

Accredited Standards Committee\*  
**InterNational Committee for Information Technology Standards (INCITS)**

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| Doc. No.: T10/03-046r0 |
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Date: January 15, 2003

Reply to: John Lohmeyer

To: T10 Membership  
From: Ralph Weber & John Lohmeyer  
Subject: SAS Protocol WG -- Jan 13-14, 2003  
Portland, OR

## Agenda

1. Opening Remarks
2. Approval of Agenda
3. Attendance and Membership
4. Old Business
  - 4.1 SAS Working Draft Review (SAS) [Elliott]
  - 4.2 SAS Disconnect-Reconnect Mode Parameters (02-324) [Gardner]
  - 4.3 CRC on Frame Header [Roberts]
  - 4.4 Transport Layer Retries (02-487) [Jones]
5. New Business
  - 5.1 SAS Revision 3 T10 letter ballot comment resolution (03-055) [Elliott]
  - 5.2 SAS Expander internal devices (03-034) [Fairchild]
  - 5.3 SAS Definitions (03-022) [Evans]
  - 5.4 SAS Requests and Confirmations (03-023) [Evans]
  - 5.5 SAS Port Layer Description Modifications (03-024) [Evans]
  - 5.6 SAS SMP error codes (03-058) [Fairchild]
  - 5.7 SAS BER Comments [Penokie]
  - 5.8 SAS External Cable Length [Penokie]
  - 5.9 Near End Analog Loopback [Penokie]
  - 5.10 LED Driver [Cox]
  - 5.11 Keying Comments [Dell]
  - 5.12 External Cable Delay HOLD/HOLDA [Elliott]
6. Review of Recommendations
7. Meeting Schedule
8. Adjournment

## Results of Meeting

### 1. Opening Remarks

John Lohmeyer called the meeting to order at 9:40 a.m. Monday, January 13, 2003. He thanked Cris Simpson of Intel for hosting the meeting.

### 2. Approval of Agenda

The draft agenda was approved with no changes.

The following items was added or revised during the course of the meeting:

- 5.6 SAS SMP error codes (03-058) [Fairchild]
- 5.7 SAS BER Comments [Penokie]
- 5.8 SAS External Cable Length [Penokie]
- 5.9 Near End Analog Loopback [Penokie]
- 5.10 LED Driver [Cox]
- 5.11 Keying Comments [Dell]
- 5.12 External Cable Delay HOLD/HOLDA [Elliott]

### 3. Attendance and Membership

Attendance at working group meetings does not count toward minimum attendance requirements for T10 membership. Working group meetings are open to any person or organization directly and materially affected by T10's scope of work. The following people attended the meeting:

| Name                   | S  | Organization                 | Electronic Mail Address        |
|------------------------|----|------------------------------|--------------------------------|
| Mr. Ron Roberts        | P  | Adaptec, Inc.                | Ron_Roberts@adaptec.com        |
| Mr. Robert Snively     | P  | Brocade Comm. Systems, Inc.  | rsnively@brocade.com           |
| Mr. John Tyndall       | A  | Crossroads Systems, Inc.     | jtyndall@crossroads.com        |
| Mr. James A. Lott, Jr. | P  | Dallas Semiconductor         | jim.lott@dalsemi.com           |
| Mr. David Freeman      | V  | Data Transit Corp.           | david.freeman@data-transit.com |
| Mr. Kevin Marks        | P  | Dell Computer Corp.          | kevin_marks@dell.com           |
| Mr. Robert H. Nixon    | P  | Emulex                       | bob.nixon@emulex.com           |
| Mr. Ralph O. Weber     | P  | ENDL Texas                   | roweber@acm.org                |
| Mr. Mike Fitzpatrick   | P  | Fujitsu                      | mfitzpatrick@fcpa.fujitsu.com  |
| Mr. Nathan Hastad      | P  | General Dynamics             | nathan.hastad@gd-ais.com       |
| Mr. Rob Elliott        | P  | Hewlett Packard Co.          | Elliott@hp.com                 |
| Dr. William Ham        | A  | Hewlett Packard Co.          | bill_ham@ix.netcom.com         |
| Mr. Steven Fairchild   | V  | Hewlett Packard Co.          | Steve.Fairchild@hp.com         |
| Mr. Werner Glinka      | AV | Hitachi America              | werner.glinka@attglobal.net    |
| Mr. Dan Colegrove      | AV | Hitachi Global Storage Tech. | dcolegro@us.ibm.com            |
| Mr. Hitoshi Ogawa      | AV | Hitachi Ltd.                 | h-ogawa@gm.str.hitachi.co.jp   |
| Mr. Steven Wirtz       | V  | I-TECH Corp.                 | steve_wirtz@i-tech.com         |
| Mr. George O. Penokie  | P  | IBM / Tivoli Systems         | gop@us.ibm.com                 |
| Mr. Pak Seto           | V  | Intel                        | pak-lung.seto@intel.com        |
| Mr. Cris Simpson       | P  | Intel Corp.                  | cris.simpson@intel.com         |
| Mr. Robert Sheffield   | A  | Intel Corp.                  | robert.l.sheffield@intel.com   |
| Mr. Richard Beckett    | V  | Intel Corp.                  | richard.c.beckett@intel.com    |
| Mr. Dennis Moore       | P  | KnowledgeTek, Inc.           | dmoore@ix.netcom.com           |
| Mr. John Lohmeyer      | P  | LSI Logic Corp.              | lohmeier@t10.org               |
| Mr. William Petty      | A  | LSI Logic Corp.              | william.petty@lsil.com         |
| Mr. Brad Besmer        | V  | LSI Logic Corp.              | brad.besmer@lsil.com           |
| Mr. Brian Day          | V  | LSI Logic Corp.              | brian.day@lsil.com             |

