Introduction to GNU-Linux

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Outline

How does it work?

- What a `shell` is: the shell is a program that takes commands from the keyboard and gives them to the operating system to perform.
- A terminal (or terminal emulator) is a program that opens a window and lets you interact with the shell. There are a bunch of different terminal emulators you can use. Most Linux distributions supply several, such as: gnome-terminal, konsole, xterm, rxvt, kvt, nxterm, and eterm.

Navigation

- Arrow keys and history: up and down arrows scroll command history.
- `pwd` : working directory
- `ls` : list directory
- `cd` : change directory
- `..` : parent directory
- full path :

  `/usr/local/lib`

- relative path :

  `local/lib`

Read files

New commands

- cat (print the file to screen)
- ls (list files and directories)
- less (view text files)
- file (classify a file's contents)

Manipulating files

- cp - copy files and directories
- mv - move or rename files and directories
- rm - remove files and directories
- mkdir - create directories
- wildcards and glob pattern `http://en.wikipedia.org/wiki/Glob_%28programming%29`

Let's see some examples:

```
daco@blind:~/class$ ls *.txt
1.txt  3.txt  5.txt    a.txt  c.txt  e.txt  man_less.tx
2.txt  4.txt  aaa.txt  b.txt  d.txt  f.txt

daco@blind:~/class$ ls ?.txt
1.txt  2.txt  3.txt  4.txt  5.txt  a.txt  b.txt  c.txt
```

Let's see some examples:

```
daco@blind:~/class$ ls [[:alpha:]].txt
a.txt  b.txt  c.txt  d.txt  e.txt  f.txt

daco@blind:~/class$ ls [[:digit:]].txt
1.txt  2.txt  3.txt  4.txt  5.txt

daco@blind:~/class$ ls [abc].txt
a.txt  b.txt  c.txt

daco@blind:~/class$ ls [!abc].txt
1.txt  2.txt  3.txt  4.txt  5.txt  d.txt  e.txt  f.txt
```

Examples

```
daco@blind:~/class$ ls [ace].txt
a.txt  c.txt  e.txt

daco@blind:~/class$ ls [!ace].txt
1.txt  2.txt  3.txt  4.txt  5.txt  b.txt  d.txt  f.txt
```

Help and command type

- type - Display information about command type
- which - Locate a command
- help - Display reference page for shell builtin
- man - Display an on-line command reference

Examples

```
daco@blind:~/class$ type echo
echo is a shell builtin

daco@blind:~/class$ type type
type is a shell builtin

daco@blind:~/class$ type cp
cp is hashed (/bin/cp)
```

Examples

```
daco@blind:~/class$ type ls
ls is aliased to ‘ls --color=auto’

daco@blind:~/class$ which ls
/bin/ls

daco@blind:~/class$ ls /bin/ls -l
-rwxr-xr-x 1 root root 108708 Jan 14 04:50 /bin/ls

daco@blind:~/class$ help echo

daco@blind:~/class$ man ls
```

List

```
>  : output to a file
>> : append to a file
|  : pipe to another command
<  : take file as input
```

Standard Output

```
$ ls > lsout.log
$ cat lsout.log
$ cat 1.txt > lsout.log
$ cat lsout.log
$ cat 1.txt
$ ls >> lsout.log
$ cat lsout.log
$ ls > lsout.log
$ cat lsout.log
```

Standard Input

```
$ ls -tr > lsout.log
$ cat lsout.log
$ sort < lsout.log
$ sort lsout.log
$ sort < lsout.log
$ cat < lsout.log
$ sort    < lsout.log    > sorted_lsout.log
$ cat sorted_lsout.log
```

Pipelines

```
ls | less
```

regular-expression

http://en.wikipedia.org/wiki/Regular_expression

sed (Stream EDitor) - references

- http://sed.sourceforge.net
  - http://sed.sourceforge.net/sed1line.txt
- http://en.wikibooks.org/wiki/Sed
- http://www.grymoire.com/Unix/Sed.html

sed (Stream EDitor) - syntax

```
sed [-n] 'from,to commands'
sed -n '1,10 p'
sed -n '/from/,/to/ commands'
sed -n 's/abc/ABC/ p'
```

awk

- http://en.wikibooks.org/wiki/An_Awk_Primer/Awk_Command-Line_Examples

Pathname Expansion

```
ls *.txt
```

Command Substitution

```
ls -l $(which cp)
```

Quoting

- double quoting

```
echo "My home folder is : $HOME"
```

- single quoting

```
echo 'The variable containing my home folder is $HO
```

Permissions

New commands

- chmod - modify file access rights
- su - temporarily become the superuser
- sudo - temporarily become the superuser
- chown - change file ownership
- chgrp - change a file's group ownership

Jobs

Commands

- ps - list the processes running on the system
- kill - send a signal to one or more processes (usually to "kill" a process)
- jobs - an alternate way of listing your own processes
- bg - put a process in the background
- fg - put a process in the foreground

cut and paste: columns file manipulation

- cut
- paste

Create a script

A script is a sequence of operations written in a file. You can execute that file instead of all operations one by one.

Use a text editor

- gedit
- emacs
- vim

Comments

```
# some comments
```

Make a file executable

```
chmod a+x ./file
```

PATH

```
export PATH=$PATH:directory
```

Configuration file

`.bashrc`

Here scripts

```
cat - <<EOF
Hello world!
EOF
```

New commands

- if
- test
- exit
- read
- case
- for
- while

if

```
if [ -f .bash_profile ]; then
    echo "Loading your .bash_profile"
else
    echo "You have no .bash_profile!"
fi
```

Exit status

- How to get it

  `echo $?`

- success

  0

- failure

  1

  2

  ...

  255

Read input from stdin

```
read message
```

case

```
case $character in
    1 ) echo "You entered one."
;;
    2 ) echo "You entered two."
;;
    3 ) echo "You entered three."
;;
    * ) echo "You did not enter a number between 1 and
esac
```

for - 1

```
for i in word1 word2 word3; do
    echo $i
done
```

for - 2

```
for counter in {1..10..2}
do
    echo $counter
done
```

for - 3

```
for i in "$@"; do
    echo $i
done
```

while

```
number=0
while [ "$number" -lt 10 ]; do
    echo "Number = $number"
    number=$((number + 1))
done

while read LINE
do
  echo $LINE
done < ‘tail -f /var/log/messages‘
```

ssh client (the terminal)

```
ssh username@hostname [command]
```

ssh configuration files

You will find the configuration files in

`/etc/ssh/`
`~/.ssh/`

ssh server (config file and keys)

`/etc/ssh/sshd_config`

Example ssh into spark cluster

```
ssh user1@52.31.253.222
```

References

- Bash Beginner Guide: `http://www.tldp.org/LDP/Bash-Beginners-Guide/html/Bash-Beginners-Guide.html`
- Bash Reference Manual: `http://www.gnu.org/software/bash/manual/bash.html`
- Advanced Bash-Scripting Guide: `http://www.tldp.org/LDP/abs/html/index.html`
- Reference card: `http://www.tldp.org/LDP/abs/html/refcards.html`