**Assignment 5**

**I am using 4 cases (1,2,4 and 8 threads ). Running my parallel sorting algorithm on different array and cutoffs.**

Degree of parallelism: 1

| | | |
|---|---|---|
| cutoff : 510000 | 10times Time:2444ms | size1000000 |
| cutoff : 560000 | 10times Time:2020ms | size1000000 |
| cutoff : 610000 | 10times Time:1273ms | size1000000 |
| cutoff : 660000 | 10times Time:1281ms | size1000000 |
| cutoff : 710000 | 10times Time:1320ms | size1000000 |
| cutoff : 760000 | 10times Time:1435ms | size1000000 |
| cutoff : 810000 | 10times Time:1306ms | size1000000 |
| cutoff : 860000 | 10times Time:1244ms | size1000000 |
| cutoff : 910000 | 10times Time:1244ms | size1000000 |
| cutoff : 960000 | 10times Time:1265ms | size1000000 |

Degree of parallelism: 2

| | | |
|---|---|---|
| cutoff : 510000 | 10times Time:1699ms | size1000000 |
| cutoff : 560000 | 10times Time:1276ms | size1000000 |
| cutoff : 610000 | 10times Time:1348ms | size1000000 |
| cutoff : 660000 | 10times Time:1237ms | size1000000 |
| cutoff : 710000 | 10times Time:1271ms | size1000000 |
| cutoff : 760000 | 10times Time:1225ms | size1000000 |
| cutoff : 810000 | 10times Time:1193ms | size1000000 |
| cutoff : 860000 | 10times Time:1212ms | size1000000 |
| cutoff : 910000 | 10times Time:1228ms | size1000000 |
| cutoff : 960000 | 10times Time:1184ms | size1000000 |

Degree of parallelism: 4

| | | |
|---|---|---|
| cutoff : 510000 | 10times Time:1506ms | size1000000 |
| cutoff : 560000 | 10times Time:2221ms | size1000000 |
| cutoff : 610000 | 10times Time:1225ms | size1000000 |
| cutoff : 660000 | 10times Time:1238ms | size1000000 |
| cutoff : 710000 | 10times Time:1231ms | size1000000 |
| cutoff : 760000 | 10times Time:1219ms | size1000000 |
| cutoff : 810000 | 10times Time:1243ms | size1000000 |
| cutoff : 860000 | 10times Time:1198ms | size1000000 |
| cutoff : 910000 | 10times Time:1226ms | size1000000 |
| cutoff : 960000 | 10times Time:1483ms | size1000000 |

Degree of parallelism: 8

| | | |
|---|---|---|
| cutoff : 510000 | 10times Time:1179ms | size1000000 |
| cutoff : 560000 | 10times Time:1283ms | size1000000 |
| cutoff : 610000 | 10times Time:1195ms | size1000000 |
| cutoff : 660000 | 10times Time:1217ms | size1000000 |

| | | |
|---|---|---|
| cutoff : 710000 | 10times Time:1212ms | size1000000 |
| cutoff : 760000 | 10times Time:1197ms | size1000000 |
| cutoff : 810000 | 10times Time:1203ms | size1000000 |
| cutoff : 860000 | 10times Time:1241ms | size1000000 |
| cutoff : 910000 | 10times Time:1372ms | size1000000 |
| cutoff : 960000 | 10times Time:1168ms | size1000000 |

