“Kyiv Vocation College of Communication”
Cyclical Commission of Computer Engineering

REPORT ON EXECUTION
LABORATORY WORK №5

on the discipline: "Operating Systems"

Topic: "Introduction to file system navigation commands and file and directory management."

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Work objectives:

1. Acquiring practical skills in working with the Bash command-line interface.
2. Introduction to basic commands for navigating the file system.
3. Introduction to basic commands for managing files and directories.

Material Support for Classes:

1. IBM PC type computers.
2. Windows operating system and VirtualBox virtual machine (Oracle).
3. GNU/Linux operating system (any distribution).
4. Cisco Networking Academy website netacad.com and its online courses on Linux.

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Tasks for Preliminary Preparation:

1. Read the brief theoretical information for the laboratory work and create a small dictionary of basic English terms related to the purpose of commands and their parameters.

English terms	Ukrainian terms
Navigating the Filesystem	Навігація в файловій системі
Globbing	Глобування
Glob characters	Символи глобування
Copying Files	Копіювання файлів
Moving Files	Переміщення файлів
Removing Files	Видалення файлів
Creating Directories	Створення каталогів
Creating Files	Створення файлів

2. Based on the material covered, provide answers to the following questions:

   2.1. Compare the file structures of a Windows-like and a Linux-like system.

   File structures of a Windows-like and a Linux-like system:

   - **Windows-like system:**

   - Windows systems typically use a hierarchical file system similar to Linux, but with some key differences.
   - Windows primarily uses drive letters (e.g., C:, D:, etc.) to represent different storage devices or partitions.
   - The file system in Windows often uses file extensions to determine file types, though this is not a strict requirement.
   - Windows systems may have a single root directory per drive letter

(e.g., C:\), with subdirectories branching out from there.
- Windows also supports the use of special folders like "My Documents," "Program Files," and "Desktop" for organizing user files and applications.

- **Linux-like system:**

- Linux systems adhere to a hierarchical file system structure, often referred to as the Filesystem Hierarchy Standard (FHS).
- Linux file systems have a single root directory ("/") from which all other directories stem.
- Instead of drive letters, Linux uses mount points to attach additional storage devices or partitions to the file system hierarchy.
- File types in Linux are determined by file permissions and attributes, rather than relying heavily on file extensions.
- Linux systems typically have directories like "/bin," "/etc," "/home," "/var," "/usr," etc., each serving specific purposes within the file system hierarchy.

These commands, when used with appropriate options and arguments, allow users to manage files and directories effectively in a Linux environment.

2.2. *Explain the concept of FHS. How is this standard used in the context of file systems?

The concept of FHS (Filesystem Hierarchy Standard):

The Filesystem Hierarchy Standard (FHS) is a set of guidelines that define the structure and organization of file systems in Unix-like operating systems, including Linux. FHS specifies the directory structure and directory contents in terms of the functionality provided, rather than prescribing specific implementations. It aims to ensure compatibility and consistency among different Unix-like systems, making it easier for users and developers to navigate and manage file

systems across various distributions.

FHS specifies the following main directories:
- /bin: Essential user command binaries.
- /etc: Host-specific system configuration files.
- /home: User home directories.
- /lib: Shared libraries essential for binaries in /bin and /sbin.
- /sbin: Essential system binaries.
- /usr: Secondary hierarchy containing non-essential command binaries, libraries, etc.
- /var: Variable data files, such as logs and spool files.

FHS helps maintain interoperability and portability among Unix-like systems by providing a common framework for organizing file systems.

2.3. **List the basic commands for working with files and directories in Linux: creation, movement, copying, deletion.

Basic commands for working with files and directories in Linux:

- Creation:
  - mkdir: Create a directory.
  - touch: Create an empty file or update the timestamp of an existing file.

- Movement:
  - cd: Change directory.
  - mv: Move or rename files or directories.

- Copying:
  - cp: Copy files or directories.

- Deletion:
  - rm: Remove files or directories.
  - rmdir: Remove empty directories.

3. Study the materials of the online course "NDG Linux Essentials" from Cisco:
    - Chapter 7 - Navigating the Filesystem
    - Chapter 8 - Managing Files and Directories

Complete✔

4. Complete testing in the NDG Linux Essentials course on the following topics:
    - Chapter 07 Exam
    - Chapter 08 Exam

Complete✔

5. Prepare an initial version of the report in electronic form:
    - Title page, topic, and purpose of the work
    - Glossary of terms
    - Answers to points 2.1 - 2.3 from the tasks for preliminary preparation

Complete✔

Progress of Work:

1. Initial work in CLI mode in a Linux operating system of the Linux family:
   1.1. Start your Linux-based operating system (if you are using your own PC and have it installed) and open the terminal.

