

Archive eXchange Format: Interchange & Interoperability

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Today's Guest Speakers



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5

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Background

- History
 - Proprietary Systems
 - Formats on Media
 - Interface Protocols
 - Same System Type Required for Recovery
 - Media Migration Not Easy
 - Danger of Orphaned Archives — If System Support Ends
 - High Costs of Implementation & Operation
 - Individualized System Integration Requirements
 - Transfer Costs Resulting from Inability to Interchange Media

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Objectives

- User Requirements
 - Movement of Material Between Different Archive Systems
 - Between Different Operations of Same Company
 - Between Companies
 - Retrieving Files & Metadata from Media Into Different Systems
 - Flexibility in Changing Archive Management Vendors
 - No Loss of Data or Metadata When Changing Vendors
 - No Requirement for Native Use of Format

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Objectives (2)

- User Requirements – cont'd.
 - Archive Investment Protection
 - Ability to Retrieve Files & Metadata In Absence of Creating System
 - Ability to Read Media Into Other Archive Systems
 - Ability to Retrieve Media Contents w/Simple Utility on Many OSs
 - Automation Metadata Support
 - Inclusion of Metadata for Systems Interacting w/Archive Systems
 - E.g., Traffic, Automation, Editing Systems
 - Allow Importing “Discovered” Items into Databases

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Objectives (3)

- Additional Requirements
 - Providing Unlimited Storage Capability (File Size, Number of Files, etc)
 - Providing an Implementation Strategy
 - Providing Support for All Types of Media – Current & Future
 - Providing for Storage on More Than One Medium – “Spanning”
 - Providing for Information Recovery from Damaged Media
- Underlying Assumption
 - Same Type of Media Supported on Both Systems
 - Source of Medium & Recipient of Medium
 - Drives, Drivers, & Control Software

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Implementation Strategy

- Large Existing Installed Base & Large Archive Inventory
- Initially, Explicit Export & Import
 - Export of Archive Objects to Media Specifically for Interchange
 - Importing of Archive Objects into Receiving Systems
 - By Translating to Native Formats of Receiving Systems
 - By Inclusion of Interchanged Objects in Databases
- Later, Adoption of Format as Native in Archive Systems
 - Eliminating Need for Separate Export/Import Steps
 - Permitting Direct Transfer of Media Between Systems

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Implementation Strategy (2)

- Data Recovery Utilities Available Through SMPTE
 - To Be Contributed by WG Participants
 - For Wide Variety of Operating Systems
 - For All Media Types
 - Permitting Data Recovery without an Archive System
 - To Help Ensure Access to Archived Files & Associated Metadata

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SMPTE Standard

- SMPTE ST 2034 Part 1 Being Written
- Result of Years of Work & Refinement
- Uses XML Schema to Define Most Structures
- Expected to Begin Balloting Process This Year
- Part 2 Will Be Recommended Practice on AXF Application
- Caution: Following detailed descriptions are work in progress
 - Some Details May Change

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AXF Specifications Overview and Technical Details

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How are my Valuable Assets Stored?

- We must take steps to ensure long term accessibility to valuable file-based assets stored in digital archives in all industries
- Key goals of the “ideal storage format” include:
 - Ensure long term accessibility
 - Self describing assets and self describing storage media
 - Encapsulation to maintain important metadata and file relationships
 - Scalability for any number of elements of any size and type
 - Standardized regardless of storage media technology
 - Transportability and compatibility between systems
 - Preservation (OAIS) features such as fixity, provenance, etc.
- What choices are there?

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What About TAR?

- Tape ARchive (TAR) format has been around for many decades
- There is no true universal TAR implementation but many “customized” ones
- TAR is a legacy format which cannot support many of the core functionality required in the M&E space
- TAR does not address many of the storage format goals we have outlined
- Do we have any other choices?

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What About LTFS?

