

Minutes of T11.1 HIPPI Ad Hoc Working Group
March 10-11, 1998
Minneapolis / St. Paul, MN

Includes change approved at April 21-22 Ad Hoc Working Group meeting

1. Opening remarks and introductions

The Chairman, Don Tolmie of Los Alamos National Laboratory, opened this meeting and thanked Jeff Young and Cray Research for hosting this meeting. This group is constituted as both the HIPPI Working Group under T11.1, and the HIPPI Networking Forum (HNF) - Technical Committee (TC).

Don lead a round of introductions. The list of attendees is at the end of these minutes. Roger Ronald noted that his company has changed their name from "Raytheon E-Systems" to "Raytheon Systems Company".

2. Review / modify the draft agenda

Draft agendas were distributed via e-mail before the meeting and hard copies were distributed at the meeting. Additional items were added for:

- 5.3 Low-cost version
- 6.2 Switch attributes
- 7.6 Mx usage
- 7.7 Keep alives

These minutes reflect the approved agenda.

3. Review minutes of previous meeting

The minutes of the February 10-11, 1998, working meeting in San Diego were reviewed. Don noted that in the minutes put out shortly after the meeting there were a few minor errors, e.g., wrong date for the minutes review and wrong rev number for action item 16. These were fixed, and are correct in the current on-line version.

Bob Willard moved, and Roger Ronald seconded, to approve the February 10-11, 1998 working meeting minutes as corrected. Motion passed unanimously.

4. Review old action items

1. Everyone to review the HIPPI-800 Switch MIB and pass comments to Marck Doppke. (Done)

2. Von Welch to contact HIPPI-6400 MIB users and developers for comments on the current draft, and to prepare a presentation on the MIB for a future meeting. (Carryover)
3. Von Welch to look at developing a HIPPI-6400 host system MIB (for a NIC), to be done now as an annex of the present MIB with the possibility of splitting it out as a separate document at a later date. (Carryover)
4. Everyone to review the HIPPI-6400 MIB. (Carryover)
5. Kevin Lahey, Jeff Young, Jean-Michel Pittet, and Greg Chesson to begin an IP and ARP over HIPPI-6400 RFC. (Carryover)
6. Don Tolmie to forward whatever he can find of Mark Kelley's HIPPI end-point MIB to Jeff Young. (Done)
7. Jean-Michel Pittet to update his HIPPI-800 ARP document, and provide it to Don Tolmie for posting on the HIPPI web page. (Done)
8. Greg Chesson to contact Bob Snively of Sun about material and format for an IEEE tutorial on HIPPI-6400 ULA usage, and the ULAs special to HIPPI-6400. (In process)
9. Greg Chesson and Jeffrey Chung to consider developing "reason codes" to explain why a particular ST Operation was rejected. (Carryover)
10. Jim Pinkerton to develop state tables for inclusion as an ST annex. (Done)
11. Greg Chesson to send e-mail detailing reasons for not doing a queue for client/server applications, and suggesting how they could be done in ST. (Carryover)
12. Jim Pinkerton to do a rewrite of ST original Annex C (now annex D). (Carryover)
13. Bob Willard to write up something on big/little endian issues for inclusion in the document. (Carryover)
14. Greg Chesson to collect text for a "folklore" annex in the document. (Carryover)

15. Greg Chesson to draft text describing how you differentiate duplicate operations from legal operations. (Carryover)
16. Don Tolmie to update ST Rev 1.5 with the changes agreed to at the February meeting. (Done)

17. Michael McGowen to collect and tabulate everyone's requirements for HIPPI-800 and HIPPI-6400 translation environments. (Carryover)
18. Don Tolmie to correct the January 13-14 minutes and replace the copy on the web page. (Done)

5. HIPPI-6400-PH (ref: Rev 2.2, February 11, 1998)

5.1 Implementation test results

Greg Chesson reported via e-mail "that with cable lengths of 5m or less we will need either an equalizer network or a smaller wire size (more resistance). The reason is that during the training sequence there is a large reflection from the receive end caused by the stub between the connector and SuMAC. It is not a problem with training turned off. But HIPPI-6400-PH does not specify a mode with training turned off - nor do we specify a procedure for automatically determining the cable length by the SuMAC. It is assumed that training is always on. There is some hope that flyby termination will help, but the basic problem remains."

