium in the market of two or three times the price of an arbitrating SCSI-S. Although absolute prices will continue to decline, the relative price differential shall continue.

Forecasts

Vendors strongly supported the SCSI Forums, and none of them ever missed any presentations that dealt with the future of SCSI in the market. As the Happenings described, things sure looked bright at the May 6-8 1986 event.

This was the best attended SCSI Forum to date, with over 200 attendees. Even more so than in Boston last October, a large number of the attendees were not knowledgeable about SCSI and could be classed as neophytes. A majority seemed to be there to discover what SCSI was all about.

Market Commitment

Paul Anderson (CDC) presented material gathered from a survey made of 150 companies with responses from 32, most of whom were suppliers. The survey covered categories of equipment from ICs to complete systems and a breakdown of supplier types was very interesting.

ENDL Letter

Both the 32 survey respondees and the 125 vendors are shown by dominant market segment activity.

	Survey	*All*		*Survey*	*All*
Intelligent Peripherals	*42.5%*	*30.2%*	*Boards*	*17.8%*	*28.3%*
Subsystems	*13.7%*	*15.1%*	*Systems*	*10.3%*	*1.9%*
Test Equipment & Other	*4.8%*	*13.2%*	*ICs*	*11.0%*	*11.3%*

The proportion of products supporting tape represents less than 10% compared with almost 75% for hard disk and if floppy was included it would be well over 80%. One value which was larger than may have been expected was that the percentage supporting the SMD interface was higher than that for ESDI and not far below that for ST506/ST412. It is less than two years ago that there were questions being raised on why anyone would want to support SMD drives with a SCSI controller.

Intelligent peripherals also show disk as dominant with the split between magnetic and optical being 55/25 and tape representing the 20% remainder. Subsystems did not show the same degree of disk dominance with disk-only being split 25/25 and combined disk and tape vs tape-only splitting 20/20.

SCSI controller boards showed a wider diversity but Winchester disk combinations still represented over half of the offerings.

Disk	*22.9%*	*Tape*	*17.1%*
Floppy	*8.6%*	*Optical*	*17.1%*
Disk/Floppy	*14.3%*	*Printer*	*2.9%*
Disk/Tape/Floppy	*5.7%*	*Other*	*11.4%*

Don Collier (AMC) has become the industry guru on interface penetration and his delivery improves each time (this was his fourth in the last year). Once again, when he made his survey of marketing and planning people for their estimates on where the market was going, he wound up with a wide divergence of opinions. This was particularly true in the sub-30 MB class of disks where ST506/ST412 held 99.1% of the market in 1985 with the remainder going to embedded bus products such as the Hardcard.

In 1990, SCSI is forecast to take 25% with ST506/ST412 falling to 40.4% and 34.5% going to embedded bus. Note: As one of those with extremist opinions about this market, the SCSI forecast seems way high. It seems far more likely that by 1990, cost pressures in this market will make embedded bus the dominant interface, with ST506/ST412 hanging on to some percentage of the market and no role for SCSI HBAs except for removable media devices.

ENDL Letter

The forecasts for the 30-100 and 100-300 MB categories reflect current industry enthusiasm by showing SCSI as dominating shipments with 39% and 36% of the 1990 markets respectively. All of this from a standing start in 1986 because there is no SCSI market presence shown for 1985.

Only in the category for disk drives above 300 MB is SCSI shown as being a secondary alternative. This is the market dominated by IBM shipments with over 63% in 1985 and not falling below 50% by 1990. The SMD/ESDI hold on the remaining market falls from 34.4% in 1985 to 22.1% by 1990. The market for new interfaces is split fairly equally between SCSI and IPI-2 with 14% and 12.5% respectively in 1990.

Compatibility

The product variations between SASI HBAs was not resolved by SCSI HBAs, the primary factor remained the desire to distinguish one from the others. Evolving from SASI to SCSI simply meant that next-generation products were fighting to be sole source to OEMs.

The other factor was that SCSI offered multiple ways to do the same thing, though this was far more true of IPI. In late 1984 ENDL promoted an industry seminar to critique and ratify the ENDL-facto, a subset of the IPI-3 standard to serve as an industry-specification.

The proposed IPI standard has a wide variety of features and options which allow it to cover almost any possible interface requirement. The OEM market cannot build or buy to an ANSI standard which is an architectural umbrella; it requires a de facto standard that can be purchased from multiple sources. The virtue of a de facto interface lies not in its technical merits but in its commercial application and general availability.

This effort did not go unnoticed, the fire it drew was noted in the January 1985 Happenings:

SCSI-Facto: Initial reaction to the ENDL-Facto for IPI has been positive, but one comment repeated several times has been "why didn't I do it for SCSI first?". Those interested in SCSI can discuss and/or resolve issues at ANSI or the SCSI Forum. As an active participant in the latter at both the annual event and the mini-sessions, I have not perceived the problem to be one of standards, but rather of compatibility between SASI implementations.

SASI is included by the standard with Group 0 and Vendor Unique commands but these are the heritage of SCSI, and do not represent its future. However, if there is interest in defining a de facto SCSI, ENDL is willing to publish one for users, systems integrators and controller companies to critique.

Several SCSI-Factos were written over the years for clients who needed a specification to attach to their RFPs for HBAs. The demand lasted several years, the last one was produced for optical devices by Ken Hallam.

Although the SCSI-Factos may have contributed to unifying the HBAs being purchased by OEMs, they were certainly nowhere near as influential as the effort to define CCS that formally began in July 1985.

> *A proposal by Daniel Loski had been distributed in the mailing, and it was asked that responses be brought in writing. Responses were submitted by ADSI, HP, NCR, Seagate and Siemens, with Adaptec distributing a copy of their ACB-4000 user's manual.*
>
> *The written goal of the meeting was to define a "minimum and mandatory" command set for software drivers. The meeting did not attempt to cover all of the submissions but spent its time working through the issues in Daniel's document. Many viewed it as containing far more than the minimum so a strong debate ensued over the goal of minimum or "desirable" plug compatibility.*

CCS had wide industry support, but it was not universally lauded as noted in this excerpt from the December 1985 Happenings.

> *The activities of the Common Command Set group have generated dissension amongst the committee. Some members feel that the group has fulfilled its original purpose and should now fall back into committee activity.*
>
> *The concern exists because of the publicity generated about CCS, some of which has given the impression that the CCS "team" is a vigilante group working outside of the auspices of the committee. The CCS effort was actually constituted as an ad hoc task group at June's Washington meeting.*
>
> *Daniel Loski (SMS/OMTI) pushed hard for the CCS effort to be expanded to include tapes and printers as well as disks. There was opposition to this plan because the full committee can now devote itself to working on SCSI-2.*
>
> *The cache commands and the CCS efforts form the basis for SCSI-2, and the committee wants to prevent the CCS taking on an entity of its own outside of the ANS Committee. There is a feeling that CCS may be moving too rapidly, and attempting to make the implementations too rigid without considering those who did not participate in the working group efforts.*
>
> *The CCS activities are to be restrained to the disk (random access) commands and are be worked on more closely with other the committee activities.*
>
> ***Perspective***
>
> *It is important that acrimony within X3T9.2 between CCS advocates and its critics be healed quickly. The majority of committee members want to continue enhancing SCSI to meet broader market needs, but it is essential that it be consistent with the needs of the majority.*

The process of review and communication has to be maintained, because the biggest criticism of CCS is that much of the review process was cut short during the last six months.

The hopes expressed in the above Perspective were dashed a month later.

The CCS has received more than its share of attention in the last six months. Its original intent not only attracted but is maintaining a large group of devotees attempting to nail down a final document.

Not everyone is a supporter, and some even find the front cover of the document offensive because the title is Common Command Set with the Small Computer System Interface as the subtitle. Those opposed feel this is symptomatic of the emotion surrounding CCS, being separately identified and promoted as distinct from SCSI.

Bill Burr reprimanded Daniel Loski and other avid CCS supporters about the separate identity which had been created, and the inference that ANSC X3T9.2 was incapable of producing a similar result. He noted that "the shield of ANS" could prove very transparent if any company felt strong enough that CCS activities were against general industry interests.

Participation in ANS is not necessarily any protection against anti trust charges and personal law suits against committee members.

The spark that ignited Bill was Daniel's agenda which included a day devoted to defining commands for tape drives and optical disks. He pointed out that at the full meeting in San Diego CCS had been authorized "one more time" to work solely on direct access.

Bill had been reluctant to authorize another meeting because it was not too clear whether or not it was completely in accordance with ANSI guidelines.

This provoked a small outburst from Jim Semenak (AT&T) and Bob Barter (Cipher). Both had been looking forward to defining CCS for tape and Bob had brought along a proposal.

During lunch a representative from Kennedy turned up for the tape session and upon learning that it was not to meet, turned around and headed back to his office.

This altercation continued outside the meeting and Bill Burr explained his concerns about the visibility and high profile in the aggressive marketing of a subcommittee ad hoc effort. At the root of this concern is that there is no SD3 (authority to work) to continue efforts on SCSI.

SCSI is out for its final public review prior to adoption as an American National Standard. If a public comment should point out that there are continuing efforts on incorporating features into the document then ANSI could take the position that SCSI is not yet ready for standardization.

Such a comment could force SCSI back into the X3T9.2 committee and quite possibly prevent it becoming an official ANSI standard as long as the interface is under active development.

The industry wanted SCSI as an ANSI standard so it was decided to freeze it at Rev 17 and move it forward. Once SCSI is accepted as a standard it will be possible to submit an SD3 to work on a revision. Even this bends the rules since revisions are normally expected to take place in 5 year cycles, not immediately after a standard is published.

Perspective

The role of CCS as an alternative to ANS is not over. Buyers of equipment want faster action than they can anticipate through ANS committee. The problem that can occur is that decisions are made quickly and if changed later will meet with a howl of protest from those manufacturers that have already implemented.

This was a stumbling barrier on the original definition of SCSI. Open conflict reigned between SASI implementors and promoters of SCSI until issues were settled by agreement to leave commands and bits as Vendor Unique, and work around existing implementations.

A tremendous amount of committee time was wasted during this phase. Bill Burr and John Lohmeyer are understandably concerned about beginning work on SCSI-2 with a similar ball and chain to SASI called CCS.

This desire must be contrasted with the complaint by buyers that they want to source a common implementation of SCSI from multiple vendors. In the past this would have been handled by each vendor producing a specification and negotiating individually with vendors.

The desire to adopt standards has affected this insofar that manufacturers would rather get together and define an industry specification they can each procure rather than define their own unique versions. This is laudable, but as can be seen, it does slow down the procurement process.

The pressure to make decisions quickly in order to make procurements versus the desire of much of the committee to make sensible long term architectural decisions that do not inhibit the growth of SCSI will remain a problem for at least another six months.

ENDL Letter

Now that the ad hoc meetings will no longer be authorized the pace of change should slow down. Rev 4 of CCS should survive the next meeting and within 90 days there will be first products shipped. It is likely that so much will be committed by then that right or wrong, CCS will be a de facto that SCSI-2 has to accept and provide for in the same way that SASI was.

Compatibility came under closer scrutiny in the July 1986 Happenings.

In a recent conversation regarding SCSI and CCS a statement that CCS had done much to improve compatibility was met with loud guffaws. It appears that compatibility is still sadly lacking despite compliance with CCS.

The claim was made that between the ADSI and SMS implementations alone there are over 50 specification differences. Stories are beginning to be related by OEMs to vendors that "Your SCSI CCS does not work although Brand X does."

To conduct an evaluation between different vendors still requires a significant effort by the OEM. It appears the old story about the company with the drive that started working first with the Host Bus Adapter is the winner is still true, and likely to remain true for some time.

The immediate market confusion is embedded SCSI disk drives. This is where OEMs are placing most of their faith in compatibility because all of them are post-CCS definition. All OEMs expect variations in controllers because they have always existed but they anticipate very little in disk drives.

The market is used to all SMD drives operating in almost exactly the same way. The variations are relatively minor. ESDI is a brand new interface with a lot of programmed functionality not unlike SCSI (configuration data and the ability to set sector size through software), so there have been some differences between implementations. The scale of differences pales by comparison with the gulf between some SCSI embeds.

Another problem facing SCSI embeds is that are going into single drive applications where neither the bus nor command processing overhead to start an operation can be overlapped with any other activity.

The effect is that every I/O is going to take longer than it would with a native bus controller and a device interface. Embeds which have high parsing overhead and slow bus response time to messages are going to lose business to drives which minimize both.

At this time the SMS embed appears to have the hottest performance and looks like the one that other companies need to catch. SMS did the Maxtor and CMI embeds on magnetic disks (sure hope SMS was paid in advance on CMI), Optotech for optical disks, and recently reached an agreement with Sony.

There is an interesting story here as the genesis of this performance came not from SMS but AIM (Applied Information Memories) - remember them, they went under last year despite a contract at Prime Computer for SCSI embeds (which wound up going to Micropolis ESDI drives with an Emulex controller).

The key implementor of the SMS turnkey embeds was an ex-AIM employee. From all accounts SMS can parse and dispatch a command anywhere from 4-10 times faster than other embeds.

Emulex has recognized the problem and is working on a new chip set that will respond in a fraction of the time that current chip sets require. Most of the current chip sets require the microprocessor to become involved and are relatively slow at message processing. Emulex plans to cut the time by using gates not micro-processor cycles.

Many drive manufacturers have had to depend on controller companies to implement their first generation of embeds. Now that they are faced with compli-cated support problems in the field it will not take them too long to build up a store of SCSI expertise (they have to in order to make design wins).

It is a short step from there to begin the building of second generation embeds in-house without controller company assistance.

One factor may bring stability to SCSI embedded drives.

In the controller market there has been no dominant supplier which has forced a de facto implementation to be adopted. However, if any disk manufacturer ever attains a significant market share then de facto embeds will occur.

The 5 1/4" market seems to be particularly susceptible to market leadership. First there was Seagate with ST506 and ST412 at the interface; Maxtor took a different tack and staked out the high ground to become the performance/capacity leader [with ESDI]; then Micropolis turned the market into a bloodbath on price to become the manufacturing leader in the 85 MB market.

o *Which company will dominate the SCSI embed market and establish a de facto?*

o *Will it be a technical winner because of better performance?*

o *Will it be a manufacturing winner that floods the market with drives?*

o *Or will it be a fragmented market with no winner as in the controller world?*

With the clarity of hindsight we all know that embedded SCSI disk drives did indeed become the norm, and they set the baseline for compatibility across the storage industry.

The other key element crucial to SCSI growth was wide spread adoption by OEMs, as noted in the September 1986 Happenings.

IBM is one company that keeps surprising people. Despite predictions that IBM would never adopt SCSI (yours truly was amongst the skeptics) an evaluation of the SCSI Model 0678 8" drive was so successful that a SCSI host bus adapter was introduced on the PC RT last week.

IBM embracing SCSI became a two-edged sword a year later, when IBM's X3T9.2 representative initiated the war to end all connector wars.

Big Byte

There are occasions when technical content disappears from a standards meeting, as happened at the December 8-9 1986 X3T9.2 meeting.

The "Burr Byte" was proposed by Elen Hunt (Hewlett Packard).

Since Bill Burr would no longer be the Chair a number of members felt that something more than a goodbye handshake was deserved. It turned out to be much more memorable.

Elen moved that in light of the ever increasing demands upon the interface to provide more function in the Command Descriptor Blocks there was a need for more bits. It seemed reasonable, therefore, that the extra lines in the cable be used to construct 10 bit bytes that would provide more CDB bits.

While Bill was trying to absorb the effect of this proposal other members started supporting the motion. Jim Scheussler (Nat Semi) described an 8-10 and 10-8 converter part that would be highly suitable for this application, and he offered to resurrect the shelved design for implementation if the SCSI committee deemed it appropriate.

Only a few were aware a practical joke was under way and the delivery was so straight that a number of members had begun to take it seriously before they caught on. As it dawned, the tempo picked up. Carl Warren (Mini Micro) suggested that since the PC Extension Committee was considering a 9 1/2 bit byte because the extra half bit proved useful for other functions, that SCSI might benefit also and recommended that AMD bit slice parts be used.

