

Task1.Part1

- 1) Log in to the system as root.

```
Ubuntu 14.04.3 LTS CsnKhai tty1

CsnKhai login: root
Password:
Last login: Tue Sep 15 07:53:37 UTC 2015 on tty1
Welcome to Ubuntu 14.04.3 LTS (GNU/Linux 3.13.0-63-generic i686)

 * Documentation:  https://help.ubuntu.com/
New release '16.04.7 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

root@CsnKhai:~#
```

- 2) Use the passwd command to change the password. Examine the basic parameters of the command. What system file does it change *?

```
student@CsnKhai:~$ passwd
Changing password for student.
(current) UNIX password:
Enter new UNIX password:
Retype new UNIX password:
Bad: new and old password are too similar
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
student@CsnKhai:~$ █
```

*This command will change /etc/shadow file.

- 3) Determine the users registered in the system, as well as what commands they execute. What additional information can be gleaned from the command execution?

Registered users:

```
student@CsnKhai:~$ cat /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/bin/sync
games:x:5:60:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
proxy:x:13:13:proxy:/bin:/usr/sbin/nologin
www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
list:x:38:38:Mailing List Manager:/var/list:/usr/sbin/nologin
irc:x:39:39:ircd:/var/run/ircd:/usr/sbin/nologin
gnats:x:41:41:Gnats Bug-Reporting System (admin)/:/var/lib/gnats:/usr/sbin/nologin
nobody:x:65534:65534:nobody:/nonexistent:/usr/sbin/nologin
libuuid:x:100:101::/var/lib/libuuid:
syslog:x:101:104::/home/syslog:/bin/false
messagebus:x:102:105::/var/run/dbus:/bin/false
sshd:x:103:65534::/var/run/sshd:/usr/sbin/nologin
student:x:1000:1000:Student KhAI,,,:/home/student:/bin/bash
student@CsnKhai:~$ █
```

You can check what commands executed by user with a command “history”:

```
student@CsnKhai:~$ history
1  w
2  ip a
3  history
```

or with displaying of .bash_history file:

```
student@CsnKhai:~$ cat /home/student/.bash_history
sudo su
top
sudo update.rc ssh defaults
sudo update-rc.d ssh defaults
sudo reboot
sudo shutdown -h now
ip a
```

From this methods you can get command execution order for each user.

4) Change personal information about yourself.

Adding comment for myself:

```
student@CsnKhai:~$ sudo usermod -c "DevOps_Course" student
[sudo] password for student:
student@CsnKhai:~$ sudo cat /etc/passwd | grep student
student:x:1000:1000:DevOps_Course:/home/student:/bin/bash
student@CsnKhai:~$
```

5) Become familiar with the Linux help system and the man and info commands. Get help on the previously discussed commands, define and describe any two keys for these commands. Give examples.

man passwd:

```
PASSWD(1)                                User Commands                                PASSWD(1)

NAME
    passwd - change user password

SYNOPSIS
    passwd [options] [LOGIN]

DESCRIPTION
    The passwd command changes passwords for user accounts. A normal user may only change the password for his/her own account, while the superuser may change the password for any account. passwd also changes the account or associated password validity period.

    Password Changes
    The user is first prompted for his/her old password, if one is present. This password is then encrypted and compared against the stored password. The user has only one chance to enter the correct password. The superuser is permitted to bypass this step so that forgotten passwords may be changed.

    After the password has been entered, password aging information is checked to see if the user is permitted to change the password at this time. If not, passwd refuses to change the password and exits.

    The user is then prompted twice for a replacement password. The second entry is compared against the first and both are required to match in order for the password to be changed.

    Then, the password is tested for complexity. As a general guideline, passwords should consist of 6 to 8 characters including one or more characters from each of the following sets:

    · lower case alphabets
    · digits 0 thru 9
    · punctuation marks

    Care must be taken not to include the system default erase or kill characters. passwd will reject any password which is not suitably complex.
```

man cat:

```
CAT(1) User Commands

NAME
    cat - concatenate files and print on the standard output

SYNOPSIS
    cat [OPTION]... [FILE]...

DESCRIPTION
    Concatenate FILE(s), or standard input, to standard output.

    -A, --show-all
        equivalent to -vET

    -b, --number-nonblank
        number nonempty output lines, overrides -n

    -e
        equivalent to -vE

    -E, --show-ends
        display $ at end of each line

    -n, --number
        number all output lines

    -s, --squeeze-blank
        suppress repeated empty output lines

    -t
        equivalent to -vT

    -T, --show-tabs
        display TAB characters as ^I

    -u
        (ignored)

    -v, --show-nonprinting
```

help history:

```
student@CsnKhai:~$ help history
history: history [-c] [-d offset] [n] or history -anrw [filename] or history -ps arg [arg...]
    Display or manipulate the history list.

    Display the history list with line numbers, prefixing each modified
    entry with a `*'. An argument of N lists only the last N entries.

    Options:
    -c          clear the history list by deleting all of the entries
    -d offset  delete the history entry at offset OFFSET.

    -a          append history lines from this session to the history file
    -n          read all history lines not already read from the history file
    -r          read the history file and append the contents to the history
               list
    -w          write the current history to the history file
               and append them to the history list

    -p          perform history expansion on each ARG and display the result
               without storing it in the history list
    -s          append the ARGs to the history list as a single entry

    If FILENAME is given, it is used as the history file. Otherwise,
    if $HISTFILE has a value, that is used, else ~/.bash_history.

    If the $HISTTIMEFORMAT variable is set and not null, its value is used
    as a format string for strftime(3) to print the time stamp associated
    with each displayed history entry. No time stamps are printed otherwise.

    Exit Status:
    Returns success unless an invalid option is given or an error occurs.
```

man ls:

```
LS(1) User Commands LS(1)

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
    -ctuvSUX nor --sort is specified.

    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
        scale sizes by SIZE before printing them. E.g., '--block-size=M' prints sizes in units of 1,048,576 bytes.
        See SIZE format below.

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

    -c
        with -lt: sort by, and show, ctime (time of last modification of file status information) with -l: show
        ctime and sort by name otherwise: sort by ctime, newest first
```

Command “ls” with “-la” will display a detailed listing of all files and directories in the current directory, including hidden files.

