



National Textile University

Department of Computer Science

Subject:

Operating System

Submitted to:

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Reg number:

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Lab no:

2

Semester: **5th**

Part 1: Linux Environment Orientation

```
esha@ESHA-DELL: ~$ echo "hello"
hello
esha@ESHA-DELL: ~$ echo "hello">hello.txt
esha@ESHA-DELL: ~$ cat hello.txt
hello
esha@ESHA-DELL: ~$ mkdir folder
esha@ESHA-DELL: ~$ ls
Operating-System  file.txt  folder  hello  hello.c  hello.txt  wsl_hello.txt
esha@ESHA-DELL: ~$ cd folder/
esha@ESHA-DELL: ~/folder$ pwd
/home/esha/folder
esha@ESHA-DELL: ~/folder$ mkdir folder1/folder2
mkdir: cannot create directory 'folder1/folder2': No such file or directory
esha@ESHA-DELL: ~/folder$ mkdir -p folder1/folder2
esha@ESHA-DELL: ~/folder$ ls
folder1
esha@ESHA-DELL: ~/folder$ ls folder1/
folder2
esha@ESHA-DELL: ~/folder$ cd folder1/
esha@ESHA-DELL: ~/folder/folder1$ ls
folder2
esha@ESHA-DELL: ~/folder/folder1$ mkdir directory
esha@ESHA-DELL: ~/folder/folder1$ ls
directory  folder2
esha@ESHA-DELL: ~/folder/folder1$ ls
ls              lsasrv.mof      lsb_release     lshw            lslogins        lsmod           lsof
lssetup.log     lsass.exe       lsblk           lsipc           lsm.dll         lsmproxy.dll    lspgpot

lsasrv.dll      lsattr          lscpu           lslocks         lsmem           lsns            lstelem
etry.dll
esha@ESHA-DELL: ~/folder/folder1$ ls
ls              lsasrv.mof      lsb_release     lshw            lslogins        lsmod           lsof
lssetup.log     lsass.exe       lsblk           lsipc           lsm.dll         lsmproxy.dll    lspgpot
```

```
esha@ESHA-DELL: ~$ cd ~/folder/folder1
esha@ESHA-DELL: ~/folder/folder1$ ls
directory  folder2
esha@ESHA-DELL: ~/folder/folder1$ mkdir fold
esha@ESHA-DELL: ~/folder/folder1$ ls
directory  fold  folder2
esha@ESHA-DELL: ~/folder/folder1$ ls1 fold
fold/      folder2/
esha@ESHA-DELL: ~/folder/folder1$ ls1 fold
fold/      folder2/
esha@ESHA-DELL: ~/folder/folder1$ rmdir folder2/
esha@ESHA-DELL: ~/folder/folder1$ ls
directory  fold
esha@ESHA-DELL: ~/folder/folder1$ touch directory/file.txt
esha@ESHA-DELL: ~/folder/folder1$ rm -r directory/
esha@ESHA-DELL: ~/folder/folder1$ ls
fold
esha@ESHA-DELL: ~/folder/folder1$ cd
esha@ESHA-DELL: ~$ mkdir recycleBin
esha@ESHA-DELL: ~$ cd fold/
-bash: cd: fold/: No such file or directory
esha@ESHA-DELL: ~$ cd folder/
esha@ESHA-DELL: ~/folder$ ls
folder1
esha@ESHA-DELL: ~/folder$ cd folder1/
esha@ESHA-DELL: ~/folder/folder1$ ls
fold
esha@ESHA-DELL: ~/folder/folder1$ cd fold/
esha@ESHA-DELL: ~/folder/folder1/fold$ ls
esha@ESHA-DELL: ~/folder/folder1/fold$ vim hello.txt
esha@ESHA-DELL: ~/folder/folder1/fold$ vim hello.txt
```

```
esha@ESHA-DELL: ~
esha
esha@ESHA-DELL:~$ pwd
/home/esha
esha@ESHA-DELL:~$ uname -a
Linux ESHA-DELL 6.6.87.2-microsoft-standard-WSL2 #1 SMP PREEMPT_DYNAMIC Thu Jun 5 18:30:46 UTC 2025 x86_64 x
86_64 x86_64 GNU/Linux
esha@ESHA-DELL:~$ date
Fri Sep 26 15:06:36 PKT 2025
esha@ESHA-DELL:~$ man ls
esha@ESHA-DELL:~$
```