Bill was reeling as the proposals flowed around the room, trying to rationalize how to handle them. He wondered out loud how, after years of justifying the use of the term byte as meaning 8 bits, he was going to sell the concept of 10 bits. One suggestion was dectet but Bill saw this as a problem of commercial connotation if it was seen as being DEC-tet.

Bill Spence (Texas Instruments) tried hard to help by proposing that the 10-bit byte be named in honor of the outgoing Chair, so it should be called either a Burr or a Burr Byte. Even this did not give the game away to Bill.

Gene Milligan kept the ball rolling when he proposed that there was still another line left, and 11 bits rather than 10 would be more useful because three bits could be used as an error correction Hamming code and individual byte errors corrected on the fly.

Some of the other wild ideas cannot be recalled. It is virtually impossible to think when one is getting a headache from laughing so hard.

The ideas became more and more ridiculous, but it also became embarrassing since Bill had not yet figured out he was the butt of a practical joke when he stated that there was obviously general committee support for the idea and that a working group was needed to evaluate the alternatives.

Bill called for an end to discussion as he did not want to spend more time on it when there was so little time left to review the SCSI-2 draft.

In a last valiant attempt to help Bill recognize that his leg had been pulled Greg Hite (HP) said he only had three words to add; "Well, fair enough." This is Bill's favorite phrase whenever something comes up which is not completely settled, but it was not a strong enough hint.

As Bill put pen to paper to record in the minutes that a working group would be established Elen Hunt requested permission to speak, and in a straight delivery told Bill "You've been had." This led the room to another crescendo of craziness as Bill's face was a picture.

Disbelief mingled with shame was mixed with relief at not having to explain what a "Burr Byte" was to his managers at the National Bureau of Standards. Bill is a good sport who recognized a job well done and was still smiling and laughing about the incident the following day.

Committee Relations

Many people seem to think that IPI and SCSI development was fraught with hostility between the two committees. Nothing could be further from the truth, there was co-operation and enthusiasm for a common goal: making interface standards. There may have been arguments over how to meet the goals, but they were more technical than personal.

Not only were many members involved in both interfaces, I was Vice Chairman concurrently of both X3T9.2 and X3T9.3 for several years. Although not always successful, the agendas were usually organized to reduce overlap so that members could stay aware of developments in each.

As an example of how close the memberships were, at tinyurl.com/2es4t85 can be found the minutes of a venture to wed the two committees. The catalyst occurred six months earlier when Chairman Bill Burr (NBS) announced that he was under marching orders to cut back the time he spent on ANSI activities.

Joint X3T9.2 #70 and X3T9.3 #62 Meeting
June 22-23, 1987
Vancouver, British Columbia

11.8 X3T9.2 and X3T9.3 Merger

John Lohmeyer spoke to the issues of joint meetings and the attendant problems with document distribution. He stated that the joint meeting approach is difficult and that he would like to proceed with the merger.

A single plenary meeting with the various projects largely developed in working groups is the proposed structure. There ensued a lengthy discussion on this topic, including issues of voting, agendas, ability to focus on tasks, and efficacy of meetings. …

Gene Milligan moved that X3T9.2 and X3T9.3 request of X3T9 that they be merged into one task group with the general charter to be the same as the charters of X3T9.2 and X3T9.3. This will include the existing projects of both task groups.

This motion specifically requests that X3T9 implement the merger as of the August meeting and that they arrange with the X3 Secretariat to maintain John Lohmeyer as the Chair and Dal Allan as the Vice-chair.

- o *X3T9.3 voted 10 in favor – 6 opposed.*
- o *X3T9.2 voted 27 in favor – 3 opposed.*

The desire to merge did not survive the political games at X3T9, it ended with a 6:7:1 defeat.

The widest gulf between the two committees occurred during the years when X3T9.3 was focussed on HIPPI.

Connector Wars

The positive aspects of SCSI-2 development were shaded by a connector imbroglio that began in August 1987.

At the working group in July, Gerry Marazas (IBM) had raised the need for a smaller SCSI connector. At this meeting both IBM and AMP had prepared presentations on smaller connectors. As smaller connectors were a subject that had been mentioned for wider IPI also, both groups had an interest.

Gerry proposed a high density ribbon connector because IBM engineers have reservations and concerns on the reliability of pin and socket alternatives. His proposal was not restricted to the connector. The recommended Burndy design has 60 pins. The expansion cable for wider SCSI would be the same connector, but keyed differently so that it would not be possible to cross the cables.

Gerry caused a small furor when he suggested that the additional 10 lines be electrically contiguous and assigned as Vendor Unique signals. Everyone wanted to know what kinds of applications were envisaged (see "IBM and SCSI" discussion for some further comments).

Ed Reynolds (AMP) made a presentation on pin and socket connectors. Members were more impressed with the quality of the colored copy material handed out than the connector. There was a general feeling that the pins could easily be damaged by a forced insertion attempt.

It has been stated several times that the micro connectors originated in Japan. AMP subliminally reinforced this as the slide of a finished assembly was shown with Furukawa cable. The AMP plug has what is referred to as a user friendly interface which is a press release at the rear to facilitate removal. This is easier to work with than the screws or the retaining wings (typical of pin/socket and miniature ribbon connectors respectively). To show that this was not restricted to pin and socket connectors, Bob Herron (3M) showed samples of his user friendly ribbon plug.

Five manufacturers committed to providing micro connectors on 50 mil centers had samples with them. AMP, Burndy and Fujitsu offer pin and socket. 3M, Burndy and Stewart offer the miniature ribbon.

The technology and politics of selecting a connector for SCSI-2 lasted until February 1988, when a vote between the alternatives took six rounds of balloting. Members could vote more than once on a ballot.

	1	2	3	4	5	6
Amp, Fujitsu, Hirose, Honda	35	34	33	30	29	32
Stewart, Viking	27	22	23	26	26	27
3M, Dupont-Berg, Elco, ITT-Cannon	31	31	30	26	23	
Hirose, Molex, T&B	26	23	21			
Burndy	12	10				
JAE	1					
TelTec	0					

It was no surprise when JAE and TelTec were eliminated on the first round, but Burndy had been expected to do better than disappear on the second. The reasons given later were that even if it was the PS/2 connector, it was not tooled and available, and it was larger than the other ribbon styles.

The Hirose camp was crushed to see itself eliminated in the third round. If a vote had been taken at the Saratoga Springs four months ago Hirose would have been the favorite, as 3M had no known alternative sources at that time.

The fourth round was recounted twice, but that did not change the result - a tie for elimination between 3M and Stewart. It was debated whether or not a rule change should be instituted, but the consensus was to try again and face that problem if the deadlock remained.

The 3M camp was confident of the outcome, and was stunned when the reballoting resulted in a win for Stewart.

Stewart was riding high going into the final round as the members who saw no need to make an immediate decision voted their preference for what they saw as a technically superior alternative. The final round resulted in AMP being selected as the winner. When it came right down to it, those members wanting a connector now chose the one with the largest number of alternate sources.

By Any Other Name

The December 1986 Happenings also included a glimpse of the "competition".

Shakespeare coined the phrase that a rose would still be a rose by any other name and that may turn out to be true for SCSI. At latest count there are three companies operating in California under the SCSI name.

> o *SCSI - Southern California Systems Inc. will be happy to sell you an AT clone at an attractive price and a whole medley of boards and peripherals to complement your existing system with. Best known for its double-page ads in PC Week, SCSI is a mail order company offering aggressive prices. It is located in Los Alamitos down south in Orange County.*

> o *SCSI - Security Control Systems Inc. has a trademark application pending at the Patent and Trademark office for "computer related goods." It has also registered "SCSI Security Control Systems" in California. The applications were filed in 1985 with claimed first use of June, 1984 "anywhere." Greg Floryance (IBM) discovered all of this as the result of a patent search. It will be interesting to find out if the Patent Office is capable of discovering that the first public use of SCSI was documented in the X3T9.3 and X3T9.2 minutes back in April, 1982.*

o *SCSI - Synthesized Computer Systems Inc. is another attempt by Gene Amdahl to do some mining at IBM's expense. At Trilogy it was a super computer based on wafer scale technology. This time its a CMOS 4381 alternative in the 3-5 MIPS range. The engineering talent is being provided by refugees from StorageTek's ill-fated attempt to build a PCM processor.*

o *SCSI - Small Computer Systems Interface does not appear to be protected by any legal filings and has no entity that is likely to stand up and take a legal position to dissuade others from using the name or logo.*

This is the first time that any name duplication has occurred and although first use may have been prior to all of these others, unless ANSI or some company on its behalf takes a stand it is possible that some day there will be an attempt made to discourage use of the initials.

Can't you just see it now, every manufacturer forced to spell out the name in full in advertisements and specifications. Maybe X3T9.2 should file a trademark application for "SCUZZY" - or better yet head for Webster's umpteenth "New Collegiate Dictionary" and set up for an entry:

SCUZ-ZY 1. Unattractive, repulsive.
2. abbr. Small Computer Systems Interface - data processing term for ease of use and claimed compatibility.

Close with a Smile

The December 5-6 1988 X3T9.2 … will be remembered as the meeting at which Larry Lamers and John Lohmeyer removed their skirts.

Unusual attire? No, the tables were set up with decorative skirts as modesty panels, but the head table had them on both sides. The skirts were attached with huge stick pins which Larry represented as being "a death threat to one's vital organs."

Top 10's for T10

Those not intimately familiar with the art perceive participating in standards development as the epitome of high flying. Okay, active T10 members rack up the frequent-flyer miles, but the destinations tend to be another story entirely.

INCITS views the locations selected for a meeting week as being selected at the convenience of the meeting host, and T10 takes this seriously.

o LSI hosts annually near their Colorado Springs offices.
o EMC takes a similar (but less frequent) tack, and hosts in Westborough, MA.
o NetApp occasionally takes the committee to their Research Triangle Park homebase.

The most flagrant counter example was January 2000, when ENDL hosted in Surfer's Paradise, Australia. Some feared that T10 would be unable to conduct a Plenary due to lack of a quorum, but exactly the right number of people made the big trek south.

A curious side effect of the T10 meeting-site selection process is recurring visits to the same locale. Visiting new places can be exciting, but nothing beats the home-again feeling of an area which has been seen many times before. Favorite restaurants can be re-frequented. The best place for a good cup of coffee is already stored in the datebook.

Using the David Letterman countdown style, here are the ten most frequented T10 meeting week cities (actually 14 to avoid shortchanging some the metropolises visited three times).

14.	Austin (3)	5.	Las Vegas (4)
13.	Bellevue (3)	6.	Monterey (4)
12.	Harrisburg (3)	7.	San Diego (4)
11.	Orlando (3)	4.	Palm Springs (5)
10.	San Jose (3)	3.	Dallas (6)
9.	Santa Ana (3)	2.	Nashua (7)
8.	Huntington Beach (4)	1.	Colorado Springs (16)

Shepherding a proposal to approval sometimes takes true grit and perseverance. Numerous revisions may be needed before the group buys the blueprint. With a little help from webmaster John Lohmeyer, we present the most tortured proposals ever passed by T10.

10.	12 revs – P. Entzel	–	SSC-3 Commands to Control Data Encryption
9.	12 revs – M. Banther	–	SMC-3 TapeAlert Enhancements
8.	12 revs – G. Houlder	–	Adding More Low Power Options
7.	13 revs – K. Marks	–	Power Conditions Transition Modifications
6.	13 revs – R. Cummings	–	Volume Replication Visibility
5.	15 revs – M. Ball, D. Black	–	Establishing a Security Association Using IKEv2
4.	16 revs – G. Penokie	–	Capability-based Command Security
3.	20 revs – A. Cox	–	6 Gbps PHY Specification
2.	20 revs – C. Ballard	–	Report Element Information
1.	21 revs – P. Suhler	–	ADT over Ethernet

C. Ballard and G. Penokie each had two entries over 12 revs. Their highest entry is the only one preserved. Another dozen players had 10 or more revisions, but … well … they simply failed to make the cut.

Attendance is another category where numbers matter. By digging through the applicable Happenings, the following top 10 T10 attendees have been identified.

10.	Roger Cummings (65)	5.	Doug Wagner (79)
9.	Erich Oetting (66)	4.	Mark Evans (82)
8.	Rob Elliott (69)	3.	George Penokie (98)
7.	Dan Colegrove (70)	2.	John Lohmeyer (98)
6.	Jay Neer (77)	1.	Ralph Weber (99)

ENDL Letter

The Curtain Rises

Since any ENDL Letter is incomplete unless a couple of bruising battles are replayed blow-by-blow, the time has come to reproduce that fateful, first T10 meeting week. Many things had changed betwixt the SCSI beginnings and the first T10 meeting week.

o The SCSI-2 monolith had been sliced into Transport and Commands layers.

o Transport standardization was proceeding apace on multiple fronts:
   – Fibre Channel and FCP;
   – a bevy of SSA (Serial Storage Architecture) endeavours; and
   – IEEE P1394 and its T10 companion SBP (Serial Bus Protocol).

o Command sets were a dime a dozen, some (but not all) of which survive to today:
   – SPC (SCSI Primary Commands);
   – SBC (SCSI Block Commands)
   – SSC (SCSI Stream Commands) which still includes line printers;
   – SGC (SCSI Graphic Commands);
   – SMC (SCSI Media Changer Commands); and
   – SCC (SCSI Controller Commands) for RAID controllers.

o There was an effort to standardize host software in CAM (Common Access Method).

o Over-arching all this was the toddler, SAM (SCSI Architecture Model), who had not yet shed his diapers.

Some things have changed very little in the years since the first T10 meeting.

The committee has had:

o only one chair, John Lohmeyer (NCR nee Symbios nee LSI); and

o only three vice-chairs:
   + Larry Lamers (Adaptec … VMware);
   + George Penokie (IBM nee LSI); and
   + Mark Evans (Western Digital).

So pour a tall one, sit back, and revel in a snapshot in time – about a third of the distance through the 25+ year history of SCSI. We hope you enjoy the Happenings for the first time that T10 met.

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JANUARY 1994 HAPPENINGS

Congratulations T10 and STA

ENDL prepared this special edition of the Happenings to support the STA (SCSI Trade Association) in celebrating the 100th T10 Plenary on Thursday November 11, 2010. A PDF copy of this Special Edition is available at: http://www.endl-letter.com/se100t10.pdf.

Permission to distribute this Special Edition is granted to STA Member companies.

SYNOPSIS

THE LONG AND SHORT OF IT   **IDA**

When short is the wrong word.

SFF COMMITTEE MEETING JANUARY 10   **IDA**

No wrinkles or ruptures in the process, with no arguments over any of the current projects. The surprise was the amount of support to initiate a project which would dimension both the 3 1/2" form factor and an extended form factor (to provide room for the Serial Unitized Connector).

ATA WORKING GROUP NOVEMBER 8   **IDA**

A new ATA-2 draft that arrived unexpectedly, and a program to work on ATA-3 was agreed upon (at least the roadmap was).

SSA-UIG MEETING JANUARY 11   **KJH**

The mapping to SCSI-2 proceeded smoothly and the Serial Unitized Connector passed the letter ballot.

X3T10.1 SSA MEETING JANUARY 11   **KJH**

The Unitized Serial Connector was confirmed, and SSWGs were set up to handle the low level details for connectors and transceivers.

SSP STUDY GROUP JANUARY 13   **KJH**

The possibility of shipping SCSI over ATM using SSP boggled the members, and will be the big topic next month.

X3T10 MEETING JANUARY 13   **KJH**

Being the first plenary of X3T10 was less of a trauma than many expected. It was a smooth transition with the biggest price to pay being a lecture on X3. The event of the day was the striking down of GPP as a standards project.

FIBRE CHANNEL WORKING GROUP JANUARY 11-12   **IDA**

Compression is on the slate for FC-EP. The improvements made to FC-AL will enhance its ability to map into the existing infrastructure of operating system support. An excellent overview of the problems faced at large sites in managing telecommunications is likely to expand the role of the fabric.

THE LONG AND SHORT OF IT

In the November Happenings, the description of UltraSCSI included a phrase that caused Doug Hagerman's (DEC) hair to curl (some of us can do that, but it is not a sensation we can all enjoy any more). Doug chewed on Bill Spence some about the error. The source of Doug's anguish was 'short.'