|                          |   |                        |                           |
|--------------------------|---|------------------------|---------------------------|
| Mr. Tim Hوجلund          | V | LSI Logic Corp.        | tim.hوجلund@lsil.com      |
| Mr. Mark Evans           | P | Maxtor Corp.           | mark_evans@maxtor.com     |
| Mr. Russ Brown           | V | Maxtor Corp.           | russ_brown@maxtor.com     |
| Mr. Rob Haydt            | A | Microsoft Corp.        | robhay@microsoft.com      |
| Mr. James R. (Bob) Davis | P | Network Appliance Inc. | bob@netapp.com            |
| Mr. Bill Galloway        | P | Pivot3, Inc.           | billg@pivot3.com          |
| Mr. Keith W. Parker      | V | PLOSkit, Inc.          | Keith_Parker@PLOSkit.com  |
| Mr. Ting Li Chan         | V | QLogic Corp.           | ting.chan@qlogic.com      |
| Mr. Arie Krantz          | V | QLogic Corp.           | l_krantz@qlc.com          |
| Mr. Jim Jones            | A | Quantum Corp.          | jim.jones@quantum.com     |
| Mr. Gerald Houlder       | P | Seagate Technology     | gerry.houlder@seagate.com |
| Mr. Jim Coomes           | V | Seagate Technology     | jim.coomes@seagate.com    |
| Mr. John Worden          | V | Seagate Technology     | john.worden@seagate.com   |
| Mr. Vit Novak            | P | Sun Microsystems, Inc. | vit.novak@sun.com         |
| Mr. Robert Kando         | V | Texas Instruments      | Robert.Kando@ti.com       |
| Mr. Haluk Aytac          | V | Velio                  | haluk@velio.com           |
| Mr. Kenneth Hirata       | P | Vixel Corp.            | Ken.Hirata@Vixel.com      |

44 People Present

Status Key: P - Principal  
 A,A# - Alternate  
 AV - Advisory Member  
 L - Liaison  
 V - Visitor

## 4. Old Business

### 4.1 SAS Working Draft Review (SAS) [Elliott]

Discussion of this topic was deferred to the next meeting.

### 4.2 SAS Disconnect-Reconnect Mode Parameters (02-324) [Gardner]

In the absence of Ed Gardner, discussion of this topic was deferred to the next meeting.

### 4.3 CRC on Frame Header [Roberts]

Ron Roberts asked that discussion of this topic be deferred to the next meeting.

### 4.4 Transport Layer Retries (02-487) [Jones]

Jim Jones presented a proposal to add transport layer retries in SAS (02-487r0). During the first day of the meeting, the group reviewed the needs that the proposal is trying to address, the limits to which various component developers are willing to go (e.g., HBA issues), and how best to develop a detailed proposal. Jim agreed to work with interested parties overnight and return with a more detailed proposal on the second day of the meeting.

