

## **SOFE 3950U – Operating Systems**

### **Lab 2: Shell Project**

#### **Lab Group 11:**

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## Introduction:

The Shell or Command Line Interpreter is the fundamental User interface to an Operating System. In this lab we will be working on implementing a simple shell –myshell- that runs given commands through the terminal application. It will be designed to be used for UNIX shell environment.

## Deliverables:

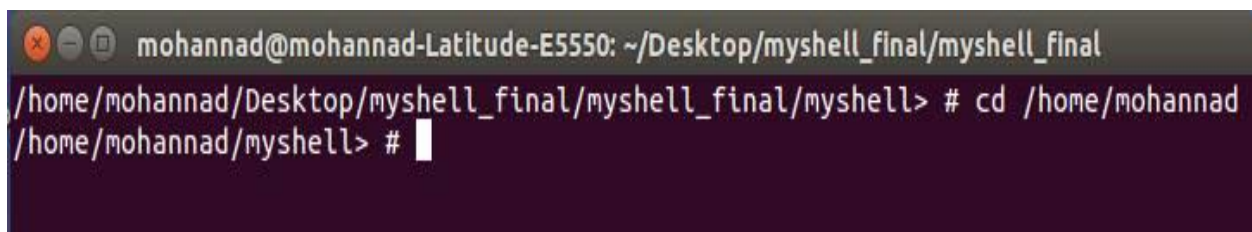
The shell will support the following internal commands:

- i. **cd <directory>** - Change the current default directory to <directory>. If the <directory> argument is not present, report the current directory. If the directory does not exist an appropriate error should be reported. This command should also change the PWD environment variable.
- ii. **clr** - Clear the screen.
- iii. **dir <directory>** - List the contents of directory <directory>.
- iv. **environ** - List all the environment strings.
- v. **echo <comment>** - Display <comment> on the display followed by a new line (multiple spaces/tabs may be reduced to a single space).
- vi. **help** - Display the user manual using the more filter.
- vii. **pause** - Pause operation of the shell until 'Enter' is pressed.
- viii. **quit** - Quit the shell.

Other commands:

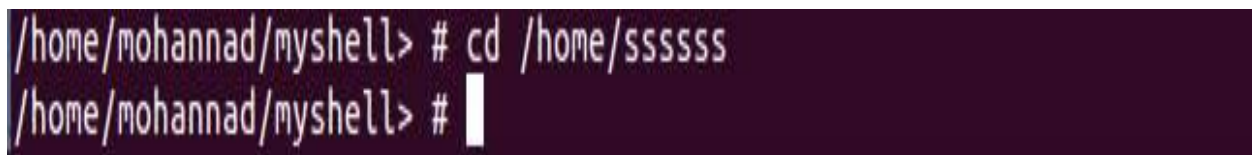
- i. **myshell batchfile** - batchfile contains a set of command lines for the shell to process. The shell exits when the end of file is reached. If the shell is invoked without a command line argument, it solicits input from the user via a prompt on the display.

## Demonstration:



```
mohannad@mohannad-Latitude-E5550: ~/Desktop/myshell_final/myshell_final
/home/mohannad/Desktop/myshell_final/myshell_final/myshell> # cd /home/mohannad
/home/mohannad/myshell> #
```

Fig 1: cd <directory> - change the current default directory to <directory>



```
/home/mohannad/myshell> # cd /home/ssssss
/home/mohannad/myshell> #
```

Fig 2: cd <directory>, report the current directory if <directory> argument is not present

---

```
/Users/luisarojas/Downloads/myshell_final/[myshell]> # cd dfnewnfje
Please enter a valid directory.
```

Fig 3: cd <directory>, report an appropriate error if the directory does not exist

```
Please enter a directory.
/home/mohannad/myshell> # cd
Please enter a directory.
/home/mohannad/myshell> # cd
Please enter a directory.
/home/mohannad/myshell> # cd
Please enter a directory.
/home/mohannad/myshell> # cd /home/mohannad/Desktop
/home/mohannad/Desktop/myshell> # clr
013;J
/home/mohannad/Desktop/myshell> # clr
013;J

/home/mohannad/Desktop/myshell> #
```

