Proposal for Storage and Access of Data on Media Auxiliary Memory T10/99-223r1

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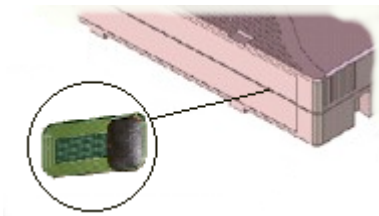
Overview of Presentation

- Background on the technology
- Opportunities and benefits
- Libraries: barcodes vs MAM
- The need for a common access method
- Existing proposal and *new changes*
- Implementing software support
- Standardisation route
- Current status and actions
- Proposal details

Background on the Technology

- Tape cartridges are incorporating E^2PROM

Sony AIT-MIC



HP/IBM/Seagate LTO-CM

?

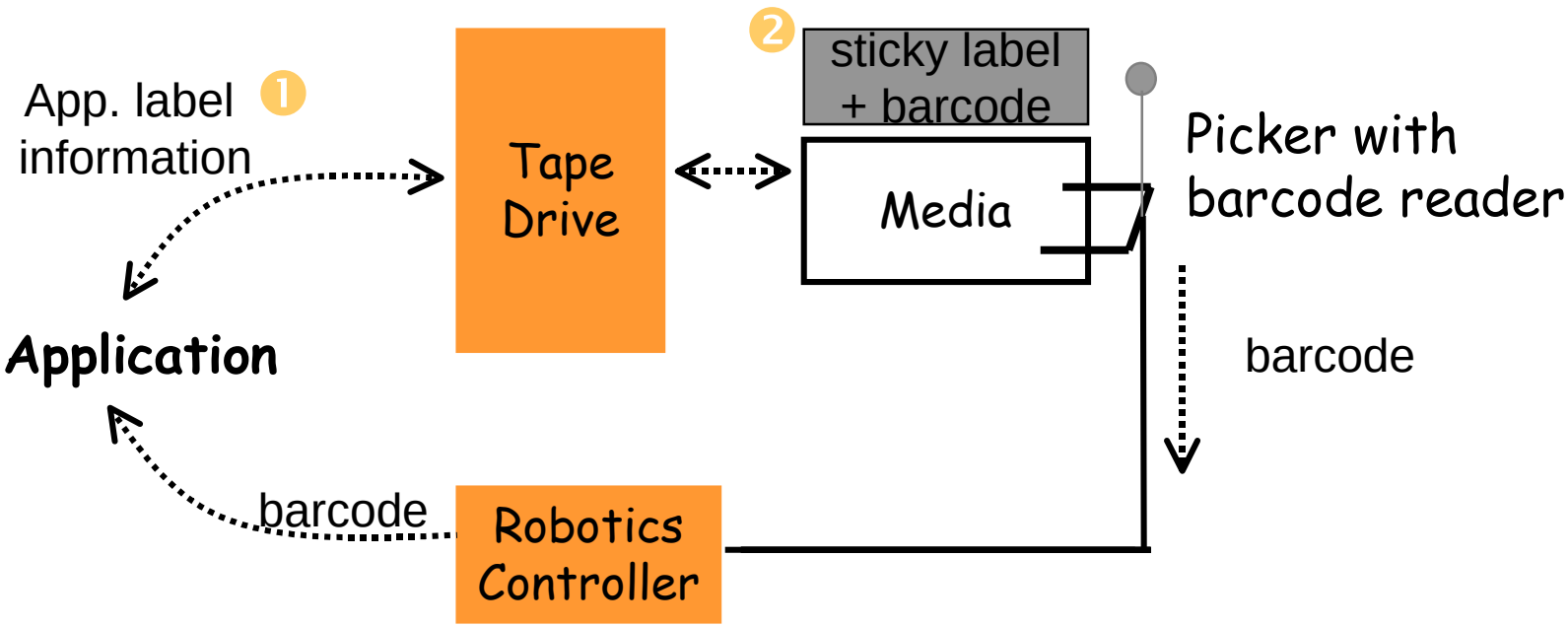
Others to come...

- "Media Auxiliary Memory" is generic term
- Primary purpose is to speed up drive internal operations e.g. load/unload, spacing - transparent to host

Opportunities and Benefits

- Free space in MAM can be used by host software for solution value-add
  - Fast library inventory via picker arm-mounted MAM readers
  - Independent label printers
  - Handheld readers and instrumented media vaults
  - Security information and encryption keys
  - Correlation of media condition and drive load history
  - Improved media tracking in the enterprise
  - Enables/safeguards media sharing in Storage Area Networks
  - Anything else software vendors can think of...

