

Embedded Systems

Week 2: Linux Fundamentals I



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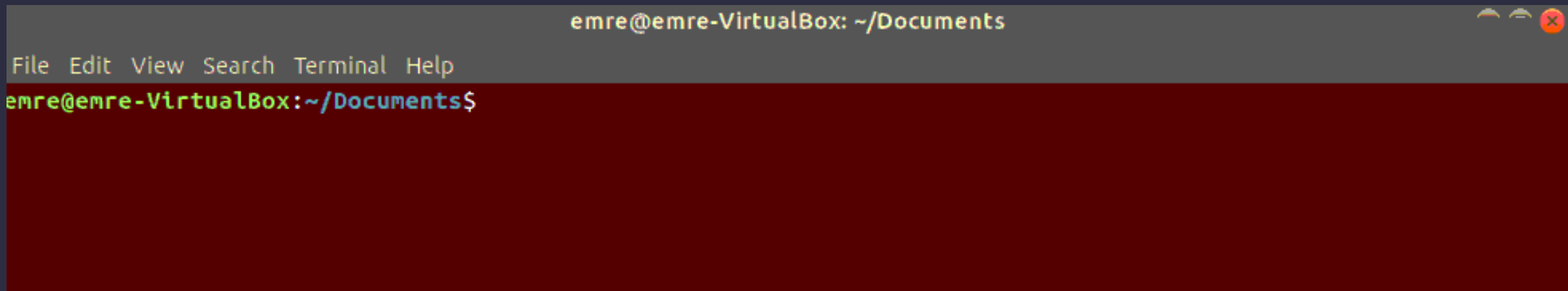
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Fundamental Linux Commands

If you are using a GUI based OS, you may type CNTRL + ALT + t for opening terminal

A screenshot of a terminal window titled "emre@emre-VirtualBox: ~/Documents". The window has a menu bar with "File", "Edit", "View", "Search", "Terminal", and "Help". The terminal prompt is "emre@emre-VirtualBox:~/Documents\$".

```
emre@emre-VirtualBox: ~/Documents
File Edit View Search Terminal Help
emre@emre-VirtualBox:~/Documents$
```

Fundamental Linux Commands

pwd: Shows full path of working directory

```
enre@enre-VirtualBox:~/Downloads$ pwd  
/home/enre/Downloads
```

Fundamental Linux Commands

ls: List files and directories under current working directory

```
emre@emre-VirtualBox:~/Downloads$ ls
petalinux-v2021.2-final-installer.run
pynq-supported-board-file-master.zip
Xilinx_Unified_2021.2_1021_0703_Lin64.bin
```

ls -al: List detailed files and directories under current working directory

```
emre@emre-VirtualBox:~/Downloads$ ls -al
total 2483188
drwxr-xr-x  2 emre emre      4096 Oca 22 16:42 .
drwxr-xr-x 41 emre emre      4096 Oca 22 16:34 ..
-rwxrw-r--  1 emre emre 2255897193 Ara 16 15:13 petalinux-v2021.2-final-installer.run
-rw-rw-r--  1 emre emre    812456 Ara 16 20:59 pynq-supported-board-file-master.zip
-rwxrw-r--  1 emre emre 286051682 Ara 16 15:09 Xilinx_Unified_2021.2_1021_0703_Lin64.bin
```

Fundamental Linux Commands

If you want more detail about command you can use

man "command"

```
enre@enre-VirtualBox:~/Downloads$ man ls
```

This will show detailed manual of command

```
LS(1)                                User Commands                                LS(1)
NAME
  ls - list directory contents
SYNOPSIS
  ls [OPTION]... [FILE]...
DESCRIPTION
  List information about the FILES (the current directory by default). Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

  Mandatory arguments to long options are mandatory for short options too.

  -a, --all
      do not ignore entries starting with .
  -A, --almost-all
      do not list implied . and ..
  --author
      with -l, print the author of each file
```

Fundamental Linux Commands

cd: Changes working folder

```
enre@enre-VirtualBox:~/Downloads$ cd /home/enre/Desktop
enre@enre-VirtualBox:~/Desktop$ pwd
/home/enre/Desktop
enre@enre-VirtualBox:~/Desktop$ █
```

For going upper folder

```
enre@enre-VirtualBox:~/Desktop$ cd ..
enre@enre-VirtualBox:~$ pwd
/home/enre
enre@enre-VirtualBox:~$
```

Fundamental Linux Commands

mkdir: Creates folder

```
emre@emre-VirtualBox:~/Documents$ ls
emre@emre-VirtualBox:~/Documents$ mkdir test
emre@emre-VirtualBox:~/Documents$ ls
test
emre@emre-VirtualBox:~/Documents$ ls -al
total 12
drwxr-xr-x  3 emre emre 4096 Oca 22 17:03 .
drwxr-xr-x 41 emre emre 4096 Oca 22 17:02 ..
drwxrwxr-x  2 emre emre 4096 Oca 22 17:03 test
```




Fundamental Linux Commands

sudo: Super user command execution

sudo command ...