Roger Ronald said that they were not seeing the same problem at Raytheon Systems Co. Bob Newhall said that a 1 meter cable was OK, but 5 meters gave problems. Bob reported that their 20 meter Tensolite cable, without an equalizer, works OK.

Greg also passed on a message from Barbara Weber of Berg: "We HAVE FINALLY received Gore cable. We have completed the 4 PC boards for the equalized cable last week, which are being reviewed by our lab. Then we will have these boards populated with the correct resistor value. The over-mold boot has been completed. I will get a confirmation date from Ralph Papa today for delivery of the 40 meter cable. I will also ask Ralph about the Amphenol cable today as well." Nothing new was reported at the meeting.

Bob Newhall and Roger Ronald reported that the ECRC was working correctly in the end-point mode,

but not in the pass-through mode. Roger also said that Raytheon Systems Co. seemed to be seeing fewer electrical problems than SGI, and felt that maybe SGI had not taken as much care with the PC board layout. SGI is still looking at the de-skew problem; other problems are minor. The de-skew works fine at 3200 Mbit/s.

5.2 Status of OMC compliance review and First Public Review

HIPPI-6400-PH Rev 2.2 was forwarded to T11 at the February Plenary. T11 in turn forwarded it to OMC for a compliance review (does it meet what we said in the SD-3 Project Proposal), and First Public Review (1PR). OMC meets March 23, so we should have their results by the April Plenary. The 1PR goes in parallel with the OMC review, but no dates have been received as yet. For comparison, HIPPI-FP Revised was forwarded in December, and its 1PR closes March 17. Based on this, the HIPPI-6400-PH 1PR could close in May.

5.3 Low-cost version

Roger Ronald asked if a lower-cost SuMAC type chip without as much buffering would meet the HIPPI-6400-PH specification. It was agreed that it would, but would not operate at full speed over 1 km. Roger felt that reducing the buffers to support 50 m distances, and cutting the skew budget in half, would still satisfy 99% of the applications. The 8 Kbyte send buffer, and 32 Kbyte receive buffers, could probably be reduced to about 1 Kbyte. It was unclear how much reducing the buffer size and skew tolerance would have on the overall chip, and if the projected volume was sufficient to support a re-design

6. HIPPI-6400-SC (ref: Rev 1.9, January 5, 1998)

6.1 Status of OMC compliance review and First Public Review

HIPPI-6400-SC Rev 1.9 was also forwarded at the February Plenary, and should be on the same processing track as HIPPI-6400-PH (reported above).

6.2 Switch attributes

Jeff Young asked "if you buy a HIPPI-6400-SC compliant switch will it always support broadcast?" The conclusion was that a switch vendor could build

a switch without hardware level broadcast capability, and note in their literature that a broadcast server was necessary for full HIPPI-6400-SC compliance. It was noted that Michael McGowen has some ideas for full broadcast capability in a switch, but most people only felt that we needed broadcast to support ARP (i.e., short messages rather than long messages).

7. Scheduled Transfer (ref: Rev 1.6, March 2, 1998)

Executive summary of ST work at this meeting:

- The change list was the shortest that it has been for a long time, and the list of technical changes was even shorter.
- Most of the document changes were accepted as written, and some more (mostly editorial), changes were made.
- The only changes to the operations summary tables were the inclusion of the number of bits in each field.
- A major portion of the meeting was spent going over the Annex E state tables and text. No major changes were made to the state transitions or actions, but many changes were made in the text.
- The text in annex B for the Optional payload format was reviewed and some changes made. Jim Pinkerton took an action item to draft text for a timestamp option.
- A proposal for a keep-alive timer was accepted in principal and will be documented as 10.3.
- A proposal for text describing Max_STU and Max_Block in annex D was reviewed, and a number of changes suggested.

7.1 Review document changes Rev 1.5 --> Rev 1.6

The recent changes were reviewed in detail.

In 3.3, the dual "VC" acronym was felt to be confusing. The places it was used in the document were identified, and they will be changed so that we can delete this acronym.

In the last paragraph of 5.2.2 it was agreed to change "...Disconnect sequences..." to "...connection management sequences...". In the third paragraph of 6.2.4 it was agreed to change "...to avoid aliasing" to "...to avoid B_num aliasing (see 10.4 page 37)". In the middle of 6.2.5 it was agreed to change "...shall

be sent to indicate a value equal to, or less than,..." to "...shall be no greater than...".

