NGSDAT 2019

Basic Linux Commands

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Linux

- Linux is an operating system just like Windows

- Open source software – the source code is available publicly

- Free software - the users have the freedom to study, modify and redistribute it.

- Many distributions of Linux comes free of cost too. Users can freely download them from the respective websites.

Linux Distributions

- Linux comes in different versions or flavors called "distributions"

- Choose your distribution based on your needs and expertise

- Some popular distributions:

  - Debian – World's largest non-commercial Linux distribution

  - Ubuntu – A popular, simple and user-friendly Debian based disbribution.

  - Red Hat Enterprise Linux – targets the commercial market

  - CentOS – Another community supported distro – opensource version of RHEL

GUI vs CLI

- Graphical User Interface (GUI)

  - Interaction is through windows and dialogue boxes which contain menus

  - Most of the input is using the mouse with minimal use of the keyboard

- Command Line Interface (CLI)

  - Makes minimum use of the mouse; the user has to type in "commands" using the keyboard to perform various operations

  - Gives more power and flexiblity to the user which comes at the cost of memorizing a good number of commands

The Linux file system

- In Linux, everything is a file. A folder is called a directory in a CLI environment.

- The file system of Linux is organized as a hierarchy which means a "parent directory" contains "child directories" which in turn contain their own child directories and so on..

- The "root", denoted as "/" is the parent directory of ALL other directories/files.

- At any given time, we are inside <u>a single</u> directory which is called the "current working directory".

- Every "user" of the OS has his/her own "home" folder named after the username itself.

- Filename conventions (rules) – Can contain letters, numbers, dots and underscores. Better to avoid spaces. Must not contain special characters like #,-,+ etc. Filenames are case-sensitive. "Desktop" is not same as "desktop" or "DESKTOP"

Sample Layout of the File system Hierarchy
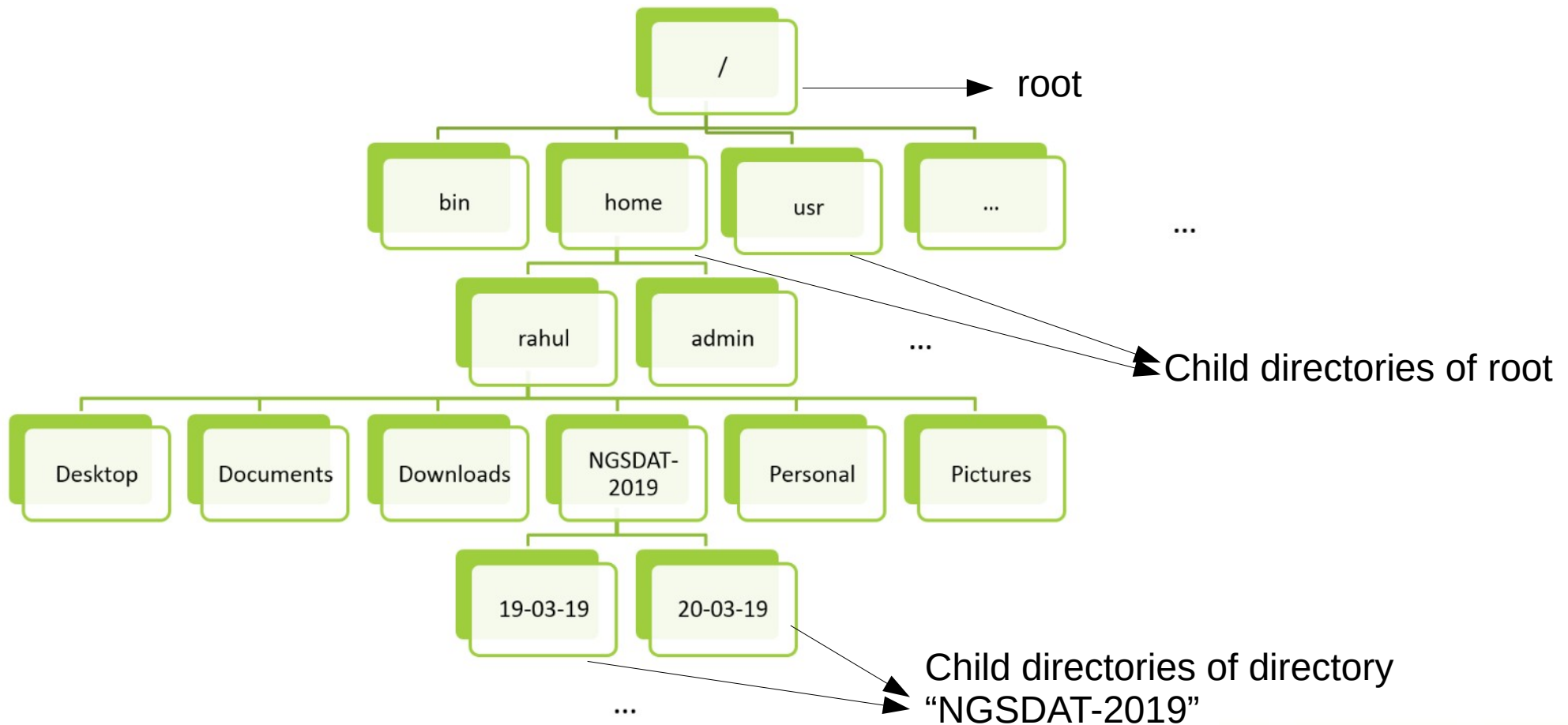
Pathnames

