About this Book

This document attempts to describe the on-disk format for ext4 filesystems. The same general ideas should apply to ext2/3 filesystems as well, though they do not support all the features that ext4 supports, and the fields will be shorter.

NOTE: This is a work in progress, based on notes that the author (djwong) made while picking apart a filesystem by hand. The data structure definitions should be current as of Linux 4.18 and e2fsprogs-1.44. All comments and corrections are welcome, since there is undoubtedly plenty of lore that might not be reflected in freshly created demonstration filesystems.

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Terminology

ext4 divides a storage device into an array of logical blocks both to reduce bookkeeping overhead and to increase throughput by forcing larger transfer sizes. Generally, the block size will be 4KiB (the same size as pages on x86 and the block layer's default block size), though the actual size is calculated as $2 \char`^ (10 + \texttt{sb.s\_log\_block\_size})$ bytes. Throughout this document, disk locations are given in terms of these logical blocks, not raw LBAs, and not 1024-byte blocks. For the sake of convenience, the logical block size will be referred to as `$block_size` throughout the rest of the document.

When referenced in `preformatted text` blocks, `sb` refers to fields in the super block, and `inode` refers to fields in an inode table entry.

Other References

Also see https://www.nongnu.org/ext2-doc/ for quite a collection of information about ext2/3. Here's another old reference: http://wiki.osdev.org/Ext2