Fundamental Linux Commands

- chmod: Change a file or folder authorizations

```
emre@emre-VirtualBox:~/Documents$ ls
test  testfile
emre@emre-VirtualBox:~/Documents$ ls -al
total 12
drwxr-xr-x  3 emre emre 4096 Oca 22 17:07 .
drwxr-xr-x 41 emre emre 4096 Oca 22 17:02 ..
drwxrwxr-x  2 emre emre 4096 Oca 22 17:03 test
-rw-rw-r--  1 emre emre    0 Oca 22 17:07 testfile
emre@emre-VirtualBox:~/Documents$ sudo chmod 777 testfile
[sudo] password for emre:
emre@emre-VirtualBox:~/Documents$ ls -al
total 12
drwxr-xr-x  3 emre emre 4096 Oca 22 17:07 .
drwxr-xr-x 41 emre emre 4096 Oca 22 17:02 ..
drwxrwxr-x  2 emre emre 4096 Oca 22 17:03 test
-rwxrwxrwx  1 emre emre    0 Oca 22 17:07 testfile
```

Fundamental Linux Commands

- chmod: Change a file or folder authorizations, authorize for execution

```
chmod u+x petalinux-v202.X.X-final-installer.run
```

```
enre@enre-VirtualBox:~/Downloads$ sudo chmod u+x petalinux-v2021.2-final-installer.run
enre@enre-VirtualBox:~/Downloads$ ls -al
total 2483188
drwxr-xr-x  2 enre enre          4096 Oca 22 16:42 .
drwxr-xr-x 41 enre enre          4096 Oca 22 16:34 ..
-rwxrw-r--  1 enre enre 2255897193 Ara 16 15:13 petalinux-v2021.2-final-installer.run
-rw-rw-r--  1 enre enre      812456 Ara 16 20:59 pynq-supported-board-file-master.zip
-rwxrw-r--  1 enre enre 286051682 Ara 16 15:09 Xilinx_Unified_2021.2_1021_0703_Lin64.bin
```

Fundamental Linux Commands

- rm: Remove a file

```
emre@emre-VirtualBox:~/Documents$ ls -al
total 12
drwxr-xr-x  3 emre emre 4096 Oca 22 17:07 .
drwxr-xr-x 41 emre emre 4096 Oca 22 17:02 ..
drwxrwxr-x  2 emre emre 4096 Oca 22 17:03 test
-rwxrwxrwx  1 emre emre    0 Oca 22 17:07 testfile
emre@emre-VirtualBox:~/Documents$ rm testfile
emre@emre-VirtualBox:~/Documents$ ls -al
total 12
drwxr-xr-x  3 emre emre 4096 Oca 22 17:09 .
drwxr-xr-x 41 emre emre 4096 Oca 22 17:02 ..
drwxrwxr-x  2 emre emre 4096 Oca 22 17:03 test
```

Fundamental Linux Commands

- `rm -rf`: Remove a folder

```
emre@emre-VirtualBox:~/Documents$ ls -al
total 12
drwxr-xr-x  3 emre emre 4096 Oca 22 17:09 .
drwxr-xr-x 41 emre emre 4096 Oca 22 17:02 ..
drwxrwxr-x  2 emre emre 4096 Oca 22 17:03 test
emre@emre-VirtualBox:~/Documents$ rm -rf test
emre@emre-VirtualBox:~/Documents$ ls -al
total 8
drwxr-xr-x  2 emre emre 4096 Oca 22 17:09 .
drwxr-xr-x 41 emre emre 4096 Oca 22 17:02 ..
```

Fundamental Linux Commands

- history: Shows previously entered commands

```
404  ls -al
405  sudo chmod 777 testfile
406  ls -al
407  rm testfile
408  ls -al
409  rm -rf test
410  ls -al
411  history
```

Fundamental Linux Commands

- touch: Creates empty file

```
emre@emre-VirtualBox:~/Documents$ ls -al
total 8
drwxr-xr-x  2 emre emre 4096 Oca 22 17:09 .
drwxr-xr-x 41 emre emre 4096 Oca 22 17:02 ..
emre@emre-VirtualBox:~/Documents$ touch testX
emre@emre-VirtualBox:~/Documents$ ls -al
total 8
drwxr-xr-x  2 emre emre 4096 Oca 22 17:19 .
drwxr-xr-x 41 emre emre 4096 Oca 22 17:02 ..
-rw-rw-r--  1 emre emre    0 Oca 22 17:19 testX
```



Fundamental Linux Commands

- `exit`: Closes current terminal

Fundamental Linux Commands

- To execute a executable file

```
./executableFile
```

- If this file is a shell script then you may call

```
sh script.sh
```

- Also you may use source command for execute a shell script

```
source script.sh
```

Difference is sh creates new session and loses if this script sets environment variables

Fundamental Linux Commands

- export: to set a environment variable:

```
export: variableName="test"
```

```
emre@emre-VirtualBox:~/Documents$ export testVar="deneme"
```

