CSE344 Homework 4 Report

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1. Problem Definition

Develop a directory copying utility called "MWCp" that copies files and sub-directories in parallel. Use a worker-manager approach to synchronize thread activity. Use POSIX and Standard C libraries.

2. General Structure

} Buffer;

Simplified version of the code. For detailly (signal handler, closing file etc.) implementation you can look code file.

```
pthread_mutex_t the_mutex; // Mutex for synchronization between threads
pthread_cond_t condc, condp; // Condition variables for controlling if buffer is full or empty
pthread_mutex_t flag; // Mutex for SIGINT
typedef struct {
    int srcFd; // File descriptor for source file
    int destFd; // File descriptor for destination file
    char srcName[PATH_SIZE]; // Source file name
    char destName[PATH_SIZE]; // Destination file name
} Files;
typedef struct {
    int bufferSize; // Buffer size Files *buffer; // Buffer
    int count; // Number of items in buffer
    int head; // Head of buffer int last; // Last of buffer
    int doneFlag; // Done flag
```

```
manager(arg) {
    char **argv = (char **) arg;
    createDirectory(argv[3], argv[4]);
    lock(&thread_mutex);
    buffer.doneFlag = 1;
    broadcast(&condc);
    unlock(&thread_mutex);
}
worker(arg) {
    while(1) {
         item = remove_item();
         if(item.srcFd == -1 and item.dest == -1) break;
         if(item.srcFd == -1 or item.dest == -1) continue;
         while(bytes_read = read(item.src) > 0) {
              bytes_write = write(item.destFd);
              totalWritten += bytes_write;
         }
         close(item.srcFd);
         close(item.dstFd);
         lock(&thread_mutex);
         totalBytes += totalWritten;
         unlock(&thread_mutex);
    }
    pthread_exit(0);
}
```

```
add_item(Files item) {
    lock(&thread_mutex);
    while(buffer.count == maxBuffer) cond_wait(&condp, &thread_mutex);
    buffer.buffer[buffer.last] = item;
    buffer.last = (buffer.last + 1) % buffer.bufferSize;
    buffer.count++;
    cond_signal(&condc);
    unlock(&thread_mutex);
}
remove_item() {
    lock(&thread_mutex);
    while(buffer.count == 0 && buffer.doneFlag == 0) cond_wait(&condc, &thread_mutex);
    if(buffer.count > 0) {
         item = buffer.buffer[buffer.head];
         buffer.head = (buffer.head + 1) % buffer.bufferSize;
         buffer.count--;
        cond_signal(&condp);
         unlock(&thread_mutex);
        return item;
    }
    unlock(&thread_mutex);
    return (Files) {-1, -1, "", ""};
}
```

3. Tests

• Test1: valgrind ./MWCp 10 10 ../testdir/src/libvterm ../tocopy, #memory leak checking, buffer size=10, number of workers=10, sourceFile, destinationFile

Still reachable blocks because of dynamic linker

```
### spokenow Measure / Manage Spiect from fid (di-load c: 997)

### spokenow from fid all manage spiect form fid (di-load c: 298)

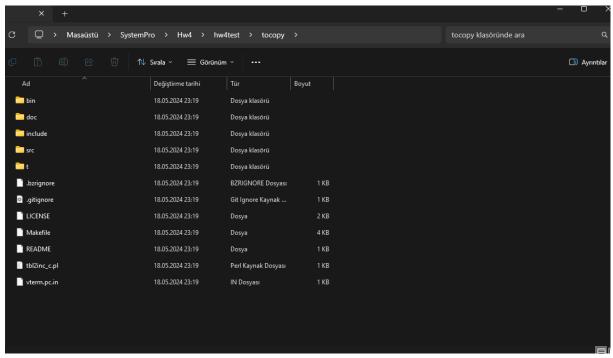
### spokenow from fid all manage spiect form fid (di-load c: 298)

### spokenow from fid all manage spiect form fid acception (di-error-skeleton c: 208)

### spokenow from fid acception (di-error-skeleton c: 207)

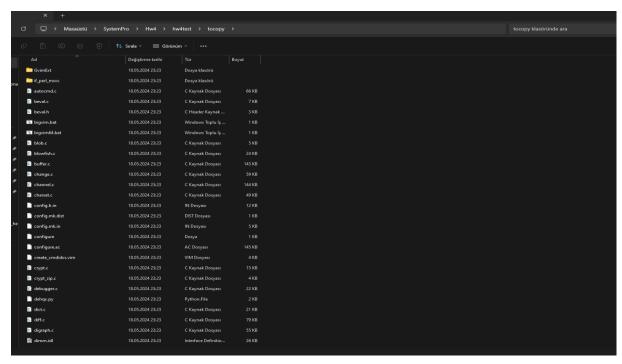
### spokenow from fid acception (di-error-skeleton c: 207)

### spokenow from fid
```



• Test2: ./MWCp 10 4 ../testdir/src/libvterm/src ../toCopy #buffer size=10, number of workers=4, sourceFile, destinationFile

```
Copied ../testdir/src/libvterm/src/if_ole.idl to ../toCopy/if_ole.idl
Copied ../testdir/src/libvterm/src/if_ole.idl to ../toCopy/if_ole.idl
Copied ../testdir/src/libvterm/src/if_perlsfio.c
Copied ../testdir/src/libvterm/src/if_perlsov/stdbool.b to ../toCopy/if_perlsfio.c
Copied ../testdir/src/libvterm/src/if_publos.c to ../toCopy/if_prlmon.c
Copied ../testdir/src/libvterm/src/if_publos.c to ../toCopy/if_prlmon.c
Copied ../testdir/src/libvterm/src/if_publos.c to ../toCopy/if_publos.c
Copied ../testdir/src/libvterm/src/if_publos.c to ../toCopy/indent.c
Copied ../testdir/src/libvterm/src/install-sh to ../toCopy/install-sh
Copied ./testdir/src/libvterm/src/INSTALlani.t to ../toCopy/INSTALlani.t to
Copied ./testdir/src/libvterm/src/INSTALlani.t to ../toCopy/INSTALlani.t to
Copied ../testdir/src/libvterm/src/INSTALlani.t to ../toCopy/INSTALlani.t to
Copied ../testdir/src/libvterm/src/libvterm/src/libvterm/src/lopy.to
Copied ../testdir/src/libvterm/src/lopy.to
Copied ../testdir/src/libvterm/src/lopy.to
Copied ../testdir/src/libvterm/src/lopy.to
Copied ../testdir/src
```



 Test3: ./MWCp 10 10 ../testdir ../toCopy #buffer size=10, number of workers=10, sourceFile, destinationFile

```
Copied ../testdir/arc/which sh to ../toCopy/src/which sh
Copied ../testdir/arc/which; sh to ../toCopy/src/which sh
Copied ../testdir/arc/which; sh to ../toCopy/src/which; sh
Copied ../testdir/arc/which; sh to ../toCopy/src/which; sh
Copied ../testdir/arc/which; sh to ../toCopy/src/which; sh
```