Process finished with exit code 0

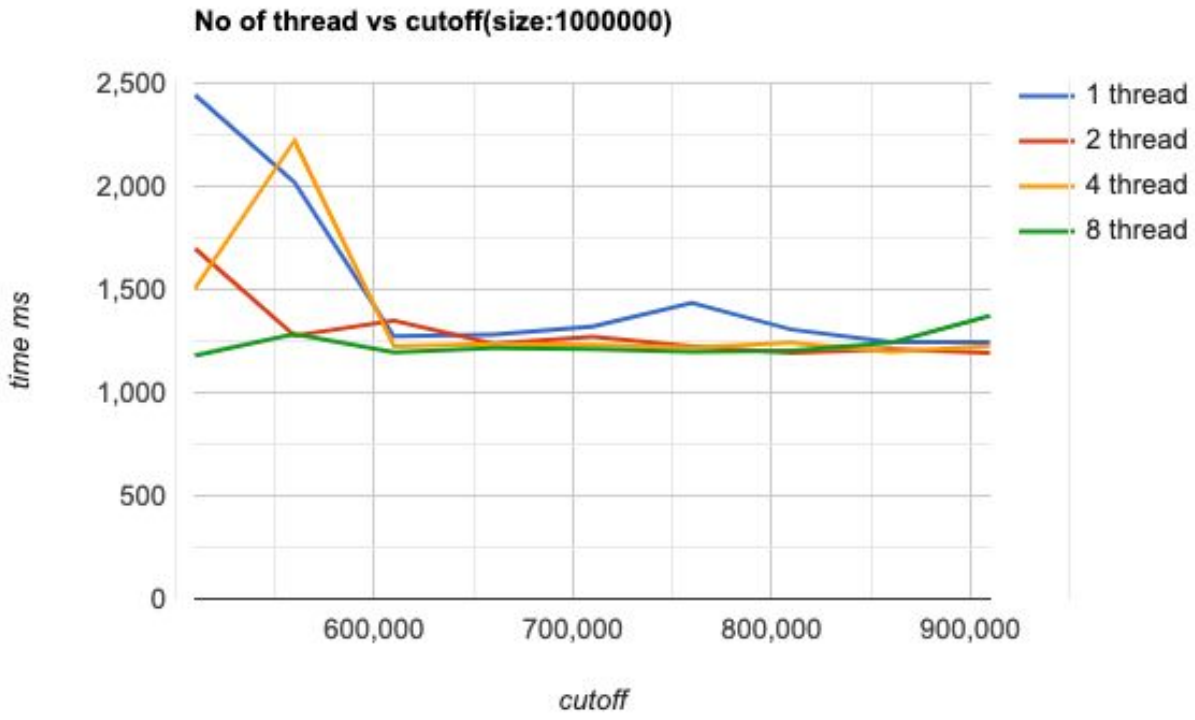


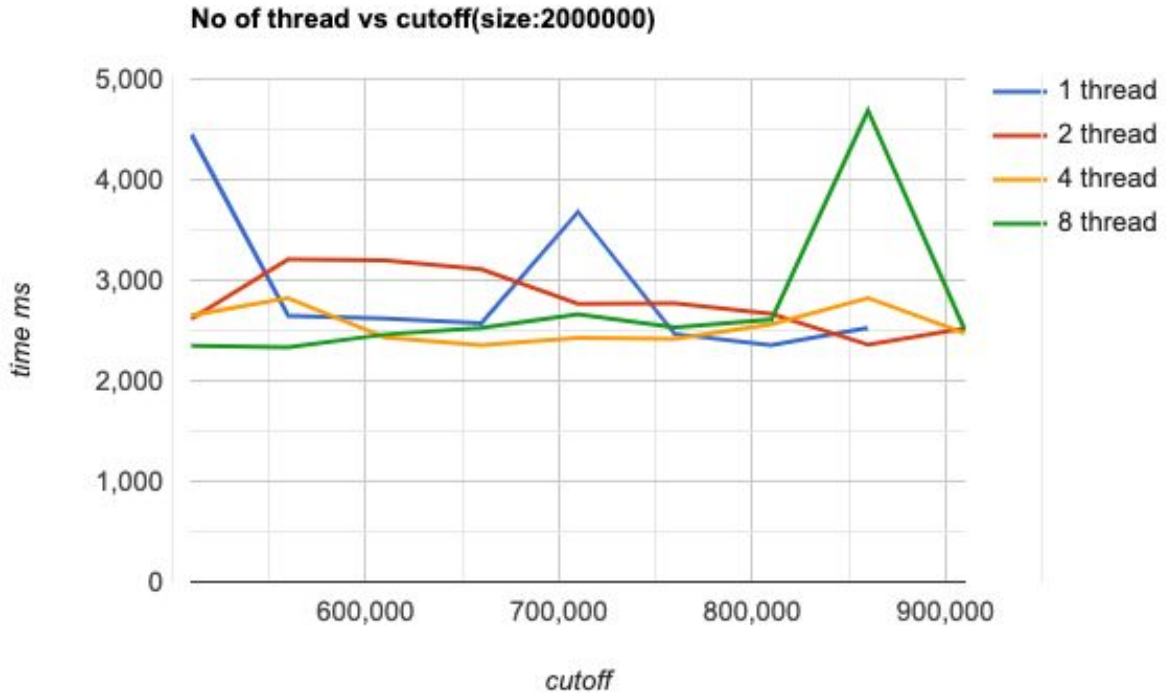

Image -1

Degree of parallelism: 1

| | | |
|---|---|---|
| cutoff : 510000 | 10times Time:4447ms | size2000000 |
| cutoff : 560000 | 10times Time:2645ms | size2000000 |
| cutoff : 610000 | 10times Time:2618ms | size2000000 |
| cutoff : 660000 | 10times Time:2575ms | size2000000 |
| cutoff : 710000 | 10times Time:3678ms | size2000000 |
| cutoff : 760000 | 10times Time:2466ms | size2000000 |

```
cutoff：810000          10times Time:2354ms     size2000000
cutoff：860000          10times Time:2528ms     size2000000
cutoff：910000          10times Time:2478ms     size2000000
cutoff：960000          10times Time:2493ms     size2000000
Degree of parallelism: 2
cutoff：510000          10times Time:2619ms     size2000000
cutoff：560000          10times Time:3207ms     size2000000
cutoff：610000          10times Time:3199ms     size2000000
cutoff：660000          10times Time:3109ms     size2000000
cutoff：710000          10times Time:2767ms     size2000000
cutoff：760000          10times Time:2770ms     size2000000
cutoff：810000          10times Time:2666ms     size2000000
cutoff：860000          10times Time:2358ms     size2000000
cutoff：910000          10times Time:2520ms     size2000000