Carlin Otto of SGI suggested by e-mail that we extend Note 2 in 8.2. Specifically, change it to "Data Channel assignment value b'00' is reserved for use by Control operations exclusively". This change was accepted.

In 8.3.3, change "An end device receiving..." to "Supporting Destinations receiving...". The text in the first paragraph of 10.4 will be split into two paragraphs and two bullets. With the addition of "Keep-alive timers" in 10.3, all of the rest of the numbers in clause 10 will be bumped up.

Don reduced the size of the operations summary, Tables 3 - 7, and rotated them so that the tables fit on a single page. In addition, he added a list of parameters and where to find the definitive text under the last table (there wasn't room on the other pages). The change was appreciated by the group.

In Table 9, the comment under "Connection operations" changed from "...48-bit..." to "...64-bit..." and from "... (Port,Key)..." to "... (Local-Port, Remote-Port, Local-Key)...". In the second bullet under "Block operations", changed "...aliasing if..." to "...aliasing that is possible if...".

Chris Satterlee of SGI noted by e-mail that the payload size in Figure A.1 was incorrect, it should be 2^{32} - 49 bytes instead of 2^{32} bytes. It was agreed that Figure A.1 and A.2 should have a payload of 2^{31} (2 gigabytes).

7.2 Optional payload format (Annex B)

The text and figure in this annex were based on Jim Pinkerton's presentation at the February meeting. In B.1, added to the last bullet "Length shall include all bytes, i.e., opcode, length, and option-data.". In Table B.1, the experimental style was changed to style 2 only. In the note in B.2.3, changed "Later assignments..." to "Accepted assignments...".

Jim Pinkerton agreed to draft text for a timestamp option.

7.3 State tables (for Annex E)

Jim Pinkerton presented his updated finite state machines (FSMs). We went through the text, making lots of changes, and then reviewed the

individual state tables in gory detail. Every square in the Connection management FSM was reviewed. The only changes suggested were to some of the timeout entries – it was felt that a timeout occurring when no timeout had been started should be marked as an error instead of a "don't care". The names for the Idle state will be changed to differentiate them between tables. The other state tables were reviewed, but just for the paths called out in the text.

While all of the operation sequences are not covered, e.g., Read, Put, Get, and FetchOp, it was felt that they could be implied by their similarity to other operations. The only real exception was FetchOp, and Jim said that he would take a look at how much work it would entail.

Jim was complemented on the state tables; no transition errors were found, and the text was very useful. Don will add in the changes agreed to at the meeting and include Annex E in the next ST revision.

7.4 Duplicated operations actions

Greg Chesson has an action item to generate something for duplicated operations, but nothing has been completed to date. It was noted that the state tables are a great aid in determining the actions to take for a duplicated operation. Jim Pinkerton said that he hopes to have something drafted for this section by the April meeting.

7.5 Annex D draft

Don Tolmie passed out some text that he had hurriedly put together before the meeting to help explain the Max_STU and Max_Block usage. Roger Ronald pointed out that Don had the wrong image of these parameters, and a discussion ensued as to the correct way to use them. Specifically, Max_STU is concerned with the maximum transmission unit (MTU) supported by a device, e.g., an Ethernet device, rather than the device's input buffering capabilities. The figure Don used for Max_STU can be used (with some modifications) for explaining Max_Block. It was suggested that a section be added on how intermediate devices can pace issuing CTS's to prevent buffer overflow.

Don also had a place-holder for a section describing why some of the parameters were expressed in 2ⁿ notation. The reasons given at the meeting included: (1) represent a big number in a few bits, (2) most

implementations naturally fall on 2ⁿ boundaries, and (3) the math is easier with smaller numbers. This will be added in the next revision.

7.6 Mx usage

Ian Philp questioned whether we needed the Mx parameter, and asked for examples of where it is needed. Ian showed some examples where he used the low-order bits of Bufx as an input to a hash table where the other parameters were kept (and validated before use). Jim Pinkerton agreed that Ian's examples were correct, and in them Mx was not needed. Jim said that Mx could be used in a similar fashion, and the choice of which, or both, to use depended on the particular implementation. Jim would not provide information on how SGI planned to use Mx.

It was agreed to change Figure 5, change Mx₀, Mx₁, etc. to B_num₀, B_num₁, etc. Also, changed the paragraph immediately preceding Figure 5 by changing "...lookup will be needed..." to "...lookup (e.g., by hashing with an Mx or Bufx value – see D.? page ?) will be needed..."

