Bash Tutorial: basic use of the command line
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1 Introduction

When dealing with data nowadays, people often have to perform operations on large numbers of files or deal with large data. The BASH command line offers several advantages:

- Possibility of working remotely
- Automation
- Speed
- Portability

This tutorial provides a hands on guide to some basic BASH commands, useful for the upcoming course projects.

2 Print Messages on the command line

```
echo "hello world"
```

3 Get help

```
man echo
```

4 Create and delete files/folders

Print the current working directory:

```
pwd
```

Create a folder in the current directory:

```
mkdir test
```

List the contents of the current working directory:

```
ls -l
```

Modify the access rights of the folder:

```
chmod 007 test
```

where:
first digit(user), second(group), third(world)
read(4), write(2), and execute(1)

Change the working directory to the new folder:

```
cd test
```

Create an empty file:

```
touch script.txt
```

5 Copy, move and remove files/folders

Create folder test2/ and copy `script.txt` to that folder:

```
mkdir test2
cp script.txt test2
```

Move folder test2 one level up:

```
mv test2 ../
```

Remove script.txt:

```
rm script.txt
```

Remove folder test:

```
rm -r test
```

6 Interrogate upon the contents of a file

Print the contents of file example.txt:

```
cat example.txt
less example.txt
```

Extract the gene names that start with "SLC" from the file example.txt:

```
grep "SLC" example.txt
```

Extract the gene names which have the pattern "SLC[digit]A[digit]":

```
grep SLC[0-9]A[0-9] example.txt
```

Calculate how many lines the file example.txt has:

```
wc -l example.txt
```

7 Piping commands

```
cat example.txt | grep "SLC"
cat example.txt | grep "SLC" | wc -l
```

8 Writing scripts

File example_script.sh is a script that takes a number as argument and prints all the even numbers smaller than that number:

```
#!/bin/bash
# the previous line tells the interpreter it's a bash script

# this is a comment

# this script takes a number X as argument and prints to the console all the even
    numbers smaller than X

# retrieve argument X
X=$1
echo "The given number is $X."

echo "The even numbers less than $X are:"

# print all the even numbers less than X
for (( i=1; i<=$X; i++ ))
do
   if [ $((i%2)) -eq 0 ];
   then
      echo $i
   fi
done
```

To run the script:

```
bash example_script.sh 3
```

To edit the script from the command line:

```
vi example_script.sh
```

Vi rules:

- to insert type i and start writing, exit insert mode with ESC
- to save the changes type :w then ENTER
- to save changes and exit type :wq then ENTER
- to exit without saving type :q then ENTER

Complete list of commands in vi: `http://www.lagmonster.org/docs/vi.html`.

9 Parallel working environments

Let's say you want to start running scripts and continue working on the same shell. With the `screen` command you can start several processes in parallel.
Start a new screen:

```
screen -S screen1
```

You can then detach and come back to the main shell with Ctrl+a+d. You can reattach the screen with the command:

```
screen -r screen1
```

You can see al the screen sessions with the command:

```
screen -ls
```

To terminate a screen, you can either attach to the session and use the `exit` command, or use:

```
screen -X -S screen1 kill
```

10 Dealing with separator-delimited files

The `awk` environment is a very powerful resource when you need to process files containing columns delimited by a specific separator (usually TAB). Some useful commands:

Extract the second column from a file:

```
awk '{print $2}' example2.txt
```

Extract features that are on the chromosome3:

```
awk '{if($1=="chr3") print $0}' example2.txt
```

11 Useful resources

http://www.grymoire.com/Unix/Awk.html

http://tldp.org/HOWTO/Bash-Prog-Intro-HOWTO.html

http://linuxconfig.org/bash-scripting-tutorial

http://www.tldp.org/LDP/abs/html/

http://ryanstutorials.net/bash-scripting-tutorial/