Lab 1
Operating Systems

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- Description:

This Code is an implementation of a Unix shell program, that allows you to run other programs.

The code is composed of 7 functions including the main function:

1. void setup_enviroment().
2. void parse_input().
3. execute_shell_bultin().
4. void execute_command()
5. void on_child_exit()
6. void shell()
7. int main().

- Major functions:

1. void setup_enviroment() :
   It is used to prepare the shell at first start, by setting the working directory to the default one which is the Desktop.

2. void parse_input():
   its used to prepare the input to be ready to be entered to execvp() function, by splitting the input string into multiple strings separated by “ “ where always args[0] contains the command the rest contains the options of the command, in this function we detect if there is ‘&’ which means that there will be a program which will

run on the background,this function also handle the situation of using ‘$’ to call a variable from the environment.

3. execute_shell_bultin():
   In this function we execute commands which are shell built-in commands as “cd”,”echo”,”export”, this function handles these commands in C functions.

4. void execute_command():
   In this function we execute the Unix commands as “ls”, “touch”,”mkdir”…..etc, this function depends mainly on the use of fork(), to have parent and child processes, and use of execvp() for Unix commands, and the waitpid() to choose to wait for the child process or no depending if the process is in the background or not.

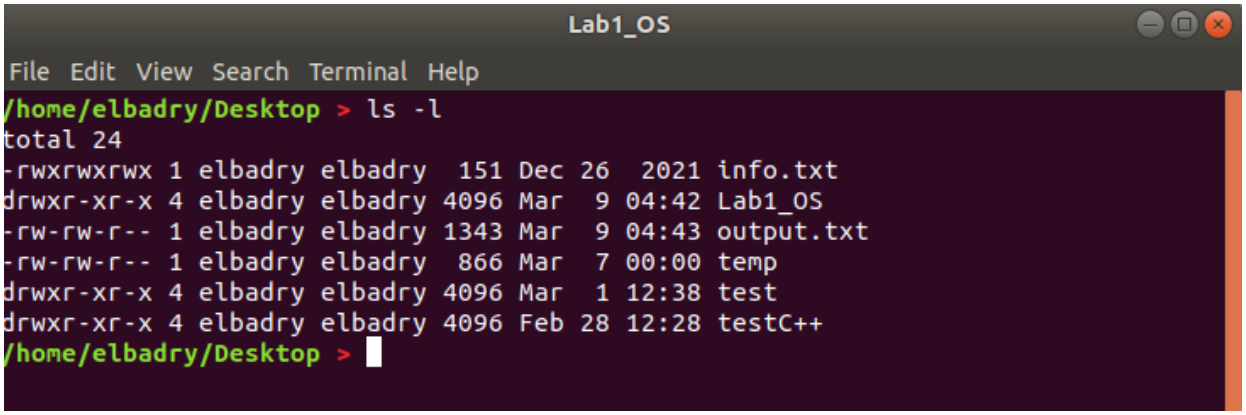
5. void on_child_exit():
   This function is used to wait for child processes to exit and reap their resources , especially the processes that run on background, and log the termination to a log file, and its called by signal SIGCHILD.

6. void shell():
   It contains most of the previous functions, to run the shell, it contains a do while loop which is stopped only by exit command, in this loop it checks whether the command is built-in or Unix command to execute the proper function.

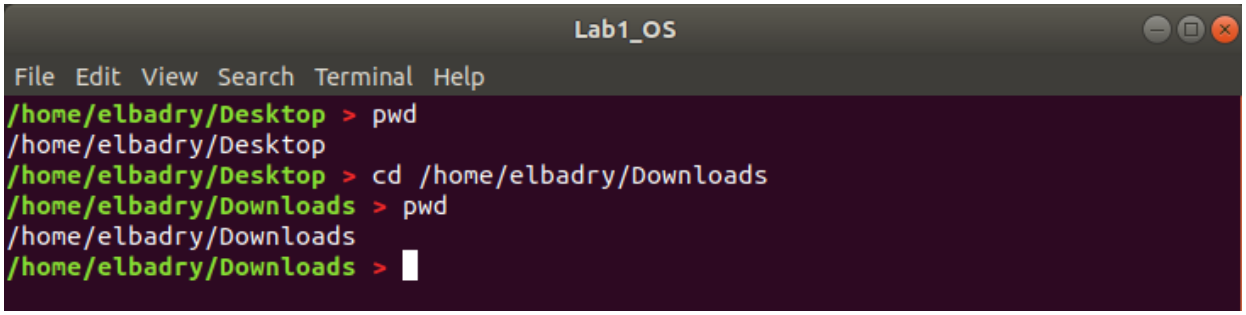
7. int main():
   The signal SIGCHILD is registered in it, also it uses the setup_enviroment() to prepare the shell, then it executes the shell itself.