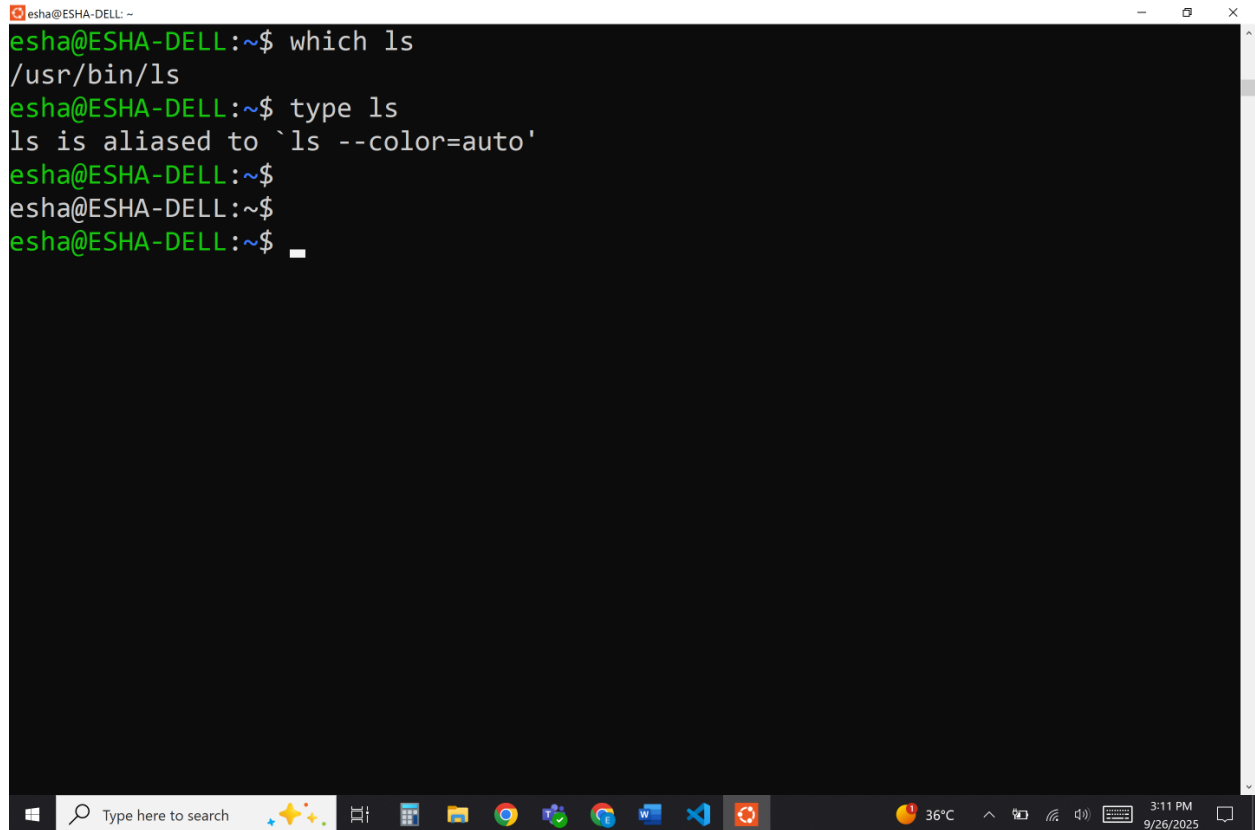
```
esha@ESHA-DELL: ~
esha@ESHA-DELL:~$ man ls
esha@ESHA-DELL:~$ ls --help
Usage: ls [OPTION]... [FILE]...
List information about the FILES (the current directory by default).
Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

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
-b, --escape             print C-style escapes for nongraphic characters
--block-size=SIZE        with -l, scale sizes by SIZE when printing them;
                        e.g., '--block-size=M'; see SIZE format below

-B, --ignore-backups     do not list implied entries ending with ~
-c                       with -lt: sort by, and show, ctime (time of last
                        change of file status information);
                        with -l: show ctime and sort by name;
                        otherwise: sort by ctime, newest first

-C                       list entries by columns
--color[=WHEN]           color the output WHEN; more info below
-d, --directory          list directories themselves, not their contents
-D, --dired              generate output designed for Emacs' dired mode
-f                       list all entries in directory order
-F, --classify[=WHEN]   append indicator (one of */=>@|) to entries WHEN
                        likewise, except do not append '*'
--file-type              across -x, commas -m, horizontal -x, long -l,
--format=WORD            single-column -1, verbose -l, vertical -C
```

```
esha@ESHA-DELL: ~$ which ls
/usr/bin/ls
esha@ESHA-DELL: ~$ type ls
ls is aliased to `ls --color=auto'
esha@ESHA-DELL: ~$
esha@ESHA-DELL: ~$
esha@ESHA-DELL: ~$
```



