LucarneFS Specification

Dorian Bourgeoisat

16th December 2019
v0.1

Contents

1 Definitions

1.1 Chain

Linked list with the last link pointing to the first.

1.2 First/Last link of a chain

As a result of the structure of a chain, the last or first links are defined by the objects that hold the structure. The link pointed to by the holding structure is the first link. The link pointing to the first link is the last link.

2 General Principles

2.1 Chain of blocks

The underlying structures are almost always a chain. The exception to this is the block itself, or a contiguous file. A block is always 512 bytes long.
The pointer to the next block is a 6 bytes long relative LBA 48 adress little-endian at the end of the block. It has a duplicate. Between the 2 pointers is a 2 bytes long volume identifier and a 2 bytes long metadata bitfield.

Rel. LBA	Content
...	...
496	NEXT_BLOCK_LBA48_DUPLICATE
502	METADATA
504	VOLUME_ID
506	NEXT_BLOCK_LBA48

This 16 bytes long structure will be called in the following "block pointer".

2.2 Free blocks

Free blocks are maintained in a chain, when a file is deleted, its blocks are put in the beginning of the chain. When a file must be given new blocks, they are taken from the beginning of the chain.

2.3 Writing to blocks

To write data in a file, new blocks are allocated and wrtten to with the last block allocated pointing to the rest of the file. A special block is used to keep track of the first replaced block. Then, the previous block of the file will be updated to point to the new blocks. The replaced blocks will be put in the free blocks chain using the same method.

2.4 Hierarchy

Each folder and file is described in a block in a chain. The content of a folder/file is the chain a second block pointer points to in the folder/file block.

Rel. LBA	Content
...	...
480	BLOCK_POINTER_CONTENT
496	BLOCK_POINTER_NEXT

2.5 Volume identifier

4 first bits of drive GUID	first byte of partition GUID	4 bits collision prevention

The 4 bits collision prevention is generated at partitionning. If there is a collision at partitioning with another partition, the prevention number is incremented until no collisions are found. If this fails to resolve collisions, increment the first byte of partition GUID until no collisions found. If this also fails to resolve collisions, increment 4 first bits of drive GUID.

Note : This operation can be interpreted and implemented as an increment to the 16 bits uint interpretation of the volume identifier.

3 Block Types

3.1 Master

The master block is the first block of the partition. It contains a pointer to the root folder, along with the volume identifier of the partition, and filesystem structures.

Rel. LBA	Content
0	ASCII for "LuFS"
4	FS_VERSION
5	FLAGS
6	VOLUME_ID
8	SLAVE_VOLUMES[64]
136	RESERVED
464	BP_CURRENT_OP
480	BP_FREE
496	BP_ROOT

Flags :

7	6	5	4	3	2	1	0
RES	RES	RES	RES	RES	RES	RES	SLAVE

3.2 Folder

The name of the folder/file is contained in a special chain. No character is forbidden except NULL (\0).

Rel. LBA	Content
0	BP_NAME
16	RESERVED
479	FLAGS
480	BP_CONTENT
496	BP_NEXT

Flags :	7	6	5	4	3	2	1	0
	RES	RES	RES	RES	RES	RES	RES	1

3.3 File

Same as above.

Rel. LBA	Content
0	BP_NAME
16	LENGTH_IN_BYTES
20	RESERVED
479	FLAGS
480	BP_CONTENT
496	BP_NEXT

Flags :	7	6	5	4	3	2	1	0
	RES	RES	RES	RES	RES	RES	RES	0

3.4 Data

File contents are stored in data blocks.

Rel. LBA	Content
0	DATA
448	RESERVED
496	BP_NEXT