2. Work through all the command examples provided in the lab assignments of the NDG Linux Essentials course - Lab 7: Navigating the Filesystem and Lab 8: Managing Files and Directories. Create a table to describe these commands.

Command	Description
`pwd`	Prints the current working directory.

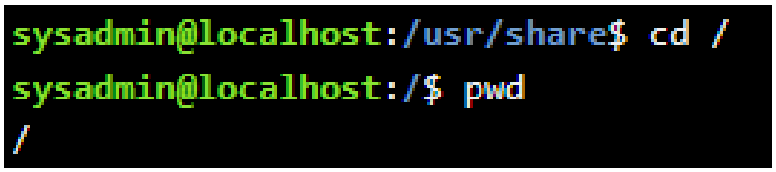
`ls`	Lists files and directories in the current directory.
`ls -l`	Lists files and directories in long format.
`ls -a`	Lists all files and directories, including hidden ones.
`cd`	Changes the current directory.
`cd ..`	Moves up one directory level.
`cd ~`	Changes to the user's home directory.
`mkdir`	Creates a new directory.
`mkdir -p`	Creates parent directories as needed.
`rmdir`	Removes an empty directory.
`touch`	Creates an empty file or updates its timestamp.
`cp`	Copies files and directories.
`cp -r`	Copies directories recursively.
`mv`	Moves or renames files and directories.
`rm`	Removes files or directories.
`rm -r`	Removes directories recursively.
`cat`	Displays the contents of a file.

`less`	Views file contents one screen at a time.
`head`	Displays the first few lines of a file.
`tail`	Displays the last few lines of a file.
`grep`	Searches for patterns in files.
`chmod`	Changes file permissions.
`chown`	Changes file ownership.
`chgrp`	Changes file group ownership.

3. Perform work in the terminal (practice reinforcement) and provide your screenshots

1. Determine your current working directory;

2. Navigate to the root directory and determine your current working directory (two commands);



3. View the contents of the current directory in long format (use the appropriate ls command option);

```
sysadmin@localhost:~$ ls -l
total 4
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Desktop
drwxr-xr-x 4 sysadmin sysadmin 4096 Feb  8  2021 Documents
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Downloads
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Music
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Pictures
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Public
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Templates
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Videos
```

4. Change to the /usr/share directory and determine your current working directory (two commands);

```
sysadmin@localhost:/$ cd /usr/share
sysadmin@localhost:/usr/share$ pwd
/usr/share
```

5. View the contents of the current directory including hidden files (use the appropriate ls command option);

```
sysadmin@localhost:/$ ls -la
total 0
drwxr-xr-x    1 root root  51 Mar 13 12:19 .
drwxr-xr-x    1 root root  51 Mar 13 12:19 ..
-rwxr-xr-x    1 root root   0 Mar 13 12:19 .dockerenv
drwxr-xr-x    1 root root  21 Feb  8  2021 bin
drwxr-xr-x    2 root root   6 Apr 24  2018 boot
drwxr-xr-x    5 root root 380 Mar 13 12:20 dev
drwxr-xr-x    1 root root  66 Mar 13 12:19 etc
drwxr-xr-x    1 root root  22 Feb  8  2021 home
drwxr-xr-x    1 root root  25 Feb  8  2021 lib
drwxr-xr-x    1 root root  34 Feb  8  2021 lib64
drwxr-xr-x    2 root root   6 Jan 18  2021 media
drwxr-xr-x    2 root root   6 Jan 18  2021 mnt
drwxr-xr-x    2 root root   6 Jan 18  2021 opt
dr-xr-xr-x 2583 root root   0 Mar 13 12:19 proc
drwx------    1 root root 168 Feb  8  2021 root
drwxr-xr-x    1 root root 124 Mar 13 12:20 run
drwxr-xr-x    1 root root  31 Feb  8  2021 sbin
drwxr-xr-x    2 root root   6 Jan 18  2021 srv
dr-xr-xr-x   13 root root   0 Mar 13 12:19 sys
```

6. *Change to the /etc directory;

```
sysadmin@localhost:/$ cd /etc
sysadmin@localhost:/etc$
```

7. *View the contents of this directory, but display only the names of files that begin with the letter of your name;

```
sysadmin@localhost:/etc$ ls -1 | grep ^[kK]
kernel
```

8. *View the contents of this directory, but display only files with names consisting of 6 letters;

```
sysadmin@localhost:/etc$ ls -1 | grep -E '^......$'
cron.d
dbus-1
group-
init.d
kernel
nanorc
passwd
shadow
shells
subgid
subuid
wgetrc
```

