



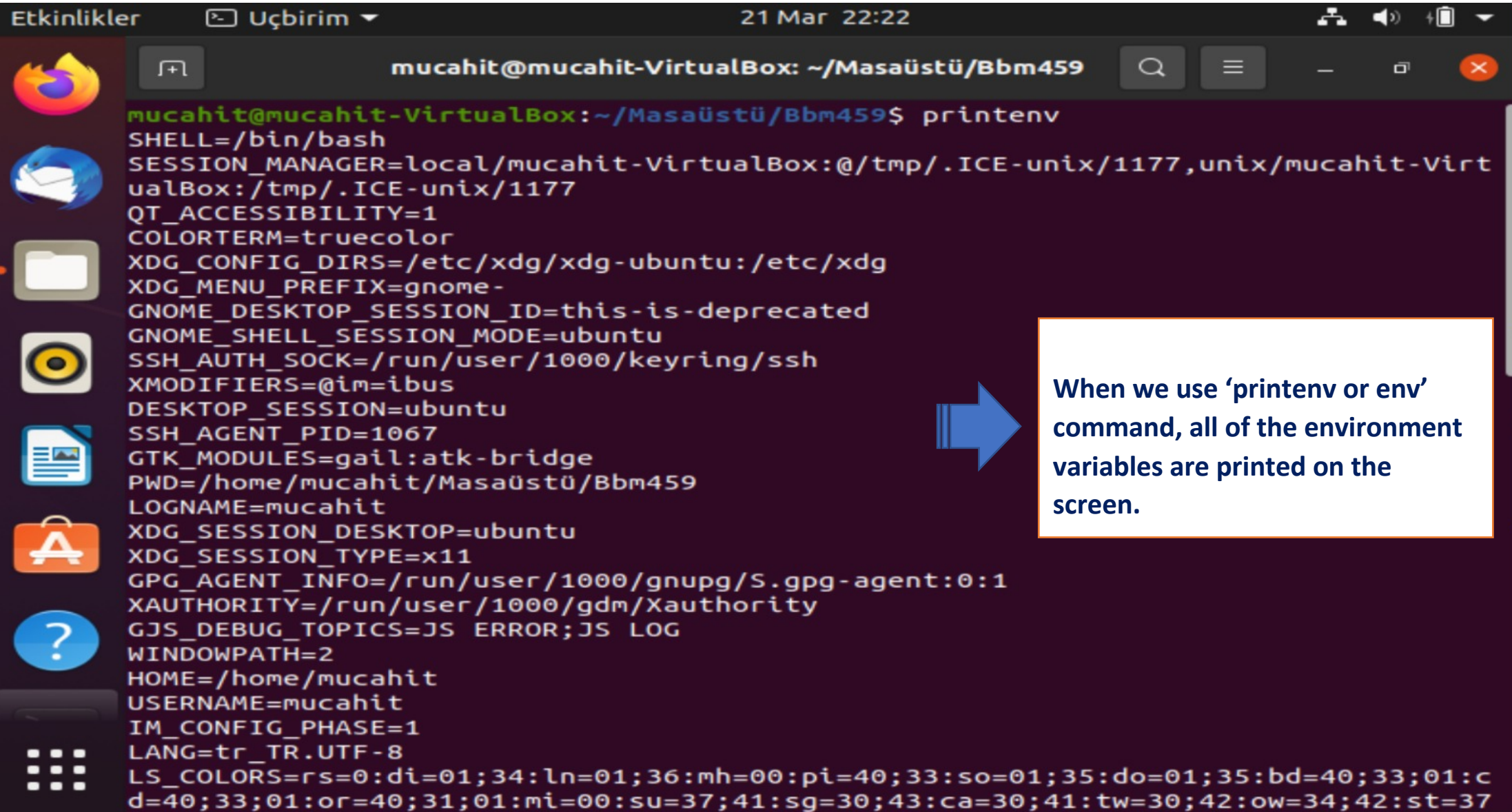
BBM459 PROJECT1

21605893 Mücahit Veli CUMART

21726875 Yunus Emre AKGÜN

Task1: Manipulating Environment Variables

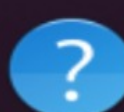
In this task, we have learned some bash commands about printing and manipulating the environment variables. These commands are printenv, env, printenv <nam>, env | grep <name>, export, unset, and echo. The screenshots of our working are below.



