

**Lab 1 OS**  
**simple shell**

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## Code design description:

- The user enters his command to the shell.
- The “main” function takes his input and parses it into C string.
- If the command is “exit”, the shell stops here and terminate.
- If not, the main function sends the user command as arguments to be executed.
- If the command is **foreground**, the arguments are sent to “execute” function where fork child and execute child happens. Parent process suspended until child terminates.
- If the command is **background**, the arguments are sent to “executeBackground” function which is similar to execute function but without parent waiting. The parent notified with SIGCHLD signal when the child process terminated.
- There is a log file to write in when child process terminated.

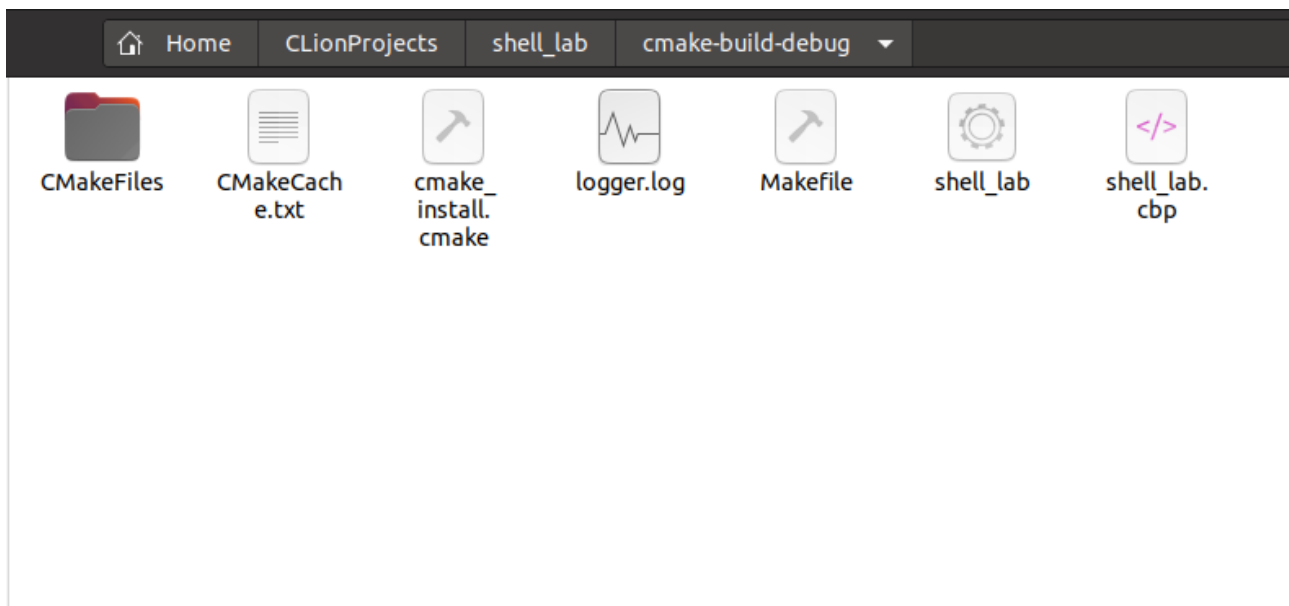
## Major functions:

- **main function:** to take input from user, parse the input and decide how to execute the user command.
- **execute function:** to execute foreground system commands.
- **execute background function:** to execute background system commands.
- **handler function:** to handle SIGCHLD signal in background commands and write in log file when any child process terminated.
- **exit command function:** to stop the shell when user enters “exit”.

