

M7 Lab: Shell Scripting

CITA 171: OPERATING SYSTEM USE & ADMIN

Marco Gonzalez
SUNY CANTON | [COMPANY ADDRESS]

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2 OBJECTIVES

Learn what scripts are and how to create and execute them.

3 PREPARATION

Start the CITA 171 VM and log in. Start a Terminal program.

4 SCRIPT

A computer program is a list of instructions for a computer to perform tasks. A script is a type of computer program. Human-readable instructions are read, translated into computer-executable instructions, and executed by a computer program called an **interpreter** one instruction at a time.

5 SCRIPT PERMISSIONS

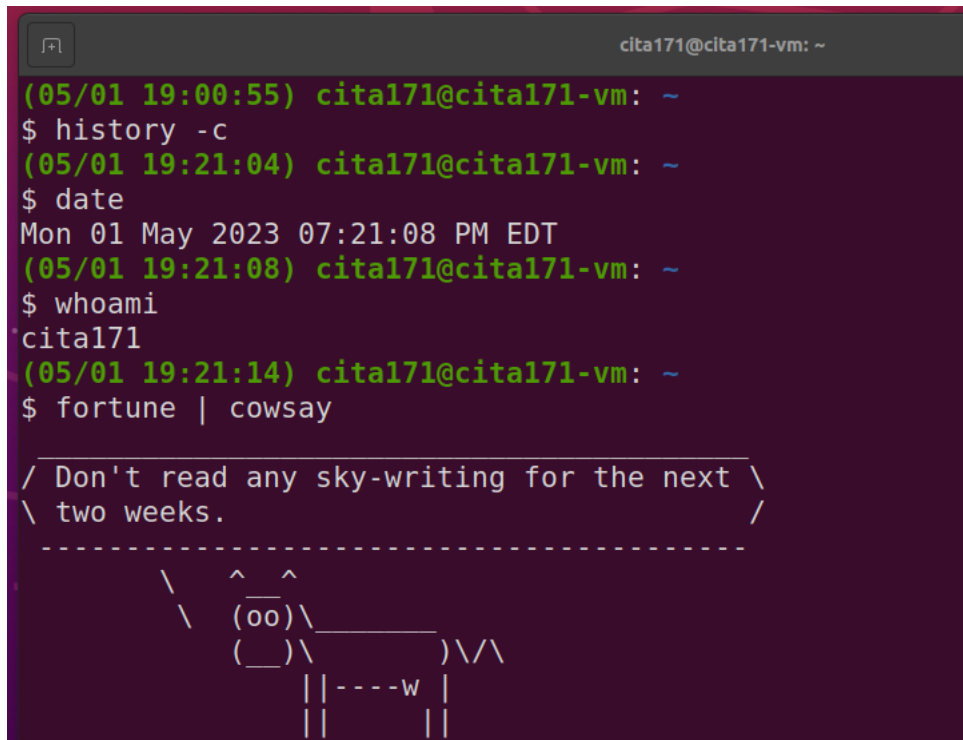
Because a script must be read and executed by the interpreter, the file **read** and **execute** permissions must be set for the user who wants to run the script.

6 SHEBANG

The first line of a Bash script must start with **#!/bin/bash**. The symbol combination **#!** is called a **shebang**. This line shows the file path to the bash interpreter (shell program). An incorrect path may cause the script to fail.

