

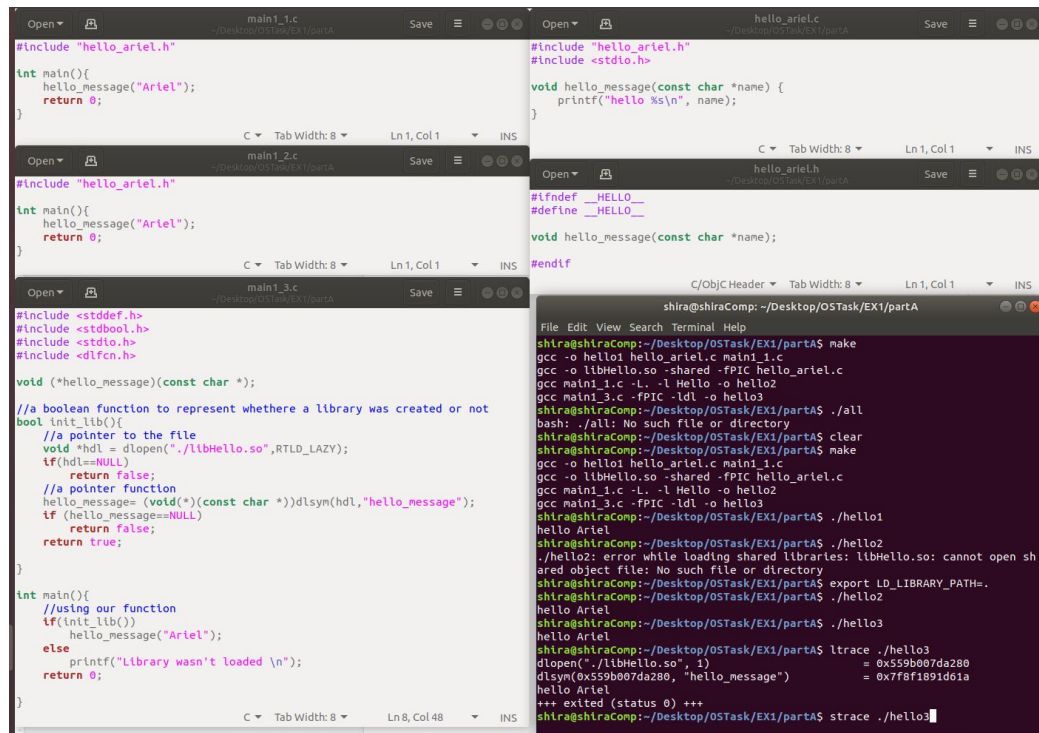
מטלה 1 - מערכות הפעלה

מגישות

208645705_302313184

חלק א':

