Accredited Standards Committee*
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Date: March 13, 2000
Reply to: John Lohmeyer

To: T10 Membership
From: John Lohmeyer and Ralph Weber
Subject: Parallel SCSI Working Group Meeting -- March 7, 2000
Dallas, TX

Agenda

1. Opening Remarks
2. Approval of Agenda
3. Attendance and Membership
4. SPI-4 Physical Topics
   - 4.1 SPI-4 clocking proposal (99-262) [Petty]
   - 4.2 Proposal for Fast-160 to be included in SPI-4 (99-295) [Milligan]
   - 4.3 Fast-160 Phase Encoded Data Enabling (99-323) [Moore]
   - 4.4 Driver Precompensation with Receiver Filtering for Ultra4 (00-175) [Smith]
   - 4.5 ISI Measurements (99-337) [Bridgewater/Bastiani]
   - 4.6 Issues with Implementing Transmitter Pre-Compensation (00-103) [Uber]
   - 4.7 Ultra 320 Summary and Recommendations (00-106) [Evans]
   - 4.8 Use of eye measurements (00-126) [Bastiani]
   - 4.9 Ultra320 SCSI Calibration Protocol (00-133) [Leshay]
   - 4.10 Proposal for training pattern to be included in SPI-4 (00-132) [Evans]
   - 4.11 Ultra320 SCSI vs. Ultra160 SCSI Eye Diagram Data (00-147) [Brown]
   - 4.12 Requirements for Measuring Receive Signals in SPI-4 and beyond (00-149) [Ham]
   - 4.13 320 data transfer rates on 25 meter cables (00-153) [McGarrah]
   - 4.14 640 data transfer rates, a first look (00-154) {McGarrah]
   - 4.15 Receiver Input Voltage Budget for Eye Patterns (00-158) [Bridgewater]
   - 4.16 Proposed Training for Skew Compensation (00-174) [Bastiani]
   - 4.17 Proposal for LVD Bus Length (00-170) [Evans]
   - 4.18 Receiver Equalization (00-168) [Brown]
   - 4.19 Pre-Emphasis Experimental Data (99-167) [Gasparik]
   - 4.20 Expander Topics [Ham]
5. SPI-4 Protocol Topics
   - 5.1 SCSI out of band communications method (99-213) [Petty]
   - 5.2 Margin Control (99-264) [Lamers]
   - 5.3 Flow Control & Read Streaming (00-142) [Lamers]
   - 5.4 PPR Message Enhancements (99-283) [Lamers]
6. Domain Validation Technical Report Topics
7. New Business
8. Meeting Schedule
9. Adjournment

Results of Meeting

1. Opening Remarks

John Lohmeyer, the T10 Chair, called the meeting to order at 9:00 a.m., Tuesday, March 7, 2000. He thanked Paul Aloisi of Texas Instruments for hosting the meeting.

As is customary, the people attending introduced themselves and a copy of the attendance list was circulated.

2. Approval of Agenda

George Penokie led the group in sorting the agenda items based on the following priorities:

1. Free running clock
2. Training patterns
3. Timings
4. Test configurations

The draft agenda was approved with the following changes:

4.16 Proposed Training for Skew Compensation (00-174) [Bastiani]
4.17 Proposal for LVD Bus Length (00-170) [Evans]
4.18 Receiver Equalization (00-168) [Brown]
4.19 Pre-Emphasis Experimental Data (99-167) [Gasparik]
4.20 Expander Topics [Ham]

During the course of the meeting, the following agenda items were added/revised:

4.4 Driver Precompensation with Receiver Filtering for Ultra4 (00-175) [Smith]

For future meetings, the agenda was reorganized as follows:

4. SPI-4 Physical Topics
   - 4.1 Free Running Clock
     - 4.1.1 SPI-4 clocking proposal (99-262) [Petty]
     - 4.1.2 Fast-160 Phase Encoded Data Enabling (99-323) [Moore]
   - 4.2 Training Patterns
     - 4.2.1 Ultra320 SCSI Calibration Protocol (00-133) [Leshay]
     - 4.2.2 Proposal for training pattern to be included in SPI-4 (00-132) [Evans]
     - 4.2.3 Proposed Training for Skew Compensation (00-174) [Bastiani]
   - 4.3 Timings
     - 4.3.1 Proposal for Fast-160 to be included in SPI-4 (99-295) [Milligan]
   - 4.4 Test Configurations
     - 4.4.1 Use of eye measurements (00-126) [Bastiani]
     - 4.4.2 Receiver Equalization (00-168) [Brown]
     - 4.4.3 Requirements for Measuring Receive Signals in SPI-4 and beyond (00-149) [Ham]
     - 4.4.4 Ultra320 SCSI vs. Ultra160 SCSI Eye Diagram Data (00-169) [Brown]
   - 4.5 Other SPI-4 Physical Topics
     - 4.5.1 320 data transfer rates on 25 meter cables (00-153) [McGarrah]
     - 4.5.2 640 data transfer rates, a first look (00-154) [McGarrah]
     - 4.5.3 Pre-Emphasis Experimental Data (99-167) [Gasparik]
     - 4.5.4 Driver Precompensation with Receiver Filtering for Ultra4 (00-175) [Smith]