Since insufficient progress was made overnight, Brian Day asked that discussion of this topic be deferred to the next meeting.

## 5. New Business

### 5.1 SAS Revision 3 T10 letter ballot comment resolution (03-055) [Elliott]

Rob Elliott led the group in a discussion of the letter ballot comments on SAS. Document 03-055r0 contains the proposed responses to the letter ballot comments to date.

Rob Elliott moved that the group accept the comment in 7.1.4.4 that increases the number of broadcast primitives from 4 to 8. Bob Nixon seconded the motion. The motion passed on a vote of 14:0:4.

George Penokie moved that one of the new broadcast-reserved primitives be made a broadcast-reserved-changed primitive. Bill Galloway seconded the motion. The motion passed on a vote of 16:2:3.

Rob Elliott moved that one of the broadcast-reserved primitives be made vendor specific. Tim Hoglund seconded the motion. The motion failed on a vote of 2:14:4.

Rob Elliott moved the comment regarding the 20 dword rule in 7.1.6.3 be accepted. Bill Galloway seconded the motion. The motion passed on a vote of 11:0:6.

Ken Hirata moved that 64 entry limit of the number of indices in fanout expanders be removed. Bob Nixon seconded the motion. Concerns were raised about interoperability with no standardization, but they were countered with claims that degraded operation is possible in all cases. The motion passed on a vote of 10:1:6.

In response to a comment requesting an additional length field in the Report Manufacturer Information response data, John Lohmeyer conducted a straw poll.

Additional length in RMI only - 2

Additional length in all response formats - 0

Do not add additional length fields until needed - 10

Bob Scheffield moved that the Microsoft comment be rejected (note that there is only one Microsoft comment on SAS and that comment requests the removal of the STP affiliation feature). Tim Hoglund seconded the motion.

After a lengthy discussion of what problem the affiliation feature is intended to solve, Bob and Tim agreed to withdraw the motion.

The group tentatively agreed to respond to comment by adding a small number of model paragraphs describing how the affiliation feature is intended to be used.

Rob Elliot moved that all comments requesting removal of labels on transitions in state diagrams be rejected. Dennis Moore seconded the motion. The motion passed on a vote of 7:3:2.

George Penokie moved that the comment requesting the removal of note 12 be accepted. Mark Evans seconded the motion. The motion passed on a vote of 5:1:10.

### 5.2 SAS Expander internal devices (03-034) [Fairchild]

Steve Fairchild presented a proposal to clarify the discussion of expander internal devices (03-034r1). The group requested that a mechanism be defined for discovering whether a phy is one of the newly defined expander internal phys and several options for accomplishing this were discussed. Other minor changes were requested.

Steve asked the group to consider changing the number of edge devices allowed on an expander from 64 to either 128 or 256. The main consideration was the number of routing table entries in expanders, particularly fanout expanders. John Lohmeyer conducted a straw poll:

phy count 64 - 0  
phy count 128 - 6  
phy count 256 - 2

Steve agreed to prepare a new version of the proposal.

### **5.3 SAS Definitions (03-022) [Evans]**

Mark Evans presented a proposal to coordinate the SAS definitions with each other and with SATA (03-022r0). It was noted that the proposal eliminates several definitions that attempt to apply SAM concepts to ATA devices. In response to questions, Mark agreed that he needs to work with Rob to insure that the terms described by the deleted definitions are not used in SAS, that work appears to involve primarily clause 4.

Mark led the group through the proposed changes. Several corrections were requested and Mark agreed to prepare a new revision.

Mark Evans moved that 03-022r1 (r0 as revised) be accepted for inclusion in SAS. George Penokie seconded the motion. The motion passed on a vote of 16:0:2.

### **5.4 SAS Requests and Confirmations (03-023) [Evans]**

Mark Evans presented a proposal that details the flows of requests and confirmations between SAS layers (03-023r0). The group requested several changes and Mark agreed to prepare a new revision. Rob noted that the document may be incorporated in SAS as the resolution to a letter ballot comment.