The narrow pulses and critical timing imply the speed enhancement could only be obtained in tightly controlled environments. This limits it to backplane bus structures or short differential cables. The cables and terminators will have to be fully defined and characterized and the system limited to a small number of enclosures.

The correct wording should be:

The narrow pulses and critical timing imply the speed enhancement could only be obtained in tightly controlled environments. This limits it to backplane bus structures or differential cables. The cables and terminators will have to be fully defined and characterized and the system limited to a small number of enclosures.

Doug is optimistic that distances beyond 25M can be supported because of the clean transitions which occur with differential lines. The only problems Doug sees with UltraSCSI are associated with single ended implementations.

All clients are encouraged to call with gripes (we also accept compliments) about the content in any articles. The initials of the author are placed at the right hand side of the titles in the Synopsis to provide you all with a guide to who you should call.

SFF COMMITTEE MEETING JANUARY 10

The meeting was hosted by Vitro at the Catamaran Hotel in San Diego. The weather cooperated with blissful surroundings and warm temperatures. Those who flew in from the East and had just escaped days of freezing rain were running around in short sleeves and spending all their free time soaking up sunshine on the verandah overlooking the bay.

Company	Name	Company	Name
Adaptec	N. Harris	Cirrus Logic	J. Chen
	R. Khalish	Conner Per'ls	L. Lee
	F. Kool	DEC	E. Gardner
AMD	D. Skinner	DEC	B. Ham
Amdahl	J. Allen	ENDL	D. Allan
Berg	G. Oleynick	Fujitsu uElect	J. Urban
C&M	R. Gannon	Hewlett Packard	J. Williams

Company	Name	Company	Name
Hitachi CPA	N. Cheng	Panasonic	C. Yang
	Y. Yano	Panasonic/MKE	K. Matsuda
Hitachi uSystems	S. Karunanithi	QLogic	J. Schaffner
Honda Connector	T. Kulesza	Quantum	J. McGrath
IBM	A. Hawes		T. Stiglich
	G. Penokie	Samsung Info Sys	H. Davenport
	J. Scheible	Seagate	H. Landis
Maxtor	L. Lamers		J. Masiewicz
	R. Roberts		G. Milligan
Mitsumi	J. Antonchick		B. Schott
	N. Sugie	Sony	M. Yokoyama
Molex	J. Neer	SSI	S. Finch
Nat Semi	R. Shergill	Sun Microsystems	R. Snively
NCR	D. Isenbell	Thomas & Betts	H. Waltersdorf
	M. Jibbe	Western Digital	T. Hanan
Oak Technology	P. Brown		D. Worrell

Tom Hanan (Western Digital) gave an update on the PCI (Peripheral Component Interconnect) and PCMCIA (Personal Computer Memory Card International Association) activities.

PCI has a well-known backwards compatibility problem with interrupts which affects booting from ATA (AT Attachment) drives (they are level sensitive and shared with other devices). Existing BIOSs (Basic Input Output Systems) cannot handle the thing and Norm Rasmussen (Intel) is wrestling with the issues (which also affect modems in some unexplained way).

It is a legacy problem unique to systems which have no AT slots, and the anticipated solution is an additional connector on the motherboard to provide separate interrupts to disks. **Note:** Legacy is the in word at present, it sounds so much nicer than 'incompatible.'

Although Tom had a copy of a confidential document which defined the additional connector and the pins, he only had permission to talk about it, and copy it for individuals. Tom could not submit it for the SFF mailing, but was hopeful a non-confidential revision would be distributed soon.

PCMCIA

On the PCMCIA front, Tom was not at all hopeful that any changes would be made to define Type II cards with the same rail dimensions as Type III. At present there is insufficient room to fit an HDA and maintain the Type II rail dimensions.

The ballot to forward SFF-8005 for 1.8" drives to a standards committee had passed the letter ballot, but Jim McGrath (Quantum) was concerned that the target committee was EIA (Electronic Industries Association).

"Why are we going to EIA?"

ENDL Letter

"All the disk drive people are involved in X3."
"Now that we are X3T10 and not hobbled by X3T9 we can create standards projects that complement the industry."

"Well, for starters, we are shy on mechanical engineers at X3T10, and the EIA members are skilled at mechanical standards and dimensioning issues."

Brian Schott (Seagate) came forward with a new figure for 1.8" disk drives and suggested it be included in SFF-8005, as it provided additional information that was useful to an implementor. Larry Lamers (Maxtor) was cautious.

"Does this figure have any PCMCIA dimensions on it?"

"Yes."

"That's a problem. We went to a great deal of trouble to avoid referencing any dimensions under control of the Card Physical committee."

"Which may be why the existing figure is confusing."
"This version provides a correlation between PCMCIA and the disk needs."

A discussion began on how SFF had to be aware of politics within PCMCIA to avoid getting mixed up in turf wars. Joel Urban (Fujitsu Microelectronics) took exception to some of the harsh statements being made about the PCMCIA in general.

"Hey, this is unfair."
"I work with the Chairman of the Card Physical Committee, and I can confidently assure you that Bob Thompson does all he can to assist everyone who works with the cards."

"You misunderstand me."
"The problem is not with the technical members but those on the Marketing committee who want to exclude disk drives from the PCMCIA memory market."

Before matters went any further, the hassling was brought to an end by Sam Karunanithi (Hitachi Microsystems).

"You were talking earlier about sending this document forward to become a standard, but I can say for sure there is no way that this is acceptable in its present form."
"The ANSI requirements call for geometric tolerancing. That confuses all but those who have been trained to work with it. I know, because I had to go to a special class to understand what it was all about."

Sam had inadvertently touched on the solution to the political problems.

The SFF and PCMCIA are both industry groups. Everybody wants to avoid a turf war yet there is a need for tighter specifications on mechanical tolerances.

If an SFF Specification forwarded to EIA is lacking in completeness, then these must be corrected in order for it to proceed in the standards process. Clarifications and tighter dimensioning would not be a turf issue between SFF and PCMCIA, but the responsibility of the EIA in completing a standard. Hokey? Yes, but a practical solution to what could otherwise turn into a problem between two functioning industry groups.

Pick a Pin

Bill Ham (DEC) embarked on quite a venture when he volunteered to create a summary of the cabling morass (honest, the spell checker did not substitute morass for mess) for the various SCSI connectors.

> "I have 22 tables of pin and conductor assignments completed, and there are still 4 more to go."
> "I believe everything is covered except the PCMCIA connector. Not all of them necessarily make sense, but at least we will have consistent usage on those that are used."

Rather than go over the details, Bill asked that everybody look over the material and draw his attention to any anomalies. He hoped to have the other four completed by the time of the mailing (he did, too).

Bob Snively (Sun Microsystems) provided an update on the SCA (Single Connector Attach), which is still not available as an SFF Specification.

> "You may recall that I was checking into the copyright issues surrounding the SCA, so that we can get the text and figures into SFF-8015."
> "Well, it turns that there are three copyrights involved; Sun, Conner and Seagate. There are no insurmountable barriers here, simply the time to get around to it."
> "There are some updates needed to the figure anyway, which I will have to include."

Form Factors

The SFF mailing had proposed that the project to define the parallel unitized connector (three separate connectors of 68-pin SCSI signals + 12-pin Options and 4-pin Power in a single plastic shell) for rack-mounted usage be canceled due to lack of interest. There was surprising resistance, led by Jim McGrath.

> "We need SFF-8014, it is the right place to do the dimensioning of 3 1/2" disk drives."

> "The SSWG (Specific Subject Working Group) has been around for months now, and Bob Whiteman's (AMP) last status said that there had been no input."

Larry Lamers disagreed.

> "That's not true. I gave Bob some input. The problem is that we have never really met to grapple with the issue. All the SSWGs have been during one or another lunch break."

"There have been no serious meetings."

Gene Milligan (Seagate) could not resist the opportunity.

"Why not let it die? I never wanted it anyway."
"We don't need two ways to rack drives and we already have SCA."

Larry supported Gene.

"I don't want to see the Unitized used in racks, either. We should just stick with SCA."

Jim McGrath could not restrain himself.

"Whoops, what's this I hear? We don't dictate what the market wants in this room!"
"We need to agree on the dimensions so we can grab an SFF Specification and add any connector the customer chooses."

Bob Snively was skeptical.

"We came up with SCA because we didn't think it could be done with the Unitized Connector."

"That's only part of the issue, the other is that we need the form factor defined."
"The Serial Unitized Connector is going to be used by P1394 and SSA (Serial Storage Architecture) and that involves deepening the form factor by 15mm or so."
"Unless we have a specified 3 1/2" form factor we certainly don't know what to lengthen."

Gene was scornful.

"Come on. Two years ago in SFF, we said it was too late to define a 3 1/2" form factor."
"It's even later and you want to do it, now?"

Tom Hanan bought in.

"The market has shifted in the last couple of years, and drives are a lot closer to each other physically than they used to be."
"We can boost the data rate by being closer to the bus, and direct mating is a much more practical option now than it was in the past."

"We've converged a lot, so it will not be a big deal to tie things down more tightly."
"We managed to do it on 2 1/2", and David White (Compaq) did such a good job, I was kinda hoping he would take on the task for 3 1/2" disks."

David had been quietly observing, now he found himself in the middle.

"Oh. Ah well, I'll go for it."

"See, we're halfway there already!"

"I'm willing to create the drawings but reaching resolution on all the details will not be easy, and I am not willing to do that at this time."
"That will be the job of the leader and we don't have one yet. However, to kick things off I am willing to do that for now, and to host the first SSWG in the next couple of weeks."

Bob Snively was shaking his head in incredulity at what he was hearing.

"You mean you guys are really ready to get together and work on the form factor so that you can specify an extension?"
"I don't believe it!"
"Do you realize how much equipment is built around this form factor?"

John Scheible (IBM) felt there was a good reason.

"This industry is driven by $/MB, and moving that connector out of the way increases the room available in the HDA by one, maybe two, platters."
"That means we can get at least 10% more capacity into the same HDA (Head Disk Assembly) for pretty much the same cost."
"It will look a lot more attractive when I offer you 100 MB for free."

There is only enough room here to include the beginning of Bob's soliloquy on form factors and his opinions of vendors willing to violate existing de facto standards.

"Oh no, it won't!"
"It means you won't even be considered as a drive vendor, because I will buy the same capacity at the same price from a vendor that builds to the same form factor as I buy today."

When Bob wound down, David questioned what material he should use to prepare a preliminary drawing for participants to consider at the first SSWG. Bob provided him with a copy of Sun's SCA documentation, which has received general industry support.

After the meeting concluded, Jay Neer (Molex) volunteered to lead the SSWG, and drew up a list of what he was willing to include in the scope. Which of these are necessary will be decided by the participants.

o Form factor of 3 1/2" drives

o Position of Unitized Serial Connector on: 2 1/2" drives
                                              3 1/2" drives
                                              5 1/4" drives

o Extended form factor for Unitized Serial Connector on: 2 1/2" drives
                                                          3 1/2" drives
                                                          5 1/4" drives

Support for >528 MB

The long-standing limitation of 528 MB for ATA drives is a combination of many factors, none of which have to do with ATA drives! The history goes all the way back to some very early decisions in the XT/AT designs.

You can blame the BIOS and software usage of the CHS (Cylinder-Head-Sector) addresses for the problem, or you can be kind and admit that back in the days of 10 MB drives no one could have anticipated the need.

Hale Landis (Seagate) related the tale of events at Comdex where Seagate and Western Digital had hosted an 'event' at which all parties were invited to offer their solutions to getting out of the dilemma.

> "There were lots of presentations, and lots of incompatible solutions were bartered around, but the bottom line is that since then, nothing."
> "Software people don't get together and scream at each other like disk drive designers do. There are no public forums that can be used to search for common solutions to problems."
> "Instead, anything that is distributed is done on Confidential documents, so there is no opportunity to share information."
> "Phoenix, Quantum and Seagate have gotten together to share notes. Curtis Stevens (Phoenix) is circulating a specification through the software industry which deals with the software aspects."

The document titled 'Enhanced Disk Drive Support - Functional Specification' is available from Curtis (who can be reached at 408-452-6500). Gene Milligan leaned into his briefcase and pulled out another document.

> "Is that the same as the Phoenix Plug 'n Play specification, and how does it relate to Microsoft's Plug 'n Play specification?"

> "Not at all, they are a completely different set of documents. I am trying diligently to avoid any issues with respect to Plug 'n Play in SFF-8019."
> "SFF-8019 will reflect what Phoenix supports. The changes to the new revision were made to correlate with Phoenix."
> "Even with the changes, there remains a limitation that the BIOS will fall apart at 8 GB. Nothing can be done to get around that one, but hopefully it will be a while before we have single disks of that size on PCs."

Jim McGrath's eagle eye spotted a problem.

> "I thought we agreed at the last meeting that LBA (Logical Block Address) would no longer be mandatory?"
> "We decided to make it optional because there was no software using LBA."

Tom Hanan defended LBA.

"That depends on who you talk to. You get different stories from individuals at AMI, IBM's OS/2, Microsoft and Phoenix groups."

ATAPI CD-ROM

The latest revision of SFF-8020 which specifies the ATAPI (ATA Packet Interface) CD-ROM was mailed shortly before Christmas.

Tom Hanan felt confident that it had addressed all the known problems.

"If the present level of comments continues, it may not be necessary for the SSWG scheduled at the end of the month to be held."

His optimism was dampened by Peter Brown (Oak Technology).

"There are a few issues that should be aired before the whole group."
"The lack of change bars on the latest revision hurt everyone's ability to review the document quickly."
"We divided the document between customers so that we could get complete coverage, and comments are still coming in."
"Soft Reset is still not settled according to things we uncovered as long ago as last October."

"Okay then, we'll plan on getting together after all, but we want to make this the last time so that we can all go off and implement."
"We've got customers yelling for drives to be delivered in March, so this thing has to be stabilized for everyone to meet their commitments."

Tilting at Windmills

Harvey Waltersdorf (Thomas & Betts) had asked for an opportunity to address the committee with an alternative proposal for the P1394 connector.

In the working group following the last P1394 plenary, it had been decided to leave the details of where the connector should be mounted up to the SFF Committee. Since Harvey's presentation to P1394 had been politely ignored, this must have seemed like a golden opportunity to his management to try again. Poor Harvey, his explanation on the first overhead drew immediate fire from George Penokie (IBM).

"This design is based on the existing high-volume connector used by SCSI-2 and SCSI-3. It has the same four bays as P1394 and the contacts are on 0.050" centers."

"I object! That is a pin and socket configuration and my position is that the only design I can support is ribbon-style."

Jay Neer nailed Harvey.

"The P1394 members insisted that leaf contacts had to be used, and the height of your connector exceeds the 5mm limit."

"The height is spurious if the drive's circuit board is to be extended."

Jim McGrath decided to leverage Harvey's presence.

"This should be taken as a hint for the ribbon guys to ship product fast."
"You must remember the SCSI-2 committee wanted a ribbon connector also."
"When it came down to buying or not buying, SCSI-2 went with a pin and socket because it could be purchased from multiple sources."
"Shipping schedules wait for no connector."

Bob Snively was critical.

"This reminds me of so many connector situations."
"A choice was made by members after due consideration and then a vendor turns up with something that he wants to sell."
"A decision was made in favor of leaf design, and this smacks of an effort to confuse the issues."

Now, Harvey is a nice guy who has built a wide circle of friends in all the years he has been attending the X3T9.* meetings. Can you imagine what sort of a reception he would have been given if he had been a stranger? As he exited left to sit down, a wag placed it all in perspective.

"Nice try, Harvey, you did your duty well."
"Now you can go back and tell your bosses we were rude to your proposal."

ATA WORKING GROUP NOVEMBER 8

Vitro hosted at the Catamaran Hotel in San Diego. There is no attendance listing as the signup sheets were not returned.

ATA-2

There was a surprise awaiting everyone, because instead of ATA-2 Rev 2 being a 1-page note stating that Rev 1 was obsoleted, there was a whole new draft document. Steve Finch (Silicon Systems) explained.

