Name: Muhammad Usman
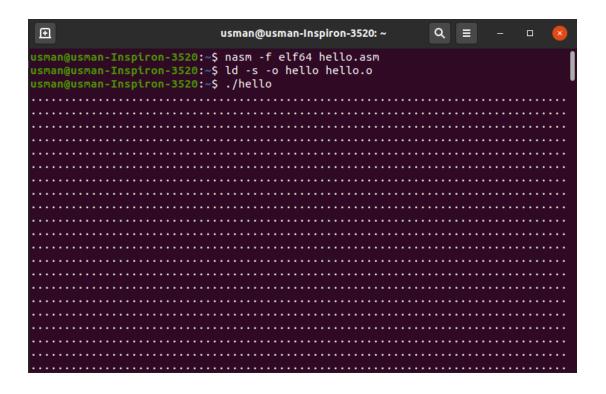
Roll no: 19P-0116

Subject: Operating Systems

hello.asm:

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```
1   section .data
2     hello: db '.'
3     helloLen equ $-hello
4
5   section .text
6   global _start
7
8   _start:
9
10  mov ecx, 500000
11
12  l1:
13      mov esi, ecx
14      mov eax, 4
15      mov ebx, 1
16      mov ecx, hello
17      mov edx, helloLen
18      int 80h
19
20      mov ecx, esi
21
22    loop l1
23
24    mov eax, 1
25    mov ebx, 0
26    int 80h
```

```
usman@usman-Inspiron-3520:~$ nasm -f elf64 hello.asm
usman@usman-Inspiron-3520:~$ ld -s -o hello hello.o
usman@usman-Inspiron-3520:~$ ./hello
```

```
usman@usman-Inspiron-3520:~$ time ./hello > /dev/null

real    0m0.604s
user    0m0.324s
sys     0m0.279s
usman@usman-Inspiron-3520:~$
```

hello2.asm:

```
File  Edit  View  Selection  Find  Packages  Help

            hello2.asm
 1   section .data
 2      hello: db '.'
 3      helloLen: equ $-hello
 4
 5   section .text
 6   global _start
 7
 8   _start:
 9   mov ecx, 500000
10
11   l1:
12       mov ebx, ecx
13
14       mov rdi, 1
15       mov rsi, hello
16       mov rdx, helloLen
17       mov rax, 1
18       syscall
19
20       mov ecx, ebx
21      loop l1
22
23      mov rdi, 0
24      mov rax, 60
25      syscall
26
~/hello2.asm    20:15
```

```
usman@usman-Inspiron-3520:~$ nasm -f elf64 hello2.asm
usman@usman-Inspiron-3520:~$ ld -s -o hello2 hello2.o
usman@usman-Inspiron-3520:~$ ./hello2
```



```
usman@usman-Inspiron-3520:~$ time .hello2  > /dev/null
.hello2: command not found

real    0m0.537s
user    0m0.187s
sys     0m0.051s
usman@usman-Inspiron-3520:~$
```

After running both files using runner.sh:

```
usman@usman-Inspiron-3520:~$ nasm -f elf64 hello.asm
usman@usman-Inspiron-3520:~$ nasm -f elf64 hello2.asm
usman@usman-Inspiron-3520:~$ ld -s -o hello hello.o
usman@usman-Inspiron-3520:~$ ld -s -o hello2 hello2.o
usman@usman-Inspiron-3520:~$ chmod +x runner.sh
usman@usman-Inspiron-3520:~$ ./runner.sh
usman@usman-Inspiron-3520:~$ 
```

hello.txt

```
 1
 2 real    0m0.610s
 3 user    0m0.317s
 4 sys     0m0.281s
 5
 6 real    0m0.598s
 7 user    0m0.313s
 8 sys     0m0.281s
 9
10 real    0m0.596s
11 user    0m0.271s
12 sys     0m0.323s
13
14 real    0m0.599s
15 user    0m0.275s
16 sys     0m0.322s
17
18 real    0m0.595s
19 user    0m0.287s
20 sys     0m0.307s
21
22 real    0m0.599s
23 user    0m0.301s
24 sys     0m0.296s
25
26 real    0m0.596s
27 user    0m0.320s
28 sys     0m0.275s
29
30 real    0m0.595s
31 user    0m0.285s
32 sys     0m0.308s
33
34 real    0m0.595s
35 user    0m0.337s
```

```
Open  ▼  ⊞                                                    hello2.txt

 1 |
 2 real    0m0.445s
 3 user    0m0.225s
 4 sys     0m0.218s
 5
 6 real    0m0.438s
 7 user    0m0.184s
 8 sys     0m0.253s
 9
10 real    0m0.440s
11 user    0m0.248s
12 sys     0m0.184s
13
14 real    0m0.435s
15 user    0m0.247s
16 sys     0m0.187s
17
18 real    0m0.440s
19 user    0m0.234s
20 sys     0m0.205s
21
22 real    0m0.435s
23 user    0m0.189s
24 sys     0m0.245s
25
26 real    0m0.435s
27 user    0m0.195s
28 sys     0m0.239s
29
30 real    0m0.438s
31 user    0m0.217s
32 sys     0m0.221s
33
34 real    0m0.440s
35 user    0m0.207s
```

Number of experiments run: N = 50

Average 'user time' for hello (int-based calls): I = 292.22s

Average 'user time' for hello2 (syscall-based calls): S = 225.74

Percentage speedup: (I-S)*100/I = 22.74%