Fig 4: clr - clear the screen

```

mohannad@mohannad-Latitude-E5550:~/Desktop/myshell_final/myshell_final$ ./myshell
/home/mohannad/Desktop/myshell_final/myshell_final/myshell> # dir /home/mohannad/Desktop
..
myshell_final.zip
myshell_new.c~
pictures
projects-os
myshell
myshell_example
.
myshell.tar.gz
myshell_new.txt~
myshell_example.zip
myshell_final
myshell_new.c
/home/mohannad/Desktop/myshell_final/myshell_final/myshell> # █

```

Fig 5: dir <directory> - list the contents of directory <directory>

```

/home/mohannad/Desktop/myshell_final/myshell_final/myshell> # environ
LESSOPEN=| /usr/bin/lesspipe %s
GNOME_KEYRING_PID=
USER=mohannad
LANGUAGE=en_CA:en
UPSTART_INSTANCE=
XDG_SEAT=seat0
SESSION=ubuntu
XDG_SESSION_TYPE=x11
COMPIZ_CONFIG_PROFILE=ubuntu
SHLVL=1
HOME=/home/mohannad
QT4_IM_MODULE=xim
OLDPWD=/home/mohannad/Desktop/myshell_final
DESKTOP_SESSION=ubuntu
GTK_MODULES=overlay-scrollbar:unity-gtk-module
XDG_SEAT_PATH=/org/freedesktop/DisplayManager/Seat0
INSTANCE=
DBUS_SESSION_BUS_ADDRESS=unix:abstract=/tmp/dbus-l0FE8zJo5y
GNOME_KEYRING_CONTROL=
QT_QPA_PLATFORMTHEME=appmenu-qt5
MANDATORY_PATH=/usr/share/gconf/ubuntu.mandatory.path
IM_CONFIG_PHASE=1
SESSIONTYPE=gnome-session
UPSTART_JOB=unity7
LOGNAME=mohannad
GTK_IM_MODULE=ibus
WINDOWID=62914571
_=./myshell
DEFAULTS_PATH=/usr/share/gconf/ubuntu.default.path
XDG_SESSION_ID=c2
TERM=xterm
GNOME_DESKTOP_SESSION_ID=this-is-deprecated
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games
COM_LANG=en_CA
XDG_SESSION_PATH=/org/freedesktop/DisplayManager/Session0
XDG_RUNTIME_DIR=/run/user/1000
COMPIZ_BIN_PATH=/usr/bin/
DISPLAY=:0
LANG=en_CA.UTF-8
XDG_CURRENT_DESKTOP=Unity
LS_COLORS=rs=0:di=01;34:ln=01;36:nh=00;pl=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:su=37;41:sg=30;43:ca=30;41:tw=30;42:ow=34;42:st=37;44:ex=01;32:*.tar=01;31:*.tgz=01;31:*.arc=01;31:*.arj=01;31:*.taz=01;31:*.lha=01;31:*.lz4=01;31:*.lzh=01;31:*.lna=01;31:*.tlz=01;31:*.txz=01;31:*.tzo=01;31:*.t7z=01;31:*.zip=01;31:*.z=01;31:*.Z=01;31:*.dz=01;31:*.gz=01;31:*.lrz=01;31:*.lz=01;31:*.lzo=01;31:*.xz=01;31:*.bz2=01;31:*.bz=01;31:*.tbz=01;31:*.tbz2=01;31:*.tz=01;31:*.deb=01;31:*.rpm=01;31:*.jar=01;31:*.war=01;31:*.ear=01;31:*.sar=01;31:*.rar=01;31:*.alz=01;31:*.ace=01;31:*.zoo=01;31:*.cpio=01;31:*.7z=01;31:*.rz=01;31:*.cab=01;31:*.jpg=01;35:*.jpeg=01;35:*.gif=01;35:*.bmp=01;35:*.pbm=01;35:*.pgm=01;35:*.ppm=01;35:*.tga=01;35:*.xbm=01;35:*.xpm=01;35:*.tif=01;35:*.tiff=01;35:*.png=01;35:*.svg=01;35:*.svgz=01;35:*.mng=01;35:*.pcx=01;35:*.mov=01;35:*.mpeg=01;35:*.mpg=01;35:*.m2v=01;35:*.mkv=01;35:*.webm=01;35:*.ogm=01;35:*.mp4=01;35:*.m4v=01;35:*.mp4v=01;35:*.vob=01;35:*.qt=01;35:*.nuv=01;35:*.wmv=01;35:*.asf=01;35:*.rm=01;35:*.rmvb=01;35:*.flc=01;35:*.avi=01;35:*.fli=01;35:*.flv=01;35:*.gl=01;35:*.dl=01;35:*.xcf=01;35:*.xwd=01;35:*.yuv=01;35:*.cgm=01;35:*.enf=01;35:*.axv=01;35:*.anx=01;35:*.ogv=01;35:*.ogx=01;35:*.aac=00;36:*.au=00;36:*.flac=00;36:*.m4a=00;36:*.mid=00;36:*.midi=00;36:*.mka=00;36:*.mp3=00;36:*.mpc=00;36:*.ogg=00;36:*.ra=00;36:*.wav=00;36:*.axa=00;36:*.oga=00;36:*.spx=00;36:*.xspf=00;36:
XMODIFIERS=@ln=ibus
XDG_SESSION_DESKTOP=ubuntu
XAUTHORITY=/home/mohannad/.Xauthority
XDG_GREETER_DATA_DIR=/var/lib/lightdm-data/mohannad
SSH_AUTH_SOCK=/run/user/1000/keyring/ssh
SHELL=/bin/bash
COMSESSION=ubuntu
LESSCLOSE=/usr/bin/lesspipe %s %s
UPSTART_EVENTS=xsession started
GPG_AGENT_INFO=/run/user/1000/keyring/gpg:0:1

