

MP4 Walkthrough

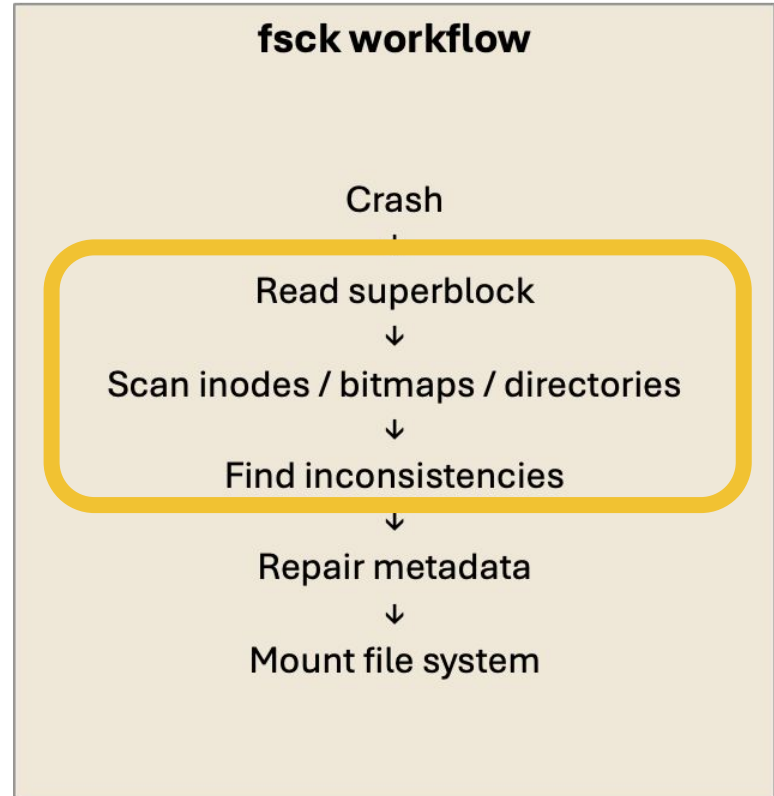
Crash-Consistency Problem

- Now we know some of the potential causes for a filesystem to be in an inconsistent state (partially updated)
- And we know that we have an amazing tool to check these inconsistencies – FSCK
- How does FSCK work?

We will look into this in MP4!

How does FSCK work

- FSCK = file system checker
- Strategy: After crash, scan whole disk for contradictions and “fix” if needed
- Filesystem stays off-line until FSCK completes



Fsck Checks

Superblock

Sanity-check core metadata, and use a backup copy if needed.

Free blocks

Rebuild allocation bitmaps by scanning actual references.

Inode state

Validate inode type and clear obviously corrupt inodes.

Inode links

Recompute link counts from the directory tree.

Duplicates

Detect multiple inodes pointing to the same block.

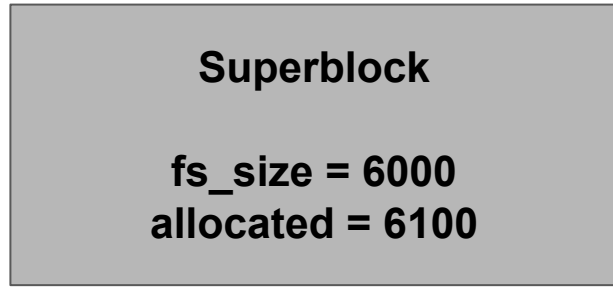
Bad blocks

Clear pointers that point outside the valid disk range.

Directories

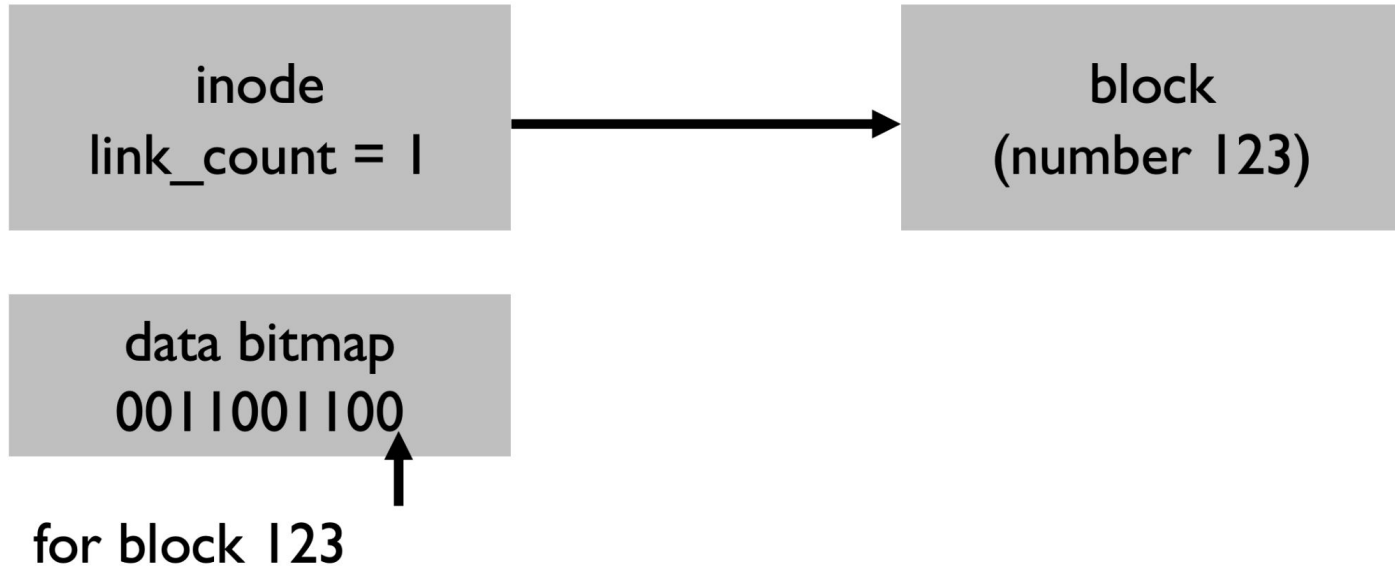
Check ., .., allocated targets, and hierarchy rules.