9. **View the contents of this directory, but display only files whose names end with the letters of your name, for example, if your names are Ivan, Anna, Maks, then select files whose names end with [i,a,m];

```
sysadmin@localhost:/etc$ ls -1 | grep '[kK]$'
logcheck
network
```

10. **Change to the home directory of the current user and display its contents in reverse alphabetical format (perform this action through a command pipeline);

```
sysadmin@localhost:~$ ls -lR | sort -r
total 4
total 4
total 4
total 4
total 1092
total 0
total 0
total 0
total 0
total 0
total 0
total 0
total 0
total 0
drwxr-xr-x 5 sysadmin sysadmin     48 Feb  8  2021 School
drwxr-xr-x 4 sysadmin sysadmin 4096 Feb  8  2021 Documents
drwxr-xr-x 2 sysadmin sysadmin 25 Feb  8  2021 Math
drwxr-xr-x 2 sysadmin sysadmin 23 Feb  8  2021 Art
drwxr-xr-x 2 sysadmin sysadmin 22 Feb  8  2021 Engineering
```

11. Create a directory with the name of your group in the current directory;

```
sysadmin@localhost:~$ mkdir group_RPZ13A
```

12. View the updated contents of the home directory of the current user. Use the -r option of the ls command. What information will you get?

```
sysadmin@localhost:~$ ls -lr
total 4
drwxrwxr-x 2 sysadmin sysadmin    6 Mar 13 12:40 group_name
drwxrwxr-x 2 sysadmin sysadmin    6 Mar 13 12:41 group_RPZ13A
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Videos
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Templates
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Public
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Pictures
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Music
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Downloads
drwxr-xr-x 4 sysadmin sysadmin 4096 Feb  8  2021 Documents
drwxr-xr-x 2 sysadmin sysadmin    6 Feb  8  2021 Desktop
```

13. Change to the directory you created with the name of your group and create an empty file named lab5 inside it;

```
sysadmin@localhost:~$ cd group_RPZ13A
sysadmin@localhost:~/group_RPZ13A$
sysadmin@localhost:~/group_RPZ13A$ touch lab5
```

14. Create 3 directories with the surnames of students in your group: surname1, surname2, surname3 (the mkdir command supports multiple arguments, so all three directories can be created with one command);

```
sysadmin@localhost:~/group_RPZ13A$ mkdir Hranat Kovalenko Topolya
```

15. Change to the first subdirectory surname1 and create an empty file named name1 inside it;

```
sysadmin@localhost:~/group_RPZ13A$ cd Hranat
sysadmin@localhost:~/group_RPZ13A/Hranat$
sysadmin@localhost:~/group_RPZ13A/Hranat$ touch Kateryna
```

16. Use the command echo "Hello, my name is Name1" > name1 to enter student data into this file (the > symbol allows the output of the echo command to be redirected directly to the name1 file;

```
sysadmin@localhost:~/group_RPZ13A/Hranat$ echo "Hello, my name is Kateryna" > Ka
teryna
```

17. View the contents of the name1 file using the command cat name1 (it should contain the information you just entered);

```
sysadmin@localhost:~/group_RPZ13A/Hranat$ cat Kateryna
Hello, my name is Kateryna
```

18. Make a copy of the first file name1 and rename it to a file with the second name of a student in your group name2;

```
sysadmin@localhost:~/group_RPZ13A/Hranat$ cp Kateryna Yana
```

19. View the contents of the directory, both files should appear;

```
sysadmin@localhost:~/group_RPZ13A/Hranat$ ls
Kateryna  Yana
```

20. View the contents of the second file cat name2 (it should currently contain a complete copy of the contents of the name1 file);

```
sysadmin@localhost:~/group_RPZ13A/Hranat$ cat Yana
Hello, my name is Kateryna
```

21. Replace the contents of the name2 file to contain the appropriate name of the second student using the command echo "Hello, my name is Name2" > name2;

```
sysadmin@localhost:~/group_RPZ13A/Hranat$ echo "Hello, my name is Yana" > Yana
```

22. View the contents of the second file cat name2 (it should now contain the updated information);

```
sysadmin@localhost:~/group_RPZ13A/Hranat$ cat Yana
Hello, my name is Yana
```

23. Move the file name2 to the surname2 directory;

```
sysadmin@localhost:~/group_RPZ13A/Hranat$ mv Yana ../Kovalenko/
```

24. Make a copy of the first file name1 and rename it to a file with the third name of a student in your group name3;

```
sysadmin@localhost:~/group_RPZ13A/Hranat$ cp Kateryna ../Topolya/Roman
```

25. Move the file name3 to the surname3 directory;

```
sysadmin@localhost:~/group_RPZ13A/Hranat$ mv ../Topolya/Roman .
```

