Strawman Proposal

for

Archival Format

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This Proposal is for a Tape Format Standard

- **Which exists at the logical level (i. e. above the electromagnetic specifications, error-correcting code, etc..)**
- **Which would span different tape technologies**
- **Which would carry file-level metadata on the tape itself**

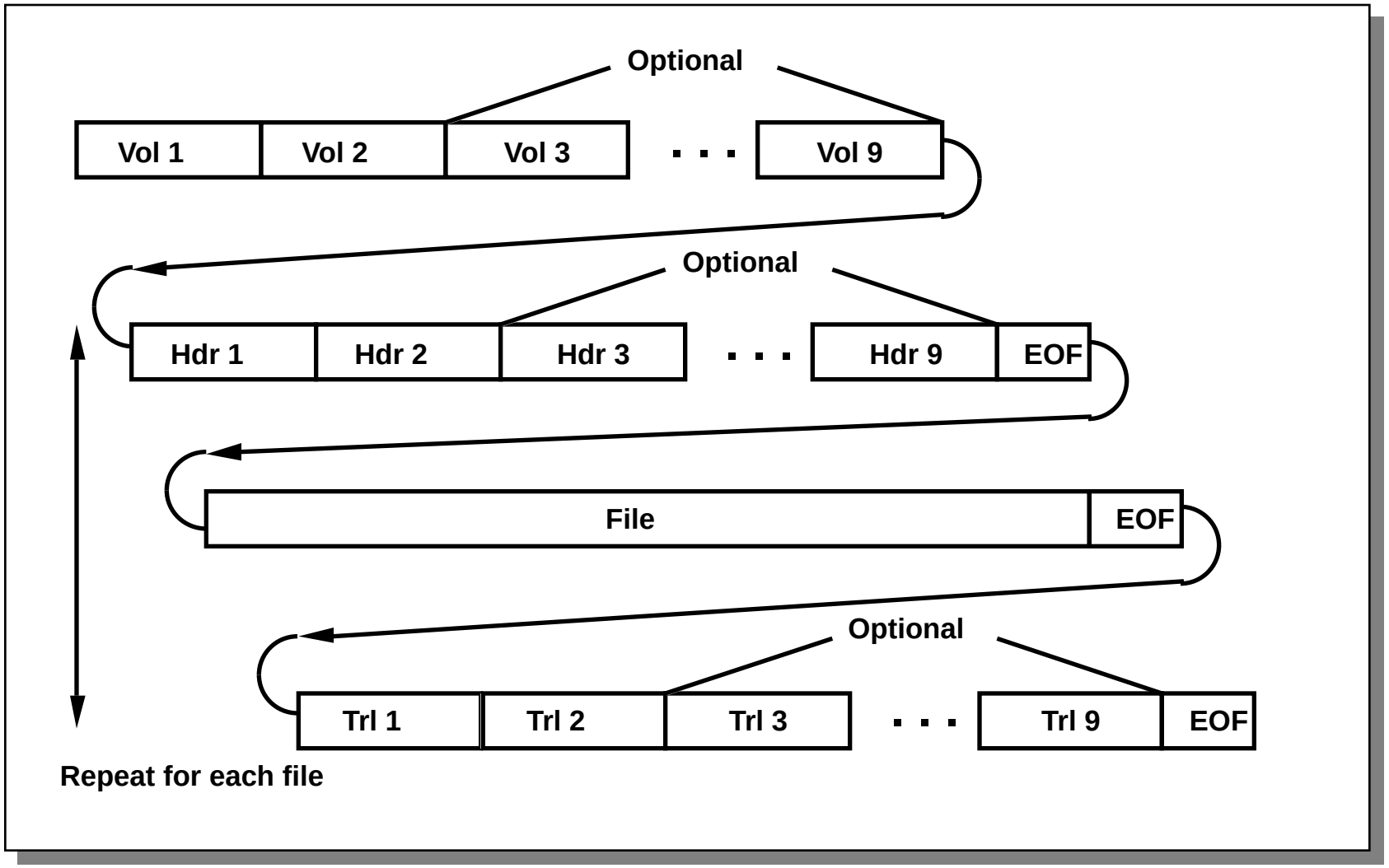
Motivation

- **This activity is motivated by the following scenarios:**
- **(1) There are several hundred thousand tapes in a tape archive. These tapes have been written by a hierarchical file management system, and this file management system is to be replaced. The tapes, however, are to reside in the same robotic storage silos. The new file management system must eventually re-write the entire archive to its format**
- **(2) A large tape archive needs to be transferred from one facility to another. Because the two facilities have different hierarchical file management systems, the tape archive must be re-written.**
- **The re-writing of this archive is, of course, costly, risky, and resource-consuming.**

