Filesystems

Inodes

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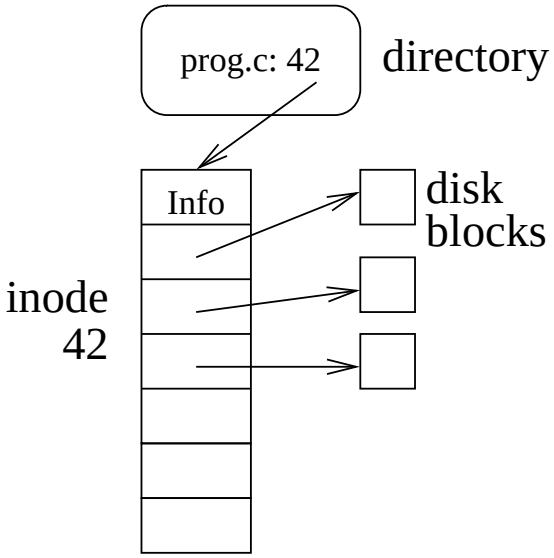
This can lead to wastage, e.g., a 1025 byte file might need two blocks, but uses just over half of the space. Though there are lot of tricks in real filesystems to avoid the worst of this

Filesystems

Inodes



An inode is of fixed size and has space for, say, 10 block pointers

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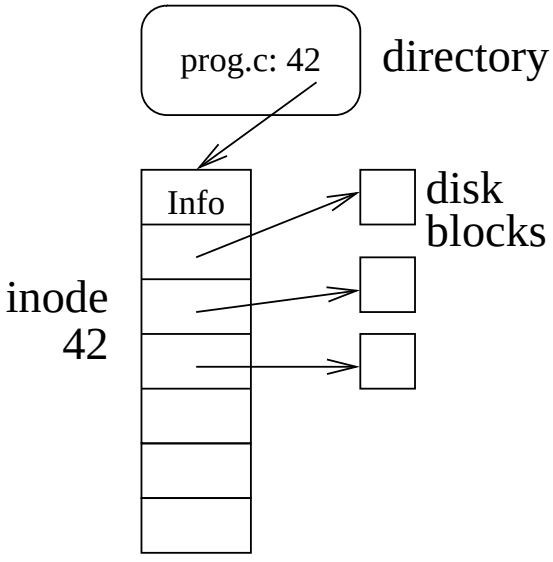
Inodes



But then you can't have files bigger than $10 \times 1024 = 10$KB

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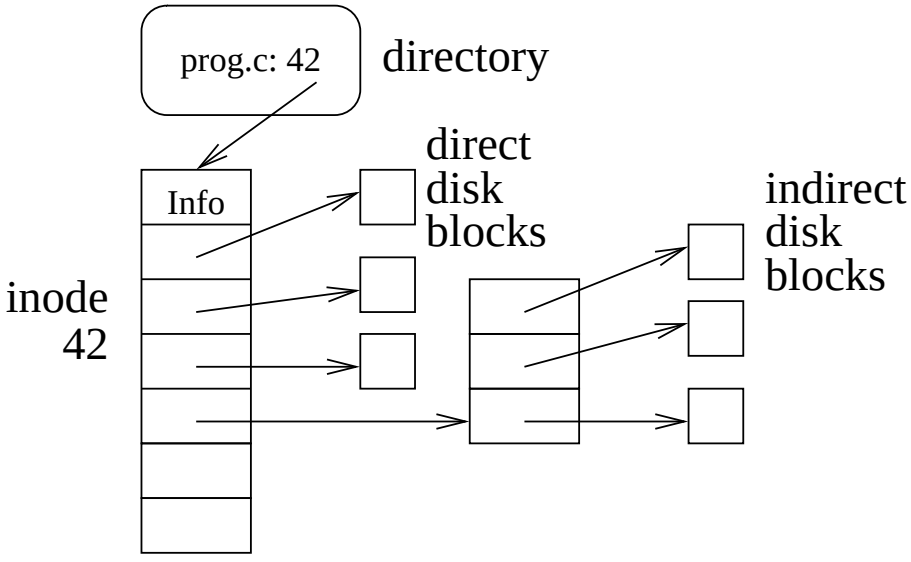