Part 2: File System Navigation

2.1

```
Select esha@ESHA-DELL: /home
esha@ESHA-DELL:~$ ls /
bin          dev          init          lib64        mnt          root         sbin.usr-is-merged  sys  var
bin.usr-is-merged  etc          lib          lost+found  opt          run          snap              tmp
boot         home        lib.usr-is-merged  media        proc         sbin         srv              usr
esha@ESHA-DELL:~$ ls -la
total 100
drwxr-x--- 11 esha esha 4096 Sep 26 15:06 .
drwxr-xr-x  3 root root 4096 Sep 18 19:27 ..
-rw----- 1 esha esha  701 Sep 26 14:33 .bash_history
-rw-r--r-- 1 esha esha  220 Sep 18 19:27 .bash_logout
-rw-r--r-- 1 esha esha 3771 Sep 18 19:27 .bashrc
drwx----- 3 esha esha 4096 Sep 18 22:05 .cache
drwxr-xr-x  3 esha esha 4096 Sep 18 22:05 .dotnet
-rw-r--r-- 1 esha esha   58 Sep 25 22:38 .gitconfig
drwxr-xr-x  2 esha esha 4096 Sep 19 13:25 .landscape
-rw----- 1 esha esha   20 Sep 26 15:06 .lessht
drwxr-xr-x  3 esha esha 4096 Sep 25 23:03 .local
-rw-rw-r-- 1 esha esha    0 Sep 26 14:28 .motd_shown
-rw-r--r-- 1 esha esha  807 Sep 18 19:27 .profile
drwx----- 3 esha esha 4096 Sep 25 23:00 .ssh
-rw-r--r-- 1 esha esha    0 Sep 18 19:34 .sudo_as_admin_successful
-rw----- 1 esha esha 1516 Sep 26 14:45 .viminfo
drwxr-xr-x  3 esha esha 4096 Sep 18 22:08 .vscode-remote-containers
drwxr-xr-x  5 esha esha 4096 Sep 18 22:05 .vscode-server
drwxr-xr-x  3 esha esha 4096 Sep 26 00:42 Operating-System
-rwxr-xr-x  1 esha esha 15960 Sep 25 23:07 hello
-rw-r--r-- 1 esha esha   82 Sep 25 23:06 hello.c
-rw-r--r-- 1 esha esha    6 Sep 26 14:33 hello.txt
drwxr-xr-x  2 esha esha 4096 Sep 26 14:40 recycleBin
-rw-r--r-- 1 esha esha   15 Sep 18 20:25 wsl_hello.txt
esha@ESHA-DELL:~$
esha@ESHA-DELL:~$ cd /home
```


