PRE-ASSIGNMENT

1. Measure the cost of a minimal function call in C/C ++ (e.g., X seconds). The minimal cost can be emulated by measuring a bare function call that neither takes any parameter nor does anything inside the function.

The cost of the minimal function call was measured by calling the function 10 times and then taking the average.
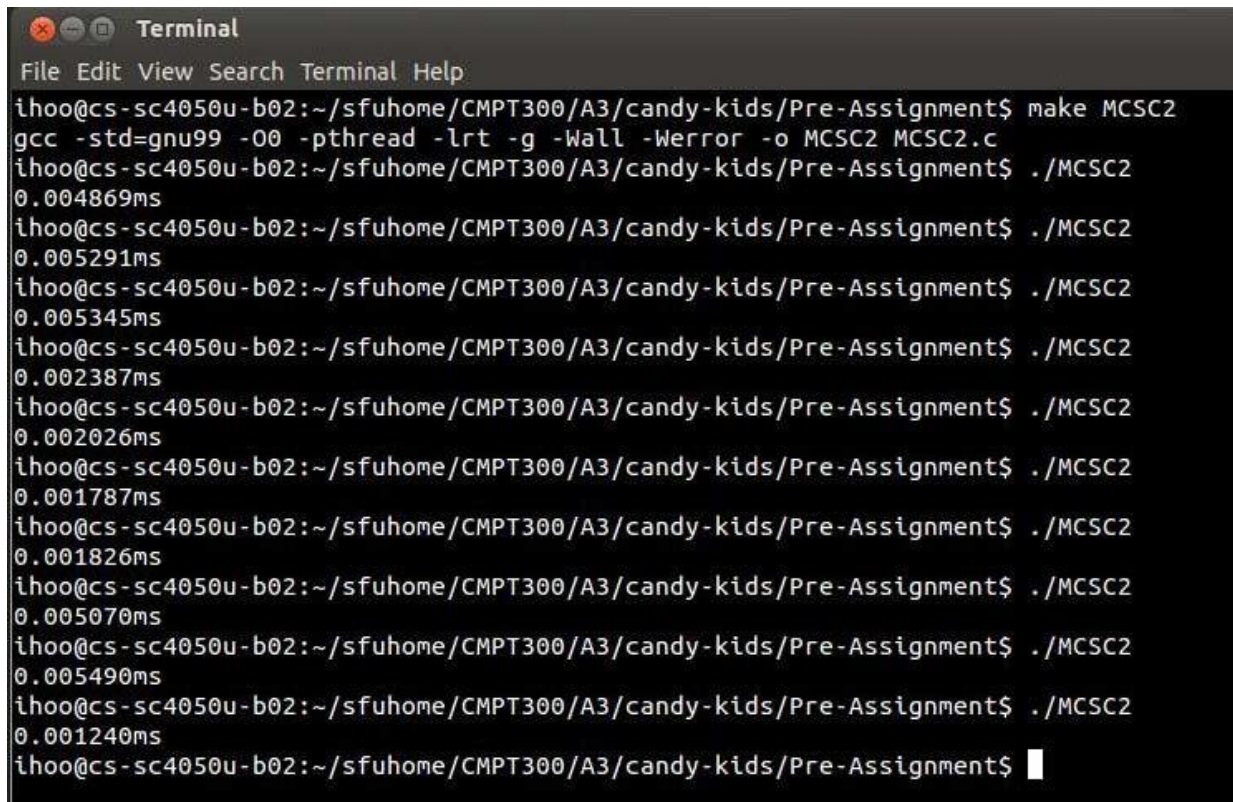
AVERAGE TIME: 0.0009874ms (milliseconds)

```
Terminal
File Edit View Search Terminal Help
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ make MCSC1
gcc -std=gnu99 -O0 -pthread -lrt -g -Wall -Werror -o MCSC1 MCSC1.c
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC1
0.000746ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC1
0.001117ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC1
0.001402ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC1
0.001377ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC1
0.000259ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC1
0.001128ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC1
0.000449ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC1
0.001147ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC1
0.001117ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC1
0.001132ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$
```

2. Measure the cost of a minimal system call in C/C++. Unlike a regular function call, a system call traps into the operating system kernel. The minimal cost can be emulated by measuring the cost of getpid() which doesn't really do anything

The cost of the system call was measured by calling the getpid() function 10 times and then taking the average.

