

# File System Simulation Report

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## 1 Introduction

This report provides a detailed explanation of the C program implementing a file system simulation. The simulation utilizes various data structures to model the components of a file system, facilitating operations such as file creation, deletion, and directory management.

## 2 Data Structures

### 2.1 Inode Struct

The `inode` struct represents an inode, which stores metadata about a file or directory in the file system.

```
1 struct inode {  
2     char name[MAX_NAME_LENGTH];  
3     int size;  
4     int block_pointers[MAX_BLOCK_POINTERS];  
5     // ... other metadata  
6 };
```

Listing 1: Inode Struct

- `name`: The name of the file or directory.
- `size`: The size of the file in bytes.
- `block_pointers`: An array of pointers to data blocks.

### 2.2 Dirent Struct

The `dirent` struct represents a directory entry, associating a filename with the corresponding inode index.

```
1 struct dirent {  
2     char name[MAX_NAME_LENGTH];  
3     int inode_index;  
4 };
```

Listing 2: Dirent Struct

- `name`: The name of the file or directory.
- `inode_index`: The index of the associated inode.

### 2.3 Superblock Struct

The `superblock` struct contains essential information about the entire file system.

```

1 struct superblock {
2     int free_blocks[MAX_FREE_BLOCKS];
3     struct inode inodes[MAX_INODES];
4     // ... other metadata
5 };

```

Listing 3: Superblock Struct

- `free.blocks`: An array representing free blocks.
- `inodes`: An array of inodes.

## 2.4 Datablock Struct

The `datablock` struct represents a block of data in the file system.

```

1 struct datablock {
2     char data[MAX_BLOCK_SIZE];
3     // ... other data block-related information
4 };

```

Listing 4: Datablock Struct

- `data`: The actual data stored in the block.

## 2.5 Disk Struct

The `disk` struct represents the overall structure of the simulated disk.

```

1 struct disk {
2     struct superblock super;
3     struct datablock data_blocks[MAX_DATA_BLOCKS];
4     // ... other disk-related information
5 };

```

Listing 5: Disk Struct

- `super`: An instance of the superblock.
- `data_blocks`: An array of data blocks.

# 3 How These Structs Aid in File System Simulation

## 3.1 Hierarchy Representation

The `inode` and `dirent` structs establish a hierarchical structure by associating files with their respective inodes and directories.

## 3.2 Metadata Management

The `inode` struct manages metadata associated with files, such as file size and pointers to data blocks.

## 3.3 Data Storage

The `datablock` struct represents the basic unit of data storage, holding either file content or directory entries.

## 3.4 Centralized Information

The `superblock` struct serves as a centralized repository for critical file system information, including the free block list and an array of inodes.

### 3.5 Disk Representation

The `disk` struct encapsulates the entire simulated disk, providing a unified structure for managing the various components of the file system.

## 4 Conclusion

The implemented data structures form a robust foundation for simulating file system operations and interactions. They mirror the essential components of a real-world file system, enabling efficient management of files, directories, and associated metadata.