2.2

```
esha@ESHA-DELL: /  
esha@ESHA-DELL:/home$ pwd  
/home  
esha@ESHA-DELL:/home$ ls  
esha  
esha@ESHA-DELL:/home$ ls -l  
total 4  
drwxr-x--- 11 esha esha 4096 Sep 26 15:06 esha  
esha@ESHA-DELL:/home$ ls -la  
total 12  
drwxr-xr-x  3 root root 4096 Sep 18 19:27 .  
drwxr-xr-x 22 root root 4096 Sep 25 23:48 ..  
drwxr-x--- 11 esha esha 4096 Sep 26 15:06 esha  
esha@ESHA-DELL:/home$ ls -lh  
total 4.0K  
drwxr-x--- 11 esha esha 4.0K Sep 26 15:06 esha  
esha@ESHA-DELL:/home$ cd  
esha@ESHA-DELL:~$ cd ..  
esha@ESHA-DELL:/home$ cd ~  
esha@ESHA-DELL:~$ cd /  
esha@ESHA-DELL:/ $
```

Part 3: File and Directory Operations

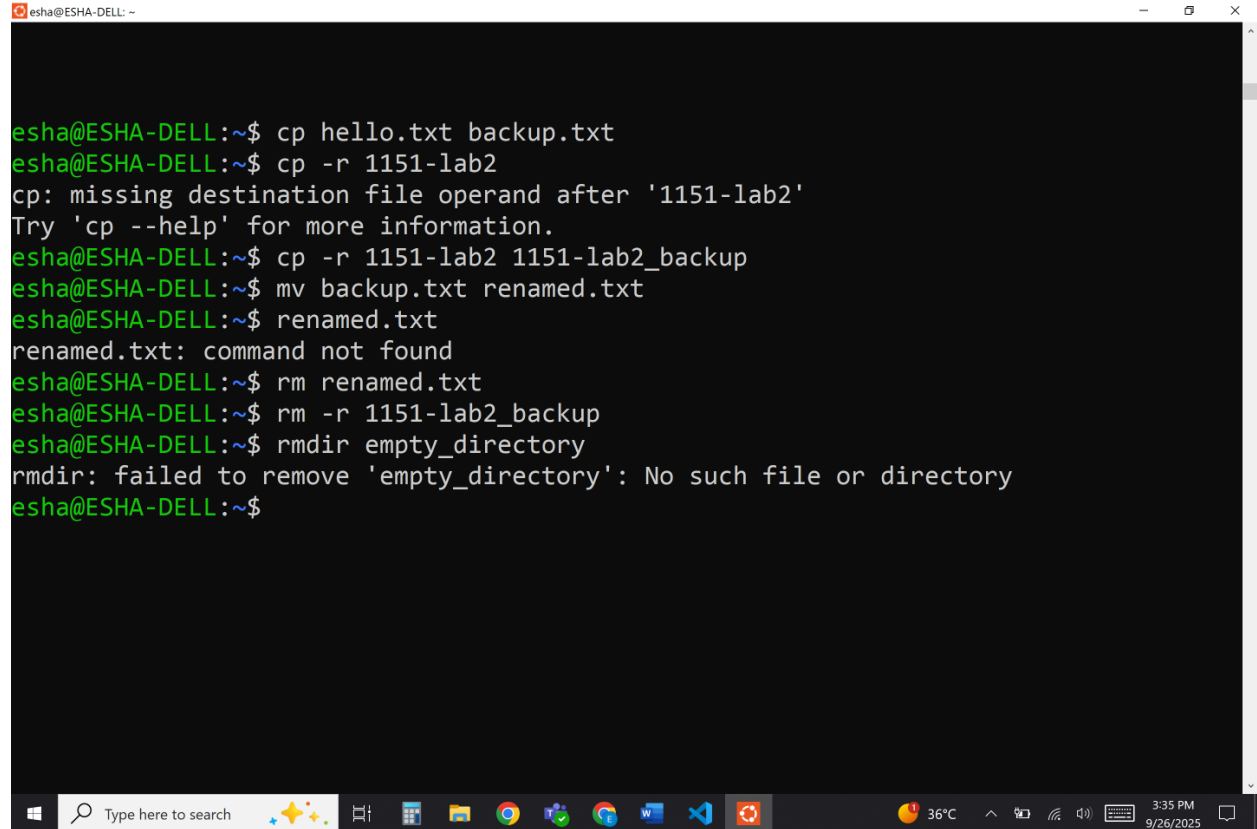
3.1

```
esha@ESHA-DELL: ~  
esha@ESHA-DELL:/$ cd ~  
esha@ESHA-DELL:~$ mkdir 1151-lab2  
esha@ESHA-DELL:~$ mkdir -p test/sub/dir  
esha@ESHA-DELL:~$ touch file.txt  
esha@ESHA-DELL:~$ touch file2.txt file3.txt  
esha@ESHA-DELL:~$ nano hello.txt  
esha@ESHA-DELL:~$ echo "hello esha">hello.txt  
esha@ESHA-DELL:~$ cat hello.txt  
hello esha  
esha@ESHA-DELL:~$ less hello.txt  
esha@ESHA-DELL:~$ head hello.txt  
hello esha  
esha@ESHA-DELL:~$ tail hello.txt  
hello esha  
esha@ESHA-DELL:~$ wc hello.t1t  
wc: hello.t1t: No such file or directory  
esha@ESHA-DELL:~$ wc hello.txt  
 1  2 11 hello.txt  
esha@ESHA-DELL:~$
```