## Sample runs:

- **some system commands:**

the files in the directory



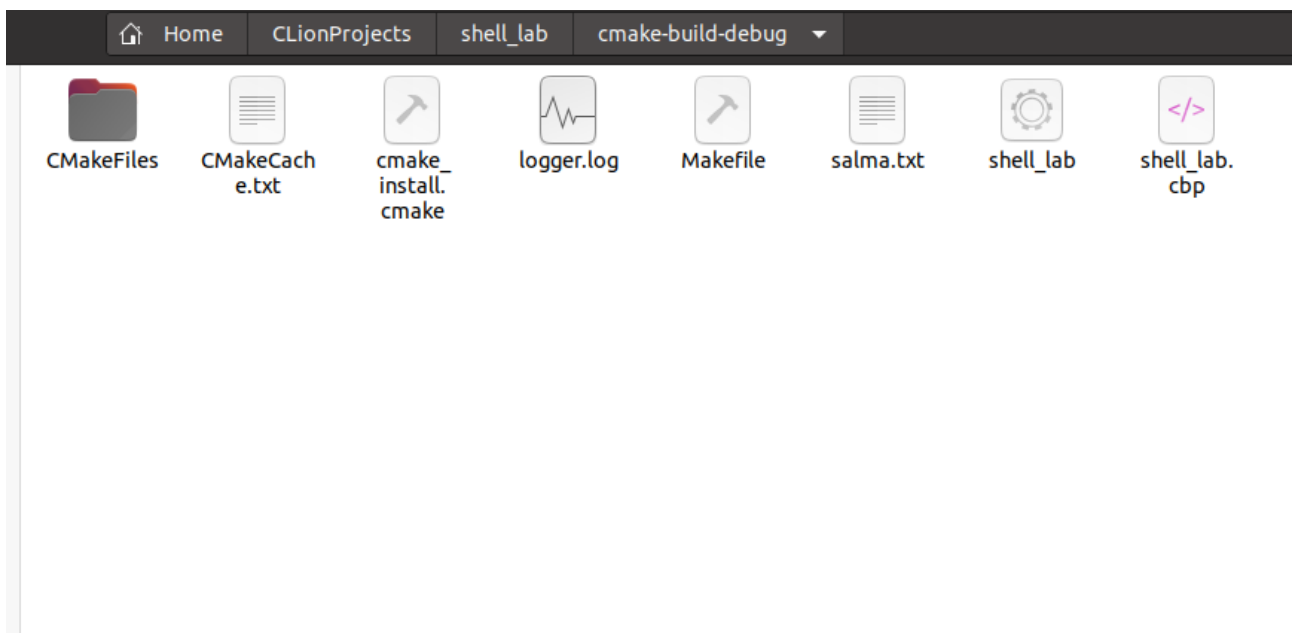
when write command “ls” in the shell

```
/home/salma/CLionProjects/shell_lab/cmake-build-debug/shell_lab
>>>ls
CMakeCache.txt  cmake_install.cmake  Makefile    shell_lab.cpp
CMakeFiles     logger.log           shell_lab
>>>|
```

copy command to copy the file “CmakeCache.txt” with the name “salma.txt”

```
/home/salma/CLionProjects/shell_lab/cmake-build-debug/shell_lab
>>>ls
CMakeCache.txt  cmake_install.cmake  Makefile  shell_lab.cbp
CMakeFiles  logger.log  shell_lab
>>>cp CMakeCache.txt salma.txt
>>>|
```

the files in the directory becomes:



ls command again:

```
/home/salma/CLionProjects/shell_lab/cmake-build-debug/shell_lab
>>>ls
CMakeCache.txt  cmake_install.cmake  Makefile  shell_lab.cbp
CMakeFiles  logger.log          shell_lab
>>>cp CMakeCache.txt salma.txt
>>>ls
CMakeCache.txt  cmake_install.cmake  Makefile  shell_lab
CMakeFiles  logger.log          salma.txt  shell_lab.cbp
>>>
```

rm command to remove “salma.txt” and list the files again.

```
/home/salma/CLionProjects/shell_lab/cmake-build-debug/shell_lab
>>>ls
CMakeCache.txt  cmake_install.cmake  Makefile  shell_lab.cbp
CMakeFiles  logger.log          shell_lab
>>>cp CMakeCache.txt salma.txt
>>>ls
CMakeCache.txt  cmake_install.cmake  Makefile  shell_lab
CMakeFiles  logger.log          salma.txt  shell_lab.cbp
>>>rm salma.txt
>>>ls
CMakeCache.txt  cmake_install.cmake  Makefile  shell_lab.cbp
CMakeFiles  logger.log          shell_lab
>>>|
```

