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Date: 16 Aug 90 X3T9.2/90-
From: Kurt Chan, X3T9.2 Principal, Hewlett-Packard
To: X3T9.2 Membership
Subject: 16-bit Connector Retention and 32-bit Physical Layer Thoughts

I would like for the committee to consider the specification of a jackscrew retention mechanism for the 16-bit "P-connector". For reference, I point to ISO/IEC 9318-6, the IPI Enchanced Physical Layer document which describes this retention mechanism. Although only 50 and 100-pin microconnectors are defined, a 68-pin version would be a relatively simple extension.

The reason I've been told that we adopted a new retention design over more proven ones is that the committee wanted a "break-away" connector which wouldn't damage SCSI devices when force was applied to their cables. Another reason for diverging from IPI/HIPPI was that it was perceived that the larger, heavier cables of our higher-performance brethren mandated a more robust retention scheme than SCSI. Some rebuttal:

1. In light of HP's quality concerns over clip retention, we feel that misoperating cables are a warranty problem, whereas clumsy users are a business opportunity.

2. As SCSI migrates to 16 and 32 bits, our cables indeed will approach if not exceed those of the X3T9.3 interfaces in bulk and size.

3. The most ubiquitous connections in the world of small computer I/O have thrived in spite of lacking any breakaway feature. Serial, parallel, and HPIB connectors all use screws. LAN connections have positive locking, and the only reason that SCSI-1 connectors might break away is because nobody uses those infernal bail locks. I suggest that this requirement is ill-conceived.

4. Many of the molded clip designs we've evaluated either do not mate properly (thanks in part to a lack of dimensioning in the standard), or indeed break away when forced -- once. Due to the lack of material on the clips and the brittle nature of the plastics involved, some of these connectors fracture in the process of breaking away. Unfortunately, molded clips seem to be convenient when dealing with molded connectors, which are convenient when using foam cables since they avoid the compression of the foam cabling as it enters the conventional backshell. Of course none of these problems are insurmountable and are being addressed. However, they explain our concern over early implementations of the clip design.

HP's solution has been to add standoffs to a conventional bulkhead connector which make it compatible with both 2-56 screws and the clips shown in the SCSI-2 standard (of course, since there are no dimensions in the standard, we can't be certain of this compatibility aside from having verified interoperability with products from the major connector vendors). This allows our equipment to be used with third party cable, yet still be able to ship our preferred cabling solution from the factory with our host adapters.

I would like to suggest that we adopt a retention mechanism similar (if not identical) to the IPI design for the P connector. This will allow us to avoid problems which will surely be compounded beyond those seen with the 50-pin design, and will also allow us to avoid embarrassing questions (or the more embarrassing answers) in the future about why we chose a different connector from X3T9.3 for such a similar application.

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In addition, we support a single 32-bit connector for all the same reasons we support a single 16-bit connector: fewer components, higher reliability, simpler implementations, and the ability to identify a machine's performance class by it's connector size.

Some of the things I'd like us to think about as we evolve to this connector is that we have the opportunity to break away from some of our existing physical layer restrictions. The schedule for 32-bit silicon should allow us enough time to architect some new functionality into 32-bit SCSI. Among some of the enhancements we could make, and things that I'm interested in contributing to over the next year or so:

- Longer distances (50m?) (perhaps implies some relaxed timing parameters).
- More devices (32)
- Low-power differential exclusively to reduce options and ensure maximal performance.
- A recommended bus fairness algorithm (perhaps just a formalization of previous IBM work).
- Autoconfiguration.
- Cable Break/terminator detection.
- Powerfail and hot insertion support (e.g., disk arrays and redundant systems).
- Topology flexibility - do we want anything besides daisy chaining?

My only requirements for the actual physical connector are:

1. I'd like to see a connector that is smaller than the existing low-density connector in both width and length (which may preclude a two-row microconnector). The reason for this is so that the connector will fit onto the bulkheads of most popular host adapters.

2. I'd like to see a retention mechanism that works.

As you have noted, many of the enhancements have to do with the fact that SCSI is becoming somewhat of a misnomer as we move into the 90's - I encourage us to think creatively about what copper physical layer we would like to see accompany fiber-optics into this decade. In order to make forward progress in SCSI-3 we'll have to depart from some of the older technology left over from SCSI-1. Expect to see proposals from Hewlett-Packard on some of the above items should the committee agree that the 32-bit connector is a realistic opportunity to make the break from SCSI-1 compatibility.