

Silicon Graphics, Inc.

XFS Overview & Internals

02 - Overview

November 2006

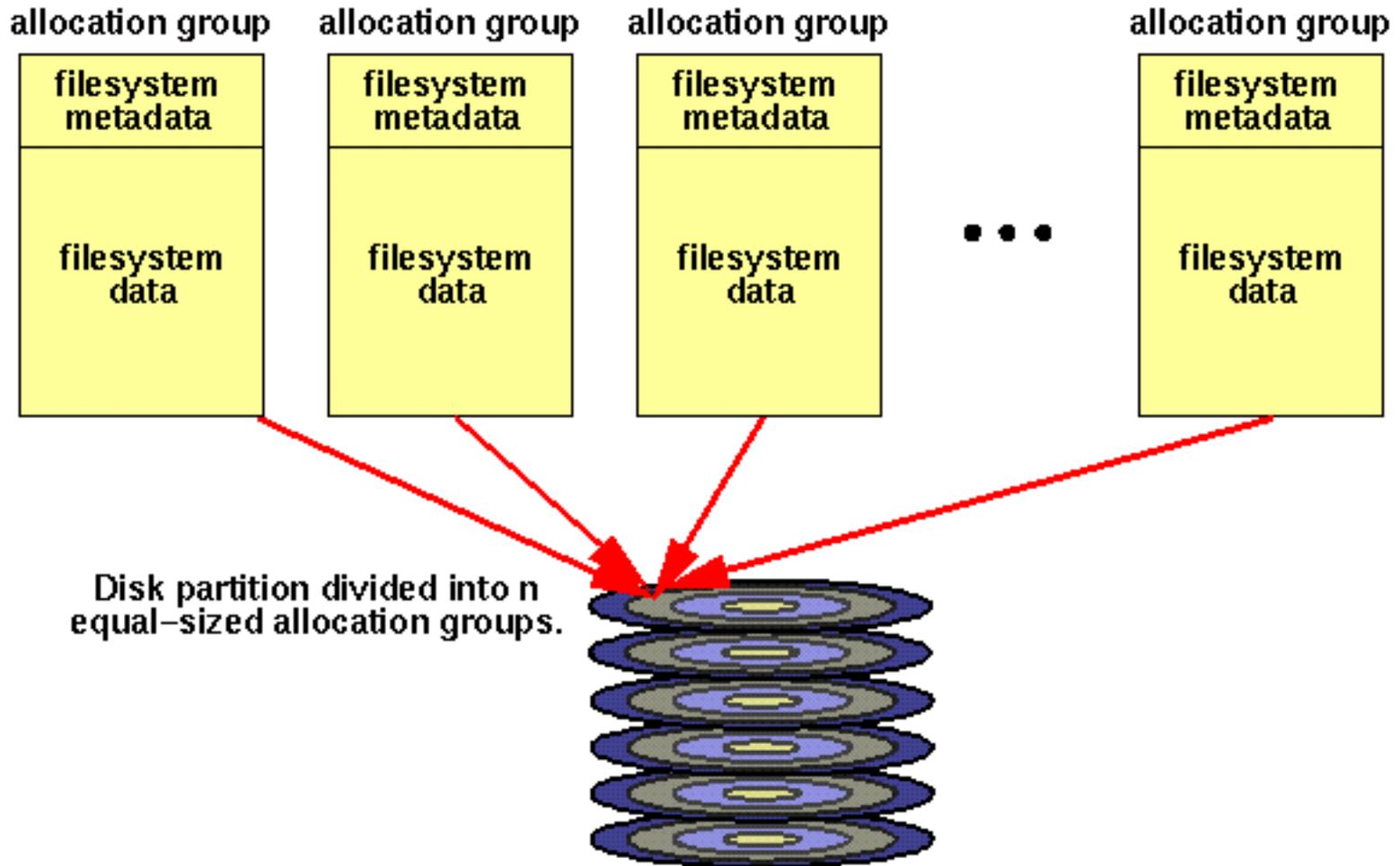
XFS Filesystem Structure

- This section gives an overview of the structure of an XFS filesystem
- More detailed examination of the filesystem structure is covered later in the course
- See xfs(5)

Allocation Groups

- An XFS filesystem is divided evenly into allocation groups
- An allocation group can be from 16MB to 1TB in size
- Each allocation group includes
 - Super block information about the entire filesystem
 - Free space management (within the allocation group)
 - Inode allocation and tracking (with the allocation group)
- Inode clusters within an allocation group are created when needed
 - mkfs.xfs does not pre-create inodes throughout the filesystem
- See xfs(5)

