Assignment 1: Reporting User Statistics

This assignment is not especially challenging algorithmically, but it requires attention to detail and it exercises several different knowledge areas. In particular, it requires a bit of command-line option parsing, reading a kernel data structure (the `wtmp` file), and manipulating UNIX time values.

The `wtmp` file is identical to the `utmp` file in structure. The only difference as far as this assignment is concerned is that, whereas a logout *modifies an entry* in the `utmp` file, a logout in the `wtmp` file *adds an entry*. When a user logs out on a terminal line, an entry with a `NULL` username field and a matching terminal line is added to the file, with the time at which the logout occurred. Therefore, for each terminated session there will be two entries – the login and the logout – and what they have in common is the same pseudo-terminal name and number.

You are to write a program that satisfies the requirements of the following man page. The information regarding program submission is at the end of the assignment. I have written this man page to look like a "real one."

NAME

`logtime -- print various statistics of logtime of one or more users`

SYNOPSIS

`logtime [options] username ...`

DESCRIPTION

Without options, `logtime` prints one line for each username argument, containing the total time that the user has spent logged into the system since record keeping was last started. *If no usernames are listed, it displays this time for the current user.* If there is no `wtmp` file, it prints a message on the standard error stream that there is no record keeping. Otherwise, for each username argument, it displays the username followed by the total login time, accurate to the second, in days, hours, minutes, and seconds. If the total time is less than a day, the days field is omitted. If less than an hour, the hours and days are omitted, and if less than a minute, only seconds are displayed. If a username is given but there are no logins for the user, "0 seconds" is listed for that username. If any value is zero, the units for that value should not be displayed.

Only completed login sessions contribute to the accounting. Sessions that are in progress at the time the command is invoked are ignored, so if there is a login without a subsequent logout, that login is ignored.

All times are in whole, non-negative integers. Usernames are not sorted alphabetically. For example, the output may look like

```
sweiss      1 day     9 hours  39 mins   51 secs
saad       14 hours   1 sec
shankar    22 days   42 mins
```

In the second case, it is an implicit time of 22 days, 0 hours, 0 minutes and 42 seconds. In the third, it is 22 days, 0 hours, 42 minutes and 0 seconds.

OPTIONS

The behavior of the command can be modified with the following option:

```
-a
    Show the log times for all users.
```

EXIT STATUS

`0` If it succeeded.

`1` If it failed.

FILES

`/var/log/wtmp`

SEE ALSO

`login (3), logout (3), utmp (5), wtmp (5)`

Submitting the Assignment

You are to create a zip file containing all of your source code and put that zip file in the directory

```
/data/biocs/b/student.accounts/cs493.66/projects/project1
```

naming it `username_hwk1.zip`. Give it permissions 600 so that only you have access to it. Whether you have a single file or multiple files, you are to create a directory named `username_hwk1`, putting all files into it and using the command

```
zip -r username_hwk1.zip username_hwk1
```

to create the zip file. Make sure that you create a Makefile if you use multiple files, and include that Makefile in the directory. If you use a Makefile, make sure that it creates an executable named `logtime` when it is built. If it is a single file program, name the source file `logtime.X`, where `X` is the GNU extension for the language (.c for C, .cpp or .C for C++, etc.)

The program must be well-documented and must conform to my programming guidelines for full credit. It must be placed in the directory no later than midnight of the due date.