- The Linear Tape File System (LTFS) is a simple file system for linear data tape
- LTFS makes data tapes appear as “removable storage”
- There are no standards bodies which currently endorse LTFS although it is often mistakenly referred to as a “standard”
- LTFS also has some significant limitations with respect to the storage format goals we have outlined
- LTFS is very useful for the physical “transport” of content but not for long term storage or preservation
- But why?

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What About LTFS?

- LTFS offers no media encapsulation and relies on simple folder hierarchies to form important asset relationships and lacks context
- LTFS does not scale well due to lack of support for spanning across storage media – a significant problem in M&E
- LTFS only supports modern data tape technologies and is not applicable to any other storage technologies
- Neither LTFS nor TAR achieve 100% of our long term storage and preservation goals
- What other choices are there?

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What About AXF?

- AXF is a file collection “wrapper” (think of it as an advanced ZIP) which can encapsulate any number of files of any type and size
- AXF does not overlap with MXF or other “media wrapper” approaches as these are simply files inside AXF Objects
- AXF brings the same level of universal transport and interoperability to storage as MXF has for media
- AXF has been designed to support all storage technologies – now and into the future
- AXF is IT-centric and not tied to media applications alone

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AXF Features

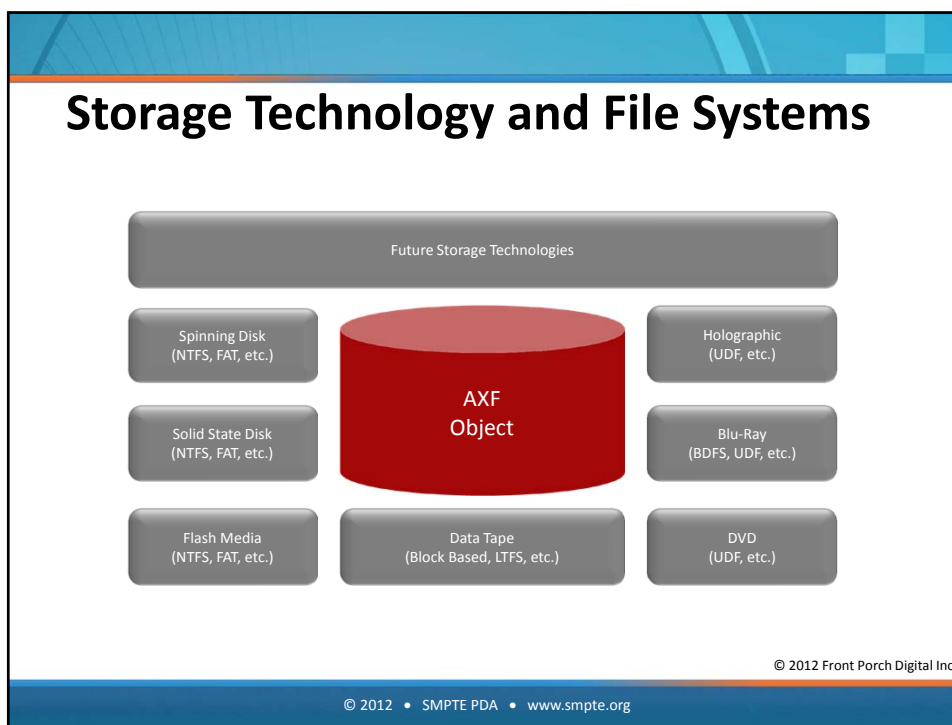
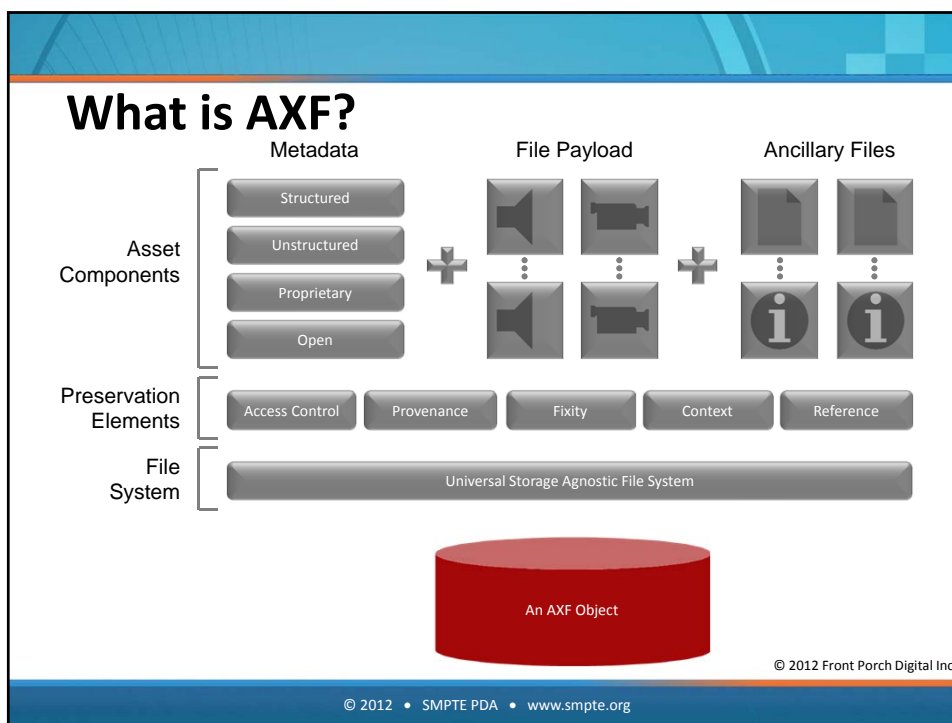
- Unlimited Storage Support
 - Any number of files, any size of files and media spanning
- Resilience to Media Damage and Corruption
 - Redundancy in all structures; payload can be independently recovered
- Support for Media with and without a File System
 - Raw data tape, LTFS data tape, spinning disk, flash media, optical, etc.
- Support for Any File System or Operating System
 - Embedded file system abstracts the underlying operating and file system