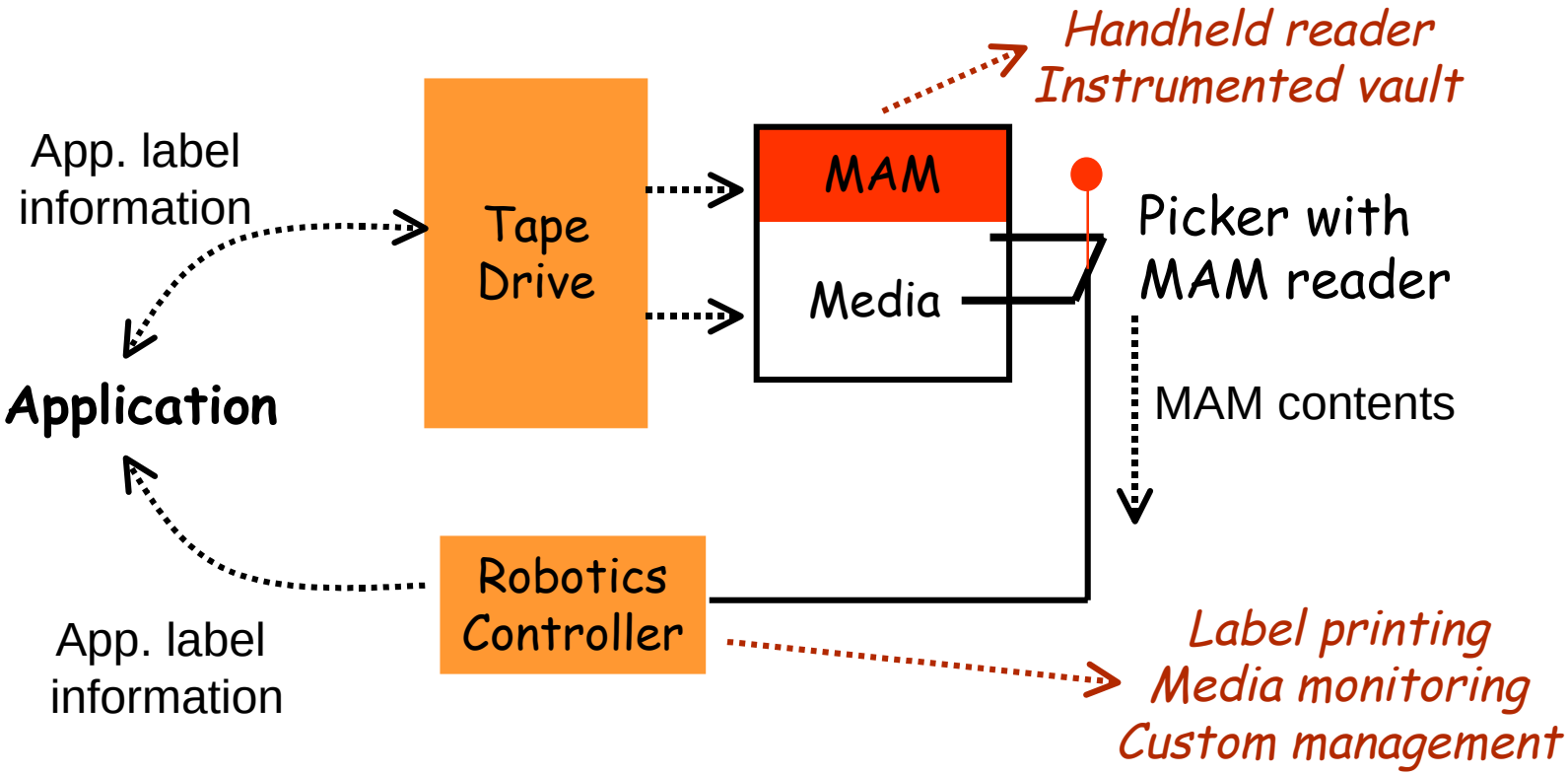
Current Libraries - Barcodes



Issues:

1. Application needs to establish and confirm the relationship between barcode and application label - needs a census operation
2. Physical label subject to human error

MAM in Libraries



- ☑ Library & drive aware of application level information
- ☑ No human interaction ➔less errors
- ☑ Enables extended applications ➔ e.g. label printer
- ☒ ISV support needed ➔needs standards!

Common Access Method

- Application software vendors require a common access method to avoid re-implementing for each tape drive technology
- A common, technology-independent access method is being proposed by Hewlett Packard - “Proposal for Storage and Access of Data on Media Auxiliary Memory”
- Tape drive vendors need to move to using SCSI Log pages ratified through T10
- *New SCSI commands to read and write MAM*

Overview of Existing Proposal

- **“Proposal for Storage and Access of Data on Media Auxiliary Memory”**
  - Version 5.2, 19 May 1999 (T10/99-148r1)
- **Proposes:**
  - **Log page 0Ah** (currently shown as reserved) to be the ‘Media Auxiliary Memory Information Page’ - allows reading and writing to MAM
  - **Inquiry Vital Product Data page 84h** to be the ‘Media Auxiliary Memory’ page - allows media detection in SANs where devices may be reserved by other hosts
  - **Read Element Status** command extensions to allow media changer devices to read MAM

