

Part 1

We changed the parse command as `"int parseCommand(char inputBuffer[], char *args[],int *background,int *is_redirected, char *file_name[])"`

We added 2 arguments to parse command which are;

`"*is_redirected"` to understand whether output is redirected or not,

`"*file_name[]"` to gather file_name for ease of use.

We treat commandline inputs as program invocation which are handled by forked child. These program invocations support the background execution utility.

Test output;

```
samed@samed-VirtualBox:~/Desktop$ shelly
shelly>pwd
/home/samed/Desktop
shelly>ls -l
total 1264
drwxrwxr-x 2 samed samed 4096 Mar 21 17:46 C files
-rw-rw-r-- 1 samed samed 1139751 Mar 20 23:44 crontest.png
drwxrwxr-x 2 samed samed 4096 Mar 19 21:12 project1
drwxrwxr-x 4 samed samed 4096 Mar 21 17:23 submission
-rw-rw-r-- 1 samed samed 87258 Mar 19 23:11 weather.png
-rw-rw-r-- 1 samed samed 43707 Mar 18 05:01 x.png
shelly>whoami
samed
shelly>ls -l -a &
shelly>total 1276
drwxr-xr-x 5 samed samed 4096 Mar 21 17:47 .
drwxr-xr-x 22 samed samed 4096 Mar 21 10:59 ..
drwxrwxr-x 2 samed samed 4096 Mar 21 17:46 C files
-rw-rw-r-- 1 samed samed 1139751 Mar 20 23:44 crontest.png
-rw-rw-r-- 1 samed samed 172 Mar 20 00:00 .cron-vvalues (copy).txt
drwxrwxr-x 2 samed samed 4096 Mar 19 21:12 project1
drwxrwxr-x 4 samed samed 4096 Mar 21 17:23 submission
-rw-rw-r-- 1 samed samed 87258 Mar 19 23:11 weather.png
-rw-rw-r-- 1 samed samed 43707 Mar 18 05:01 x.png

shelly>pwd &
shelly>/home/samed/Desktop

shelly>exit
samed@samed-VirtualBox:~/Desktop$
```

