LECTURE NOTES IN CIS300

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SPRING, 2018

SECTION 1: BASH

REFERENCES

- "Basic UNIX commands" [link]
- "Bash Guide for Beginners" [link]
- "Advanced Bash-Scripting Guide" [link]

GETTING STARTED

Access Shell terminal in your computer

- Option 1: Web terminal
  - [http://www.webminal.org/terminal/]
- Option 2: Setting up Ubuntu through VirtualBox
  - TA will talk about this.

LECTURE 2: FILES & DIRECTORIES

DIRECTORIES

- List files and directories: `ls`
  - `ls ~`, `ls .`, `ls`
  - `ls /`
  - `ls -al`
- Enter a directory: `cd`
  - `cd`, `cd ~`, `cd ..`
  - `cd /`
- Print the current pathname: `pwd`
- Create a directory: `mkdir`
  - `mkdir dir_a`

BASIC FILE MANAGEMENT

- Create a file: `touch`
  - `touch file_a`
- Move a file (change file name): `mv`
  - `mv file_a file_b`
- Copy a file: `cp`
  - `cp file_a file_b`
- Remove a file: `rm`
  - `rm file_a`

BASIC FILE MANAGEMENT (2)

- Show the content of a file: `cat`, `more`
  - `cat file_a`
  - `more file_a`: use `q` to quit, `/` to search
  - Write text to a file: `echo >>`
    - `echo "Alice Bob" >> file_a`
    - `echo "Alice" >> file_b`,
      `echo "Alice" >> file_c`
- Show the count of lines/words/chars a file: `wc`
  - `wc file_a`
- Show difference between files: `diff`
  - `diff file_a file_b`

EXERCISE 2.1

1. Run command `ls -a /`. Copy and paste (C&P) the printout on BB.
2. Run command `cat file_b`. C&P printout on BB.
3. Create a directory `dir_b` under `dir_a` and enter it. C&P the commands on BB.
4. Create a text file named `file_d.txt` and put there the following string: `Charlie is a student`. Run `cat file_d.txt`.
   - C&P the list of commands and their printout on BB

LECTURE 3: FILE PERMISSION

REFERENCES

- Understanding linux file permissions [link]

