Report By: Ayodeji Osho

Part 1

a)

```
ayodeji.osho@gfx03-7:~/Documents/CPSC457/palindrome-main$ time python3 palindrome.py < t3.txt
Longest palindrome: ___o.O.o___

real    0m0.027s
user    0m0.014s
sys     0m0.006s
```

```
ayodeji.osho@csx:~/Documents/CPSC457/palindrome-main$ time python3 palindrome.py < t4.txt
Longest palindrome: redder

real    0m0.489s
user    0m0.464s
sys     0m0.019s
```

```
ayodeji.osho@gfx03-7:~/Documents/CPSC457/palindrome-main$ time ./slow-pali < t3.txt
Longest palindrome: ___o.O.o___

real    0m0.005s
user    0m0.002s
sys     0m0.003s
```

```
ayodeji.osho@gfx03-7:~/Documents/CPSC457/palindrome-main$ time ./slow-pali < t4.txt
Longest palindrome: redder

real    0m2.485s
user    0m1.160s
sys     0m1.320s
```

b) For the c++ programs, more time is spent in kernel mode while python programs spend more time in user mode

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c)

```
ayodeji.oshc@linux05-wb:~/Documents/CPSC457/palindrome-main$ strace -c python3 palindrome.py < t3.txt
Longest palindrome: ___o.O.o___
% time     seconds  usecs/call     calls    errors syscall
------ ----------- ----------- --------- --------- ----------------
 25.48    0.000411           1       320       212 openat
 18.72    0.000302           0       461        50 newfstatat
 12.34    0.000199           1       153           mmap
 11.84    0.000191           1       160           read
  5.89    0.000095           2        44           mprotect
  5.83    0.000094           0       112           close
  5.39    0.000087           4        20           getdents64
  3.72    0.000060           0       126         2 lseek
  3.35    0.000054           0        68           rt_sigaction
  2.05    0.000033           0        69        65 ioctl
  0.87    0.000014           2         7           munmap
  0.74    0.000012           0        14           brk
  0.74    0.000012           2         6         4 prctl
  0.68    0.000011           2         4         3 access
  0.50    0.000008           4         2         2 statfs
  0.37    0.000006           1         4         3 readlink
  0.31    0.000005           1         3           fcntl
  0.19    0.000003           1         2           getcwd
  0.12    0.000002           2         1           rt_sigprocmask
  0.12    0.000002           1         2           futex
  0.12    0.000002           2         1           set_tid_address
  0.12    0.000002           2         1           set_robust_list
  0.12    0.000002           2         1           prlimit64
  0.12    0.000002           2         1           getrandom
  0.06    0.000001           1         1           write
  0.06    0.000001           0         2         1 arch_prctl
  0.06    0.000001           1         1           gettid
  0.06    0.000001           1         1           epoll_create1
  0.00    0.000000           0         6           pread64
  0.00    0.000000           0         3           dup
  0.00    0.000000           0         1           execve
  0.00    0.000000           0         1           uname
  0.00    0.000000           0         1           sysinfo
  0.00    0.000000           0         1           getuid
  0.00    0.000000           0         1           getgid
  0.00    0.000000           0         1           geteuid
  0.00    0.000000           0         1           getegid
------ ----------- ----------- --------- --------- ----------------
100.00    0.001613           1      1603       342 total
```