Command “history” with “-c” will clear history.

6) Explore the more and less commands using the help system. View the contents of files .bash* using commands.

man more:

```
MORE(1) User Commands MORE(1)
NAME
  more - file perusal filter for crt viewing
SYNOPSIS
  more [-dlfpcsu] [-num] [+/-pattern] [+linenum] [file ...]
DESCRIPTION
  more is a filter for paging through text one screenful at a time. This version is especially primitive. Users
  should realize that less(1) provides more(1) emulation plus extensive enhancements.
OPTIONS
  Command-line options are described below. Options are also taken from the environment variable MORE (make sure to
  precede them with a dash ('-'')) but command line options will override them.
  -num This option specifies an integer which is the screen size (in lines).
  -d more will prompt the user with the message "[Press space to continue, 'q' to quit.]" and will display "[Press
  'h' for instructions.]" instead of ringing the bell when an illegal key is pressed.
  -l more usually treats ^L (form feed) as a special character, and will pause after any line that contains a form
  feed. The -l option will prevent this behavior.
  -f Causes more to count logical, rather than screen lines (i.e., long lines are not folded).
  -p Do not scroll. Instead, clear the whole screen and then display the text.
  Notice that this option is switched on automatically if the executable is named page.
  -c Do not scroll. Instead, paint each screen from the top, clearing the remainder of each line as it is dis-
  played.
  -s Squeeze multiple blank lines into one.
  -u Suppress underlining.
Manual page more(1) line 1 (press h for help or q to quit)
```

man less:

```
LESS(1) General Commands Manual LESS(1)
NAME
  less - opposite of more
SYNOPSIS
  less -?
  less --help
  less -V
  less --version
  less [-[+aABcDeEfGgIiJkLmMnNqOrRsSuUVvWwX~]
  [-b space] [-h lines] [-j line] [-k keyfile]
  [-{o0} logfile] [-p pattern] [-P prompt] [-t tag]
  [-T taglogfile] [-x tab,...] [-y lines] [-z] lines]
  [-# shift] [+{+}cmd] [--] filename...
  (See the OPTIONS section for alternate option syntax with long option names.)
DESCRIPTION
  less is a program similar to more (1), but it has many more features. Less does not have to read the entire input
  file before starting, so with large input files it starts up faster than text editors like vi (1). Less uses
  termcap (or terminfo on some systems), so it can run on a variety of terminals. There is even limited support for
  hardcopy terminals. (On a hardcopy terminal, lines which should be printed at the top of the screen are prefixed
  with a caret.)
  Commands are based on both more and vi. Commands may be preceded by a decimal number, called N in the descrip-
  tions below. The number is used by some commands, as indicated.
COMMANDS
  In the following descriptions, ^X means control-X. ESC stands for the ESCAPE key; for example ESC-v means the two
  character sequence "ESCAPE", then "v".
  h or H Help: display a summary of these commands. If you forget all the other commands, remember this one.
  SPACE or ^V or f or ^F
  Scroll forward N lines, default one window (see option -z below). If N is more than the screen size, only
  the final screenful is displayed. Warning: some systems use ^V as a special literalization character.
Manual page less(1) line 1 (press h for help or q to quit)
```

more ~/.bashrc:

```
student@CsnKhai:~$ more ~/.bashrc
# ~/.bashrc: executed by bash(1) for non-login shells.
# see /usr/share/doc/bash/examples/startup-files (in the package bash-doc)
# for examples

# If not running interactively, don't do anything
case $- in
    *) ;;
    *) return;;
esac

# don't put duplicate lines or lines starting with space in the history.
# See bash(1) for more options
HISTCONTROL=ignoreboth

# append to the history file, don't overwrite it
shopt -s histappend

# for setting history length see HISTSIZE and HISTFILESIZE in bash(1)
HISTSIZE=1000
HISTFILESIZE=2000

# check the window size after each command and, if necessary,
# update the values of LINES and COLUMNS.
shopt -s checkwinsize

# If set, the pattern "*" used in a pathname expansion context will
# match all files and zero or more directories and subdirectories.
#shopt -s globstar

# make less more friendly for non-text input files, see lesspipe(1)
[ -x /usr/bin/lesspipe ] && eval "$(SHELL=/bin/sh lesspipe)"

# set variable identifying the chroot you work in (used in the prompt below)
if [ -z "${debian_chroot:-}" ] && [ -r /etc/debian_chroot ]; then
    debian_chroot=$(cat /etc/debian_chroot)
fi
```

