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To: X3T9.2 Membership

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Subject: LRC/CRC Negotiation, Commands vs. Messages

During the November working group meeting there was a lively discussion of George Penokie's "SCSI Data Phase LRC Proposal" (91-176R0). Any LRC or CRC scheme requires that the initiator and target agree that it is being used and parameters affecting its use (e.g., how often or where an LRC or CRC appears).

It was suggested that this negotiation use messages, similar to current practice for synchronous or wide transfers. However some people objected to creating yet another message, saying this caused problems for their implementations. I wish to point out an issue related to but not identical to the message vs. command debate, namely layering and separation of physical channel control functions from device control functions.

Certain functions within SCSI are for control of the physical channel. Synchronous transfer rate and wide transfers are obvious examples of these. In a CAM environment physical channel control functions are primarily the responsibility of the SIM. These functions are only meaningful for the current SCSI parallel bus. Other physical channels (e.g., fiber channel) have their own controls outside the scope of SCSI.

Other functions within SCSI are for device control. These are the functions whereby an initiator controls a target device as opposed to its parallel SCSI bus interface. In a CAM environment device control functions are primarily the responsibility of the peripheral driver. These functions will be relatively unaltered on other physical channels.

The important point is that physical channel control and device control functions are implemented in different layers. One compelling example is a host attached to a fiber channel talking through an adapter to a target on a SCSI parallel bus. The physical channel control is dictated by the adapter's interface hardware, not by anything in the host. The host should not have to know the details of the adapter's parallel SCSI interface hardware. Having the host control the adapter's SCSI parallel interface parameters enormously complicates the system yet provides no benefit.

It is important that it be easy to distinguish between physical channel control functions and device control functions. In the above example, the fiber channel to parallel SCSI adapter needs to be able to intercept and process physical channel control functions. It needs to be able to do this simply, without having to "understand" all the

device control functions. Similarly, in a CAM environment, the SIM needs to be able to easily recognize and process physical channel control functions while passing device control functions on to the peripheral driver.

Negotiating to include an LRC or CRC is physical channel control, dependent on whether a device's bus interface includes LRC or CRC hardware. Furthermore, it is only applicable to the SCSI parallel interface, since other prospective physical channels (fiber channel, P1394) already define their own error detection schemes.

At present, most but not all physical channel control for the SCSI parallel interface uses the message system. The crucial features of data transfers are negotiated by messages. But other parameters are negotiated by commands. For example, the Disconnect-Reconnect Page controls physical channel parameters.

Performing LRC or CRC negotiation with messages is the obvious approach. It keeps the separation of physical channel control versus device control functions no worse than it is now.

However, if we choose to perform LRC or CRC negotiation with commands, we can use that as a tool to remedy layering problems in the current command set. If we choose this route, we should define a command or class of commands that are exclusively for physical channel control. They would include all physical channel control functions from the current command set as well as LRC or CRC negotiation. Presumably the physical channel control functions would also remain in the current (device control) commands, but an implementor's note would state that their use should be avoided.

One minor unrelated point. One objection that was raised to using a command for LRC or CRC negotiation was determining whether or not it's data phase had a LRC or CRC and the resulting complexity. An easy remedy is to decree that the negotiation command's data transfers always have an LRC or CRC, regardless of the current state of the LRC or CRC negotiation.