Operating Systems CS/CE 232L / 324L
Lab 01

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Q1) What's a shell?

Ans) The text etc within a terminal is known as shell. It defines how the terminal will function and behave(looks after running or executing a command(s)). The most common is bash - Bourne again shell, that will be used.

Q2) Which shell are you in?

Ans) Running the command ``echo $SHELL'', gives the following output: ``/bin/bash''. This shows that I am in a bash shell.

Q3) What's a Home Directory?

Ans) A Home directory, is commonly given to a user on a UNIX or Linux Variant Operating System. It is a directory for a particular user of the system and contains the individual files and stores data including but not limited to personal data, files, scripts, user information etc.

Q4) What's your Home Directory?

Ans) Firsly, we will use the the ``cd..'' command to go back as much as we can so that we move back directories if there is any directory we are currently in. This ensures we are in the Home directory. Then using the command ``pwd'' which stands for "print working directory" we can get our home directory. Running the command ``pwd'' gives me the output ``/home/user''. Therefore, that is my home directory.

Q5) What's a Working Directory?

Ans) Working Directory is that directory that we are currently inside and working in.

Q6) Which directory are you in?

Ans) I am currently in the home directory as indicated by the previous answer.

Q7) What's your username?

Ans) The ``pwd'' command also shows the username which is currently ''user''. However, we can also get the username using the ``whoami'' command which also gives the output ''user''.

Q8) What's a PATH?

Ans) The 'PATH' is the unique location of a file, folder etc in the file system of an OS. For Linux, a PATH is an environment variable which shows the subsequent directories a file is located in. Through this, a shell can follow the directories. In essence, a path is a means to get to a particular file or directory in the system.

Q9) What's an Absolute PATH?

Ans) An Absolute Path specifies a location to a file or directory in relation to the root directory. They can easily be identified with a forward slash '/'.

Q10) What's a Relative PATH?

Ans) Relative paths specify a location which would be a file or directory, in relation to the directory in which the user is currently working on / the current working directory of the user.

Q11) What's inside the directory ``/usr/bin''?

Ans) This directory contains the location of several files related to the functionalities of the user known as user binaries. These files are needed for booting, and other operating system tasks. From the home directory, we can get to this directory using the command: ``cd /usr/bin''. The files inside this directory can be listed using ``ls''. Or simply ``ls /usr/bin'' from the home directory.

```
~$ ls /usr/bin
2to3-2.7              dircolors             iclingo           ntthal            select-editor
411toppm              dirmngr               ico               numba             sem
4ti2-circuits         dirmngr-client        icombine          numfmt            sendiso
4ti2-genmodel         dirname               icontopbm         nuweb2noweb       sensible-browser
4ti2-gensymm          disco                 iconv             nvim              sensible-editor
4ti2-graver           disdvi                iconx             nw                sensible-pager
4ti2-groebner         display               icotool           obabel            sensors
4ti2-hilbert          display-im6           icuexportdata     obconformer       sensors-conf-convert
4ti2-markov           display-im6.q16       icuinfo           obdistgen         sepdebugcrcfix
4ti2-minimize         distmat               id                obenergy          seq
4ti2-normalform       distro-info           ident             obfit             seq_cache_populate.pl
4ti2-output           django-admin          identify          obfitall          seqcount
4ti2-ppi              djpeg                 identify-im6       obgen             seqdb_perf
4ti2-qsolve           dkimsign              identify-im6.q16   obgrep            seqmatchall
4ti2-rays             dkimverify            idle              obj2yaml          seqret
4ti2-walk             dknewkey              idle-python3.10   obj2yaml-11       seqretsetall
4ti2-zbasis           dmcs                  iecset            obj2yaml-14       seqretsplit
4ti2-zsolve           dmesg                 iep               objc_count        seqxref
7z                    dnsdomainname         ietf2bibtex       objcopy           seqxrefget
```

Q12) What's the largest file inside the directory ``/usr/bin''?

Ans) We can use the command ``ls -l -S'' which lists the files in a long format, sorted by file size in the descending order. Then the file at the top will be the largest file by size.

We can modify this command to ``ls -l -S | head -n 2'' to display the top most file, which will be the largest file. The result is ''-rwxr-xr-x 1 root root 306428176 Mar 21 00:46 materialized''

```
~$ ls /usr/bin -l -S | head -n 2
total 2714248
-rwxr-xr-x 1 root root    306428176 Mar 21 00:46 materialized
```

Q13) What's the most recently created file inside the directory ``/usr/bin''?
Ans) The command ``ls -lt'' displays the files in descending order (in long format) by time. Therefore we can get the most recently created file using this command. It can be modified to ``ls -lt | head -n 2'' to get the top most file which is "lrwxrwxrwx 1 root root   38 Jun 28 13:22 npm -> ../lib/node_modules/npm/bin/npm-cli.js".

```
~$ ls /usr/bin -lt | head -n 2
total 2714248
lrwxrwxrwx 1 root root            38 Jun 28 13:22 npm -> ../lib/node_modules/npm/bin/npm-cli.js
```

Q14) Go to your home directory and list all the directories in it.
Ans) ``ls'' lists all the directories in a directory. Using ``ls'' we get, "2023-08-21-file-1.temr".