4.5.5 Expander Topics [Ham]

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. Lawrence J. Lamers	P	Adaptec, Inc.	ljlamers@ieee.org
Mr. Vincent Bastiani	A#	Adaptec, Inc.	bastiani@corp.adaptec.com
Mr. Charles Brill	P	AMP, Inc.	cebrill@ix.netcom.com
Mr. Douglas Wagner	P	Berg Electronics	wagnerdl@bergelect.com
Mr. Bill Galloway	P	BREA Technologies, Inc.	billg@breatech.com
Mr. Dennis Lang	A	Circuit Assembly Corp.	dennisl@circuitassembly.com
Mr. Edward Haske	P	CMD Technology	haske@cmd.com
Mr. Robert C. Elliott	P	Compaq Computer Corp.	Rob_Elliott@compuserve.com
Dr. William Ham	A	Compaq Computer Corp.	bill.ham@digital.com
Mr. John Tyndall	A	Crossroads Systems, Inc.	jtyndall@crossroads.com
Mr. Rick DeMars	V	CTS	rdemars@ctscorp.com
Mr. Charles Tashbook	P	Dallas Semiconductor	charles.tashbook@dalsemi.com
Mr. Bill Anderson	O	DDK Electronics	bill_anderson@ddkconnectors.com
Mr. William Dawkins	O	Dell Computer	bill_dawkins@dell.com
Mr. Ralph O. Weber	A	ENDL Texas	roweber@acm.org
Mr. Eugene Lew	P	Fujitsu	elew@fcpa.fujitsu.com
Mr. Nathan Hastad	P	General Dynamics	nathan.j.hastad@gd-is.com
Mr. Zane Daggett	P	Hitachi Cable Manchester, Inc	zdaggett@hcm.hitachi.com
Mr. George O. Penokie	P	IBM Corp.	gop@us.ibm.com
Mr. John Lohmeyer	P	LSI Logic Corp.	lohmeyer@t10.org
Mr. Frank Gasparik	V	LSI Logic Corp.	frank.gasparik@lsil.com
Mr. William Petty	V	LSI Logic Corp.	william.petty@lsil.com
Mr. Andrew Brown	V	LSI Logic Corp.	andrew.brown@lsil.com
Mr. Brian Day	V	LSI Logic Corp.	brian.day@lsil.com
Mr. Mark Strauss	V	Lucent Technologies	msstrauss@lucent.com
Mr. W. Hunsicker	V	Lucent Technologies	whunsicker@lucent.com
Mr. Makeshwar Kothandaraman	V	Lucent Technologies	makesh@lucent.com
Ms. Jie Fan	P	Madison Cable Corp.	jfan@madisoncable.com
Mr. Jay Neer	P	Molex Inc.	jneer@molex.com
Ms. Betty Akeredolu	O	Molex Inc.	bakeredolu@molex.com
Mr. Galen Fromm	V	Molex Inc.	gfromm@molex.com
Mr. Richard Moore	A#	QLogic Corp.	r_moore@qlc.com
Mr. Ting Li Chan	V	QLogic Corp.	t_chan@qlc.com
Mr. Richard L. Rananiec	V	QLogic Corp.	
Mr. Mark Evans	P	Quantum Corp.	mark.evans@quantum.com
Mr. Russ Brown	V	Quantum Corp.	russ.brown@quantum.com

Mr. Bruce Leshay	V	Quantum Corp.	bleshay@tdh.qntm.com
Mr. Gene Milligan	P	Seagate Technology	Gene_Milligan@notes.seagate.com
Mr. Gerald Houlder	A	Seagate Technology	gerry_houlder@notes.seagate.com
Mr. Daniel (Dan) F. Smith	O	Seagate Technology	daniel_f_smith@notes.seagate.com
Mr. Mayank R. Patel	V	Seagate Technology	mayank_r_patel@notes.seagate.com
Mr. Erich Oetting	P	Storage Technology Corp.	erich_oetting@stortek.com
Mr. Paul D. Aloisi	P	Texas Instruments	Paul_Aloisi@ti.com
Mr. Donald R. Getty	A#	Texas Instruments	donald_getty@ti.com
Mr. Mike Kosco	V	Texas Instruments	mike@mvbuilders.com
Mr. John Wilson	V	Texas Instruments	jwilson@asic.sc.ti.com
Mr. Kenneth J. Hallam	P	UNISYS Corporation	ken.hallam@unisys.com

47 People Present

Status Key:
- P - Principal
- A,A# - Alternate
- O - Observer
- L - Liaison
- V - Visitor

4. SPI-4 Physical Topics

4.1 SPI-4 clocking proposal (99-262) [Petty]

Bill Petty reviewed the proposal to run P1 as an ST type signal (99-262r0). The P1 is not trained or deskewed and has the same timing budget as SPI-3.

