

Shell

The Linux shell is a *smart* command-line interpreter. It takes user commands (in the form of texts), executes them, and returns the result. It is smart in the sense that it provides more utilities than just blindly executing the commands.

By default, the **Terminal** application comes with the shell

A shell is a program that runs other programs. Shells can find programs and files quickly, remember what you've done before, and store information that you use over and over.

A 'shell' can be thought of as an interface between the user and the computer's operating system, or a 'wrapper' around the operating system. It lets you use the computer without needing to understand the low-level details that programmers do.

Why use a command line interface?

In the age of VR/AR, it may seem odd to have to learn a command-line tool. But the fact is that the Command Line Interface (CLI) is the most universal interface there is. It gives users total control over applications.

Simple commands

On the prompt, you can type in some text and press Enter. The shell interprets that as you requesting it to execute the given command.

```

#include "splashkit.h"

// Enum for product categories
enum ProductCategory {
    DAIRY,
    BAKERY,
    SNACK,
    FROZEN
};

// Struct to represent a product
struct Product {
    string name;
    string brand;
    ProductCategory category;
    int stockLevel;
};

// Function to add a product to StorePOS
void add_product(Product& product) {
    clear_input_buffer();
    product.name = read_string("Enter product name: ");
    product.brand = read_string("Enter product brand: ");
}

// Display category options and get user choice
write_line("Select product category:");

```

3. Exit
1
Enter product name: Amul
Enter product brand: Amul
Select product category:
0. Dairy
1. Bakery
2. Snack
3. Frozen

Following is a screenshot from vs code an app for programming, which comes with an in built terminal and processes the commands after we write the code.

Navigating in the shell

The file path in Linux specifies a location in the file system. The path uses / as the separator.

The / directory is the root directory, i.e. top of the filesystem hierarchy.

- Any path starts with / is called an *absolute path*.
- Else, it is called a *relative path*. Relative means in relation to the **current working directory**.

To see what the current directory is, uses `pwd`. To see the content of the directory, `ls`. To change to another directory, use `cd`

In each directory, there are two special directories. . refers to the current directory, and .. refers to the parent directory.

Environment Variables

How to find a specific file before executing it ? The shell does it by consulting **environment variables**. We Think of the shell as a Python program being executed, then environment variables are *global variables* accessible anywhere inside the program.

Connecting Applications

One distinguishing feature of the Linux shell is its support for stitching up multiple applications together, to build a workflow. It does it by connecting the inputs and outputs of different applications

MANUAL:

The man command in Unix-like operating systems is used to display the manual pages for various commands. For example, to see the manual page for the ls command, you would type man ls in the terminal.

The manual page provides detailed information about the command, including its syntax, options, usage examples, and often additional details about its functionality. By using the man command, users can quickly access documentation for commands and learn about their available options and how to use them effectively.

REGULAR EXPRESSION:

A regular expression is a string **pattern** that describes a set of strings. It mixes normal ASCII characters with special, *metacharacters*. These metacharacters have unique matching capabilities:

- . matches any single character. So a.c matches with any string starts with a and ends with c.
- [abc] matches any one of the three characters. For example, [cs]at matches with cat and with sat. Another example [0-9] matches with any digit.
- (RX1|RX2) matches any string that either matches RX1 or RX2.
- + means one or more of the **previous matches**. For example, a+ matches strings with at least one a.
- ? means zero or one appearance of the **previous match**. For example, colou?r matches with both colour and color.
- * means zero or more appearances of the **previous match**. For example, ba* will match `b, ba, baaa, baaaa, etc.
- ^ matches the start of the line. For example, ^d matches any line of string that starts with d.
- [^a-z] matches any character **NOT** in the set a-z.
- \$ matches the end of the line.

