

CSCI-4210/6140 Operating Systems HW#3 Grading Criteria

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0 Preparation

- `grading` directory used for testing:

```
grading/
├── mybackup
├── mybackup.c
├── test2
│   ├── pipe.c
│   └── repeat.c
├── test3
│   ├── pipe.c
│   ├── repeat.c
│   ├── subdir1
│   │   └── fork.c
├── test4
│   ├── pipe.c
│   ├── repeat.c
│   ├── subdir1
│   │   ├── fork.c
│   │   └── subdir2
│   │       └── struct.c
```

`mybackup.c` is the program under test. `test2`, `test3`, and `test4` are directories used for testing in Section 2, 3, and 4 of this document respectively.

- Add the `grading` directory to the `$PATH` environment variable: `bash$ export PATH=$PATH:[path to the grading directory (e.g., ~/OpSys/HW3/grading)]`.
- Software environment used:
 - OS: Ubuntu 14.04 LTS (64-bit)
 - Compiler: gcc (Ubuntu 4.8.2-19ubuntu1) 4.8.2

1 Compilation (20 points)

- Compilation command: `bash$ gcc -Wall mybackup.c -o mybackup -lpthread`
- Penalty: -10 points per error, -5 points per warning (up to -20 points in total).

2 Backup/restore files (40 points)

Test cases in this section are performed in the `test2` directory. Hereafter, test cases are shown in **blue** and expected outputs in **red**.

(a) Initial backup (10 points)

```
bash$ mybackup
[thread 2230925056] Backing up repeat.c...
[thread 2230925056] Copied 128 bytes from repeat.c to repeat.c.bak
[thread 2239317760] Backing up pipe.c...
[thread 2239317760] Copied 996 bytes from pipe.c to pipe.c.bak
Successfully backed up 2 files (1124 bytes) and 0 subdirectory
bash$ ls -l .mybackup
total 8
-rw-rw-r-- 1 user user 996 Apr 16 23:59 pipe.c.bak
-rw-rw-r-- 1 user user 128 Apr 16 23:59 repeat.c.bak
```

(b) Second-time backup (10 points)

```
bash$ touch xyz.txt
bash$ mybackup
```

- If the up-to-date check is implemented, `xyz.txt` is the only file to be backed up:

```
[thread 3200079616] Backup copy of repeat.c is already up-to-date
[thread 3208472320] Backing up xyz.txt...
[thread 3208472320] Copied 0 bytes from xyz.txt to xyz.txt.bak
[thread 3216865024] Backup copy of pipe.c is already up-to-date
Successfully backed up 1 files (0 bytes) and 0 subdirectory
```
- If not, overwriting existing files with warnings is also fine:

```
[thread 3200079616] WARNING: repeat.c.bak exists (overwriting!)
[thread 3208472320] Backing up xyz.txt...
[thread 3208472320] Copied 0 bytes from xyz.txt to xyz.txt.bak
[thread 3200079618] WARNING: pipe.c.bak exists (overwriting!)
[thread 3200079616] Copied 128 bytes from repeat.c to repeat.c.bak
[thread 3200079618] Copied 996 bytes from pipe.c to pipe.c.bak
Successfully backed up 3 files (1124 bytes) and 0 subdirectory
```

```
bash$ ls -l .mybackup
total 8
-rw-rw-r-- 1 user user 996 Apr 16 23:59 pipe.c.bak
-rw-rw-r-- 1 user user 128 Apr 16 23:59 repeat.c.bak
-rw-rw-r-- 1 user user 0 Apr 16 23:59 xyz.txt.bak
```

(c) Backup with up-to-date check (10 points)

```
bash$ echo xyz > xyz.txt (do this to update the xyz.txt's timestamp)
bash$ mybackup
[thread 4227856128] Backup copy of repeat.c is already up-to-date
[thread 14935808] Backing up xyz.txt...
[thread 14935808] Copied 4 bytes from xyz.txt to xyz.txt.bak
[thread 23328512] Backup copy of pipe.c is already up-to-date
Successfully backed up 1 files (4 bytes) and 0 subdirectory
bash$ ls -l .mybackup
```

```
total 12
-rw-rw-r-- 1 user user 996 Apr 16 23:59 pipe.c.bak
-rw-rw-r-- 1 user user 128 Apr 16 23:59 repeat.c.bak
-rw-rw-r-- 1 user user 4 Apr 16 23:59 xyz.txt.bak
```

(d) **Restore files (10 points)**

```
bash$ rm * (remove all the files in the current directory except for .mybackup)
bash$ mybackup -r (or mybackup --restore)
[thread 2985228032] Restoring repeat.c...
[thread 2985228032] Copied 128 bytes from repeat.c.bak to repeat.c
[thread 2993620736] Restoring xyz.txt...
[thread 2993620736] Copied 4 bytes from xyz.txt.bak to xyz.txt
[thread 3002013440] Restoring pipe.c...
[thread 3002013440] Copied 996 bytes from pipe.c.bak to pipe.c
Successfully restored 3 files (1128 bytes) and 0 subdirectory
bash$ ls -l
total 12
-rw-rw-r-- 1 user user 996 Apr 17 00:00 pipe.c
-rw-rw-r-- 1 user user 128 Apr 17 00:00 repeat.c
-rw-rw-r-- 1 user user 4 Apr 17 00:00 xyz.txt
```

3 Backup/restore sub-directories (20 points)

Test cases in this section are performed in the `test3` directory.