less ~/.bashrc:

```
# ~/.bashrc: executed by bash(1) for non-login shells.
# see /usr/share/doc/bash/examples/startup-files (in the package bash-doc)
# for examples

# If not running interactively, don't do anything
case $- in
    *) ;;
    *) return;;
esac

# don't put duplicate lines or lines starting with space in the history.
# See bash(1) for more options
HISTCONTROL=ignoreboth

# append to the history file, don't overwrite it
shopt -s histappend

# for setting history length see HISTSIZE and HISTFILESIZE in bash(1)
HISTSIZE=1000
HISTFILESIZE=2000

# check the window size after each command and, if necessary,
# update the values of LINES and COLUMNS.
shopt -s checkwinsize

# If set, the pattern "*" used in a pathname expansion context will
# match all files and zero or more directories and subdirectories.
#shopt -s globstar

# make less more friendly for non-text input files, see lesspipe(1)
[ -x /usr/bin/lesspipe ] && eval "$(SHELL=/bin/sh lesspipe)"

# set variable identifying the chroot you work in (used in the prompt below)
if [ -z "${debian_chroot:-}" ] && [ -r /etc/debian_chroot ]; then
    debian_chroot=$(cat /etc/debian_chroot)
fi

# set a fancy prompt (non-color, unless we know we "want" color)
case "$TERM" in
    xterm-color) color_prompt=yes;;
esac

# uncomment for a colored prompt, if the terminal has the capability; turned
# off by default to not distract the user: the focus in a terminal window
# should be on the output of commands, not on the prompt
#force_color_prompt=yes

if [ -n "$force_color_prompt" ]; then
    if [ -x /usr/bin/tput ] && tput setaf 1 >&/dev/null; then
        # We have color support; assume it's compliant with Ecma-48
        # (ISO/IEC-6429). (Lack of such support is extremely rare, and such
        # a case would tend to support setf rather than setaf.)
        color_prompt=yes
    else
        color_prompt=
    fi
fi

if [ "$color_prompt" = yes ]; then
    :|
```

```

if [ "$color_prompt" = yes ]; then
    PS1='${debian_chroot:+($debian_chroot)}\[\033[01;32m\]\u@\h\[\033[00m\]:\[\033[01;34m\]\w\[\033[00m\]\$ '
else
    PS1='${debian_chroot:+($debian_chroot)}\u@\h:\w\$ '
fi
unset color_prompt force_color_prompt

# If this is an xterm set the title to user@host:dir
case "$TERM" in
xterm*|rxvt*)
    PS1="\[\e]0;${debian_chroot:+($debian_chroot)}\u@\h: \w\a\]$PS1"
    ;;
*)
    ;;
esac

# enable color support of ls and also add handy aliases
if [ -x /usr/bin/dircolors ]; then
    test -r ~/.dircolors && eval "$(dircolors -b ~/.dircolors)" || eval "$(dircolors -b)"
    alias ls='ls --color=auto'
    #alias dir='dir --color=auto'
    #alias vdir='vdir --color=auto'

    alias grep='grep --color=auto'
    alias fgrep='fgrep --color=auto'
    alias egrep='egrep --color=auto'
fi

# some more ls aliases
alias ll='ls -lF'
alias la='ls -A'
alias l='ls -CF'

# Add an "alert" alias for long running commands. Use like so:
# sleep 10; alert
alias alert='notify-send --urgency=low -i "${[ $? = 0 ]} && echo terminal || echo error)" "${history|tail -n1|sed -e '\''s/^s*[0-9]\s*//;s/[:&|]\s*alert$/\''\''}'"

# Alias definitions.
# You may want to put all your additions into a separate file like
# ~/.bash_aliases, instead of adding them here directly.
# See /usr/share/doc/bash-doc/examples in the bash-doc package.

if [ -f ~/.bash_aliases ]; then
    . ~/.bash_aliases
fi

# enable programmable completion features (you don't need to enable
# this, if it's already enabled in /etc/bash.bashrc and /etc/profile
# sources /etc/bash.bashrc)
if ! shopt -oq posix; then
    if [ -f /usr/share/bash-completion/bash_completion ]; then
        . /usr/share/bash-completion/bash_completion
    elif [ -f /etc/bash_completion ]; then
        . /etc/bash_completion
    fi
fi
[END]

```

7) * Describe in plans that you are working on laboratory work 1. Tip: You should read the documentation for the finger command.

Installing finger:

```

student@CsnKhai:~$ man finger
No manual entry for finger
student@CsnKhai:~$ ^C
student@CsnKhai:~$ sudo apt-get install finger
[sudo] password for student:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libpvm3 libreadline-dev libreadline6-dev libtinfo-dev pvm
Use 'apt-get autoremove' to remove them.
The following NEW packages will be installed:
  finger
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 17.0 kB of archives.
After this operation, 67.6 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu/trusty/universe finger i386 0.17-15 [17.0 kB]
Fetched 17.0 kB in 0s (37.2 kB/s)
Selecting previously unselected package finger.
(Reading database ... 54877 files and directories currently installed.)
Preparing to unpack .../finger_0.17-15_i386.deb ...
Unpacking finger (0.17-15) ...
Processing triggers for man-db (2.6.7.1-1ubuntu1) ...
Setting up finger (0.17-15) ...
student@CsnKhai:~$ man finger
student@CsnKhai:~$ █

```

man finger:

```
FINGER(1) BSD General Commands Manual FINGER(1)

NAME
    finger - user information lookup program

SYNOPSIS
    finger [-lmsp] [user ...] [user@host ...]

DESCRIPTION
    The finger displays information about the system users.

    Options are:

    -s    Finger displays the user's login name, real name, terminal name and write status (as a '*' after the terminal name if write permission is denied), idle time, login time, office location and office phone number.

           Login time is displayed as month, day, hours and minutes, unless more than six months ago, in which case the year is displayed rather than the hours and minutes.

           Unknown devices as well as nonexistent idle and login times are displayed as single asterisks.

    -l    Produces a multi-line format displaying all of the information described for the -s option as well as the user's home directory, home phone number, login shell, mail status, and the contents of the files ".plan", ".project", ".pgpkey" and ".forward" from the user's home directory.

           Phone numbers specified as eleven digits are printed as '+N-NNN-NNN-NNNN'. Numbers specified as ten or seven digits are printed as the appropriate subset of that string. Numbers specified as five digits are printed as 'xN-NNNN'. Numbers specified as four digits are printed as 'xNNNN'.

           If write permission is denied to the device, the phrase '(messages off)' is appended to the line containing the device name. One entry per user is displayed with the -l option; if a user is logged on multiple times, terminal information is repeated once per login.

           Mail status is shown as 'No Mail.' if there is no mail at all, 'Mail last read DDD MMM ## HH:MM YYYY (TZ)' if the person has looked at their mailbox since new mail arriving, or 'New mail received ...', 'Unread since ...' if they have new mail.

Manual page finger(1) line 1 (press h for help or q to quit)
```

8) * List the contents of the home directory using the ls command, define its files and directories. Hint: Use the help system to familiarize yourself with the ls command.