- **Exit command:**

```
/home/salma/CLionProjects/shell_lab/cmake-build-debug/shell_lab
>>>ls
CMakeCache.txt  cmake_install.cmake  Makefile  shell_lab.cbp
CMakeFiles  logger.log          shell_lab
>>>cp CMakeCache.txt salma.txt
>>>ls
CMakeCache.txt  cmake_install.cmake  Makefile  shell_lab
CMakeFiles  logger.log          salma.txt  shell_lab.cbp
>>>rm salma.txt
>>>ls
CMakeCache.txt  cmake_install.cmake  Makefile  shell_lab.cbp
CMakeFiles  logger.log          shell_lab
>>>exit
Bye!^_^

Process finished with exit code 0
```

written with background sign (doesn't affect built in commands)

```
/home/salma/CLionProjects/shell_lab/cmake-build-debug/shell_lab
>>>ls
CMakeCache.txt  cmake_install.cmake  Makefile  shell_lab.cbp
CMakeFiles  logger.log          shell_lab
>>>exit&
Bye!^_^

Process finished with exit code 0
```

- **background commands**

```
/home/salma/CLionProjects/shell_lab/cmake-build-debug/shell_lab  
>>>firefox&  
>>>
```

firefox opened in the background while the shell is ready to take another command

executing another command

```
/home/salma/CLionProjects/shell_lab/cmake-build-debug/shell_lab  
>>>firefox&  
>>>ls  
CMakeCache.txt  cmake_install.cmake  Makefile  shell_lab.cbp  
CMakeFiles  logger.log  shell_lab  
>>>|
```

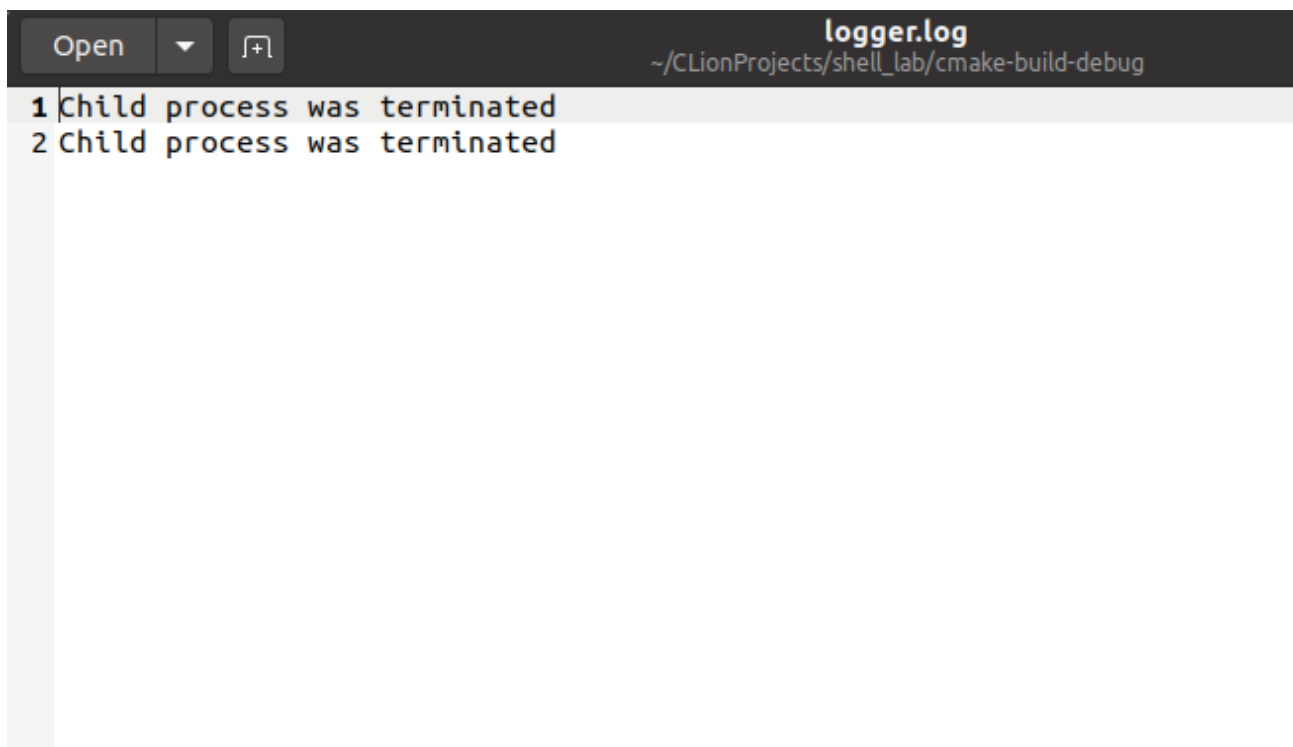


the log file after “ls” terminated



A screenshot of a code editor window titled "logger.log" with the path "~/CLionProjects/shell\_lab/cmake-build-debug". The editor shows a single line of text: "1 Child process was terminated". The line is highlighted in light gray. The editor has a dark theme with a toolbar at the top containing "Open", a dropdown arrow, and a "+" icon.

