

Emerging Storage Management Standards for Intelligent Digital Data Storage Devices

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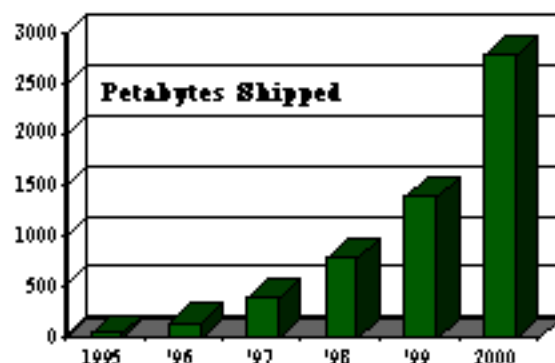
Outline

- Data storage subsystem reliability and data integrity
- Proposed industry storage management standards
- The “MEMRI” approach
- The “TapeAlert” approach
- Current status of these standard developments
- Potential integration of the “MEMRI” and the “TapeAlert” efforts
- Perceived qualities of a combined standard
- Possible approach

Data Storage Subsystem Reliability and Data Integrity

The magnitude of storage requirements for mass storage, high performance applications, and the Enterprise has risen drastically and will continue to rise.

The Computer Storage Market - Worldwide



1995 data; remainder, estimated
source: International Data Corporation

*For **sequential** storage media subsystems, there exist no standardized techniques that allow the host to identify potential errors and problems that may compromise storage reliability or integrity.*

Data Storage Subsystem Reliability and Data Integrity (Continued)

The following questions need to be answered continually:



- What is the level of correction that is taking place in the storage device?
- Should the given media continue to be used, or should the data be copied to fresh media?
- Is the device/library functioning correctly, in need of maintenance, nearing failure or failed?

Proposed Industry Storage Management Standards

- Industrial groups are developing techniques to monitor the reliability of sequential storage devices and the data integrity of stored data:
 - **MEMRI “Media Error Monitoring and Reporting Information”**
 - A standard being developed under the Association for Information and Image Management (AIIM) International, Optical Tape Subcommittee.
 - Current scope is techniques and metadata to verify stored data on optical tapes.
 - **TapeAlert™**
 - A specification being developed under the TapeAlert Working Group.
 - Developed by Hewlett-Packard as a proposed new industry standard for magnetic tape drive management.

The “MEMRI” Approach

- Defines a means of transporting media error monitors, reports and information in a technology and interface independent manner.
- Defines information-level and report-level content.
- Defines a standard means for describing and transporting standardized and vendor-specific metadata contained in accumulators and registers.

The “TapeAlert” Approach

- Magnetic Tape Drives/Libraries:
 - Perform constant self-diagnostics.
 - Interpret this information into standard high-level error flags.
- Storage Applications:
 - Access the error flags via SCSI Log and Mode Pages.
 - Are enabled by the flags to clearly communicate the behavior of the drive or the library.
 - Can therefore improve the overall reliability and usability of the storage solution.

Comparing the “MEMRI” and the “TapeAlert” Approaches

- **The proposed standard based on MEMRI™ is interface independent.**
 - Auxiliary standards (or an extension of the standard) perhaps required to specify transport across popular interfaces.
 - Currently proposed for optical tape devices but with the goal of extending the activity to any type of sequential storage media.
- **The current TapeAlert™ specification is specific to magnetic tape SCSI devices.**
 - But could be easily adapted to other interfaces.

MEMRI™ Metadata Collection

- Accumulates extensive statistics:
 - Across media and drive lifetime
 - Across many media and drives
 - Collected into a single database of media metadata
- Media and drive failures can be computed from trends:
 - Across long time periods
 - Across many media use sessions

TapeAlert™ Metadata Collection

- TapeAlert™ specifies event driven monitoring.
- Drive failures or media degradation are flagged when they occur.
- Accumulation of trend metadata is not explicitly specified.

Current Status of the “MEMRI” Effort

- The initial proposal for an ANSI/AIIM standard has been accepted by AIIM.
- It is being developed under Subcommittee C21.3, “Optical Tape”.
- The scope of the proposed standard has been defined and technical proposals have been discussed.
- The content of the standard is being generated by the subcommittee.

Current Status of the “TapeAlert” Effort

- Specification versions through 2.0 are fully written.
- The TapeAlert Working Group includes about 13 major tape drive and backup software companies.
- Compliance to the specification is certified by the TapeAlert Logo Program Licensed by HP.

Potential Integration of the “MEMRI” and the “TapeAlert” Efforts

- TapeAlert™ is well-accepted in the industry.
- Proposed enhancements in the proposed standard based on MEMRI™ would allow trend prediction of reliability.
- The AIIM “MEMRI” Ad-Hoc of Subcommittee C21.3 will present a proposed integration of both efforts at the next TapeAlert Working Group meeting (April 7th) for the development of a standard(s) based on TapeAlert™ and MEMRI™ for all types of sequential storage media.

Perceived Qualities of a Combined ANSI Standard

- Will support magnetic and optical sequential storage removable devices and libraries.
- Will provide device and media error monitoring and reporting.
- Will specify techniques to verify the state of the device and the stored data on the media.
- Will specify how to transport the related metadata:
 - In a technology and interface-independent manner.
 - Providing transport layer specification for popular interfaces such as SCSI.
(Can be extended to other interfaces as needed by industry.)
- Will provide different levels of conformance to support different levels of system sophistication and requirements.
- An equivalent international effort from an approved ANSI standard possible, if needed.

Possible Approach

- AIIM Committee C21, “Storage Devices, Media, Systems, and Applications” - SDMSA Committee
 - C21.1, “FSMS”
 - C21.2, “COLD Technologies”
 - C21.3, “Optical Tape”
 - **C21.4, “Intelligent Data Storage Devices” (Proposed)**
- Proposed strategy:
 - “TapeAlert” and “MEMRI” membership and any other interested organization to submit to AIIM a project proposal for the development of a ANSI/AIIM standard
 - Propose C21.4 as the home for this activity