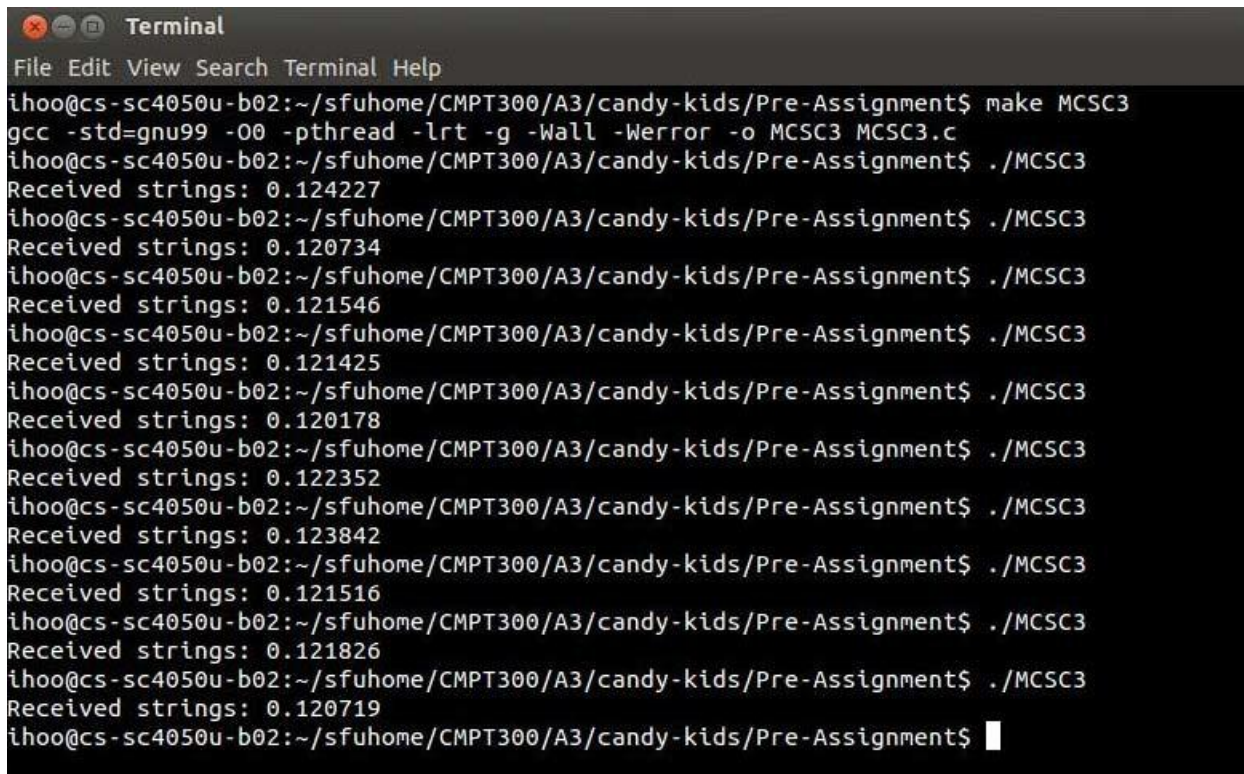AVERAGE TIME: 0.0035331ms (milliseconds)

```
Terminal
File Edit View Search Terminal Help
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ make MCSC2
gcc -std=gnu99 -O0 -pthread -lrt -g -Wall -Werror -o MCSC2 MCSC2.c
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC2
0.004869ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC2
0.005291ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC2
0.005345ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC2
0.002387ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC2
0.002026ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC2
0.001787ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC2
0.001826ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC2
0.005070ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC2
0.005490ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC2
0.001240ms
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$
```

