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

To: T10 Membership
From: Ralph Weber and John Lohmeyer
Subject: Data Integrity Study Group -- August 19-20, 2003
            Denver, CO

Agenda

1. Opening Remarks
2. Approval of Agenda
3. Attendance and Membership
4. Old Business
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    4.2   CAP Data Integrity Usage Models (03-222) [Sheffield, Holt, Rassbach]
    4.3   Simplified End-to-End Data Protection (03-176) [Penokie]
    4.4   End-to-End Error Cases (03-207) [Penokie]
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    4.6   Checksum vs. CRC guard algorithm
    4.7   16-bit vs. 32-bit CRC
    4.8   Long CDB vs. short CDB
5. New Business
6. Review of Recommendations
7. Meeting Schedule
8. Adjournment

Results of Meeting

1.   Opening Remarks

John Lohmeyer called the meeting to order at 1:00 p.m. Tuesday, August 19, 2003. He thanked LSI Logic for hosting the meeting. As usual, the people present introduced themselves.

2.   Approval of Agenda

The draft agenda was approved with no changes.

No items was added or revised during the course of the meeting.

3.   Attendance and Membership

Attendance at study group meetings does not count toward minimum attendance requirements for T10 membership. Study 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:

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        Name            S        Organization        Electronic Mail Address
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Mr. Walter Rassbach     V                            rassbach@nilenet.com
Mr. Tim Symons          A  Adaptec, Inc.             Timothy_Symons@adaptec.
                                                     com
Ms. Pat Thaler          P  Agilent Technologies      pat_thaler@agilent.com
Mr. Robert H. Nixon     P  Emulex                    bob.nixon@emulex.com
Mr. Ralph O. Weber      P  ENDL Texas                roweber@acm.org
Mr. George O. Penokie   P  IBM / Tivoli Systems      gop@us.ibm.com
Mr. Robert Sheffield    A  Intel Corp.               robert.l.sheffield@intel.
                                                     com
Mr. John Lohmeyer       P  LSI Logic Corp.           lohmeyer@t10.org
Mr. Keith Holt          V  LSI Logic Corp.           keith.holt@lsil.com
Mr. David Weber         V  LSI Logic, Inc.           david.weber@lsil.com
Mr. Mark Evans          P  Maxtor Corp.              mark_evans@maxtor.com
Mr. Edward A. Gardner   AV Ophidian Designs          eag@ophidian.com
Mr. Craig W. Carlson    A# QLogic Corp.              craig.carlson@qlogic.com
Mr. Michael Walker      V  Seagate                   michael.d.walker@seagate.
                                                     com
Mr. Jim Coomes          A  Seagate Technology        jim.coomes@seagate.com
Mr. Gary D. Moorhead    V  Seagate Technology        gary.moorhead@seagate.com
Mr. Steven Sletten      V  Sun Microsystems          steven.sletten@sun.com
Mr. Charles Binford     A  Sun Microsystems, Inc.    Charles.Binford@sun.com
Mr. Richard Lary        V  TuteLary, LLC             ANSI-T10@lary.com

19 People Present

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

4.1   End-to-End Data Protection Proposal (03-111) [Houlder]

This topic was discussed under items 4.2 and 4.7.

4.2   CAP Data Integrity Usage Models (03-222) [Sheffield, Holt, Rassbach]

The group discussed the structure and content of the Data Integrity Field (DIF) subfields and reviewed the uses for each of the subfields based on the contents of 03-222r0 and 03-111r0.

Jim Coomes requested a straw poll on whether the proposal should include mechanisms for validating the contents of the Meta Tag DIF field at the target. The straw poll favored not validating the Meta Tag at the target with a vote count of 13:2:1.

Mark Evans requested a straw poll on whether the proposal should include a new 16 byte Read/Write CDB format with a Ref Tag field. The straw poll was against adding the new 16 byte CDB format with a tally of 12:3:4.

4.3 Simplified End-to-End Data Protection (03-176) [Penokie]

George Penokie led a line-by-line review of his end-to-end data protection proposal (03-176r3). The group discussed the structure of the Data Integrity Field, formatting disks, legacy read commands, legacy verify commands, and numerous other aspects of the proposal.

Ed Gardner requested a straw poll to advise George on whether discussion of the Extended Copy command should be retained in the proposal. The straw poll favored removing the Extended Copy 8:0.

The group requested numerous changes in the proposal and George agreed to prepare a new revision for consideration at the September CAP meeting.

4.4 End-to-End Error Cases (03-207) [Penokie]

George Penokie asked that this topic be deferred to the September CAP meeting.

4.5 End-to-End Data Protection justification (03-224) [Holt]

Keith Holt asked that this topic be deferred to the September CAP meeting.

4.6 Checksum vs. CRC guard algorithm (03-247)

Walter Rassbach presented 03-274r0 showing how use of a checksum guard can aid in detecting RAID data reconstruction (a.k.a., write hole) errors. Ed Gardner noted that application of a vendor specific guard algorithm on only the RAID parity drive will provide the same level of checking. Richie Lary reviewed the error rates that the various algorithms (including checksum) will detect and concluded that the proposed checksum usage represents a line of a defense for an error case that should have been caught very much earlier in the activities of a device.

Ed Gardner and Pat Thaler stated unequivocally that CRC is superior to checksum for detecting bit flips. Walter stated that checksum should be defined as the only guard algorithm. Richie noted that in the context of this system, CRC and checksum have nearly equal error detection effectiveness.

Jim Coomes requested a straw poll to chose between CRC, checksum, and both for the guard algorithm. The poll results were as follows:
- 15 — CRC
- 2 — checksum
- 0 — both

Walter Rassbach requested that the CRC have no seed. Richie Lary asked that there be no 1's complement at the end. The group agreed with both ideas.

4.7 16-bit vs. 32-bit CRC

The group discussed the 16-bit CRC proposal presented in 03-111r0. George Penokie requested that the CRC description be revised to conform to the CRC description form found in 03-176r3 and/or SAS.

During the second day, Ed Gardner asked the group to consider the 1100B CRC instead of the 18BB7 CRC.

The group agreed to study the various options on the table and revisit this issue during the September CAP working group meeting.

4.8 Long CDB vs. short CDB

This topic was discussed under item 4.6.

5.   New Business

No new business was brought before the group.

6.   Review of Recommendations

No documents were recommended for approval during this meeting.

7.   Meeting Schedule

The next Data Integrity discussions will be held as an agenda item in the CAP Working Group, Tuesday, September 9, 2003 commencing at 1:30 p.m. and continuing Wednesday, September 10, 2003 from 9 a.m. to 7 p.m. (or until all agenda items are completed). The meeting will be in Seattle, WA at the Renaissance Hotel (800-278-4159), hosted by Microsoft.

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

8.   Adjournment

The meeting was adjourned at 12:15 p.m. on Wednesday August 20, 2003.