

CSCI 3150 Introduction to Operating Systems

Assignment Two

Deadline: **23:59, October 31, 2021**

Total Marks: 100

Question One (50 marks)

Suppose that there is a file with SFS and we have read the contents of its inode and related data blocks into the memory as shown in Figure 1.

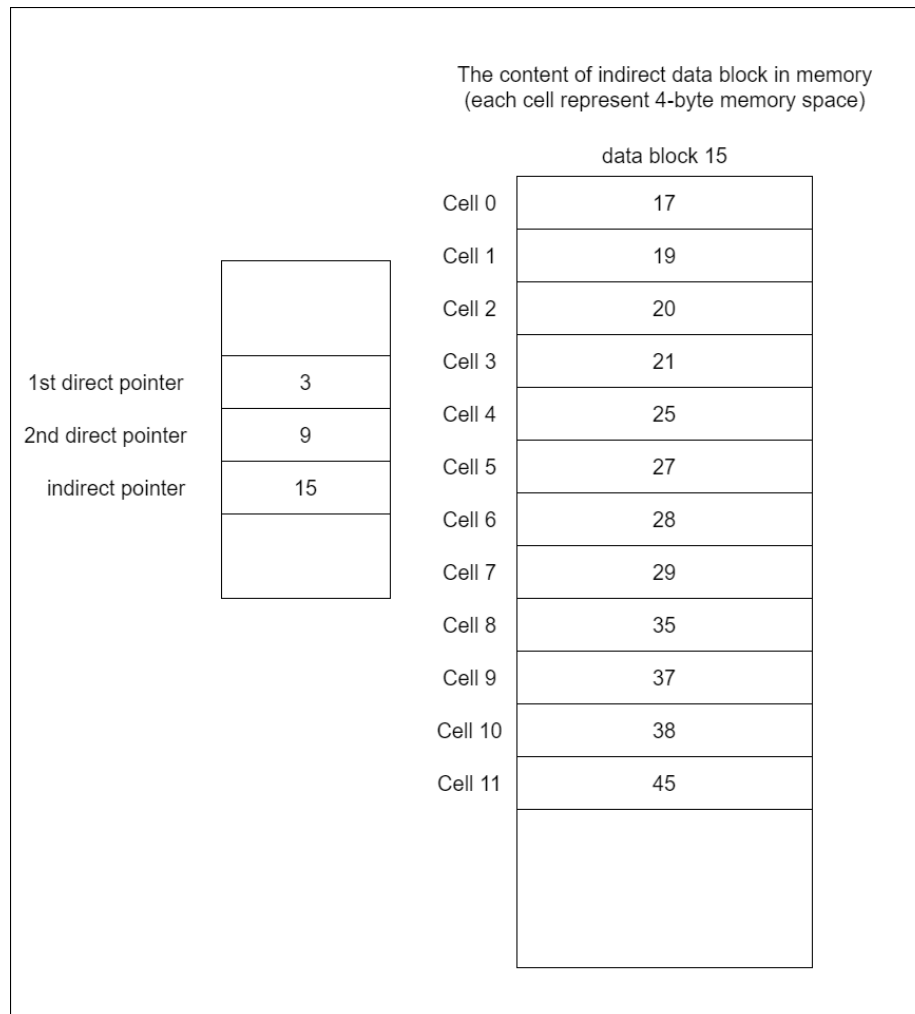


Fig.1 A file in SFS. The contents of *inode* and *indirect_blk* are shown.

Here, each cell represents a 4-byte memory space and the decimal number inside is the unsigned integer stored correspondingly.

Answer the following questions:

- What is the biggest size we can have for a file with SFS? (10 marks)
- Provide data block numbers in sequence that will be read from the disk (only data blocks that contain file data) when `read_t (inum, offset, buf1, count)` is called in a user program, where `inum` is the corresponding inode number for the above inode, and `buf1` is a pointer that points to a user-defined buffer. (40 marks)

	read_t (inum, offset, buf1, count)	The data block numbers in sequence that will be read from (only list the data blocks that contain file data)
Example 1	read_t(inum, 133, buf1, 400);	3
Example 2	read_t(inum, 133, buf1, 6000);	3,9
(i)	read_t(inum, 7000, buf1, 10000);	
(ii)	read_t(inum, 12000, buf1, 26000);	
(iii)	read_t(inum, 10000, buf1, 36000);	
(iv)	read_t(inum, 1000, buf1, 31000);	

Question Two (50 marks)

In the SFS file system, there exist the files with the hierarchy shown in Figure 2.