ביצענו צילום מסך של כל קבצי ה-SOURCE שלנו.
וכן צילום מסך של הטרימינל בו מתבצעות כל הפקודות הנדרשות.
להלן הצילומים:



```
#include "hello_ariel.h"

int main(){
    hello_message("Ariel");
    return 0;
}
```

```
#include "hello_ariel.h"

int main(){
    hello_message("Ariel");
    return 0;
}
```

```
#include <stddef.h>
#include <stdbool.h>
#include <stdio.h>
#include <fcntl.h>

void (*hello_message)(const char *);

//a boolean function to represent whether a library was created or not
bool init_lib(){
    //a pointer to the file
    void *hdl = dlopen("./libHello.so", RTLD_LAZY);
    if(hdl==NULL)
        return false;
    //a pointer function
    hello_message = (void*)(const char *)dlsym(hdl, "hello_message");
    if (hello_message==NULL)
        return false;
    return true;
}

int main(){
    //using our function
    if(init_lib())
        hello_message("Ariel");
    else
        printf("Library wasn't loaded \n");
    return 0;
}
```

```
#include "hello_ariel.h"
#include <stdio.h>

void hello_message(const char *name) {
    printf("hello %s\n", name);
}
```

```
#ifndef __HELLO__
#define __HELLO__

void hello_message(const char *name);

#endif
```

```
shira@shiraComp: ~/Desktop/OSTask/EX1/partA
File Edit View Search Terminal Help
shira@shiraComp:~/Desktop/OSTask/EX1/partA$ make
gcc -o hello1 hello_ariel.c main1_1.c
gcc -o libHello.so -shared -fPIC hello_ariel.c
gcc main1_1.c -L. -l Hello -o hello2
gcc main1_3.c -fPIC -ldl -o hello3
shira@shiraComp:~/Desktop/OSTask/EX1/partA$ ./all
bash: ./all: No such file or directory
shira@shiraComp:~/Desktop/OSTask/EX1/partA$ clear
shira@shiraComp:~/Desktop/OSTask/EX1/partA$ make
gcc -o hello1 hello_ariel.c main1_1.c
gcc -o libHello.so -shared -fPIC hello_ariel.c
gcc main1_1.c -L. -l Hello -o hello2
gcc main1_3.c -fPIC -ldl -o hello3
shira@shiraComp:~/Desktop/OSTask/EX1/partA$ ./hello1
hello Ariel
shira@shiraComp:~/Desktop/OSTask/EX1/partA$ ./hello2
./hello2: error while loading shared libraries: libHello.so: cannot open sh
ared object file: No such file or directory
shira@shiraComp:~/Desktop/OSTask/EX1/partA$ export LD_LIBRARY_PATH=.
shira@shiraComp:~/Desktop/OSTask/EX1/partA$ ./hello2
hello Ariel
shira@shiraComp:~/Desktop/OSTask/EX1/partA$ ./hello3
hello Ariel
shira@shiraComp:~/Desktop/OSTask/EX1/partA$ ltrace ./hello3
dlopen("./libHello.so", 1)          = 0x559b007da280
dlsym(0x559b007da280, "hello_message") = 0x7f8f1891d61a
hello Ariel
+++ exited (status 0) +++
shira@shiraComp:~/Desktop/OSTask/EX1/partA$ strace ./hello3
```

```

main1_1.c
#include "hello_ariel.h"

int main(){
    hello_message("Ariel");
    return 0;
}

main1_2.c
#include "hello_ariel.h"