Goals

- **Ability to transfer tapes from one file management system to another seamlessly**
- **High-level format which encompasses many physical formats**
- **File-level metadata on the tape itself**
- **Support multi-reel files and striped files**
- **Ability to reconstruct the file system just from reading the tapes**
  - **—Hopefully this will not be necessary**

ANSI X3.27 - ISO 1001-1986 Tape Format Standard



Problems With This Standard

- **Information on the files is scattered over the tape, not centralized**
- **If a tape is mounted containing the second file section of a multi-reel file, there is no indication of the location of the first section of the file**
- **There is no support for striped files**
- **17 character file name--not possible to include the full file name, much less the full path name.**
  - **—80 Character headers**

Partitioning of a Tape

- **Definition: a partition of a tape is a part of the tape which may be updated without changing any other part of the tape after or before the partition.**

Some Current Standards

Standard or Practice	Partitioning Allowed?	Directory on Tape?
D1	Yes	Yes
D2 - EMASS	Yes	Yes
D3	Yes	Yes
DDS (3.81mm)	Yes	No
IBM Magstar	Soon	Unknown
Quantum DLT	Yes	Unknown
Exabyte 8mm	Yes	Unknown

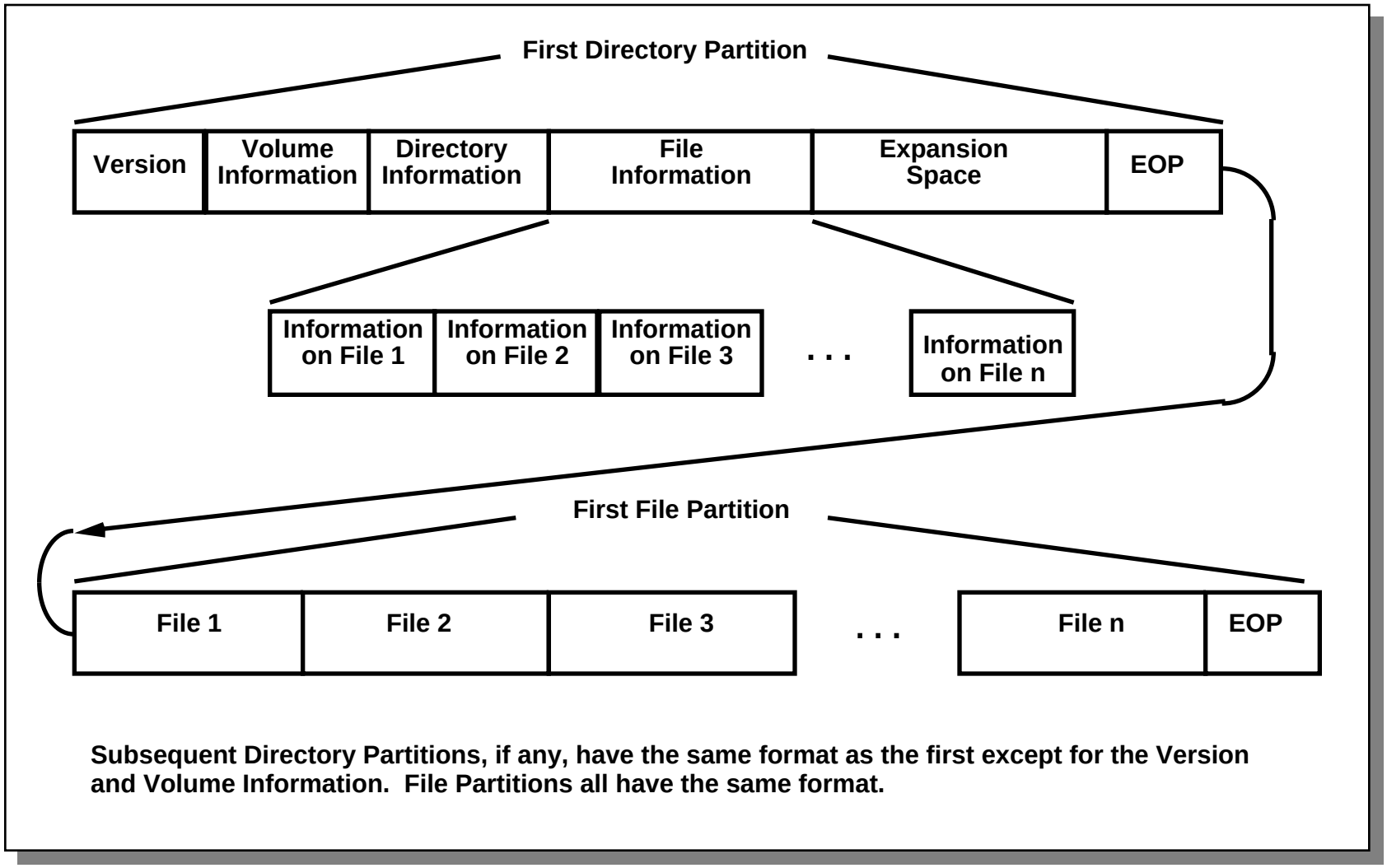
Assumptions for this Proposed Standard

- **The tape may be partitioned, so that there may be a directory partition which may be updated whenever anything is changed**
- **There is a positioning mechanism, and some way to represent location on a tape, although these things may vary with the tape technology**
- **Note: if the partitioning requirement is not met, then it would still be valuable to be able to export in some standard form the information defined in the directory**
  - **—In fact, this might be a part of the standard also**

Basic Framework of the Proposal

- Two types of partitions: directory and file
- Tape layout: at least one pair of consecutive directory and file partitions
- No length restrictions on the partitions in the standard
- Directory information stored as ASCII text
- A directory partition contains information about the files in the following file partition
  - —Location
  - —Identification
  - —Striping information
