

# **IBM Linear Tape File System Format Verifier**

**White Paper  
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**Systems and Technology Group  
Systems Software Development**



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## Executive Overview

The IBM Linear Tape File System Format Verifier (Ifv) is a verification tool developed by the IBM Systems and Technology Group. This tool will support the Linear Tape File System (LTFS) Format standardization process and creation of LTO and 3592 cartridges using the LTFS Format. An LTO or 3592 cartridge can thoroughly be checked if its contents are compliant to the LTFS Format specification. The tool is designed to perform in-depth cartridge meta data analysis therefore it accesses the data on a cartridge and performs syntax checks as well as semantic and dynamic checks. Cross-checks are performed to ensure data record consistency. The verifier reports if a tested cartridge violates the standard.

## Purpose of this Document

The intention of this document is to give an overview about the IBM Linear Tape File System Verifier. This document contains the potential use cases. It describes the command line parameters and the verification steps performed and provides prerequisites like the list of supported operating Systems .

## Motivation and Use Cases

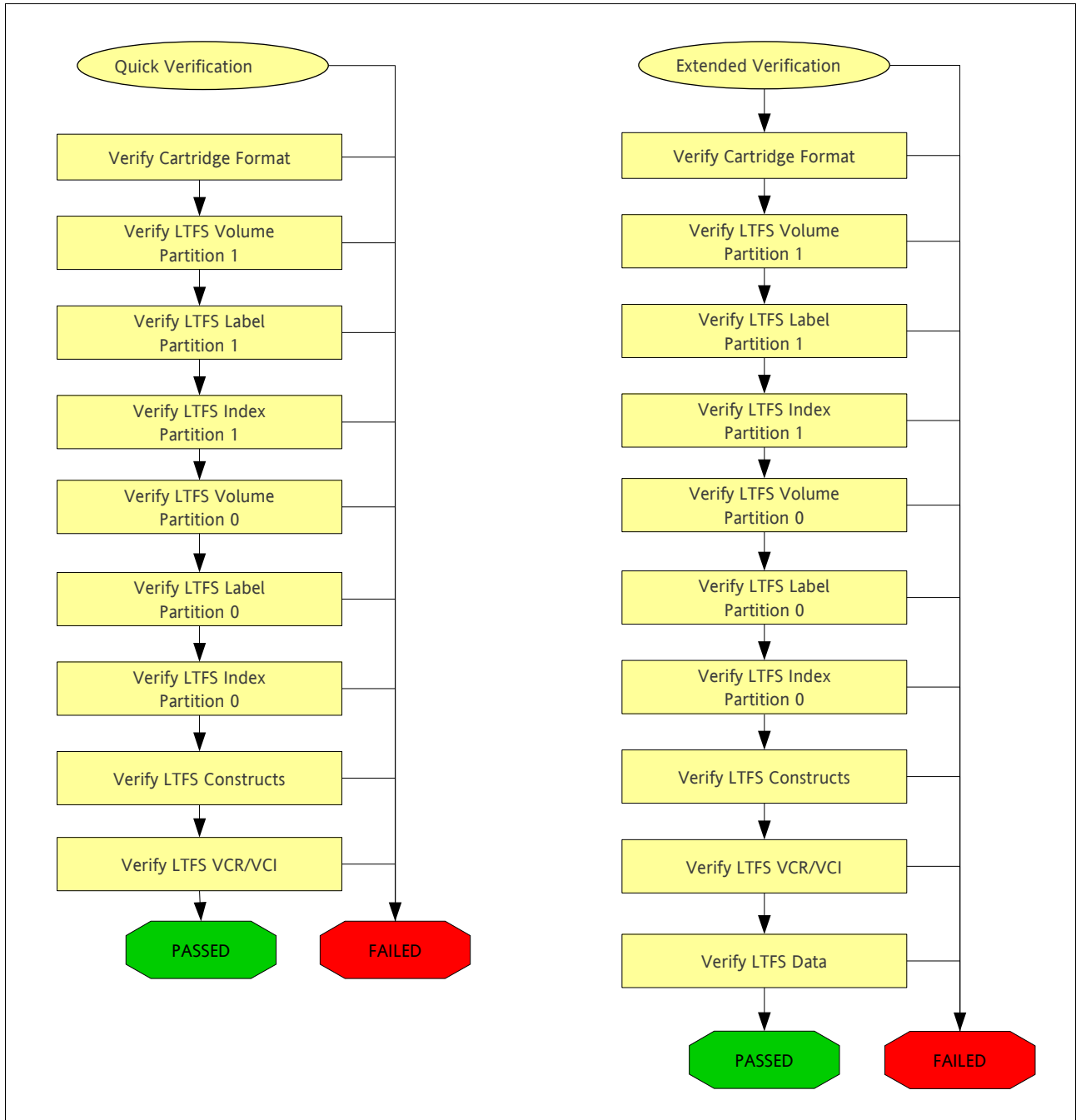
Customers handling with tape cartridges formatted with the LTFS Format need a software utility that can inspect a tape cartridge mounted into a tape drive to determine if the data written on the cartridge is compliant to the LTFS Format specification.