GREP

grep is a popular search tool that comes with most Linux distributions. Try to read the manual of this command to understand more. It supports **basic regular expression** by default, meaning that most of the metacharacters, e.g. (,), |, +, \$, {}, needs to be preceded by a backslash \

Example:

- grep Linux <file> finds occurrences of the words Linux in file

- `ls | grep ^[0-9]` finds all files starting with a letter
- `ls | grep -v "\.py$"` finds all files not ending with .py

DATA WRANGLING TOOLS:

One typical example of data wrangling (or data processing) that is very suitable for Linux shells is log processing. Your computer often produces many log messages, from the OS as well as from the applications. The logs are often structured, but they are very long to be able to process by hand or by eye.

SED

sed is a **stream editor**, whose most popular use is to perform **search & replace** on the file content. The common syntax is below:

```
sed 's/<SEARCH PATTERN>/<REPLACE PATTERN>/g' <file>
```

It scans through the file, finding all matches for <SEARCH PATTERN>, which is a regular expression, and replacing them with <REPLACE PATTERN>.

Example:

```
echo "Hello SIT111" | sed 's/SIT/SIT_/g'  
echo "Hello world SIT111" | sed 's/world//g'
```

awk

While sed excels at text transformation, especially at search and replace, awk is another popular tool whose main use is for extracting data.

awk reads the file line by line, automatically splitting the line into tokens, denoted as \$1, \$2,... The basic syntax is as:

```
awk '<CONDITION> {COMMAND}' <file>
```

Whenever it reads a line satisfying <CONDITION>, it performs COMMAND.

Introduction to Bash

Bash, or the Bourne Again SHell, is the default command-line interpreter for Linux systems. It provides a powerful interface for interacting with the system, running programs, and managing files and processes. Bash combines features from the original Bourne Shell (sh) with additional enhancements, making it a standard for shell scripting.

Script Basics

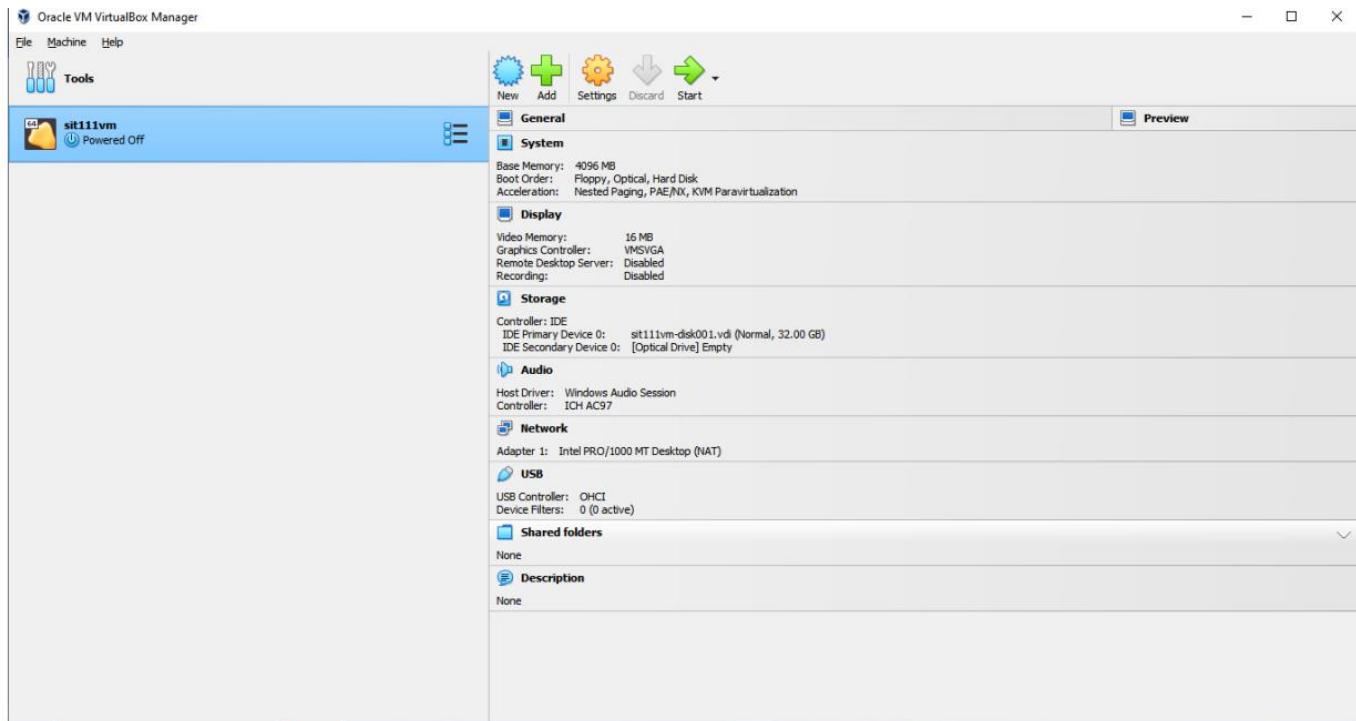
- **Scripts:** Text files containing a series of commands executed by the shell.
- **Creating a Script:** Use any text editor to write Bash commands, then save the file with a .sh extension. In Ubuntu, typically there are a few default text editors such as: vi/vim, nano, and gedit. Alternatively you can also use other text editors such as Emacs or integrated development editors (IDEs) such as Eclipse. This is a personal choice and you can use any editor of your preference.
- **Running a Script:** Make the script executable with chmod +x script.sh and run it using ./script.sh.