  - —Continuation information
- No file headers or trailers in the file partition

Tape Layout of Proposed Standard



Subsequent Directory Partitions, if any, have the same format as the first except for the Version and Volume Information. File Partitions all have the same format.

Information in the First Directory Partition

- **Version Information: Version of the standard**
- **Volume Information**
  - **—Volume Identification (Name and DCE UUID)**
  - **—Tape manufacturer**
  - **—Introduction, creation, and last access times**
  - **—Error statistics (number of mounts, number of errors, drive id)**
- **Directory Information**
  - **—Number of partitions**
  - **—Size of Directory Partition**
  - **—Size of associated File Partition**
  - **—Number of files in the File Partition**
  - **—Next available location in the File Partition**

Information in the First Directory Partition (Continued)

- File Information: For each file
  - —Identification of the file (Name and DCE UUID)
  - —Location of the file
  - —Times of creation, access, modification
  - —Identification of the tape and partition of
    - – The next file segment if the file is continued
    - – The first file segment if the file is a continuation
    - – The other stripes if the file is striped

Possible Extensions or Additions

- **Volume Sets**
- **Multiple logical volumes contained in one physical volume**
- **File Sets**
- **Continuation of a file within the same partition--currently there is only one continuation field**

Current Objections

- **Not all tape technologies allow for partitioning; hence it is better to define a format for exporting file-level metadata**
- **Re-writing the first partition every time the tape is mounted will wear the first part of the tape very quickly, and then the tape will become unusable.**
  - **—But there are already standards which require this--what is the experience using them?**
- **It would be advantageous to allow a tape to be dismounted from the drive without being positioned to the beginning of the tape**

Next Steps

- **Modification of this proposal based on comments**
- **Presentation to the X3B5 committee in November**
- **Attempt to gain sponsorship for and participation in this standards activity**