Fundamental Linux Commands

- echo: print variables:

echo \$varName

```
emre@emre-VirtualBox:~/Documents$ echo $testVar  
deneme
```

Fundamental Linux Commands

- ip a: lists current ethernet settings

```
emre@emre-VirtualBox:~/Documents$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:e4:f8:c4 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
        valid_lft 82776sec preferred_lft 82776sec
    inet6 fe80::62a0:5fee:8f60:af5/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
```

Fundamental Linux Commands

- ping: Send a ethernet packet to remote host for checking alive test

```
emre@emre-VirtualBox:~/Documents$ ping 10.0.2.15
PING 10.0.2.15 (10.0.2.15) 56(84) bytes of data.
64 bytes from 10.0.2.15: icmp_seq=1 ttl=64 time=0.032 ms
64 bytes from 10.0.2.15: icmp_seq=2 ttl=64 time=0.024 ms
64 bytes from 10.0.2.15: icmp_seq=3 ttl=64 time=0.024 ms

```

Fundamental Linux Commands

- ps aux: List all process currently working

```
root      17335  0.0  0.0    0     0 ?        I    16:48   0:00 [kworker/2:2]
emre      17356  0.0  0.0  29908  4328 pts/0    T    16:55   0:00 man ls
emre      17366  0.0  0.0  18376   952 pts/0    T    16:55   0:00 pager
emre      17376  0.0  0.0  29908  4252 pts/0    T    16:57   0:00 man ls
emre      17386  0.0  0.0  18376  1040 pts/0    T    16:57   0:00 pager
emre      17416  0.1  0.5 680460 47400 pts/0    Sl+  17:02   0:03 gedit x.txt
emre      17426  0.0  0.1  35420  9812 pts/1    Ss   17:03   0:00 bash
root      17446  0.0  0.0    0     0 ?        I    17:05   0:00 [kworker/0:0-cg
root      17474  0.0  0.0    0     0 ?        I    17:09   0:00 [kworker/1:1-cg
root      17486  0.0  0.0    0     0 ?        I    17:14   0:00 [kworker/3:1-cg
root      17487  0.0  0.0    0     0 ?        R    17:14   0:00 [kworker/u12:3-
root      17506  0.0  0.0    0     0 ?        I    17:24   0:00 [kworker/u12:1-
root      18366  0.0  0.0    0     0 ?        I    17:34   0:00 [kworker/5:0-cg
emre      18394  0.0  0.0  45896  3764 pts/1    R+   17:37   0:00 ps aux
```

Fundamental Linux Commands

- top: List all process with their hardware (CPU, RAM) usage

```
top - 17:38:26 up 1:04, 1 user, load average: 0,06, 0,09, 0,08
Tasks: 241 total, 1 running, 179 sleeping, 4 stopped, 0 zombie
%Cpu(s): 0,1 us, 0,1 sy, 0,0 ni, 99,8 id, 0,0 wa, 0,0 hi, 0,0 si, 0,0 st
KiB Mem : 8152360 total, 3158788 free, 1256060 used, 3737512 buff/cache
KiB Swap: 2097148 total, 2097148 free, 0 used. 6560028 avail Mem
```

| PID | USER | PR | NI | VIRT | RES | SHR | S | %CPU | %MEM | TIME+ | COMMAND |
|-------|------|----|-----|---------|--------|--------|---|------|------|---------|-------------|
| 1752 | emre | 20 | 0 | 4638500 | 327516 | 124028 | S | 0,7 | 4,0 | 1:14.47 | gnome-shell |
| 2103 | emre | 20 | 0 | 5466992 | 235988 | 31348 | S | 0,7 | 2,9 | 0:42.63 | java |
| 1472 | emre | 20 | 0 | 1387476 | 148328 | 74208 | S | 0,3 | 1,8 | 0:43.54 | Xorg |
| 1665 | emre | 20 | 0 | 189740 | 2944 | 2588 | S | 0,3 | 0,0 | 0:13.43 | VBoxClient |
| 18397 | emre | 20 | 0 | 50440 | 4224 | 3568 | R | 0,3 | 0,1 | 0:00.01 | top |
| 1 | root | 20 | 0 | 225664 | 9420 | 6672 | S | 0,0 | 0,1 | 0:05.26 | systemd |
| 2 | root | 20 | 0 | 0 | 0 | 0 | S | 0,0 | 0,0 | 0:00.08 | kthreadd |
| 3 | root | 0 | -20 | 0 | 0 | 0 | I | 0,0 | 0,0 | 0:00.00 | rcu_gp |
| 4 | root | 0 | -20 | 0 | 0 | 0 | I | 0,0 | 0,0 | 0:00.00 | rcu_par_gp |
| 6 | root | 0 | -20 | 0 | 0 | 0 | I | 0,0 | 0,0 | 0:00.00 | kworker/0:+ |
| 7 | root | 20 | 0 | 0 | 0 | 0 | I | 0,0 | 0,0 | 0:00.94 | kworker/u1+ |
| 8 | root | 0 | -20 | 0 | 0 | 0 | I | 0,0 | 0,0 | 0:00.00 | mm_percpu + |