Assignment 3

Overview

This is a relatively simple exercise whose purpose is twofold: to give you some experience in using program tracing tools on the command line in Linux, and to give you more experience in using various other command line tools.

The `ltrace` command was demonstrated in class and is also described in the lecture notes in Chapter 2. You will be using it on a particular program that I have written and placed in the file system on our network. You will run this command with specific options, collect its output, and answer a few questions about that output.

*Note.* This program has been designed so that when two different users run it, its behavior will be different. The output will be different and the functions called will be different. Therefore, the only correct answers for you are the ones you can determine on your own.

You must complete this assignment before its *deadline*, which is *Monday, March 8, at 7:00 PM. This is important.*

Instructions

To get full credit, you must follow these instructions exactly. If not, either the content or the form of your submitted work will be incorrect in one way or another.

In these instructions, the dollar sign ‘$’ in the command descriptions is the prompt character by the system. You do not type it.

1. Login to eniac as you have done in the past using `ssh`.
2. When you login successfully, `ssh` to any `cslab` host. For example, to `ssh` to `cslab8` you would type:
   ```bash
   $ ssh cslab8
   ```
3. The remaining instructions assume that you have logged into some `cslab` host. It does not matter which one.
5. Copy the two files `hwk3` and `hwk3_questions.txt` to your home directory using the command
   ```bash
   $ cp hwk3 hwk3_questions.txt ~/
   ```
6. You can put these files anywhere you like in your home directory. These instructions assume they are in `~/`.
7. The file `hwk3` is an executable file. It can be run by simply typing
   ```bash
   $ ./hwk3
   ```
   If your `PATH` includes “.” you could also type
   ```bash
   $ hwk3
   ```
   When you run it, the output will look something like this:
   ```bash
   $ hwk3
   111000101010011001010110001001010101100000101111001110110000010
   abibmvifsbmfmno
   ```
8. We want to see a summary of the calls it makes to dynamically linked library functions and to system calls. Therefore you will run the `ltrace` command on it, supplying the `-c` and `-S` options, as follows:

   ```bash
   $ ltrace -cS ./hwk3
   ```

9. If you run `ltrace` like this a few times, you will see that the output changes in small ways for each new run, but that some things do not change. The parts of the output that change will not affect the answers to the questions that you will have to answer.

10. The problem that you will have to solve is the following. If you try to redirect the output of `ltrace` like this:

    ```bash
    $ ltrace -cS ./hwk3 > outputfile
    ```

    all you will see in `outputfile` are the program’s outputs, not those of `ltrace`. This is because it is writing to the standard error device in UNIX, not to the standard output stream. Therefore you need to redirect the standard error as well as the standard output to a file. You can do this as follows:

    ```bash
    $ ltrace -cS ./hwk3 >& outputfile
    ```

    If you do this, observe that there is one fewer call to `SYS_write`, the `write` system call, than when output is redirected.

11. You are to save the output of `ltrace` as just described, in a file named `hwk3_username_ltrace.txt`, where you replace the string `username` by your own username on the system. In the remaining instructions, replace every occurrence of `username` by your actual username.

12. The next step is to answer the questions that are in the file `hwk3_questions.txt` based on the output of `ltrace`. You must answer the questions in the exact places in that file as specified there, following the word “HERE:” for each question. If you alter the file in any way other than writing after the word “HERE:”, you will get no credit for that work. I have written a script that is designed to look for your answers there and expects the file to be unaltered otherwise.

13. Make a copy of your answers in a file named `hwk3_username_answers.txt`.

14. Create a directory named named `hwk3_username`:

   ```bash
   $ mkdir hwk3_username
   ```

15. Put both files into this directory:

   ```bash
   $ mv hwk3_username_ltrace.txt hwk3_username_answers.txt hwk3_username
   ```

   **Do not place anything else into this directory.** You will lose 5% for each file that does not belong there, and you will lose 5% if you do not name the directory correctly.

16. Next, create a zip archive for this directory by running the `zip` command

   ```bash
   $ zip -r hwk3_username.zip ./hwk3_username
   ```

17. You will use the `submithwk_cs340` command to submit this zip file. **To submit your file, you give it the `-z` option:**

   ```bash
   $ submithwk_cs340 -z 3 hwk3_username.zip
   ```

   The program will copy your zip file into the directory

   `/data/biosc/b/student.accounts/cs340_sw/hwks/hwk3/`

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and if it is successful, it will display the message, “File hwk3_username.zip successfully submitted.” You will not be able to read this file, nor will anyone else except for me. But you can double-check that the command succeeded by typing the command

```bash
ls -l /data/biocs/b/student.accounts/cs340_sw/hwks/hwk3
```

and making sure you see a non-empty file named hwk3_username.zip.

18. **You can resubmit as many times as you want. Newer versions of the file will overwrite older ones.**

**Grading Rubric**

This assignment is 2% of your final grade. You will receive full credit if the file you submit showing the ltrace and program output is what it should be based on your username, if your answers to the questions are consistent with the output in that file, and it has been submitted by the assignment deadline, which is, as stated above, Monday, March 8 at 7:00 PM.