```

Fig 6: environ - list all the environment strings

```
/home/mohannad/Desktop/myshell_final/myshell_final/myshell> # echo This is the operating system lab 2015
This is the operating system lab 2015
/home/mohannad/Desktop/myshell_final/myshell_final/myshell> #
```

Fig 7: echo <comment> - display <comment> on the display followed by a new line

```
/Users/luisarojas/Downloads/myshell_final/[myshell]> # help

SOFÉ 3950U / CSCI 3020U (Lab 2) - readme

Description: application designed to be used for unix shell environment - Linux. Below are the
commands defined internally in this shell.

((expression))      ((description))
cd <directory>      Change the current default directory to <directory>.
clr                 Clear the screen.
dir <directory>     List the contents of directory <directory>.
environ             List all the environment strings.
echo <comment>      Display <comment> on the display followed by a new line.
help                Display the user manual using the more filter.
pause               Pause operation of the shell until 'Enter' is pressed.
quit                Quit the shell.
```

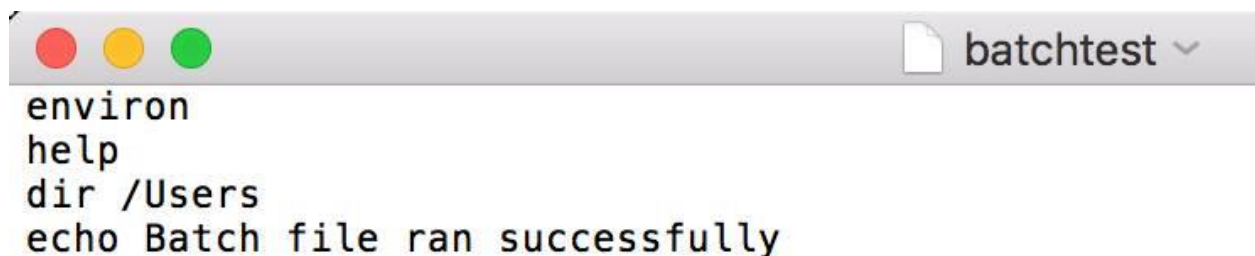
Fig 8: help - display the user manual using the more filter

```
/home/mohannad/Desktop/myshell_final/myshell_final/myshell> # pause
System paused. Press ENTER to continue
Continued
/home/mohannad/Desktop/myshell_final/myshell_final/myshell> #
```

