

CSE231: Operating Systems

Assignment 1: Basic Linux/Unix Shell

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Introduction:

A screenshot of a terminal window with a dark background. The text 'Welcome to' is displayed in green. Below it, the word 'LAKSH' is rendered in a large, stylized green font with a double outline and a halftone dot pattern. Underneath, the text 'Available Commands: cd, echo, pwd, ls, cat, date, mkdir, rm' is shown in a light blue font. At the bottom, the prompt 'lakSH>' is displayed in green, followed by a white cursor bar.

```
Welcome to

LAKSH

Available Commands: cd, echo, pwd, ls, cat, date, mkdir, rm

lakSH> █
```

I created this basic Linux/Unix shell named **LakSH**, and as part of assignment 1, I have implemented a total of eight commands (internal) `cd`, `echo`, `pwd` and (external) `ls`, `cat`, `date`, `mkdir`, `rm`.

Distinctive Feature:

- **Colorful output:** Green color indicates a successful run, while the Red color indicates that the command is exited with an error.
- **ASCII text block:** To stand out a little from a simplified shell, Made with the help of fsymbols.com.

Assumptions:

There are certain assumptions that I have made for the user for this assignment.

- For commands like mkdir, rm and cat, only one argument per command is supported.
 - **ALLOWED:** mkdir newfolder
 - **NOT ALLOWED:** mkdir newfolder1 newfolder2
 - No option with "--" besides **--help** in echo is supported.
 - Command "**cd -**" is implemented in a way that it will **always** return to the directory where **laksh.c** is present.
 - The user can **only use eight commands**(3-internal & 5-external) that I have implemented. Commands like grep, locate, head, etc., are not supported.
-

Commands(Internal) :

cd

Use cd to change the working directory.

OPTIONS:

- **cd ~** : changes the current working directory to the user's HOME directory.
- **cd -** : changes the current working directory to the previous working directory.
- **cd ..** : move to the parent directory of the current directory or used to level up from the current directory.

pwd

print name of current/working directory.

OPTIONS:

- -L : use PWD from the environment, even if it contains symlinks.
- -P : avoid all symlinks.

echo

displays a line(arguments) to standard output(stdout)

OPTIONS:

- -n : skips the output for trailing new line.
- --help : displays help for echo and exit.

Commands(External) :

ls

displays a list of directory contents.

OPTIONS:

- -a : list all files and files starting with "."
- -r : list all the files without starting with "." in reverse order.

cat

prints the contents of a file on the standard output

OPTIONS:

- -e : prints "\$" at the end of each line in a file.
- -n : number all the output lines in a file.

rm

removes files or directories

OPTIONS:

- -r : removes the directories and their files recursively.
- -v : (verbose) explains what is being done.

mkdir

make directories.

OPTIONS:

- -m : set modes (as in chmod) *{only 0777 and 0755 is done}*
- -v : (verbose) explains what is being done.

date

prints the system date and time.

OPTIONS:

- -u : prints the Coordinated Universal Time (UTC).
- -R : output date and time in RFC 5322 format. Example: Mon, 14 Aug 2006 02:34:56 -0600.

Error handling:

- Wrong command entered by the user
- Wrong command option entered by the user
- Directory already exists
- Directory doesn't exist
- The user would always required enter a command (even though wrong)
- The user would always required to enter the complete path (even though wrong)
- Exit command - for user to exit the shell
- and so on...

Part 2 - Implementation of one set of command using pthread_create() and system()

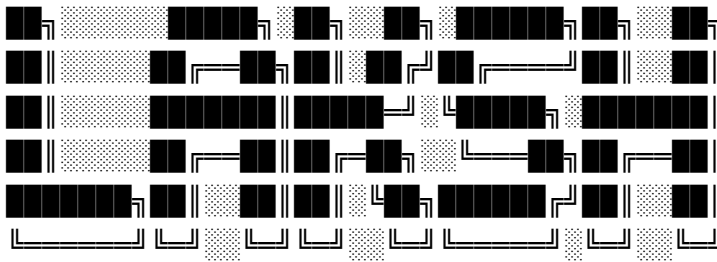
- The external command - date is also implemented using pthread_create() & system() when "&t" is present while calling the command.

>> Makefile

- Run "make" to compile and run lakSH
- Run "make clean" to remove temp files

Test Case:

Welcome to



Available Commands: cd, echo, pwd, ls, cat, date, mkdir, rm

```
lakSH> pwd
/Users/lakshaybhushan/Developer/OS Assignment
lakSH> pwd -L
/Users/lakshaybhushan/Developer/OS Assignment
lakSH> pwd -p
lakSH: invalid option !!
lakSH> pwd -P
/Users/lakshaybhushan/Developer/OS Assignment
lakSH> cd
lakSH> pwd
/Users/lakshaybhushan
lakSH> cd -
lakSH> pwd
/Users/lakshaybhushan/Developer/OS Assignment
```

```
lakSH> cd ..
lakSH> pwd
/Users/lakshaybhushan/Developer
lakSH> cd -
lakSH> cd ~
lakSH> pwd
/Users/lakshaybhushan
lakSH> cd -
lakSH> ls
Makefile cat cat.c date date.c hello laksh laksh.c ls ls.c mkdir
  mkdir.c rm rm.c
lakSH> ls -a
. . . .DS_Store .vscode Makefile cat cat.c date date.c hello laksh
  laksh.c ls ls.c mkdir mkdir.c rm rm.c
lakSH> ls -r
rm.c rm mkdir.c mkdir ls.c ls laksh.c laksh hello date.c date cat.c
  cat Makefile
lakSH> echo hello
hello
lakSH> echo -n hello
hellolakSH>
lakSH> echo --help
----- Echo Help Page -----
NAME:
  echo - Write arguments to the standard output (stdout).SYNOPSIS:
  echo [OPTION]... [STRING]...
DESCRIPTION:
  Use to write arguments to the standard output.
  -n      do not output the trailing newline
  --help displays help and exit
lakSH> mkdir -v newfolder
Directory created successfully!! "newfolder"
lakSH> mkdir newfolder1
lakSH> ls
Makefile cat cat.c date date.c hello laksh laksh.c ls ls.c mkdir
  mkdir.c newfolder newfolder1 rm rm.c
lakSH> mkdir -m 755 newfolder 2
LakSH: Directory Already Exists!!
```

```
lakSH> mkdir -m 755 newfolder2
lakSH> ls
Makefile cat cat.c date date.c hello laksh laksh.c ls ls.c mkdir
  mkdir.c newfolder newfolder1 newfolder2 rm rm.c
lakSH> date
Mon Oct 31 23:21:06 IST 2022
lakSH> date -u
Mon Oct 31 17:51:11 UTC 2022
lakSH> date -R
Mon, 31 Oct 2022 23:21:14 +0530
lakSH> date&t
Mon 31 Oct 2022 23:21:20 IST
lakSH> date&t -u
Mon 31 Oct 2022 17:51:25 UTC
lakSH> date&t -R
Mon, 31 Oct 2022 23:21:31 +0530
lakSH> rm file1
lakSH> ls
Makefile cat cat.c date date.c file2 hello laksh laksh.c ls ls.c
  mkdir mkdir.c newfolder newfolder1 newfolder2 rm rm.c
lakSH> rm -v file2
File named file2 has been deleted successfully!!
lakSH> rm -r hello
lakSH> rm -r newfolder1
lakSH> cat display.txt
hello world
i am lakshay
bhushan
lakSH> cat -e display.txt
hello world$
i am lakshay$
bhushan$
lakSH> cat -n display.txt
1 hello world
2 i am lakshay
3 bhushan
lakSH> exit
```