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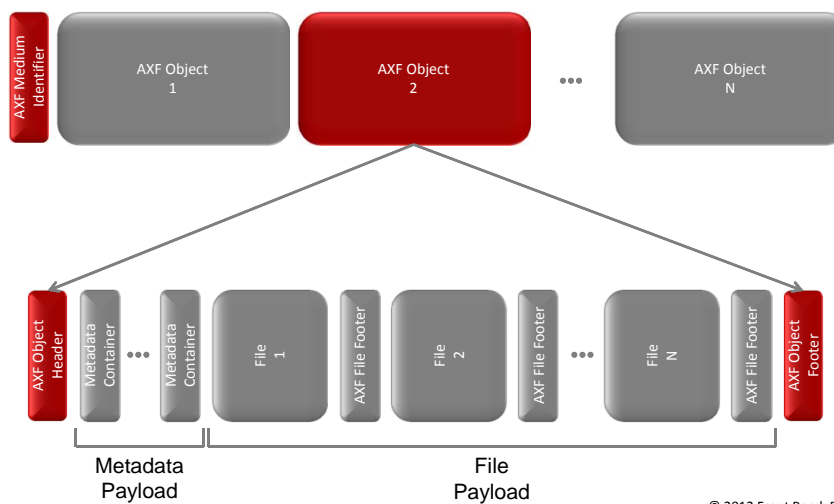
AXF Features

- Self describing Objects and Self Describing Media
 - Enables simple transport of objects and media between systems
- Object Versioning and Collection Support
 - Supports complex relationships between objects; additions, updates, etc.
- Support for All File Types – Not Just Media Files
 - IT-centric implementation based on experience in M&E big data handling
- Streaming and File Based Asset Transport and Delivery
 - Support for streaming de-encapsulation; in-path checksums for structures and files; cloud storage and delivery applications