Fig 9: pause - pause operation of the shell until 'Enter' is pressed

```
/home/mohannad/Desktop/myshell_final/myshell_final/myshell> # quit
mohannad@mohannad-Latitude-E5550:~/Desktop/myshell_final/myshell_final$
```

Fig 10: quit - quit the shell



```
environ
help
dir /Users
echo Batch file ran successfully
```

Fig 11: batchtest file



```

/Users/luisarojas/Downloads/myshell_final/[myshell]> # myshell batchtest
TERM_PROGRAM=Apple_Terminal
TERM=xterm-256color
SHELL=/bin/bash
TMPDIR=/var/folders/7s/mh4zfn4s2t5_d44rz1k9sc9m0000gn/T/
Apple_PubSub_Socket_Render=/private/tmp/com.apple.launchd.i3DYgHDeCi/Render
TERM_PROGRAM_VERSION=361
TERM_SESSION_ID=FAA8562C-7A26-448F-9C19-9E545D1FF53E
USER=luisarojas
SSH_AUTH_SOCK=/private/tmp/com.apple.launchd.tpCajJ6Kgv/Listeners
__CF_USER_TEXT_ENCODING=0x1F5:0x0:0x0
PATH=/usr/local/bin:/usr/bin:/bin:/usr/sbin:/sbin
_=/usr/bin/env
PWD=/Users/luisarojas/Downloads/myshell_final
LANG=en_CA.UTF-8
XPC_FLAGS=0x0
XPC_SERVICE_NAME=0
HOME=/Users/luisarojas
SHLVL=2
LOGNAME=luisarojas
/Users/luisarojas/Downloads/myshell_final/[myshell]> # /Users/luisarojas/Downloads/m
yshell_final/[myshell]> #
SOFE 3950U / CSCI 3020U (Lab 2) - readme

```

Description: application designed to be used for unix shell environment - Linux. Below are the commands defined internally in this shell.

| ((expression))  | ((description))  |
|-----------------|--|
| cd <directory>  | Change the current default directory to <directory>.     |
| clr             | Clear the screen.  |
| dir <directory> | List the contents of directory <directory>.              |
| environ         | List all the environment strings.                        |
| echo <comment>  | Display <comment> on the display followed by a new line. |
| help            | Display the user manual using the more filter.           |
| pause           | Pause operation of the shell until 'Enter' is pressed.   |
| quit            | Quit the shell.  |

```

/Users/luisarojas/Downloads/myshell_final/[myshell]> # .
..
.localized
Guest
luisarojas
Shared
/Users/luisarojas/Downloads/myshell_final/[myshell]> # Batch file ran successfully

```

Fig 12: batchfile – commands executed

```

mohannad@mohannad-Latitude-E5550:~/Desktop/myshell_final/myshell_final$ make
clang -Wall -Wextra -std=c99 -c myshell.c
myshell.c:43:5: warning: implicit declaration of function 'strtok_r' is invalid in C99
      [-Wimplicit-function-declaration]
      strtok_r(command, "\n ", &dir);
      ^
myshell.c:88:25: warning: comparison between pointer and integer ('int' and 'void *')
      if(buffer[0]==NULL){
                        ^
myshell.c:33:10: warning: unused variable 'arg' [-Wunused-variable]
      char arg[BUFFER_LEN] = { 0 };
      ^
myshell.c:25:14: warning: unused parameter 'argc' [-Wunused-parameter]
int main(int argc, char *argv[])
      ^
myshell.c:25:26: warning: unused parameter 'argv' [-Wunused-parameter]
int main(int argc, char *argv[])
                        ^
5 warnings generated.
clang -Wall -Wextra -std=c99 myshell.o -lm -o myshell.exe
rm myshell.o
mohannad@mohannad-Latitude-E5550:~/Desktop/myshell_final/myshell_final$ ./myshell
/home/mohannad/Desktop/myshell_final/myshell_final/myshell> #

```

Fig 13: make - build the source code using the make command

## Conclusion:

In this lab, we have learned how to implement a shell that runs given commands and display results through the terminal. We have also learned how to develop software using git, Along with gaining experience using Makefiles and developing multisource file projects in C.

## GitHub:

Github link: <https://github.com/MirnaZohiry/Lab-2-OS/tree/Luisa>