7.7 Keep alives

Jim Pinkerton led a discussion on keep-alive timers, and how they were used in TCP. After some discussion it was agreed that we should include them in the document in new section 10.3. Jim volunteered to draft some text for the next meeting.

8. Other HIPPI items

8.1 ARP over HIPPI-800

Jean-Michel Pittet distributed a version of the document that included the page headers and trailers for review (the text was the same as the PDF copy on the HIPPI web page). He contacted John Renwick (the author of the original HIPPI ARP RFC); John said that he was unable to work on it now but would review it later. John strongly supporting having a broadcast capability. Jean-Michel also reviewed the Fibre Channel ARP RFC.

Changes to the document included: changed the layout of the HIPARP algorithm and encoding, deleted the redundant self-address resolution, expanded the IP broadcast emulation, detailed the address self-discovery, and made numerous editorial changes. It was agreed to change the name

from "ARP over HIPPI-800" to "ARP and IP Broadcast over HIPPI-800" to more closely represent the contents.

Jean-Michel described the IETF processing, and suggested that we take the Standards Track. The other options were Historic, Informational, and Experimental. It was also suggested that we process our MIBs in the Standards Track.

An IETF Standards Track document starts out as an Internet Draft (ID) with a 6 month lifetime. Multiple revisions can be made to ID's, with a new 6-month clock starting with each revision. When we feel it is stable we can advance it as a Proposed Standard. Further steps are Draft Standard, then Internet Standard. Very few documents make it all the way to Internet Standard. Only ID's have expiration dates, the others do not.

The document deadline for the next IETF meeting is March 13 (two days after our meeting) and Jean-Michel suggested that we submit the document for processing. Carlin Otto of SGI was going to review the document for grammar and spelling, and we did not feel the need to review it fully at this meeting.

It was noted that the document does not address ARP server fail-over, but does contain the hooks, e.g., tables for more than one server address. It was suggested that fail-over be documented in a future separate RFC so that vendors can claim compliance with one or the other rather than compliance/non-compliance to some option. It was suggested that the last two paragraphs of section 5 be copied to the Scope to clearly delineate that this draft does not address fail-over. After our review, and some changes, Jean-Michel left to get the changes made before the submission date.

Jean-Michel was thanked for his good work.

8.2 HIPPI end-point MIB

Don looked back through past minutes and found the following in the December 1995 minutes.

John Renwick of NetStar previously reported that the HIPPI end-point MIB has been revised, and is available via anonymous ftp from the Internet-Drafts repositories as:

draft-renwick-hippimib-01.txt

Mark Kelley of Cray Research said that he will soon be doing an implementation. Based on his experience, we will consider document modifications before further processing in IETF.

Don forwarded the information to Jeff Young, who in turn tried to contact Mark Kelley (now at NetStar), about the current status. Jeff had not been able to make contact yet.

8.3 HIPPI switch MIB

Marck Doppke of Essential Communications has a draft document out for comment. Marck was not at this meeting, but John Gibbon said that the MIB is a beta-2 product now, with final production soon. They had contacted Jerry DeLapp of LANL, Von Welch of NCSA, etc. about it. John will talk to Marck about processing it through the IETF.

8.4 HIPPI-6400 MIB

Von Welch of NCSA has a draft document, based on HIPPI-6400-PH Rev 1.4, out for comment. Von was not at this meeting and nothing new was reported. Roger Ronald said that Raytheon Systems Co. is working on a HIPPI-6400 switch MIB.

8.5 HIPPI-6400 ARP and IP RFC

Jean-Michel Pittet said that the HIPPI-6400 ARP and IP RFC would essentially be a cut-and-paste of the ARP over HIPPI-800 document. He is concentrating on the -800 document now since it is the harder one; the -6400 version should be a subset.

8.6 IEEE Tutorial for HIPPI-6400 ULA usage

Don Tolmie reported that Greg Chesson has contacted Bob Snively of Sun and obtained the format for this document. Drafting of the actual text is pending.