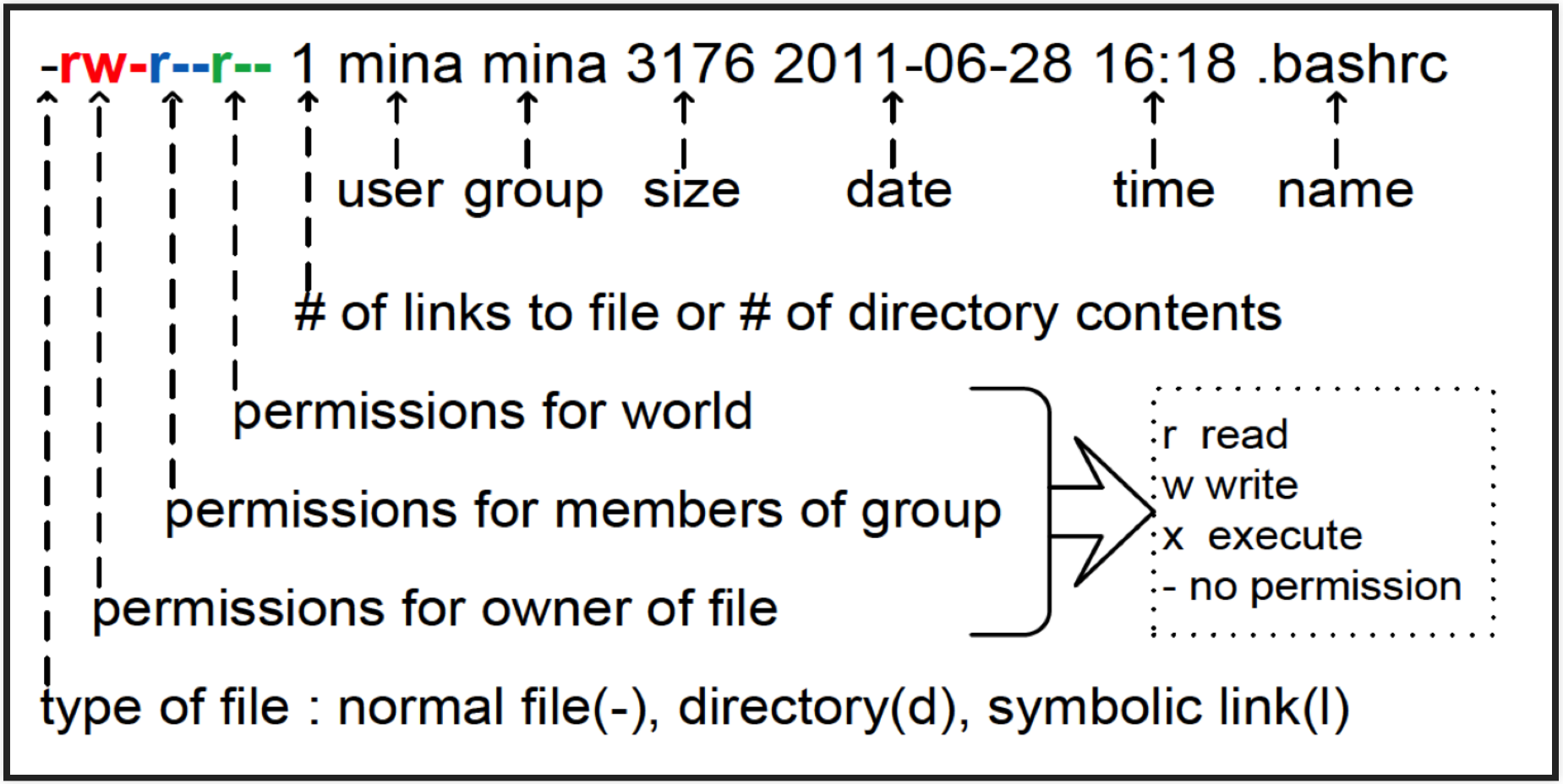
BASIC CONCEPT

- file permission: access right, or file mode
  - permission controls the ability of a *user* to take *actions* on a *file*
  - user: owner, group, all users
    - group: group of users and files.
  - type: read, write, execute

VIEWING PERMISSION

`ls -l`

- owner and group
- permissions
  - users: owner (`u`), group (`g`), others (`o`), all users (`a`)
  - type: read (`r`), write (`w`), execute (`x`)


-rw-r--r-- 1 mina mina 3176 2011-06-28 16:18 .bashrc
user group size date time name
# of links to file or # of directory contents
permissions for world
permissions for members of group
permissions for owner of file
r read
w write
x execute
- no permission
type of file : normal file(-), directory(d), symbolic link(l)

ls -al

CHANGING PERMISSION

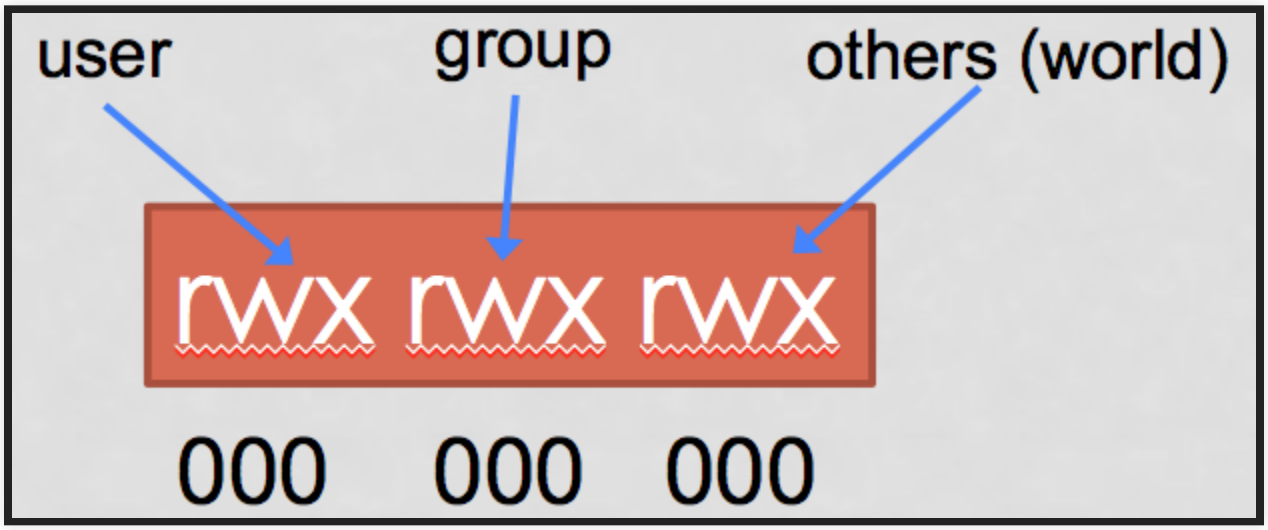
- `chmod`: change mode
  - add +:
    - `chmod a+wx file_a`: add write/execute permission to all users
    - `chmod g+r file_a`: add read permission to group users
  - assign/copy =:
    - `chmod g=rw file_a`: assign read/write permission to group
    - `chmod g=u file_a`: copy owner permission to group permission