Super Block Example



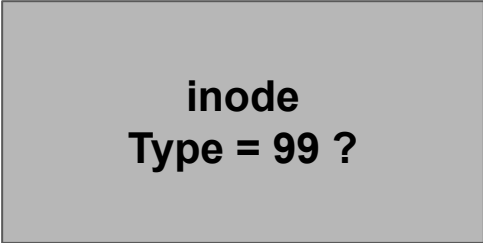
Impossible! fs_size less than allocated!
-> use an alternate copy of the superblock

Free Blocks Example



**Inconsistency between inode and bitmap
→ trust the actual inode references**

Inode State Example

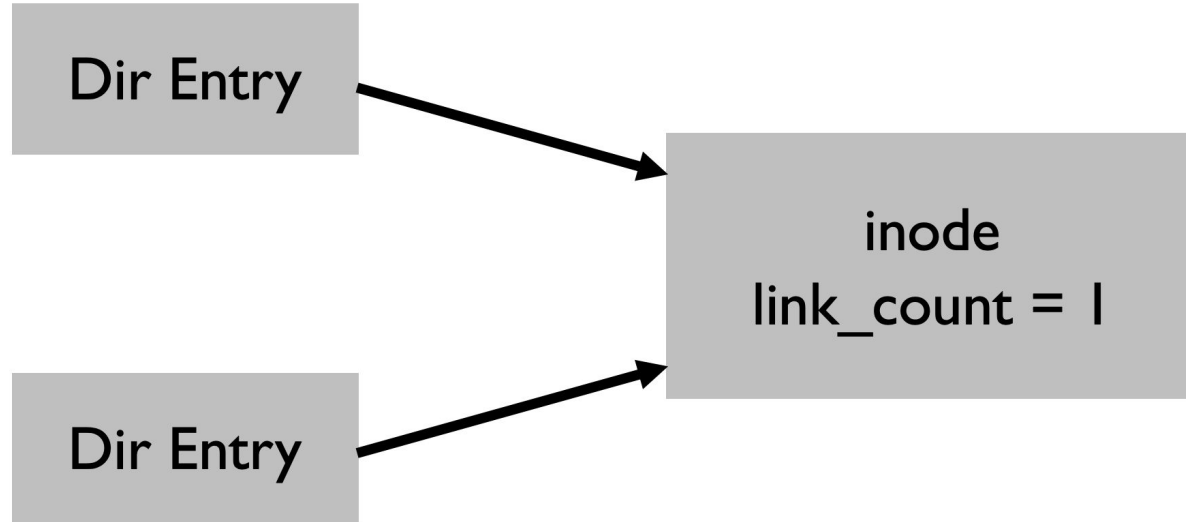


inode
Type = 99 ?

Invalid type!