(a) **Backup sub-directories (10 points)**

```
bash$ mybackup
[thread 1360762624] Backing up subdir1
[thread 1360762624] Created subdir1
[thread 1369155328] Backing up repeat.c...
[thread 1369155328] Copied 128 bytes from repeat.c to repeat.c.bak
[thread 1377548032] Backing up pipe.c...
[thread 1377548032] Copied 996 bytes from pipe.c to pipe.c.bak
[thread 1385940736] Backing up fork.c...
[thread 1385940736] Copied 2414 bytes from fork.c to fork.c.bak
Successfully backed up 3 files (3538 bytes) and 1 subdirectory
bash$ ls -lR .mybackup
.mybackup/:
total 12
-rw-rw-r-- 1 user user 996 Apr 16 23:58 pipe.c.bak
-rw-rw-r-- 1 user user 128 Apr 16 23:58 repeat.c.bak
drwx----- 2 user user 4096 Apr 16 23:58 subdir1

.mybackup/subdir1:
total 4
-rw-rw-r-- 1 user user 2414 Apr 16 23:58 fork.c.bak
```

(b) **Restore sub-directories (10 points)**

```
bash$ rm -r * (remove all the files in the current directory except for .mybackup)
```

```

bash$ mybackup -r (or mybackup --restore)
[thread 360474368] Restoring subdir1
[thread 360474368] Created subdir1
[thread 368867072] Restoring repeat.c...
[thread 368867072] Copied 128 bytes from repeat.c.bak to repeat.c
[thread 377259776] Restoring pipe.c...
[thread 377259776] Copied 996 bytes from pipe.c.bak to pipe.c
[thread 385652480] Restoring fork.c...
[thread 385652480] Copied 2414 bytes from fork.c.bak to fork.c
Successfully restored 3 files (3538 bytes) and 1 subdirectory
bash$ ls -lR
.:
total 12
-rw-rw-r-- 1 user user 996 Apr 17 00:52 pipe.c
-rw-rw-r-- 1 user user 128 Apr 17 00:52 repeat.c
drwx----- 2 user user 4096 Apr 17 00:52 subdir1

./subdir1:
total 4
-rw-rw-r-- 1 user user 2414 Apr 17 00:52 fork.c

```

4 Backup/restore nested sub-directories (20 points)

Test cases in this section are performed in the `test4` directory.

(a) Backup nested sub-directories (10 points)

```

bash$ mybackup
[thread 3438429952] Backing up subdir1
[thread 3438429952] Created subdir1
[thread 3446822656] Backing up repeat.c...
[thread 3446822656] Copied 128 bytes from repeat.c to repeat.c.bak
[thread 3455215360] Backing up pipe.c...
[thread 3455215360] Copied 996 bytes from pipe.c to pipe.c.bak
[thread 3355440896] Backing up fork.c...
[thread 3355440896] Copied 2414 bytes from fork.c to fork.c.bak
[thread 3463608064] Backing up subdir1/subdir2
[thread 3463608064] Created subdir1/subdir2
[thread 3438429952] Backing up struct.c...
[thread 3438429952] Copied 1583 bytes from struct.c to struct.c.bak
Successfully backed up 4 files (5121 bytes) and 2 subdirectory
bash$ ls -lR .mybackup/
.mybackup/:
total 12
-rw-rw-r-- 1 user user 996 Apr 17 00:56 pipe.c.bak
-rw-rw-r-- 1 user user 128 Apr 17 00:56 repeat.c.bak
drwx----- 3 user user 4096 Apr 17 00:56 subdir1

.mybackup/subdir1:
total 8

```

```
-rw-rw-r-- 1 user user 2414 Apr 17 00:56 fork.c.bak
drwx----- 2 user user 4096 Apr 17 00:56 subdir2

.mybackup/subdir1/subdir2:
total 4
-rw-rw-r-- 1 user user 1583 Apr 17 00:56 struct.c.bak
```

(b) **Restore nested sub-directories (10 points)**

```
bash$ rm -r * (remove all the files in the current directory except for .mybackup)
bash$ mybackup -r (or mybackup --restore)
[thread 3712120576] Restoring subdir1
[thread 3712120576] Created subdir1
[thread 3720513280] Restoring repeat.c...
[thread 3720513280] Copied 128 bytes from repeat.c.bak to repeat.c
[thread 3728905984] Restoring pipe.c...
[thread 3728905984] Copied 996 bytes from pipe.c.bak to pipe.c
[thread 3701540608] Restoring subdir1/subdir2
[thread 3701540608] Created subdir1/subdir2
[thread 3737298688] Restoring fork.c...
[thread 3737298688] Copied 2414 bytes from fork.c.bak to fork.c
[thread 3712120576] Restoring struct.c...
[thread 3712120576] Copied 1583 bytes from struct.c.bak to struct.c
Successfully restored 4 files (5121 bytes) and 2 subdirectory
bash$ ls -lR
.:
total 12
-rw-rw-r-- 1 user user 996 Apr 17 00:56 pipe.c
-rw-rw-r-- 1 user user 128 Apr 17 00:56 repeat.c
drwx----- 3 user user 4096 Apr 17 00:56 subdir1

./subdir1:
total 8
-rw-rw-r-- 1 user user 2414 Apr 17 00:56 fork.c
drwx----- 2 user user 4096 Apr 17 00:56 subdir2

./subdir1/subdir2:
total 4
-rw-rw-r-- 1 user user 1583 Apr 17 00:56 struct.c
```

5 Other penalties

- -20 points for late submissions.