3.2

```
esha@ESHA-DELL: ~$ cp hello.txt backup.txt
esha@ESHA-DELL: ~$ cp -r 1151-lab2
cp: missing destination file operand after '1151-lab2'
Try 'cp --help' for more information.
esha@ESHA-DELL: ~$ cp -r 1151-lab2 1151-lab2_backup
esha@ESHA-DELL: ~$ mv backup.txt renamed.txt
esha@ESHA-DELL: ~$ renamed.txt
renamed.txt: command not found
esha@ESHA-DELL: ~$ rm renamed.txt
esha@ESHA-DELL: ~$ rm -r 1151-lab2_backup
esha@ESHA-DELL: ~$ rmdir empty_directory
rmdir: failed to remove 'empty_directory': No such file or directory
esha@ESHA-DELL: ~$
```



PART 4: File Permissions and Ownership

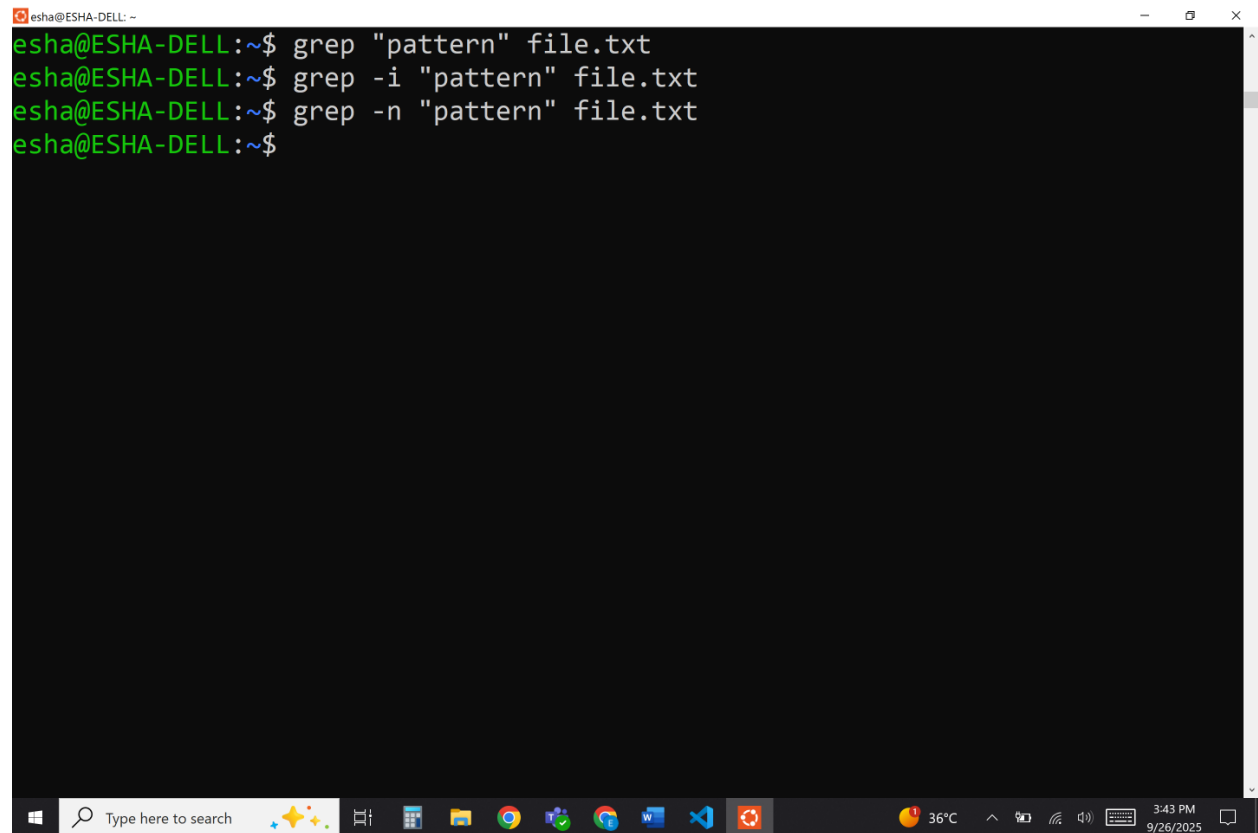
4.1


```
esha@ESHA-DELL: ~$ ls -l
total 44
drwxr-xr-x 2 esha esha 4096 Sep 26 15:24 1151-lab2
drwxr-xr-x 3 esha esha 4096 Sep 26 00:42 Operating-System
-rw-r--r-- 1 esha esha 0 Sep 26 15:25 file.txt
-rw-r--r-- 1 esha esha 0 Sep 26 15:26 file2.txt
-rw-r--r-- 1 esha esha 0 Sep 26 15:26 file3.txt
-rwxr-xr-x 1 esha esha 15960 Sep 25 23:07 hello
-rw-r--r-- 1 esha esha 82 Sep 25 23:06 hello.c
-rw-r--r-- 1 esha esha 11 Sep 26 15:30 hello.txt
drwxr-xr-x 2 esha esha 4096 Sep 26 14:40 recycleBin
