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Long Term Asset Storage, Archive and Preservation with AXF

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Agenda

- Content Storage Management system (CSM) and Hierarchical Storage Management (HSM)
- Which storage technologies to use for preservation?
- Format expectations on data tape ?
- Questions

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CSM Environment

Transmission

Newsroom

Post Production

Online Publishing

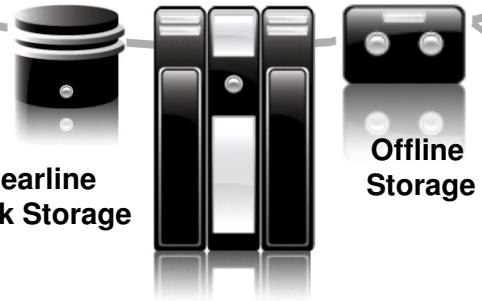
Daily Ingest

Content Storage Management

Digital Archive

Deep Archive

Migration



Nearline Disk Storage

Offline Storage

Nearline Tape Storage

Disaster Recovery

Solutions for the past, present and future of media

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Content Storage Management (CSM)

- CSM is a content aware, intelligent archive management solution
- CSM is middleware (software) which resides between any devices which produce/consume file-based content and commodity storage
- CSM solutions are based around “content aware” features such as transcoding, timecode partial restore, file based QA, asset analytics, etc.
- CSM solutions allow connection to various higher level systems to fundamentally link dynamic metadata with the content repository

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CSM – HSM Comparison (1/2)

•Content Storage Management

•Focused on complex objects like audiovisual content

•Content aware (inline transcoding, video, audio analysis, checksum, etc.)

•Direct interface to external devices like NLE systems or applications via rich API

•Content can be archived to disk or tape on demand:

- Supports **multiple instances** of identical content on the same tier of storage
- Content can be grouped per thema
- Offline storage

•Automatic defragmentation in background

•Content is managed through Database

•Supports command priorities

Hierarchical Storage Management

- IT centric solution designed for computer files having no link together
- No Content aware
- No direct interface to conventional broadcast equipment
- Content always archived to disk first:
  - Copies of files are all at the same level
  - Can make difficult the Offline Storage
- No Media repack operation
- Stub Files
- No priority mechanism

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CSM – HSM Comparison (2/2)

Content Storage Management

- Distributed architecture
  - Load balancing
  - High scalability
- Multisite archive replication for disaster recovery
- Supports Partial File Restore (TC based)
  - DIVArchive supports more than 100 different formats
- Application Filtering with rights

Hierarchical Storage Management

- Monolithic
- No multisite functionality
- No Partial File Restore
- No filter rights at application level

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Storage Technology Choices

	Hard Disk Storage	Flash Storage	Optical Storage	Data Tape Storage
Pros	• Fast transfer speeds • Good storage density • Random access media • Fast mechanical times • Multiple R/W streams	• Random access • Persistent storage • Low energy costs • Acquisition format • Fast access • Rugged	• Random access • No contact read/write • Acquisition format • Emerging holographic • Low replication costs	• Fast transfer speeds • Storage density • Rugged media • Cost per TB • Extremely portable • Expansion costs • Low replication costs
Cons	• Tied to host chassis • Not portable • Cost per TB • Cost of ownership • Highly mechanical • Expansion costs • High replication costs	• Limited read/write • Cost per TB • Proprietary formats • Low transfer speeds • Low storage density	• Low storage density • Low transfer speeds • Questionable shelf life • Portability • Single R/W stream	• Sequential data access • Head and tape wear • Slower access • Single R/W stream

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Data Tape is the Only Solution

- Unmatched storage density
- High performance media ensures no bottlenecks
- TCO is low as data tapes consume no power or cooling
- Low media costs allow automatic offsite asset replication
- Checksums confirm all subsequent file operations
- Automatic migration to new formats ensures longevity
- Initial capital costs are high but flatten out very quickly

Solutions for the past, present and future of media

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Ideal Solution to store assets for long term?

- Key goals of the "ideal storage solution" include:
  - Ensure long term accessibility and preservation
  - Self describing assets and self describing storage media
  - OAIS (Open Archival Information System) features such as fixity, provenance, checksum, etc.
  - File encapsulation to wrap related metadata and files
  - Scalability for any number of elements of any size and type
  - Standardized regardless of storage media technology
  - Transportability and compatibility between systems
- What choices are there?

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What About TAR?

- Tape ARchive (TAR) format has been around for many decades
- Despite following established standards there is no true “standard” TAR implementation
- TAR is an archaic format which disables the core value of the CSM solution as it does not allow timecode based partial restore, etc.
- TAR does violates most of our key storage goals outlined

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What About LTFS?

- The Linear Tape File System (LTFS) is basically … a simple file system for linear data tape
- LTFS relies on modern data tape partitioning functionality and makes data tapes appear as "removable USB drives"
- LTFS does not offer preservation features such as those defined in the OAIS model
- LTFS is not a standard
- LTFS is useful for the physical "transport" of file based content as a video tape replacement but **not** for long term storage or preservation

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Key LTFS Limitations

- LTFS has no concept of media encapsulation forcing users to rely on rudimentary folder hierarchies to form important asset relationships and context
- LTFS cannot scale as it has no support for spanning across storage media, a file cannot be longer than an LTO tape
- LTFS is a data tape based technology which does not apply to disk or other storage formats
- Unfortunately neither LTFS nor TAR help us realize our long term storage and preservation goals, what else there?

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What is AXF?

- AXF is a fully self-contained, self-describing file storage "container" or “wrapper”
- AXF does not overlap with MXF or other “media wrapper” approaches as these are simply files inside an AXF Object
- AXF is based on an innovative “file system per object” approach which fully abstracts the underlying operating system, storage technology and file system
- AXF supports **all** storage technologies – now and into the future!

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AXF Technology

- AXF Objects can scale to any size and encapsulate any number of files with full support for media spanning
- No need to upgrade existing systems as AXF does not rely on modern tape functionality such as partitioning
- AXF guarantees long term compatibility and resiliency with self-describing features for **both** AXF Objects and AXF Media
- AXF overcomes all the technical, operational and functional limitations of TAR and LTFS
- AXF is an IT-centric implementation and is not limited to media files alone (metadata, documents, image files, etc.)

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AXF
archive exchange format

OpenAXF.org

- OpenAXF.org is the community portal for the AXF initiative
- The website includes news, documentation, videos and whitepapers providing technical details on AXF
- This is the focal point for the AXF community – please sign up now!
- Front Porch Digital has contributed our AXF intellectual property to SMPTE and is actively working on its standardization

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Thank you !

Any questions ?

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