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```
ayodeji.osho@linux05-wb:~/Documents/CPSC457/palindrome-main$ strace -c python3 palindrome.py < t4.txt
Longest palindrome: redder
% time     seconds  usecs/call     calls    errors syscall
------ ----------- ----------- --------- --------- ----------------
 22.05    0.000554           1       461        50 newfstatat
 19.22    0.000483           0       864           read
 15.20    0.000382           1       320       212 openat
  8.08    0.000203          10        20           getdents64
  6.25    0.000157           1       153           mmap
  5.93    0.000149         149         1           execve
  4.78    0.000120           1        68           rt_sigaction
  4.54    0.000114           1       112           close
  4.34    0.000109           0       126         2 lseek
  3.34    0.000084           1        69        65 ioctl
  1.87    0.000047           1        44           mprotect
  1.35    0.000034           1        24           brk
  0.99    0.000025           3         7           munmap
  0.48    0.000012           2         6           pread64
  0.28    0.000007           2         3           dup
  0.24    0.000006           1         4         3 readlink
  0.16    0.000004           1         4         3 access
  0.16    0.000004           4         1           sysinfo
  0.16    0.000004           2         2         1 arch_prctl
  0.12    0.000003           1         2           getcwd
  0.08    0.000002           2         1           rt_sigprocmask
  0.08    0.000002           1         2           futex
  0.08    0.000002           2         1           set_tid_address
  0.08    0.000002           2         1           prlimit64
  0.08    0.000002           2         1           getrandom
  0.04    0.000001           1         1           gettid
  0.04    0.000001           1         1           set_robust_list
  0.00    0.000000           0         1           write
  0.00    0.000000           0         1           uname
  0.00    0.000000           0         3           fcntl
  0.00    0.000000           0         1           getuid
  0.00    0.000000           0         1           getgid
  0.00    0.000000           0         1           geteuid
  0.00    0.000000           0         1           getegid
  0.00    0.000000           0         2         2 statfs
  0.00    0.000000           0         6         4 prctl
  0.00    0.000000           0         1           epoll_create1
------ ----------- ----------- --------- --------- ----------------
100.00    0.002513           1      2317       342 total
```

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```
ayodeji.osho@gfx03-7:~/Documents/CPSC457/palindrome-main$ strace -c ./slow-pali < t3.txt
Longest palindrome: ___o.0.o___
% time     seconds  usecs/call     calls    errors syscall
------ ----------- ----------- --------- --------- ----------------
  0.00    0.000000           0        50           read
  0.00    0.000000           0         1           write
  0.00    0.000000           0         5           close
  0.00    0.000000           0         8         7 stat
  0.00    0.000000           0         6           fstat
  0.00    0.000000           0         7           lseek
  0.00    0.000000           0        22           mmap
  0.00    0.000000           0         7           mprotect
  0.00    0.000000           0         1           munmap
  0.00    0.000000           0         3           brk
  0.00    0.000000           0         1         1 access
  0.00    0.000000           0         1           execve
  0.00    0.000000           0         2         1 arch_prctl
  0.00    0.000000           0        48        43 openat
------ ----------- ----------- --------- --------- ----------------
100.00    0.000000           0       162        52 total
```

```
ayodeji.osho@gfx03-7:~/Documents/CPSC457/palindrome-main$ strace -c ./slow-pali < t4.txt
Longest palindrome: redder
% time     seconds  usecs/call     calls    errors syscall
------ ----------- ----------- --------- --------- ----------------
100.00    9.594476           1   5767205           read
  0.00    0.000006           6         1           write
  0.00    0.000003           0         6           fstat
  0.00    0.000000           0         5           close
  0.00    0.000000           0         8         7 stat
  0.00    0.000000           0         7           lseek
  0.00    0.000000           0        22           mmap
  0.00    0.000000           0         7           mprotect
  0.00    0.000000           0         1           munmap
  0.00    0.000000           0         3           brk
  0.00    0.000000           0         1         1 access
  0.00    0.000000           0         1           execve
  0.00    0.000000           0         2         1 arch_prctl
  0.00    0.000000           0        48        43 openat
------ ----------- ----------- --------- --------- ----------------
100.00    9.594485           1   5767317        52 total
```

d) For small input (t3.txt), c++ makes less read calls than python which leads to less running time. However, as the text file gets larger (t4.txt), c++ makes significantly more read calls which drastically increase the running time

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Part 3

a)

```
ayodeji.osho@linux06-wc:~/Documents/CPSC457/palindrome-main$ time ./fast-pali < t3.txt
Longest palindrome: ___o.O.o___

real    0m0.005s
user    0m0.004s
sys     0m0.001s
ayodeji.osho@linux06-wc:~/Documents/CPSC457/palindrome-main$
```

```
ayodeji.osho@linux06-wc:~/Documents/CPSC457/palindrome-main$ time ./fast-pali < t4.txt
Longest palindrome: redder

real    0m0.072s
user    0m0.051s
sys     0m0.019s
```

```
ayodeji.osho@linux06-wc:~/Documents/CPSC457/palindrome-main$ strace -c ./fast-pali < t3.txt
Longest palindrome: ___o.O.o___
% time     seconds  usecs/call     calls    errors syscall
------ ----------- ----------- --------- --------- ----------------
 44.94    0.000142           2        58        53 openat
 24.37    0.000077           3        22           mmap
 11.39    0.000036           2        16         9 newfstatat
  5.70    0.000018           2         9           mprotect
  4.43    0.000014           2         6           read
  3.48    0.000011           2         5           close
  2.53    0.000008           2         4           pread64
  0.95    0.000003           3         1           munmap
  0.95    0.000003           1         3           brk
  0.63    0.000002           2         1           write
  0.63    0.000002           1         2         1 arch_prctl
  0.00    0.000000           0         1         1 access
  0.00    0.000000           0         1           execve
------ ----------- ----------- --------- --------- ----------------
100.00    0.000316           2       129        64 total
```

Report By: Ayodeji Osho

```
ayodeji.osho@linux06-wc:~/Documents/CPSC457/palindrome-main$ strace -c ./fast-pali < t4.txt
Longest palindrome: redder
% time     seconds  usecs/call     calls    errors syscall
------ ----------- ----------- --------- --------- ----------------
 57.02    0.001141          27        42           brk
 36.33    0.000727          66        11           read
  5.20    0.000104          10        10           munmap
  0.80    0.000016           0        31           mmap
  0.45    0.000009           1         9           mprotect
  0.10    0.000002           2         1           write
  0.10    0.000002           0        16         9 newfstatat
  0.00    0.000000           0         5           close
  0.00    0.000000           0         4           pread64
  0.00    0.000000           0         1         1 access
  0.00    0.000000           0         1           execve
  0.00    0.000000           0         2         1 arch_prctl
  0.00    0.000000           0        58        53 openat
------ ----------- ----------- --------- --------- ----------------
100.00    0.002001          10       191        64 total
```

b) The fast-pali is significantly faster than the slow-pali.cpp for both text files. The reason for this is my program is making less read calls. It is reading 1mb per call instead of 1 character at a time.

c) fast-pali.cpp is faster that palindrome.py because it spends less time in kernel mode since it makes less read call