- A pathname of a file/folder is the route to be followed to reach that particular file or folder in the hierarchy.

- The directories along the path are separated by a forward slash "/" as opposed to a backward slash "\" in Windows OS.

- There are two types of paths.

  1. Absolute path – Starts at the root (/) and is the full path of the file.

     eg. /home/Desktop/myfile.txt

  2. Relative path – Starts at the current working directory

     ➢ The special character '.' (dot) represents the current working directory (and can be omitted in some cases).

        e.g. ./NGSDAT19/sequences/phyto.fasta

        NGSDAT19/sequences/phyto.fasta

     ➢ The special characters '..' (double dots) represent the parent directory of working directory.
        e.g. ../Downloads/ral.fasta

- The tilde(~) symbol represents the home folder of the current logged in user.
 e.g. ~/NGSDAT-2019/20-03-19/Linux/linux_commands.pdf

Users

- An installation of an OS can have more than one users identified by their respective "usernames"

- Every user has a dedicated "home" folder named after the username itself. e.g. The home folder of the user "Rahul" will be named "Rahul".

- Superuser – is a special user that has ALL the administrative privileges, including installing and updating software, which other users don't have

- In Linux, the superuser is called "root"

The Linux Command Line

- Shell or bash is the program used to run commands in Linux

- In a GUI environment, a program called "terminal" is used to invoke the shell or bash.

- Shell prompt - appears whenever the shell is ready to accept input. Usually takes the format: username@machinename, followed by the current working directory and a dollar sign($) and a blinking cursor. eg. raj@dell-inspiron:~$

- Command history – A user can naviagate through the previously typed commands using the up and down arrow keys. Simply press the up arrow key repeatedly to see the previously entered commands.

General form of a Command

- Basic form : command_name -options arguments
- Options – modify the behavior of the command. Preceded by a hyphen (-) or two hyphens (--) after the command name.
- Arguments – are the items upon which the command operates
- Both arguments and options are optional. Commands can be issued without them
- Commands are case-sensitive and are given in small letters (lower case)

ls -a Desktop

command name   option   argument
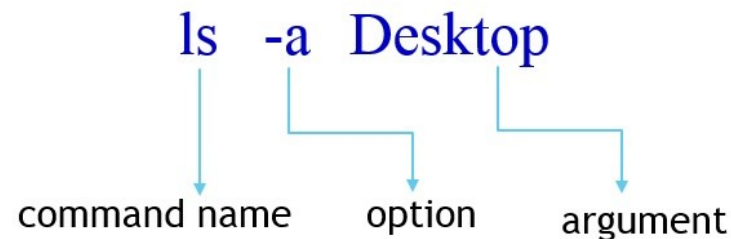
Some basic Linux Commands

- pwd – displays the absolute path of the current working directory
- ls – lists the contents of the specified directory

    Examples :

    `ls Desktop` : displays the contents of Desktop

    `ls -l` : displays the contents of current working directory in <u>long format</u>

    `ls ..` : displays the contents of parent directory

    `ls NGSDAT-2019/Linux` : displays the contents of the directory Linux inside the directory NGSDAT-2019 inside the directory Desktop

- man – Displays the man pages (manual) of the specified command. The man pages describe the functionality and all available options of the command

  e.g. `man ls`

- cd – Changes the current directory to the specified one

  Examples

  `cd ..` : Changes to the parent directory

  `cd ../Desktop` : Changes to the directory Desktop in the parent directory

  `cd NGSDAT-2019/Linux or cd ./NGSDAT-2019/Linux`: Changes to the directory NGSDAT-2019 in the current directory

  `cd ~` : Changes to the home folder of the current user

- mkdir – creates a directory in the specified path.

