GTU Department of Computer Engineering
CSE 312/504 - Spring 2022
Homework #3 Report

Hasan Mutlu
1801042673

File System Structure

Superblock	i-nodes	Blocks
24 B	? B	? B

Superblock is 24 bytes. A single i-node is 168 bytes.

Firstly, size of the remaining of the file system is calculated. According to the file system size in MB's, this space is allocated for equal number of i-nodes and blocks. i-nodes are allocated on left and blocks are allocated on right.

Size of the file system is 16MB as default. This value can be changed by changing the macro in filesystem.h header file.

Suppose that the size of the file system is 16MB, and the block size is 32KB. With these values, there would be 509 I-nodes and 509 blocks fit in the remaining space.

Superblock	i-nodes	Blocks
24 B	509*168 Bytes = 85.512 Bytes	509*32 KB = 16.678.912 Bytes

Superblock Structure

```
struct Superblock{
    uint32_t blocksize;
    uint32_t numblocks;
    uint32_t numinodes;
    uint32_t numfiles;
    uint32_t startblock;
    uint32_t startinode;
};
```

- ➔ blocksize: Size of each block in KB.
- ➔ numblocks: Number of blocks in the file system.
- ➔ numinodes: Number of i-nodes in the file system.
- ➔ startblock: The address of the first block in the file system.
- ➔ startinode: The address of the first i-node in the file system.

i-node Structure:

```
struct Inode{
    uint32_t size;
    time_t lastmodif;
    uint32_t numlinks;
    uint8_t type;

    uint16_t owner;
    uint16_t group;
    uint16_t protection;

    uint32_t directBlock[DIRECT];
    uint32_t singIndirect;
    uint32_t doubIndirect;
    uint32_t tripIndirect;
};
```

- ➔ size: Size of the i-node's content.
- ➔ lastmodif: Last modification date and time.
- ➔ numlinks: Number of links to the i-node.
- ➔ owner: Index of the owner user.
- ➔ Group: Index of the group.
- ➔ Protection: Protection properties of the content.
- ➔ directBlock: Addresses in direct block. Default value of DIRECT is 32.
- ➔ singIndirect: Address of the single indirect blocks.
- ➔ doubIndirect: Address of the double indirect blocks.
- ➔ tripIndirect: Address of the triple indirect blocks.

File/Directory Structure

```
struct File{
    uint16_t inode;
    char name[NAME_LEN];
};
```

- ➔ inode: Index of the file's i-node.
- ➔ name: Name of file. NAME_LEN is 32 as default so name of file can be at most 31 characters long.

Free Blocks: If the i-node index of the first file in a block is 0, the block is empty.

Functions in Part3:

- ➔ **void dir(uint8_t *filesystem, char *path):** This function executes dir command. It prints files in root path.
- ➔ **void dumpe2fs(uint8_t* filesystem):** This function prints information about the file system.