drwxr-xr-x 3 esha esha 4096 Sep 26 15:25 test
-rw-r--r-- 1 esha esha 15 Sep 18 20:25 wsl_hello.txt
esha@ESHA-DELL:~$ chmod 755 file.txt
esha@ESHA-DELL:~$ chmod u+x file.txt
esha@ESHA-DELL:~$ chmod g-w file.txt
esha@ESHA-DELL:~$ chown user:group file.txt
chown: invalid user: 'user:group'
esha@ESHA-DELL:~$ chown esha:esha file.txt
esha@ESHA-DELL:~$ whoami
esha
esha@ESHA-DELL:~$
```

PART 5: Text Processing and Utilities

5.1

```
esha@ESHA-DELL: ~$ grep "pattern" file.txt
esha@ESHA-DELL: ~$ grep -i "pattern" file.txt
esha@ESHA-DELL: ~$ grep -n "pattern" file.txt
esha@ESHA-DELL: ~$
```

A screenshot of a Windows terminal window. The title bar at the top shows 'esha@ESHA-DELL: ~' and standard window controls. The terminal has a black background with green text. It shows four lines of commands: 'grep "pattern" file.txt', 'grep -i "pattern" file.txt', 'grep -n "pattern" file.txt', and a final prompt. The Windows taskbar is visible at the bottom, featuring a search bar, several application icons, and system status information including temperature (36°C) and time (3:43 PM, 9/26/2025).