The screenshot shows a terminal window titled "mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459". The terminal displays the output of the command "printenv". The output lists various environment variables and their values, such as SHELL=/bin/bash, SESSION_MANAGER=local/mucahit-VirtualBox:~/tmp/.ICE-unix/1177, and HOME=/home/mucahit. A blue arrow points from the text box on the right to the terminal output.

```
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ printenv
SHELL=/bin/bash
SESSION_MANAGER=local/mucahit-VirtualBox:~/tmp/.ICE-unix/1177,unix/mucahit-VirtualBox:~/tmp/.ICE-unix/1177
QT_ACCESSIBILITY=1
COLORTERM=truecolor
XDG_CONFIG_DIRS=/etc/xdg/xdg-ubuntu:/etc/xdg
XDG_MENU_PREFIX=gnome-
GNOME_DESKTOP_SESSION_ID=this-is-deprecated
GNOME_SHELL_SESSION_MODE=ubuntu
SSH_AUTH_SOCK=/run/user/1000/keyring/ssh
XMODIFIERS=@im=ibus
DESKTOP_SESSION=ubuntu
SSH_AGENT_PID=1067
GTK_MODULES=gail:atk-bridge
PWD=/home/mucahit/Masaüstü/Bbm459
LOGNAME=mucahit
XDG_SESSION_DESKTOP=ubuntu
XDG_SESSION_TYPE=x11
GPG_AGENT_INFO=/run/user/1000/gnupg/S.gpg-agent:0:1
XAUTHORITY=/run/user/1000/gdm/Xauthority
GJS_DEBUG_TOPICS=JS ERROR;JS LOG
WINDOWPATH=2
HOME=/home/mucahit
USERNAME=mucahit
IM_CONFIG_PHASE=1
LANG=tr_TR.UTF-8
LS_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=00:su=37;41:sg=30;43:ca=30;41:tw=30;42:ow=34;42:st=37
```

When we use 'printenv or env' command, all of the environment variables are printed on the screen.



mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459



```
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ env | grep PWD
```

```
PWD=/home/mucahit/Masaüstü/Bbm459
```

```
OLDPWD=/home/mucahit/Masaüstü
```

```
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ printenv PWD
```

```
/home/mucahit/Masaüstü/Bbm459
```

```
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ printenv
```

```
SHELL=/bin/bash
```

```
SESSION_MANAGER=local/mucahit-VirtualBox:@/tmp/.ICE-unix/1177,unix/mucahit-VirtualBox:/tmp/.ICE-unix/1177
```

```
QT_ACCESSIBILITY=1
```

```
COLORTERM=truecolor
```

```
XDG_CONFIG_DIRS=/etc/xdg/xdg-ubuntu:/etc/xdg
```

```
XDG_MENU_PREFIX=gnome-
```

```
GNOME_DESKTOP_SESSION_ID=this-is-deprecated
```

```
GNOME_SHELL_SESSION_MODE=ubuntu
```

```
SSH_AUTH_SOCK=/run/user/1000/keyring/ssh
```

```
XMODIFIERS=@im=ibus
```

```
DESKTOP_SESSION=ubuntu
```

```
SSH_AGENT_PID=1067
```

```
GTK_MODULES=gail:atk-bridge
```

```
PWD=/home/mucahit/Masaüstü/Bbm459
```

```
LOGNAME=mucahit
```

```
XDG_SESSION_DESKTOP=ubuntu
```

```
XDG_SESSION_TYPE=x11
```

```
GPG_AGENT_INFO=/run/user/1000/gnupg/S.gpg-agent:0:1
```

```
XAUTHORITY=/run/user/1000/gdm/Xauthority
```

```
GJS_DEBUG_TOPICS=JS ERROR;JS LOG
```

```
WINDOWPATH=2
```

```
HOME=/home/mucahit
```



We can see all of the environment variables containing the word specified when we use the command 'env | grep <name>'. Also, We can see the value of the environment variable we specified when we use the command 'printenv <name>'.



mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459

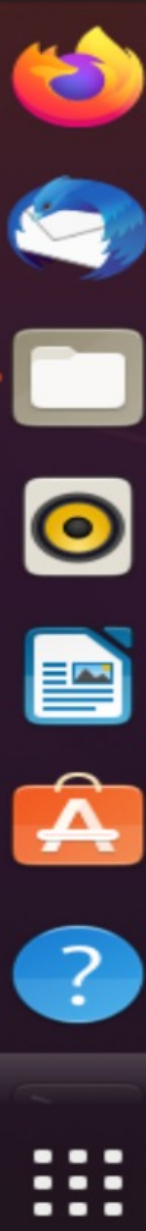


```
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ variable="BBM459 Project1"
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ echo $variable
BBM459 Project1
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ unset variable
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ echo $variable

mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ export variable2="Project1 BBM459"
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ echo $variable2
Project1 BBM459
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ printenv
SHELL=/bin/bash
SESSION_MANAGER=local/mucahit-VirtualBox:@/tmp/.ICE-unix/1177,unix/mucahit-Virt
ualBox:/tmp/.ICE-unix/1177
QT_ACCESSIBILITY=1
COLORTERM=truecolor
XDG_CONFIG_DIRS=/etc/xdg/xdg-ubuntu:/etc/xdg
XDG_MENU_PREFIX=gnome-
GNOME_DESKTOP_SESSION_ID=this-is-deprecated
GNOME_SHELL_SESSION_MODE=ubuntu
SSH_AUTH_SOCK=/run/user/1000/keyring/ssh
XMODIFIERS=@im=ibus
DESKTOP_SESSION=ubuntu
SSH_AGENT_PID=1067
GTK_MODULES=gail:atk-bridge
PWD=/home/mucahit/Masaüstü/Bbm459
LOGNAME=mucahit
XDG_SESSION_DESKTOP=ubuntu
XDG_SESSION_TYPE=x11
```