"At the December working group it was decided that it would take too long to re-structure ATA-2 into layers like SCSI-3."

ENDL Letter

"We moved that effort to ATA-3, and are going to rush out ATA-2 to revise the standard by correcting all the errors in it and adding the features which we have been working on."
"ATA-2 will include the faster Mode timings specified in SFF-8011 as well as commands like Download Microcode."

Tom Hanan (Western Digital) described the effort to come up with an even faster Mode of 16.6 MBs. John Masiewicz (Seagate) justified the rationale.

"We all know that 20 MBs is not achievable yet, and a lot of work remains to be done in order to get up there."
"The 16.6 MBs rate fits well with 33 MHz machines and looks achievable."
"We have had some lively discussions, and there seems to be a groundswell in favor of doing it."

Tom expanded on the 'lively discussions.'

"There are three approaches: Adaptec, Seagate and Western Digital."
"Details need to be worked out, but as far as all three go, John's seems to fit the middle ground. We have a target to complete by June."

John was concerned that the new Mode might not make ATA-2.

"When do you expect ATA-2 to be completed, Steve?"

"I want people to know it is in final review now, and have it completed by June."

Tom did not like the timetable.

"You are saying that 16.6 MBs won't make it into ATA-2."
"We already have the ATA standard, and the SFF Specifications have been widely embraced throughout the industry."
"We certainly don't need ATA-2 to have them further accepted."
"Help me out now, just what is the value-add of ATA-2 to the industry?"

Tom was unhappy with Steve's reply about correcting errors and consolidating all the activities since the standard was forwarded. This disappointment was displaced by an even stronger emotion when Steve suggested that the members approve the new revision of ATA-2 as a working draft.

"If we recommend that X3T10 accept ATA-2 as a Working Draft it can be made available through Global Engineering for industry-wide distribution."

"What? We just got it today."
"We haven't even had a chance to look over the content!"

"No way should we let this out of the group until we have had time to look over it and make a reasoned decision."
"I can't even tell what is different from the standard because there are no change bars."
"That means it will take even longer to reach an opinion because it will have to be read line-by-line!"

Many more words were said by several parties but it was pretty much a repeat of the opening remarks. Steve ended matters by calling for a vote by company which failed by 4:7.

The other activities covered on ATA-2 included Hale's excellent discourse on the nuances related to Master and Slave. This is one area in ATA where few have the least comprehension of how it works (your editor has to struggle mightily and turn to the standard every time the subject arises).

PDIAG and DASP have to be the least-liked signals of all time.

It is recommended that any readers interested in understanding Master/Slave better, obtain a copy of Hale's description. The catalyst for Hale to put pen to paper was a technical issue that arose with Commodore (not on an AT-based system). Nothing but praise was heard from all who have read it.

ATA-3

As well as the new ATA-2 draft, Steve had brought copies of several project proposals for ATA-3. His representation of the roadmap included ATAPI (ATA Packet Interface), but the relationships between the boxes was not met with acclaim.

A handful of members had strong views of their own on how the ATA-3 projects should be represented in relationship to each other. The silence from the others did not last long, and voices were heard asking that the topic be dropped so the group could move on to other subjects. Eventually, matters came to a head and Hale Landis (Seagate) put things into perspective with a strident, even belligerent, cry for progress.

"Enough already."
"We've all got a feeling for what you guys are arguing about, and I for one will agree with anything you can agree on."
"Just do it off-line so that the rest of us can get some work done!"

Moving on produced a dual benefit. Not only did everybody else get a chance to do some work, but the tempers had mellowed by the time the meeting ended. Progress on the roadmap proceeded with less emotion to an agreement.

The underlying general principle is that all SCSI-3 command sets will be capable of being carried by the ATAPI protocol, which relies upon ATA-PI (Physical Interface) to transport its packets. The existing command set for hard disks will remain, and be named Blocked Commands (the names were chosen to provide consistency and similarity with SCSI-3 titling).

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  │     SFF      │   │             SCSI-3               │   │  ATA-BC  │
  ├───────┬──────┤   ├─────┬─────┬─────┬─────┬────────┤   │          │
  │Floppy │CD-ROM│   │ SPC │ SBC │ SSC │ MMC │ • • •  │   │          │
  │ Tape  │      │   │     │     │     │     │        │   └────┬─────┘
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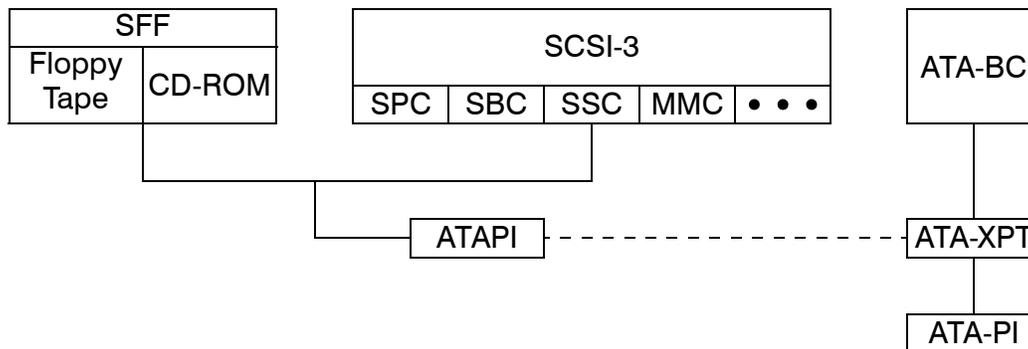
The SFF Committee will be responsible for specifications related to CD-ROMs (SFF-8020) and the anticipated activity to support the QIC (1/4" Cartridge) tapes which are shipping on the floppy interface at present. These are not likely to go forward to a standards committee, because the SCSI-3 MMC (Multi Media Commands) will include and go beyond the functionality in SFF-8020.

Over time, MMC is expected to become the migration choice for CD-ROM vendors as the software suppliers will be able to write a common driver independent of the physical interface (be it ATAPI, parallel SCSI or serial SCSI).

Similarly with the other SCSI-3 command sets e.g. if 4mm DAT (Digital Audio Tape) falls in price to become attractive on a desktop, there is a natural path via ATAPI and SSC (SCSI-3 Stream Commands). An interesting twist on this course is that the existing SCSI infrastructure can be tapped by ATA via the Packet Interface. Any OEM which currently uses SCSI disks, but is looking to compete in the PC price arena can now hope to leverage the lower-priced ATA drives, yet avoid the expense of setting up a new infrastructure.

Future Dates

Although Steve Finch and Tom Hanan spent much of the meeting on the opposite sides of issues, they closed ranks on the subject of getting 'a fair shake for ATA in X3T10.' Both feel ATA has been short-changed by getting little time during the working group week.

Although the ATA working group is scheduled for a full day, the day does not start until 2:00pm and lasts until 8:00pm. Steve has been vociferous about the fact that only a small number of members remain beyond 6:00pm.

A number of ideas were put forth:

(a) ATA from 1400–2000 on Monday preceded by SFF on Monday 0900–1400
(b) ATA from 0900–1300 on Monday preceded by SFF on Sunday 1300–1700
(c) ATA from 0900–1700 on Tuesday with SFF at 'some other time'
(d) ATA from 0900–1700 on any day with SFF at 'some other time'
(e) ATA from 0900–1300 on Thursday followed by SFF on Friday 0900–1400

Choice (a) is the present schedule. The first round of voting was between (a-d). Members could vote more than once, for any that suited them, so the counts represent relative weightings.

		Round 1	Round 2
a	Leave as-is	9	9
b	Monday morning	10	6
c	All day Tuesday	4	n/a
d	All day any day	2	n/a
e	Thursday morning	n/a	7

Before the runoff between (a) and (b), Larry Lamers (Maxtor) suggested (e): ATA to meet on Thursday morning, so members could stay on to participate in the plenary in the afternoon and vote on issues.

Those who were involved in SFF would stay overnight for the Friday morning meeting. The second round was between (a,b,e).

Rather than take a runoff vote, there was a discussion of what members would like. The preferences came down to staying 'as-is' or re-arranging the week as per (e) to give ATA members a way to attend the plenary.

There is some sentiment to form an independent task group for ATA, but this would not solve the problem of X3T10 being the committee which everything has to pass through.

Those that complain about SCSI being the dominant subject in X3T10 (as it was in X3T9.2) will find nothing changes unless SCSI also becomes a task group so that X3T10 can effectively serve the same function as X3T9.

Fortunately, there is a spirit of willingness to see how things work out in the coming year, rather than attempting to jump the gun before X3T10 has had a chance to try working out the problems. **Note:** At the X3T10 plenary, the members looked favorably upon plan (e) and it looks like it will come into effect at the May meeting.

SSA-UIG MEETING JANUARY 11

The first meeting of SSA-UIG in 1994 was hosted by Vitro in conjunction with the X3T10 meetings at the Catamaran Hotel in San Diego.

Company	Name	Company	Name
Adaptec	N. Harris	C&M	B. Gannon
Berg	G. Oleynick	DEC	E. Gardner

Company	Name	Company	Name
DEC	W. Ham	Molex	K. Alberts
Hitachi	N. Cheng	NCR	F. Meadows
IBM	A. Hawes	QLogic	M. Ramezani
	J. Scheible	Seagate	M. Fitzpatrick
Madison Cable	R. Bellino	STK	T. Nguyen
Micropolis	K. Erickson	Western Digital	T. Asami

The meeting opened with welcome news from Tak Asami (Western Digital).

> "In response to many requests, we have established an Internet reflector for the exclusive use of those interested in SSA (Serial Storage Architecture)."
> "This should reduce the complaints from those on other reflectors about message clutter."

Note: All it requires to join any reflector set up by Western Digital involves sending an e-mail to majordomo@dt.wdc.com consisting of a command(s) to 'SUBSCRIBE *xyz*@dt.wdc.com', where *xyz* is ATA or ATAPI or SSA.

This is a real boon to the group and many thanks went to Western Digital for implementing a reflector. With so much of the work being accomplished over e-mail these days, a reflector devoted to a specific standard helps meetings flow more smoothly.

Patent

An omission by IBM regarding patents was identified by Ed Gardner (DEC).

> "IBM has made the patent policy regarding SSA clear to the UIG but, so far as I am aware, no letter has been filed with X3T10.1 to that effect."

The form letter which is needed identifies any patent(s) involved in a draft standard and states the commitment to follow the ANSI patent policy. This is needed before the draft can be approved as a National Standard. The policy is straightforward; the patent holder must agree to make licenses available on a non-discriminatory basis at a 'reasonable' charge.

John Scheible (IBM) confirmed there is no problem as IBM has already stated that licenses will be issued on SSA patents for $5,000 each and a reciprocal agreement that if the licensee develops any SSA-related patents, IBM gets to license them for the same fee.

> "You're right Ed, we need to send a formal letter to X3T10."
> "I will follow up on that for the next meeting."

Were those smiles or smirks on the faces of those who have had past dealings with IBM? Everybody wishes John luck (if he gets a letter from IBM's lawyers by March, it will be a feat worthy of the Guiness 'Book of Records').

ENDL Letter

SSA-SCSI

In November, John had proposed modifying the document that describes mapping SCSI-2 over SSA. Ed was primed and ready to respond to the proposed changes.

"Your proposal to limit the number of Data Ready messages outstanding to a maximum of two seems unnecessary to me."
"As long as you allow more than one outstanding Data Ready message, you have overhead to track it, so why not permit more than two?"
"You are only making the protocol more complex for no gain."

Mehran Ramezani (QLogic) came back with a sharp retort.

"That is not true!"
"John's proposal actually simplifies the protocol because the queue is much easier to manage with a maximum of only two messages outstanding."
"If we allow an unlimited number of Data Ready messages to accumulate, we must consider the worst case, which is a very high overhead."

"Any restrictions will impair some applications."
"I'm not opposed to limitations established by parameter passing between individual nodes, but arbitrary limits will affect latency."
"An application may want to send multiple commands in a sequence and not wait for a Data Reply message on each."

John felt it was necessary to re-establish the purpose.

"This proposal does not affect sending multiple commands, the limits apply only to the number of Data Ready messages within a single command."
"It has nothing to do with command chaining."

"Then change the words to state exactly that. The way it is now, I read that the limits applied to multiple commands."

"Okay."

"Since we are on the topic of confusing words, I have another gripe."
"Throughout the text when you refer to offsets, the statement is made that offsets must be a multiple of the block size."
"As far as I can recall, we have had conversations that defined offsets in terms of 16 or 8 byte multiples. This is inconsistent wording."

"Gee Ed, you're right!"
"This is odd, as I agree that we never intended offsets to be a multiple of block size."
"I will remove that statement after checking with our engineering group, but I can't see why there would be any need for such a limit."

ENDL Letter

One consequence of a serial link is that when multiple paths exist between two nodes, commands are no longer guaranteed to arrive in the same sequence as they were sent. To simplify some of the housekeeping chores associated with this new state of affairs, John wanted to limit data transfers to the same path that the command had originated on. The obvious exception would be error recovery, when an alternate path might become necessary.

> "By establishing a rule that for normal transfers, the same path must be followed for commands, data and status we can simplify things and reduce the amount of code needed to track a complex configuration."
>
> "If you all agree, I can remove the rather large section on multiple path operation in the specification."

Ken Erickson (Micropolis) did not disagree with the intent, but wanted more detail spelled out in the standard.

> "We should not remove the section on multiple paths. Just change the words to say that error recovery should begin on the same path, but can move to alternate paths if required. In fact, it should be clear that no limits apply to the error recovery process as far as paths are concerned."

Ed thought this was going a bit too far.

> "Simply stating that error recovery is not limited to the same path should be sufficient."
>
> "Let's keep things simple and not attempt to solve the problems of stupid implementations. We are not preventing the maximum of latitude in error recovery, but remember that ultimate responsibility is on the Initiator."
>
> "Error recovery can be a mess, with actions occurring between intelligent Targets and Initiators. Let's not try to define it."

> "I don't agree. We need to spell out the rules of error recovery in order to not give too much leeway for potential disaster. Users may be confused by the existing wording."
>
> "I have no alternative to the words, only a more narrow interpretation of what already exists in the multiple path section of the document."
>
> "We should leave the entire section on multiple paths, but give a warning and say multiple paths are not to be used in the normal case."

Although John wanted to remove the section on multiple paths, he was swayed towards the approach Ken espoused. Ed had said his piece and was willing to remain silent while John wrestled with what to do.

> "I see your point, but I am still afraid we leave open the possibility of more than one path active at a time."
>
> "Okay, we will leave the section on multiple paths in the document, but post a warning that limits its use to error recovery."

Connectors

When it comes to connectors, a simple vote of members present at a meeting is not a final solution. This is one area where everyone feels compelled to express an opinion. Consequently, it was decided to settle the issue by a letter ballot asking the members if they approved of Molex's Serial Unitized Connector (as adopted by P1394).

The Serial Unitized Connector has four bays containing power, two ports and auxiliary signals, all contained within a single housing. It can be used for either a backplane-style direct connect (as seen in many RAID subsystems) or be cabled (one cable per bay).

In Favor	Opposed	Did not Vote
Adaptec DEC IBM Madison Cable Micropolis	Siemens Western Digital	AMP Array Technology EMC ITT-Cannon QLogic

Siemens and Western Digital were opposed because they believed Molex's connector would not be available in time for SSA product shipments.

John Scheible qualified his support.

"We plan to tool up for production of our SSA drives within the next two months and if the Molex connector is not available by then we will use the 2mm flat cable header connector."

In the discussion regarding connector documentation, Kevin Alberts (Molex) promised to have final drawings available soon. This initiated an issue on where the connector should be documented.

"Should SSA-PH completely document the connector or should it just include a reference to P1394?"
"That would mean we rely on the IEEE and that committee to specify everything that is necessary."

There were lots of opinions, but the consensus that emerged was for John to add as much as possible regarding the Molex connector to SSA-PH. This would be insurance against the P1394 committee being delayed in their documentation efforts. There is time enough ahead to change SSA-PH to a reference; it is more important that the present information be easily found.

Another possibility is that the EIA (Electronic Industries Association) will process the Serial Unitized Connector as a standard. Nobody knew enough to comment on the probability of this occurring.