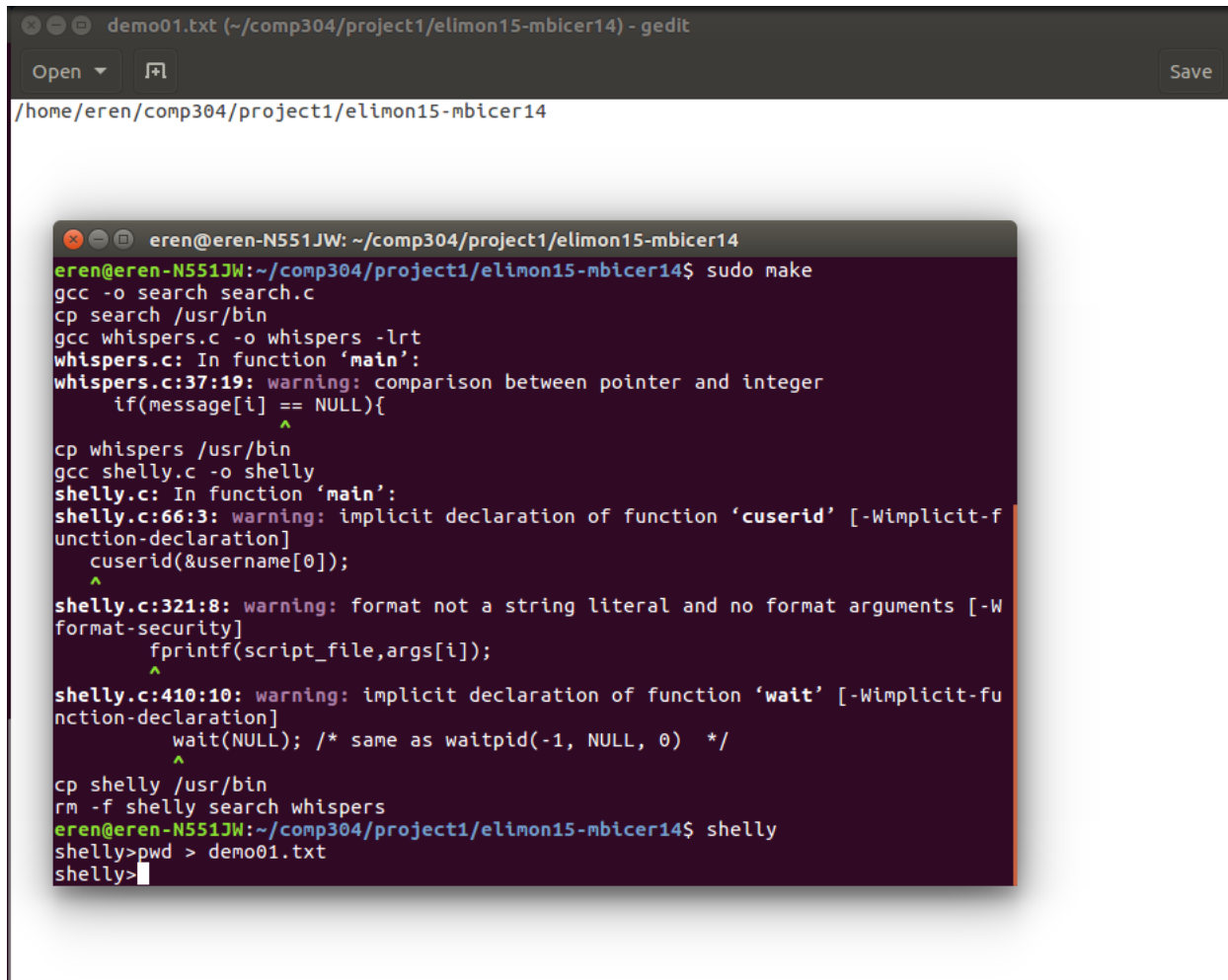
Part 2

Redirection test output;

In the first image below, we show that redirection of the pwd with ">" is successfully done.

In the second image, ">" truncates the already existing file and replace the content.

In the third image, ">>" successfully appends.



```
demo01.txt (~/comp304/project1/elimon15-mbicer14) - gedit
Open [icon] Save

/home/eren/comp304/project1/elimon15-mbicer14

eren@eren-N551JW: ~/comp304/project1/elimon15-mbicer14
eren@eren-N551JW:~/comp304/project1/elimon15-mbicer14$ sudo make
gcc -o search search.c
cp search /usr/bin
gcc whispers.c -o whispers -lrt
whispers.c: In function 'main':
whispers.c:37:19: warning: comparison between pointer and integer
    if(message[i] == NULL){
                   ^
cp whispers /usr/bin
gcc shelly.c -o shelly
shelly.c: In function 'main':
shelly.c:66:3: warning: implicit declaration of function 'cuserid' [-Wimplicit-f
unction-declaration]
    cuserid(&username[0]);
    ^
shelly.c:321:8: warning: format not a string literal and no format arguments [-W
format-security]
    fprintf(script_file,args[i]);
    ^
shelly.c:410:10: warning: implicit declaration of function 'wait' [-Wimplicit-fu
nction-declaration]
    wait(NULL); /* same as waitpid(-1, NULL, 0) */
    ^
cp shelly /usr/bin
rm -f shelly search whispers
eren@eren-N551JW:~/comp304/project1/elimon15-mbicer14$ shelly
shelly>pwd > demo01.txt
shelly>
```

```
demo01.txt (~/.comp304/project1/elimon15-mbicer14) - gedit
Open Save
"testing"
```

```
eren@eren-N551JW: ~/comp304/project1/elimon15-mbicer14
gcc whispers.c -o whispers -lrt
whispers.c: In function 'main':
whispers.c:37:19: warning: comparison between pointer and integer
    if(message[i] == NULL){
                   ^
cp whispers /usr/bin
gcc shelly.c -o shelly
shelly.c: In function 'main':
shelly.c:66:3: warning: implicit declaration of function 'cuserid' [-Wimplicit-f
unction-declaration]
    cuserid(&username[0]);
    ^
shelly.c:321:8: warning: format not a string literal and no format arguments [-W
format-security]
    fprintf(script_file,args[i]);
    ^
shelly.c:410:10: warning: implicit declaration of function 'wait' [-Wimplicit-fu
nction-declaration]
    wait(NULL); /* same as waitpid(-1, NULL, 0) */
    ^
cp shelly /usr/bin
rm -f shelly search whispers
eren@eren-N551JW:~/comp304/project1/elimon15-mbicer14$ shelly
shelly>pwd > demo01.txt
shelly>echo "hello"
"hello"
shelly>echo "testing" > demo01.txt
shelly>
```

```
demo01.txt (~/.comp304/project1/elimon15-mbicer14) - gedit
Open Save
"testing"
"line2"
```

```
eren@eren-N551JW: ~/comp304/project1/elimon15-mbicer14
whispers.c: In function 'main':
whispers.c:37:19: warning: comparison between pointer and integer
    if(message[i] == NULL){
                   ^
cp whispers /usr/bin
gcc shelly.c -o shelly
shelly.c: In function 'main':
shelly.c:66:3: warning: implicit declaration of function 'cuserid' [-Wimplicit-f
unction-declaration]
    cuserid(&username[0]);
    ^
shelly.c:321:8: warning: format not a string literal and no format arguments [-W
format-security]
    fprintf(script_file,args[i]);
    ^
shelly.c:410:10: warning: implicit declaration of function 'wait' [-Wimplicit-fu
nction-declaration]
    wait(NULL); /* same as waitpid(-1, NULL, 0) */
    ^
cp shelly /usr/bin
rm -f shelly search whispers
eren@eren-N551JW:~/comp304/project1/elimon15-mbicer14$ shelly
shelly>pwd > demo01.txt
shelly>echo "hello"
"hello"
shelly>echo "testing" > demo01.txt
shelly>echo "line2" >> demo01.txt
shelly>
```