If we use the command 'export <variable>=<value>', we can add to environment a new variable.



```
mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459
LOGNAME=mucahit
XDG_SESSION_DESKTOP=ubuntu
XDG_SESSION_TYPE=x11
GPG_AGENT_INFO=/run/user/1000/gnupg/5.gpg-agent:0:1
XAUTHORITY=/run/user/1000/gdm/Xauthority
GJS_DEBUG_TOPICS=JS ERROR;JS LOG
WINDOWPATH=2
HOME=/home/mucahit
USERNAME=mucahit
IM_CONFIG_PHASE=1
LANG=tr_TR.UTF-8
LS_COLORS=rs=0:di=01;34:ln=01;36:mh=00:pi=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=00:su=37;41:sg=30;43:ca=30;41:tw=30;42:ow=34;42:st=37;44:ex=01;32:*.tar=01;31:*.tgz=01;31:*.arc=01;31:*.arj=01;31:*.taz=01;31:*.lha=01;31:*.lz4=01;31:*.lzh=01;31:*.lzma=01;31:*.t=01;31:*.txz=01;31:*.tzo=01;31:*.t7z=01;31:*.zip=01;31:*.z=01;31:*.dz=01;31:*.gz=01;31:*.lrz=01;31:*.lz=01;31:*.lzo=01;31:*.xz=01;31:*.zst=01;31:*.tzt=01;31:*.bz2=01;31:*.bz=01;31:*.tbz=01;31:*.tbz2=01;31:*.tz=01;31:*.deb=01;31:*.rpm=01;31:*.jar=01;31:*.war=01;31:*.ear=01;31:*.sar=01;31:*.rar=01;31:*.alz=01;31:*.ace=01;31:*.zoo=01;31:*.cpio=01;31:*.7z=01;31:*.rz=01;31:*.cab=01;31:*.wlm=01;31:*.swm=01;31:*.dwm=01;31:*.e=01;31:*.jpg=01;35:*.jpeg=01;35:*.mjpg=01;35:*.mjpeg=01;35:*.gif=01;35:*.bmp=01;35:*.pbm=01;35:*.pgm=01;35:*.ppm=01;35:*.tga=01;35:*.xbm=01;35:*.xpm=01;35:*.tif=01;35:*.tiff=01;35:*.png=01;35:*.svg=01;35:*.svgz=01;35:*.mng=01;35:*.pcx=01;35:*.mov=01;35:*.mpg=01;35:*.mpeg=01;35:*.m2=01;35:*.mkv=01;35:*.webm=01;35:*.ogm=01;35:*.mp4=01;35:*.m4v=01;35:*.mp4v=01;35:*.vob=01;35:*.qt=01;35:*.nuv=01;35:*.wmv=01;35:*.asf=01;35:*.m=01;35:*.rmvb=01;35:*.flc=01;35:*.avi=01;35:*.fli=01;35:*.flv=01;35:*.gl=01;35:*.dl=01;35:*.xcf=01;35:*.xwd=01;35:*.yuv=01;35:*.cgm=01;35:*.m=01;35:*.ogv=01;35:*.ogx=01;35:*.aac=00;36:*.au=00;36:*.flac=00;36:*.m4a=00;36:*.mid=00;36:*.midi=00;36:*.mka=00;36:*.mp3=00;36:*.mpc=00;36:*.ogg=00;36:*.ra=00;36:*.wav=00;36:*.oga=00;36:*.opus=00;36:*.spx=00;36:*.xspf=00;36:
XDG_CURRENT_DESKTOP=ubuntu:GNOME
VTE_VERSION=6003
GNOME_TERMINAL_SCREEN=/org/gnome/Terminal/screen/f2268aac_f085_4369_a561_9a0475d7160c
INVOCATION_ID=8a9d5366072946409a25bb36c5a8515c
MANAGERPID=678
GJS_DEBUG_OUTPUT=stderr
LESSCLOSE=/usr/bin/lesspipe %s %s
XDG_SESSION_CLASS=user
TERM=xterm-256color
LESSOPEN=| /usr/bin/lesspipe %s
USER=mucahit
GNOME_TERMINAL_SERVICE=:1.104
DISPLAY=:0
SHLVL=1
QT_IM_MODULE=ibus
variable2=Project1 88M459
XDG_RUNTIME_DIR=/run/user/1000
JOURNAL_STREAM=8:27928
XDG_DATA_DIRS=/usr/share/ubuntu:/usr/local/share:/usr/share:/var/lib/snapd/desktop
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
GDMSESSION=ubuntu
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus
OLDPWD=/home/mucahit/Masaüstü
_=/usr/bin/printenv
mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459$
```



After the command 'export ...', we can see the new variable is added to environment.