- Sample runs:

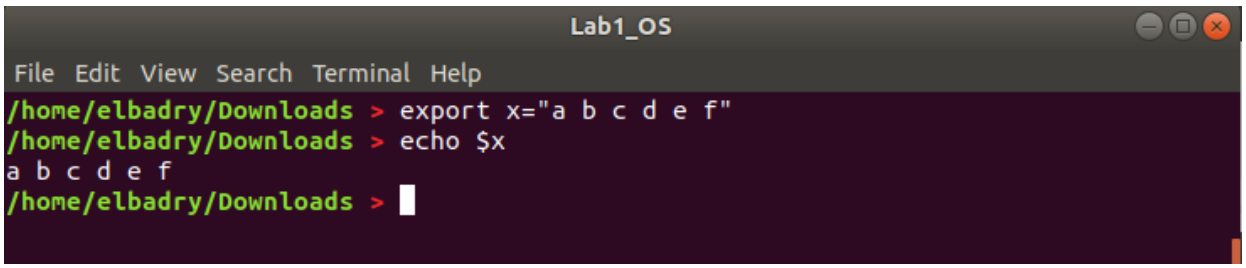
1.



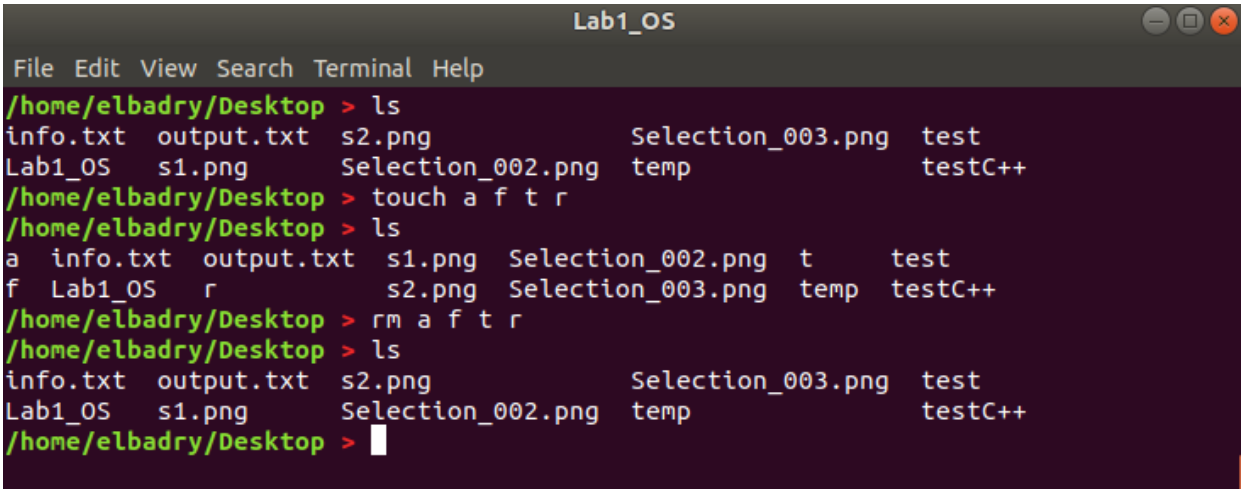
2.



3.

