

Filesystems

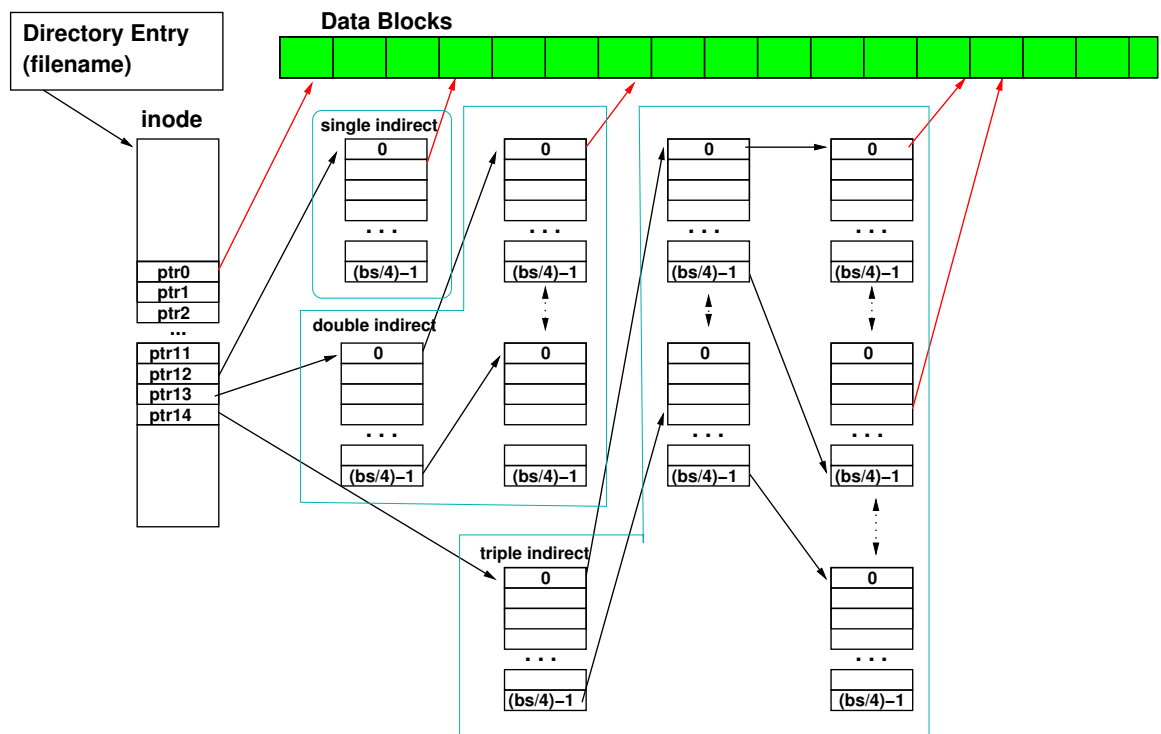
ECE598: Advanced Operating Systems – Homework 8

Spring 2016

Due: Thursday, 14 April 2016, 9:30am

Answer the following questions, putting the answer in some sort of document (.txt, .pdf, .doc).

1. On an ext2 filesystem, is the filename stored in the inode? Explain why this may be.
2. The ext2 filesystem inode contains 15 block pointers. The first 12 (0-11) point directly to disk blocks. Entry 12 points to an indirect block which contains $\text{BLOCKSIZE}/4$ (divided by 4 because the pointer size is 32-bits) block pointers. Entry 13 points to a double indirect block where each pointer points to an indirect block. And finally, entry 14 points to a triple indirect block. (See the diagram below which may or may not help).
 - (a) Assuming a blocksize of 1kB, what is the maximum file size supported without using indirect blocks?
 - (b) What is the maximum file size if additionally all the blocks from the first indirect block are used?
 - (c) What is the maximum file size if additionally the second indirect blocks are used?
 - (d) What is the maximum size of a file if all possible blocks are used (including the triple indirect)?
 - (e) For the previous answer involving the maximum size, what is the overhead involved (i.e. how much space is spent holding all of the indirect blocks)?



3. The ext2 and fat filesystems are very different.

(a) List one use case where an ext2 filesystem works better than fat.

(b) List one use case where a fat filesystem works better than ext2.

4. The file `new_file` is shown via the `ls` command to be 41 Megabytes in size

```
rasp-pi:~% ls -lh new_file
-rw-r--r-- 1 vince weaver 41M Mar 30 21:34 new_file
```

But the command `du -h` which shows how many disk blocks a file uses only shows 16k being used.

```
rasp-pi:~% du -h new_file
16K new_file
```

How is this possible? Why might this be a useful feature to have?

5. On a raspberry pi running Linux you can run the command `cat /proc/cpuinfo` and it will return the following:

```
processor       : 0
model name     : ARMv6-compatible processor rev 7 (v6l)
BogoMIPS      : 2.00
Features      : half thumb fastmult vfp edsp java tls
CPU implementer : 0x41
CPU architecture: 7
CPU variant    : 0x0
CPU part      : 0xb76
CPU revision   : 7

Hardware      : BCM2708
Revision     : 000e
Serial       : 0000000067d41798
```

Is this information stored on disk, or somewhere else?

6. Pick a filesystem supported by Linux (that isn't ext2/3/4, btrfs, or fat) and do some brief research on it. Write a few sentences describing where the filesystem originated, its strengths and weaknesses, and why there's a Linux driver for it. You can find a list of Linux filesystems under the `fs` subdirectory of a Linux source tree, which you can find online here:

<http://lxr.free-electrons.com/source/fs/>.

Submit your work

E-mail the file containing your answers to the questions to me by the homework deadline.