CSE 3033
OPERATING SYSTEMS
Programming Assignment #3

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Introduction

In this project, we are working with threads. There are four different type of threads, which are read threads, upper thread, replace threads and, write threads.

- **Read Thread**: These threads are responsible for reading from file line by line. Then, puts the readed line into array.
- **Upper Thread**: These threads are responsible for firstly read from the array then convert the readed lines to uppercase letters and write back to the same index of the array.
- **Replace Thread**: These types of the threads will read from the array, replace all spaces with underscore character and write back to the same index of the array.
- **Write Thread**. They will read from the array and store it to the text file, each line in the correct place.

Also there is a main thread which has a main task about creating all thread types.

How to Work?

Read Threads

Mutex name : readMutex

After the pthread_create() function every thread should be inside of the Read() function. When the threads come, one of them first enter the mutex lock zone then this threads get the line number and this line number means that thread will read the this number of line. After this thread print the information about line and give us information about it's thread id. The reading process will continue in this way and every thread will get the line number when enter the mutex lock zone.

Upper Threads

Mutex name : upperMutex

These thread types work a little bit similar with read threads. Differences are when the one of the upper threads start the working it will lock the replace threads mutex. Because we do not want to work these two thread types on the same line. When the upper threads jobs done it will unlock the replace threads mutex. Upper threads jobs is if the read the line indices one by one and if it is lowercase letter change the content to uppercase.

Replace Threads

Mutex name : replaceMutex

These thread types also get the line number when enter the lock zone which is similar with upper threads and read threads. When the replace threads start the working then that thread will lock the upper threads mutex. Replace threads jobs is read the line and replace the all spaces with underscore character and write back to the same index of the array.

Write Threads

Mutex name : writeMutex

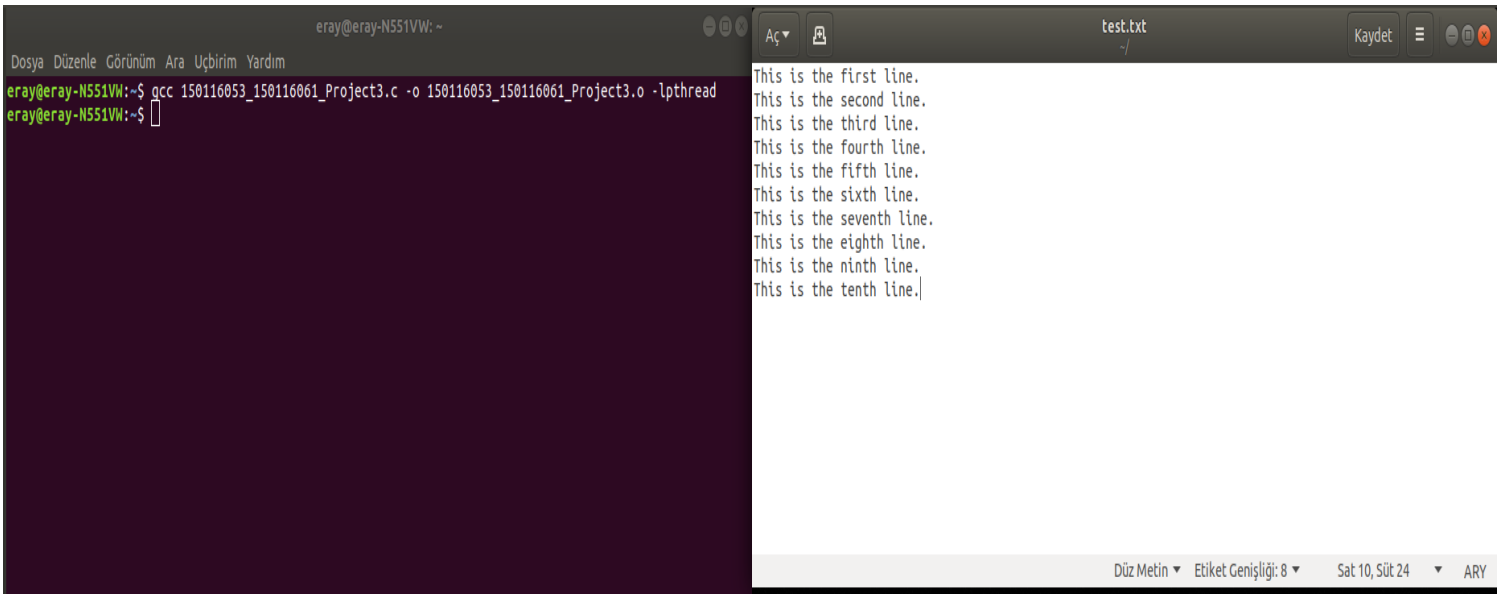
In this thread types when the replace threads and upper threads modifications are done at least one array index. Then write threads can start to work with this array. After that, writer thread can write to same file and print the information about line and give us information about it's thread id.