Contents of home directory using “ls -la”:

```
student@CsnKhai:/home$ ls -la
total 12
drwxr-xr-x  3 root    root    4096 Sep 15  2015 .
drwxr-xr-x 21 root    root    4096 Sep 15  2015 ..
drwxr-xr-x  3 student student 4096 Aug 16 12:52 student
student@CsnKhai:/home$
```

man ls:

```
LS(1) User Commands LS(1)

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 -cftuvSUX nor --sort is specified.

    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
        scale sizes by SIZE before printing them. E.g., '--block-size=M' prints sizes in units of 1,048,576 bytes. See SIZE format below.

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

    -c
        with -lt: sort by, and show, ctime (time of last modification of file status information) with -l: show ctime and sort by name otherwise: sort by ctime, newest first

Manual page ls(1) line 1 (press h for help or q to quit)
```


Task1.Part2

1) Examine the **tree** command. Master the technique of applying a template, for example, display all files that contain a character **c**, or files that contain a specific sequence of characters. List subdirectories of the root directory up to and including the second nesting level.

Install tree:

```
student@CsnKhai:/home$ sudo apt install tree
[sudo] password for student:
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libpvm3 libreadline-dev libreadline6-dev libtinfo-dev pvm
Use 'apt-get autoremove' to remove them.
The following NEW packages will be installed:
  tree
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 36.7 kB of archives.
After this operation, 112 kB of additional disk space will be used.
Get:1 http://us.archive.ubuntu.com/ubuntu/ trusty/universe tree i386 1.6.0-1 [36.7 kB]
Fetched 36.7 kB in 0s (70.4 kB/s)
Selecting previously unselected package tree.
(Reading database ... 54883 files and directories currently installed.)
Preparing to unpack .../archives/tree_1.6.0-1_i386.deb ...
Unpacking tree (1.6.0-1) ...
Processing triggers for man-db (2.6.7.1-1ubuntu1) ...
Setting up tree (1.6.0-1) ...
student@CsnKhai:/home$
```

man tree:

```
TREE(1)                                General Commands Manual                                TREE(1)

NAME
    tree - list contents of directories in a tree-like format.

SYNOPSIS
    tree [-acdghilnpqrstuvxACDFONSUX] [-L level [-R]] [-H baseHREF] [-T title] [-o filename] [--nolinks] [-P pattern] [-I pattern] [--inodes] [--device] [--noreport] [--dirsfirst] [--version] [--help] [--filelimit #] [--si] [--prune] [--du] [--timefmt format] [directory ...]

DESCRIPTION
    Tree is a recursive directory listing program that produces a depth indented listing of files, which is colorized ala dircol-
    ors if the LS_COLORS environment variable is set and output is to tty. With no arguments, tree lists the files in the current
    directory. When directory arguments are given, tree lists all the files and/or directories found in the given directories
    each in turn. Upon completion of listing all files/directories found, tree returns the total number of files and/or direc-
    tories listed.

    By default, when a symbolic link is encountered, the path that the symbolic link refers to is printed after the name of the
    link in the format:

        name -> real-path

    If the '-l' option is given and the symbolic link refers to an actual directory, then tree will follow the path of the sym-
    bolic link as if it were a real directory.

OPTIONS
    Tree understands the following command line switches:

LISTING OPTIONS
    -a    All files are printed. By default tree does not print hidden files (those beginning with a dot '.'). In no event does
          tree print the file system constructs '.' (current directory) and '..' (previous directory).

    -d    List directories only.

    -l    Follows symbolic links if they point to directories, as if they were directories. Symbolic links that will result in
          recursion are avoided when detected.

    -f    Prints the full path prefix for each file.

    -x    Stay on the current file-system only. Ala find -xdev.

    -L level
    Manual page tree(1) line 1 (press h for help or q to quit)
```


tree | grep 'libnet':

```
student@CsnKhai:/$ tree | grep 'libnet'
|_ libnet.cfg
|_ libnetcfg
|   |_ libnetcfg.1.gz
|   |_ libnetlink.3.gz
|   |_ libnetFAQ.pod
```

tree -L 2:

```
student@CsnKhai:/$ tree -L 2
.
├── bin
│   ├── bash
│   ├── bunzip2
│   ├── busybox
│   ├── bzip2
│   ├── bzip2recover
│   ├── bzcat
│   ├── bzcmp -> bzdiff
│   ├── bzdiff
│   ├── bzegrep -> bzgrep
│   ├── bzexe
│   ├── bzfgrep -> bzgrep
│   ├── bzgrep
│   ├── bzip2
│   ├── bzless -> bzmores
│   ├── bzmores
│   ├── cat
│   ├── chgrp
│   ├── chmod
│   ├── chown
│   ├── chvt
│   ├── cp
│   ├── cpio
│   ├── dash
│   ├── date
│   ├── dbus-cleanu-sockets
│   ├── dbus-daemon
│   ├── dbus-uuiugen
│   ├── dd
│   ├── df
│   ├── dir
│   ├── dmesg
│   ├── dnsdomainname -> hostname
│   ├── domainname -> hostname
│   ├── dumpkeys
│   ├── echo
│   ├── ed
│   ├── egrep
│   ├── false
│   ├── fgconsole
│   ├── fgrep
│   ├── findmnt
```

...

```
├── var
│   ├── backups
│   ├── cache
│   ├── lib
│   ├── local
│   ├── lock -> /run/lock
│   ├── log
│   ├── mail
│   ├── opt
│   ├── run -> /run
│   ├── spool
│   └── tmp
└── vmlinuz -> boot/vmlinuz-3.13.0-63-generic

257 directories, 658 files
```

2) What command can be used to determine the type of file (for example, text or binary)? Give an example.

