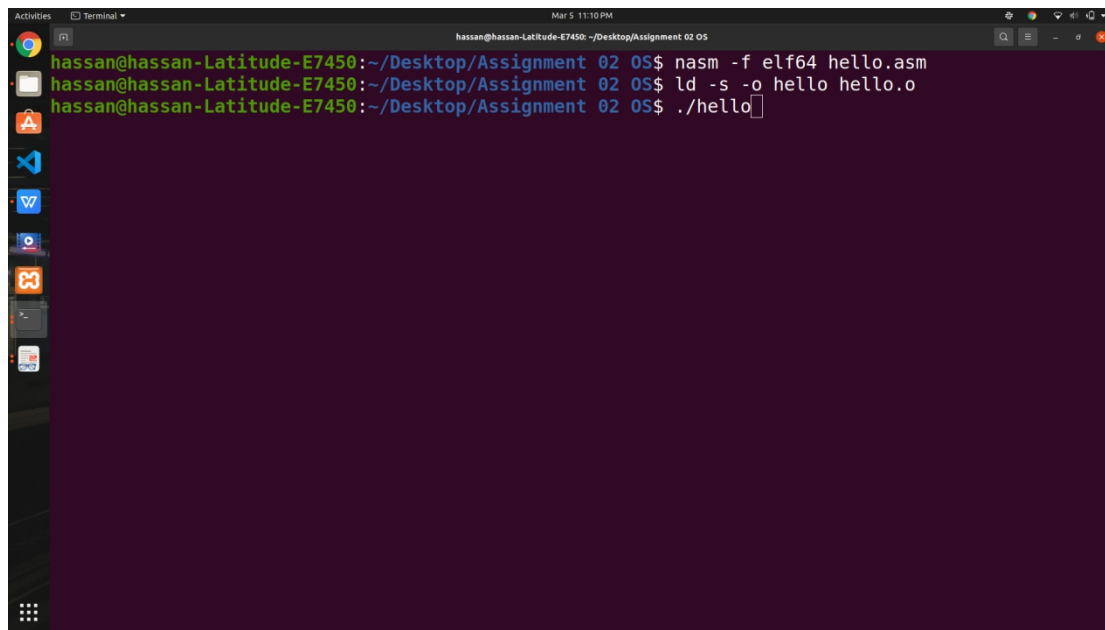


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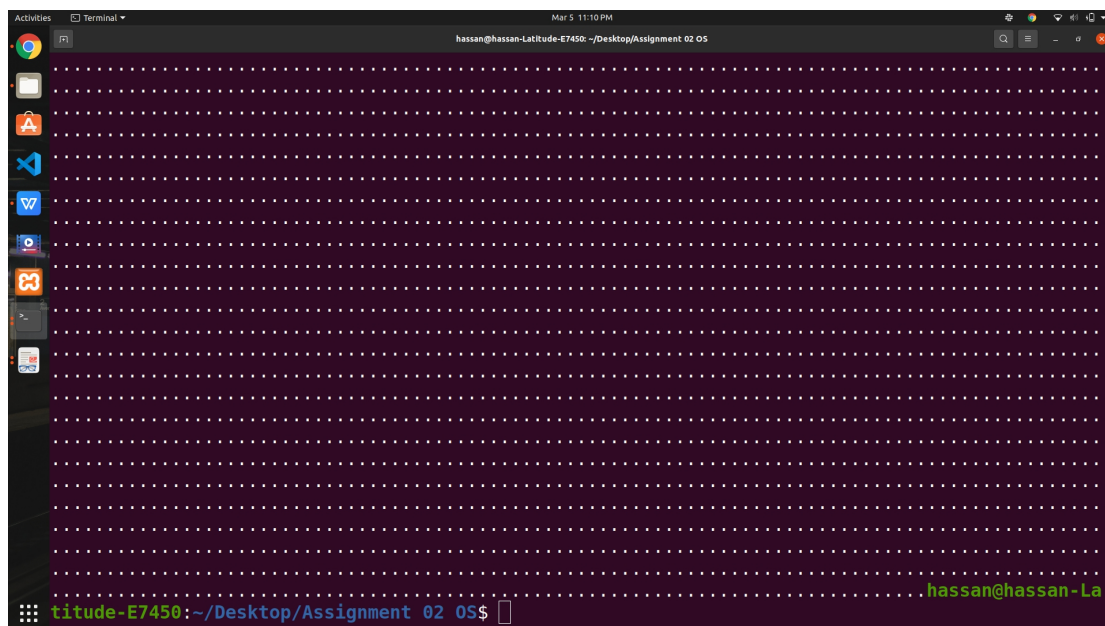
Assignment 02



A terminal window titled "Terminal" with a subtitle "hassan@hassan-Latitude-E7450: ~/Desktop/Assignment 02 OS". The terminal shows the following commands and output:

```
hassan@hassan-Latitude-E7450:~/Desktop/Assignment 02 OS$ nasm -f elf64 hello.asm
hassan@hassan-Latitude-E7450:~/Desktop/Assignment 02 OS$ ld -s -o hello hello.o
hassan@hassan-Latitude-E7450:~/Desktop/Assignment 02 OS$ ./hello
```

The terminal has a dark purple background and a sidebar on the left with various application icons.