int main(){
    hello_message("Ariel");
    return 0;
}

main1_3.c
#include <stddef.h>
#include <stdbool.h>
#include <stdio.h>
#include <dlfcn.h>

void (*hello_message)(const char *);

//a boolean function to represent whethere a library was created or not
bool init_lib(){
    //a pointer to the file
    void *hdl = dlopen("./libHello.so", RTLD_LAZY);
    if(hdl==NULL)
        return false;
    //a pointer function
    hello_message= (void*)(const char *)dlsym(hdl, "hello_message");
    if (hello_message==NULL)
        return false;
    return true;
}

int main(){
    //using our function
    if(init_lib())
        hello_message("Ariel");
    else
        printf("Library wasn't loaded \n");
    return 0;
}

hello_ariel.c
#include "hello_ariel.h"
#include <stdio.h>

void hello_message(const char *name) {
    printf("hello %s\n", name);
}

hello_ariel.h
#ifndef __HELLO__
#define __HELLO__

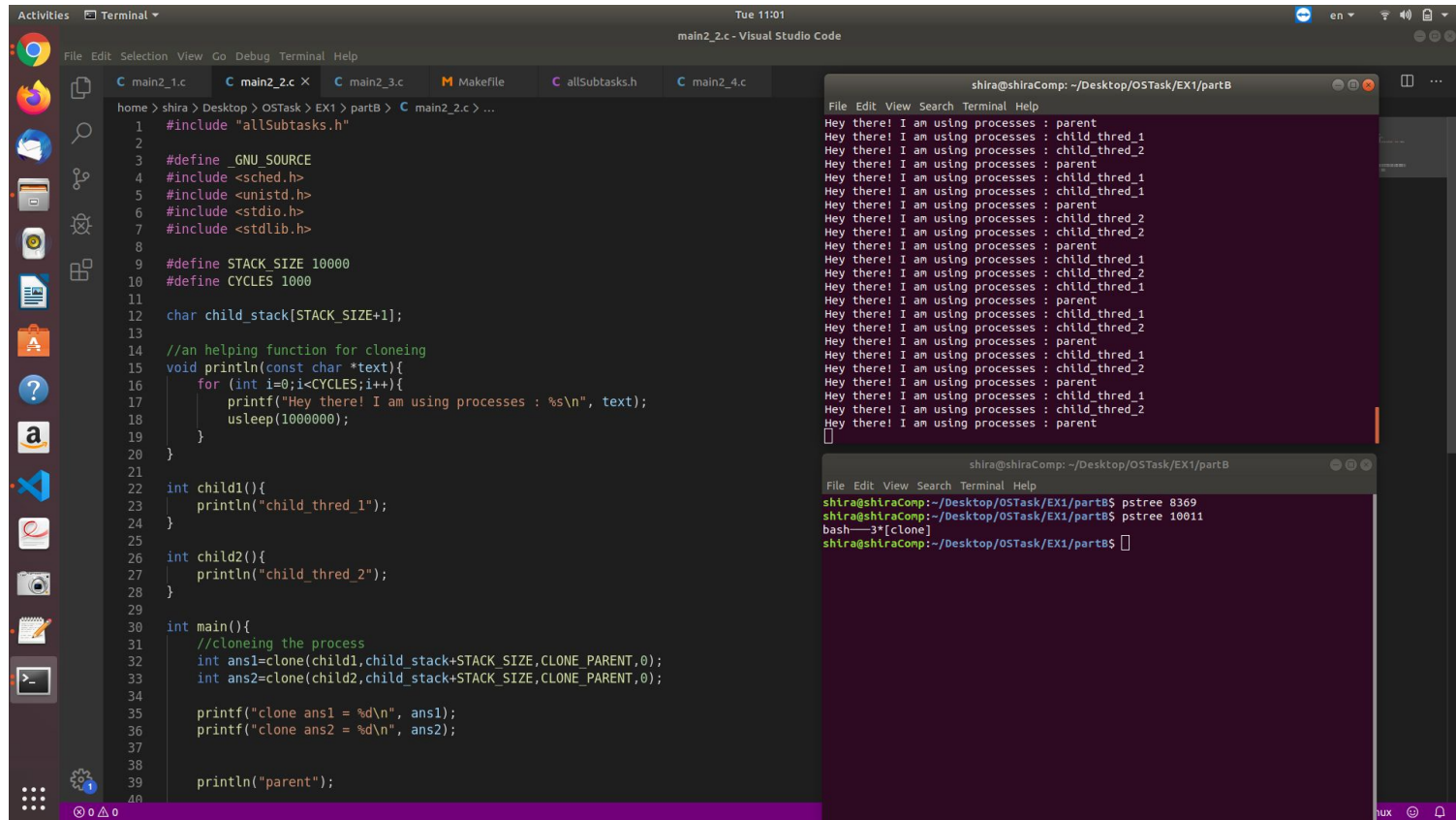
void hello_message(const char *name);

#endif

shira@shiraComp: ~/Desktop/OSTask/EX1/partA
File Edit View Search Terminal Help
hello Ariel
+++ exited (status 0) +++
shira@shiraComp:~/Desktop/OSTask/EX1/partA$ strace ./hello3
execve("./hello3", ["/.hello3"], 0x7fff007db250 /* 58 vars */) = 0
brk(NULL)                               = 0x55e93763e000
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or direct
ory)
access("/etc/ld.so.preload", R_OK)      = -1 ENOENT (No such file or direct
ory)
openat(AT_FDCWD, "/tls/haswell/x86_64/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1
ENOENT (No such file or directory)
openat(AT_FDCWD, "/tls/haswell/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOEN
T (No such file or directory)
openat(AT_FDCWD, "/tls/x86_64/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT
(No such file or directory)
openat(AT_FDCWD, "/tls/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No su
ch file or directory)
openat(AT_FDCWD, "/.haswell/x86_64/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 EN
OENT (No such file or directory)
openat(AT_FDCWD, "/.haswell/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (N
o such file or directory)
openat(AT_FDCWD, "/x86_64/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No
such file or directory)
openat(AT_FDCWD, "/libdl.so.2", O_RDONLY|O_CLOEXEC) = -1 ENOENT (No such f
ile or directory)
openat(AT_FDCWD, "/etc/ld.so.cache", O_RDONLY|O_CLOEXEC) = 3
fstat(3, {st_mode=S_IFREG|0644, st_size=95363, ...}) = 0
mmap(NULL, 95363, PROT_READ, MAP_PRIVATE, 3, 0) = 0x7f471d3d3000
close(3)                                = 0
access("/etc/ld.so.nohwcap", F_OK)      = -1 ENOENT (No such file or direct