cutoff：960000          10times Time:2582ms     size2000000
Degree of parallelism: 4
cutoff：510000          10times Time:2651ms     size2000000
cutoff：560000          10times Time:2823ms     size2000000
cutoff：610000          10times Time:2434ms     size2000000
cutoff：660000          10times Time:2354ms     size2000000
cutoff：710000          10times Time:2425ms     size2000000
cutoff：760000          10times Time:2416ms     size2000000
cutoff：810000          10times Time:2562ms     size2000000
cutoff：860000          10times Time:2822ms     size2000000
cutoff：910000          10times Time:2475ms     size2000000
cutoff：960000          10times Time:2442ms     size2000000
Degree of parallelism: 8
cutoff：510000          10times Time:2351ms     size2000000
cutoff：560000          10times Time:2332ms     size2000000
cutoff：610000          10times Time:2461ms     size2000000
cutoff：660000          10times Time:2526ms     size2000000
cutoff：710000          10times Time:2659ms     size2000000
cutoff：760000          10times Time:2531ms     size2000000
cutoff：810000          10times Time:2607ms     size2000000
cutoff：860000          10times Time:4691ms     size2000000
cutoff：910000          10times Time:2506ms     size2000000
cutoff：960000          10times Time:2638ms     size2000000

Process finished with exit code 0
```




