



Simple Shell

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ID 08

Overview

This is a simple unix shell application implemented with c++, it executes linux commands like ls, ls-l, cp, rm ..etc it also executes the cd command closes directly after writing exit command.

The application blocks until the command completes and, if the return code is abnormal, it prints out a message to that effect, it executes apps in background when written the name of the app followed by the & char, the opened process is then nested as a child process to the shell program.

An interrupt handler is implemented to terminate any child process completely forbidden it to be a zombi process, the entire application log is saved in the log file.

Important Functions

```
//writes in a log file and records time of the log.
void WriteLogFile(const char* szString);

//handler to the SIGCHLD signal that logs the instance of child termination
void handler(int sig);

//reads the input line and sences the exit statement
void readLine(char line[]);

//fills the arguments array
void processLine(char line[],char* args[]);

//calls the previous 2 functions
int readAndProcessLine(char line[],char* args[]);

//handles the non system call cd
int cd(char *path);
```

Code Structure

The main function begins with an infinite `while` loop in which we call the `readAndProcess` function which in turn calls `readLine` function and `processLine` function, these 2 functions fill the arguments array and deals with the `exit` command.

Then we check for the `&` character in the command read, if found a flag is set to deal with it later, after that we check if the command were `cd`, in that case we just call the `cd` function and continue the while loop.

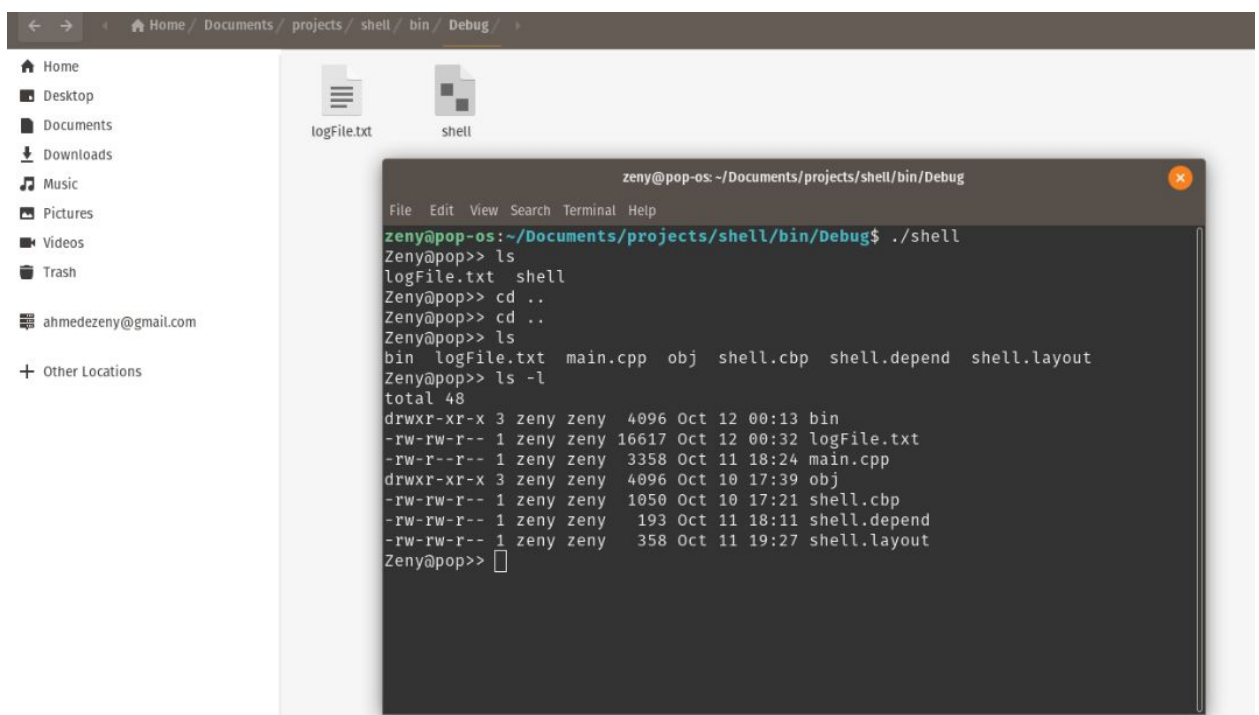
We then fork saving the child process id, checking it's value if less than 0 then the fork failed, if more we wait for the child process to be created unless the flag mentioned earlier is set, in which case we continue the while loop.

The signal function is called after each iteration to scout any possible zombi state process.

The loop goes on.