Marketing

Although much of the marketing discussion turned into a recount of Comdex, some points were made by Ed.

"One of the problems we face internally is a total lack of any silicon to support SSA at the host adapter level."
"Everything we have seen so far is intended for the drive side."
"What I would really like is a PCI-to-SSA chip."
"Failing that, even a chip that incorporates SSA and a high speed buffer manager like the WD 61C40 will do."
"What I don't need is another drive controller and SSA combo chip."
"And by the way, I need it in beta test by the middle of this summer at the latest in order to do our programs any good."

Tak Asami and Mehran Ramezani responded in chorus:

"Let's talk after the meeting Ed."
"I have some information for you."

Ed was right on in assessing the market's need for a PCI-SSA host adapter.

The high performance storage market is already moving to the PCI (Peripheral Component Interconnect) local bus as the interface of choice for peripheral controllers, so it is a natural market for SSA host adapters.

X3T10.1 SSA MEETING JANUARY 11

The first meeting of the new X3T10.1 committee was hosted by Vitro at the Catamaran Hotel on the shore of Mission Bay in San Diego. The former X3T9.7 was renamed after the reorganization of X3T9 into new Technical Committees.

Company	Name	Company	Name
Adaptec	N. Harris	Micropolis	K. Erickson
Berg	G. Oleynick	Molex	K. Alberts
C&M	B. Gannon	NCR	J. Lohmeyer
DEC	E. Gardner		F. Meadows
	W. Ham	QLogic	M. Ramezani
ENDL	K. Hallam	Quantum	J. McGrath
Hitachi	N. Cheng	Seagate	M. Fitzpatrick
IBM	A. Hawes	STK	T. Nguyen
	J. Scheible	Western Digital	T. Asami
Madison Cable	R. Bellino		

Administrivia

John Lohmeyer (NCR) helped the meeting get off to a good start by explaining the membership rules.

> "At this first meeting, all of you can become members. However, anyone who wants to join after today will have to attend two meetings out of three and write a letter to the Chairman requesting membership."

> "At one time there was concern about having to nominate officer candidates all over again, but X3 has informed me that the officer nominations from X3T9.7 are sufficient."

> "One thing you do need to decide soon is whether or not you want to participate in the CBEMA (Computer and Business Equipment Manufacturers Association) mailing program."

> "I estimate that for this group, the fee would probably be in the order of $150 per year."

CBEMA is the secretariat for X3, and began a program several years ago that distributes the cost of committee mailings equitably across all. A separate fee (on top of the annual membership fee) is charged subscribers to cover the cost of the mailings. The other choice is to find a volunteer willing to gather, organize, duplicate, and mail all the documents involved in the operation of the committee. This is an onerous task.

Steve Finch (Silicon Systems) suggested an alternative.

> "All of us are already on the X3T10 mail program and it seems silly to add yet another fee to our bills. Why not just add the X3T10.1 documents to the existing load sent out with the X3T10 mail?"

> "That should not increase the X3T10 mail fees by $150, it only ought to add another $50 or so."

> "I'm not sure you have to face the problem yet because John Scheible (IBM) has expressed his willingness to continue the mailing, at least for now."

> "Eventually, alternatives will have to be considered. I will ask CBEMA if a combined mail of two committees is possible."

The only obstacle anyone could think of would be from members of X3T10 objecting to the clutter of X3T10.1 documents being included in their mail. For the present, John Scheible will providing the service at no charge.

Connectors

John Scheible related the actions, discussions and voting results in SSA-UIG (Users Industry Group) regarding the unitized connector proposal from Molex. When he asked for a formal vote to adopt the unitized connector, Steve Finch (Silicon Systems) objected.

> "I don't like the idea of taking something done by the SSA-UIG and rubber stamping it without due consideration."

"We should not vote on anything not presented and discussed at X3T10.1."

"I agree we should not vote on things never discussed before this group, but, the connector issue has been discussed here. Not only that, we held two meetings dedicated to the connector issue last summer."

"The preliminary drawings of the Molex connector have been in the mail to all members and we discussed it at the last meeting."

Steve found little sympathy from the other members and several demanded that a vote be held without further debate. The result was a unanimous decision to adopt the Serial Unitized Connector as the specified internal connector.

John also had some news about the external connector.

"ITT-Cannon have informed me that we need to accept a change in jackscrew dimensions in order to achieve a universal bulkhead connector that will retain cable plugs by a latch, simple friction, or jackscrews."

"The jackscrew is slightly smaller and can be retrofitted to connectors."

"We should adopt the change as it will both simplify life for the user and reduce inventory for system manufacturers."

It was another unanimous result, but it yielded a related objection from Ed Gardner (DEC).

"I dislike the definition given for the external cable. We should supply more information regarding the shield and ground connections."

"I agree, but what exactly should that information be?"

"Have you any test data to back up any recommendation?"

"No, but aren't your lab people working on cable and connector testing?"

"They are probably doing something along these lines already."

"I don't know, but can check on it."

"I also have a problem with ITT-Cannon having the sole commercial version of this connector."

"All the other companies only offer the mil spec version."

"There are other companies preparing commercial versions for sale in the near future."

"I certainly hope so."

Bill Ham (DEC) had another bone to pick.

"The drawings of the 9-pin connector in this draft are not acceptable for connector representation. They are in need of a major overhaul."

"I fully agree, Bill."

"Those drawings were put in as a place holder until we made more progress in other areas. I will contact ITT-Cannon, Bob Whiteman (AMP), and you to get agreement on the presentation style to use."

"This may be best handled as a separate SSWG (Specific Subject Working Group), in order to reach closure without tying up the full committee for a day or so."

"How about adding some information regarding the use of pulse transformers for external cable extensions?"

"I'd love to."

"Do you have some data for inclusion into the draft?"

"Does anyone have some data for inclusion into the draft?"

The silence was deafening.

Miscellaneous

Changes: John reviewed the changes made in November. These included those that had been discussed and approved at the SSA-UIG meeting in the morning.

o Update the cable attenuation values and double the allowed length.

o Change the external cable description to use 28 AWG wire, rather than 26.

o Limit the size of all data transfers to multiples of 8 bytes, rather than 16 bytes.

o Change the Configure Port message and the Async Alert message to force the same Port and path to be used for both, thus eliminating the need for a Return Path field.

Although it appeared that Ed was arguing with John about the Configure Port and Async Alert messages, eventually it dawned on all that they were violently agreeing and differed only in the words they were using. The changes were approved unanimously.

Priority: Adge Haws (IBM) had an interesting proposal.

"Over the past few months there has been work accomplished at IBM-Havant regarding the problem of avoiding deadlock conditions. A node can still issue priority out of sequence due to an error."

"We have a paper from a Ph.D. candidate who was working as an intern at Havant which makes recommendations to improve the priority scheme."

"Do you have it here to distribute?"

"Unfortunately no, but I can easily obtain it before the next meeting."

"If I get it in time, I will include it in the next mailing."

Schedule: The scenario to complete the draft was summarized by John.

"If we want to move this standard out of X3T10.1 by the end of this year, September is about the last time for accepting changes. If we authorize a letter ballot at that meeting, we will have the ballot results to respond to in November."

"After responding, we can submit the package to X3T10 for their approval, to go on for further processing and to begin the public comment period."

Missing Pieces: Bill Ham still had a few items he felt needed closure.

"We need to include more information on the transceivers, such as adding chip specifications like the rise and fall times and error rates."

"These should not be arbitrary numbers, but values that at least three chip vendors agree are reasonable."

"Good point Bill."

"Not only do we need to have a SSWG on connectors then, we also need one on transceivers. Who should be included in this SSWG?"

"How about Adaptec, DEC, IBM, NCR, QLogic, Raytheon, and Western Digital?"

"Are there any others? Intel maybe?"

"If anyone comes up with other names, contact me and I will try and set up a convenient date for a transceiver SSWG."

SSP STUDY GROUP JANUARY 13

While X3T10.1 labors to refine SSA-PH (Serial Storage Architecture Physical Interface), there is a need to describe how SCSI maps on to SSA. Thus it was that an X3T10 study group was hosted by Vitro under sunny skies at the Catamaran Hotel in San Diego.

The Project Request submitted to X3 was still pending approval, hence the need to operate as a 'study group' and not a working group of X3T10. According to X3 rules, no work may be accomplished until a project has been approved and a press release issued.

Company	Name	Company	Name
3M	A. Olson	Future Domain	R. Macare
Amdahl	J. Allen	Hewlett Packard	J. Williams
Buslogic	C. Strang	Hitachi	P. Boulay
CMD Technology	E. Haske		S. Karunanithi
DEC	E. Gardner	IBM	R. Kembal
	R. Weber		J. Scheible
ENDL	K. Hallam	PE Logic	E. Perera
Fujitsu	R. Liu	SSI	S. Finch

Company	Name	Company	Name
StorageTek	E. Oetting	Western Digital	T. Asami
Tandem Computers	J. Moy		J. Stai

Beginnings

Mapping SCSI-3 to SSA does not require starting from scratch, as a paper was submitted by the SSA-UIG (Users Industry Group) in November which describes mapping SCSI-2 to SSA. Although it is not in the proper format for a draft standard, nor to the SCSI-3 terms of reference, it makes for an excellent starting place.

John Scheible (IBM) spent an hour or so on a tutorial about the workings of SSA and how SCSI was expected to operate over it. As this was not a working group, no actions could be taken to adopt the SSA-UIG document or establish any specific parameters. There was nothing that prevented a discussion on how to port the material over to a 'useful' format (all of John's work has been done on a mainframe using IBM's BookMaster software).

> "Conversion of the text from BookMaster to one of the more popular word processing programs is a non-trivial task that I expect will take me a month or two to accomplish."
> "This has to be done for SSA-PH as well, and the biggest problem will be finding the time, as my company has me on the road almost continuously."

Ed Gardner (DEC) offered a solution.

> "I am familiar with BookMaster and can help with converting SSA-PH if you would allow me to split the draft into two separate parts."
> "I want to break it into a physical and a transport layer for reasons that can be described later."

Although this was neither the time nor the place for accomplishing SSA-PH business, John was not one to look a gift horse in the mouth.

> "Great idea Ed!"
> "You can be the new editor of the SSA physical draft."
> "Anyone want to take on the job of editing the SSP draft?"

Although no one was willing to take on the latter task, there was no shortage of opinions on what word processor should be used. Although FrameMaker, PageMaker, Word for Windows and Word Perfect 6.0 were all mentioned, in the end, the choice boils down to the preference of the editor. Editor John's preference settled the issue.

> "I already have some experience working with Ami-Pro and my department has established it as an internal standard. It has an export/import feature for most of the other word processors on the market, so if anyone needs the draft in another format, it should be easy."

Ralph Weber (DEC) felt there were still some potential problems.

"Although I have no preference for a specific program, it has been my experience that exporting tables and boxes is less than satisfactory between most word processors."
"If we want to keep things transportable, I suggest using text characters to form box and table outlines. This will also allow us to send documents over e-mail without loss of content."

"That is a great idea, but I have already set up all the tables and boxes in Ami-Pro's format. How do I convert them without spending a lot of time on it?"

"I have just the solution. It is a program written in C that will convert all of those special characters into ASCII text characters."
"Here's a copy on floppy disk."

"Thanks. Guess I'd better get busy."

When John converts the SCSI-2 mapping over to Ami-Pro, he will also remove the references to SCSI-2 and ACA (Auto Contingent Allegiance). It will then be more suitable to serve as a base draft document at the first (hopefully) working group meeting come March.

SSA-SCSI-2

Ed Gardner had a problem with the SCSI-2 mapping document.

"Why is a VU (Vendor Unique) field needed in the command block? Why open things up so early for this sort of function?"
"We should wait for a clear need to arise before setting aside VU fields all over a document."

"Why wait at all? We know that there will be requests for VU functions, so we might as well get it over with early."

"By displaying these fields, we encourage VU implementations and reduce interoperability. Besides, space is precious and we may need it later for other things."

Steve Finch (SSI) sided with Ed.

"I like Ed's suggestion, we should limit our exposure to VU fields."

"But I already have a customer who demands this type of field, or he won't buy into SSA."

Jeff Williams (Hewlett Packard) felt there was no conflict.

"You guys are both in violent agreement."

"Ed supports VU fields if a customer need exists and John has a customer."
"We have 3 bytes reserved in the command block for this kind of thing."

"Like I said, space is precious and we may need to expand another field like the return path or something later."

Jeff did some thinking out loud about the return path field.

"Hmm. If we use all existing 6 bytes of the return path it could become a real burden, but we really don't need to use them all."
"Most or all of the time, the path information will be one byte."
"Only switched paths need more bytes and they are not very likely at this stage of the market."
"I see no need for expanding the return path in the foreseeable future."

"It was only an example, but okay, I concede that we can leave the 3 bytes of VU in the command block."
"Even so, we need to resist the temptation to resolve everything with VU."

Talk of the return path field led Ed to bring up a related issue.

"You realize that Async Alert will often have a different Tag from any previous command?"
"I worry that SCSI-2 software normally assigns Tag values per Target, but SSP requires that Tag value assignment be by Initiator."
"This creates the potential for duplicate Tag value assignments."

Ralph felt Ed was overly concerned.

"I'm aware of this problem. It may be a nuisance, but it is not a major block to operations nor a huge effort to solve."

John was worried about alternate pathing.

"You realize that things can easily get out of order if multiple paths are always used?"
"An Abort can arrive at a Target before the command that it is intended to stop arrives."
"An Abort affects all commands from a given Initiator and you could have many commands operating over multiple paths."

"Don't worry, just specify that path be considered as part of the Tag."

Jeff Stai (Western Digital) did not like that idea.

"Then you cannot do hot swapping of drives or error tolerant systems."
"To a Target, each path will look like a different Initiator, even though they originate from the same one."

John had a better solution.

"If there is an error due to a broken link on the SSA, you must issue a Quiesce command for all commands on that path."

"The master who receives the Async Alert is obliged to issue the Quiesce command to everyone."

"This relies on one Initiator being designated as a master."

"An Async Alert will be generated by any node that detects a loss of an adjacent node or the addition of a new adjacent node. It then sends the Async Alert message to the Master."

"Only one Initiator on a loop can be a master, and all nodes have a path assigned to them that Async Alert must be sent over. In reality, all the nodes will probably use the same path, so only one Async Alert message will be received."

"If the master itself is removed, then we can do one of 2 things:
- Pre-assign a secondary master that will also get all the Async Alerts and watches for the primary master to fail.
- Take a poll at specified intervals to see if the master still lives."

Jeff had a different worry.

"I wonder if the Tag value limitation of 64K will be large enough for some RAID applications?"

"With a large disk farm in place and lots of queued commands, you could burn up 64 thousand sequence numbers fairly quick."

John had already given this problem some thought.

"In theory no, but practically speaking the 64K limit should be enough for all applications. Remember, Tag values can be re-used."

"I'll have to think about it some more. But I have another problem with the command block. It is misleading to label a bit as Split Transfer."

"What it really means is the transfer can be out-of-order, not split."

"That's right. If that bit is active, the Target can send the last 10 KB of a 22 KB transfer first, then send the remaining 12 KB with a second Data Ready message."

"We can call it the OOT bit for Out-of-Order-Transfer. It must identify the offset along with the first Data Ready message."

Ed questioned this type of transfer.

"Well then, if one Data Ready is issued under a command with this bit set, must multiple Data Reply messages be in-order?"

"Yes. The rules for outbound transfers during a Write are different."

"If there are multiple Data Reply messages outstanding, they must be for in-order data transfers."

"What about odd byte transfers?"

"Only the last transfer can be the odd one, all others must be a multiple of 8 bytes."

Steve brought up a problem in Unix.

"You know that Unix time stamps the beginning and end of all transfers?"
"Because of this, out of order transfers can cause a problem."

Ed was not ready to take on the problems of Unix quite yet.

"That may be true Steve, but the Unix software is broke!"
"We need no changes to our specifications. This is not a problem for this group. Let someone at a higher level of protocol deal with that mess."

Jeff Stai asked about the purpose of another bit in the command block.

