

GEBZE TECHNICAL UNIVERSITY

CSE 344

SYSTEM PROGRAMMING

Homework #4 Report

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1.Problem Definition

This project develops a program that aims to speed up file and directory copying operations using multithreading. This program, called MWCp, executes file copy operations in parallel using a manager thread and multiple worker threads. This allows source directories containing large amounts of files and directories to be quickly copied to target directories.

2.Implementation

The "MWCp" utility consists of the following key components:

Main Program:

- Parses command-line arguments.
- Initiates the manager and worker threads.
- Measures and reports execution time and statistics.

Manager Thread:

- Traverses the source directory recursively.
- Fills a shared buffer with file paths to be copied.
- Signals workers to start copying once the buffer is filled or traversal is complete.

Worker Threads:

- Retrieve file paths from the buffer.
- Copy files from source to destination.
- Handle file copying errors gracefully.

Signal Handling:

- Handles SIGINT (Ctrl+C) to ensure graceful shutdown.

Synchronization:

- Uses mutexes and condition variables to manage buffer access and thread synchronization.

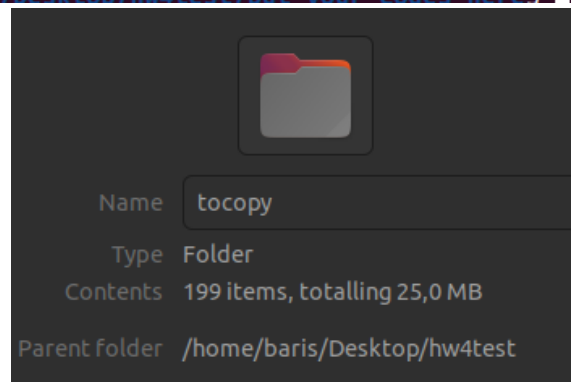
3.Result and Test Cases

- Test 1:

> `./MWCp 10 10 ../testdir/src/libvterm ../tocopy`

```
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$ ./MWCp 10 10 ../testdi
r/src/libvterm ../tocopy

-----STATISTICS-----
Consumers: 10 - Buffer Size: 10
Number of Regular File: 194
Number of FIFO File: 0
Number of Directory: 7
TOTAL BYTES COPIED: 24888648
TOTAL TIME: 00:00.021 (min:sec.mili)
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$
```



- Test 2:

> `./MWCp 10 10 ../testdir/src/libvterm/src ../tocopy`

```
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$ ./MWCp 10 10 ../testdi
r/src/libvterm/src ../tocopy



-----STATISTICS-----
Consumers: 10 - Buffer Size: 10
Number of Regular File: 140
Number of FIFO File: 0
Number of Directory: 2
TOTAL BYTES COPIED: 24107414
TOTAL TIME: 00:00.025 (min:sec.mili)
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$
```

- Test 3:

> ./MWCp 10 10 ../testdir ../tocopy

```
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$ ./MWCp 10 10 ../testdir ../tocopy
```

```
-----STATISTICS-----
Consumers: 10 - Buffer Size: 10
Number of Regular File: 3116
Number of FIFO File: 0
Number of Directory: 151
TOTAL BYTES COPIED: 70244717
TOTAL TIME: 00:00.146 (min:sec.mili)
```

	
Name testdir	Name tocopy
Type Folder	Type Folder
Contents 3.257 items, totalling 74,2 MB	Contents 3.257 items, totalling 74,2 MB
Parent folder /home/baris/Desktop/hw4test	Parent folder /home/baris/Desktop/hw4test

With Valgrind :

```
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$ valgrind ./MWCp 10 10 ../testdir ../tocopy
==14868== Memcheck, a memory error detector
==14868== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==14868== Using Valgrind-3.18.1 and LibVEX; rerun with -h for copyright info
==14868== Command: ./MWCp 10 10 ../testdir ../tocopy
==14868==

-----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: 00:01.926 (min:sec.mili)
==14868==
==14868== HEAP SUMMARY:
==14868==   in use at exit: 0 bytes in 0 blocks
==14868==   total heap usage: 165 allocs, 165 frees, 5,073,968 bytes allocated
==14868==
==14868== All heap blocks were freed -- no leaks are possible
==14868==
==14868== For lists of detected and suppressed errors, rerun with: -s
==14868== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$
```

- If there is no file with given name, creates the file and copies :

```
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$ ./MWCp 10 10 ../testdir ../tonotcopy
-----STATISTICS-----
Consumers: 10 - Buffer Size: 10
Number of Regular File: 3116
Number of FIFO File: 0
Number of Directory: 151
TOTAL BYTES COPIED: 71494464
TOTAL TIME: 00:00.070 (min:sec.mili)
```

- If the command line arguments are missing/invalid your program must print usage information and exit :

```
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$ ./MWCp 10 10 ../testdir
Usage: ./MWCp <buffer_size> <num_workers> <source_dir> <dest_dir>
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$ ./MWCp 10 ../testdir ../tonotcopy
Usage: ./MWCp <buffer_size> <num_workers> <source_dir> <dest_dir>
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$
```

- Signal Handler (Ctrl + C)
 - Tested with valgrind because execution time was too small

```
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$ valgrind ./MWCp 10 10 ../testdir ../tonotcopy
==15735== Memcheck, a memory error detector
==15735== Copyright (C) 2002-2017, and GNU GPL'd, by Julian Seward et al.
==15735== Using Valgrind-3.18.1 and LibVEX; rerun with -h for copyright info
==15735== Command: ./MWCp 10 10 ../testdir ../tonotcopy
==15735==
^CSIGINT received, shutting down...
-----STATISTICS-----
Consumers: 10 - Buffer Size: 10
Number of Regular File: 3116
Number of FIFO File: 0
Number of Directory: 151
TOTAL BYTES COPIED: 0
TOTAL TIME: 00:00.313 (min:sec.mili)
==15735==
==15735== HEAP SUMMARY:
==15735==   in use at exit: 0 bytes in 0 blocks
==15735==   total heap usage: 165 allocs, 165 frees, 5,073,968 bytes allocated
==15735==
==15735== All heap blocks were freed -- no leaks are possible
==15735==
==15735== For lists of detected and suppressed errors, rerun with: -s
==15735== ERROR SUMMARY: 0 errors from 0 contexts (suppressed: 0 from 0)
baris@baris-Ubuntu:~/Desktop/hw4test/put_your_codes_here$
```