LTO Drive / Tape Library Interface
SCSI Encapsulated Protocol

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LTO Drive / Tape Library Interface

- Agenda
  - Design Goals
  - Features
  - Encapsulated SCSI Protocol
  - Summary
Design Goals

Host

SCSI Bus

Library

Backup data @ 32 MBps+

Tape Drive

Tape Drive

Tape Drive

Library Controller

Serial Lines

Drive control and status @ 9600 baud +
Design Goals

- Library queries drive
- Library controls drive
- Drive alerts library to errors
- Drive accepts LUN 1 commands and passes to library
Features

- SCSI commands transmitted in serial packets
- Information in standard and custom pages
- Commands from library not affected by reservations
- Asynchronous RS-422 at various rates
Encapsulated SCSI (ESP) Command Set

- All supported commands are available to library
  - Library mainly uses Inquiry/Mode/Log Sense/Select
  - Should not do Read or Write commands over serial link

- Vendor-specific pages
  - Status summary
  - Interface control (SCSI bus address, serial baud rate, reset)

- Alert functions:
  - Unit attention, deferred errors, Tape Alert
  - May never be implemented
ESP Architecture

- Serial packet protocol encapsulates:
  - SCSI commands, including task management
  - SCSI data
  - SCSI status
  - Alerts

- Library interface task forwards commands and data to SCSI task for execution

- SCSI task sends data, status, and alerts to library task
ESP Information Over Serial Link

Alert Transaction

Non-Data Transaction

Command

Command

Status

Data & Good Status

Transfer Ready

Data

Status
Command Forwarding (non-data)
Command Forwarding (data-in)
**Fibre Channel drives only**

Command Forwarding (data-out)

- **Command** from Host to Drive
- **Transfer Ready** from Drive to Host
- **Data** from Drive to Library
- **Response** from Library to Drive
- **Forwarded Command** from Host to Library
- **Transfer Ready** from Library to Host
- **Data** from Library to Drive
- **Response** from Drive to Host
ESP Error Checking

- Link layer:
  - Packet header
  - Length
  - Checksum
  - Acknowledgement

- Transaction layer:
  - Packet loss
  - Data overrun/underrun

- Application layer:
  - Command validity
Command Forwarding

- One drive in a library will accept commands at LUN 1
- Each command is sent to the library
- Library sends read data and command status to drive
- Drive returns data and status to host
- SCSI disconnect after command out
Summary

- Commands, alerts, and data over RS-422
- Reliable delivery
- Additional information via vendor-unique pages
- Accessible via serial port or SCSI bus
- Command forwarding
Questions