

# OS Lab 10 Assignment

Rayavarapu Sai Krupakar (200010047), Myla Venkata Sai Kiran (200010031)

Apr 5, 2023

In this lab, we are implementing files in the Minix File System, for files of size up to 32 bytes. This implementation is only for the file system mounted at /home.

Functionalities that need to be changed to implement immediate files are:

## File Creation:

We can start by creating a file as an immediate one.

When a file grows beyond 32B, then we can make it a regular file.

Since the `creat()` system call is equivalent to `open()` with the flags equal to `O_CREAT|O_WRONLY|O_TRUNC`, `creat()` is considered as a special case of the `open()`. The `open()` system call's arguments are: `const char *path, int flags, mode_t mode`

General mechanism for file creation:

1. Open the parent directory: The first step is to open the directory where the new file will be created. Here, we obtain the file descriptor for the parent directory using the `open()` system call.
2. Next we can allocate an inode for the new file.
3. After the inode is allocated, then can allocate a block on disk to store the file's data.
4. Then writing a new directory entry that contains the name of the file and the inode number of the new file.
5. Then we update metadata by updating the parent directory's inode, the new file's inode, and the block bitmap.

The current contents of the file stored in the inode are moved to a newly allocated data block on disk. The space which we are using now needs to be vacated so that we can store pointers to data blocks instead. If we create a new file (which is an immediate file), and add bytes to it without pushing it over 32B, then the data is stored in the inode and no new data blocks are allocated.

We are defining an additional flag that marks the file and inode as immediate.

**File Read:**

If the file which we are going to read is an immediate file, we can respond with inode file contents.

If it is not an immediate file, then we can follow the default behavior of looking up zones

Similarly, when you read from an immediate file, do not follow the links, just retrieve the data from the inode itself.

**File write:**

This is similar to reading. Here, we are ensuring that if we want to write to the inode structure, then the new file size is still within 32B.

When a regular file shrinks to less than 32 bytes, then we don't have to come back to immediate mode.

For each write operation, we will check to determine whether the data after write will exceed the 32 maximum bytes in the immediate file.

If not, then no problem, just we will add the bytes to the inode storage. In that case, the immediate file is changed into a regular file. So, we need to allocate blocks to store the data that is currently in the inode. Then we will move the data over to the new block and fix the inode so that the pointers are valid.

All pointers other than block pointers are set to NO\_ZONE.

**File delete:**

Deleting immediate files does not require any handling of zones.

**Screen shots****File create:**

```

PID 116 swapped in Rollno:200010031,200010047
file deleted: 92
Minix: PID 364 exited
# ls
Minix: PID 365 created
Time Slice fixed : 200
Time slice used :200
PID 117 swapped in Rollno:200010031,200010047
Lab10      byte-unixbench-mod  foo      krupa
Minix: PID 365 exited
# Time Slice fixed : 200
Time slice used :200
PID 28 swapped in Rollno:200010031,200010047
Time Slice fixed : 200
Time slice used :3
PID 28 swapped in Rollno:200010031,200010047

# touch test.txt
Minix: PID 366 created
Time Slice fixed : 200
Time slice used :200
PID 118 swapped in Rollno:200010031,200010047
file created: 92
Minix: PID 366 exited
# =

```

#### File write : (below 32 bytes)

```

Time Slice fixed : 200
Time slice used :3
PID 28 swapped in Rollno:200010031,200010047

# touch test.txt
Minix: PID 366 created
Time Slice fixed : 200
Time slice used :200
PID 118 swapped in Rollno:200010031,200010047
file created: 92
Minix: PID 366 exited
# echo "Hi this is a team" > test.txtTime Slice fixed : 200
Time slice used :200
PID 27 swapped in Rollno:200010031,200010047

Minix3: Writing to Immediate File.
file write: 92; nbytes = 18; offset = 18
# Time Slice fixed : 200
Time slice used :2
PID 27 swapped in Rollno:200010031,200010047

# echo "Hi this is a team" > test.txt
Minix3: Writing to Immediate File.
file write: 92; nbytes = 18; offset = 18
# =

```

#### File read:

```

Time slice used :200
PID 28 swapped in Rollno:200010031,200010047
Time Slice fixed : 200
Time slice used :1
PID 28 swapped in Rollno:200010031,200010047
Time Slice fixed : 200
Time slice used :200
PID 27 swapped in Rollno:200010031,200010047
Time Slice fixed : 200
Time slice used :5
PID 27 swapped in Rollno:200010031,200010047
ls
Minix: PID 372 created
Time Slice fixed : 200
Time slice used :200
PID 124 swapped in Rollno:200010031,200010047
Lab10          foo          test.txt
byte-unixbench-mod  krupa
Minix: PID 372 exited
# echo "Now we are going to see an example that exceeds the limit of an immediat
e file" > test.txt
file write: 92; nbytes = 79; offset = 79
# echo "Hey" > test.txt
file write: 92; nbytes = 4; offset = 4
#
Minix: PID 372 created
Time Slice fixed : 200
Time slice used :200
PID 124 swapped in Rollno:200010031,200010047
Lab10          foo          test.txt
byte-unixbench-mod  krupa
Minix: PID 372 exited
# echo "Now we are going to see an example that exceeds the limit of an immediat
e file" > test.txt
file write: 92; nbytes = 79; offset = 79
# echo "Hey" > test.txt
file write: 92; nbytes = 4; offset = 4
# cat test.txt
Minix: PID 373 created
Time Slice fixed : 200
Time slice used :200
PID 125 swapped in Rollno:200010031,200010047
file read: 92; nbytes = 4096; offset = 4
Hey
file read: 92; nbytes = 4096; offset = 4
Minix: PID 373 exited
# Time Slice fixed : 200
Time slice used :200
PID 27 swapped in Rollno:200010031,200010047

```

**File delete:**

```
file write: 92; nbytes = 4; offset = 4
# cat test.txt
Minix: PID 373 created
Time Slice fixed : 200
Time slice used :200
PID 125 swapped in Rollno:200010031,200010047
file read: 92; nbytes = 4096; offset = 4
Hey
file read: 92; nbytes = 4096; offset = 4
Minix: PID 373 exited
# Time Slice fixed : 200
Time slice used :200
PID 27 swapped in Rollno:200010031,200010047
Time Slice fixed : 200
Time slice used :9
PID 27 swapped in Rollno:200010031,200010047

# rm -f test.txt
Minix: PID 374 created
Time Slice fixed : 200
Time slice used :200
PID 126 swapped in Rollno:200010031,200010047
file deleted: 92
Minix: PID 374 exited
#
```