So for such files we have an *indirect block*, that contains a pointer to an array of 256, say, block pointers

Filesystems

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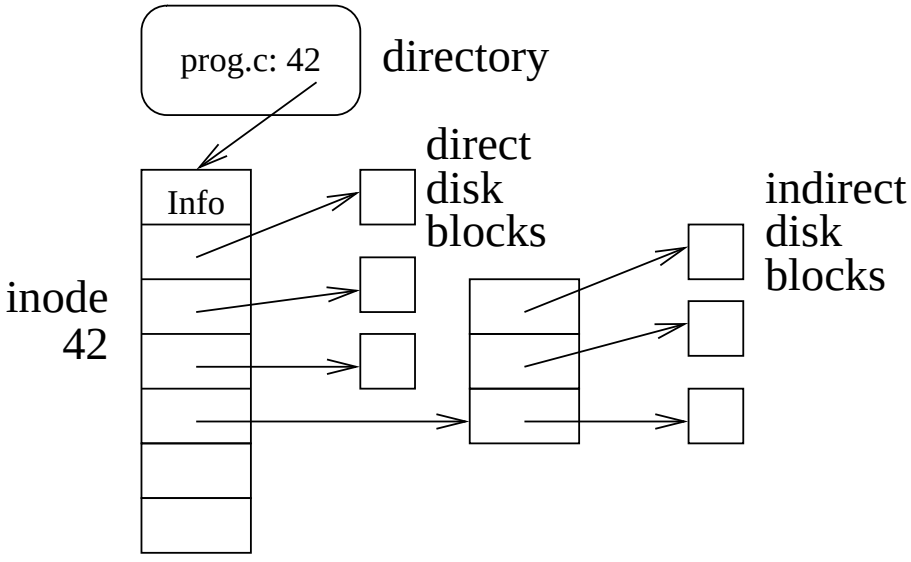

This gives us 256 more blocks, which is 256KB more space

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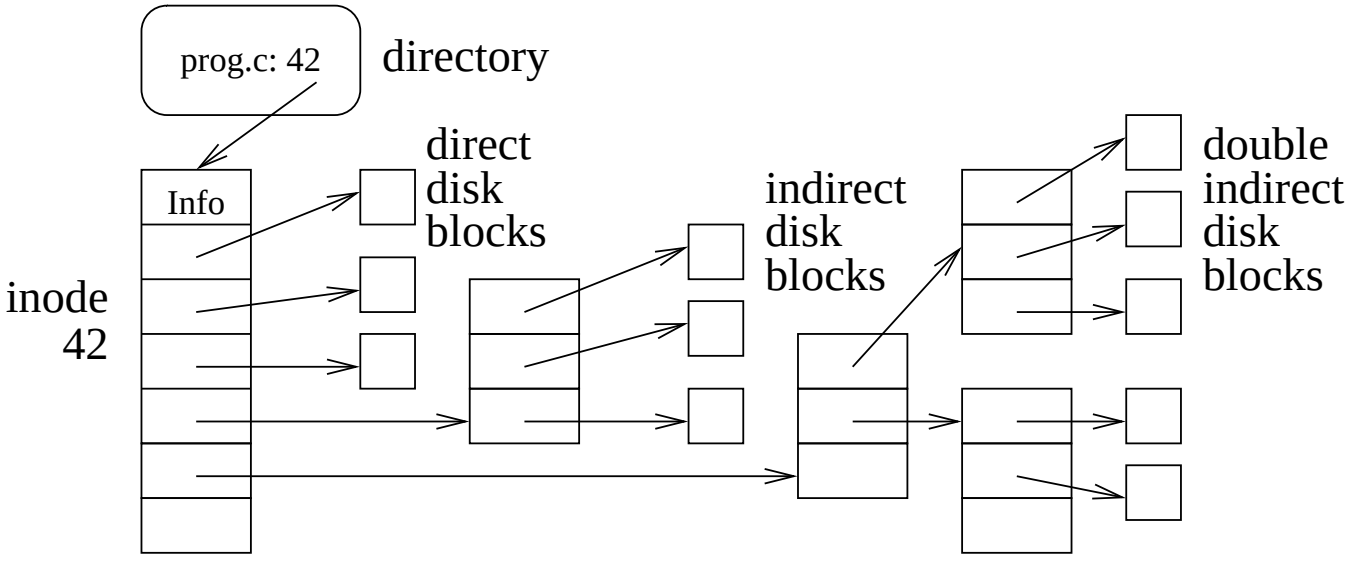