8.7 HIPPI-LE Reaffirm or Amend ?

HIPPI-LE Rev is reaching its 5-year sunset date as ANSI standard X3.218-1993. We need to decide whether to (1) reaffirm it without changes, or (2) amend it, or (3) withdraw it. Don reviewed the changes made since ANSI X3.218 was approved and published (the changes are listed behind the front cover of Rev 3.4). All of the changes suggested to date have been editorial changes from the ISO editor, and these changes have been incorporated

into Rev 3.4. Don felt that amending the published document to include these few editorial changes was not worth the effort, and suggested that if more proposed changes are not forthcoming that we reaffirm the standard as is.

Don took an action item to issue a call for everyone to review the HIPPI-LE document to see if other changes were desired. If no proposals for changes are made, then a vote to reaffirm will be taken at the June T11.1 Plenary.

Jim Pinkerton noted that Jean-Michel's "ARP and IP Broadcast over HIPPI-800" used some specific message types, and wondered if we should include this usage in a revised HIPPI-LE document. After some discussion, it was agreed that the "ARP and IP Broadcast over HIPPI-800" document should be changed to use message type = 0 for all HIPPI-ARP uses. The LLC/SNAP header would then be used to carry the specific message type. It was felt that this was preferred since many implementations now leave the HIPPI-LE header blank. This concept was approved, hence no changes to HIPPI-LE.

8.8 HIPPI-800 / HIPPI-6400 translators

Jeff Young expressed interest in documenting a HIPPI-6400 to HIPPI-800 translation box's capability. After some discussion it was noted that Michael McGowen already had an action item to collect the information. "Documenting the information" was added to Michael's action item. The information could be in an ANSI Technical Report, or a Profile.

8.9 Patents

Jeff Young asked about the status of the HP patent claims against ST. Don reported that HP has not released the patents for the standards process, and that HP seems to be using them as a bargaining chip in their negotiations with SGI for the SuMAC chip. Don queried the ANSI lawyer about the patent issue, and she suggested formally asking HP for the release, and lacking action we can only express our displeasure with HP. If HP still doesn't comply, then Don needs to talk to NCITS about other remedies. Bob Willard felt that the HP/SGI negotiations would probably come to a conclusion within a few months and we should wait before starting to cast stones. This proposal was accepted.

John Gibbon asked if someone could make a frivolous patent claim to stonewall development.

Don felt that we were somewhat vulnerable, but should be able to weed out flagrant violations.

9. Future meeting schedule

9.1 Plenary week, April 21-22, Palm Springs, CA

The April working meeting will be April 21-22, 1998. The location is the Hyatt Regency Suites Palm Springs, 285 North Palm Canyon Drive, Palm Springs, CA 92262, phone 760-322-9000 or 800-233-1234. Jeff Stai and Brocade Communications Systems are the host. The group name for reservations is "Brocade", and the group room rate is \$122 per night including tax and parking. The reservation cutoff date is March 20, 1998. (See the meeting announcement on the web page at <http://www.cic-5.lanl.gov/~det/> for further details.)

Tuesday - April 21 :

9 AM - 6 PM : HIPPI working meeting
6 PM - 9 PM : HIPPI-6400 Optical

Wednesday - April 22 :

9 AM - 6 PM : HIPPI working meeting
6 PM - 8 PM : T11.1 Plenary

Specific new items for the April working meeting include a walk-through of the "ARP and IP Broadcast over HIPPI-800" RFC, duplicate ST operations, and more on HIPPI-6400-PH cable testing.

9.2 Interim meeting, May 12-13, Mountain View, CA

The next interim working meeting will be hosted by Greg Chesson and SGI in Mountain View, CA. The meeting will be held at the SGI facility. No meeting hotel was identified, but participants were urged to make hotel reservations early as rooms are scarce in Silicon Valley. A meeting announcement will be posted on the HIPPI Standards Activities web page at www.cic-5.lanl.gov/~det/ as soon as it is available. Hopefully this will be the last interim meeting and we can just meet during the Plenary weeks in the future.

Tuesday - May 12 : 1 PM - 9 PM

Wednesday - May 13 : 8 AM - 9 PM

9.3 Future meeting dates and locations

A new interim working meeting was scheduled for July 14-15 in Boston, hosted by DEC. The July meeting is tentative now, and will be firmed up or cancelled depending on our work load. If it makes, we will probably start in the morning of the 14th, and adjourn the afternoon of the 15th so people can fly home that evening.

The T11.1 (i.e., HIPPI), Plenary meeting will be on Wednesday evening of the T11 Plenary week, following the HIPPI working meetings.