Bruce Leshay questioned how an expander could detect the beginning of training. Bill noted that the choices of training methods are strongly tied to the clocking mechanism.

4.2 Proposal for Fast-160 to be included in SPI-4 (99-295) [Milligan]

Gene Milligan reviewed the draft in progress of 99-295 (r2 is completed and r3 is in progress). He noted that agreement had been reached with Bill Petty on the error tolerances timing values for Fast-160. The group discussed the table of error tolerance values in detail and agreed on some corrections to its contents.

The group discussed the degree to which data can be transmitted at rates below the negotiated rate. The problem is that the current and previous versions of SCSI use the negotiated data transmission rate as a maximum -- transmission at slower rates are perfectly legal. However, transmission at rates other than negotiated rate cause problems for the timing budget compensation functions (skew compensation, adaptive equalization, etc.) that rely on training operations because the training results are only good for the transfer rate at which the training was performed. Everybody had been assuming that transfers would occur at the negotiated rate, which would also be the rate at which the training was performed. The potential for slower transfer rates raised questions about such assumptions. One agreement was that, if slower transfer rates are used, the training must be done at the slower rate and redone anytime the rate is changed.

4.3 Fast-160 Phase Encoded Data Enabling (99-323) [Moore]

Richard Moore asked that this item be removed from future agendas.

4.4 Driver Precompensation with Receiver Filtering for Ultra4 (00-175) [Smith]

Dan Smith presented data and computed filtering results for a configuration where precompensation is combined with receiver filtering (which is different from receiver equalization). Many questions were raised about the appropriateness of the Chebyshev filter used to generate the presented data. Dan agreed that a better filter than the one selected could be used, and stated that he would work on that issue in preparation for the next meeting. Bill Ham wondered if precompensation would be necessary if a good enough filter were used, and explained how Dan's data seemed to demonstrate this point.

4.5 ISI Measurements (99-337) [Bridgewater/Bastiani]

Vince Bastiani asked that discussion of this topic be deferred to the next meeting.

4.6 Issues with Implementing Transmitter Pre-Compensation (00-103) [Uber]

Mark Evans asked that this item be removed from future agendas.

4.7 Ultra 320 Summary and Recommendations (00-106) [Evans]

Mark Evans requested that this item be removed from future agendas

4.8 Use of eye measurements (00-126) [Bastiani]

Vince Bastiani asked that discussion of this topic be deferred to the next meeting.

4.9 Ultra320 SCSI Calibration Protocol (00-133) [Leshay]

Mark Evans presented a list of options for the frequency of training. The group discussed the effects of the options on expanders and performance. The length of time required to do training weighed on the choices and was also discussed.

The three choices as presented for straw poll voting were:

- remember (i.e., train once for data in and once for data out after each PPR negotiation),
- train before each data phase,
- train for I_T nexus once for data in and once for data out.

On a straw poll vote of 18:2, the group decided not to include training at the beginning of each phase.

The group then unanimously agreed to select only one of the remaining two choices. The straw poll was 13 for remember and 7 for train for I_T nexus… George stated that the vote was not conclusive and recommended that both choices remain in the proposal.

Bruce Leshay presented a detailed proposal for handling the transmission of a training pattern. One key feature of the proposal was the use of the SEL signal to identify a training a sequence.

George Penokie asked Bill Petty if he wanted to continue with his competing training pattern proposal. Bill's concern was that Bruce's proposal had the deskew training running at full speed. Bill Petty discussed this issue with Bruce. Bruce agreed that the fact that SCSI allows transmitting at rates slower than the negotiated rate had not been accounted for in the proposal (see also item 4.2).

Another problem with training patterns was the time they consume. Some argued that the ‘training time’ would be so short as to be unnoticeable. George Penokie was very concerned about the overall performance impact of training times. This issue caused difficulties because being able to use longer training patterns (with longer training times) would solve some problems. To assist in the decision making, George Penokie accepted an action item to build a model that shows the performance impact of the training times on packetized performance.

4.10 Proposal for training pattern to be included in SPI-4 (00-132) [Evans]

The group agreed to review 00-132, which casts 00-133 (discussed in item 4.9) into standards wording, outside the meeting.

4.11 Ultra320 SCSI vs. Ultra160 SCSI Eye Diagram Data (00-169) [Brown]

Russ Brown presented data on receiver equalization.