Part 3

We have implemented bookmark method such that it enables users to bookmark their choice of frequently-used commands. We also consider cases which are not stated in project description file such as trying to define a key which is already defined previously or trying to define a key without a command.

Bookmark test output;

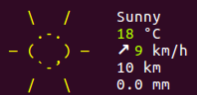
```
samed@samed-VirtualBox:~$ shelly
shelly>bookmark
Please provide valid bookmark name or command
shelly>bookmark test
Please provide valid bookmark name or command
shelly>bookmark alpha "pwd"
shelly>bookmark alpha "ls -l -a"
There is already a bookmark entry with specified key "alpha".
Please specify another key for your bookmark.
shelly>alpha
/home/samed
shelly>bookmark -r alpha
shelly>alpha
shelly>bookmark alpha "ls -l -a"
shelly>alpha
total 164
drwxr-xr-x 22 samed samed 4096 Mar 21 10:59 .
drwxr-xr-x  3 root  root  4096 Mar 17 13:45 ..
-rw-r--r--  1 samed samed 17306 Mar 21 17:30 .bash_history
-rw-r--r--  1 samed samed  220 Mar 17 13:45 .bash_logout
-rw-r--r--  1 samed samed 3771 Mar 17 13:45 .bashrc
drwx----- 17 samed samed 4096 Mar 21 11:28 .cache
drwxr-xr-x  3 samed samed 4096 Mar 17 14:41 .codeblocks
drwx-----  3 samed samed 4096 Mar 17 14:35 .compiz
drwx----- 21 samed samed 4096 Mar 21 17:25 .config
drwx-----  3 root  root  4096 Mar 20 16:28 .dbus
drwxr-xr-x  4 samed samed 4096 Mar 21 11:57 Desktop
-rw-r--r--  1 samed samed  25 Mar 17 13:48 .dmrc
drwxr-xr-x  2 samed samed 4096 Mar 17 13:48 Documents
drwxr-xr-x  4 samed samed 4096 Mar 19 02:26 Downloads
-rw-r--r--  1 samed samed 8980 Mar 17 13:45 examples.desktop
drwx-----  3 samed samed 4096 Mar 18 07:01 .gconf
drwx-----  3 samed samed 4096 Mar 21 10:45 .gnupg
drwx-----  2 root  root  4096 Mar 20 22:53 .gvfs
-rw-r--r--  1 samed samed 2506 Mar 21 10:45 .ICEauthority
drwx-----  3 samed samed 4096 Mar 17 13:48 .local
drwx-----  5 samed samed 4096 Mar 19 02:35 .mozilla
drwxr-xr-x  2 samed samed 4096 Mar 17 13:48 Music
-rw-rw-r--  1 samed samed  17 Mar 21 17:37 .mybookmarks
drwxrwxr-x  2 samed samed 4096 Mar 19 23:12 .nano
drwxr-xr-x  2 samed samed 4096 Mar 17 13:48 Pictures
-rw-r--r--  1 samed samed  655 Mar 17 13:45 .profile
-rw-rw-r--  1 samed samed  43 Mar 20 22:47 program.txt
drwxr-xr-x  2 samed samed 4096 Mar 17 13:48 Public
-rw-rw-r--  1 samed samed  66 Mar 19 23:12 .selected_editor
drwx-----  2 samed samed 4096 Mar 17 22:21 .ssh
-rw-r--r--  1 samed samed  0 Mar 17 14:52 .sudo_as_admin_successful
drwxr-xr-x  2 samed samed 4096 Mar 17 13:48 Templates
drwxr-xr-x  2 samed samed 4096 Mar 17 13:48 Videos
-rw-r--r--  1 samed samed  61 Mar 21 10:45 .Xauthority
-rw-r--r--  1 samed samed 308 Mar 21 10:45 .xsession-errors
-rw-r--r--  1 samed samed 308 Mar 20 22:54 .xsession-errors.old
shelly>bookmark -r alpha
shelly>alpha
shelly>exit
samed@samed-VirtualBox:~$
```

Second method we implemented in shelly is wforecast. It creates a cron job to print weather forecast image from “wttr.in/Istanbul” to user specified file in user’s desktop[defined as default by us].