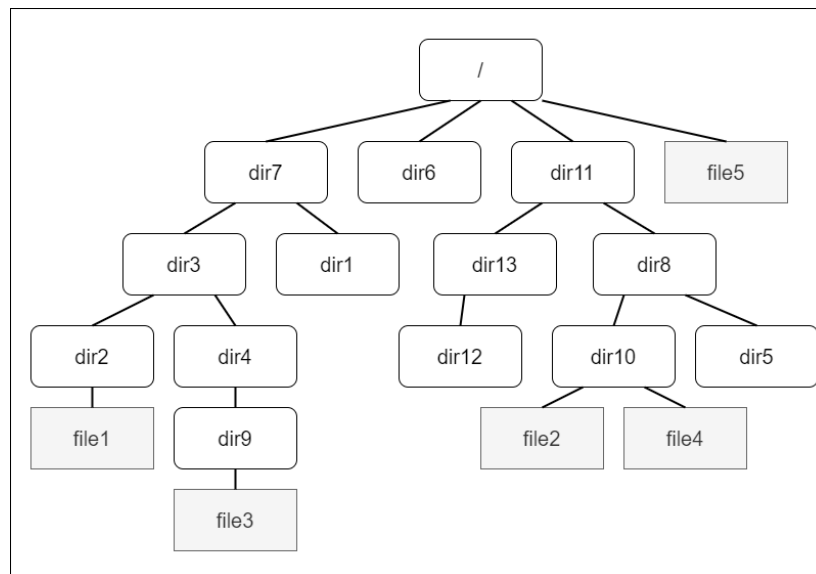


Fig.2 Directory hierarchy

Here, “/” is the root directory; “dir1”, “dir2”, “dir3”, “dir4”, “dir5”, “dir6”, “dir7”, “dir8”, “dir9”, “dir10”, “dir11”, “dir12” and “dir13” are directory file; “file1”, “file2”, “file3”, “file4”, “file5” are regular file.

Suppose we have known that the inode numbers of “/”, “dir1”, “dir2”, “dir3”, “dir4”, “dir5”, “dir6”, “dir7”, “dir8”, “dir9”, “dir10”, “dir11”, “dir12”, “dir13”, “file1”, “file2”, “file3”, “file4” and “file5” are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17 and 18, respectively.

Moreover, each directory entry only occupies one data block (4 KB for one data block), and the data block numbers allocated to “/”, “dir1”, “dir2”, “dir3”, “dir4”, “dir5”, “dir6”, “dir7”, “dir8”, “dir9”, “dir10”, “dir11”, “dir12” and “dir13” are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 respectively.

Answer the following questions:

(a) Suppose that each directory entry in a directory file is defined by the following structure:

```
typedef struct dir_mapping
{
    char dir_name[20]; /* The file name in current directory */
    int i_number; /* The inode number */
}DIR_NODE;
```

Each directory file should at least contain two mapping items, “.” and “..”, for itself and its parent directory, respectively (the parent of the root directory is itself). **Give the contents of data blocks 0, 7, 8, 4 and 10, respectively.** (30 marks)

(For each data block, use the following format to list one map:

filename inode_number

For example, if “dir1” and “1” are stored in a data block (as the file name and inode correspondingly), then show them as follows:

dir1 1

Note that the mappings for “.” and “..” needs to be displayed as well in a data block.)

(b) Suppose a user provides the following absolute path:

/dir11/dir8/dir10/file2

Show the sequence of the inode numbers and data block numbers we need to pass in order to obtain the inode number of **file2** (starting from the root directory). (20 marks)

What to submit – A pdf that contains your answers.