"The DDRM (Disable Data Ready Message) bit requires all data transfers to be in-order."
"This sounds like single threaded and very limiting. What is the purpose?"

Ed had a ready answer.

"You might want to use that bit for transfers lower than some limit, such as 16 KB."
"This will save the round trip time for acknowledgment of the DR message."

"But you can only have as many Data Ready messages outstanding as you have DMA channels. Assuming only two DMA channels, the limits seem restrictive, so why bother with it?"

"Why would anyone build an SSA channel with DMA a scarce resource?"

It was time to move on to other concerns. Steve had been trying to get a word in edgewise for some time and John asked him to speak.

"I suggest you call Target and Initiator channels by a different name."
"I-channel and T-channel would at least help me from getting confused."

"Anything that helps reduce confusion is a good idea."
"While we are on this topic I want to make it clear Targets and Initiators must use commonsense when setting a transfer size."
"You need to match the limits of system buffering ability or the network will be held up by long delays."

Ed had a question that always comes up in a SCSI meeting.

"Is anyone besides me concerned about LUN addressing?"
"Is the allocation of only 8 bits for the LUN field enough?"

"Yes and No. Several people are concerned."
"We need to look at the impact as RAID applications will likely want more bits. SAM allows 64 bits, but there is no room in the standard CDB."

"I suggest a modification of the command block to allow 16 bits of LUN transfer addressing. In fact, there should be a general modification of the draft to follow SAM terms and rules throughout."

"Okay."

As has often happened, the two Jeffs (Stai and Williams) formed a tag team, with one starting a question and the other finishing it.

"I notice that your draft has no Untagged commands allowed."

"Fibre Channel was forced to add Untagged commands. Be aware of this, as you may face the same pressure."

Ed did not think this would become an issue.

"SSA is fundamentally different from Fibre Channel. Our Tags are not the same in that they are assigned on an Initiator basis, not by Target."

Auto Sense

John Scheible suggested that AutoSense occur via an extra Data Ready message but before Status was sent. Steve Finch found it particularly repugnant.

"Oh, please don't do it that way!"
"Send the Status first to set up a context. An Initiator may want to avoid taking in all the Sense data if it already has the Status information."
"It makes no sense (pardon the pun) to send Sense information prior to the Status that caused it."

Ralph disagreed.

"The Status message constitutes the end of the command and closes off all actions and frees up the Tag for re-use."

"Any further data from the Target must be sent with an Async Alert which is very messy."
"John's proposal may be the least objectionable way to deal with this."

Jeff Williams had an alternative way to accommodate the situation.

"The way you describe Status closing off all actions is not the way it has to be, we can re-define the action."
"We could send a Status message to say another 100 bytes of Sense follow."

Ed pointed out a problem from the viewpoint of the host.

"You must realize that most host adapters funnel all command transfers on DMA channels and the CPU is never aware of what is going on at any instant in time."
"It will take a separate message to alert the host that there is a problem which requires analysis of Sense information."

John explained his reasoning.

"I just want to make the AutoSense Data Ready message a special case which aborts any remaining command actions and offers 256 bytes of Sense data before Status is ever sent."

The above is but part of the discussion which continued apace. Things went pretty far afield before eventually settling upon a compromise to deal with John's desire for AutoSense data and Steve's wish to avoid accepting large chunks of unwanted Sense information.

A special AutoSense Data Ready message can be sent before any Status is returned, but the responding Data Reply message can restrict the amount of Sense data that is actually transferred. This allows the Initiator to avoid receiving unwanted Sense data.

AEN

Although John was prepared to discuss a way to deal with AEN (Asynchronous Event Notification) he was not sure if it was needed.

"I hear people want a way for AEN to work, but I don't think anyone is even using it in parallel SCSI."

"Think again John, IBM tape drives use it."

Jeff Stai felt it was not a simple thing to implement, in spite of the fact that tape drives are doing it.

"The only way AEN works properly today is after a discovery process takes place where each target and Initiator exchanges information and permission to use it."

"We could accommodate AEN by something similar to the AutoSense process."
"Use a special Data Ready message bit and let a Data Reply message change the length to truncate the transfer if all 255 bytes are not wanted."

"Why not go with Async Alert?"

"Because all 255 bytes of Sense information could not be sent."
"In addition, the very concept of AEN is foreign to SSA."

There was a discussion on following the method used by SBP (Serial Bus Protocol) for P1394, but it was realized SSA never gets a buffer overflow condition because of the interaction between Data Ready and Data Reply messages. SBP has a buffer overflow problem so it implements a re-registration process for every AEN type of action.

Alternate Transport

Ed Gardner came forth with the rationale behind his generous editing offer.

"If you compare the basic functionality of SSA to ATM (Asynchronous Transfer Mode) you will find they are not dissimilar."
"In theory, if we wanted to describe mapping SCSI to ATM we only need to change 128 byte frames to 48 byte cells in our document."
"In reality, it is not quite that simple, but it could be!"
"If this group is willing to split the functions in SSP, DEC will edit the document. We think we'll have to do both protocols anyhow, so this could help us with our internal projects."

Jeff Williams asked where else Ed might be going with this concept.

"Are you going to make the same proposal to the Fibre Channel group?"

"No, I don't see any value right now in converting FC to ATM."
"Most of the ATM addressing fits well in SSP and other areas of SSP map nicely to ATM."

Jeff Stai continued the interrogation begun by Jeff Williams.

"Is this just a way to avoid a new SD3 (the X3 project request form) for creating a new project to run SCSI over ATM?"

"No, we want to avoid yet another standard and would like to use one for two transports. The ability to operate SSP over either SSA or ATM will be a real advantage for us."
"It reduces the complexity of the bridges that will have to be built."

Steve liked the idea but had a qualifier.

"This sounds like a good idea, as long as the ATM physical level provides all the services needed to support SCSI as defined in SSP."

Most of the members were not ready to commit until they knew more about the impact to the SSP document. Ed promised to give a general description of the ATM and the potential impact on SSP at the next gathering.

X3T10 MEETING JANUARY 13

Vitro hosted at the Catamaran Hotel in San Diego.

Unlike January 1993 when the wind lashed and it rained torrents, the group luxuriated in 'chamber of commerce weather' this year, with lots of sunshine and balmy breezes. All this while the East coast was suffering one of the coldest winters on record.

Company	Name	Company	Name
3M	A. Olson	Hitachi uSystems	S. Karunanithi
Adaptec	N. Harris	Honda Connectors	T. Kulesza
AMD	D. Skinner	IBM	R. Kembel
Amdahl	J. Allen		G. Penokie
	N. Wanamaker		J. Scheible
AMP	C. Brill	Interphase	V. Der-
Amphenol	K. Scherzinger		Hacopian
Ancot	G. Porter	JAE Electronics	G. Addis
Apple	S. Smyers	Linfinity Micro	D. Wallace
Bull	C. Mollard	Madison Cable	R. Bellino
BusLogic	C. Strang	Maxoptix	D. Pope
Ciprico	G. Johnsen	Maxtor	L. Lamers
Circuit Assembly	D. Lang		R. Roberts
	I. Morrell	Methode	B. Masterson
Cirrus Logic	D. Weber	Molex	J. Dambach
CMD Tech	E. Haske	Nat Semi	R. Shergill
Compaq Computer	B. Galloway	NCR	C. Binford
Conner Per'ls	J. Wach		J. Lohmeyer
Dallas Semi	L. Grantham	NEC Tech	B. Anderson
DEC	E. Gardner	NRAD	C. Carlson
	D. Hagerman	Oak Tech	P. Brown
	C. Monia	Pac Electro Data	T. Steury
	R. Weber	Panasonic	C. Yang
	W. Ham	PE Logic	E. Perera
DPT	T. Treadway	Quantum	J. McGrath
ENDL	D. Allan	Rancho Tech	A. Garg
	K. Hallam	Ricoh	S. Mangat
Exabyte	E. Lappin	Samsung Semi	S. Zaidi
Foxconn	N. Ladas	Seagate	G. Houlder
FSI	G. Stephens		G. Milligan
Fujitsu	J. Urban	Sony	M. Yokoyama
	R. Liu	SSI	S. Finch
	K. Pokorney	StorageTek	R. Cummings
Future Domain	M. Woithe		E. Oetting
Harbor Elect	R. Kallio	Sun Microsystems	R. Snively
Harting Elect	S. Johnson	Tandem Computers	J. Moy
Hewlett Packard	J. Williams	Texas Instruments	B. Boyd
Hitachi CPA	P. Boulay	Thomas & Betts	H. Waltersdorf

Company	Name	Company	Name
Unisys	P. Dougherty	Western Digital	T. Asami
Unitrode	P. Aloisi		J. Stai
US Design	C. Duquette		D. Worrell

Administration

With the demise of X3T9, this was the first meeting of SCSI and ATA members under the new designation of X3T10. The X3 rules require every new committee to undergo some training. The fact that the new X3T10 consisted of the old X3T9.2 which has been operating for a decade was not a consideration to the less than flexible bureaucratic mind.

Since 'rules are rules' the training was required.

X3 sent a member of the OMC (Operational Management Committee) to do the honors. John Hill (Unisys) and a big (really big!) box of foils came along to give a 2-hour presentation on X3 structure and parliamentary rules. All of this was old hat to the vast majority of members, but there was no way to shortcut the process.

The training went on, and on, and on, and on, and …

At every meeting there is a call for patents just to see if anyone has something that affects a standard under development. Usually this call is just a blip on the agenda which goes unanswered. Bob Snively (Sun Microsystems) broke the pattern.

> "Let me bring everyone's attention to some patents regarding the Plug 'n Play Initiative. It seems that two companies have applied for a patent on how to use a pin to detect if a cable is attached."
> "Now, this is an old technique which has been used since the dawn of the computer age, but I understand that Compaq and Future Domain have chosen to apply anyway."
> "Sun has been shipping systems with this feature for over 18 months."
> "Even though it does not directly affect SCSI, I bring this up because it is probably of interest to everyone in this room."

A few raised eyebrows and a couple of glances from one to another was the sum total of reactions from the assembly present. The matter rests.

It may seem hard to believe (does this qualify for Ripley's?); SCSI-2 is still entangled in the process of ANSI approval. John Lohmeyer (NCR) heard that BSR (Board of Standards Review) had given its verbal okay to SCSI-2, but no one has seen a letter making it official.

This is the last step prior to publication, and if it was approved as John thinks, it will have a publication date of 1993 (even though it is not likely to become available in an ANSI-printed form for a few more months).

SAM

From a lonely voice in the wilderness crying for others to participate in SAM (SCSI-3 Architectural Model) development, Charles Monia (DEC) is now at the opposite pole, having been overwhelmed by comments and suggestions after the SAM letter ballot.

> "As you all know, there were lots of comments on SAM. I'm happy to report that as of this week, all replies have been drafted."
> "They were distributed over the SCSI reflector and are on the BBS."
> "The next revision of SAM will include the comment results and be ready prior to our next meeting."
> "The bad news is that I will only get it published about two weeks before the meeting. I can mail it directly to anyone who wants it."

The next step for SAM approval is a letter ballot of X3T10 to forward the document to X3. The letter ballot could be authorized at the next meeting.

Charles was not quite finished.

> "One of the public comments was from Steve Heil (Panasonic) who suggested we remove annex A from SAM because it shows an alternate way of task set management of boundary conditions not approved elsewhere in SAM."

Ralph Weber agreed and wanted to make it final.

> "I move that we remove all alternate task set definitions from SAM such as in Annex A. This will leave only the task set definition by LUN."

Bob Snively wanted a different approach.

> "I would rather see SAM document a way to allow alternate task set definitions through Mode pages or some other method."

Jeff Williams (Hewlett Packard) felt two issues were muddled together.

> "I agree with what you want Bob, but this is not time to develop that kind of alternative."
> "We need a formal written proposal to allow what you want."
> "Let's do it after removing this erroneous annex."

The vote of 34:2:0 confirmed that most everybody else agreed also. Charles had yet another problem for the group to deal with.

> "At present the service delivery subsystem definition in SAM requires that things arrive in order."
> "Should it allow out-of-order transactions as might happen in FC fabrics?"

Gary Stephens (FSI) did not feel it was necessary to modify SAM.

"Why worry about it? You can use Linked commands to preserve the sequence order."

"Maybe, but applications which work without Linked commands should be portable to other systems and might not be unless we change the definition."

"All delivery systems provide a means to force in-order delivery so it is not an architecture issue."
"If you need in-order, choose a transport mechanism that forces it."

Bob Snively wanted SAM to reflect reality.

"I move that SAM not require in-order delivery."
"Leave it for applications which want in-order to select a way to guarantee delivery sequence. Don't force something like this on Fibre Channel."

"The consequences mean that ordering is non-deterministic."
"Unless you enforce it, the results are not predictable."

"Fine. The responsibility is on the Initiator to preserve task ordering."

"That means the designations of Head of Queue, Ordered and Unordered Tags become meaningless."

"Face it. There is a CAM, a SIM (SCSI Interface Module) and an HBA (Host Bus Adapter) that can and will change the order of commands."
"Remember, more than one control stream provides input to these elements."
"Responsibility properly belongs to the application and I/O driver, so unless you know all about the characteristics of the HBA, SIM and driver, you cannot assume ordering."
"There is no way the present situation can be deterministic, so why worry about the results of this change?"

"But what about all of the Tags, Head of Queue, Ordered and all that?"

"Only the application will know if it needs Ordering, not the Initiator."
"The generic driver used must make the determination about Ordering. There are two tools to use, Command Completion or Linking."

The DEC trio of Ed Gardner, Charles Monia and Ralph Weber were all anti-Bob or rather anti-Bob's motion, and all three talked at once against him. As Charles was the loudest, he could be heard best.

"The way CAM is written, it requires in-order delivery."

"No it does not! It does not specify in-order delivery, it does not even address it."

Then came Ralph.

"But CAM compliance means in-order delivery. Your motion would remove all possibility of in-order delivery. If it's not described in SAM it is not there, and CAM compliance would be impossible."

Charles went back for more.

"Every other protocol require in-order delivery! I'm pretty sure that SSA (Serial Storage Architecture) requires in-order delivery."

"That is not true. SSA allows out-of-order delivery."

Steve Finch had had enough of the this madness and called the question. He was the voice of many thoughts.

In spite of the emotional debate, the 32:4 margin showed that only a few people were opposed to removing the requirement in SAM for in-order delivery of commands.

GPP

Gary Stephens (FSI) reported on GPP (Generic Packetized Protocol), his baby for the past two years.

"GPP is now at Rev 7A. As per the agreement discussed after the November meeting, I made additions to the Scope that everyone should read."
"All claims of performance, or functional improvement over other versions of SCSI-3 that are in your copy have been removed."
"We no longer reference what other standards do not do."

To refresh you memory about last November, Gene Milligan (Seagate) had moved that GPP be converted from a dpANS to a Technical Report.

After a calm and reasoned debate (ha ha), members had deferred the decision until now.

Gene had an extensive presentation which was complete with selected quotes from various X3 standing documents that laid the case for GPP being changed to a Technical Report.

"The SD1 (X3 Master Plan) says that each stage of project development must show the project has benefits for the industry. In addition, vendors should generate marketing responses along with technical responses when reviewing the draft."
"The SD5 (Standards Evaluation Criteria) and SD9 (Guide for Standardization) say there should be no conflict or duplication among standards."
"After a development project is approved a Technical Committee may conclude a Technical Report is more appropriate than a standard."

There was a short breathing space for members to absorb what they had just heard (two lectures on procedures in one day was heavy sledding).

> "I find conflict in the GPP Introduction where it states it should be the primary protocol for Fibre Channel and SPI (SCSI-3 Parallel Interface)."
> "Now, if it has been changed to accommodate my concerns, I could possibly support it as a dpANS."

Gary had been listening intently and asked for some specifics.

> "Just what exactly are you asking for?"

> "I want you to clarify the Scope and make clear it is intended for use in long distance applications and as a secondary, not a primary protocol to Fibre Channel and SPI for crossing multiple transport mechanisms."

Bob Snively was on Gene's side.