Degree of parallelism: 1

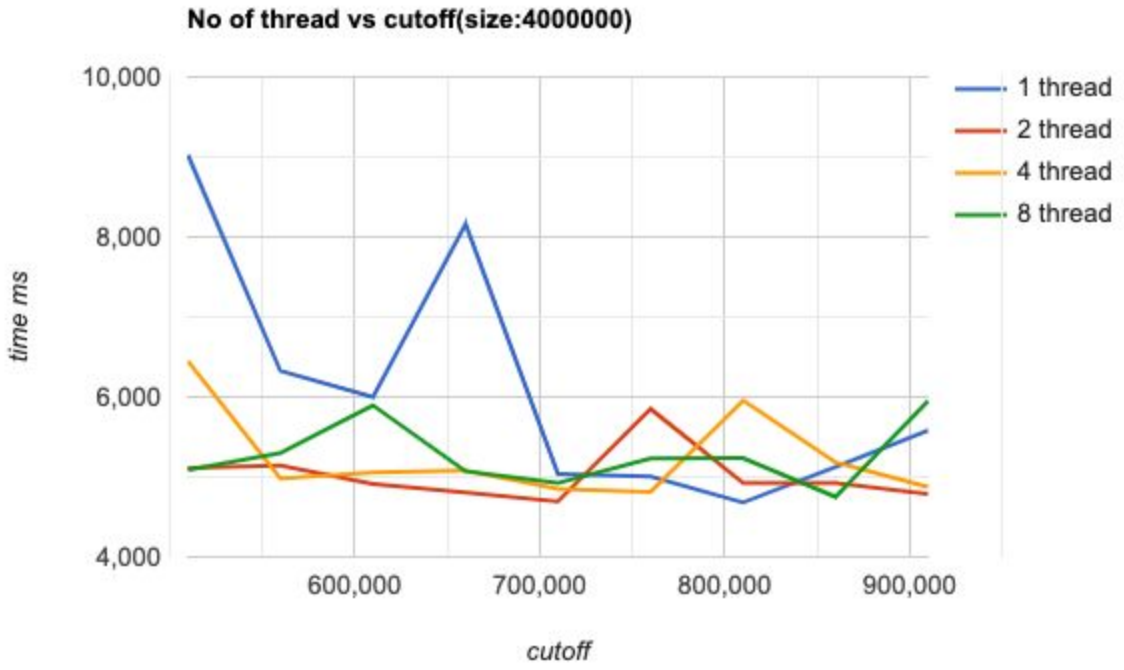
| | | |
|---|---|---|
| cutoff : 510000 | 10times Time:9023ms | size4000000 |
| cutoff : 560000 | 10times Time:6324ms | size4000000 |
| cutoff : 610000 | 10times Time:5998ms | size4000000 |
| cutoff : 660000 | 10times Time:8164ms | size4000000 |
| cutoff : 710000 | 10times Time:5036ms | size4000000 |
| cutoff : 760000 | 10times Time:5007ms | size4000000 |
| cutoff : 810000 | 10times Time:4685ms | size4000000 |
| cutoff : 860000 | 10times Time:5125ms | size4000000 |
| cutoff : 910000 | 10times Time:5581ms | size4000000 |
| cutoff : 960000 | 10times Time:4892ms | size4000000 |

Degree of parallelism: 2

| | | |
|---|---|---|
| cutoff : 510000 | 10times Time:5110ms | size4000000 |
| cutoff : 560000 | 10times Time:5142ms | size4000000 |
| cutoff : 610000 | 10times Time:4911ms | size4000000 |
| cutoff : 660000 | 10times Time:4804ms | size4000000 |
| cutoff : 710000 | 10times Time:4693ms | size4000000 |
| cutoff : 760000 | 10times Time:5851ms | size4000000 |
| cutoff : 810000 | 10times Time:4925ms | size4000000 |
| cutoff : 860000 | 10times Time:4925ms | size4000000 |
| cutoff : 910000 | 10times Time:4790ms | size4000000 |

cutoff：960000 10times Time:4889ms size4000000
Degree of parallelism: 4
cutoff：510000 10times Time:6444ms size4000000
cutoff：560000 10times Time:4983ms size4000000
cutoff：610000 10times Time:5058ms size4000000
cutoff：660000 10times Time:5082ms size4000000
cutoff：710000 10times Time:4850ms size4000000
cutoff：760000 10times Time:4811ms size4000000
cutoff：810000 10times Time:5958ms size4000000
cutoff：860000 10times Time:5185ms size4000000
cutoff：910000 10times Time:4876ms size4000000
cutoff：960000 10times Time:4907ms size4000000
Degree of parallelism: 8
cutoff：510000 10times Time:5086ms size4000000
cutoff：560000 10times Time:5299ms size4000000
cutoff：610000 10times Time:5897ms size4000000
cutoff：660000 10times Time:5072ms size4000000
cutoff：710000 10times Time:4923ms size4000000
cutoff：760000 10times Time:5231ms size4000000
cutoff：810000 10times Time:5236ms size4000000
cutoff：860000 10times Time:4749ms size4000000
cutoff：910000 10times Time:5951ms size4000000
cutoff：960000 10times Time:5234ms size4000000