the log file after closing firefox



A screenshot of a code editor window titled "logger.log" with the path "~/CLionProjects/shell\_lab/cmake-build-debug". The editor shows two lines of text: "1 Child process was terminated" and "2 Child process was terminated". Both lines are highlighted in light gray. The editor has a dark theme with a toolbar at the top containing "Open", a dropdown arrow, and a "+" icon.

## System monitor screenshots:

- running firefox in background

```
/home/salma/CLionProjects/shell_lab/cmake-build-debug/shell_lab
>>>firefox&
>>>|
```

Processes							
Resources							
File Systems							
Process Name	User	% CPU	ID	Memory	Disk read tot	Disk writ	
evolution-alarm-not	salma	0	1994	15.5 MiB	728.0 KiB		
gsd-disk-utility-noti	salma	0	1992	1.0 MiB	24.0 KiB		
update-notifier	salma	0	3136	10.4 MiB	3.0 MiB	14.7	
gnome-session-ctl	salma	0	1798	416.0 KiB	20.0 KiB		
gnome-shell	salma	2	1818	179.4 MiB	397.6 MiB	43.4	
clion.sh	salma	0	305069	120.0 KiB	N/A	36.0	
java	salma	0	305127	1.1 GiB	16.7 MiB	68.4	
fsnotifier64	salma	0	305180	184.0 KiB	N/A		
ion.clangd.ma	salma	0	305385	13.7 MiB	4.0 KiB	1.1	
shell_lab	salma	0	312656	64.0 KiB	N/A		
firefox	salma	0	312657	111.0 MiB	N/A	244.0	
Privilege	salma	0	312709	39.4 MiB	N/A		
Web Con	salma	0	312804	15.6 MiB	N/A		
WebExte	salma	0	312757	24.9 MiB	N/A		
gnome-system-mon	salma	0	312826	15.8 MiB	N/A		
ibus-daemon	salma	0	1842	1.7 MiB	32.0 KiB	4.0	
ibus-engine-simp	salma	0	2055	900.0 KiB	N/A		
ibus-extension-gt	salma	0	1847	13.4 MiB	744.0 KiB		
ibus-memconf	salma	0	1846	696.0 KiB	N/A		
oosplash	salma	0	200569	372.0 KiB	2.2 MiB		
soffice.bin	salma	0	200585	177.7 MiB	152.0 MiB	26.4	

- running firefox & gedit in the background

```
/home/salma/CLionProjects/shell_lab/cmake-build-debug/shell_lab
>>>firefox&
>>>gedit&
>>>|
```

Processes Resources File Systems							
Process Name	User	% CPU	ID	Memory	Disk read tot	Disk writ	
evolution-alarm-not	salma	0	1994	15.5 MiB	728.0 KiB		
gsd-disk-utility-noti	salma	0	1992	1.0 MiB	24.0 KiB		
update-notifier	salma	0	3136	10.4 MiB	3.0 MiB	14.7	
gnome-session-ctl	salma	0	1798	416.0 KiB	20.0 KiB		
gnome-shell	salma	0	1818	179.7 MiB	397.6 MiB	43.4	
clion.sh	salma	0	305069	120.0 KiB	N/A	36.0	
java	salma	0	305127	1.1 GiB	16.7 MiB	68.5	
fsnotifier64	salma	0	305180	184.0 KiB	N/A		
ion.clangd.ma	salma	0	305385	13.7 MiB	4.0 KiB	1.1	
shell_lab	salma	0	312656	64.0 KiB	N/A		
firefox	salma	0	312657	106.2 MiB	N/A	344.0	
Privilege	salma	0	312709	38.2 MiB	N/A		
Web Con	salma	0	312804	15.8 MiB	N/A		
WebExte	salma	0	312757	24.3 MiB	N/A		
gedit	salma	0	313134	18.6 MiB	N/A		
gnome-system-mon	salma	0	312826	16.3 MiB	N/A		
ibus-daemon	salma	0	1842	1.7 MiB	32.0 KiB	4.0	
ibus-engine-simp	salma	0	2055	900.0 KiB	N/A		
ibus-extension-gt	salma	0	1847	13.4 MiB	744.0 KiB		
ibus-memconf	salma	0	1846	696.0 KiB	N/A		
oosplash	salma	0	200569	372.0 KiB	2.2 MiB		