3. Measure the cost of a process switching.

The cost of context switching for processes was measured by recording the time it took to run 10 times and then taking the average. The process of measuring the context switch was achieved by piping the times from one process to the other and then finding the difference it took to start the first process and to start the second process.
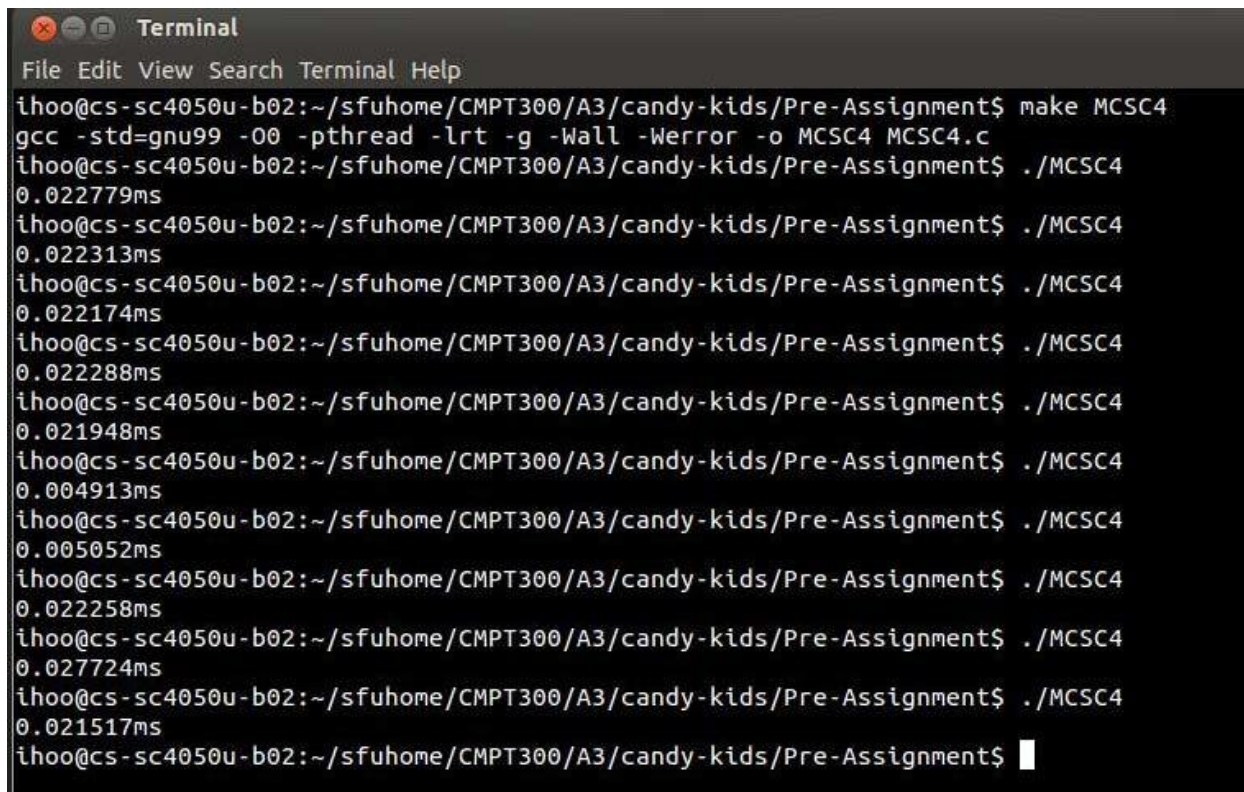
AVERAGE TIME: 0.1218365ms (milliseconds)

```
⊗⊜◎ Terminal
File Edit View Search Terminal Help
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ make MCSC3
gcc -std=gnu99 -O0 -pthread -lrt -g -Wall -Werror -o MCSC3 MCSC3.c
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC3
Received strings: 0.124227
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC3
Received strings: 0.120734
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC3
Received strings: 0.121546
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC3
Received strings: 0.121425
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC3
Received strings: 0.120178
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC3
Received strings: 0.122352
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC3
Received strings: 0.123842
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC3
Received strings: 0.121516
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC3
Received strings: 0.121826
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ ./MCSC3
Received strings: 0.120719
ihoo@cs-sc4050u-b02:~/sfuhome/CMPT300/A3/candy-kids/Pre-Assignment$ █
```

4. Measure the cost of a thread switching. A possible measurement strategy

The cost of context switching for threads was measured by recording the time it took to run the cost of switching the threads when both were programmed to increment/decrement the shared variable. We run the timing 10 times and take the average.

AVERAGE TIME: 0.192966ms (milliseconds)