-> clear suspect inode and bitmap entry

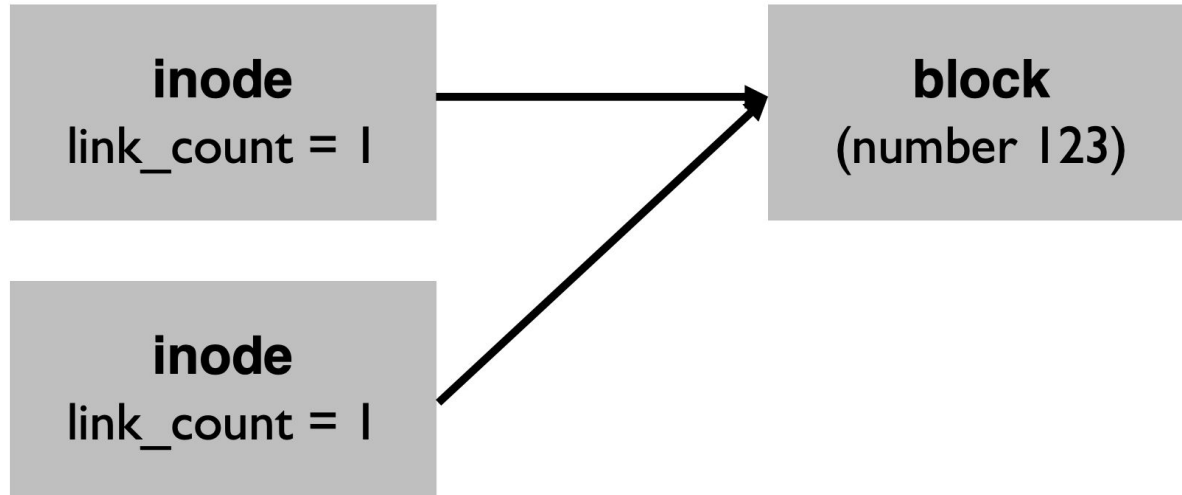
Link Count Example



Mismatch link count

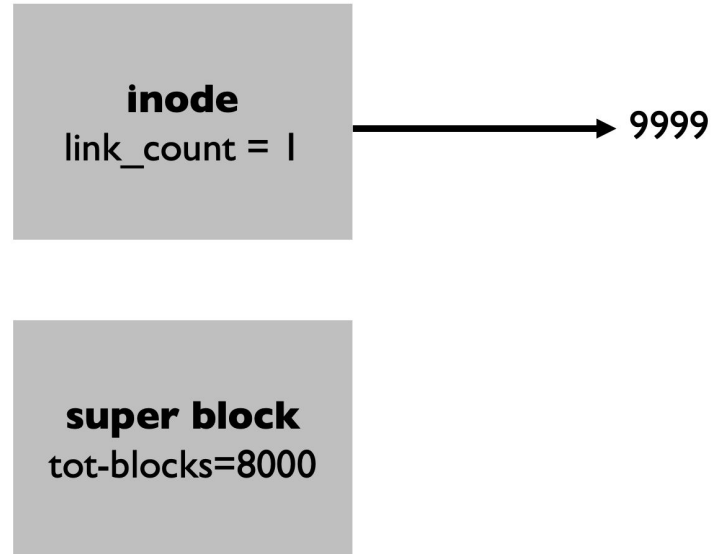
-> fixing count within inode / move to lost + found if link_count = 0

Duplicates Example



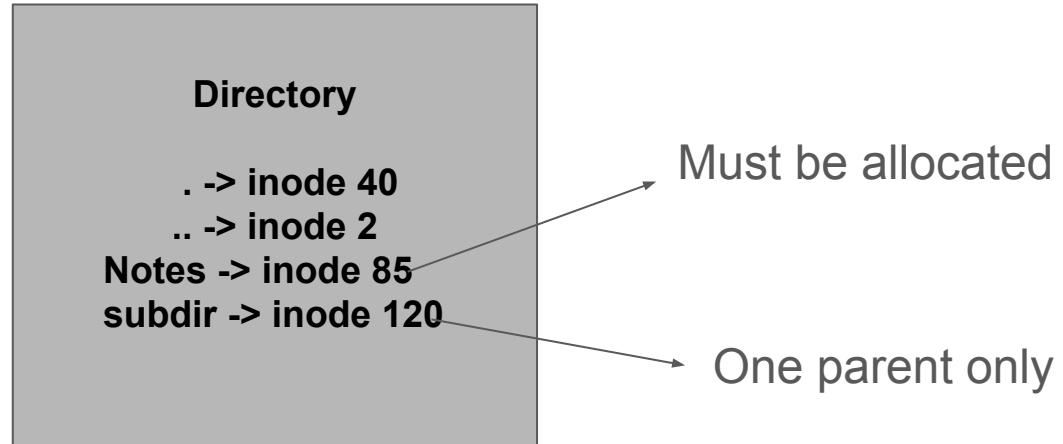
Two inodes refer to the same block
-> either cleans one bad inode or copies the block

Bad Blocks Example



**Pointer 9999 is out side the valid range [0, 7999]
-> clears the pointer**

Directory Checks Example



Demo

Demo Compile and Test

1. Used a dummy directory testroot
2. Make mkfs and lsfs
3. `./mkfs fs.img testroot` (generate filesystem img, can be used to check myfsck functionalities)
4. `./lsfs fs.img` (walk the filesystem)
5. Make myfsck
6. `./myfsck fs.img`
7. **Note: only use log.h for error logging!**
8. **Filesystem format is similar but not identical to VSFS. Make sure you read through the fs.h for on-disk layout, and lsfs.c can give you some idea how to traverse through the filesystem directory hierarchy**
9. **Max file size check in good.img**
10. **Don't do #11 and extra credit #5 yet. We'll send post about it.**