Sample runs

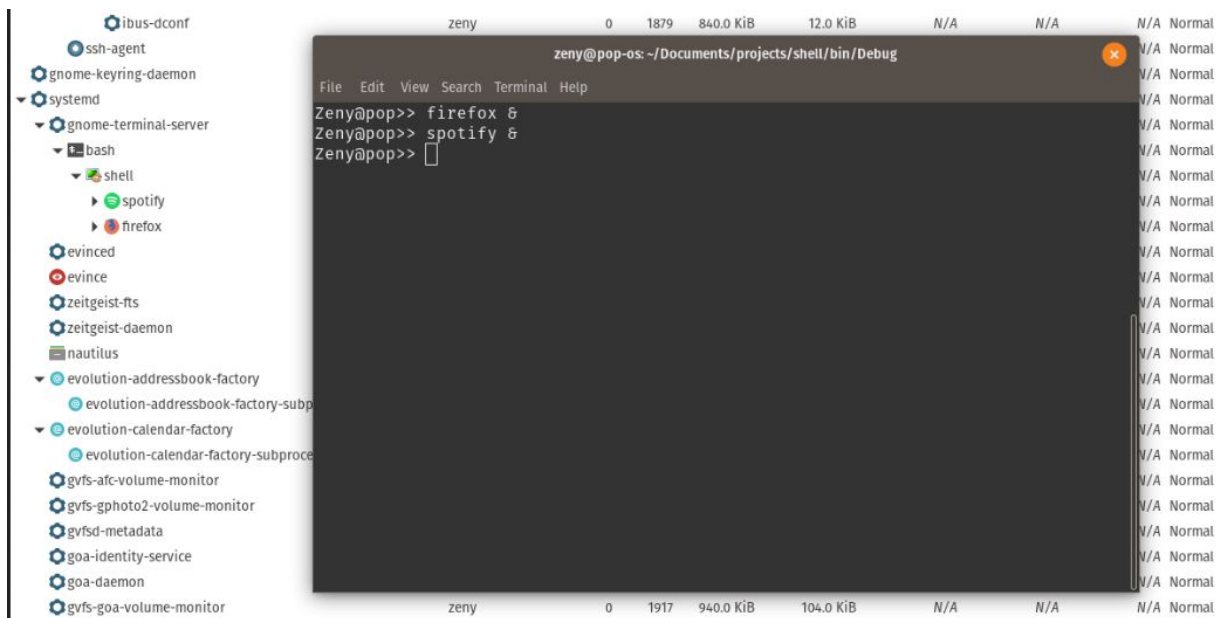
Performing simple commands



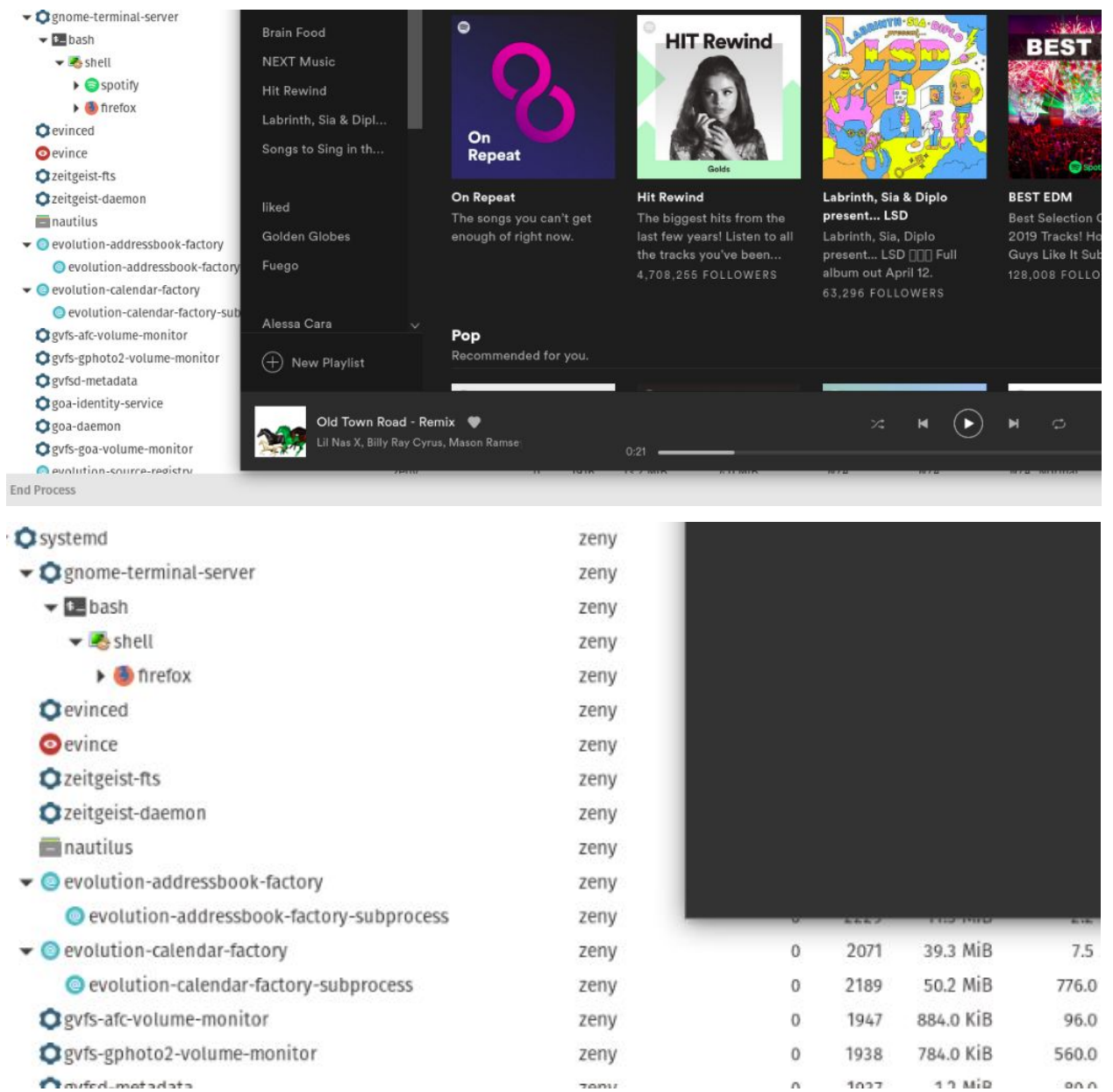
The screenshot shows a file manager window with a sidebar on the left containing navigation options: Home, Desktop, Documents, Downloads, Music, Pictures, Videos, Trash, and a user profile for ahmedezeny@gmail.com. The main pane displays two files: `logFile.txt` and `shell`. Overlaid on this is a terminal window titled `zeny@pop-os: ~/Documents/projects/shell/bin/Debug`. The terminal shows the following sequence of commands and output:

```
zeny@pop-os:~/Documents/projects/shell/bin/Debug$ ./shell
Zeny@pop>> ls
logFile.txt  shell
Zeny@pop>> cd ..
Zeny@pop>> cd ..
Zeny@pop>> ls
bin  logFile.txt  main.cpp  obj  shell.cbp  shell.depend  shell.layout
Zeny@pop>> ls -l
total 48
drwxr-xr-x 3 zeny zeny 4096 Oct 12 00:13 bin
-rw-rw-r-- 1 zeny zeny 16617 Oct 12 00:32 logFile.txt
-rw-r--r-- 1 zeny zeny 3358 Oct 11 18:24 main.cpp
drwxr-xr-x 3 zeny zeny 4096 Oct 10 17:39 obj
-rw-rw-r-- 1 zeny zeny 1050 Oct 10 17:21 shell.cbp
-rw-rw-r-- 1 zeny zeny 193 Oct 11 18:11 shell.depend
-rw-rw-r-- 1 zeny zeny 358 Oct 11 19:27 shell.layout
Zeny@pop>> 
```