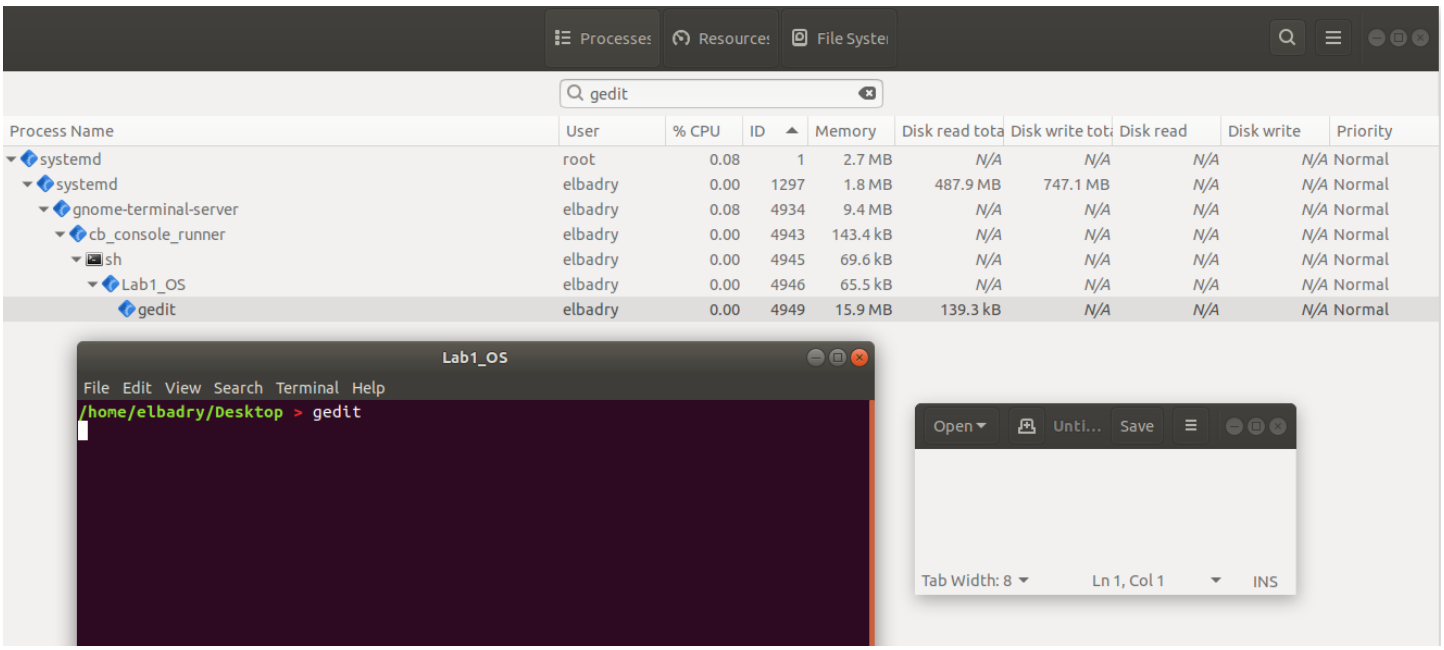


4.

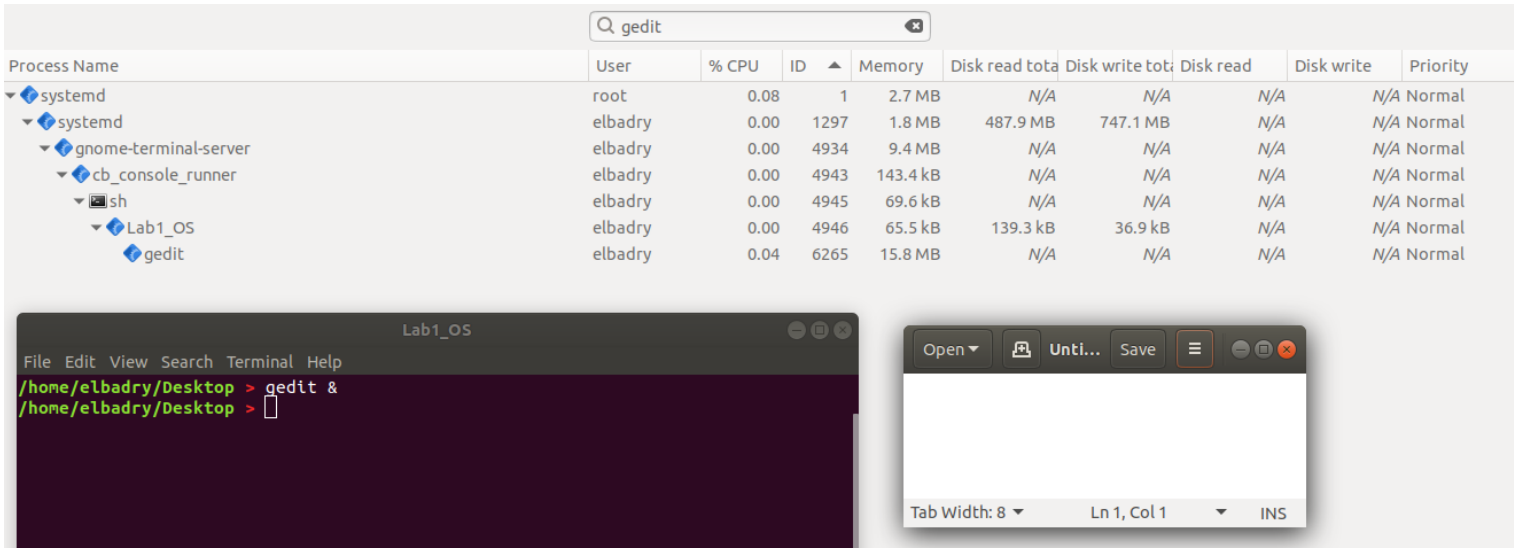


- Screenshots for process hierarchy:

1.



2.


gedit
Process Name
User
% CPU
ID
Memory
Disk read tota
Disk write tota
Disk read
Disk write
Priority
systemd root 0.08 1 2.7 MB N/A N/A N/A N/A Normal
systemd elbadry 0.00 1297 1.8 MB 487.9 MB 747.1 MB N/A N/A Normal
gnome-terminal-server elbadry 0.00 4934 9.4 MB N/A N/A N/A N/A Normal
cb_console_runner elbadry 0.00 4943 143.4 kB N/A N/A N/A N/A Normal
sh elbadry 0.00 4945 69.6 kB N/A N/A N/A N/A Normal
Lab1_OS elbadry 0.00 4946 65.5 kB 139.3 kB 36.9 kB N/A N/A Normal
gedit elbadry 0.04 6265 15.8 MB N/A N/A N/A N/A Normal
Lab1_OS
File Edit View Search Terminal Help
/home/elbadry/Desktop > gedit &
/home/elbadry/Desktop >
Open
Unti...
Save
Tab Width: 8
Ln 1, Col 1
INS