SCSI + TLS: How It Works

Qualstar White Paper
By: Steve Zook

Questions have arisen over the past few days from several sources about the TLS library's SCSI bus speed and width. First, some terminology:

Narrow
8 bits per data transfer cycle. This is the default (power-on and/or reset mode of data transfer no matter what the bus/device capability). All SCSI devices and cables are capable of this transfer width.

Wide
16 bits per data transfer cycle. This mode is negotiated between an Initiator and a Target device. A 68 pin cable is necessary for this to work (note that neither the Initiator nor the Target is directly aware of the cable width and so if they negotiate for Wide and the cable is only 50 pins, things break).

High Density
The new connector style specified in the SCSI-III specification. Both 50 and 68 pins versions are defined. In ribbon cable, the ribbon cable is .025" in pitch.

Low Density
The original SCSI connector styles. In ribbon cable the cable is .05" in pitch.

Asynchronous
The default transfer speed. In this mode the transfers are controlled by both the transmitter and the receiver with an interlocked handshake. The slower device will set the effective transfer rate. All devices are capable of and default to this speed. This speed is typically in the 0-1.5 MegaTransfer per Second (MTS) range.

Synchronous
A non-interlocked transfer speed. The mode is negotiated between an Initiator and a Target device. This transfer mode is only used in the DATA phase of the bus and is not used for command and message transfers. The transfer in this mode is controlled by the transmitter at the negotiated rate. There are currently 4 industry standard ranges of Synchronous transfer rates: Slow (0-5 MTS), Fast (0-10 MTS), Ultra (0-20 MTS) and Ultra II (0-40 MTS).

Because all devices are capable of Narrow, Asynchronous transfers, this is the default mode and all devices reset to this mode. All faster and/or wider modes are negotiated between individual devices. Thus, Initiator A might negotiate a different mode to Target 0 than to Target 1. Also Initiator B and Initiator C might negotiate a different mode with

Target 2. All on the same bus. No device, however, is directly aware of the type or width of cable(s) on which the bus is implemented. Therefore, if Initiator D and Target 3 are wide capable (and so will probably negotiate to a wide transfer mode), and the cable is only 50 wires, they will fail to transfer data properly (although the parity check should catch the failure).

And so the question: Is our Library a Fast and/or Wide device?

The answer is a matter of how you look at it: If by "Library" one is talking about the Media Changer component of the TLS box (that is the SCSI port that communicates with the robotics), the answer is NO. Our SCSI electronics are capable of Slow Synchronous (although by default we are limited to Asynchronous) and Narrow.
If by "Library" one is talking about the sub-system as a whole (that is the Media Changer and the tape drives), the answer is dependent on which tape drives are being used. The concept here is that if all 6 tape drives in a TLS-46120 are SONY AIT drives, then you have 6 Wide, Fast Synchronous devices and 1 Narrow, Slow Synchronous device in the sub-system. And so I say that the library is as good as its best component instead of as bad as it worst. This is made even more reasonable by the observation that the performance of a library system is dominated by the tape drives not by the robotics. In most applications, the Media Changer transfers a couple of kilobytes of command and control information for every 20 gigabytes of data transferred by a tape drive.