> "Just listening to the quotes cited by Gene makes me feel that GPP should clearly be a Technical Report."
> "In addition, I have a problem with GPP's port definition because it conflicts with FCP."
> "I think GPP needs to modify its functionality statement regarding error tolerance."
> "I would not expect to see GPP in a native Fibre Channel implementation, only in a special situation that crosses multiple protocols that include IP (Internet Protocol) or ATM (Asynchronous Transfer Mode)."

Jim McGrath (Quantum) had a different perspective.

> "I think GPP is for stuff we have not yet defined as a physical layer."
> "I don't see how the multiple protocol environment bothers me. Being a device, upper layers should insulate me from any such effects."
> "I would rather see something that says in the simplest form, do not use GPP at the device level."

Gary wanted to satisfy the concerns.

> "How about a note that states GPP is not suitable for devices with short interconnects, e.g. disks in a cabinet?"
> "GPP could be considered as an option for retransmission by a local router to cross boundaries, not as a device mode or a host mode link."

Ed Gardner did not want to tinker with the draft language at all.

> "I think the motion as it stands is a good solution."
> "GPP should be a Technical Report and not a dpANS, because this thing is not commercially viable."

Other voices disputed that statement.

"Not true! There are at least three companies doing GPP, so it is a commercial product."

An ally from the US Navy rose to defend GPP on practical grounds.

"You can use GPP to take SCSI parallel across an Ethernet and the whole thing is executable in hardware. Someone will probably do it in silicon soon. It should not be a Technical Report but a full standard."

Jim McGrath did not buy that line of reasoning.

"That is not a valid argument. Anyone can do something in silicon, but it is not a reason to declare it a standard."

Neal Wanamaker (Amdahl) resorted to the parliamentary procedure of calling the question which forced a vote of the members to see if they were willing to halt debate. He found 22 wanted to stop and only 8 wanted to continue.

Larry Lamers (Maxtor) was unhappy. He had been next in line to speak, and this action shut him down before he allowed to say his piece. At his request, the vote was done by rollcall.

It was 37:11:0:11 to change GPP into a Technical Report. This meant that the original SD3 had to be modified to reflect the change. When John asked for volunteers to modify the SD3 he found no one willing take on the task.

Perspective

This episode sends a bad message to the industry. The vote was swayed by the majority of members not implementing GPP. GPP was the original serial project and it is tough to go all the way through the technical committee process, then have the rug pulled out from under the draft.

The time to have challenged GPP was when the other serial protocols were approved. Backing off from the commitment at this late stage is an obvious case of the technical committee making a marketing decision. Some members were heard to say that if any real customers wanted GPP, they would be willing to re-consider making it into a standard.

Later in the meeting, Gene Milligan offered to rewrite the Project Request. Regardless of the motive (some assumed he was feeling a tinge of guilt), it was a generous gesture.

Whether this will pull GPP back from the limbo into which the committee sent remains to be seen. Gary might refuse to act as the editor and simply let the project lapse while industry support builds from implementors. It would be easier to turn GPP into a standard by creating another Project Request after there is market demand, than convert a Technical Report into a dpANS.

RAID Study Group

George Penokie (IBM) has been heavily involved with RAID (Redundant Array of Independent Disks) since long before any work began on creating a model and defining the modifications needed in SCSI to support large storage systems.

> "We have held two study groups and revised four documents. They are not all available yet, but will be in the next mailing."
> "The addressing scheme we are using does not affect other parts of SCSI, it is intended to be exclusive to RAID."
> "SDA-only (SCSI Disk Array) command descriptions and an SDA Mode Page are drafted now, but both need lots of work."
> "Dual controllers are not in the SDA model, but it is premature to do so, and no one is willing to do the work yet to incorporate them."
> "I believe the SDA model, which is at Rev 4, is stable now."

Gene Milligan was not pleased with the last line of George's report.

> "I move we adopt the SDA model as the basis for work on this project."
> "It's wrong to make decisions about document stability without a vote being taken."

John Lohmeyer felt this motion was out-of-order.

> "Hey, hold on there!"
> "I don't want it on the record that we are working on something with no project yet approved."
>
> "Okay, then change the motion to say we accept the SDA model as the report of George's Study Group."

John was much happier, and because it was not a final action or forwarding motion, the infamous 2-week rule did not apply (thus no one could object on grounds that the document had not been in circulation 2 weeks prior to the meeting). Doug Hagerman (DEC) still had a problem with the motion.

> "I'm against accepting this without an approved project."
> "What is wrong with simply leaving it alone until the project does get its approval?"
> "Approving this model now implies we all agree with it and we may regret it later."

This sparked a long debate between Gene, George and Doug. During a lull John had a suggestion.

> "I know how to settle this quickly."
> "Gene, will you consider withdrawing your motion?"
>
> "Okay."

This left the matter of correcting the X3T9 boo-boo by approving the project (again) to be sent to X3. It was a no-discussion 47:0:0:5 endorsement.

Reports

CAM: Ralph Weber (DEC) brought the group up to date on the progress of the first edition of CAM (Common Access Method).

"We are to Rev 5 now, but still have lots of work to do yet to finish the response to public comments received in the review period. We estimate a July completion date."

"To give you an idea of how tough this process is, we held a meeting this week to review Rev 5 and only got to page 10 after 5 hours of work. The document is basically finished from a technical standpoint and no changes in that area are expected."

"There are lots of style issues and clarification points and we all know that everyone is an expert on language, so there is no shortage of viewpoints. We plan another review in March that will hopefully get through most of the remaining issues."

Larry Lamers (Maxtor) wanted to see the document get wider circulation.

"We should vote to accept Rev 5 as the current working draft if you think it is technically sound."

"If we accept it, Global can distribute it."

Gene Milligan began to say something about the draft needing more study, but changed his mind in mid-thought and offered the motion to accept Rev 5. That was enough for the other doubters. It was unanimous.

All work on CAM-2 (64-bit support) is suspended until CAM-1 is completed.

SPI: Larry Lamers brought everybody up to date on SPI status.

"This draft is still in the Public Review period which closes February 26, and the current plan is to add SCAM (SCSI Configured AutoMagically) as a Normative Annex after that date."

"Bill Ham (DEC) may want to see Ultra-SCSI added to SPI, but I think most of the committee will be against it."

This prompted a quick comment from Gene.

"Not only No, but Hell No!"

SIP: Larry continued on about SIP (SCSI-3 Interlocked Protocol).

"The problem here is one of bandwidth. This document requires work, and at least one more working group will be needed to finish it."

"It did not get worked on in December as much as planned."

ATA: Steve Finch (SSI) sounded pleased with progress on ATA (AT Attachment).

"We are now in a clean up and review phase of ATA-2 and have cut off all new proposals. Anyone with new changes or additions is being requested to defer them for the ATA-3 project, once it gets approval. This way we will forward ATA-2 as soon as possible."

"In ATA-3 we want to have separate documents for the ATA disk command set, physical layer, transport layer, plus a packet layer for other command sets like SCSI-3."

Steve's enthusiasm for the ever-expanding taxonomy of ATA was not shared by everyone in the audience. One or two groans were overheard at his display of the obligatory road map chart showing multiple boxes representing various ATA documents and their relationship to each other.

SBP: Scott Smyers (Apple) found himself with an unanticipated task, filling the shoes of Gerry Marazas (IBM) who had left earlier in the day without providing a report on the activities. Scott was brief.

"An editorial meeting is scheduled to work on letter ballot responses."

P1394: Scott is the official liaison from IEEE on P1394.

"We are thinking about forwarding the draft in March for a vote of IEEE membership."

"The draft is about ready, so we should be able to make that date."

FCP: There was a comprehensive report on FCP status from Bob Snively.

"Rev 7A is available now. It incorporates all resolutions of the letter ballot comments. We held a meeting earlier today and had 4 conclusions:
 − The entity address = LUN address
 − Only one task management per command
 − You must state definition after a power-on or reset
 − Abort task completion must include any recovery qualifiers."

"I will incorporate all of these in Rev 8 and then recommend a new letter ballot of X3T10 at our next meeting."

John Lohmeyer asked about coordination.

"Will Rev 8 be in compliance with where SAM is going?"

"I don't know, as I have not been following SAM's changes."

"If there are changes needed for SAM compliance, we could hold off on the letter ballot."

Gene Milligan did not like where this might lead.

"But if we wait for all reference documents to be finished, then we can't forward any standard until they all are done, including SAM."

John hastened to explain his motives.

"I didn't mean that we should hold up the draft because of SAM references, I was only concerned about pure architectural issues."
"Is this draft in general conformance to SAM, or will we have to bring it back to fix it later?"

"I think we are okay on that score."

SPC: Defining the SPC (SCSI-3 Primary Commands) is Ralph Weber's task.

"The outline I drafted was distributed in the mailing. Expect to see a complete draft after March."

Gene had a question regarding the outline.

"Why have you included Medium Changer commands in SPC?"
"These are funny peripherals to be included in the primary set."

"That was the direct result of a decision we made long ago."
"Medium Changer commands affect tape, disk, optical and maybe other types of media. Where else could they go?"
"Besides, I have included only a severe subset of changer commands."

"I seem to recall that decision now that you mention it."
"Now, why do you show some commands reserved for SCSI-4 when SCSI-3 is not even done yet?"

Ralph's explanations was interrupted by John.

"Wait a minute here!"
"It looks like we need to schedule an editorial meeting for SPC."

Gene was miffed.

"But I thought you wanted to see reactions to this proposal?"

"Yes, but in a working group. The plenary is the wrong place for this."

SBC/SSC/SGC/SMC: The remaining command set documents are at a standstill until editors are found.

SCC: There has been a snafu on SCC (SCSI-3 Controller Commands) for disk arrays which was explained by John Lohmeyer.

"We approved the Project Request and sent it to X3T9."

"In the transition at the end of the year, the original of the Project Request and the electronic copy on disk were both lost."
"We have been asked by X3 to re-submit it."

MMC: The Project Request for MMC (Multi Media Commands) was in the same boat as the SCC, and was approved by the same margin of 47:0:0:5.

Norm Harris (Adaptec) is going to lead this effort which will incorporate the CD-ROM improvements incorporated by ATAPI (ATA Packet Interface) into SCSI-3, along with other advanced features.

SSP: The SSP (Serial SCSI Protocol) is a project waiting approval, but John Scheible (IBM) had status to report.

"We are meeting as a study group until project approval."
"We've distributed a proposal which is the SCSI-2 format. Lots of changes have to be made to comply with SAM."
"We heard a suggestion from Ed Gardner to change the draft to allow SSP to run over ATM (Asynchronous Transfer Mode) as well as SSA."
"We took no action and will be studying it since it seems an interesting proposal."

Gene had several problems with wording in the Scope of the proposed draft, but John deflected them.

"Gene, this is neither a committee draft, nor an approved working group document."
"We realize it needs major work and once the project gets approved, we will be changing it drastically."

X3T10.1: John continued with the liaison for the former X3T9.7.

"We discussed the SSA-PH (Physical Interface) and voted to adopt the Molex connector for Serial Unitized applications."
"There are two SSWGs (Specific Subject Working Group) authorized for next month, one on connector documentation and the other on transceiver characteristics."

ISO: The IR (International Representative) is Gene Milligan, who reported that the lack of an effective secretariat at SC25 had prevented progress, but help was on the way.

"I sent a letter to SC25 complaining about the lack of progress and asked about a rumor that a new Secretariat had been appointed."
"It was true."
"The new Secretariat is a guy from Siemens and he appears to be taking steps to correct these problems."
"ISO had taken the unusual step of removing his predecessor because of inaction."

FIBRE CHANNEL WORKING GROUP JANUARY 11-12

Vitro hosted at the Catamaran Hotel in San Diego, where the skies were blue and the members were mellow.

Company	Name	Company	Name
Amdahl	R. Taborek	IBM	R. Cook
	N. Wanamaker		G. Frazier
	S. Wilson		R. Kembel
Ancor	R. Cornelius		J. Mathis
Ancot	G. Porter		J. Thatcher
Berg	Y. Belopolsky		H. Truestedt
DEC	D. Hagerman		J. Williams
DemoGraFX	P. Walford		C. Zeitler
EMC	Y. Wang	Jaycor	T. Ash
Emulex	S. Berman		S. Cafferty
	K. Henson		B. Duchovnay
	W. Rickard		T. Parish
ENDL	D. Allan	Livermore Labs	D. Coffland
FSI	G. Stephens		P. Rupert
H-P CNO	K. Malavalli		L. Sloan
	B. Stoevhase	StorageTek	R. Cummings
	K. Teow		D. LaFollette
Hewlett Packard	K. Chan	Unisys	A. Stone
	S. Dean	Vitro	M. Parvaresh
	E. Frymoyer	Western Digital	J. Stai

Compression

It was about 18 months ago (see May 1992 Happenings) that Kurt Chan (Hewlett Packard) proposed using data compression to improve effective transfer rates over Fibre Channel by reducing the amount of data transmitted.

Since that time, there has been significant acceptance of the technology, especially in tapes where all media now provide compression capabilities as a standard feature. LZ (Lempel-Ziv) derivatives dominate the implementations (IBM's mathematical compression is the only known dissenter).

One advantage of LZ is that pre-loaded dictionaries can produce a more than satisfactory result on packets of almost any size. The actual ratios which can be achieved are non-deterministic, being dependent on data content.

Although any communications could benefit significantly from the apparent performance improvement (a compression ratio of 2:1 effectively doubles the transfer rate), it has not become a significant factor in LANs (Local Area Networks).

The cause is too many LANs, too many compression algorithms to choose from, and a general lack of protocol support for the capability.

> "Fibre Channel could provide an elegant solution."
> "We can define a single algorithm for hardware-only implementation."
> "Compression is transparent to the fabric, and it works for all classes."

A study of LAN traffic at HP's Roseville site turned up the surprising fact that packet size had relatively little to do with compression effectiveness. Packet sizes ranged from 60-1,500 bytes. More than 80% were packets of <600 bytes. About 30% of total bytes transmitted were in packets of <200 bytes, which were over half of the packet traffic.

There was little difference in compression ratios between large and small packets, or between packets and files. The ratios on text-oriented (word processor) transmittals averaged about 1.8:1, and for numbers (spreadsheets) it averaged 2.3:1. Graphics files such as TIFF were the big winners at 8:1.

There is always a risk that compression can increase the size of data, which would have disastrous consequences for an implementation that assigned the SEQ_CNT (Sequence Count) to a frame before compression began. Kurt recommended there be a latency of one outbound frame, so that a decision could be made to ship the smaller of two frames (original or compressed). A flag in the frame header would identify whether or not the data was compressed.

At the FC-4 level, an Information Unit would be submitted to the Service Interface as at present, but buried in the port along with FC-2 would be a compression engine. There are two implementation choices, between frame and Sequence management:

o Generate the same number of frames, each about half the size
o Generate half the number of frames by concatenating compressed data

Paul Rupert (Livermore Labs) did not care for the choice.

> "We don't need two ways to do compression."
> "Pick one and be done with it, practise KISS (Keep It Simple Stupid)."

Others did not care for the latency aspect.

> "There is no need for the lag time delay on transmitting a frame."
> "As data is compressed it can be transmitted. If the size expands, slap an EOFi (Invalid) on the end and follow it immediately with a frame of the raw data."

Paul growled.

> "We can't have any choices here. A port built to handle frame compression will not be able to receive Sequence compression will it?"

"No."

"Alright then, that makes it easier. We do it on a frame basis."

This was a bit too presumptuous.

"Whoa, we haven't even covered the design tradeoffs yet. At least give us the chance to compare frame vs Sequence and latency vs none before we define the standard!"

"There are ways to predict within 10% of the data whether or not expansion is likely to occur. It is not precise, so there will be occasions when a full frame is shipped rather than a compressed one."

"That's no big deal. It is the full-frame latency hit that could affect an application. Waiting 10% is acceptable because there would have been some performance lost from having to re-transmit after EOFi anyway."

There are other consequences to consider. If an implementation concatenates compressed data into the minimum number of frames, the receiver has to be prepared to accept more data than would be anticipated by the Credit Count. The payload will be increased by the compression ratio, so the interface to the memory bus must clock faster to dump the increase in received data.