We first copy current cron jobs to a buffer file, after that we append our wforecast cron job to buffer file. Finally, we replace cron job list with our buffer file.

Wforecast test output;

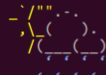
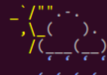
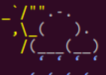
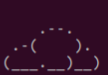
```
samed@samed-VirtualBox:~$ shelly
shelly>curl wttr.in/Istanbul
Weather report: Istanbul, Turkey


Sunny
18 °C
↗ 9 km/h
10 km
0.0 mm


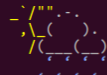
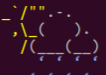
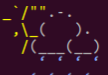


| Wed 21 Mar                                                                                                                                          |                                                                                                                                                     |                                                                                                                                                  |                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Morning                                                                                                                                             | Noon                                                                                                                                                | Evening                                                                                                                                          | Night                                                                                                                                              |
|  Partly cloudy<br>12-13 °C<br>↗ 18-28 km/h<br>19 km<br>0.0 mm   0% |  Partly cloudy<br>15-16 °C<br>↗ 19-30 km/h<br>18 km<br>0.0 mm   0% |  Partly cloudy<br>16 °C<br>↗ 19-36 km/h<br>19 km<br>0.0 mm   0% |  Partly cloudy<br>14 °C<br>↗ 18-31 km/h<br>16 km<br>0.0 mm   0% |



| Thu 22 Mar                                                                                                                                              |                                                                                                                                                          |                                                                                                                                                         |                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Morning                                                                                                                                                 | Noon                                                                                                                                                     | Evening                                                                                                                                                 | Night                                                                                                                                         |
|  Patched rain po...<br>5-9 °C<br>↗ 38-49 km/h<br>12 km<br>1.9 mm   84% |  Patched rain po...<br>6-10 °C<br>↗ 39-49 km/h<br>17 km<br>0.1 mm   73% |  Patched rain po...<br>4-9 °C<br>↗ 41-53 km/h<br>18 km<br>0.0 mm   23% |  Cloudy<br>4-7 °C<br>↗ 38-50 km/h<br>19 km<br>0.1 mm   46% |



| Fri 23 Mar                                                                                                                                             |                                                                                                                                                             |                                                                                                                                                             |                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Morning                                                                                                                                                | Noon                                                                                                                                                        | Evening                                                                                                                                                     | Night                                                                                                                                                         |
|  Partly cloudy<br>10-12 °C<br>↗ 13-18 km/h<br>17 km<br>0.2 mm   49% |  Patched rain po...<br>14-15 °C<br>↗ 23-36 km/h<br>15 km<br>0.0 mm   27% |  Patched rain po...<br>13-15 °C<br>↗ 23-39 km/h<br>16 km<br>0.3 mm   72% |  Patched rain po...<br>12-13 °C<br>↗ 17-30 km/h<br>16 km<br>0.9 mm   79% |



New feature: multilingual location names wttr.in/станция+Восток (in UTF-8) and location search wttr.in/~Kilimanjaro (just add ~ before)
Follow @igor_chubin for wttr.in updates
shelly>crontab -l
no crontab for samed
shelly>wforecast wforecast_test.png
no crontab for samed
shelly>crontab -l
0 9 * * * /usr/bin/curl wttr.in/Istanbul.png >> /home/samed/Desktop/wforecast_test.png
shelly>exit
samed@samed-VirtualBox:~$
```

As a custom command we have chosen to implement search feature of an OS using directory streams. We traverse directories by depth first search algorithm. When the searched file found, method returns its directory. This method is implemented using primitives, note that no built-in command that shows the directory of a file is used.

Custom command “search” test output;

```
shelly>search chap02
/home/comp410/chap02
shelly>search Angel.h
/home/workspace/sampleapp3/Angel.h
shelly>search NonExistingFile
/home/ is searched, but could not found.
shelly>
```

Part 4

As described project description file, we create a message queue and n (character size of string given by user) child processes. Each child reads from queue and writes back to queue with one character appended to message read. After last child append the last character, the parent process prints out the last message.

Chinese whispers test output;

```
shelly>whispers TheQuickBrownFoxJumpsOverTheLazyDogZZZ
ThfQuidkCsoxnGoxJumqsOwesTieMbazEogZAA
shelly>whispers TheQuickBrownFoxJumpsOverTheLazyDogZZZ
TifQvjckCspwoGpxKunptOvfsTieMbayDphAZA
shelly>whispers SomeBoringSentence
TpmfBpsjnhSeotfocf
shelly>whispers AAAAAAAAAA
ABBABBABB
shelly>
```