7 CREATING A SIMPLE SCRIPT

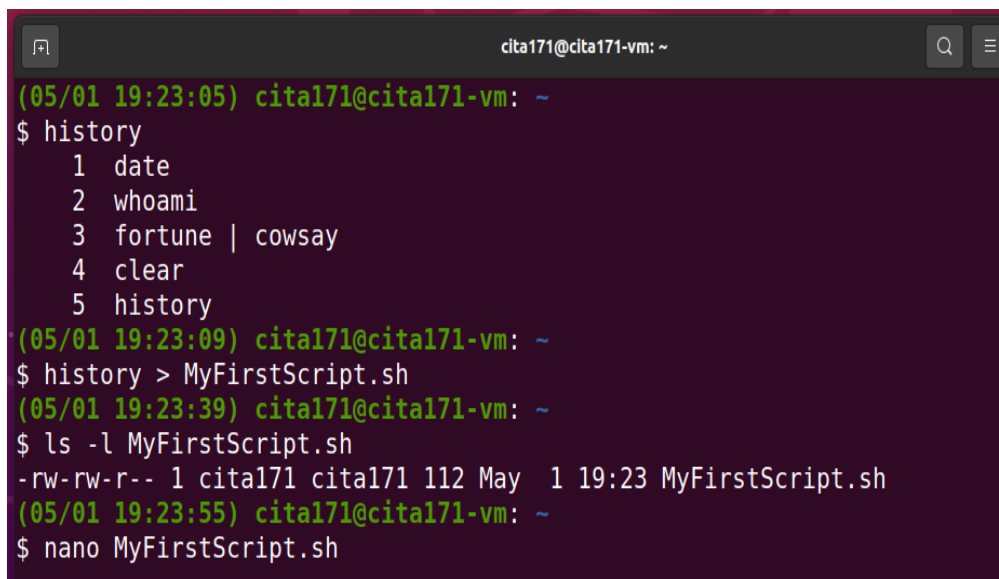
The simplest way to write a script is to perform the task and capture the commands manually. The captured commands are then edited with a text editor to become a script. See Figure 1, Figure 2, Figure 3, and Figure 4. In this example, three commands are executed. The manually-typed commands are saved automatically into a file called **~/.bash_history** (notice the period at the beginning of the name). The **history** command with the **-c** option clears the previously captured commands. The three commands are then executed. The history command without options displays the contents of the **~/.bash_history** file. The output is redirected to a script file called **MyFirstScript.sh**. The **.sh** is a common file extension for a Bash script. The **nano** command is used to edit the script file. Finally, the **chmod** command is used to set the proper permissions.



```
(05/01 19:00:55) cita171@cita171-vm: ~
$ history -c
(05/01 19:21:04) cita171@cita171-vm: ~
$ date
Mon 01 May 2023 07:21:08 PM EDT
(05/01 19:21:08) cita171@cita171-vm: ~
$ whoami
cita171
(05/01 19:21:14) cita171@cita171-vm: ~
$ fortune | cowsay

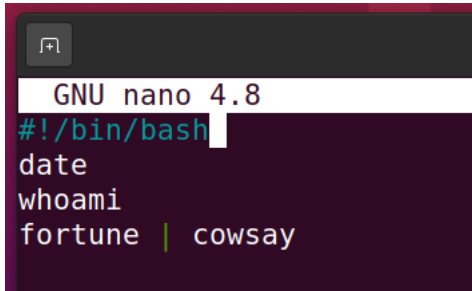
/ Don't read any sky-writing for the next \
\ two weeks. /
-----
      ^  ^
      (oo)\_____
      (__) \       )\/\
           ||----w |
           ||     ||
```

Figure 1. Clearing Command History and Manually Executing Commands



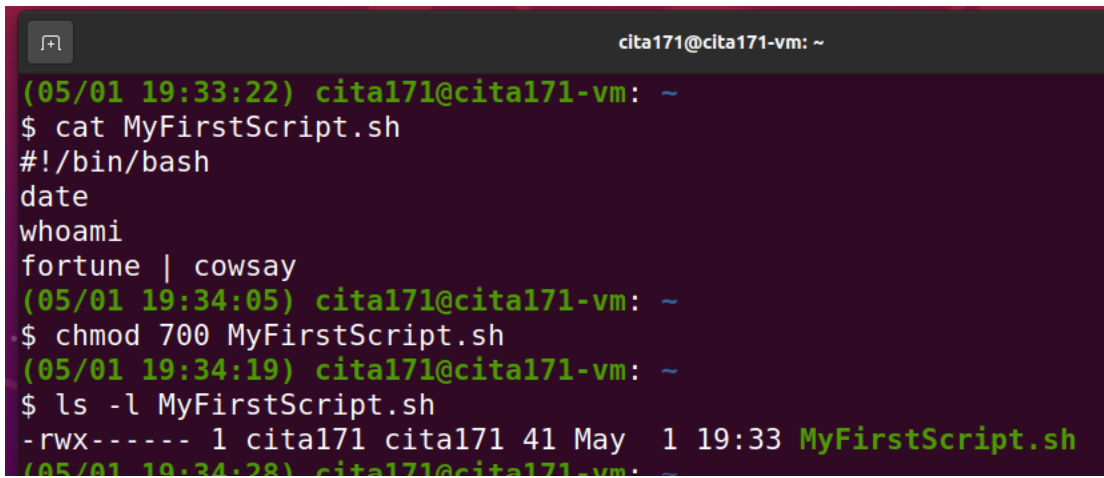
```
(05/01 19:23:05) cita171@cita171-vm: ~
$ history
 1 date
 2 whoami
 3 fortune | cowsay
 4 clear
 5 history
(05/01 19:23:09) cita171@cita171-vm: ~
$ history > MyFirstScript.sh
(05/01 19:23:39) cita171@cita171-vm: ~
$ ls -l MyFirstScript.sh
-rw-rw-r-- 1 cita171 cita171 112 May  1 19:23 MyFirstScript.sh
(05/01 19:23:55) cita171@cita171-vm: ~
$ nano MyFirstScript.sh
```