If a single algorithm was selected, all Fibre Channel silicon could include compression capabilities. This would represent a 'free' upgrade to higher performance, and delay the need to update cable plant and transceivers as usage rates climbed. Another benefit would be to push the bleeding edge out to the next frontier e.g. 2 Gbaud performance at 1 Gbaud rates.

The algorithm proposed would be protected by Unisys and Hewlett Packard patents. As both companies meet the ANSI Guidelines, there would be no licensing issues. Based on reactions, it looks like Kurt has an FC-EP winner.

Clarifications

There will probably be a continuing string of requests for clarifications on FC-PH. Kurt Chan had a small list.

"It is unclear whether the LESB (Link Error Status Block) is required or not, and the fields that get updated appear to contain duplicates."
"An error should not affect more than one field, and what goes into some fields is not at all obvious."

In the discussion that followed, Kurt was not the only one who saw duplication and/or unnecessary fields.

Everything wound down into resolution, but unless a better explanation appears in the next revision, it is unlikely that implementations will be consistent. The other issue was a simpler one to resolve.

> "There is no precise definition of when to increment counters. FC-PH only says there is no specific hardware or software implementation."

> "That's right, you can do anything you want, you don't have to implement 32-bit counters in silicon."
> "You could use 4-bit counters and interrupt the processor on overflow to bump the value. This is not a performance issue, because the error rate either means you only do it once in a while or nothing else is going on because you keep bumping it constantly."

Unidirectional transfers was a simple concept introduced to help congestion problems at the initiator, but Kurt raised some new wrinkles by discussing the concept of unidirectional recipients. The considerations will not affect FC-PH, but may be introduced in FC-EP (Enhanced Physical Interface).

FC-AL

Horst Truestedt (IBM) was unwilling to let the intended discussion on FC-AL occur within the main group.

> "There is nothing wrong with FC-AL. We saw some e-mail over Christmas and Steve Dean (Hewlett Packard) has a proposal to make."
> "What we want is to go off and huddle in a corner together, otherwise we will be constantly explaining and re-explaining principles that are well understood by the FC-AL working group."

> "You realize of course, that wanting to meet privately leads to the prima facie conclusion that there is something wrong you don't want us to know anything about."

> "No, no, no. That is not the reason for getting together privately."
> "We can make faster progress if there is only a few of us."

Horst led his troops out to the comfortable chairs in the open foyer.

All were back by early afternoon. Gary Stephens (FSI) took center stage to cover the issues which originated on the reflector over the Christmas break when Bob Thompson (ICL) in England questioned the initialization algorithm.

> "Several people seem to have the impression that initialization is broken, and that Bob found a gaping hole. Not true. Bob uncovered something that was bent, not broken. If we left it alone, there would be no problems."
> "There were some readability issues and interpretation of grey areas which Horst improved by wordsmithing."

> "In examining these, I developed an improvement that turns address assignment into an atomic operation, and this dramatically simplifies recovery; you can throw away about 2/3 of the existing logic."

As Gary continued, it was clear that several improvements had been made as a result of the morning get-together. Steve Dean (Hewlett Packard) explained why he had requested some changes to initialization.

> "In trying to implement FC-AL, we felt that there was too much complexity involved, and went searching for something that was simpler."
> "With the present algorithm, when a new port enters the loop, everybody keeps their present address."
> "My simpler approach forced all the ports to re-arbitrate."
> "It was voted down by all of the other guys because that causes every I/O Process to fail, and is effectively an implicit Logout."

Steve was hoping the sentiments in the larger group might be more forgiving of the deficiency, but found another unsympathetic hearing.

> "Well, that's okay anyway. Gary's idea which turns address assignment into an atomic operation eliminates much of the logic that was of concern."

There was more, and Gary continued with his litany.

> "There is a desire for devices on the loop to keep the same address every time they power up. Software likes fixed configurations."
> "Until operating systems are re-written to adapt to dynamic addressing, we decided on an allocation of fixed addresses which are greater than 7Fh and variable or don't care addresses are those below 80h."

It turned out that 'fixed' addresses did not mean fixed, as they could be re-allocated if there was a conflict (as when two loops get combined on a site reconfiguration). Gary's explanation became most confusing because it was unclear when 'fixed' was fixed and when 'fixed' was not fixed. A change in syntax to 'preferred' addressing was all it took to simplify matters.

When Wayne Rickard (Emulex) and Steve Dean talked about 'fixed', they meant absolute. Both were very unhappy about how the fabric could override the addresses presently assigned by the FL_Port. This had obviously been a subject of prior debate with Gary, who sat back and listened to other members such as Paul Rupert battle the issues.

> "The fabric controller has to manage the whole address space. Just think about the security considerations in a site such as Livermore Labs."
> "The site administrator has strict control over all the addresses and he assigns security clearances to specific locations on the fabric."
> "He doesn't care what addresses are assigned by the FL_Port, when you log into the fabric, you take the address you are given."

After more in the same vein, Steve and Wayne yielded. They had been hoping to simplify some of the FC-AL initialization to avoid changes in address, but were satisfied that considerations outside the realm of FC-AL dictated the eventual configuration.

There is an issue with the Directory Server on FC-AL, because it happens to have a Well Known Address which is not legal on a loop (loop addresses have to be values with both negative and positive disparity). Several ideas were discussed and at one time it was thought best that if the Server was on the same loop then the local address should be used. The end result of playing scenarios of varying complexity was summarized by Horst Truestedt.

> "If the Directory Server is outside the loop, then the request has to be sent to the F_Port for transmission into the fabric."
>
> "We can avoid two procedures if we ignore the case of the Server being on the same loop, and always send the request to the F_Port. If it is local, the F_Port will re-address the request."
>
> "There is a performance loss, but given how few requests will be made of the Directory Server, who cares?"

Telemanagement

So what's in a name that nobody understands?

That's what Doug Coffland (Livermore Labs) was present to talk about.

> "Telemanagement was coined to represent all that is involved in managing a large site with lots of local links."
>
> "It is not enough to have good technology to succeed, because the support systems, or lack thereof, can be show-stoppers."
>
> "The tale of Narrowband-ISDN (Integrated Services Digital Networking) can give you an idea of the issues involved."

It is almost 15 years since ISDN was introduced with great fanfare and lots of promise. Today it is but a shadow of the expectations, and is fading to black. The goal of digital technology in the local loop has been a disaster, with only 0.05% penetration of the market.

The telecommunications infrastructure is very complex, and there are a large number of contributing factors.

- o Training
- o Standards
- o Compatibility with installed systems
- o Complex support systems and processes
- o Number of customers experiencing change

The problems of ISDN are gradually being solved, with tariff issues squared away in most of California. The major elements that interact are:

- o Users
- o Service providers
- o Regulatory agencies
- o CPE (Customer Premise Equipment) vendors

The service providers have been an Achilles Heel, with obsolete equipment no longer being maintained (the market did not grow enough to justify companies staying in the market). Livermore has had to build its own operational support system on a discontinued product that was withdrawn several years ago.

It takes three computer scientists and one software technician to support and continue development of the system. Many services have been automated.

Directory	Traffic management
Inventory	Workforce management
Accountability	Switch administration
Trouble ticket	Service order processing
Alarm monitoring	Cable and wire management

Something that is not well known is the size and scope of the operational support systems which are in place in the RBOCs (Regional Bell Operating Companies). These handle order flows from start to finish.

Billing	Translations	Cable pair assignment
Work order	Service order entry	Originating Equipment assignment

No new technology can succeed unless it melds in with the traditional offerings this massive system supports. Narrowband-ISDN did not. It was an orphan and it remains an orphan.

The rollout of N-ISDN nationwide only supported a minimum set of functions. This meant that proprietary ISDN sites had more function than was available publicly, and found the nationwide capability too limiting.

Rather than just relating tales, Doug was present to offer advice on what he felt was necessary in the way of hooks to feed into an infrastructure.

"If a single Telemanagement system can support switches from various vendors, any switch technology upgrades will be less limited."

"Today, such systems are unique to a switch product, and if a switch is less than successful, suppliers disappear. A support system that crossed multiple switch offerings could be assured of a large market."

Doug identified the interfaces that he felt were the minimum set that had to be standardized for an Operational Support system.

- o Accounting
- o Traffic monitoring
- o Maintenance control and monitoring
- o Recent changes and switch administration

Doug's material was an eye opener.

> "The effect of telemanagement is like having the tail wag the dog."

All the national labs are combining their telemanagement needs into an RFP (Request for Price). Doug does not believe that a satisfactory products is available, so the labs will have to make do with 'the best of a bad lot.'

Bob Snively (Sun Microsystems) was incredulous.

> "There have to be commercial sites with the same problem. It is hard to believe there is no software to manage them."

> "There is. It belongs to the RBOCs who charge an arm and a leg for the services. They don't sell software, they merely demand ransoms to manage comm. resources."
> "Standardizing Support interfaces across all the communication choices is not at all feasible. Just having every switch vendor for Fibre Channel provide the same Support interfaces would be a great step forward."

Fabric Services

At the last get-together on fabric services, Kha-Sin Teow (Hewlett Packard CNO) had found himself fighting a lonely battle to support Class 3. For a while it looked like the same scenario as Paul Rupert opened up.

> "There should be no Class 3 support by Services."

An unexpected ally came in the form of Bryan Cook (IBM).

> "I used to feel that way, too, but I've switched from that attitude."
> "FC-PH supports Class 3, so we have to provide it services, but that does not mean I am prepared to design services which require a protocol that does what IP (Internet Protocol) does."

Kha-Sin did not feel the cost of entry was too high.

> "Supporting IP is not that bad."
> "You don't have to buy into TCP (Transmission Control Protocol)."

A new tack was introduced.

"Services are an application, right? Applications can be written for any class of service, that is a choice of the implementor."

Paul was suspicious.

"Does that mean I have to support Class 3?"

"No. If your applications require confirmed delivery then they can stream service requests and rely on the Class 1 and 2 protocol."
"On a system that does use Class 3 the Services would need interlocks on a Sequence basis to achieve the same level of control."

"That's not an answer."
"Do I have to write services for Class 3?"

"No. It is the same user decision that is made on every application."

The MIBs (Management Information Blocks) represent information about the configuration that has to be known for SNMP (Simple Network Management Protocol) routines to maintain a fabric and related N_Ports (Node ports).

Reviewing the MIBs is a laborious task, but it had to be done. The influence of Doug's presentation the day before was obvious in the approach that was taken to the review by Steve Wilson (Amdahl). His emphasis was on reducing the amount of information that had to be kept in the N_Port, but there were a few additions.

"A number of conditions which should be kept by the N_Port are not errors but represent useful information."
"One example might be the number of times that frames have to be queued because of lack of transmit credit."
"This is important to system tuning and behavior analysis."

Instances of replicated data between the F_Ports and N_Ports were obvious candidates for elimination. The biggest chunk to disappear was parameters that are exchanged at Login, because the fabric controller could retain the Login information, and not require it to be held in the N_Port.

Miscellaneous

FC-XS: Kumar Malavalli (HP Canada Network Operations) led the line-by-line review of FC-XS (Circuit Switch). It proceeded at a snail's pace through the glossary and concepts. It was no surprise (but disappointing) that so few had read the document beforehand.

It is amazing how some subjects can cause excitement.

Special Edition

There was a lot over the wording about asynchronous switches that can cause a bit alignment change. Bryan Cook (IBM) won the wordsmithing debate with a phrase to the effect that 'implementations which cause the N_Port to detect an error are to be discouraged.'

Icon: Bob Snively (Sun Microsystems) provided a letter to the committee in which Sun Microsystems granted permission for X3T11 to authorize use of the icon by any manufacturer or publisher for any product or documentation associated with Fibre Channel.

ACRONYM GLOSSARY

ACA	Auto Contingent Allegiance		**DASP**	Drive Active/drive 1 iS Present
AEN	Asynchronous Event Notification		**DAT**	Digital Audio Tape
ANS	American National Standard		**DC**	Direct Current
ANSC	American National Standards Committee		**DDRM**	Disable Data Ready Message
ANSI	American National Standards Institute		**DMA**	Direct Memory Access
			dpANS	draft proposed American National Standard
ATA	AT Attachment		**DR**	Disable Registration
ATA-BC	ATA/ATAPI Block Commands		**ECMA**	European Computer Manufacturers Association
ATA-PI	ATA/ATAPI Physical Interface		**EIA**	Electronic Industries Alliance
ATA-XPT	ATA/ATAPI Transport		**FC-AL**	Arbitrated Loop
ATAPI	ATA Packet Interface		**FC-EP**	Enhanced Physical Interface
ATM	Asynchronous Transfer Mode		**FC-PH**	Physical Interface
AWG	American Wire Gauge		**FC-XS**	Circuit Switch
BBS	Bulletin Board System		**FCP**	Fibre Channel Protocol for SCSI
BIOS	Basic Input Output System			
BSR	Board of Standards Review		**FIPS**	Federal Information Processing Standard
BYSE	BYte SErial			
CAM	Common Access Method		**FSI**	File System Interface
CBEMA	Computer Business Equipment Manufacturers Association		**GPP**	Generic Packetized Protocol
			GSA	General Services Administration
CCS	Common Command Set		**HBA**	Host Bus Adapter
CD	Compact Disk		**HDA**	Head Disk Assembly
CDB	Command Descriptor Block		**HIPPI**	High Performance Parallel Interface
CHS	Cylinder-Head-Sector			
CMOS	Complementary Metal-Oxide Semiconductor		**IC**	Integrated Circuit
CNO	Hewlett Packard Canadian Network Operations		**IEEE**	Institute for Electrical and Electronics Engineers
CPE	Customer Premise Equipment		**INCITS**	InterNational Committee for Information Technology Standards
CPU	Central Processing Unit			

IP	Internet Protocol
IPI	Intelligent Peripheral Interface
IR	International Representative
ISDN	Integrated Services Digital Network
ISI	Inter Symbol Interference
ISO	Organization for International Standards
KISS	Keep It Stupid Simple
LAN	Local Area Network
LBA	Logical Block Address
LESB	Link Error Status Block
LUN	Logical Unit Number
LZ	Lempel-Ziv
MIB	Management Information Base
MIPS	Millions of Instructions Per Second
MMC	Multi-Media Commands
NBS	National Bureau of Standards
OEM	Original Equipment Manufacturer
OMC	Operational Management Committee
OOT	Out-of-Order Transfer
OS	Operating System
PC	Personal Computer
PCI	Peripheral Component Interconnect
PCM	Pulse-Code Modulation
PCMCIA	Personal Computer Memory Card International Association
PDIAG	Passed DIAGnostics
QIC	1/4" Cartridge
RAID	Redundant Array of Independent Disks
RBOC	Regional Bell Operating Companies
RDI	Rigid Disk Interface
RFP	Request for Price
ROM	Read Only Media
RT	Real Time
SAM	SCSI Architecture Model
SASI	Shugart Associates System Interface
SBC	SCSI Block Commands
SBP	Serial Bus Protocol
SC	SubCommittee
SCA	Single Connector Attach
SCAM	SCSI Configured AutoMag-ically
SCC	SCSI Controller Commands
SCSI	Small Computer System Interface
SCSI-M	SCSI Multi-Task
SCSI-S	SCSI Single Task
SD1	Master Plan
SD3	Project Request
SD5	Standards Evaluation Criteria
SD9	Guide for Standardization
SDA	SCSI Disk Array
SEQ_CNT	Sequence Count
SGC	SCSI-3 Graphics Commands
SIM	SCSI Interface Module
SIP	SCSI-3 Interlocked Protocol
SMC	SCSI Media changer Commands
SNMP	Simple Network Management Protocol
SPC	SCSI Primary Commands
SPI	SCSI Parallel Interface
SSA	Serial Storage Architecture
SSA-PH	SSA PHysical interface
SSC	SCSI Stream Commands
SSP	Serial SCSI Protocol
SSWG	Specific Subject Working Group
TCP	Transmission Control Protocol
TIFF	Tagged Image File Format
UIG	Users Industry Group
US	United States
VU	Vendor Unique
WD	Western Digital
XT	eXtended Technology

This ENDL Letter Special Happenings is to be shared with all STA members and T10 friends. Congratulations T10!