Running 2 apps in background (children to the shell program)



Closing a program doesn't make it a zombi process



Exiting Shell

Process list showing various system and user processes. The 'shell' process is highlighted in blue.

Process Name	User
gnome-shell	zeny
spotify	zeny
spotify	zeny
spotify	zeny
spotify	zeny
codeblocks	zeny
kazam	zeny
gnome-system-monitor	zeny
ibus-daemon	zeny
ibus-engine-simple	zeny
ibus-dconf	zeny
ssh-agent	zeny
gnome-keyring-daemon	zeny
systemd	zeny
gnome-terminal-server	zeny
bash	zeny
shell	zeny
firefox	zeny
evince	zeny
evince	zeny
zeitgeist-fts	zeny
zeitgeist-daemon	zeny
nautilus	zeny
evolution-addressbook-factory	zeny
evolution-addressbook-factory-subprocess	zeny
evolution-calendar-factory	zeny
spotify	zeny
spotify	zeny
spotify	zeny
spotify	zeny
codeblocks	zeny
kazam	zeny
gnome-system-monitor	zeny
ibus-daemon	zeny
ibus-engine-simple	zeny
ibus-dconf	zeny
ssh-agent	zeny
gnome-keyring-daemon	zeny
systemd	zeny
firefox	zeny
Web Content	zeny
Web Content	zeny
WebExtensions	zeny
file:/// Content	zeny
gnome-terminal-server	zeny
bash	zeny
evince	zeny
evince	zeny
zeitgeist-fts	zeny

1	1852	385.8 MiB	921.8 MiB	5.9 GiB	N/A	N/A	Normal
0	15765	203.0 MiB	11.9 MiB	40.2 MiB	N/A	N/A	Normal
0	18816	40.1 MiB	N/A	28.0 KiB	N/A	N/A	Normal

Terminal window showing the execution of commands in a shell environment.

```

zeny@pop-os: ~/Documents/projects/shell/bin/Debug
File Edit View Search Terminal Help
Zeny@pop>> firefox &
Zeny@pop>> spotify &
Zeny@pop>> exit

```

0	15765	203.0 MiB	11.9 MiB	40.2 MiB	N/A	N/A	Normal
0	18816	40.1 MiB	N/A	28.0 KiB	N/A	N/A	Normal

Terminal window showing the execution of commands in a shell environment, including the prompt change after exiting the shell.

```

zeny@pop-os: ~/Documents/projects/shell/bin/Debug
File Edit View Search Terminal Help
Zeny@pop>> firefox &
Zeny@pop>> spotify &
Zeny@pop>> exit
zeny@pop-os:~/Documents/projects/shell/bin/Debug$

```