Q15) List all hidden files and directories in your home directory.
Using ``ls -a'' we can get all hidden files and directories as well. Which are ".2023-08-21-file-1.term-0.term .bash_history .bash_profile .bashrc .jupyter-blobs-v0.db .lesshst .smc .snapshots .ssh 2023-08-21-file-1.term".

```
~$ ls -a
.  ..  .2023-08-21-file-1.term-0.term  .bash_history  .bash_profile  .bashrc  .jupyter-blobs-v0.db  .lesshst  .smc  .snapshots  .ssh  20
~$
```

Q16) What does the command ``file'' do?
Ans) The command ``file'' is used to determine a file type. It works by running various tests to determine the file type and its data. The description can be further viewed by the command ``man file''.

Q17) What options does ``ls'' command have?
Ans) ``man ls'' gives us a detailed description of the ``ls'' command. It has options to not ignore entries starting with ., include all hidden files, print the author of each file, print block size, sort by and show time, color, list directories themselves, and much more.

```
LS(1)                                                   User Commands

NAME
      ls - list directory contents

SYNOPSIS
      ls [OPTION]... [FILE]...

DESCRIPTION
      List information about the FILEs (the current directory by default).  Sort entries alphabetically if none of -cft

      Mandatory arguments to long options are mandatory for short options too.

      -a, --all
             do not ignore entries starting with .

      -A, --almost-all
             do not list implied . and ..

      --author
             with -l, print the author of each file

      -b, --escape
             print C-style escapes for nongraphic characters

      --block-size=SIZE
             with -l, scale sizes by SIZE when printing them; e.g., '--block-size=M'; see SIZE format below

      -B, --ignore-backups
             do not list implied entries ending with ~
```

Q18) Search for the option "-h" option of "ls". What does it do? Use it.
Ans) Using ``man ls -h'', we can find that the -h option displays the file in human readable format. Running the command ``ls -h'' outputs the file "2023-08-21-file-1.term".

Q19) Make directories dir1, dir2, and dir3 in your home directory using one command only.
Ans) The command ``mkdir'' makes directories. We can put different directories inside curly braces seperated by a comma to make multiple directories. Such as ``mkdir {dir1,dir2,dir3}''.

Q20) Make the directory dir9/subdir8/subsubdir7 using one command only, even if dir9/subdir8/subsubdir7 doesn't exist.
Ans) ``mkdir -p dir9/subdir8/subsubdir7''. We need the option -p since the parent directory doesn't exist, therefore, it first creates the parent directory, then proceeds to create the subsequent directories.

Q21) While staying in your home directory, create an empty file dummy.txt in dir9/subdir8/subsubdir7.
Ans) We can use "touch" command specifying the path where we want to create a file, then specify the file type to .txt.
``touch dir9/subdir8/subsubdir7/dummy.txt''

Q22) While staying in your home directory, copy the following files from /usr/bin to dir9/subdir8/subsubdir7: zip, zipgrep, zipinfo.
Ans) We can use the ``cp'' command with the directory we want to copy from to the directory we want to copy to.
``cp /usr/bin/zip dir9/subdir8/subsubdir7''
``cp /usr/bin/zipgrep dir9/subdir8/subsubdir7''
``cp /usr/bin/zipinfo dir9/subdir8/subsubdir7''

Q23) Move the file zipgrep from dir9/subdir8/subsubdir7 to dir9/subdir8.
Ans) ``mv dir9/subdir8/subsubdir7/zipgrep dir9/subdir8''

Q24) Rename it to myzipgrep.
Ans) ``mv dir9/subdir8/zipgrep dir9/subdir8/myzipgrep''

Q25) Move all files from dir9/subdir8/subsubdir7 to dir9/subdir8.
Ans) ``mv ~/dir9/subdir8/subsubdir7/* ~/dir9/subdir8/''

Q26) Delete the dir9/subdir8 directory.
Ans) ``rm -r dir9/subdir8''

Q27) List all files in /usr/bin that start with the letter z.
Ans) ``ls z*''

Q28) List all the files in /etc whose second letter is c.
Ans) ``ls /etc/?c*''

```
~$ ls /etc/?c*
/etc/ocamlfind.conf  /etc/screenrc  /etc/ucf.conf

/etc/dconf:
db  profile

/etc/gconf:
2  gconf.xml.defaults  gconf.xml.mandatory

/etc/mc:
edit.indent.rc  filehighlight.ini  mc.default.keymap  mc.emacs.keymap  mc.ext  mc.keymap  mc.menu  mcedit.menu  sfs.ini

/etc/ncbi:

/etc/rc0.d:
K01alsa-utils          K01apache2       K01cups-browsed  K01glances  K01pgbouncer  K01postgresql  K01rpcbind  K01supervisor  K01udev                 K01uuidd
K01apache-htcacheclean K01avahi-daemon  K01fio           K01monit    K01pgpool2    K01pyro4-nsd   K01saned    K01tinc        K01unattended-upgrades  K01xpra

/etc/rc1.d:
K01alsa-utils          K01apache2       K01cups          K01fio      K01monit      K01pgpool2     K01pyro4-nsd  K01saned      K01tinc    K01xpra
K01apache-htcacheclean K01avahi-daemon  K01cups-browsed  K01glances  K01pgbouncer  K01postgresql  K01rpcbind    K01supervisor K01uuidd

/etc/rc2.d:
```


Q29) Copy all of them to /dir9/subdir8
Ans) First we have to make subdir8 again using ``mkdir -p dir9/subdir8''.
Then we can use the command ``cp /etc/?c* ~/dir9/subdir8'' to copy all those files to this directory.

Q30) Among them, delete all those that contain a digit in their name.
Ans) ``rm -r dir9/subdir8/*[0-9]*''