
**Information technology — Linear
Tape File System (LTFS) Format
Specification**

*Technologies de l'information — Spécification du format de système
de fichier à bande magnétique*



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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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Linear Tape File System (LTFS) Format Specification

Version 2.2.0

This document has been released and approved by the SNIA. The SNIA believes that the ideas, methodologies and technologies described in this document accurately represent the SNIA goals and are appropriate for widespread distribution. Suggestions for revision should be directed to <http://www.snia.org/feedback/>

SNIA Technical Position

December 21, 2013

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Suggestion for changes or modifications to this document should be sent to the SNIA Linear Tape File System Technical Work Group at <http://www.snia.org/feedback/>.

Changes between v1.0 and v2.0.0

- Incremented version number to 2.0.0 and updated date to March 11, 2011.
- Improvements in specification text to remove ambiguity and clarify intention of the specification. These changes were made at several locations throughout the document.
- Improvements to clarify description of MAM parameters in Section 9 [Medium Auxiliary Memory](#).
- Removed reference to a specific version of the Unicode standard in Section 6.5 [Name pattern format](#). This removes any requirement to use specific versions of Unicode support code in an implementation.
- Improved description of Name pattern format to remove ambiguity in Section 6.5 [Name pattern format](#).
- Added description of LTFS Format specification version numbering in Section 2.1 [Versions](#).
- Updated XML Schema for Label and Index to match version number format in [Annex A](#) and [Annex B](#).
- Added specification of minimum and recommended blocksize value for LTFS Volumes to Section 7.1.2 [LTFS Label](#).
- Added definition of allowed version numbers to Section 7.1.2 [LTFS Label](#) and Section 8.2 [Index](#).
- Added definition of fileoffset tag in Section 8.2 [Index](#).
- Extended description in Section 5 [Data Extents](#) to support addition of fileoffset tag and associated functionality.
- Added definition of highestfileuid tag in Section 8.2 [Index](#).
- Added definition of fileuid tag in Section 8.2 [Index](#).

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- Added definition of backuptime tag in Section [8.2 Index](#).
- Incremented version number in Application Client Specific Information (ACSI) structure shown in [9.3 Use of Volume Coherency Information for LTFS](#). This increment allows identification of LTFS Volumes written with a LTFS v1.0 compliant implementation. A widely used v1.0 implementation wrote ambiguous ACSI values due to an implementation bug.
- Added definition of extended attributes in the `lfs.*` namespace in [Annex C](#).
- Added description for handling unknown XML tags in Index to Section [8.2.10 Managing LTFS Indexes](#).

Changes between v2.0.0 and v2.0.1

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- Updated specification date to August 17, 2011.
- Expanded historical record of changes between revisions of LTFS Format Specification.
- Improved description of constraints for two Indexes having the same generation number in Section [4.4.1 Generation Number](#) to make it clear that differences in access time values is permitted between Indexes that are otherwise except for self pointer and index pointer values.
- Added note in Section [4.4.1 Generation Number](#) to explicitly state that Index generation numbers may increase by integer values other than 1.
- Expanded description of the `lfs.sync` extended attribute in [Annex C](#). The expanded description explicitly states that this extended attribute triggers a sync of the in-memory data to the storage media. That is, the operation is analogous to a POSIX sync operation.

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- Added definition of symlink tag in Section [8.2 Index](#).
- Added example of symlink tag use in [Annex E](#) (informative) Complete Example LTFS Index.
- Added symlink tag to [Annex B](#).
- Added description of “`lfs.vendor.X.Y`” extended attribute namespace in [Annex C](#).
- Added description of software metadata section in [Annex C](#).
- Added description of drive metadata section in [Annex C](#).
- Added “`lfs.labelVersion`” extended attribute in [Annex C](#).
- Added “`lfs.indexVersion`” extended attribute in [Annex C](#).
- Added “`lfs.mediaEncrypted`” extended attribute in [Annex C](#).
- Improved description of “`lfs.mediaStorageAlert`” extended attribute in [Annex C](#).