The 1998 schedule is firm. Note that T11 schedules the plenary meetings. Hopefully HIPPI-6400 will be far enough along that we will not continue to need interim working meetings after May; the May date was firmed up since we now see the need. Recent additions and changes are underlined and bold.

1998 -

Jun 9-10	Plenary	St. Petersburg Beach, FL	AMP
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Jul 14-15 Wkg Mtg Boston, MA DEC

Aug 11-12	Plenary	Portsmouth, UK	Xyratex
Oct 6-7	Plenary	Ft. Lauderdale, FL	Adaptec
Dec 14-18	Plenary	Tucson	FSI

All of the 1999 schedule is new, and just includes the Plenary weeks; no interim working meetings are scheduled yet. Meeting locations and hosts marked with (?) are tentative at this time. The meetings in bold underline without a (?) have been firmed up. Note that the HIPPI and T11.1 meeting days are not specified; they will be somewhere within the Plenary week.

1999 -

Feb 8-12	Plenary	San Diego, CA	Qlogic
Apr 5-9	Plenary	Palm Springs, CA	Brocade
Jun 7-11	Plenary	Minneapolis, MN (?)	Ancor
Aug 2-6	Plenary	Minneapolis, MN	ENDL
Oct 4-8	Plenary	Ft. Lauderdale, FL	Adaptec
Dec 6-10	Plenary	Reno, NV (?)	Solution

2000 Proposed dates -

Feb 7-11	Plenary	San Diego, CA (?)	QLogic
Apr 3-7	Plenary	Palm Springs, CA (?)	Brocade
Jun 5-9	Plenary	(?)	(?)
Aug 7-11	Plenary	(?)	(?)
Oct 2-6	Plenary	San Diego, CA (?)	QLogic
Dec 6-10	Plenary	(?)	(?)

12. Review action items

(The action items are grouped by project or category to hopefully make them easier to find.)

1. Von Welch to contact HIPPI-6400 MIB users and developers for comments on the current draft, and to prepare a presentation on the MIB for a future meeting.
 2. Von Welch to look at developing a HIPPI-6400 host system MIB (for a NIC), to be done now as an annex of the present MIB with the possibility of splitting it out as a separate document at a later date.
 3. Everyone to review the HIPPI-6400 MIB.
 4. Jeff Young to generate an "ARP and IP over HIPPI-6400" document.
 5. John Gibbon to talk to Marck Doppke about processing the HIPPI-800 switch MIB through the IETF.
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6. Greg Chesson to draft an IEEE tutorial on HIPPI-6400 ULA usage, and the ULAs special to HIPPI-6400.
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7. Greg Chesson and Jeffrey Chung to consider developing "reason codes" to explain why a particular ST Operation was rejected.
 8. Greg Chesson to send e-mail detailing reasons for not doing a queue for client/server applications, and suggesting how they could be done in ST.
 9. Jim Pinkerton to do a rewrite of ST original Annex C (now annex D).
 10. Bob Willard to write up something on big/little endian issues for inclusion in the document.
 11. Greg Chesson to collect text for a "folklore" annex in the document.
 12. Greg Chesson to draft text describing how you differentiate duplicate operations from legal operations.
 13. Jim Pinkerton to draft a timestamp option for the optional payload for inclusion in the next ST revision.
 14. Jim Pinkerton to propose text for ST 10.1 on timeout calculation.
 15. Jim Pinkerton to propose text for the T=1 parameter in ST annex E.1.2.
 16. Jim Pinkerton to propose additional text for the keep-alive timers in ST 10.3.

17. Jim Pinkerton to re-write the "Request_Connection arrives and the FSM is not in the Idle state" error condition of ST E.3.4.
18. Ian Philp to draft text describing hashing Bufx or Mx to vector to an operation's parameters.
19. Bob Willard to draft text for ST 6.1.4.4 on FetchOp collision and lockout cases.
20. Don Tolmie to update ST Rev 1.6 with the changes agreed to at the March meeting.
21. Michael McGowen to collect, tabulate, and document everyone's requirements for HIPPI-800 and HIPPI-6400 translation environments.
22. Don Tolmie to issue a call for proposed changes to ANSI X3.218-1993, HIPPI-LE.

13. Adjournment

The meeting adjourned at 9:00 PM on March 11, after a very intense and productive meeting.

Attendance

Jeff Young	Cray Research Inc.	612-683-5536	jsy@cray.com
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