5.2

```
esha@ESHA-DELL: ~  
esha@ESHA-DELL:~$ ls -l | grep ".txt"-rwxr-xr-x 1 esha esha    0 Sep 26 15:25 file.txt  
-rw-r--r-- 1 esha esha    0 Sep 26 15:26 file2.txt  
-rw-r--r-- 1 esha esha    0 Sep 26 15:26 file3.txt  
-rw-r--r-- 1 esha esha   11 Sep 26 15:30 hello.txt  
-rw-r--r-- 1 esha esha   15 Sep 18 20:25 wsl_hello.txt  
esha@ESHA-DELL:~$ cat file.txt file2.txt > combined.txt  
esha@ESHA-DELL:~$ echo "new line">>file1.txt  
esha@ESHA-DELL:~$ sort file1.txt | uniq  
new line  
esha@ESHA-DELL:~$
```

PART 6: Introduction to Processes

6.1

```
esha@ESHA-DELL:~$ ps
  PID TTY          TIME CMD
 1897 pts/0    00:00:01 bash
 12286 pts/0    00:00:00 ps

esha@ESHA-DELL:~$ ps aux
USER          PID %CPU %MEM    VSZ   RSS TTY      STAT START   TIME COMMAND
root             1  0.0  0.3 21700 12408 ?        Ss   12:29   0:04 /sbin/init
72 1920 ?          S1   12:29   0:00 /inroot
0:00 planroot
0.1 25140 6144 ?        Ss   12:29   0:04 /usr/lib/systemd+
12:29 0:00 /usr/lib/systemd+
117 0.0 0.1 91024 7552 ?        Ssl  12:29   0:01 /usr/lib/systemd+
1 0.0 0.0 4236 2560 ?        Ss   12:29   0:01 /usr/lib/systemd+
174 0.0 0.3 1756096 13696 ?       Ssl  12:29   0:01 /usr/lib/systemd+
4 ?          Ssl  12:29   0:00 /usr/lib/systemd+
179 0.0 0.0 3160 1920 hvc0
broot 184 0.0 0.0 3116 1792 tty1
032 22528 ?        Ssl  12:29   0:00 /usr/lib/systemd+
0:00 /bin/sh
0.0 21148 3516 ?        S   12:29   0:00 (sd-pam)
12:29 0:00 -baroot
74 0.0 0.0 3096 1036 ?        S   14:29   0:00 /inroot
Ss+ 14:29   0:00 sh
esha 1176 0.0 0.0 2800 1792 pts/2
esha 1182 0.0 0.0 2800 1792 pts/2
esha 1186 0.5 3.7 11861984 143688 pts/2 S1+ 14:29   0:23 /horoot
80 1028 ?          Ss   14:29   0:00 /inroot
0:01 /inroot
0.0 3080 1028 ?          Ss   14:29   0:00 /inroot
14:29 0:00 /inroot
4 4.0 19.3 55114908 738240 pts/2 S1+ 14:29   3:07 /horoot
Ss   14:29   0:00 /inroot
1257 0.0 0.0 2800 1664 pts/6 Ss+ 14:29   0:00 /bin/sh
2 pts/6 S+   14:29   0:00 /bin/sh
oesha 1292 0.0 0.0 2804 1792 pts/6 S+   14:29   0:00 /bin/sh
8532 72772 pts/2 S1+ 14:29   0:13 /hoshesha
0:00 /bin/sh
0.0 3096 1164 ?          S   14:33   0:00 /inroot
1897 0.0 0.1 6204 5376 pts/0 Ss
```

```
Select esha@ESHA-DELL:~$ ps -ef
UID          PID    PPID  C STIME TTY          TIME CMD
root             1      0  0 12:29 ?          00:00:04 /sbin/init
root             2      1  0 12:29 ?          00:00:00 /init
root             6      2  0 12:29 ?          00:00:00 plan9 --control-soroot
29 ?          00:00:04 /usr/lib/systemd/sroot
systemd/ssysd+  113      1  0 12:29 ?          00:00:00 /usr/lib/systemd/ssysd+
1 0 12:29 ?          00:00:01 /usr/lib/systemd/sroot
sr/sbin/cron -f
message+ 162      1  0 12:29 ?          00:00:00 @dbus-daemon --sysroot
29 ?          00:00:00 /usr/lib/systemd/sroot
ec/wsl-psyslog 177      1  0 12:29 ?          00:00:00 /usr/sbin/rsyslogdroot
1 0 12:29 hvc0    00:00:00 /sbin/agetty -o -p -root
bin/agetty -o -p -root
5 2 0 12:29 pts/1    00:00:00 /bin/login -f
esha 340      1  0 12:29 ?          00:00:01 /usr/lib/systemd/sesha
29 ?          00:00:00 (sd-pam)
esha 362      295  0 12:29 pts/1    00:00:00 -bash
root 1173      2  0 14:29 ?          00:00:00 /init
root 1174      173  0 14:29 ?          00:00:00 /init
esha 1175      174  0 14:29 pts/2    00:00:00 sh -c "$VSCODE_WSLesha
29 pts/2    00:00:00 sh /mnt/c/Users/m
esha 1182      176  0 14:29 pts/2    00:00:00 sh /home/esha/.vscodesha
29 pts/2    00:00:23 /home/esha/.vscoderoot
root 1198      1197  0 14:29 ?          00:00:01 /init
esha 1199      1198  0 14:29 pts/3    00:00:03 /home/esha/.vscoderoot
29 ?          00:00:00 /init
root 1211      1210  0 14:29 ?          00:00:00 /init
esha 1213      1211  0 14:29 pts/4    00:00:02 /home/esha/.vscodesha
29 pts/2    00:03:07 /home/esha/.vscoderoot
```

