Lab 1 (OS): Introduction to the UNIX shell & the C language

Shokhista Ergasheva, Muwaffaq Imam, Artem Kruglov, Nikita Lozhnikov, Giancarlo Succi, Xavier Vasquez, Herman Tarasau, Firas Jolha

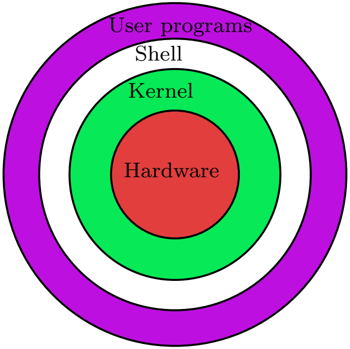
Week 01 – Lab

Outline

- The UNIX Shell
- The C Language

What is the UNIX shell?

- **Shell** is a text user interface (TUI) for access to an operating system's services. Has many implementations: bash shell, original Unix shell, Bourne shell, ksh, csh, etc.



Architecture of UNIX Systems

What is the UNIX shell?

- The job of the **Shell** is to translate the user's command lines into operating system instructions.

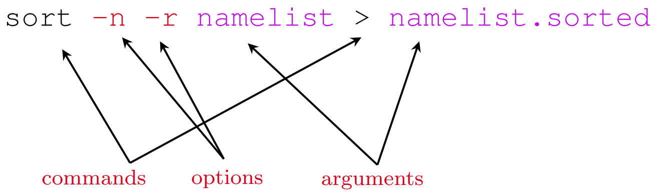
What is the UNIX shell?

- The job of the **Shell** is to translate the user's command lines into operating system instructions.
- For example, consider this command line:

```
sort -n -r namelist > namelist.sorted
```

What is the UNIX shell?

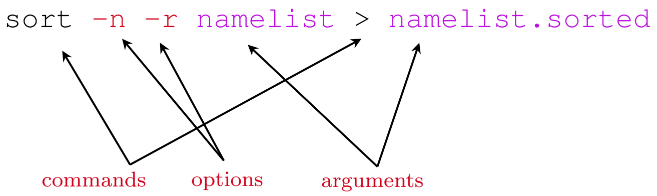
- The job of the **Shell** is to translate the user's command lines into operating system instructions.
- For example, consider this command line:



```
sort -n -r namelist > namelist.sorted
```

What is the UNIX shell?

- The job of the **Shell** is to translate the user's command lines into operating system instructions.
- For example, consider this command line:



```
sort -n -r namelist > namelist.sorted
```

This means, "Sort lines in the file *namelist* in numerical and reverse order, and put the result in the file *namelist.sorted*."

Introduction to the UNIX shell

- **whoami** - Print userid.
- **hostname** - Show the system's host name.
- man $<< item >$ - Display manual for the $< item >$. Use arrows to navigate and q to exit. Example: **man whoami** - Display manual on command **whoami**.
- **man man** - Display man on man.
- **man --help** - The other way to get help on command is to write an option **--help** or often **-h**.

Shell - Display

- **less** - Display the contents of a file one screen at a time with navigation.
- **head** - Print the first lines of the file to standard output.
- **tail** - Print the last lines of the file to standard output.
- **man -h — head**
- **man –help — tail**
- **grep PATTERN** $< file >$ - Search for PATTERN in file or stdin.

Shell - Streams

Standard streams are preconnected communication channels of programs. They are:

- **stdin** - standard input that going into program,
- **stdout** - standard out where program writes output,
- **stderr** - to display error messages.

It is possible to redirect streams to or from files with > and <.

Shell - Pipelines

- **ls > list.txt** - Save list of files in current directory to file.txt.
- **head -n 3 < file.txt** - Display the first 3 entries.
  It is possible to redirect output of one program to input of another by | (pipe symbol).
- **ls | sort -r | tail -n 3**
  Get list of files, reverse sort and display the 3 last.

Shell - File system commands

- **pwd** - Print name of current/working directory.
- **mkdir <dirname>** - Make directory.
- **cd <path>** - Change directory.
- **rm <filenames>** - Remove a file.
- **rm -r <dirname>** - Remove (recursive) a directory.
- **ls** - List content of a directory.
- **mv <old_path> <new_path>** - Move file.
- **cat <filenames>** - Concatenate files to stdout.
- **gedit <filename>** - Run text editor for GNOME.

Shell - File System - Special Characters

- $\sim -homedirectory$
- . - represent current directory
- .. - represent parent directory of current directory
- Examples:
  - cd ..
  - ls .
  - cd $\sim$

Shell - File System FAQ

- **Q: How to create a new file?**
  touch <filename>
  cat > <filename>
  echo > <filename>
  gedit <filename>
- **Q: How to rename file?**
  mv <oldname> <newname>

Foreground and Background

Foreground processes block shell during execution and **background** do not. Appending & will run process in background.

- **gedit &**

Foreground process can be suspend by ctrl+z and run in background with **bg** or foreground with **fg**.

- **jobs** - display list of jobs.

A job can be chosen by its number in the list with %, %+ for the current job and %- for the previous one:

- **fg** %1 - run job 1 in foreground

Exercise 1

Create directory “week1” in home directory.

- **mkdir** $\sim/week1$
- **cd** $\sim/week1$

List entries in /usr/bin that contain **“gcc”** in reverse alphabetical order. Save results in

- “$\sim/week1/ex1.txt$”.

Exercise 2

Try some commands and save history to “$\sim /week1/ex2.txt$”.
history > ex2.txt

Exercise 3

Write a shell script **“ex3.sh”** that prints time (use **date** command), then **sleep** for 3 seconds (use sleep 3) and prints time again. Run script with:

sh ex3.sh

Exercise 4 - Hello World

Write "Hello world" in the C language. Create source file:
gedit ~ /week1/main.c
Write program:

```c
#include <stdio.h>
int main(void)
{
  printf("Hello World!");
}
```

Exercise 4 - Compilation

Compile the program, where ex4 is name of executable file:

- **gcc main.c -o ex4**

Run the program with:

- **./ex4**

Useful Links

- About foreground and background processes
- Learning the bash Shell - 3rd Edition
- Design of the Unix Operating System By Maurice Bach
- Console emulator

The End.

Be strong.

Week 01 – Lab 01