

APRIL 1990 FIBER CHANNEL WORKING MEETING

- Seventy people from 52 companies attended.
- Jim Kubinec of AMD gave pre-announcement review of FOXI integrated FDDI transmitters and receivers. Initial costs said to be \$295/pair with eventual decrease to \$50/pair seen as possible.
- Brent Carlson of IBM Poughkeepsie reviewed latest FC-1 document (Revision 1.2):
 - Included previously adopted four byte delimiter structure and a service interface.
 - Did not include Dirty EOF or Canstar Red/Blue flags.
 - Issue of initial lock pattern ("1010") raised.
 - Safety discussed, Brent accepted action item.
 - Primitives to handle different data path widths defined.
 - Patric Savage accepted action item to define error control.
- Joe Mathis of IBM Austin reviewed latest FC-2 document (1.4):
 - Support for Canstar red/blue scheme discussed.
 - Major problem in supporting Canstar identified as echo detect and retry.

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- Fabric Model with buffering described. R_Ready name questioned.
- Size of the XID field questioned as being too small. Confirmed XID not transaction id and qualified by source.
- Betsy Moore of Amdahl presented method of carrying IBM 370 Channel Control Words (CCWs) over FC:
 - Same XID throughout chain.
 - "Stop transfer" bit in Ack or Ready.
 - Problems with System Reset etc. due to non-broadcast medium.
- Rich Taborek of Amdahl proposed some modifications to FC-2:
 - Give FC-3 control over XID to use as "process id".
 - Change generic device commands named Control and Data to Interlocked and Streaming respectively.
 - Use komma characters for fill (assume zero for CRC).
 - Use second character of SOF for red/blue indication.

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- Roger Cummings of StorageTek presented FC-3 for IPI:
 - Only used Write Device Data frames (i.e. everything streamed).
 - Similar to HIPPI-FP port but with additional functions:
 - Full support for multiple command issuers per executor port.
 - Used primitive signalling for resets.
 - Device Generic Command Set only, not Device Specific.
 - Cleaner flow control and acknowledgement scheme.
- Schelto Van Doorn summarized separate FC-0 meeting:
 - Presentations by Dan Stigliani of IBM Poughkeepsie on mid-range single mode system; Jan Wildrup of Network Systems on coax FC-0; Del Hanson of Hewlett-Packard on link analysis; and Mike Hartmann of BT&D UK on led components.
 - Discussion on appropriate standardization points. Recommendations with straw vote results (one per company):
 - Standardize at electrical output of receiver (11 for, 8 against, 2 abstentions).
 - Include parallel interface definition in annex (19 for, 0 against, 3 abstentions)

MAY FIBER CHANNEL WORKING MEETING

- Thirty-three people from 25 companies attended. Thanks go to Peter Blackford of Astro/Carol cable for excellent arrangements.
- Brent Carlson of IBM Poughkeepsie reviewed latest FC-1 document (Revision 1.2):
 - Reviewed receiver synch rules and synch partitioning with FC-2.
 - Was suggested that unrecognized but valid word not be regarded as loss of sync.
 - Recommended that safety feedback be in FC-0.
 - Use of primitive signalling for offline/online.
- Dal Allan suggested that reduction of address fields to 16 bits be considered.
- Detailed and lengthy review of FC-2 Revision 1.4 performed. Major points:
 - Frame terminology changed.
 - Address field partitioning again discussed.
 - Abort operation to be clarified.
 - Method of addressing fabric TBD (D_ID=S_ID rejected)
 - Ack defined and mutually exclusive with Ready in exchange.

MAY FIBER CHANNEL WORKING MEETING (Contd)

- Frank Shott of IBM Endicott presented longwave laser module approved by CDRH and IEC. IBM encouraged to make available, even if only for prototypes.
- Schelto Van Doorn summarized separate FC-0 meeting:
 - Presentation by Jerry Radcliffe of IBM Endicott on reflection-induced intensity noise.
 - Specify worst-case characteristics with zero margin.
 - Cable plant ground rules discussed (50 and 62.5 micron fiber both included).
 - Only optical jitter defined (i.e. not electrical).
 - Problems with standardizing SC connector highlighted.
- Jerry Radcliffe presented FC-0 block diagram.

