CSE344 SYSTEMS PROGRAMMING

HOMEWORK 5

REPORT

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I have used both condition variables and barrier in HW4 so I have sent the same homework with HW4.

```c
void* manager(void* args) {
    ArgumentsManager* arguments = (ArgumentsManager*) args;
    copy_directory(arguments->src, arguments->dest, arguments); // Start copying from the source directory
    if(pthread_mutex_lock(&arguments->mutex) != 0){
        perror("Failed to lock mutex");
        exit(EXIT_FAILURE);
    }
    arguments->done = 1;
    if(pthread_cond_broadcast(&arguments->buffer->not_empty) != 0){
        perror("Failed to broadcast not_empty condition variable");
        exit(EXIT_FAILURE);
    }
    if(pthread_mutex_unlock(&arguments->mutex) != 0){
        perror("Failed to unlock mutex");
        exit(EXIT_FAILURE);
    }
    pthread_barrier_wait(&arguments->barrier);
    return NULL;
}
```

Both barrier and condition variables are used in manager.

```c
void* worker(void* args) {
    ArgumentsManager* arguments = (ArgumentsManager*) args;
    Buffer* buffer = arguments->buffer;

    while (1) {
        if(pthread_mutex_lock(&buffer->mutex) != 0){
            perror("Failed to lock mutex");
            return NULL;
        }

        while (buffer->count == 0 && !arguments->done && !terminate) {
            if(pthread_cond_wait(&buffer->not_empty, &buffer->mutex) != 0){
                perror("Failed to wait on not_empty condition variable");
                return NULL;
            }
        }
        if((arguments->done && buffer->count == 0) || terminate){
            if(pthread_mutex_unlock(&buffer->mutex) != 0){
                perror("Failed to unlock mutex");
            }
            pthread_barrier_wait(&arguments->barrier);
            break;
        }
```

Both barrier and condition variables are also used in workers. Barrier waits for every worker and manager to finish their job.

Test Results:

```
burak@DESKTOP-NK4AG8G:/mnt/c/Users/User/Desktop/BİLGİSAYAR/bilgisayar 6.yarıyıl/system prog/Hw4/hw4test/put_your_codes_here$ valgrind ./MWCp 10 10 ../testdir/src/libvterm ../tocopy
==2412== Memcheck, a memory error detector
==2412== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==2412== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==2412== Command: ./MWCp 10 10 ../testdir/src/libvterm ../tocopy
==2412==
==2412== error calling PR_SET_PTRACER, vgdb might block
Manager thread is created.
Worker threads are created.
Copying files from ../testdir/src/libvterm to ../tocopy
Buffer is freed.

---------------STATISTICS--------------------
Consumers: 10 - Buffer Size: 10
Number of Regular File: 194
Number of FIFO File: 0
Number of Directory: 7
TOTAL BYTES COPIED: 25009680
TOTAL TIME: 00:01.937 (min:sec.mili)
==2412==
==2412== HEAP SUMMARY:
==2412==     in use at exit: 0 bytes in 0 blocks
==2412==   total heap usage: 23 allocs, 23 frees, 286,832 bytes allocated
==2412==
==2412== All heap blocks were freed -- no leaks are possible
==2412==
==2412== For lists of detected and suppressed errors, rerun with: -s
==2412== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
```

```
burak@DESKTOP-NK4AG8G:/mnt/c/Users/User/Desktop/BİLGİSAYAR/bilgisayar 6.yarıyıl/system prog/Hw4/hw4test/put_your_codes_here$ ./MWCp 10 4 ../testdir/src/libvterm/src ../tocopy
Manager thread is created.
Worker threads are created.
Copying files from ../testdir/src/libvterm/src to ../tocopy

---------------STATISTICS--------------------
Consumers: 4 - Buffer Size: 10
Number of Regular File: 140
Number of FIFO File: 0
Number of Directory: 2
TOTAL BYTES COPIED: 24873082
TOTAL TIME: 00:00.484 (min:sec.mili)
```

```
burak@DESKTOP-NK4AG8G:/mnt/c/Users/User/Desktop/BİLGİSAYAR/bilgisayar 6.yarıyıl/system prog/Hw4/hw4test/put_your_codes_here$ ./MWCp 10 10 ../testdir ../tocopy
Manager thread is created.
Worker threads are created.
Copying files from ../testdir to ../tocopy

---------------STATISTICS--------------------
Consumers: 10 - Buffer Size: 10
Number of Regular File: 3116
Number of FIFO File: 0
Number of Directory: 151
TOTAL BYTES COPIED: 73520554
TOTAL TIME: 00:04.125 (min:sec.mili)
```

```
burak@DESKTOP-NK4AG8G:/mnt/c/Users/User/Desktop/BİLGİSAYAR/bilgisayar 6.yarıyıl/system prog/Hw4/hw4test/put_your_codes_here$ valgrind ./MWCp 10 10 ../testdir/src ../tocopy
==4336== Memcheck, a memory error detector
==4336== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==4336== Using Valgrind-3.15.0 and LibVEX; rerun with -h for copyright info
==4336== Command: ./MWCp 10 10 ../testdir/src ../tocopy
==4336==
==4336== error calling PR_SET_PTRACER, vgdb might block
Manager thread is created.
Worker threads are created.
Copying files from ../testdir/src to ../tocopy
^CReceived SIGINT, shutting down...

---------------STATISTICS--------------------
Consumers: 10 - Buffer Size: 10
Number of Regular File: 260
Number of FIFO File: 0
Number of Directory: 11
TOTAL BYTES COPIED: 12034730
TOTAL TIME: 00:01.359 (min:sec.mili)
==4336==
==4336== HEAP SUMMARY:
==4336==     in use at exit: 0 bytes in 0 blocks
==4336==   total heap usage: 27 allocs, 27 frees, 418,096 bytes allocated
==4336==
==4336== All heap blocks were freed -- no leaks are possible
==4336==
==4336== For lists of detected and suppressed errors, rerun with: -s
==4336== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
```

Last one tested with SIGINT interrupt.