Bigger files have a *double indirect block*

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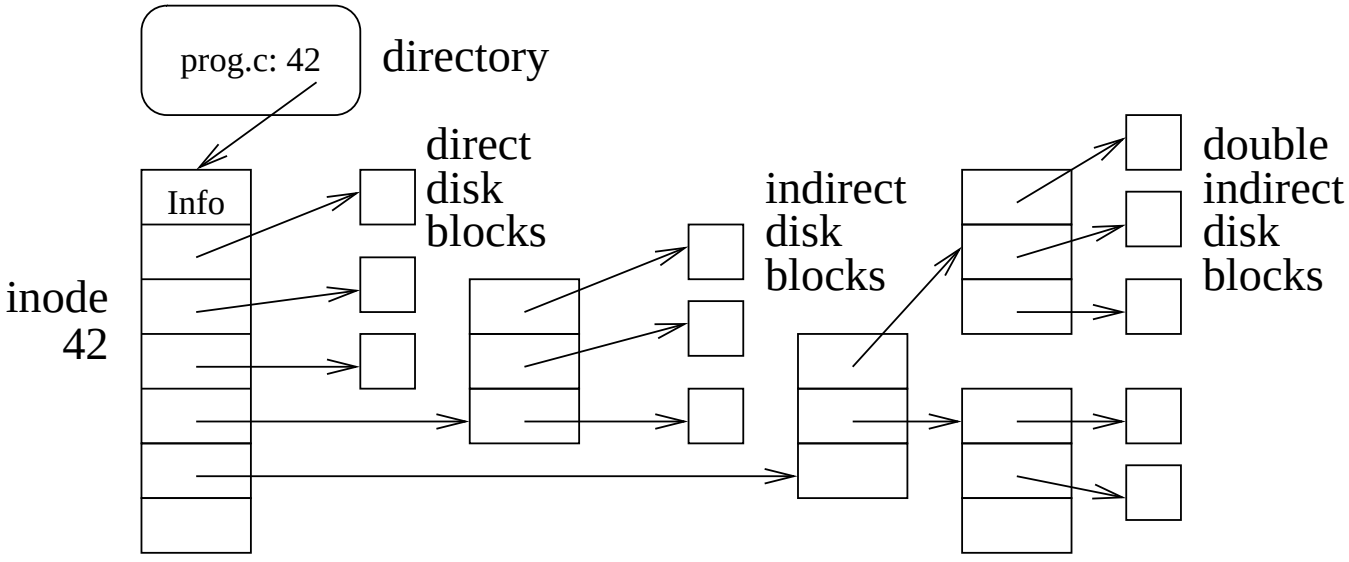
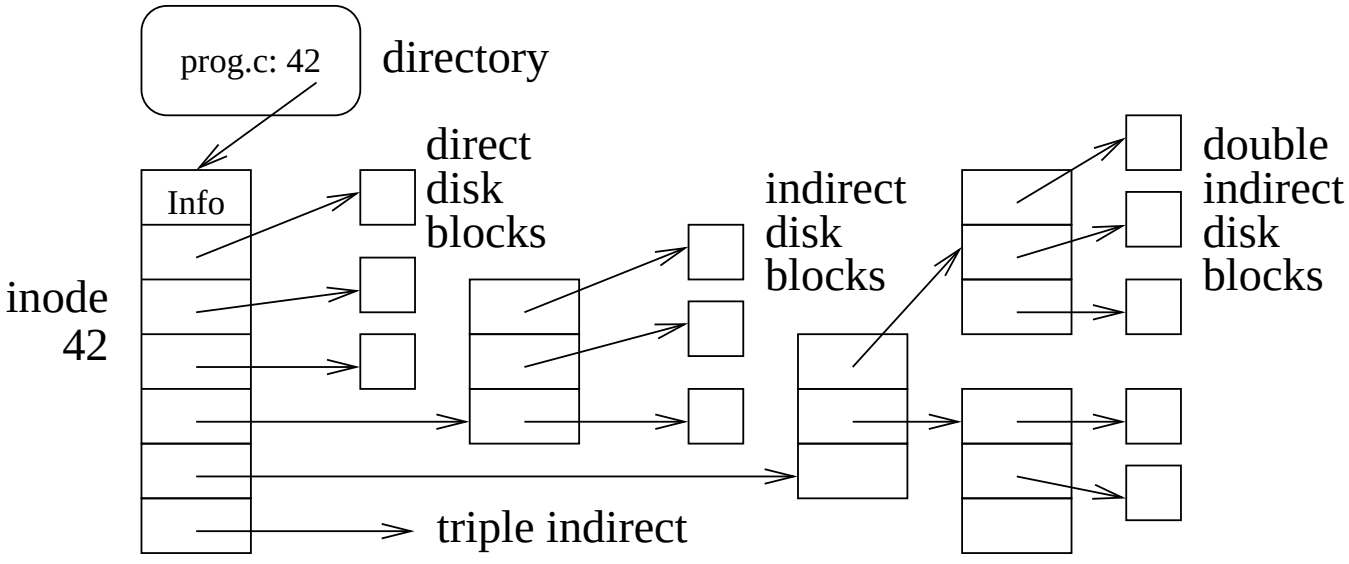
Inodes