A terminal window titled "Terminal" with a subtitle "hassan@hassan-Latitude-E7450: ~/Desktop/Assignment 02 OS". The terminal displays a large grid of dots, likely representing a memory dump or a large output file. The grid is composed of many rows of dots, with the last row showing the prompt "hassan@hassan-La" followed by "titude-E7450:~/Desktop/Assignment 02 OS\$".

```

hassan@hassan-Latitude-E7450:~/Desktop/Assignment 02 OS$ time ./hello > /dev/null
real    0m0.047s
user    0m0.043s
sys     0m0.004s

hassan@hassan-Latitude-E7450:~/Desktop/Assignment 02 OS$ nasm -f elf64 -o hello.o hello.asm
hassan@hassan-Latitude-E7450:~/Desktop/Assignment 02 OS$ nasm -f elf64 -o hello2.o hello2.asm
hassan@hassan-Latitude-E7450:~/Desktop/Assignment 02 OS$ ld -s -o hello hello.o
hassan@hassan-Latitude-E7450:~/Desktop/Assignment 02 OS$ ld -s -o hello2 hello2.o
hassan@hassan-Latitude-E7450:~/Desktop/Assignment 02 OS$ chmod +x runner.sh
hassan@hassan-Latitude-E7450:~/Desktop/Assignment 02 OS$ ./runner.sh
Average Time Of hello
user 0.019400
Average Time Of hello2
user 0.160600
hassan@hassan-Latitude-E7450:~/Desktop/Assignment 02 OS$

```

For calculating avg time ive done some changes in runner.sh

Code:

```

home > hassan > Desktop > Assignment 02 OS > $ runner.sh
1  #!/bin/bash
2  x=1
3
4  while [ $x -le 50 ]
5  do
6      (time ./hello2 > /dev/null) &>> hello2.txt
7      (time ./hello > /dev/null) &>> hello.txt
8      x=$(( $x + 1 ))
9
10 done
11
12 avg_time() {
13     #
14     # usage: avg_time n command ...
15     #
16     n=$1; shift
17     (( $# > 0 )) || return          # if no command given
18     for ((i = 0; i < n; i++)); do
19         { time -p "$@" &>/dev/null; } 2>&1 # ignore the output of the command
20         # collect time's output in stdout
21     done | awk '
22     /user/ { user = user + $2; nu++ }
23
24     END {
25         if (nu>0) printf("user %f\n", user/nu);
26     }'
27 }
28
29 echo -e "Average Time Of hello"
30 avg_time 50 ./hello
31
32 echo -e "Average Time Of hello2"
33 avg_time 50 ./hello2
34

```

Number of experiments run: N = 50

Average 'user time' for hello (int-based calls): I =0.019400

Average 'user time' for hello2 (syscall-based calls): S =0.160600

Percentage speedup: $(I-S)*100/I = (0.019400-0.160600) * 100 / 0.019400 = -727.833$

hello.txt - Visual Studio Code

File Edit Selection View Go Run Terminal Help

EXPLORER: OUTLINE

No symbols found in document 'hello.txt'

home > hassan > Desktop > Assignment 02 OS > hello.txt

```
1 |
2 real    0m0.037s
3 user    0m0.024s
4 sys     0m0.012s
5
6 real    0m0.037s
7 user    0m0.021s
8 sys     0m0.016s
9
10 real   0m0.040s
11 user   0m0.024s
12 sys    0m0.016s
13
14 real   0m0.040s
15 user   0m0.024s
16 sys    0m0.016s
17
18 real   0m0.042s
19 user   0m0.019s
20 sys    0m0.023s
21
22 real   0m0.038s
23 user   0m0.009s
24 sys    0m0.030s
25
26 real   0m0.036s
27 user   0m0.028s
28 sys    0m0.008s
```

Ln 1, Col 1 Spaces: 4 UTF-8 LF Plain Text

hello2.txt - Visual Studio Code

File Edit Selection View Go Run Terminal Help

EXPLORER: OUTLINE

No symbols found in document 'hello2.txt'

home > hassan > Desktop > Assignment 02 OS > hello2.txt

```
1 |
2 real    0m0.283s
3 user    0m0.198s
4 sys     0m0.085s
5
6 real    0m0.291s
7 user    0m0.155s
8 sys     0m0.135s
9
10 real   0m0.279s
11 user    0m0.171s
12 sys    0m0.107s
13
14 real   0m0.270s
15 user    0m0.185s
16 sys    0m0.084s
17
18 real   0m0.282s
19 user    0m0.153s
20 sys    0m0.128s
21
22 real   0m0.271s
23 user    0m0.167s
24 sys    0m0.103s
25
26 real   0m0.266s
27 user    0m0.157s
28 sys    0m0.109s
```

Ln 9, Col 1 Spaces: 4 UTF-8 LF Plain Text