26. Change to the surname3 directory;

```
sysadmin@localhost:~/group_RPZ13A/Hranat$ cd ../Topolya
```

27. View the contents of the third file with the command cat name3 (it should contain data about the second student);

```
sysadmin@localhost:~/group_RPZ13A/Topolya$ cat Roman
cat: Roman: No such file or directory
```

28. Replace the contents of the name3 file to contain the appropriate name of the third student using the command echo "Hello, my name is Name3" > name3;

```
sysadmin@localhost:~/group_RPZ13A/Topolya$ echo "Hello, my name is Roman" > Roma
n
```

29. View the contents of the file using cat name3 (it should now contain updated information);

```
sysadmin@localhost:~/group_RPZ13A/Topolya$ cat Roman
Hello, my name is Roman
```

30. Return to the home directory of the user;

```
sysadmin@localhost:~/group_RPZ13A/Topolya$ cd ~
sysadmin@localhost:~$
```

31. **View the contents of this directory, but display only your subdirectory with the group name and all its contents (subdirectories surname1, surname2, surname3, and files name1, name2, name3). Moreover, files and directories should be colored (use the appropriate -R option of the ls command and don't forget to use a special glob pattern [directory name]).

```
group_RPZ13A:
Hranat  Kovalenko  Topolya  lab5

group_RPZ13A/Hranat:
Kateryna

group_RPZ13A/Kovalenko:
Yana

group_RPZ13A/Topolya:
Roman
```

4. Describe the actions performed by commands for navigating through directories in the system:

- Command: cd /

Action: Moves to the root directory.

- Command: cd /home

Action: Changes to the /home directory.

- Command: cd ~
Action: Changes to the user's home directory.
- Command: cd (without argument)
Action: Returns to the user's home directory.
- Command: cd ..
Action: Moves to the parent directory.
- Command: cd ../..
Action: Moves two levels up in the directory structure.
- Command: cd -
Action: Switches to the previous directory.

Control questions

1. How can you view the path to the user's home directory using the echo command? There are 2 ways, provide both examples in the terminal (the answer is in the materials of the Cisco Academy on the netacad.com website).

```
sysadmin@localhost:~$ echo $HOME
/home/sysadmin
sysadmin@localhost:~$
sysadmin@localhost:~$ echo ~
/home/sysadmin
```

2. *Is it possible to view the contents of the root directory while in the user's home directory without changing to the root directory? Demonstrate this in the command line.

Yes, you can view the contents of the root directory while being in the user's home directory without changing to the root directory.

```
sysadmin@localhost:~$ ls /
bin   dev  home  lib64  mnt  proc  run   srv  tmp  var
boot  etc  lib   media  opt  root  sbin  sys  usr
```

3. *How can you add information to an empty file in the terminal?

To add information to an empty file in the terminal, you can use the echo command with the append (>>) redirection operator.

```
sysadmin@localhost:~$ echo "Additional information" >> filename.txt
```

4. **How to copy and delete an existing directory? Will there be a difference in commands if the directory is not empty?

To copy and delete an existing directory, you can use the ‘cp’ and ‘rm’ commands, respectively. If the directory is not empty, you will need to use additional options to ensure all contents are copied or deleted.

Example of copying a directory:

```
sysadmin@localhost:~$ cp -r source_directory destination_directory
```

Example of deleting a directory:

```
sysadmin@localhost:~$ rm -r directory_name
```

5. **In which of the examples below does the file move? its renaming? both actions simultaneously?

mv /work/tech/comp.png. /Desktop
mv /work/tech/comp.png. /work/tech/my_car.png
mv /work/tech/comp.png. /Desktop/computer.png

In the provided examples, the actions are as follows:

- `mv /work/tech/comp.png. /Desktop`: This command moves the file `comp.png` from the `/work/tech/` directory to the `Desktop` directory.
- `mv /work/tech/comp.png. /work/tech/my_car.png`: This command renames the file `comp.png` to `my_car.png` within the `/work/tech/` directory.
- `mv /work/tech/comp.png. /Desktop/computer.png`: This command moves the file `comp.png` from the `/work/tech/` directory to the `Desktop` directory and simultaneously renames it to `computer.png`.

Conclusions:

During the course of the laboratory work, I gained practical skills in working with the Bash command-line shell, which is a powerful tool for interacting with the Linux operating system. I familiarized myself with basic navigation commands within the file system, such as `cd` for changing the current directory and `ls` for viewing the contents of a directory. Additionally, I learned basic commands for managing files and directories, such as `cp` for copying, `mv` for moving or renaming, and `rm` for deleting. I improved my English language skills. I prepared for the work, completed the assigned tasks, and answered control questions.