Task2: Inheriting environment variables from parents

```
#include <unistd.h>
#include <stdio.h>
#include <stdlib.h>

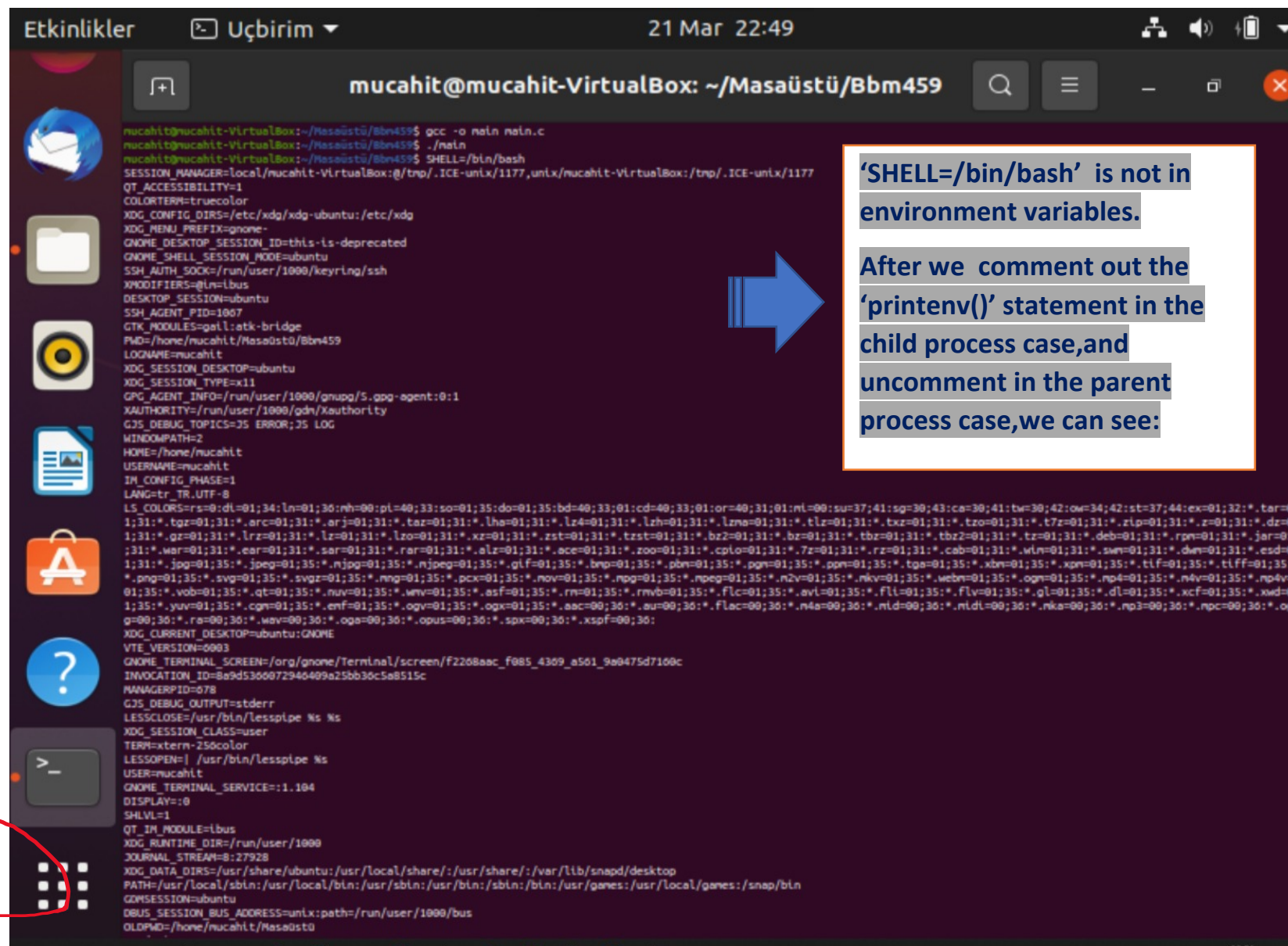
extern char **environ;

void printenv()
{
    int i = 0;
    while (environ[i] != NULL) {
        printf("%s\n", environ[i]);
        i++;
    }
}

void main()
{
    pid_t childPid;

    switch(childPid = fork()) {
        case 0: /* child process */
            printenv();
            exit(0);
        default: /* parent process */
            //printenv();
            exit(0);
    }
}
```

When we compile this program and run, we can see :



'SHELL=/bin/bash' is not in environment variables.

After we comment out the 'printenv()' statement in the child process case, and uncomment in the parent process case, we can see:



mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459



mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459\$./main2

SHELL=/bin/bash

SESSION_MANAGER=local/mucahit-VirtualBox:@/tmp/.ICE-unix/1177,unix/mucahit-VirtualBox:/tmp/.ICE-unix/1177