- after closing gedit:

Processes Resources File Systems							
Process Name	User	% CPU	ID	Memory	Disk read tot	Disk writ	
evolution-alarm-not	salma	0	1889	15.6 MiB	692.0 KiB		
gsd-disk-utility-noti	salma	0	1871	1.0 MiB	24.0 KiB		
update-notifier	salma	0	3268	9.5 MiB	2.6 MiB	14.7	
gnome-session-ctl	salma	0	1676	420.0 KiB	20.0 KiB		
gnome-shell	salma	4	1696	153.5 MiB	87.3 MiB	32.0	
clion.sh	salma	0	3385	116.0 KiB	11.7 MiB	36.0	
java	salma	0	3464	870.0 MiB	191.8 MiB	6.1	
fsnotifier64	salma	0	4985	184.0 KiB	814.0 KiB		
ion.clangd.ma	salma	0	5831	7.5 MiB	7.4 MiB	576.0	
shell_lab	salma	0	33699	64.0 KiB	N/A	24.0	
firefox	salma	0	34400	120.0 MiB	616.0 KiB	2.6	
Privilege	salma	0	34454	31.9 MiB	N/A		
Web Con	salma	0	34634	17.5 MiB	N/A		
Web Con	salma	0	34850	15.9 MiB	N/A		
WebExte	salma	0	34666	24.1 MiB	N/A		
gnome-system-mon	salma	1	43776	16.1 MiB	16.0 KiB		
ibus-daemon	salma	0	1720	1.6 MiB	32.0 KiB	4.0	
ibus-engine-simp	salma	0	1955	820.0 KiB	N/A		
ibus-extension-gt	salma	0	1725	13.3 MiB	744.0 KiB		
ibus-memconf	salma	0	1724	696.0 KiB	N/A		
ibus-memconf	salma	0	1724	696.0 KiB	N/A		

- after closing firefox:

Processes Resources File Systems							
Process Name	User	% CPU	ID	Memory	Disk read tot	Disk writ	
evolution-calendar-fac	salma	0	1766	4.0 MiB	5.2 MiB		
evolution-source-regis	salma	0	1757	3.8 MiB	3.8 MiB		
gjs	salma	0	1796	5.1 MiB	N/A		
gnome-calendar	salma	0	25091	14.6 MiB	1.6 MiB		
gnome-keyring-daemo	salma	0	1669	668.0 KiB	N/A		
gnome-session-binary	salma	0	1682	2.8 MiB	7.0 MiB	4.	
evolution-alarm-not	salma	0	1889	15.6 MiB	692.0 KiB		
gsd-disk-utility-noti	salma	0	1871	1.0 MiB	24.0 KiB		
update-notifier	salma	0	3268	9.5 MiB	2.6 MiB	14.7	
gnome-session-ctl	salma	0	1676	420.0 KiB	20.0 KiB		
gnome-shell	salma	3	1696	155.6 MiB	87.4 MiB	32.	
clion.sh	salma	0	3385	116.0 KiB	11.7 MiB	36.	
java	salma	0	3464	871.6 MiB	193.5 MiB	6.2	
fsnotifier64	salma	0	4985	184.0 KiB	814.0 KiB		
ion.clangd.ma	salma	0	5831	7.5 MiB	7.4 MiB	576.	
shell_lab	salma	0	33699	64.0 KiB	732.0 KiB	2.9	
gnome-system-mon	salma	1	43776	16.1 MiB	20.0 KiB		
ibus-daemon	salma	0	1720	1.6 MiB	32.0 KiB	4.	
ibus-engine-simp	salma	0	1955	820.0 KiB	N/A		
ibus-extension-gt	salma	0	1725	13.3 MiB	744.0 KiB		