CHANGING PERMISSION (2)

Options	Definitions
u	Owner
g	Group
o	Other
a	All (same as ugo)
x	Execute
w	Write
r	Read
+	Add permission
-	Remove permission
=	Set permission

CHANGING PERMISSION: NUMERIC MODE (3)

- `chmod 777 file_a;chmod a+rwx file_a`
  - `chmod 666 file_a;chmod a=rw file_a`
  - `chmod 000 file_a;chmod a-rwx file_a`



CHANGE OWNERSHIP

- `chown owner:group filename`
  - `chown user1:staff file_a`

EXERCISE 3.1

1. Run command `chmod o-r file_a; cat file_a`. C&P the printout on BB.
2. Design the command to make a file read-only to group. C&P your command on BB.
3. Design the command to make a file read-only to all users. C&P your command on BB.
4. Conver the following two commands to numeric mode: `chmod a-rwx file_a; chmod o+x file_a`. C&P your command on BB.

LECTURE 4: TEXT EDITING

- `gedit`: text editor with GUI
  - `gedit filename &`
- `vim`: text editor in terminal
- other editors: `emacs`, etc.

VIM

- basic movement: `h`,`j`,`k`,`l`
  - word movement: `w`,`e`,`b`
  - number powered movement: `5w`
- find character in current line: `f`
  - find word under cursor: `*` and `#`
  - go to matching parenthese: `%`
- begin and end of line: `0` and `$`
- go to line: `g`
  - first line: `gg`
  - last line: `G`
- search: `/keyword` with `n` and `N`

VIM (2)

- modes: normal and insert
- from normal to insert: `i`, `o`, `R`
  - backward: `esc`
- editing in normal mode
  - copy/yank : `v+y`
  - and paste: `p`
  - cut: `v+x`
  - delete: `v+d`

PRACTICE

- Install vim on your VM: `sudo apt-get install vim`
- Or use online Vim: http://www.openvim.com/

LECTURE 5: SHELL PROGRAMMING

INTRODUCTION

- Why learn shell programming?
  - automate administrative tasks, save your efforts!
  - e.g. automatic software update, file backup, resource monitoring
- Script: tie shell commands in a file
- Execute script `script.sh`:
  - `./script.sh`
  - `source script.sh`

BASICS: SHELL LANGUAGE

- `#!` sha-bang is a two-byte magic number that designates a file t
  - basically says it's an executable shell script
- Language syntax: if/else, variable
- demo:

1. `#!/bin/bash echo 'hello world';`
2. `#!/bin/bash a=1;b=2;a=$a+$b;echo $a;`
3. `#!/bin/bash a=1;b=2; a=$((a+b));echo $a;`
4. `if [ $a -gt $b ];then echo 'a larger than b`

- exercise:
  1. * try `a=1;b=2;c=$a;a=$b;b=$c;echo $a,$b;`, and put the output to the **blackboard**.
  2. write a script to initialize variables `a`, `b`, `c` and print their sum.
  3. write a script to swap the names of two files, file1 and file2. For example if input file1 contains Alice and file2 contains Bob at the beginning, after the execution, file1 should contain Bob and file2 should contain Alice.

PASSING ARGUMENTS

- demo:
  - `#!/bin/bash echo $1; echo $2; echo $#;`
- exercise:
  1. `#!/bin/bash a=$1; b=$2; echo $((a*b));;` try this script and tell what it does?
  2. write a script to get 3 integers from the command-line and prints their product.
     - what happens if you do not pass the 3 required integers when executing the bash script?

COMMENTING

- # is used to comment in bash