This gives us $256 \times 256 = 65536$ more blocks, 65MB more space

Filesystems

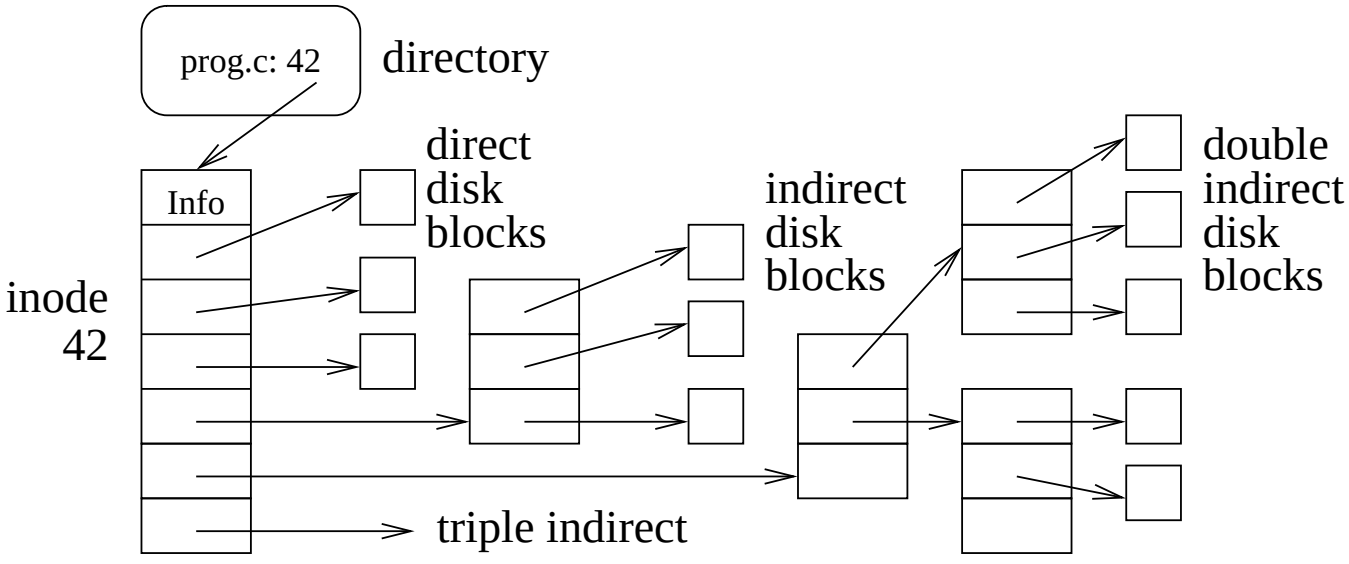
Inodes



Extreme files need a *triple indirect block*

Filesystems

Inodes



This takes us to 16 million blocks, 16GB more space

Filesystems

Inodes

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But this is not so wasteful as you might think as most files are quite small; the overhead for large files is relatively small, too

Filesystems

Inodes

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The space for the pointers is used for various other things when the inode refers to something other than a disk file

Filesystems

Inodes

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In effect, this is another way for files to have multiple names, but it is very different from normal multiple names, called *hard links*

