

CS39002 Operating Systems Laboratory
Spring 2024

Lab Assignment: 9
Date: 10-Apr-2024

Synchronizing two directory trees

Let **src** and **dst** be two existing local directories specified by relative or absolute path names. We want to synchronize the contents of **dst** to those of **src**. This is very useful for taking backups and restoring from backups. The Unix command *rsync* can be used for this purpose. In this assignment, you implement a toy version of *rsync*.

Assume that the entire subtrees under these two directories are owned by the user, and every file or directory there has read, write, and execute (for directories) permissions for the user. Assume also that the two directories contain no special files (like devices or sockets) or symbolic/hard links.

For each pair of corresponding items **src/path/item** and **dst/path/item** (regular file / directory), do:

Case 1: item is a regular file

- If **src/path/item** does not exist, delete **dst/path/item**.
- If **dst/path/item** does not exist, copy **src/path/item** to **dst/path/item**.
- If both **src/path/item** and **dst/path/item** exist, then:
 - If the two files have the same size and the same modification timestamp, assume that these two are the same file, and do nothing.
 - Otherwise, copy **src/path/item** to **dst/path/item**.

Case 2: item is a directory

- If **src/path/item** does not exist, recursively delete **dst/path/item**.
- If **dst/path/item** does not exist, recursively copy **src/path/item** to **dst/path/item**.
- If both **src/path/item** and **dst/path/item** exist, then:
 - Recurse into the two subdirectories.

After you have handled the above changes starting from **src** and **dst**, the two subdirectories have identical trees rooted at them. Recursively change the timestamps and permissions of each **dst/path/item** to those of **src/path/item** (if they disagree).

Do a verbose reporting of the changes that your program makes. You may use the following format for each item. The meanings of the first symbols are explained to the right.

[+] dst/path/item	[item is added to the destination]
[-] dst/path/item	[item is deleted from the destination]
[o] dst/path/item	[item in destination is overwritten by item in source]
[t] dst/path/item	[timestamp changed for item in destination]
[p] dst/path/item	[permission changed for item in destination]

Write a C program using the GNU C's *File System Interface* to do the above task. Your program should run as a single process. Do not create child processes to *exec* commands like *cp* or *rm*.