Figure 2. Saving and Editing a Script File



```
GNU nano 4.8
#!/bin/bash
date
whoami
fortune | cowsay
```

Figure 3. Edited Script



```
cita171@cita171-vm: ~
(05/01 19:33:22) cita171@cita171-vm: ~
$ cat MyFirstScript.sh
#!/bin/bash
date
whoami
fortune | cowsay
(05/01 19:34:05) cita171@cita171-vm: ~
$ chmod 700 MyFirstScript.sh
(05/01 19:34:19) cita171@cita171-vm: ~
$ ls -l MyFirstScript.sh
-rwx----- 1 cita171 cita171 41 May  1 19:33 MyFirstScript.sh
(05/01 19:34:28) cita171@cita171-vm: ~
```

Figure 4. Setting the Proper Script Permissions

8 EXECUTING A SCRIPT

There are two ways to execute a script. The **immediate execution** method executes the script immediately, whereas the **scheduled execution** method executes the script at a future time. A scheduled script is sometimes referred to as a **batch job**.

8.1 IMMEDIATE EXECUTION

Immediate execution requires the path to the script file is used. The path can be absolute or relative. See Figure 5 and Figure 6.

```

cita171@cita171-vm: ~
(05/01 19:44:06) cita171@cita171-vm: ~
$ pwd
/home/cita171
(05/01 19:44:10) cita171@cita171-vm: ~
$ /home/cita171/MyFirstScript.sh
Mon 01 May 2023 07:44:31 PM EDT
cita171

/ Kiss me, Kate, we will be married o' \
| Sunday.                               |
|                                     |
| -- William Shakespeare, "The Taming of |
\ the Shrew"                           /
-----

      ^ ^
      (oo)\_____
      (__) \       )\/\
           ||----w |
           ||     ||

```

Figure 5. Immediate Execution using an Absolute Path

```

cita171@cita171-vm: ~
(05/01 19:45:41) cita171@cita171-vm: ~
$ pwd
/home/cita171
(05/01 19:45:43) cita171@cita171-vm: ~
$ ./MyFirstScript.sh
Mon 01 May 2023 07:45:57 PM EDT
cita171

/ The naked truth of it is, I have no \
| shirt.                               |
|                                     |
| -- William Shakespeare, "Love's      |
\ Labour's Lost"                     /
-----

      ^ ^
      (oo)\_____
      (__) \       )\/\
           ||----w |
           ||     ||

```

Figure 6. Immediate Execution using a Relative Path

8.2 SCHEDULED EXECUTION

A script can be executed at a future time using the **cron** or the **at** command. See Figure 7. In this example, the `MyFirstScript.sh` script is scheduled to run at 7:55 PM (Use two minutes from the current time) using the **at** command, and the result is saved in a file **Result.dat**.

```

(05/01 19:53:30) cita171@cita171-vm: ~
$ at 7:55pm
warning: commands will be executed using /bin/sh
at> /home/cita171/MyFirstScript.sh > /home/cita171/Result.dat
at> <EOT>
job 6 at Mon May  1 19:55:00 2023
(05/01 19:54:14) cita171@cita171-vm: ~
$ date
Mon 01 May 2023 07:55:06 PM EDT
(05/01 19:55:06) cita171@cita171-vm: ~
$ cat Result.dat
Mon 01 May 2023 07:55:00 PM EDT
cita171

/ Wrinkles should merely indicate where \
| smiles have been.                    |
|                                     |
\ -- Mark Twain                        /
-----
      ^ ^
      (oo)\_____ )\/\
      (__) \       || ---w ||
              ||       ||
  
```

Figure 7. Scheduled Execution using the `at` Command