CONTROL STRUCTURES:

Control structures are fundamental elements in scripting and programming that allow you to **control** the **flow of execution** based on *conditions* or by *repeating actions*. They are essential for making decisions within your scripts and handling different inputs or situations.

ACTIVITIES:

*INSTALLATION OF VIRTUAL BOX:



EXERCISE 1

QUESTION 1, 2, 3

```
/home/sit111
sit111@sit111-VirtualBox:~$ ls
Desktop Downloads Pictures sit111 Templates
Documents Music Public snap Videos
sit111@sit111-VirtualBox:~$ cd sit111
sit111@sit111-VirtualBox:~/sit111$ ls
data hello script.sh test test.a test.c test.h test.py test.so
sit111@sit111-VirtualBox:~/sit111$ pwd
/home/sit111/sit111
sit111@sit111-VirtualBox:~/sit111$ echo "This is my attempt of creating a file using the linux terminal." >testfile.txt
sit111@sit111-VirtualBox:~/sit111$ cat script.sh
#!/bin/sh
echo "Hi from the script file"
echo "You've finished it at " `date`
sit111@sit111-VirtualBox:~/sit111$
```

FVFFCRR

```
sit111@sit111-server:~$ man touch
sit111@sit111-server:~$ man cat
sit111@sit111-server:~$ pwd
/home/sit111
sit111@sit111-server:~$ touch testfile.txt
sit111@sit111-server:~$ echo " i have written this sentence." > testfile.txt
sit111@sit111-server:~$ cat testfile.txt
i have written this sentence.
sit111@sit111-server:~$ cat script.sh
cat: script.sh: No such file or directory
sit111@sit111-server:~$ cd /home/sit111/sit111
sit111@sit111-server:~/sit111$ cat script.sh
#!/bin/sh
echo "Hi from the script file"
echo "You've finished it at " `date`
sit111@sit111-server:~/sit111$ ./script.sh
Hi from the script file
You've finished it at Fri Apr 19 03:37:04 AM UTC 2024
sit111@sit111-server:~/sit111$ ls -l script.sh
-rwxr-xr-x 1 sit111 sit111 78 Feb 5 03:40 script.sh
sit111@sit111-server:~/sit111$ cd /home/sit111
sit111@sit111-server:~$ pwd
/home/sit111
sit111@sit111-server:~$ ./script.sh
bash: ./script.sh: No such file or directory
sit111@sit111-server:~$ /home/sit111/sit111/script.sh
Hi from the script file
You've finished it at Fri Apr 19 03:40:08 AM UTC 2024
sit111@sit111-server:~$
```