```


Subtask2: clone

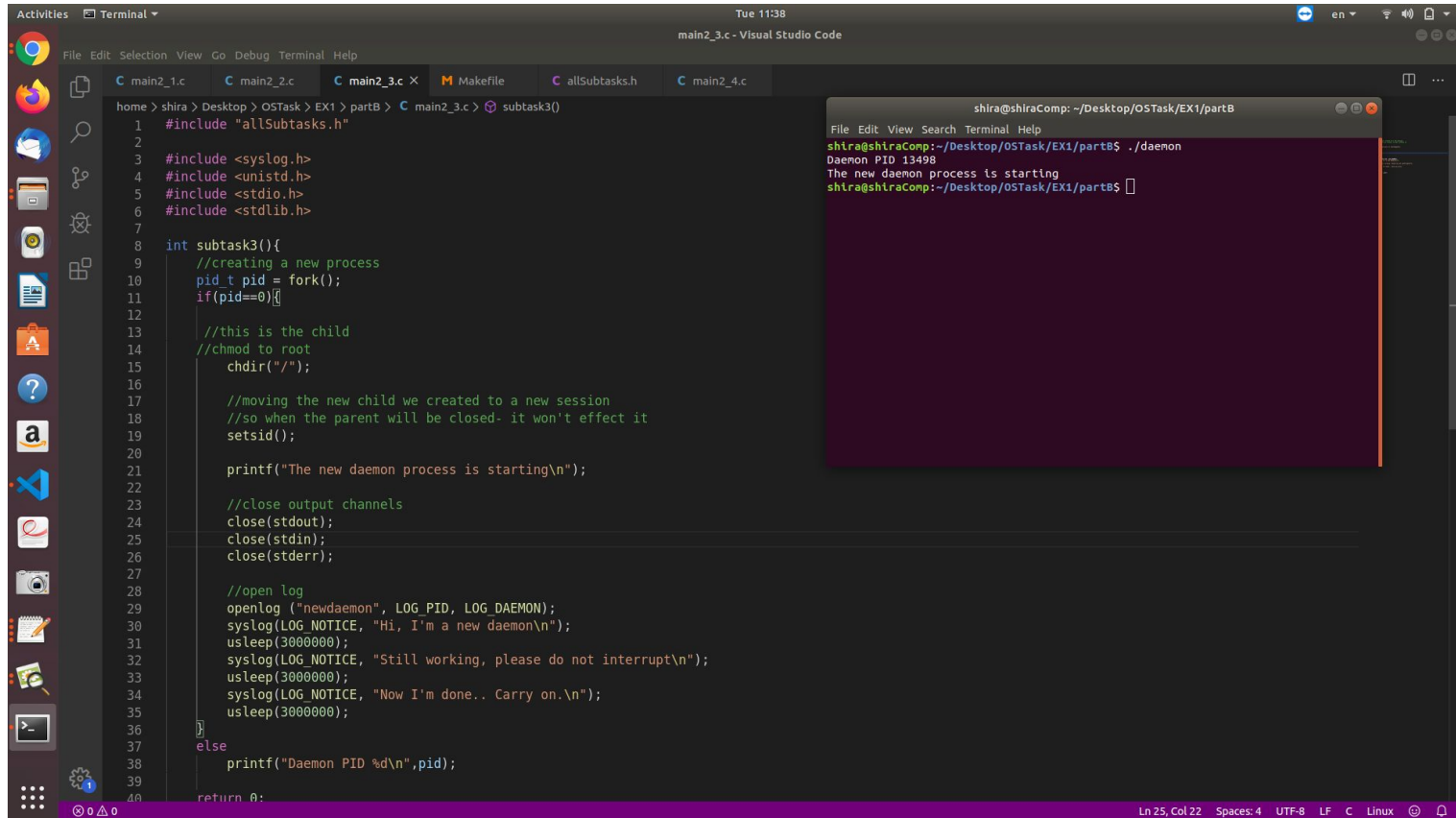


The image shows a Visual Studio Code editor window with a C program named `main2_2.c` open. The program is designed to demonstrate process cloning using `clone()`. It includes headers for `unistd.h`, `stdio.h`, and `stdlib.h`. It defines `STACK_SIZE` as 10000 and `CYCLES` as 1000. The program creates two child processes, `child1` and `child2`, each printing their thread ID and sleeping for 10000000 units. The main function clones these children and prints the return values of `clone()`.

```
1 #include "allSubtasks.h"
2
3 #define _GNU_SOURCE
4 #include <sched.h>
5 #include <unistd.h>
6 #include <stdio.h>
7 #include <stdlib.h>
8
9 #define STACK_SIZE 10000
10 #define CYCLES 1000
11
12 char child_stack[STACK_SIZE+1];
13
14 //an helping function for cloneing
15 void println(const char *text){
16     for (int i=0;i<CYCLES;i++){
17         printf("Hey there! I am using processes : %s\n", text);
18         usleep(10000000);
19     }
20 }
21
22 int child1(){
23     println("child_thred_1");
24 }
25
26 int child2(){
27     println("child_thred_2");
28 }
29
30 int main(){
31     //cloneing the process
32     int ans1=clone(child1,child_stack+STACK_SIZE,CLONE_PARENT,0);
33     int ans2=clone(child2,child_stack+STACK_SIZE,CLONE_PARENT,0);
34
35     printf("clone ans1 = %d\n", ans1);
36     printf("clone ans2 = %d\n", ans2);
37
38     println("parent");
39
40 }
```

Two terminal windows are open. The top terminal shows the output of the program, displaying "Hey there! I am using processes : parent" followed by multiple "Hey there! I am using processes : child_thred_1" and "Hey there! I am using processes : child_thred_2" messages. The bottom terminal shows the command `ps -ef | grep clone` being executed, resulting in the output: `shira@shiraComp: ~/Desktop/OSTask/EX1/partB$ ps -ef | grep clone`.