Filesystems

Inodes

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Note: a hard link refers to the file, while a soft link refers to a *name* of the file. So a hard link is a name, while a soft link is a name of a name

Filesystems

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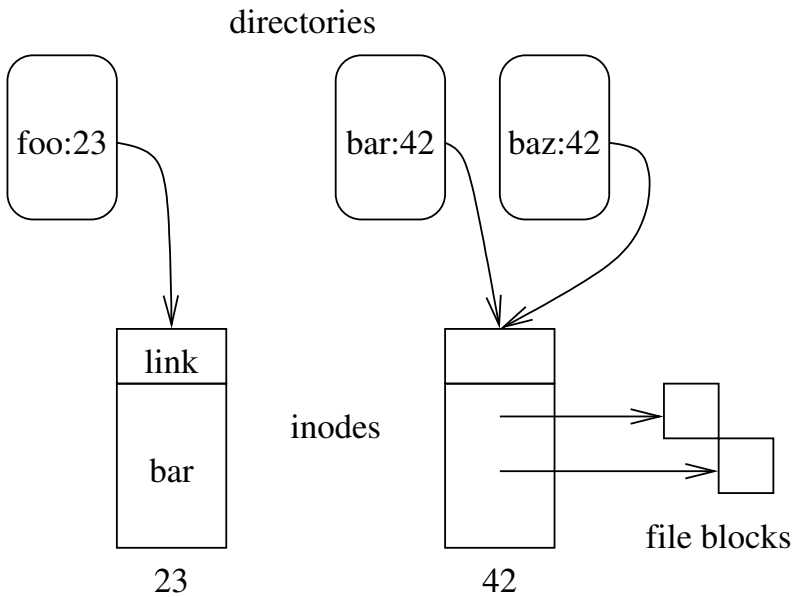

Filesystems

Inodes

Use `ls -li` to see the link details and inode number of a file under Unix

```
% ln -s somefile link1
% ls -li link1
3154340 lrwxrwxrwx 2 rjb users 6 2010-04-22 10:38 lin
k1 -> somefile
% ln link1 link2
% ls -li link*
3154340 lrwxrwxrwx 2 rjb users 6 2010-04-22 10:38 lin
k1 -> somefile
3154340 lrwxrwxrwx 2 rjb users 6 2010-04-22 10:38 lin
k2 -> somefile
```