“file” can be used to determine the type of file:

Example:

```
student@CsnKhai:~$ file .bash_history
.bash_history: ASCII text
```

or

```
student@CsnKhai:~$ file .cache
.cache: directory
```

3) Master the skills of navigating the file system using relative and absolute paths. How can you go back to your home directory from anywhere in the filesystem?

Navigation using relative path:

```
student@CsnKhai:/home$ cd student
```

Navigation using absolute path:

```
student@CsnKhai:/$ cd /home/student
```

To go back to your home directory you can use:

```
student@CsnKhai:/$ cd
```

or

```
student@CsnKhai:/$ cd ~
```

4) Become familiar with the various options for the **ls** command. Give examples of listing directories using different keys. Explain the information displayed on the terminal using the **-l** and **-a** switches.

The “-l” option displays the content of directories in a detailed long format. It provides information about file permissions, number of links, owner, group, file size, modification date, and filename.

Example:

```
student@CsnKhai:/$ ls -l
total 72
drwxr-xr-x  2 root root 4096 Sep 15  2015 bin
drwxr-xr-x  3 root root 4096 Sep 15  2015 boot
drwxr-xr-x 14 root root 4000 Aug 16 10:58 dev
drwxr-xr-x 83 root root 4096 Aug 16 13:16 etc
drwxr-xr-x  3 root root 4096 Sep 15  2015 home
lrwxrwxrwx  1 root root   33 Sep 15  2015 initrd.img -> boot/initrd.img-3.13.0-63-generic
drwxr-xr-x 22 root root 4096 Sep 15  2015 lib
drwx----- 2 root root 16384 Sep 15  2015 lost+found
drwxr-xr-x  2 root root 4096 Sep 15  2015 media
drwxr-xr-x  2 root root 4096 Apr 10  2014 mnt
drwxr-xr-x  2 root root 4096 Sep 15  2015 opt
dr-xr-xr-x 78 root root   0 Aug 16 10:58 proc
drwx----- 5 root root 4096 Sep 15  2015 root
drwxr-xr-x 16 root root  540 Aug 16 11:00 run
drwxr-xr-x  2 root root 4096 Sep 15  2015/sbin
drwxr-xr-x  2 root root 4096 Sep 15  2015/srv
dr-xr-xr-x 13 root root   0 Aug 16 10:58 sys
drwxrwxrwt  2 root root 4096 Aug 16 17:17 tmp
drwxr-xr-x 10 root root 4096 Sep 15  2015/usr
drwxr-xr-x 11 root root 4096 Sep 15  2015/var
lrwxrwxrwx  1 root root   30 Sep 15  2015/vmlinuz -> boot/vmlinuz-3.13.0-63-generic
```

The “-a” option includes hidden files and directories (those starting with a dot .) in the listing. By default, these hidden files are not shown.

Example:

```
student@CsnKhai:/$ ls -a
.  ..  bin  boot  dev  etc  home  initrd.img  lib  lost+found  media  mnt  opt  proc  root  run /sbin  srv  sys  tmp  usr  var  vmlinuz
```

The “-h” option makes the file sizes more human-readable by using units like KB, MB, GB.

Example:

```
student@CsnKhai:/$ ls -lh
total 72K
drwxr-xr-x  2 root root 4.0K Sep 15  2015 bin
drwxr-xr-x  3 root root 4.0K Sep 15  2015 boot
drwxr-xr-x 14 root root 4.0K Aug 16 10:58 dev
drwxr-xr-x 83 root root 4.0K Aug 16 13:16 etc
drwxr-xr-x  3 root root 4.0K Sep 15  2015 home
lrwxrwxrwx  1 root root   33 Sep 15  2015 initrd.img -> boot/initrd.img-3.13.0-63-generic
drwxr-xr-x 22 root root 4.0K Sep 15  2015 lib
drwx----- 2 root root 16K Sep 15  2015 lost+found
drwxr-xr-x  2 root root 4.0K Sep 15  2015 media
drwxr-xr-x  2 root root 4.0K Apr 10  2014 mnt
drwxr-xr-x  2 root root 4.0K Sep 15  2015 opt
dr-xr-xr-x 78 root root   0 Aug 16 10:58 proc
drwx----- 5 root root 4.0K Sep 15  2015 root
drwxr-xr-x 16 root root 540 Aug 16 11:00 run
drwxr-xr-x  2 root root 4.0K Sep 15  2015 sbin
drwxr-xr-x  2 root root 4.0K Sep 15  2015 srv
dr-xr-xr-x 13 root root   0 Aug 16 10:58 sys
drwxrwxrwt  2 root root 4.0K Aug 16 17:17 tmp
drwxr-xr-x 10 root root 4.0K Sep 15  2015 usr
drwxr-xr-x 11 root root 4.0K Sep 15  2015 var
lrwxrwxrwx  1 root root   30 Sep 15  2015 vmlinuz -> boot/vmlinuz-3.13.0-63-generic
```

5) Perform the following sequence of operations:

- create a subdirectory in the home directory:

```
student@CsnKhai:~$ mkdir new_folder
```

- in this subdirectory create a file containing information about directories located in the root directory (using I/O redirection operations):

```
student@CsnKhai:~/new_folder$ ls -ld / > directory_info.txt
```

- view the created file:

```
student@CsnKhai:~/new_folder$ cat directory_info.txt
drwxr-xr-x 21 root root 4096 Sep 15  2015 /
```

- copy the created file to your home directory using relative and absolute addressing.

