

Operating System: Project 4

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Task 2

To make sure that only one thread can access the segment buffer and segment bitmap, we use a mutex lock named `segment_lock`. Threads intend to enter `get_block()`, `new_data_block()`, `new_inode_block()` and `remove_inode()` have to acquire `segment_lock` first and then release it before returning.

To maintain the consistency of the whole file system, we use locks for each independent inode. In each file operation, the thread needs to first locate the inodes it need to access and then acquire the locks corresponding to them.

To make the cache operations atomic, we use a mutex lock for all the cache operations.

Task 3

The write-back cache overrides our original `read_block()` and `write_segment()` functions with their `_through_cache()` versions. The cache occupies 4MB space with 512 cachelines, and each cacheline contains contiguous 8 blocks. Upon any cache miss, LRU policy is applied to decide to-be-deleted cachelines. When an eviction finishes, all evicted dirty cachelines are `fsync()`ed to disk.

The cache also provides `init_cache()` and `flush_cache()` functions to support file system initialization and garbage collection.