QUESTION 4:

SCREENSHOT FROM THE TERMINAL:

```
sit111@sit111-VirtualBox:~$ pwd
/home/sit111
sit111@sit111-VirtualBox:~$ ls
Desktop Downloads Pictures sit111 Templates
Documents Music Public snap Videos
sit111@sit111-VirtualBox:~$ cd sit111
sit111@sit111-VirtualBox:~/sit111$ ls
data hello script.sh test test.a test.c test.h test.py test.so
sit111@sit111-VirtualBox:~/sit111$ pwd
/home/sit111/sit111
sit111@sit111-VirtualBox:~/sit111$ echo "This is my attempt of creating a file using the linux terminal." >testfile.txt
sit111@sit111-VirtualBox:~/sit111$ cat script.sh
#!/bin/sh
echo "Hi from the script file"
echo "You've finished it at " `date`
sit111@sit111-VirtualBox:~/sit111$ chmod +x script.sh
sit111@sit111-VirtualBox:~/sit111$ ./script.sh
Hi from the script file
You've finished it at Sat 20 Apr 2024 12:04:10 AEST
sit111@sit111-VirtualBox:~/sit111$
```

QUESTION 5:

SCREENSHOT FROM THE TERMINAL:

```

sit111@sit111-VirtualBox:~$ pwd
/home/sit111
sit111@sit111-VirtualBox:~$ ls
Desktop  Downloads  Pictures  sit111  Templates
Documents  Music  Public  snap  Videos
sit111@sit111-VirtualBox:~$ cd sit111
sit111@sit111-VirtualBox:/sit111$ ls
data  hello  script.sh  test  test.a  test.c  test.h  test.py  test.so
sit111@sit111-VirtualBox:/sit111$ pwd
/home/sit111/sit111
sit111@sit111-VirtualBox:/sit111$ echo "This is my attempt of creating a file using the linux terminal." >testfile.txt
sit111@sit111-VirtualBox:/sit111$ cat script.sh
#!/bin/sh
echo "Hi from the script file"
echo "You've finished it at " `date`
sit111@sit111-VirtualBox:/sit111$ chmod +x script.sh
sit111@sit111-VirtualBox:/sit111$ ./script.sh
Hi from the script file
You've finished it at Sat 20 Apr 2024 12:04:10 AEST
sit111@sit111-VirtualBox:/sit111$ pwd
/home/sit111/sit111
sit111@sit111-VirtualBox:/sit111$ cd ..
sit111@sit111-VirtualBox:/$ pwd
/home/sit111
sit111@sit111-VirtualBox:$ chmod +x script.sh
chmod: cannot access 'script.sh': No such file or directory
sit111@sit111-VirtualBox:$ ./script.sh
bash: ./script.sh: No such file or directory
sit111@sit111-VirtualBox:$ ls
Desktop  Documents  Downloads  Music  Pictures  Public  sit111  snap  Templates  Videos
sit111@sit111-VirtualBox:$

```

EXERCISE 2 :