Relative:

```
student@CsnKhai:~/new_folder$ cp directory_info.txt ~/directory_info.txt
```

Absolute:

```
student@CsnKhai:~/new_folder$ cp directory_info.txt /home/student/directory_info.txt
```

- delete the previously created subdirectory with the file requesting removal:

```
student@CsnKhai:~$ rm -r new_folder
```

- delete the file copied to the home directory:

```
student@CsnKhai:~$ rm directory_info.txt
```

6) Perform the following sequence of operations:

- create a subdirectory **test** in the home directory:

```
student@CsnKhai:~$ mkdir test
```

- copy the **.bash_history** file to this directory while changing its name to **labwork2**:

```
student@CsnKhai:~$ cp ~/.bash_history ./labwork2
```

- create a hard and soft link to the **labwork2** file in the test subdirectory:
Hard link:

```
student@CsnKhai:~$ ln labwork2 test/hard_link_labwork2
```

Soft link:

```
student@CsnKhai:~$ ln -s ../labwork2 test/soft_link_labwork2
```

- how to define soft and hard link, what do these concepts:

A hard link is a reference to an inode (data structure on disk) of a file. When you create a hard link to a file, both the original file and the hard link share the same inode, which means they point to the same data blocks on the disk.

A symbolic link (also known as a symlink or soft link) is a separate file that contains a reference to another file's pathname. It acts as a pointer to the target file or directory, rather than sharing data blocks.

- change the data by opening a symbolic link. What changes will happen and why:

opening link:

```
student@CsnKhai:~/test$ nano soft_link_labwork2
```



After opening I have changed original file.

- rename the hard link file to **hard_lnk_labwork2**:

```
student@CsnKhai:~/test$ mv hard_link_labwork2 hard_lnk_labwork2
```

Name of hard link file has changed.

- rename the soft link file to **symb_lnk_labwork2_file**:

```
student@CsnKhai:~/test$ mv soft_link_labwork2 symb_lnk_labwork2_file
```

Only the link itself is renamed.

- then delete the **labwork2**. What changes have occurred and why?

```
student@CsnKhai:~/test$ rm labwork2
```

Deleting the original file will not immediately affect hard links, as they still reference the same data blocks.

Deleting the original file will cause symbolic links pointing to it to become invalid

and unusable (dangling links).

7) Using the locate utility, find all files that contain the squid and traceroute sequence:

```
student@CsnKhai:/$ locate squid
student@CsnKhai:/$ locate traceroute
/etc/alternatives/tcptraceroute
/etc/alternatives/tcptraceroute.8.gz
/etc/alternatives/traceroute
/etc/alternatives/traceroute.1.gz
/etc/alternatives/traceroute.sbin
/etc/alternatives/traceroute6
/etc/alternatives/traceroute6.8.gz
/lib/modules/3.13.0-63-generic/kernel/drivers/tty/n_tracerouter.ko
/usr/bin/traceroute
/usr/bin/traceroute-nanog
/usr/bin/traceroute.db
/usr/bin/traceroute6
/usr/bin/traceroute6.db
/usr/bin/traceroute6.iputils
/usr/sbin/tcptraceroute
/usr/sbin/tcptraceroute.db
/usr/sbin/traceroute
/usr/share/doc/traceroute
/usr/share/doc/traceroute/CREDITS
/usr/share/doc/traceroute/README
/usr/share/doc/traceroute/TOD0
/usr/share/doc/traceroute/changelog.Debian.gz
/usr/share/doc/traceroute/copyright
/usr/share/man/man1/traceroute-nanog.1.gz
/usr/share/man/man1/traceroute.1.gz
/usr/share/man/man1/traceroute.db.1.gz
/usr/share/man/man1/traceroute6.db.1.gz
/usr/share/man/man8/tcptraceroute.8.gz
/usr/share/man/man8/tcptraceroute.db.8.gz
/usr/share/man/man8/traceroute6.8.gz
/usr/share/man/man8/traceroute6.iputils.8.gz
/var/cache/apt/archives/traceroute_1%3a2.0.20-0ubuntu0.1_i386.deb
/var/lib/dpkg/alternatives/tcptraceroute
/var/lib/dpkg/alternatives/traceroute
/var/lib/dpkg/alternatives/traceroute6
/var/lib/dpkg/info/traceroute.list
/var/lib/dpkg/info/traceroute.md5sums
/var/lib/dpkg/info/traceroute.postinst
/var/lib/dpkg/info/traceroute.prerm
student@CsnKhai:/$
```

8) Determine which partitions are mounted in the system, as well as the types of these partitions:

```
student@CsnKhai:/$ mount
/dev/sda1 on / type ext4 (rw,errors=remount-ro)
proc on /proc type proc (rw,noexec,nosuid,nodev)
sysfs on /sys type sysfs (rw,noexec,nosuid,nodev)
none on /sys/fs/cgroup type tmpfs (rw)
none on /sys/fs/fuse/connections type fusectl (rw)
none on /sys/kernel/debug type debugfs (rw)
none on /sys/kernel/security type securityfs (rw)
udev on /dev type devtmpfs (rw,mode=0755)
devpts on /dev/pts type devpts (rw,noexec,nosuid,gid=5,mode=0620)
tmpfs on /run type tmpfs (rw,noexec,nosuid,size=10%,mode=0755)
none on /run/lock type tmpfs (rw,noexec,nosuid,nodev,size=5242880)
none on /run/shm type tmpfs (rw,nosuid,nodev)
none on /run/user type tmpfs (rw,noexec,nosuid,nodev,size=104857600,mode=0755)
none on /sys/fs/pstore type pstore (rw)
systemd on /sys/fs/cgroup/systemd type cgroup (rw,noexec,nosuid,nodev,none,name=systemd)
```

9) Count the number of lines containing a given sequence of characters in a given file:

```
student@CsnKhai:~$ grep -c "l" .bash_history
0
student@CsnKhai:~$ grep -c "w" .bash_history
1
```