JUNE FABRIC WORKING MEETING

- Seventeen people from 12 companies attended. Thanks to Kumar Malavalli and Canstar for hosting.
- Bob Cornelius of Ancor chaired in absence of Terry Anderson.
- Kumar Malavalli of Canstar and Peter Boulton of the University of Toronto presented requirements for supporting the Canstar broadcast hub system with FC-2:
 - Hub responds to any SOF, indicates Broadcast Hub fabric type in F_ACC response to ESTS command.
 - Host port uses optional echo detect/retry only when connected to Broadcast Hub.
 - If echo does not appear within retry time (varies by configuration), transmission is aborted and immediately restarted.
 - Implement red/blue scheme by use of special "blue colored idle" immediately before frame.
- Considerable discussion on requirement for non-Canstar fabrics to propagate red/blue when connected to Canstar. Kumar Malavalli accepted action to work.
- Brent Carlson of IBM Poughkeepsie and Charlie Martin of IBM Kingston presented proposal for fabric initialization and automatic assignment of addresses and routes within the fabric:
 - Includes the determination of fabric element "area codes", collection of worldwide unique names for switch points and ports, and distribution of tables relating names to short addresses.

JUNE FABRIC WORKING MEETING (Contd)

- Additional FC-2 frames for these functions identified and contents defined.
- IBM accepted action to create fabric initialization document. Will solicit participation by DEC (Autonet experience).
- Bob Cornelius of Ancor presented proposal on fabric addressing:
 - Reserve most significant bit to indicate fabric alias
 - Two aliases values identified - Service Access Point (fabric controller) and Name Server.
- Broadcast and multicast discussed:
 - Patric Savage of Shell Development indicated multicast required to allow multiple message transmission using a single operating system call.
 - Agreed to be another FC-2½ function (along with striping)
 - Recommendation agreed that this be renamed FC-3 with present FC-3 level becoming FC-4.
 - Inclusion of address translation in new FC-3 discussed but not agreed.
 - Patric Savage accepted action to create strawman on multicast.

JUNE FABRIC WORKING MEETING (Contd)

- Operation of fabrics in all three Classes reviewed in detail:
 - Class 1:
 - a) Arbitration required to resolve path conflicts. Tie-breaker rule of lower source address agreed.
 - b) F_Busy required to dismantle partial connection after conflict.
 - c) Determined that FC-2 port receiving connection request when it has connection outstanding must react as if its connection aborted.
 - Class 2:
 - a) Buffer required at fabric receiving port for correct operation if buffer elsewhere in fabric.
 - b) R_Readys do not cross buffers and F_Busy generated when timeout causes buffer flush.
 - c) Separate credit counts for R-Readys and P_Readys required. P_Readys only suppressed if destination port has "infinite buffers".
 - Class 3:
 - a) Every frame has XID of 0 Sequence Count of zero.
 - b) Fabric with buffers has to differentiate between Class 2 and 3 because of R_Readys.
 - c) Richard Thomsen of Los Alamos objected to requirement for fabric login in Class 3 and accepted action to propose changes.

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- Jerry Rouse of IBM Austin agreed to incorporate additional items in class definitions in FC-2 for clarity.
 - List of Fabric Goals agreed.
 - Explicit path definition agreed repugnant by all. Roger Cummings of StorageTek in propose elimination.
 - Agreed that Expedited frames should be deleted (if not already done). Richard Thomsen to investigate Priority frames (treated differently by fabric).
 - Kumar Malavalli made two proposals:
 - a) To allow a broadcast fabrics as an option, support Echo Detect, Fabric Login Identification and Implicit addressing
 - b) Support red and blue flags for operation with broadcast fabrics only.
- Straw vote identical for each - eight for, zero against and one abstention.
- Agreed to recommend extending plenary week working meetings to Thursday on basis of success of three day fabric meeting. Starting in August?

RESOLUTIONS

The Fiber Channel Working Group submits the following resolutions to the plenary:

- That the FC-0 document include a parallel interface definition in annex.
- That FC-2 support Echo Detect, Fabric Login Identification Implicit addressing, and Red/Blue flags as options to allow fabrics with broadcast hub topology to be used.
- That expedited frames be deleted from FC-2.
- That Multi-Level Addressing, Explicit paths, and any concept of addressing points internal to the fabric, be deleted from the FC-2 document.