QT_ACCESSIBILITY=1

COLORTERM=truecolor

XDG_CONFIG_DIRS=/etc/xdg/xdg-ubuntu:/etc/xdg

XDG_MENU_PREFIX=gnome-

GNOME_DESKTOP_SESSION_ID=this-is-deprecated

GNOME_SHELL_SESSION_MODE=ubuntu

SSH_AUTH_SOCK=/run/user/1000/keyring/ssh

XMODIFIERS=@ln=ibus

DESKTOP_SESSION=ubuntu

SSH_AGENT_PID=1067

GTK_MODULES=gail:atk-bridge

PWD=/home/mucahit/Masaüstü/Bbm459

LOGNAME=mucahit

XDG_SESSION_DESKTOP=ubuntu

XDG_SESSION_TYPE=x11

GPG_AGENT_INFO=/run/user/1000/gnupg/S.gpg-agent:0:1

XAUTHORITY=/run/user/1000/gdm/Xauthority

GJS_DEBUG_TOPICS=JS ERROR;JS LOG

WINDOWPATH=2

HOME=/home/mucahit

USERNAME=mucahit

IM_CONFIG_PHASE=1

LANG=tr_TR.UTF-8

LS_COLORS=rs=0:di=01;34:ln=01;36:nh=00:pl=40;33:so=01;35:do=01;35:bd=40;33;01:cd=40;33;01:or=40;31;01:mi=00:su=37;41:sg=30;43:ca=30;41:tw=30;42:ow=34;42:st=37;44:ex=01;32:*.tar=01;31:*.tgz=01;31:*.arc=01;31:*.arj=01;31:*.taz=01;31:*.lha=01;31:*.lzh=01;31:*.lzm=01;31:*.tlz=01;31:*.txz=01;31:*.tzo=01;31:*.t7z=01;31:*.zip=01;31:*.z=01;31:*.dz=01;31:*.gz=01;31:*.lrz=01;31:*.lzo=01;31:*.xz=01;31:*.zst=01;31:*.tztst=01;31:*.bz2=01;31:*.bz=01;31:*.tbz=01;31:*.tbz2=01;31:*.tz=01;31:*.deb=01;31:*.rpm=01;31:*.jar=01;31:*.war=01;31:*.ear=01;31:*.sar=01;31:*.rar=01;31:*.alz=01;31:*.ace=01;31:*.zoo=01;31:*.cpio=01;31:*.7z=01;31:*.rz=01;31:*.cab=01;31:*.wim=01;31:*.swm=01;31:*.dwm=01;31:*.esd=01;31:*.jpg=01;35:*.jpeg=01;35:*.njpg=01;35:*.njpeg=01;35:*.gif=01;35:*.bmp=01;35:*.pbm=01;35:*.pgm=01;35:*.ppm=01;35:*.tga=01;35:*.xbm=01;35:*.xpm=01;35:*.tif=01;35:*.tiff=01;35:*.png=01;35:*.svg=01;35:*.svgz=01;35:*.mng=01;35:*.png=01;35:*.pcx=01;35:*.mov=01;35:*.mpg=01;35:*.mpeg=01;35:*.m2v=01;35:*.mkv=01;35:*.webm=01;35:*.ogm=01;35:*.mp4=01;35:*.m4v=01;35:*.mp4v=01;35:*.vob=01;35:*.qt=01;35:*.nuv=01;35:*.wmv=01;35:*.asf=01;35:*.rm=01;35:*.rmvb=01;35:*.flc=01;35:*.avi=01;35:*.fli=01;35:*.flv=01;35:*.pl=01;35:*.dl=01;35:*.xcf=01;35:*.xwd=01;35:*.yuv=01;35:*.cgm=01;35:*.emf=01;35:*.ogv=01;35:*.ogx=01;35:*.aac=00;30:*.au=00;30:*.flac=00;30:*.n4a=00;30:*.m4a=00;30:*.m4b=00;30:*.m4p=00;30:*.m4r=00;30:*.m4v=00;30:*.oga=00;30:*.opus=00;30:*.spx=00;30:*.xspf=00;30:

XDG_CURRENT_DESKTOP=ubuntu:GNOME

VTE_VERSION=0003

GNOME_TERMINAL_SCREEN=/org/gnome/Terminal/screen/f2268aac_f085_4309_a501_9a9475d7100c

INVOCATION_ID=8a9d5360072946409a25bb36c5a8515c

MANAGERPID=678

GJS_DEBUG_OUTPUT=stderr

LESSCLOSE=/usr/bin/lesspipe %s %s

XDG_SESSION_CLASS=user

TERM=xterm-256color

LESSOPEN=| /usr/bin/lesspipe %s

USER=mucahit

GNOME_TERMINAL_SERVICE=:1.104

DISPLAY=:0

SHLVL=1

QT_IM_MODULE=ibus

XDG_RUNTIME_DIR=/run/user/1000

JOURNAL_STREAM=8:27928

XDG_DATA_DIRS=/usr/share/ubuntu:/usr/local/share/:/usr/share/:/var/lib/snapd/desktop

PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin

GDMSESSION=ubuntu

DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus

OLDPWD=/home/mucahit/Masaüstü

= ./main2



'SHELL=/bin/bash' is in
environment variables.

0 Additions

Real-time

Regular

Split

Unified

Word

Character

Tools ▾

```
mucahit-VirtualBox:~/Masaüstü/Bbm459$ ./main
```

```
mucahit-VirtualBox:~/Masaüstü/Bbm459$ SHELL=/bin/bash
```

```
MANAGER=local/mucahit-VirtualBox:@/tmp/.ICE-unix/1177,unix/mucahit-Virtual
```

```
ICE-unix/1177
```

```
IBILITY=1
```

```
1 mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ ./main
```

```
2 SHELL=/bin/bash
```

```
3 SESSION_MANAGER=local/mucahit-VirtualBox:@/tmp/.ICE-unix/1177,unix/mucahit-Virtual
```

```
Box:/tmp/.ICE-unix/1177
```

```
4 QT_ACCESSIBILITY=1
```

When we check the difference between them, we can see this difference. Actually there are no differences between first and second step

Task3: Environment Variables and “execve()”

This is a simple C program to print out the environment variables of the current process.