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- Changed “extentinfo” definition in Section 8.2 Index.
- Changed “symlink” definition in Section 8.2 Index.
- Added additional paragraph to “symlink” definition in Section 8.2 Index.
- Added general comments at start of Section 9 Medium Auxiliary Memory.
- Added Section 9.4 Use of Host-type Attributes for LTFS.
- Removed Section 9 Certification from document.
- Added “lfs.mamBarcode” extended attribute in Annex C.4 Volume Metadata.
- Added “lfs.mamApplicationVendor” extended attribute in Annex C.4 Volume Metadata.
- Added “lfs.mamApplicationVersion” extended attribute in Annex C.4 Volume Metadata.
- Added “lfs.mamApplicationFormatVersion” extended attribute in Annex C.4 Volume Metadata.
- Added new Annex F Interoperability Recommendation and added File Spanning and File Permissions subsections

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1 Introduction

This document defines a Linear Tape File System (LTFS) Format separate from any implementation on data storage media. Using this format, data is stored in LTFS Volumes. An LTFS Volume holds data files and corresponding metadata to completely describe the directory and file structures stored on the volume.

The LTFS Format has these features:

- An LTFS Volume can be mounted and volume content accessed with full use of the data without the need to access other information sources.
- Data can be passed between sites and applications using only the information written to an LTFS Volume.
- Files can be written to, and read from, an LTFS Volume using standard POSIX file operations.

The LTFS Format is particularly suited to these usages:

- Data export and import.
- Data interchange and exchange.
- Direct file and partial file recall from sequential access media.
- Archival storage of files using a simplified, self-contained or “self-describing” format on sequential access media.

2 Scope

This document defines the LTFS Format requirements for interchanged media that claims LTFS compliance. Those requirements are specified as the size and sequence of data blocks and file marks on the media, the content and form of special data constructs (the LTFS Label and LTFS Index), and the content of the partition labels and use of MAM parameters.

The data content (not the physical media) of the LTFS format shall be interchangeable among all data storage systems claiming conformance to this format. Physical media interchange is dependent on compatibility of physical media and the media access devices in use.

NOTE: This document does not contain instructions or tape command sequences to build the LTFS structure.

2.1 Versions

This document describes version 2.2.0 of the Linear Tape File System (LTFS) Format Specification.

The version number for the LTFS Format Specification consists of three integer elements separated by period characters of the form *M.N.R*, where *M*, *N*, and *R* are positive integers or zero. Differences in the version number between different revisions of this specification indicate the nature of the changes made between the two revisions. Each of the integers in the format specification are incremented according to Table 1.

Table 1 — Version elements

Element	Description
<i>M</i>	Incremented when a major update has been made to the LTFS Format Specification. Major updates are defined as any change to the on-media format or specification semantics that are expected to break compatibility with older versions of the specification.
<i>N</i>	Incremented when a minor update has been made to the LTFS Format Specification. Minor updates are defined as any change to the on-media format or specification semantics that is not expected to break compatibility with older versions of the specification that have the same value for <i>M</i> in the version number.
<i>R</i>	Incremented when textual revisions are made to the LTFS Format Specification. Textual revisions are defined as revisions that improve the clarity of the specification document <i>without</i> changing the intent of the document. By definition, minor changes do not alter the on-media format or specification semantics.

NOTE 1: When any element of the specification version number is incremented, all sub-ordinate elements to the right are reset to zero. For example, if the version is 1.0.12 and *N* is incremented to 1, then *R* is set to zero resulting in version 1.1.0.

NOTE 2: The first public version of this document used version number 1.0. This value should be interpreted as equivalent to 1.0.0 in the version numbering defined in this document.

The result of comparison between two LTFS version numbers $M_A.N_A.R_A$ and $M_B.N_B.R_B$ is defined in Table 2.

Table 2 — Version comparisons

Conditional	Description
$M_A < M_B$	$M_A.N_A.R_A$ is an earlier version than $M_B.N_B.R_B$.
$M_A = M_B$ and $M_A < N_B$	$M_A.N_A.R_A$ is an earlier version than $M_B.N_B.R_B$.
$M_A = M_B$ and $N_A = N_B$ and $R_A < R_B$	$M_A.N_A.R_A$ is an earlier version than $M_B.N_B.R_B$. However, as defined above, changes that result only in a different R value are descriptive changes in the specification rather than on media changes.

2.2 Conformance

Recorded media claiming conformance to this format shall be in a consistent state when interchanged or stored. See Section 3.1.4.

Any implementation conforming to this specification should be able to correctly read Label and Index structures from all prior versions of this specification and write Label and Index structures conforming to the descriptions in this document. The current Label and Index structures are defined in Section 7 Label Format and in Section 8 Index Format.

NOTE: Where practical, any implementation supporting a given version value for M should endeavor to support LTFS volumes with version numbers containing higher values for N and R than those defined at the time of implementation.