Select esha@ESHA-DELL: ~

```
esha@ESHA-DELL:~$ pstree
```

```
systemd-2*[agetty]
```

```
graph TD; cron[cron]; dbus-daemon[dbus-daemon]; init-systemd(Ubuntu) --- Session+1[Session+]; init-systemd --- Session+2[Session+]; init-systemd --- Session+3[Session+]; init-systemd --- Session+4[Session+]; init-systemd --- Session+5[Session+];
```

```
init+++
```

```

├─login++
└─{init++
    ├─rsyslogd—3*[{rsyslogd}+
    └─systemd—(sd-pam)
systemd-journal
systemd-logind
systemd-resolve
systemd-timesyn—{system+
unattended-upgr—{unatt+
    ├─systemd-udev
    └─wsl-pro-service—7*[{wsl+esha@ESHA-DELL:~$ top

```

```
top - 15:47:14 up 3:18, 1 user,
```

```
Tasks: 44 total, 1 running, 43
```

```
%Cpu(s):  0.0 us,  4.3 sy,  0.0 ni
```

```
Mem Mem: 3721.2 total, 2255.0  
MiB Swap: 1024.0 total 1024.0
```

PID	USER	PR	NI	VIRT
1	root	20	0	21700
2	root	20	0	3072
6	root	20	0	3072
45	root	19	-1	66748
100	root	20	0	25140
113	systemd+	20	0	21456
117	systemd+	20	0	91024
161	root	20	0	4236
162	message+	20	0	9624