Execution

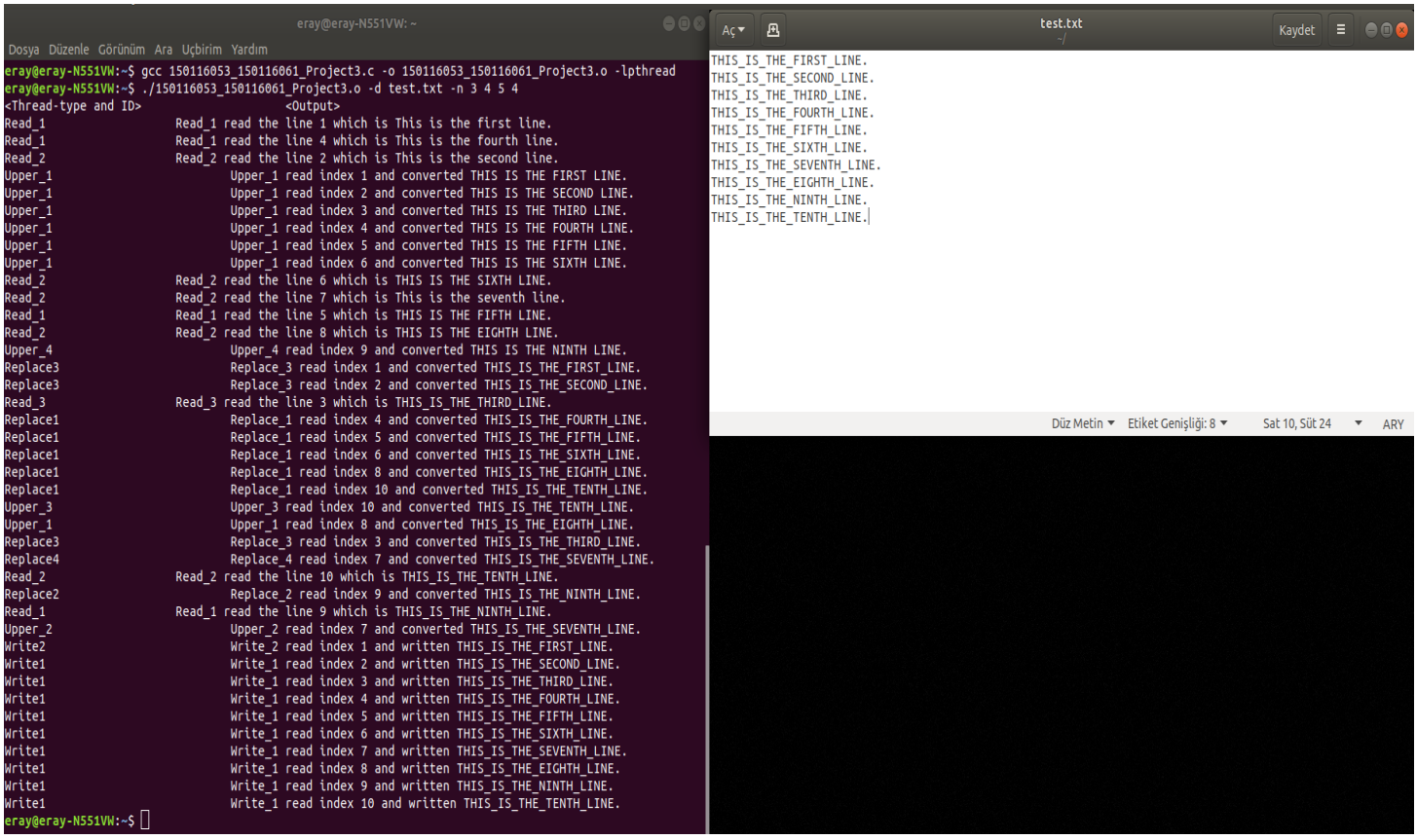
The execution starts from read threads. First, read threads read the assigned lines from txt file. After first read, upper thread or replace threads do their work. There is no order between upper and replace threads. If upper thread first locks replace threads, upper threads will start execution. After they finish, one of the upper thread will unlock replace threads and then, replace threads will start execution. On the other hand, if replace thread first locks upper threads, replace threads will start execution. After they finish, one of the replace thread will unlock upper threads and then, upper threads will start execution. While reading txt file, one of the write thread is writing the same file from the beginning.

Down below you can find one of the execution example.

Before the execution;



After the execution;



Conclusion

After this project we have better understanding of our knowledge and their difference with threads. We also have better knowledge of how to use the threads.