10) Using the **find** command, find all files in the /etc directory containing the **host** character sequence:

```
student@CsnKhai:/$ find /etc -exec grep -l 'host' {} \;
grep: /etc: Is a directory
grep: /etc/apt: Is a directory
grep: /etc/apt/trusted.gpg.d: Is a directory
grep: /etc/apt/sources.list.d: Is a directory
grep: /etc/apt/preferences.d: Is a directory
grep: /etc/apt/apt.conf.d: Is a directory
grep: /etc/sudoers.d: Is a directory
grep: /etc/sudoers.d/README: Permission denied
grep: /etc/update-manager: Is a directory
grep: /etc/update-manager/release-upgrades.d: Is a directory
grep: /etc/logrotate.d: Is a directory
grep: /etc/blkid.tab: No such file or directory
grep: /etc/default: Is a directory
grep: /etc/ufw: Is a directory
grep: /etc/ufw/before.init: Permission denied
grep: /etc/ufw/before.rules: Permission denied
grep: /etc/ufw/applications.d: Is a directory
grep: /etc/ufw/after.rules: Permission denied
grep: /etc/ufw/before.rules: Permission denied
grep: /etc/ufw/after.init: Permission denied
grep: /etc/ufw/after.rules: Permission denied
/etc/ufw/sysctl.conf
grep: /etc/emacs: Is a directory
grep: /etc/emacs/site-start.d: Is a directory
grep: /etc/rc3.d: Is a directory
grep: /etc/ldap: Is a directory
/etc/protocols
grep: /etc/.pwd.lock: Permission denied
grep: /etc/subuid: Permission denied
grep: /etc/ca-certificates: Is a directory
grep: /etc/ca-certificates/update.d: Is a directory
grep: /etc/fonts: Is a directory
grep: /etc/fonts/conf.avail: Is a directory
grep: /etc/fonts/conf.d: Is a directory
grep: /etc/rc5.d: Is a directory
grep: /etc/python3: Is a directory
grep: /etc/udev: Is a directory
grep: /etc/udev/rules.d: Is a directory
grep: /etc/udev/hwdb.d: Is a directory
grep: /etc/ssl: Is a directory
```

...

```
grep: /etc/X11/xkb: Is a directory
grep: /etc/subgid: Permission denied
grep: /etc/perl: Is a directory
grep: /etc/perl/Net: Is a directory
/etc/perl/Net/libnet.cfg
grep: /etc/perl/CPAN: Is a directory
grep: /etc/kernel: Is a directory
grep: /etc/kernel/postinst.d: Is a directory
grep: /etc/kernel/postrm.d: Is a directory
grep: /etc/cron.d: Is a directory
grep: /etc/terminfo: Is a directory
grep: /etc/gshadow: Permission denied
/etc/sysctl.conf
grep: /etc/initramfs-tools: Is a directory
grep: /etc/initramfs-tools/hooks: Is a directory
grep: /etc/initramfs-tools/scripts: Is a directory
grep: /etc/initramfs-tools/scripts/local-bottom: Is a directory
grep: /etc/initramfs-tools/scripts/init-bottom: Is a directory
grep: /etc/initramfs-tools/scripts/nfs-premount: Is a directory
grep: /etc/initramfs-tools/scripts/panic: Is a directory
grep: /etc/initramfs-tools/scripts/init-top: Is a directory
grep: /etc/initramfs-tools/scripts/local-top: Is a directory
grep: /etc/initramfs-tools/scripts/local-premount: Is a directory
grep: /etc/initramfs-tools/scripts/nfs-top: Is a directory
grep: /etc/initramfs-tools/scripts/init-premount: Is a directory
grep: /etc/initramfs-tools/scripts/nfs-bottom: Is a directory
grep: /etc/initramfs-tools/conf.d: Is a directory
grep: /etc/iproute2: Is a directory
/etc/iproute2/route scopes
grep: /etc/sysctl.d: Is a directory
grep: /etc/fstab.d: Is a directory
grep: /etc/libnl-3: Is a directory
grep: /etc/bash_completion.d: Is a directory
grep: /etc/cron.hourly: Is a directory
grep: /etc/xml: Is a directory
grep: /etc/rc1.d: Is a directory
grep: /etc/console-setup: Is a directory
grep: /etc/rc4.d: Is a directory
grep: /etc/sudoers: Permission denied
grep: /etc/opt: Is a directory
grep: /etc/rc6.d: Is a directory
/etc/mime.types
grep: /etc/shadow: Permission denied
grep: /etc/rcS.d: Is a directory
student@CsnKhai:/$
```

11) List all objects in /etc that contain the ss character sequence. How can I duplicate a similar command using a bunch of **grep**:


```

student@CsnKhai:/$ find /etc -exec grep -rl 'ss' {} \;
grep: /etc/sudoers.d/README: Permission denied
/etc/logrotate.d/apt
/etc/logrotate.d/ufw
/etc/logrotate.d/ppp
/etc/logrotate.d/aptitude
/etc/logrotate.d/dpkg
/etc/logrotate.d/upstart
/etc/logrotate.d/rsyslog
/etc/default/rcS
/etc/default/ssh
/etc/default/grub
/etc/default/useradd
/etc/default/crda
/etc/default/ntpdate
/etc/default/keyboard
/etc/default/dbus
/etc/default/nss
/etc/default/console-setup
/etc/default/rsyslog
/etc/default/rsync
grep: /etc/ufw/before.init: Permission denied
grep: /etc/ufw/before.rules: Permission denied
grep: /etc/ufw/after.rules: Permission denied
grep: /etc/ufw/before.rules: Permission denied
grep: /etc/ufw/after.init: Permission denied
grep: /etc/ufw/after.rules: Permission denied
/etc/ufw/sysctl.conf
/etc/emacs/site-start.d/50dictionaries-common.el
/etc/ldap/ldap.conf
/etc/locale.alias
/etc/protocols
grep: /etc/.pwd.lock: Permission denied
grep: /etc/subuid-: Permission denied
/etc/ca-certificates.conf
/etc/fonts/conf.avail/99-language-selector-zh.conf
/etc/bindresvport.blacklist
/etc/udev/rules.d/README
grep: /etc/ssl/private: Permission denied
/etc/ssl/openssl.cnf
/etc/ssl/certs/ca-certificates.crt