QUESTION 1:

```

/home/sit111/sit111
sit111@sit111-VirtualBox:/sit111$ ls
data  hello  script.sh  test  test.a  test.c  testfile.txt  test.h  test.py  test.so
sit111@sit111-VirtualBox:/sit111$ cd data
sit111@sit111-VirtualBox:/sit111/data$ grep -i "pride" pride_and_prejudice.txt
The Project Gutenberg eBook of Pride and Prejudice
Title: Pride and Prejudice
*** START OF THE PROJECT GUTENBERG EBOOK PRIDE AND PREJUDICE ***
PRIDE.
I, for my part, declare for Pride and Prejudice unhesitatingly. It
the playwright has ever been laid upon Pride and Prejudice; and I dare
should put Pride and Prejudice far lower if it did not contain what
The goodness of the minor characters in Pride and Prejudice has been
comparison. It has sometimes, I believe, been urged that his pride is
his pride had been pampered, is perfectly rational and sufficient; and
[Illustration: •PRIDE AND PREJUDICE•]
was; everybody says that he is eat up with pride, and I dare say he had
"His pride," said Miss Lucas, "does not offend me so much as pride
his pride, if he had not mortified mine."
"Pride," observed Mary, who piqued herself upon the solidity of her
quality or other, real or imaginary. Vanity and pride are different
proud without being vain. Pride relates more to our opinion of
pronounced to be very bad indeed,--a mixture of pride and impertinence:
"Such as vanity and pride."
"Yes, vanity is a weakness indeed. But pride--where there is a real
superiority of mind--pride will be always under good regulation."
pride and obsequiousness, self-importance and humility.
Hertfordshire. Everybody is disgusted with his pride. You will not find
pride of this Mr. Darcy has not made him just to you. If from no better
traced to pride; and pride has often been his best friend. It has
impulses even than pride."
"Can such abominable pride as his have ever done him good?"
poor. Family pride, and filial pride, for he is very proud of what his
Pemberley House, is a powerful motive. He has also brotherly pride,
very different man from what he is to the less prosperous. His pride
her authoritative manner, and the rest from the pride of her nephew, who
could refuse him; and though his pride was hurt, he suffered in no other
health. Mr. Collins was also in the same state of angry pride. Elizabeth

```

QUESTION 2:

```
sit111@sit111-VirtualBox:~/sit111/data$ wc --help
Try 'wc --help' for more information.
sit111@sit111-VirtualBox:~/sit111/data$ wc --help
Usage: wc [OPTION]... [FILE]...
      or: wc [OPTION]... --files0-from=F
Print newline, word, and byte counts for each FILE, and a total line if
more than one FILE is specified. A word is a non-zero-length sequence of
characters delimited by white space.

With no FILE, or when FILE is -, read standard input.

The options below may be used to select which counts are printed, always in
the following order: newline, word, character, byte, maximum line length.
-c, --bytes          print the byte counts
-m, --chars          print the character counts
-l, --lines          print the newline counts
--files0-from=F     read input from the files specified by
                   NUL-terminated names in file F;
                   If F is - then read names from standard input
-L, --max-line-length print the maximum display width
-W, --words          print the word counts
--help display this help and exit
--version output version information and exit

GNU coreutils online help: <https://www.gnu.org/software/coreutils/>
Full documentation <https://www.gnu.org/software/coreutils/wc>
or available locally via: info '(coreutils) wc invocation'
sit111@sit111-VirtualBox:~/sit111/data$ ^C
sit111@sit111-VirtualBox:~/sit111/data$ ^C
sit111@sit111-VirtualBox:~/sit111/data$ 
sit111@sit111-VirtualBox:~/sit111/data$ pwd
/home/sit111/sit111/data
sit111@sit111-VirtualBox:~/sit111/data$ grep -i -o "pride" pride_and_prejudice.txt | wc -1
wc: invalid option -- '1'
Try 'wc --help' for more information.
sit111@sit111-VirtualBox:~/sit111/data$ grep -i -c "pride" pride_and_prejudice.txt
55
sit111@sit111-VirtualBox:~/sit111/data$
```