- Hardware vendors who want to ensure compatibility and use the tool to verify that the Linear Tape File System Format works with their hardware/software and that the formatted media is interchangeable across hardware vendors
- Independent Software Vendors (ISV) or appliance makers that want to integrate the Linear Tape File System. They need a tool to verify that their software writes the Linear Tape File System Format compliant to the standard
- LTFS customers that do not trust the LTFS software entirely want to check the compliance of the LTFS Format
- Customers using different software applications to create LTFS tapes and want to verify that this format is consistent with the LTFS Format.
- Applications and utilities that would test ingested tapes before data ingest will only mount and accept healthy tapes.
- A customer who gets an LTO tape and has no clue what is on this tape.

# Verification Steps

The format verification will either perform a quick check or an extended check. The quick verification will analyze the LTFS constructs and should be completed within 5 minutes. The extended verification is analyzing the entire cartridge which can take more than 3 hours.

If any of the steps described below fail, a FAILED result shall be shown, along with a message that describes the failure reason. If all verification steps pass, an PASSED result shall be shown.



## Verify Cartridge Format

The Verify Cartridge Format step will check if the cartridge can be accessed, has exactly two partitions and is not encrypted with application managed encryption.

## Verify LTFS Volume

The first data record (ANSI VOL1 Tape Label) on each partition is verified during this step. Checked are the data record length and the record contents. Volume identifier, implementation identifier and version information must match with the LTFS Format Specification.

## **Verify LTFS Label**

On an LTFS Format compliant cartridge the ANSI VOL1 Tape Label should be followed by an LTFS Label data record on each partition, this is checked during this test step. Further it is checked if the LTFS Label data is XML formatted, uses Normalized Form C (NFC) character encoding and if the XML data validates with the LTFS Label XML schema. The reported block size is used for the following verification steps.

## **Verify LTFS Index**

The Verify LTFS Index step checks that every partition is closed by an LTFS Index Construct. The Index Construct should be valid XML, using NFC character encoding and the XML data should validate with the LTFS Index XML schema.

## **Verify LTFS Constructs**

The consistency between the LTFS Label and LTFS Index records is verified.

## **Verify LTFS VCR/VCI**

The Volume Change Reference (VCR) and Volume Coherency Information (VCI) consistency as being stored in the Cartridge Memory (MAM = Medium Auxiliary Memory) with the LTFS Label and LTFS Index records is verified if the VCR/VCI information is in use on the cartridge under test.

## **Verify LTFS Data**

The entire cartridge is analyzed, data placement should be compliant to the LTFS Format specification. All indexes and data extents are verified. All indexes should have correct links (self pointer, back pointer), valid extents and the records within a data extent should conform to the block size rule.