```

OR

```

student@CsnKhai:/$ grep -rl 'ss' /etc | xargs grep 'ss'
grep: /etc/sudoers.d/README: Permission denied
grep: /etc/ufw/before.init: Permission denied
grep: /etc/ufw/before.rules: Permission denied
grep: /etc/ufw/after.rules: Permission denied
grep: /etc/ufw/before.rules: Permission denied
grep: /etc/ufw/after.init: Permission denied
grep: /etc/ufw/after.rules: Permission denied
grep: /etc/.pwd.lock: Permission denied
grep: /etc/subuid-: Permission denied
grep: /etc/ssl/private: Permission denied
grep: /etc/ppp/chap-secrets: Permission denied
grep: /etc/ppp/pap-secrets: Permission denied
grep: /etc/gshadow-: Permission denied
grep: /etc/ssh/ssh_host_rsa_key: Permission denied
grep: /etc/ssh/ssh_host_ecdsa_key: Permission denied
grep: /etc/ssh/ssh_host_dsa_key: Permission denied
grep: /etc/ssh/ssh_host_ed25519_key: Permission denied
grep: /etc/passwd-: Permission denied
grep: /etc/group-: Permission denied
grep: /etc/security/opasswd: Permission denied
grep: /etc/fuse.conf: Permission denied
grep: /etc/apparmor.d/cache/usr.sbin.tcpdump: Permission denied
grep: /etc/apparmor.d/cache/sbin.dhclient: Permission denied
grep: /etc/shadow: Permission denied
grep: /etc/subgid-: Permission denied
grep: /etc/gshadow: Permission denied
grep: /etc/sudoers: Permission denied
grep: /etc/shadow-: Permission denied
/etc/logrotate.d/apt: compress
/etc/logrotate.d/apt: missingok
/etc/logrotate.d/apt: compress
/etc/logrotate.d/apt: missingok
/etc/logrotate.d/ufw: missingok
/etc/logrotate.d/ufw: compress
/etc/logrotate.d/ufw: delaycompress
/etc/logrotate.d/ppp: missingok
/etc/logrotate.d/ppp: compress
/etc/logrotate.d/aptitude: compress
/etc/logrotate.d/aptitude: missingok
/etc/logrotate.d/dpkg: compress
/etc/logrotate.d/dpkg: delaycompress
/etc/logrotate.d/dpkg: missingok
/etc/logrotate.d/dpkg: compress
/etc/logrotate.d/dpkg: delaycompress

```

12) Organize a screen-by-screen print of the contents of the /etc directory. Hint: You must use stream redirection operations.

```
student@CsnKhai:/$ find /etc | more
find: `/etc/ssl/private': Permission denied
/etc
/etc/apt
/etc/apt/sources.list
/etc/apt/trusted.gpg.d
/etc/apt/sources.list.d
/etc/apt/preferences.d
/etc/apt/trusted.gpg
/etc/apt/trusted.gpg~
/etc/apt/apt.conf.d
/etc/apt/apt.conf.d/00trustcdrom
/etc/apt/apt.conf.d/20changelog
/etc/apt/apt.conf.d/01autoremove-kernels
/etc/apt/apt.conf.d/70debconf
/etc/apt/apt.conf.d/00aptitude
/etc/apt/apt.conf.d/01autoremove
/etc/sudoers.d
/etc/sudoers.d/README
/etc/update-manager
/etc/update-manager/release-upgrades.d
/etc/update-manager/release-upgrades
/etc/update-manager/meta-release
/etc/timezone
/etc/logrotate.d
/etc/logrotate.d/apt
/etc/logrotate.d/ufw
/etc/logrotate.d/ppp
/etc/logrotate.d/aptitude
/etc/logrotate.d/dpkg
/etc/logrotate.d/upstart
/etc/logrotate.d/rsyslog
/etc/blkid.tab
/etc/default
/etc/default/ufw
/etc/default/bsdmainutils
/etc/default/ntfs-3g
/etc/default/rcS
/etc/default/ssh
/etc/default/grub
/etc/default/irqbalance
/etc/default/useradd
/etc/default/crda
/etc/default/cron
```

13) What are the types of devices and how to determine the type of device? Give examples.

Linux supports three types of hardware device: character, block and network.

Character devices are read and written directly without buffering, for example the system's serial ports /dev/cua0 and /dev/cua1. Block devices can only be written to and read from in multiples of the block size, typically 512 or 1024 bytes. Block devices are accessed via the buffer cache and may be randomly accessed, that is to say, any block can be read or written no matter where it is on the device. Block devices can be accessed via their device special file but more commonly they are accessed via the file system. Only a block device can support a mounted file system. Network devices are accessed via the BSD socket interface and the networking subsystems.

Examples of Block Devices:

- /dev/sda: A typical hard drive.
- /dev/sdb: Another hard drive or storage device.
- /dev/nvme0n1: A NVMe-based SSD.

Examples of Character Devices:

- /dev/tty: Terminal device.
- /dev/ttyS0: Serial port device.
- /dev/zero: Null device (returns zeros when read).

14) How to determine the type of file in the system, what types of files are there?

With command “file” we can determine the type of file in the system.

Seven standard file types are:

- Regular
- Directory
- Symbolic link
- FIFO special
- Block special
- Character special
- Socket

15) * List the first 5 directory files that were recently accessed in the /etc directory.

```
student@CsnKhai:/$ ls -lt | find /etc | head -5
find: `/etc/ssl/private': Permission denied
/etc
/etc/apt
/etc/apt/sources.list
/etc/apt/trusted.gpg.d
/etc/apt/sources.list.d
```