  Examples

  `mkdir linux_commands` : Creates a directory with name phyto inside the current working directory

  `mkdir linux_commands/phyto` : Creates a directory phyto inside the directory pathogen(if it exists)

- chmod – used to change the permissions of a file
- 3 types of commonly used permissions – read(r), write(w), execute(x)
- A combination of the letters u,g,o,a controls which users' access to the file will be changed
  - ➢ u – owner of the file
  - ➢ g – other users in the file's group
  - ➢ o – other users not in the file's group
  - ➢ a – all users

  Examples
- `chmod a+rwx readme.txt` – adds read, write and execute permissions of the file readme.txt to *all* users
- `chmod -v a-x readme.txt` – removes the execute permission of readme.txt for all users

- vi – vi is actually a text editor used in a command line mode

  `vi test` – Creates(if doesn't exist) a file test and opens it for editing

  Basic operations :

  ➢ create a file – `vi filename` e.g. `vi myfile.txt`

  ➢ enter insert mode – To edit the file, press "i" and type in the contents

  ➢ exit insert mode and enter command mode – if you have completed editing, press "Esc" key to enter "command mode"

  ➢ save file Esc+:+w (Press Esc, then press :, then press w, then q and enter

  ➢ close file Esc+:+q

  ➢ save and close file Esc+:+wq

- cat – Displays the contents of a file or concatenates multiple files

  Examples

  `cat readme.txt` : Displays the contents of the file readme

  cat file1 file2 > file3 : Concatenates file1 & file2 to a new file file3

- grep – Searches for specified text in a specified file

  Examples

  - `grep 'hello' test` : Searches for the text 'hello' in the file test

  - `grep -c 'hello' test` : c option is used; displays the no. of lines containing 'hello' in the file test

- wc – Displays the no. of newlines, words and bytes in the specified file

  `wc readme.txt` : Displays above items for the file readme.txt

- **cp** – Copy files/directories

  Format : cp source_file target_file

  Copies the source file to the target file. i.e. the first argument is the file to be copied and the second argument is target location, i.e. directory or the full path name of the new copy.

  Examples

  `cp readme.txt phyto/` : Copies the file readme.txt to the directory phyto with the same name readme.txt

  `cp readme.txt phyto/readit.txt` : Copies the file readme.txt to the directory phyto with the name readit.txt

  `cp -i readme.txt phyto/readit.txt` : Prompts the user to decide whether to overwrite the target file if it already exists, before actually copying

- mv – moves the source file to the target file. i.e. the first argument is the file to be copied and the second argument is target location (similar to cut and paste)

- Can be used for renaming a file

  format : mv source_file target_file

  e.g. `mv myfile1.txt myfile_1.txt`

- rmdir – Removes (deletes) empty directories

  Example : `rmdir phyto`

- rm – Deletes the specified file. Can be used to delete directories if the "r" option is used.

  `rm testfile.txt` – Deletes the file testfile.txt

  `rm -ri phyto` – Deletes the folder phyto and its contents in interactive mode

- **tar** – Used for archiving files. i.e. it can be used for functions like zipping, extracting (unzipping), listing the contents of a zipped file etc.

  - ➢ The first option denotes the function to be performed and <u>must be</u> c,x or one of the other possible functions (refer man page for details)

  Examples

  - ➢ `tar -cvf files.tar file1 file2 file3` : Creates a tar archive with the name files.tar containing the three files file1 file2 and file3 verbosely

  - ➢ `tar -xvf test.tar` : Extracts the tar file files.tar to retrieve the original files

  - ➢ `tar -tvf test.tar` : Lists the contents of the tar file test.tar verbosely.

- gzip / gunzip – For compressing / uncompressing files

  Examples

  ➢ gzip myfile.txt – Replaces t with the compressed file file1.zip

  ➢ gunzip file1.gz or gunzip file1 : Uncompresses the file file1.gz to the original uncompressed file file1

- free - displays the total amount of free and used physical and swap memory in the system

  `free -h` : displays the above info in human-readable format

- sudo – to execute a command as another user, the "superuser" by default. 'u' option is used to specify a user other than the superuser.
  - Usually used for installing and updating softwar and other such operations, which require superuser privileges.
  - When sudo is used, the system will prompt to enter the password of the specified user (or superuser by default). The action can be completed only if the correct password is entered

    `sudo apt-get update`

Thank You