QUESTION 3:

```
--version output version information and exit

GNU coreutils online help: <https://www.gnu.org/software/coreutils/>
Full documentation <https://www.gnu.org/software/coreutils/wc>
or available locally via: info '(coreutils) wc invocation'
sit111@sit111-VirtualBox:~/sit111/data$ ^C
sit111@sit111-VirtualBox:~/sit111/data$ ^C
sit111@sit111-VirtualBox:~/sit111/data$ 
sit111@sit111-VirtualBox:~/sit111/data$ pwd
/home/sit111/sit111/data
sit111@sit111-VirtualBox:~/sit111/data$ grep -i -o "pride" pride_and_prejudice.txt | wc -1
wc: Invalid option -- '1'
Try 'wc --help' for more information.
sit111@sit111-VirtualBox:~/sit111/data$ grep -i -c "pride" pride_and_prejudice.txt
55
sit111@sit111-VirtualBox:~/sit111/data$ grep -i "prejudice" pride_and_prejudice.txt
The Project Gutenberg eBook of Pride and Prejudice
Title: Pride and Prejudice
*** START OF THE PROJECT GUTENBERG EBOOK PRIDE AND PREJUDICE ***
PREJUDICE
I, for my part, declare for_Pride and Prejudice_unhesitatingly. It
the playwright has ever been laid upon_Pride and Prejudice; _and I dare
should put_Pride and Prejudice_far lower if it did not contain what
_The goodness of the minor characters in_Pride and Prejudice_has been
[Illustration: ·PRIDE AND PREJUDICE·
"And never allow yourself to be blinded by prejudice?"
prejudice against everything he might say, she began his account of
prejudiced, absurd.
natural consequence of the prejudices I had been encouraging. There is
conduct, who will believe me? The general prejudice against Mr. Darcy is
prejudice, to which he attributed her excessive commendation of her
heart in the world, she knew it was a circumstance which must prejudice
her former prejudices had been removed.
*** END OF THE PROJECT GUTENBERG EBOOK PRIDE AND PREJUDICE ***
sit111@sit111-VirtualBox:~/sit111/data$ grep -i -c "prejudice" pride_and_prejudice.txt
18
sit111@sit111-VirtualBox:~/sit111/data$
```

QUESTION 4:

SCREENSHOT FROM THE TERMINAL:

```
sit111@sit111-VirtualBox:~/sit111$ pwd  
/home/sit111/sit111  
sit111@sit111-VirtualBox:~/sit111$ grep -i '^a.*a.*a[^s]$' /usr/share/dict/words  
Ahmadabad  
Alabaman  
Alabamian  
Allahabad  
Appalachian  
Araucanian  
Arawakan  
Athabascan  
Bahamian  
Baha'ullah  
Balthazar  
Barbadian  
Bataan  
Bavarian  
Caesarean  
Callaghan  
Callahan  
Canaan  
Canadian  
Canaveral  
Cantabrigian  
Carpathian  
Carthaginian  
Catalan  
Caucasian  
Chandrasekhar  
Dalmatian  
Delawarean  
Faisalabad  
Faraday  
Farrakhan  
Flanagan  
Galahad  
Ghananian
```

EXERCISE 3:

QUESTION 1:

```

433007,1238,2014-09-01 09:49:00,Embarcadero at Folsom,51,2014-09-01 10:10:00,Embarcadero at Sansome,60,431
433006,601,2014-09-01 09:42:00,San Francisco Caltrain 2 (330 Townsend),69,2014-09-01 09:53:00,Powell Street BART,39,376
433005,715,2014-09-01 09:41:00,San Francisco Caltrain (Townsend at 4th),70,2014-09-01 09:53:00,Harry Bridges Plaza (Ferry Building),50,259
433004,485,2014-09-01 09:36:00,Steuart at Market,74,2014-09-01 09:43:00,2nd at Townsend,61,449
433003,518,2014-09-01 09:30:00,Ryland Park,84,2014-09-01 09:38:00,San Jose Civic Center,3,161
433002,23767,2014-09-01 09:29:00,Market at 4th,76,2014-09-01 16:05:00,Powell at Post (Union Square),71,625
433001,23783,2014-09-01 09:29:00,Market at 4th,76,2014-09-01 16:05:00,Powell at Post (Union Square),71,878
432999,661,2014-09-01 09:18:00,South Van Ness at Market,66,2014-09-01 09:29:00,Market at Sansome,77,470
432998,321,2014-09-01 09:16:00,Market at 10th,67,2014-09-01 09:22:00,Powell Street BART,39,421
432996,437,2014-09-01 08:58:00,Grant Avenue at Columbus Avenue,73,2014-09-01 09:45:00,Howard at 2nd,63,313
432995,7588,2014-09-01 08:55:00,Powell at Post (Union Square),71,2014-09-01 11:00:00,Powell at Post (Union Square),71,535
432994,7503,2014-09-01 08:55:00,Powell at Post (Union Square),71,2014-09-01 11:00:00,Powell at Post (Union Square),71,400
432991,314,2014-09-01 08:49:00,Market at 4th,76,2014-09-01 08:54:00,San Francisco Caltrain (Townsend at 4th),70,575
432985,419,2014-09-01 08:41:00,Embarcadero at Vallejo,48,2014-09-01 08:48:00,Embarcadero at Sansome,60,285
432981,1536,2014-09-01 08:31:00,Market at 4th,76,2014-09-01 08:57:00,Embarcadero at Sansome,60,317
432980,1545,2014-09-01 08:31:00,Market at 4th,76,2014-09-01 08:57:00,Embarcadero at Sansome,60,590
432979,1298,2014-09-01 08:30:00,Davis at Jackson,42,2014-09-01 08:52:00,Davis at Jackson,42,462
432978,630,2014-09-01 08:26:00,Embarcadero at Bryant,54,2014-09-01 08:36:00,Embarcadero at Sansome,60,566
432977,333,2014-09-01 08:24:00,Market at 10th,67,2014-09-01 08:29:00,Powell Street BART,39,578
432972,6937,2014-09-01 08:16:00,Post at Kearny,47,2014-09-01 10:12:00,Market at Sansome,77,357
432971,450,2014-09-01 08:12:00,Steuart at Market,74,2014-09-01 08:19:00,Embarcadero at Sansome,60,375
432967,161,2014-09-01 08:11:00,Embarcadero at Folsom,51,2014-09-01 08:14:00,Harry Bridges Plaza (Ferry Building),50,496
432966,17396,2014-09-01 07:37:00,Mountain View City Hall,27,2014-09-01 12:27:00,Mountain View City Hall,27,140
432965,17297,2014-09-01 07:37:00,Mountain View City Hall,27,2014-09-01 12:25:00,Mountain View City Hall,27,57
432964,169,2014-09-01 07:32:00,Embarcadero at Bryant,54,2014-09-01 07:35:00,Embarcadero at Folsom,51,496
432960,5667,2014-09-01 07:03:00,Japantown,9,2014-09-01 08:38:00,Japantown,9,56
432959,441,2014-09-01 06:58:00,Market at 10th,67,2014-09-01 07:05:00,Market at Sansome,77,617
432957,398,2014-09-01 05:54:00,Yerba Buena Center of the Arts (3rd @ Howard),68,2014-09-01 06:06:00,Steuart at Market,74,561
432952,240,2014-09-01 04:59:00,South Van Ness at Market,66,2014-09-01 05:03:00,Civic Center BART (7th at Market),72,292
432951,619,2014-09-01 04:21:00,Powell Street BART,39,2014-09-01 04:32:00,Townsend at 7th,65,335
432950,6712,2014-09-01 03:16:00,Harry Bridges Plaza (Ferry Building),50,2014-09-01 05:08:00,San Francisco Caltrain (Townsend at 4th),70,259
432949,538,2014-09-01 00:05:00,South Van Ness at Market,66,2014-09-01 00:14:00,5th at Howard,57,466
432948,568,2014-09-01 00:05:00,South Van Ness at Market,66,2014-09-01 00:15:00,5th at Howard,57,461
432947,569,2014-09-01 00:05:00,South Van Ness at Market,66,2014-09-01 00:15:00,5th at Howard,57,318

