COP4610
Introduction to Operating Systems
Project #3: Implementing a FAT32 File System

Outline

- Program commands
  - `cd DIRNAME`
  - `creat FILENAME`
  - `mkdir DIRNAME`
  - `mv FROM TO`

Program Commands

`cd DIRNAME`

- Switch the current directory to DIRNAME

Steps:

- Find the DIRENTRY within the current directory that corresponds to DIRNAME
- Set the current directory as DIRNAME

Program Commands

`cd DIRNAME`

- Need to maintain the current working directory
- Keep state of (at least):
  - DIRNAME first cluster
- Hint: You can get the DIRENTRY with the logic implemented for **`ls`**
  - Compare `DIR_Name` field with DIRNAME
  - Check `DIR_Attr`'s `ATTR_DIRECTORY` bit
    - Is it set?

Program Commands

`cd DIRNAME`

- Return an error if the DIRENTRY does not exist or the entry is not a directory

Program Commands

`creat FILENAME`

- Create an empty file under the current directory

Steps:

- Allocate the first cluster of the file
  - Perform a linear search over the FAT until an empty cluster is found
  - Update the FAT entry to `0xFFFFFFFF` (last cluster)
- Create a DIRENTRY with `DIR_FileSize` = 0 under the current directory

Program Commands

`creat FILENAME`

Root cluster

0000000	XXXXXXXX	XXXXXXXX	00000009	00000004
0000004	00000005	00000007	FFFFFFFF	00000008
0000008	FFFFFFFF	0000000A	0000000B	00000011
000000C	0000000D	0000000E	FFFFFFFF	00000010
0000010	00000012	FFFFFFFF	00000013	00000014
0000014	00000015	00000016	FFFFFFFF	00000000
0000018	00000000	00000000	00000000	00000000
000001C	00000000	00000000	00000000	00000000
0000020	00000000	00000000	00000000	00000000
…	…	…	…	…

- Start at root cluster
- Linearly search through FAT until you find an empty cluster (0x0)

Allocate cluster 0x6

Program Commands

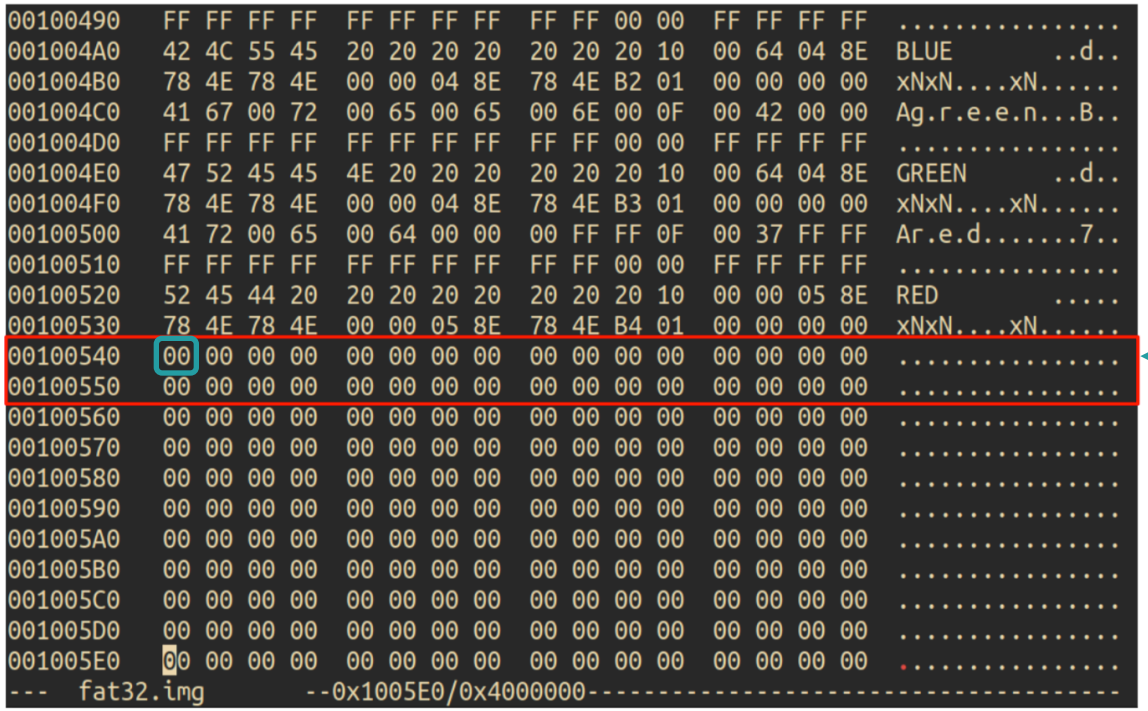
`creat FILENAME`

- Allocate a DIRENTRY
  - Set name field
    - No need to suport long names
    - 8 char max (pad name with spaces on the right)
    - No extension
  - Set `DIR_FileSize` = 0
  - Set `DIR_FstClusLO` and `DIR_FstClusHI`
  - Set file attributes accordingly

Program Commands

`creat FILENAME`

- Store the DIRENTRY at the first empty space



Program Commands

`creat FILENAME`

- The rest of the fields are optional (unless specific value required in the FAT32 specs)
- If you did OK, your file should be listed under your current directory (**`ls`**)

Program Commands

`mkdir DIRNAME`

- Very similar to creat FILENAME
  - Allocate first cluster of directory in the FAT
  - Create DIRENTRY under current directory
    - Set name field
      - No need to suport long names
      - 8 char max (pad name with spaces on the right)
    - `DIR_Attr` will have `ATTR_DIRECTORY` bit set
    - Set `DIR_FileSize` = 0 (will remain unchanged)

Program Commands

`mkdir DIRNAME`

- Use just-allocated cluster and create DIRENTRY entries in it for
  - Parent directory (`..`). Cluster is the current directory's
  - Just-created directory (`.`). Cluster is just-allocated one
- Create empty DIRENTRY right after those entries
  - Means no more entries in the new directory other than . and ..
  - Set `DIR_Name[0] = 0x0` and store DIRENTRY
  - Or just set the first byte of the allocated cluster as 0x0

Program Commands

`mv FROM TO`

- Moves a file or directory or changes the name of a file or directory
- Move file or directory
  - Only if TO exists and is a directory
  - Find the DIRENTRY corresponding to FROM in the current directory
  - Allocate a new DIRENTRY under TO directory
    - Copy the contents of the previously found DIRENTRY

Program Commands

`mv FROM TO`

- Move file or directory (cont.)
  - Set the original DIRENTRY as empty
    - First byte as 0x0 if last entry
    - First byte as 0xE5 otherwise

Program Commands

`mv FROM TO`

- Change file/directory name
  - Only if TO does not exist
  - Find the DIRENTRY associated to TO
  - Set the field `DIR_Name` with the value set by TO
- If FROM is a file and TO is a file
  - Print error “The name is already being used by another file”

Program Commands

`mv FROM TO`

- If FROM is a directory and TO is a file
  - Print "Cannot move directory: invalid destination argument”
- `.` and `..` are valid arguments for FROM, TO
  - Root directory cannot be used as FROM argument
    - Cannot move root directory!

Questions?