# **Supported System Environments**

### **Linux**

RedHat Enterprise Linux (RHEL) 5/6 (32-bit X86 and 64-bit x86\_64)  
SuSE Linux Enterprise Server (SLES) 11 (32-bit X86 and 64-bit x86\_64)

### **Mac OS X (Intel only)**

Mac OS X 10.5.6 and later (Leopard) (32-bit)  
Mac OS X Server 10.5.6 and later (Leopard) (32-bit)  
Mac OS X 10.6 and later (Snow Leopard) (32-bit and 64-bit)  
Mac OS X Server 10.6 and later (Snow Leopard) (32-bit and 64-bit)  
Mac OS X 10.7 and later (Lion) (32-bit and 64-bit)  
Mac OS X Server 10.7 and later (Lion) (32-bit and 64-bit)

### **Microsoft Windows**

Microsoft Windows 7 (32-bit and 64-bit)  
Microsoft Windows Server 2008 (64-bit)  
Microsoft Windows Server 2012 (64-bit)  
Microsoft Windows 8 (64-bit)

## Additional Requirements

LFV currently only supports IBM LTO and IBM TS1140 drives and following cartridge types:

	LTO-5 Cartridge	LTO-6 Cartridge	JB/JC/JK Cartridge
LTO-5 Tape Drive	X		
LTO-6 Tape Drive	X	X	
TS 1140			X

The application shall be started from a Terminal window/Command Prompt.

For Linux systems, root access rights are required for starting the program on systems where the IBM Tape Device Driver is not installed and/or the standard user does not have access rights to the Tape drive device. On Mac OS X systems, no administrative rights are required.

On Microsoft Windows the program must be started from a Command Prompt that was launched using "Run as Administrator...".

## Command Line Parameter Reference

Program invocation: `./lfv [options]`

General Options	Description
<code>-f &lt;target device&gt;</code>	Target Tape Device to perform verification on
<code>-s</code>	Scans for tape devices and prints the results to the screen
<code>-h --help</code>	Prints help information
<code>-V --version</code>	Prints version information
Verification related Options	
<code>-x</code>	Extended verification will be performed (default: quick verification)
<code>-v</code>	Enable Verbose information (default:off)
Logging related Options	
<code>-ll [Errors Warnings Information Debug]</code>	Specify Log level (default:Errors)
<code>-l</code>	Log File Name (default: lfv.log)
<code>-lp</code>	Logging output directory (default: ./output)

For Linux systems where the IBM Tape Device Driver is installed, `<target device>` shall be `/dev/IBMtapeX` where X is the index of the tape device to use. Example:

```
./lfv -f /dev/IBMtape1
```

For Linux systems where no IBM Tape Device driver is installed, `<target device>` shall be `/dev/sgX` where X is the index for the tape device to use. Example:

```
./lfv -f /dev/sg0
```

On MacOS X systems, `<target device>` shall be entered as a `<M>:X` construct where `<M>` is the model name for the tape device (example: ULT3580-TD5) and X is the index for the tape device to use. Example:

```
./lfv -f ULT3580-TD5:0
```

On Microsoft Windows systems, `<target device>` shall be entered as a `<H> <B> <T> <L>` construct where `<H>` is the host bus adapter (HBA) number, `<B>` the HBA bus number, `<T>` the SCSI Target Id and `<L>` the Lun of the tape device to use. Example:

```
./lfv -f H2-B0-T1-L0
```

To help the user better identify which drive to use, the Scan (`-s`) option provides a list of the available devices.

```
./lfv -s
```

```
#0 /dev/IBMtape0 - [ULT3580-TD4] - [85V1] S/N:1300000388 H2-B0-T0-L0
#1 /dev/IBMtape1 - [ULT3580-HH5] - [A2SG] S/N:1068000051 H2-B0-T1-L0
```

This list contains a sequential number, the driver handle/device file name, the drive's product name, the drive firmware revision, the drive serial number (S/N) and the host (H), bus (B), Target Id (T) and Lun (L) physical address of the drive.

# Trademarks

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