When we call this “execve” function with “/usr/bin/env”,argv,Null”, we can not print out the environment variables. But we change the “Null” parameter with “environ” which is a pointer of an adress, we can print out the environment variables. See the screenshots:

This screenshot is the compiling and running of the first case and:

```
#include <stdio.h>
#include <stdlib.h>

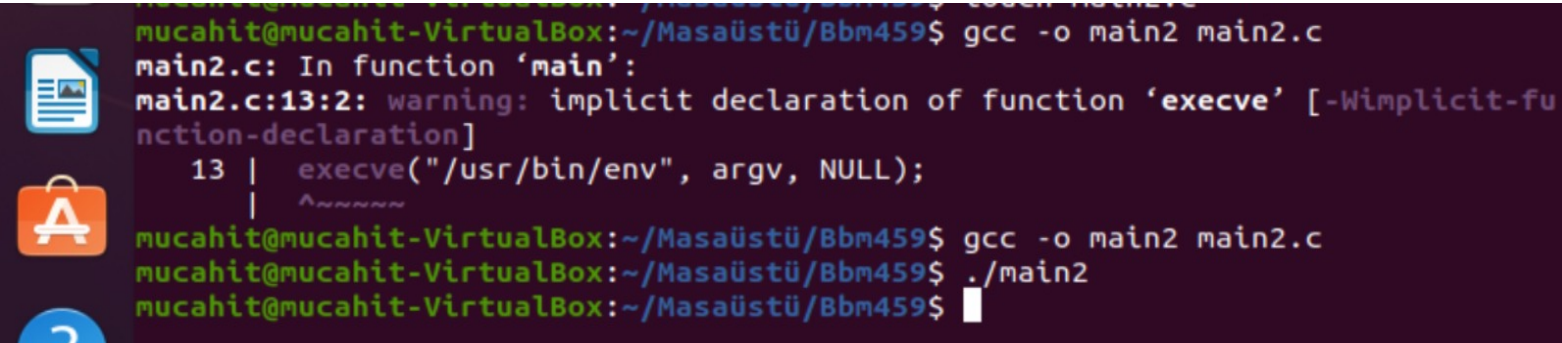
extern char **environ;

int main()
{
    char *argv[2];

    argv[0] = "/usr/bin/env";
    argv[1] = NULL;

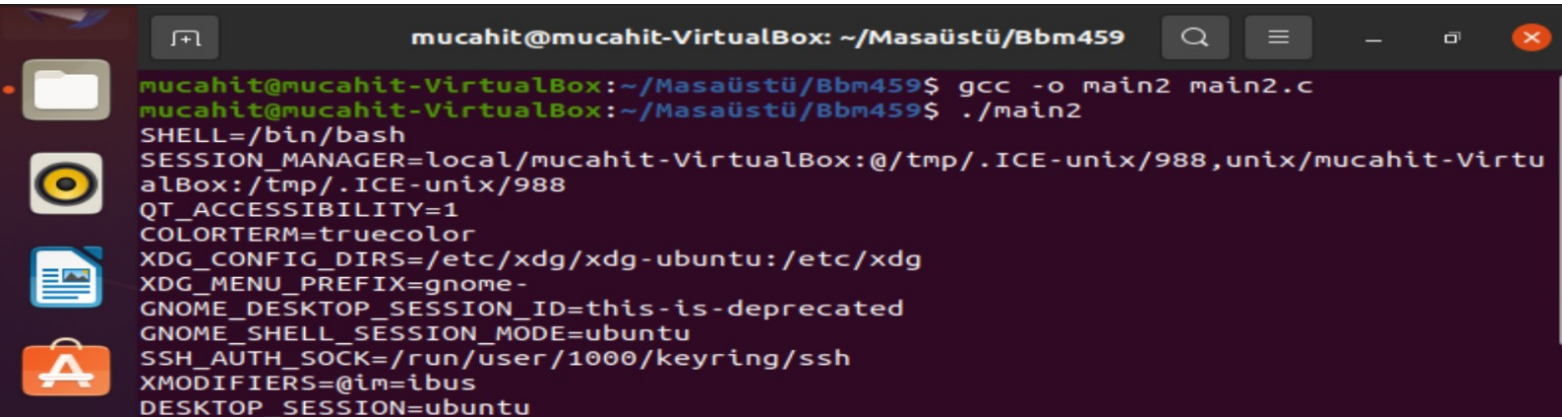
    execve("/usr/bin/env", argv, NULL);

    return 0 ;
}
```

A terminal window with a dark background. The prompt is 'mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459\$'. The first command is 'gcc -o main2 main2.c', which produces a warning: 'main2.c: In function 'main': main2.c:13:2: warning: implicit declaration of function 'execve' [-Wimplicit-function-declaration]'. The second command is 'gcc -o main2 main2.c', which completes successfully. The third command is './main2', which results in a blank line.

```
mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459$ gcc -o main2 main2.c
main2.c: In function 'main':
main2.c:13:2: warning: implicit declaration of function 'execve' [-Wimplicit-function-declaration]
    13 |     execve("/usr/bin/env", argv, NULL);
        |           ^~~~~~
mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459$ gcc -o main2 main2.c
mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459$ ./main2
mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459$
```