Changes to Existing Proposal

- **New SCSI commands for SPC**
  - Write Attribute
  - Read Attribute
- **Data structure**
  - Terminology: “Attributes” not “Parameters”
  - Existing definitions retained, but become device-specific in SSC. Other device types can define their own attribute sets
- **Existing SCSI commands**
  - **Inquiry VPD page 84h** to be retained
  - **Log page 0Ah** is no longer required
  - **Read Element Status** - no extensions now proposed

New SCSI Commands

- **Write Attribute**
  - Opcode 8Ah
  - Allows library devices to write MAM contents - not possible with previous proposal
- **Read Attribute**
  - Opcode 8Bh
- **16-byte CDB Fields**
  - “Attribute Class” - Media Aux. Memory / Device Aux. Memory
  - “Element Address” - For devices with multiple locations (e.g. libraries with many pieces of media)
  - “Volume Number” - For locations with multiple MAMs (e.g. dual-sided optical media)
  - *Concept only at the moment - full definition is required*

Implementing Software Support

- All MAM attributes are accessible via new SCSI commands, for *all* device types (e.g. libraries as well as tape drives)
- Mandatory MAM attributes are common to each device type

Standardisation Route

- Proposal versions on TapeAlert Working Group email reflector since February 1999
- T10 SSC proposal T10/99-148rX
- Significant collaboration between HP and Sony to ensure AIT/LTO compatibility and future extensibility
- IHV/ISV comments/inputs integrated into proposal
- Nearly ready for inclusion in SPC

Current Status

- Still some minor outstanding issues
  - Final proposal needed for inclusion in SPC
- Vendors are keen to implement soon
  - Drive manufacturers are ready to implement
  - Some ISVs are very keen to use MAM and are ready to implement now
  - Significant interest from non-tape parties also
- Seeking T10/T11 tape group endorsement
  - Need to be ready for SPC inclusion

Specific T10/T11 Actions

- **SPC**
  - Include new SCSI commands in SPC-2
  - Identify Inquiry page 84h as reserved for MAM. Reference **T10/99-148** in SSC-2
- **SSC**
  - Define Attribute Set for stream devices (‘parameter’ definitions from T10/99-148)

Other Actions

- Revise proposal T10/99-148 to include new SCSI commands - *HP*
- Split into Access Method (for SPC) and Attribute Set Definition (for SSC)
- Full presentation of proposal at September ‘99 T10/T11 meetings

Detail of Proposal (1)

- Data represented as logical *attributes* - physical MAM format irrelevant to host software
- Attributes are device class specific (e.g. tape)
- Attributes grouped into *areas* to signify source of changes, and whether mandatory or optional

Parameter IDs	**Area Name**	**Support multi-partition media**	**Support in single-partition media**
0000h - 01FFh	Multi-partition area	Mandatory	Partially Mandatory
0200h - 03FFh	Media Mandatory area	Mandatory	Mandatory
0400h - 04FFh	Device Mandatory area	Mandatory	Mandatory
0500h - 05FFh	Host Mandatory area	Mandatory	Mandatory
0600h - 06FFh	Media Vendor Unique area	Optional	Optional
0700h - 09FFh	Device Vendor Unique area	Optional	Optional
0A00h - FFFFh	Host Vendor Unique area	Optional	Optional

Detail of Proposal (2)

- **Multi-partition Area**
  - Provided for compatibility with Sony's existing MIC format for AIT media,
  - Can be used by other multi-partition drives that wish to follow the AIT model.
  - Non-AIT drives need only support a subset of the attributes in this area
- **Media Mandatory Area**
  - Hardcoded at media manufacture time - read-only
  - Allows host to determine physical media characteristics, manufacture date, unique serial number, etc.

Detail of Proposal (3)

- **Device Mandatory Area**
  - Maintained by device
  - Allows host to determine current media status, e.g. *remaining tape capacity, remaining MAM capacity* and media history
    e.g. *load count, TapeAlert flags, drive load history*
- **Host Mandatory Area**
  - Maintained by software applications
  - Allows host to write basic ownership information e.g. *application vendor, name and version; media text label; date and time last written*

Detail of Proposal (4)

- **Media Vendor Unique Area** (optional)
  - Placeholder for future media vendor usage
- **Device Vendor Unique Area** (optional)
  - Device technology-specific usage, e.g. extended multi-partition information, ECC/retry rates
- **Host Vendor Unique Area** (optional)
  - Software application value-add, e.g. backup session information, disaster recovery information
- **Limitations**
  - Typical 4kbyte MAM only leaves ~1.5kbytes for host usage. Not enough for a complete file catalog at the moment, but sizes will increase with time