

Chapter 4

4. To start with, if there were no open, on every read it would be necessary to specify the name of the file to be opened. The system would then have to fetch the i-node for it, although that could be cached. One issue that quickly arises is when to flush the i-node back to disk. It could time out, however. It would be a bit clumsy, but it might work.

21. Hard links do not require any extra disk space, just a counter in the i-node to keep track of how many there are. Symbolic links need space to store the name of the file pointed to.

Symbolic links can point to files on other machines, even over the Internet. Hard links are restricted to pointing to files within their own partition.

23. The number of blocks on the disk = $4 \text{ TB} / 4 \text{ KB} = 2^{30}$. Thus, each block address can be 32 bits (4 bytes), the nearest power of 2. Thus, each block can store $4 \text{ KB} / 4 = 1024$ addresses.

25. The beginning of the bitmap looks like:

- (a) After writing file B: 1111 1111 1111 0000
- (b) After deleting file A: 1000 0001 1111 0000
- (c) After writing file C: 1111 1111 1111 1100
- (d) After deleting file B: 1111 1110 0000 1100

35. The blocks allotted to f1 are: 22, 19, 15, 17, 21.

The blocks allotted to f2 are: 16, 23, 14, 18, 20.

40. The i-node holds 10 pointers. The single indirect block holds 1024 pointers. The double indirect block is good for 1024^2 pointers. The triple indirect block is good for 1024^3 pointers. Adding these up, we get a maximum file size of 1,074,791,434 blocks, which is about 4 TB.

41. The following disk reads are needed:

- directory for /
- i-node for /usr
- directory for /usr
- i-node for /usr/ast
- directory for /usr/ast
- i-node for /usr/ast/courses
- directory for /usr/ast/courses
- i-node for /usr/ast/courses/os
- directory for /usr/ast/courses/os
- i-node for /usr/ast/courses/os/handout.t

In total, 10 disk reads are required.