XFS Filesystem Structure



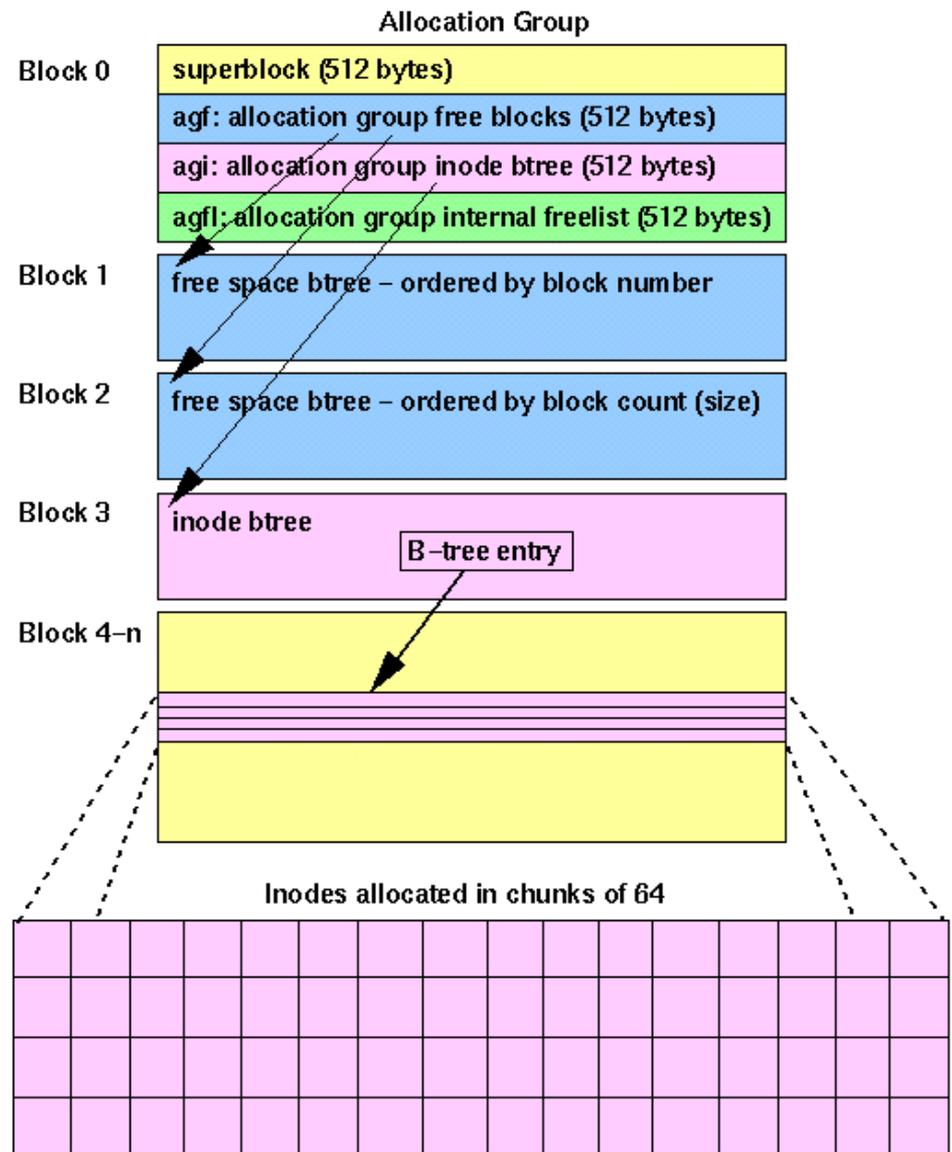


Illustration assumes mkfs' default 4096-byte blocks and 256-byte inodes

XFS Limits

- 32 bit Linux
 - Maximum File Size = 1TB
 - Maximum Filesystem Size = TBD
- 64 bit Linux
 - Maximum File Size = 9 Million TB = 9 ExaB
 - Maximum Filesystem Size = 18 Million TB = 18 ExaB

Filesystem Block Size (FSB)

- Filesystem blocks (FSBs) are the unit of space for a filesystem
 - Filesystem blocks are comprised of one or more device-level sectors.
- The page management implementation in Linux limits the FSB size to the page size
 - 4KB on ia32 and x86_64 architectures
 - 16KB on ia64
 - TBD on powerpc
- Performance can improve with different block sizes depending on the size of I/O requests and the size of files
 - Larger blocks will also use more disk space for small (<1FSB) files