```

EXERCISE 4 :

QUESTION 1:

```

systemd-network:x:100:102:systemd Network Management,,,:/run/systemd:/usr/sbin/nologin
systemd-resolve:x:101:103:systemd Resolver,,,:/run/systemd:/usr/sbin/nologin
messagebus:x:102:105::/nonexistent:/usr/sbin/nologin
systemd-timesync:x:103:106:systemd Time Synchronization,,,:/run/systemd:/usr/sbin/nologin
syslog:x:104:111::/home/syslog:/usr/sbin/nologin
_apt:x:105:65534::/nonexistent:/usr/sbin/nologin
tss:x:106:112:TPM software stack,,,:/var/lib/tpm:/bin/false
uuidd:x:107:115::/run/uuidd:/usr/sbin/nologin
systemd-oom:x:108:116:systemd Userspace OOM Killer,,,:/run/systemd:/usr/sbin/nologin
tcpdump:x:109:117::/nonexistent:/usr/sbin/nologin
avahi-autoipd:x:110:119:Avahi autoip daemon,,,:/var/lib/avahi-autoipd:/usr/sbin/nologin
usbmux:x:111:46:usbmux daemon,,,:/var/lib/usbmux:/usr/sbin/nologin
dnsmasq:x:112:65534:dnsmasq,,,:/var/lib/misc:/usr/sbin/nologin
kernoops:x:113:65534:Kernel Oops Tracking Daemon,,,:/usr/sbin/nologin
avahi:x:114:121:Avahi mDNS daemon,,,:/run/avahi-daemon:/usr/sbin/nologin
cups-pk-helper:x:115:122:user for cups-pk-helper service,,,:/home/cups-pk-helper:/usr/sbin/nologin
rtkit:x:116:123:RealtimeKit,,,:/proc:/usr/sbin/nologin
whoopsie:x:117:124::/nonexistent:/bin/false
sssd:x:118:125:SSSD system user,,,:/var/lib/sssd:/usr/sbin/nologin
speech-dispatcher:x:119:29:Speech Dispatcher,,,:/run/speech-dispatcher:/bin/false
fwupd-refresh:x:120:126:fwupd-refresh user,,,:/run/systemd:/usr/sbin/nologin
nm-openvpn:x:121:127:NetworkManager OpenVPN,,,:/var/lib/openvpn/chroot:/usr/sbin/nologin
saned:x:122:129::/var/lib/saned:/usr/sbin/nologin
colord:x:123:130:colord colour management daemon,,,:/var/lib/colord:/usr/sbin/nologin
geoclue:x:124:131::/var/lib/geoclue:/usr/sbin/nologin
pulse:x:125:132:PulseAudio daemon,,,:/run/pulse:/usr/sbin/nologin
gnome-initial-setup:x:126:65534::/run/gnome-initial-setup:/bin/false
hplip:x:127:7:HPLIP system user,,,:/run/hplip:/bin/false
gdm:x:128:134:Gnome Display Manager:/var/lib/gdm3:/bin/false
sit111:x:1000:1000:sit111,,,:/home/sit111:/bin/bash
sshd:x:129:65534::/run/sshd:/usr/sbin/nologin
sit111_admin:x:1001:1001,,,:/home/sit111_admin:/bin/bash
sit111@sit111-VirtualBox:~$ grep '/bin/bash' /etc/passwd
root:x:0:0:root:/root:/bin/bash
sit111:x:1000:1000:sit111,,,:/home/sit111:/bin/bash
sit111_admin:x:1001:1001,,,:/home/sit111_admin:/bin/bash
sit111@sit111-VirtualBox:~$ █

```

QUESTION2:

ANSWER:

I can understand the contents of these files because they are essentially symbolic links, indicating that they are linked to another directory.