### **5.5 SAS Port Layer Description Modifications (03-024) [Evans]**

Mark Evans presented a brief summary of the proposed port layer description rewrite (03-024r0) but also asked that discussion and approval of the proposal be deferred to the next meeting.

The open issues raised by John Worden were cited as a key reason for deferring the approval vote, because Mark wanted a chance to review John's issues and revise the proposal accordingly.

### **5.6 SAS SMP error codes (03-058) [Fairchild]**

Steve Fairchild reviewed a proposal to eliminate overlapping SMP error codes (03-058r0). Concerns were raised over how to represent which responses are valid in the various SMP functions and it was agreed that the information should be represented by the method is an editorial issue.

Steve Fairchild moved that 03-058r0 be recommended for inclusion in SAS. Steve Wirtz seconded the motion. In the absence of any objections, the motion passed unanimously.

### **5.7 SAS BER Comments [Penokie]**

George Penokie led a discussion of the importance or unimportance of BER (Bit Error Rate) in SAS. Bill Ham, Alvin Cox and several others attempted (without success) to convince George that all BER information in SAS is very necessary. Eventually, it was agreed that every occurrence of BER in SAS be inspected and agreement reached by the group to keep them, remove them, or reword them to emphasize a preference for the use of better BERs than those stated in SAS.

## 5.8 SAS External Cable Length [Penokie]

George Penokie requested inclusion of cable length specifications in SAS.

The group agreed to add the following:

These signal specifications are consistent with using good quality cable assemblies constructed with shielded twinex cable with 24 gauge solid wire up to eight meters in length without using any form of equalization (e.g., transmitter pre-emphasis, receiver adaptive equalization, or passive cable equalization).

George noted that the wire gauge has to be stated in ISO phrasing.

## 5.9 Near End Analog Loopback [Penokie]

George Penokie asked the group to consider removing the near end analog loopback feature.

George Penokie moved that the group recommend that near end analog loopback be removed from SAS. Mark Evans seconded the motion. The motion passed on a vote of 8:2:10.

## 5.10 LED Driver [Cox]

Alvin Cox reported that the phy group left the required behavior for the LED driver unchanged, but that the requirements have been clarified extensively.

## 5.11 Keying Comments [Dell]

Alvin Cox reported that the keying comments from Dell were rejected by the phy working group. He noted that the current connector is not able to support robust keying.

## 5.12 External Cable Delay HOLD/HOLDA [Elliott]

Rob Elliott reported that the timings on hold and hold acknowledge assume a cable delay of no more than 50 nano-seconds.

# 6. Review of Recommendations

John Lohmeyer noted that the following recommendations were made during this meeting:

Accept the comment in 7.1.4.4 that increases the number of broadcast primitives from 4 to 8. [14:0:4]

Make one of the new broadcast-reserved primitives a broadcast-reserved-changed primitive. [16:2:3]

Accept the comment regarding the 20 dword rule in 7.1.6.3. [11:0:6]

Remove the 64 entry limit of the number of indices in fanout expanders.[10:1:6]

Remove near end analog loop back. [8:2:10]

Remove note 12. [5:1:10]

SAS Definitions (03-022r1) [Evans] {r0 as revised, unanimous}

SAS SMP error codes (03-058r0) [Fairchild] {unanimous}

## **7. Meeting Schedule**

SAS Protocol Working Group meetings are scheduled for:

Monday-Tuesday, March 10-11, 2003 commencing at 10 a.m., or ten minutes following the conclusion of the SPI Working Group meeting which ever is earlier in Dallas, TX at the Crowne Plaza Suites Hotel (972-233-7600), hosted by Texas Instruments. If there is no SPI Working Group meeting, the SAS Protocol Working Group meeting will commence at 9:00 a.m.

It was noted that a SAS editing meeting is planned for Friday, January 17 commencing at 8:00 a.m.

Holding a face-to-face meeting in the second half of February was discussed, but no specific dates, times, or locations were agreed, because no volunteer hosts were identified.

A SAS letter ballot comment resolution teleconference is planned for Tuesday, January 21, 2003 at 11:00 a.m. until 2:00 p.m. EST. Details will be posted on the T10 reflector.

Additional teleconference calls may be announced on the T10 reflector as needed.

## **8. Adjournment**

The meeting was adjourned at 7:00 p.m. on Tuesday January 14, 2003.