This screenshot is the compiling and running of the second case of the

A terminal window with a dark background. The prompt is 'mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459\$'. The first command is 'gcc -o main2 main2.c', which completes successfully. The second command is './main2', which prints out the environment variables.

```
mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459$ gcc -o main2 main2.c
mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459$ ./main2
SHELL=/bin/bash
SESSION_MANAGER=local/mucahit-VirtualBox:@/tmp/.ICE-unix/988,unix/mucahit-VirtualBox:/tmp/.ICE-unix/988
QT_ACCESSIBILITY=1
COLORTERM=truecolor
XDG_CONFIG_DIRS=/etc/xdg/xdg-ubuntu:/etc/xdg
XDG_MENU_PREFIX=gnome-
GNOME_DESKTOP_SESSION_ID=this-is-deprecated
GNOME_SHELL_SESSION_MODE=ubuntu
SSH_AUTH_SOCK=/run/user/1000/keyring/ssh
XMODIFIERS=@im=ibus
DESKTOP_SESSION=ubuntu
```

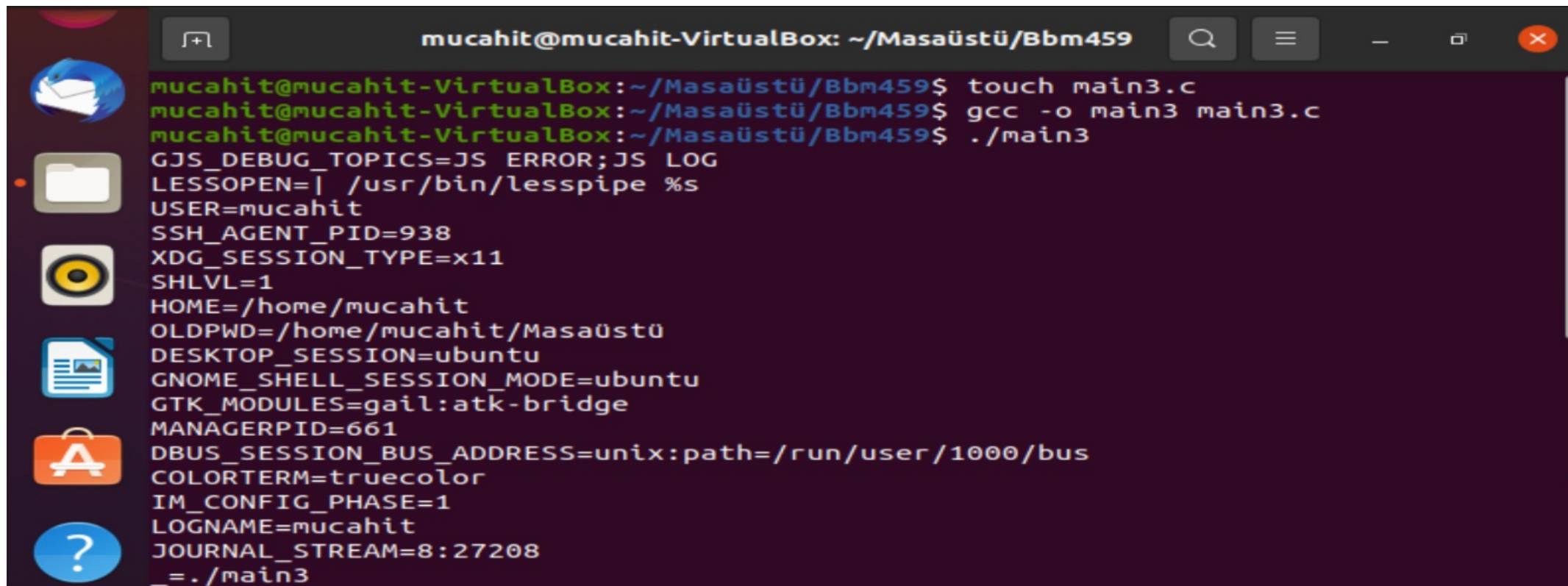

Task4: Environment variables and "system()"

```
#include <stdio.h>
#include <stdlib.h>

int main()
{
    system("/usr/bin/env");

    return 0 ;
}
```

"System()" is a function that executes "/bin/sh -c command", it executes "/bin/sh", and asks the shell to execute the command. When we call system with an argument, the function executes the argument. Like below:



```
mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ touch main3.c
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ gcc -o main3 main3.c
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ ./main3
GJS_DEBUG_TOPICS=JS ERROR;JS LOG
LESSOPEN=| /usr/bin/lesspipe %s
USER=mucahit
SSH_AGENT_PID=938
XDG_SESSION_TYPE=x11
SHLVL=1
HOME=/home/mucahit
OLDPWD=/home/mucahit/Masaüstü
DESKTOP_SESSION=ubuntu
GNOME_SHELL_SESSION_MODE=ubuntu
GTK_MODULES=gail:atk-bridge
MANAGERPID=661
DBUS_SESSION_BUS_ADDRESS=unix:path=/run/user/1000/bus
COLORTERM=truecolor
IM_CONFIG_PHASE=1
LOGNAME=mucahit
JOURNAL_STREAM=8:27208
_=./main3
```