Subtask3: daemon



```
home > shira > Desktop > OSTask > EX1 > partB > C main2_3.c > subtask3()
1  #include "allSubtasks.h"
2
3  #include <syslog.h>
4  #include <unistd.h>
5  #include <stdio.h>
6  #include <stdlib.h>
7
8  int subtask3(){
9      //creating a new process
10     pid_t pid = fork();
11     if(pid==0){
12
13         //this is the child
14         //chmod to root
15         chdir("/");
16
17         //moving the new child we created to a new session
18         //so when the parent will be closed- it won't effect it
19         setsid();
20
21         printf("The new daemon process is starting\n");
22
23         //close output channels
24         close(stdout);
25         close(stdin);
26         close(stderr);
27
28         //open log
29         openlog ("newdaemon", LOG_PID, LOG_DAEMON);
30         syslog(LOG_NOTICE, "Hi, I'm a new daemon\n");
31         usleep(3000000);
32         syslog(LOG_NOTICE, "Still working, please do not interrupt\n");
33         usleep(3000000);
34         syslog(LOG_NOTICE, "Now I'm done.. Carry on.\n");
35         usleep(3000000);
36     }
37     else
38         printf("Daemon PID %d\n",pid);
39
40     return 0;
}
```

```
shira@shiraComp: ~/Desktop/OSTask/EX1/partB
File Edit View Search Terminal Help
shira@shiraComp:~/Desktop/OSTask/EX1/partB$ ./daemon
Daemon PID 13498
The new daemon process is starting
shira@shiraComp:~/Desktop/OSTask/EX1/partB$
```

Ln 25, Col 22 Spaces: 4 UTF-8 LF C Linux

Subtask4: all

The screenshot displays the Visual Studio Code interface with a C program in the editor and its execution output in the terminal.

Editor Content (main2_4.c):

```
17 }
18 }
19
20 void t_clone(){
21     char* args[2]= {"../clone",NULL};
22     execvp(args[0],args);
23 }
24
25 void t_daemon(){
26     char* args[2]= {"../daemon",NULL};
27     execvp(args[0],args);
28 }
29
30
31 int main(){
32     pid_t pid1 = fork();
33     printf("pid is: %d",pid1);
34     if(pid1==0) {
35         char* args[2] = {"../fork",NULL};
36         int result = clone(t_clone,child_stack+STACK_SIZE,CLONE_PARENT,0);
37         execvp(args[0],args);
38     }
39
40
41     else{
42         pid_t pid2 = fork();
43         if(pid2==0) {
44             t_daemon();
45         }
46         println("parent");
47     }
48
49     return 0;
50 }
```

Terminal Output (shira@shiraComp: ~/Desktop/OSTask/EX1/partB):

```
Hey there! I am using processes : grand child
Hey there! I am using processes : child_thred_2
Hey there! I am using processes : parent
Hey there! I am using processes : parent
Hey there! I am using processes : parent
Hey there! I am using processes : child
Hey there! I am using processes : grand child
Hey there! I am using processes : child_thred_1
Hey there! I am using processes : child_thred_2
Hey there! I am using processes : parent
Hey there! I am using processes : parent
Hey there! I am using processes : parent
Hey there! I am using processes : child
Hey there! I am using processes : grand child
Hey there! I am using processes : child_thred_1
Hey there! I am using processes : child_thred_2
Hey there! I am using processes : parent
Hey there! I am using processes : parent
Hey there! I am using processes : parent
Hey there! I am using processes : child
Hey there! I am using processes : grand child
Hey there! I am using processes : child_thred_1
Hey there! I am using processes : child_thred_2
[]
```

Terminal Output (shira@shiraComp: ~/Desktop/OSTask/EX1/partB):

```
shira@shiraComp:~/Desktop/OSTask/EX1/partB$ pstree 19633
bash--all--3*[clone]
      |
      +--daemon
            |
            +--fork--fork
shira@shiraComp:~/Desktop/OSTask/EX1/partB$
```

The status bar at the bottom indicates: Ln 42, Col 29 Spaces: 4 UTF-8 LF C Linux.

End!