Extents

- An extent is a set of one or more contiguous FSBs that define a region in the filesystem for file data or metadata
 - A single extent can be up to 8GB in length
- A file's inode lists the extents associated with that file
 - For very large files, the file's inode may have thousands of extents, or one very large extent. Usually something in between.
- Extents are also used for file and directory metadata when the information exceeds the space reserved for an inode

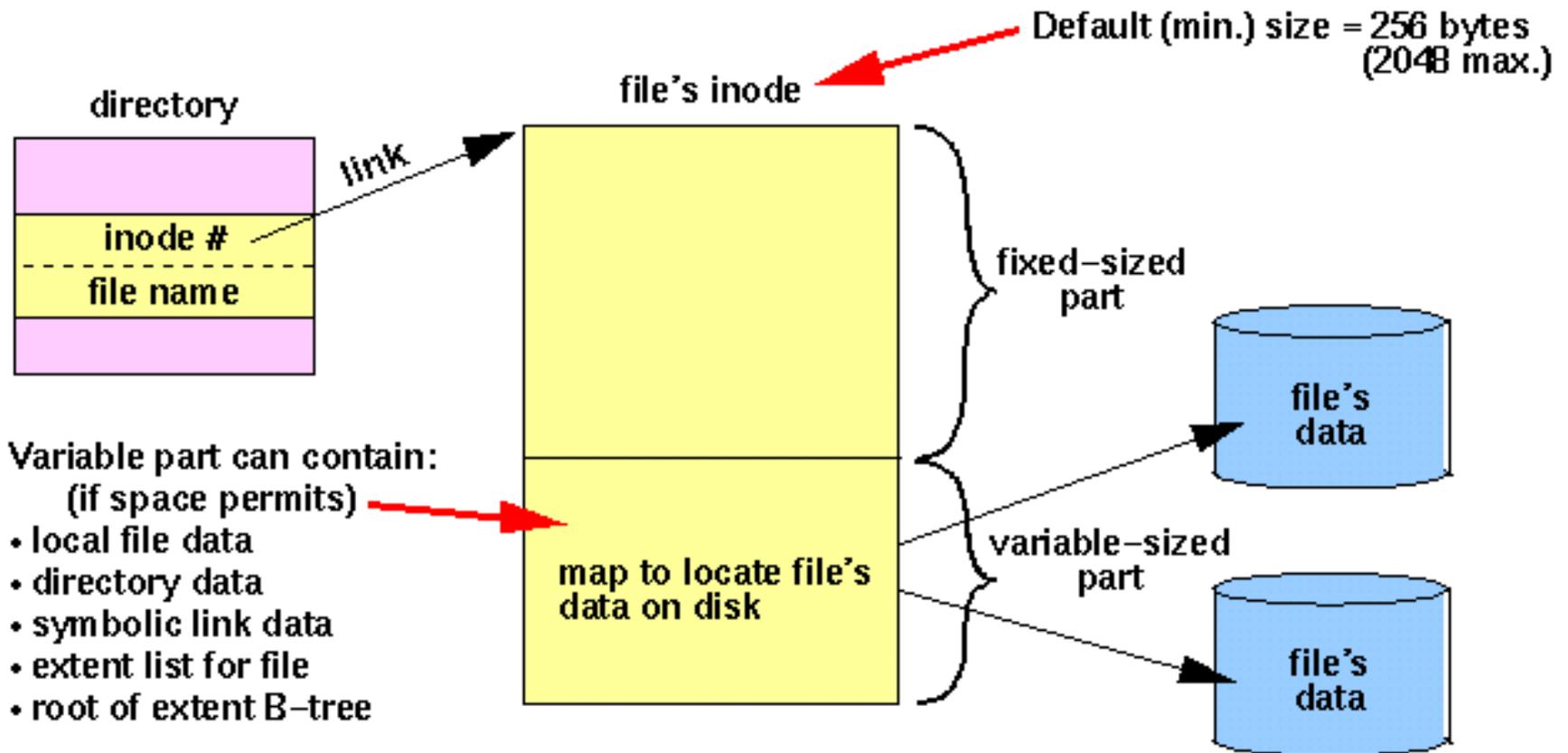
Unwritten Extents

- TODO

Inodes

- XFS has three inode structures
- Ondisk inode
 - Used for storing the metadata for all files, directories and other file types
 - By default 256 bytes but can be up to 2KiB
- Linux inode
 - TODO
- XFS inode
 - TODO
- The Linux and XFS inodes have different lifecycles, which can cause problems

Directory and File Inodes



Journal Log

- TODO

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