Task 5: Environment variable and Set-UID Programs

In this task, we have changed the owner of the file to root. After this changing, we exported environment variable to our environment as a user 'mucahit'. Also, we give read and write permission on task5 with sudo chmod 4755. When we run task5 with argument which are newly exported in user, we can see that the variable is for user, not root.

```
mucahit@mucahit-VirtualBox: ~/Masaüstü/Bbm459
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ gcc -o task5 main4.c
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ sudo chown root task5
[sudo] mucahit için parola:
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ sudo chmod 7018 task5
chmod: geçersiz kip: '7018'
Try 'chmod --help' for more information.
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ sudo chmod 4755 task5
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ ls -l
toplam 232
-rw-rw-r-- 1 mucahit mucahit 189706 Mar 21 23:23 BBM459_Spring_2021_Project1.pdf
-rw-rw-r-- 1 mucahit mucahit 3123 Mar 21 23:22 first.txt
-rw-rw-r-- 1 mucahit mucahit 235 Mar 22 20:03 main2.c
-rw-rw-r-- 1 mucahit mucahit 93 Mar 22 20:06 main3.c
-rw-rw-r-- 1 mucahit mucahit 157 Mar 22 22:20 main4.c
-rw-rw-r-- 1 mucahit mucahit 377 Mar 22 22:20 main.c
-rw-rw-r-- 1 mucahit mucahit 3074 Mar 21 23:22 second.txt
-rwsr-xr-x 1 root mucahit 16768 Mar 22 22:21 task5
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ echo $PATH
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games:/snap/bin
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ echo $LD_LIBRARY_PATH
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ echo $Galatasaray
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ export LD_LIBRARY_PATH=/Bbm459/Project1/lib
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ echo $LD_LIBRARY_PATH
/Bbm459/Project1/lib
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ export Galatasaray=1905
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ ./task5 | grep -i LD_LIBRARY_PATH
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ ./task5 | grep -i Galatasaray
Galatasaray=1905
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$
```

Talking: Harun Cumart

Task6: The "LD_PRELOAD" environment variable and Set-UID Programs

In Task6, we have a C program which has an overwritten sleep() function in it. Also, we have a library which is named libmylib.so.1.0.1. Then, we set a LD_PRELOAD variable with this library. After doing this, we compiled our C program which has sleep() function in it. We ran the compiled program for four times. Firstly, we ran it as a regular program and normal user. We can see that "I am not sleeping!" is printed on screen. Because, we changed the sleep() function to do this action in this user. Secondly, we made SET-UID and we made root owner of this program, and we ran this program. We can't see the "I am not sleeping" because we didn't set the LD_PRELOAD to root. Thirdly, We made root owner of the program, again. Also, we set the LD_PRELOAD variable to root and we ran the program by the way. That's why we can see "I am not sleeping!" on the screen. Finally, we changed user and ran the program in this user. We can't see "I am not sleeping!" in this user because we didn't set LD_PRELOAD to this user.

```
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ gcc -fPIC -g -c mylib.c
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ gcc -shared -o libmylib.so.1.0.1
mylib.o -lc
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ export LD_PRELOAD=./libmylib.so.1
.0.1
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ gcc -o myprog myprog.c
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ ./myprog
I am not sleeping!
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ sudo chown root myprog
[sudo] mucahit için parola:
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ sudo chmod 4755 myprog
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ ./myprog
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ sudo chown root myprog
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ export LD_PRELOAD=./libmylib.so.1
.0.1
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ ./myprog
I am not sleeping!
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ cp myprog myprog1
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ sudo chown yunus myprog1
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ sudo chmod 4755 myprog1
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ ./myprog1
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$
```

Task 7: Capability Leaking

In this task, we have a C program which wants to read a very important folder named `/etc/zzz` and wants to write “Malicious Data” in it. This folder is owned by root with permission 0644. When we want to run this program with a normal user, we cannot open this folder and there can’t be any change in this folder. But, after we made root owner of this program, we runned this program and we can open this folder and we can make change on this folder. In the screenshot, We can see that the difference of two runs. First running was as a normal user and we cannot open the folder and no changes(totally 3 line with “Malicious Data” because we tried before). Second running was as a root and we can open the folder and there are one more line (4 “Malicious Data”). This caused from the permission. Because the folder is in root , and a normal user has no permission for opening and writing for this folder.

```
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ gcc -o task7 main6.c
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ ./task7
Cannot open /etc/zzz
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ cat /etc/zzz
Malicious Data
Malicious Data
Malicious Data
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ ./task7
Cannot open /etc/zzz
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ cat /etc/zzz
Malicious Data
Malicious Data
Malicious Data
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ sudo chown root task7
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ sudo chmod 4755 task7
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ ./task7
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$ cat /etc/zzz
Malicious Data
Malicious Data
Malicious Data
Malicious Data
mucahit@mucahit-VirtualBox:~/Masaüstü/Bbm459$
```