4.12 Requirements for Measuring Receive Signals in SPI-4 and beyond (00-149) [Ham]

Bill Ham presented a description showing the need for SPI-4 to include a transformation function that describes the effects of a receiver equalization or filtering mechanism so that signals at the receiver connector can be transformed to the signals processed by the receiver. He reminded the group that SCSI is obliged to specify signals at the connector, but the quality of the signals processed by the receiver is what really matters.

Bill Galloway noted that specifying a better filter loosens requirements on the other components of the system, while, specifying a 'sloppy' filter puts more work on the other system components (e.g., cables, connectors, and transmitters).

4.13 320 data transfer rates on 25 meter cables (00-153) [McGarrah]

Russ Brown presented data showing the value of receiver equalization on 25 m cables operating a 320 MB/sec transfer rates, using experimental data and the computed effects of equalization.

4.14 640 data transfer rates, a first look (00-154) {McGarrah]

Russ Brown presented data showing the value of receiver equalization on 25 m cables operating a 640 MB/sec transfer rates, using experimental data and the computed effects of equalization.

4.15 Receiver Input Voltage Budget for Eye Patterns (00-158) [Bridgewater]

Vince Bastiani asked that discussion of this topic be deferred to the next meeting.

4.16 Proposed Training for Skew Compensation (00-174) [Bastiani]

Vince Bastiani asked that discussion of this topic be deferred to the next meeting.

4.17 Proposal for LVD Bus Length (00-170) [Evans]

Mark Evans presented a proposal that Fast-160 allow 25 m cables for point-to-point applications and 12 m cables for multi-drop applications (00-170r0). He noted that items 4.13 and 4.14 present data to justify the proposal. Mark noted that this proposal uses the same cable lengths as Fast-80.

Bill Ham commented that the cable working group may request changes in this proposal as a result of the work in cable performance specifications and in cable testing.

Bill also requested that note 1 be removed from the table and Mark agreed.

In the absence of any objections, the group unanimously recommended that 00-170r1 (r0 as modified) be approved for inclusion in SPI-4. George noted that this is the first proposal to be approved for inclusion in SPI-4.

4.18 Receiver Equalization (00-168) [Brown]

Russ Brown presented key concepts and properties of a receiver equalization method.

4.19 Pre-Emphasis Experimental Data (99-167) [Gasparik]

Frank Gasparik presented experimental data showing the helpful effects of transmitter precompensation.

4.20 Expander Topics [Ham]

Bill Ham presented a list of expander topics that he believes must be added to SPI-4:

- definition of simple expander port requirements (may use content from EPI)
- inclusion of domain validation level 1 required for all initiator ports
- inclusion of minimal target requirements to support the first two

5. SPI-4 Protocol Topics

5.1 SCSI out of band communications method (99-213) [Petty]

John Lohmeyer noted that Bill has presented the proposal a couple of times and has received no feedback. He stated that the proposal has been tested in the lab. Bill Ham asked that ‘out-of-band’ be dropped from the topic title because it caused people to misinterpret the intent of the proposal.

In the absence of Bill Petty, John led the group in a discussion of the key benefits of having such a protocol (i.e., that no SCSI IDs are required to communicate with devices such as simple expanders, terminators, etc. Larry Lamers announced that SDV (Domain Validation Technical Report) contains expander communication. The group agreed to put this item under the Domain Validation topic for future meetings.

5.2 Margin Control (99-264) [Lamers]

George Penokie stated a concern about use of messages to do margin control.

Larry Lamers asked that any interested parties send comments on this proposal and that this topic be deferred to the next meeting.

5.3 Flow Control & Read Streaming (00-142) [Lamers]

Larry Lamers asked that any interested parties send comments on this proposal and that this topic be deferred to the next meeting.

5.4 PPR Message Enhancements (99-283) [Lamers]

Larry Lamers asked that any interested parties send comments on this proposal and that this topic be deferred to the next meeting.

6. Domain Validation Technical Report Topics

Larry Lamers asked that this topic be changed to “Expanders and Domain Validation”.

John Lohmeyer reported that SDV revision 0 was posted on the T10 web site as of this morning.

7. New Business

Bill Ham announced the SCSI Physical Test group meeting to be held the next morning (Wednesday, 3/8) and gave a brief overview of the expected content of that meeting.

8. Meeting Schedule

The next meeting of the Parallel SCSI Working Group will be Monday, March 27, 2000 commencing at 1:00 p.m. until 6 p.m. and continuing Tuesday, March 28, 2000 at 9:00 a.m. until 5:00 p.m. at the Embassy Suites (408-942-0400) in Milpitas, CA hosted by Adaptec.

The subsequent meetings of this group are April 26 starting at 1:00 p.m. and continuing to April 27 in Colorado Springs, CO and May 16 starting at 9 a.m. in Nashua, NH.

9. Adjournment

The meeting was adjourned at 5:45 p.m. on Tuesday March 7, 2000.