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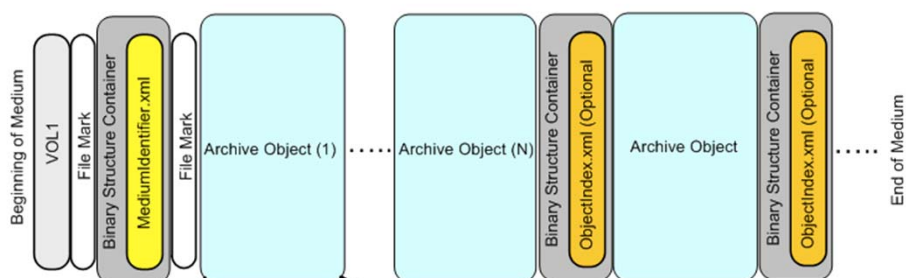
AXF on Storage Media



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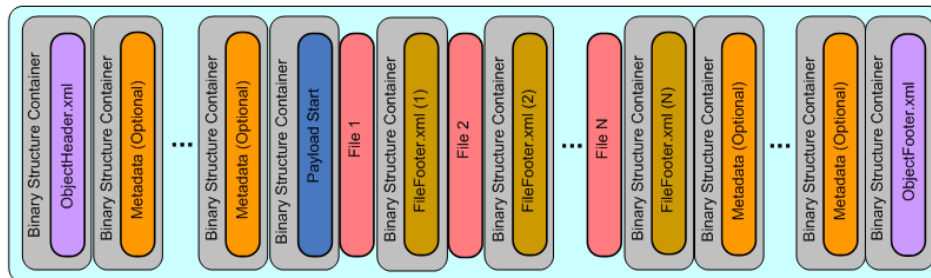
AXF Layout on Linear Medium



Important: Standard has not been published. This is a status update only

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Inside an AXF Object



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AXF Features Summary

- AXF Objects can scale to any size and encapsulate any number of files with full support for media spanning
- No need to upgrade existing storage infrastructures
- 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 (documents, imaging data, etc.)
- AXF does satisfy all of our ideal storage format goals

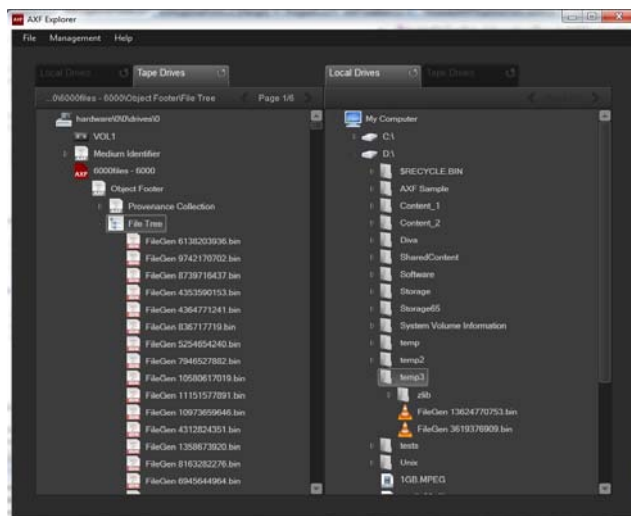
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AXF in the Industry

- Manufacturers are beginning to release products which fully support AXF today
- Implementations are based on the SMPTE draft technical specifications which is nearing completion
- Universal exchange tools such as *AXF Explorer* can be used to access AXF objects stored on data tape, disk, etc.
- AXF is also the basis for cloud-based asset transport, archive and preservation services being offered – AXF is not just for storage!
- Very important milestone for the media, archive and preservation communities and offers real-world proof of AXF

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AXF in the Industry



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OpenAXF.org



- OpenAXF.org is the community portal for the AXF initiative
- The website includes news, documentation, videos and whitepapers providing additional technical details on AXF
- This is the focal point for the AXF community – so please sign up now!
- SMPTE is always looking for active participants (users, manufacturers, etc) to help bring other perspectives to AXF
- Visit smpte.org for more information

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Q & A

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