Report
Assignment-2

Vivek Kumar(B18092)
Bhumanyu Goyal(B18012)
Harish Jaglan(B18115)

Q1 Linux Kernel

Using INSTALL_MOD_STRIP along with make modules_install strips all debugging symbols and reduces the size of the modules to be installed and the size of the initrd image. Though the size of the kernel(vmlizuz) is not affected.

Size of initrd.img-5.8.0-45-generic : 52.9 MB
Size of initrd.img-5.10.1 : 50.5 MB

Size of lib/modules/5.8.0-45-generic : 291.6 MB
Size of lib/modules/5.10.1 : 284.6 MB

Q3 Multithreaded In-place merge sort

Idea
Convert the threads to the nearest no. of threads suitable to form a perfect tree, then use the normal function of merge sort with following changes:-

a) If the level in perfect tree(mergeSort tree) is greater than or equal to last level of perfect tree use mergeSort function without any threads
b) Else form 2 threads, for [left, mid] and [mid+1, hi] mergesort
c) Use *pthread_join* to wait for both subarrays to get sorted
d) Merge the sorted subarrays in the same thread and return

Note:-

a) For measuring time of execution of mergeSort with threading use Wall clock time not CPU clock time.
b) Benefit of multithreading is observed for arrays of very large size, most likely because of overhead in thread creation

Graphs

X-axis → #threads, Y-axis → time

Fig1. Array size=1e2, thread_step= +1

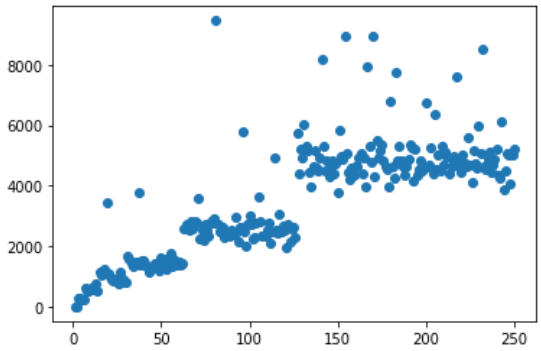


Fig2. Array size=1e4, thread_step= +1

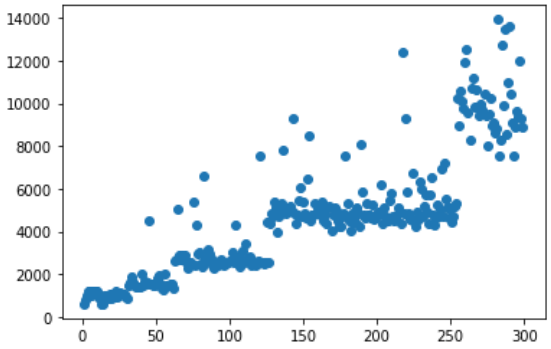


Fig3. Array size=1e7, thread_step= +1

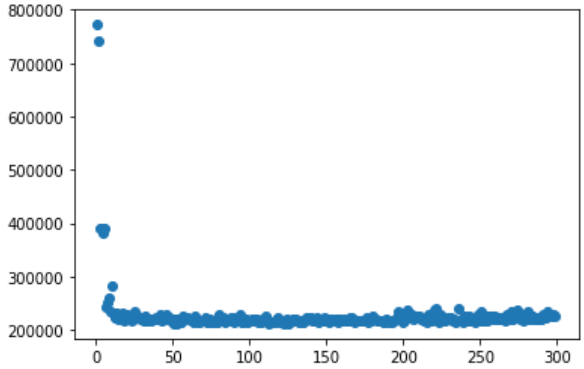
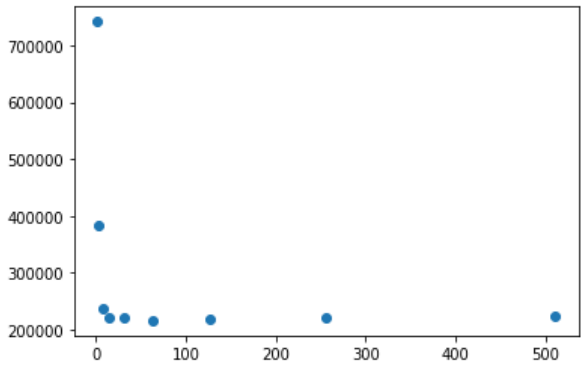


Fig4. Array size=1e7, thread_step= x2



Conclusion

As observed from graphs, multithreading decreases execution time for arrays of size 1e7(or large array) while for others multithreading has more time than 1 thread execution.