Process finished with exit code 0




Degree of parallelism: 1

| | | |
|---|---|---|
| cutoff : 510000 | 10times Time:12660ms | size8000000 |
| cutoff : 610000 | 10times Time:10084ms | size8000000 |
| cutoff : 710000 | 10times Time:9933ms | size8000000 |
| cutoff : 810000 | 10times Time:11355ms | size8000000 |
| cutoff : 910000 | 10times Time:9964ms | size8000000 |

Degree of parallelism: 2

| | | |
|---|---|---|
| cutoff : 510000 | 10times Time:11583ms | size8000000 |
| cutoff : 610000 | 10times Time:13969ms | size8000000 |
| cutoff : 710000 | 10times Time:11528ms | size8000000 |
| cutoff : 810000 | 10times Time:10542ms | size8000000 |
| cutoff : 910000 | 10times Time:13648ms | size8000000 |

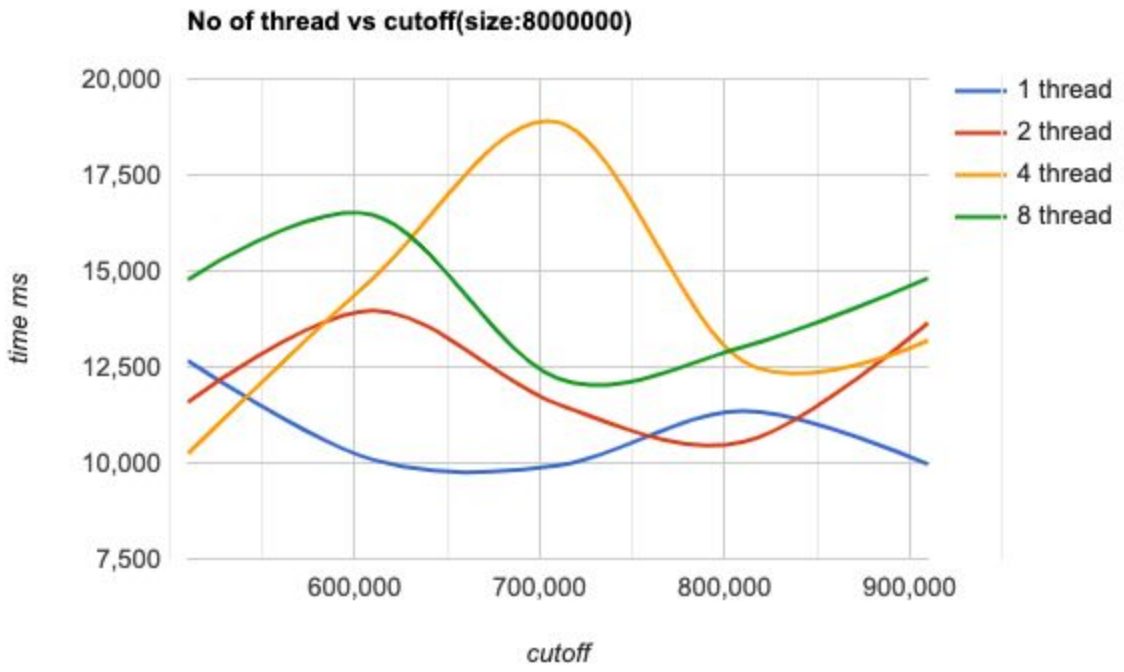
Degree of parallelism: 4

| | | |
|---|---|---|
| cutoff : 510000 | 10times Time:10248ms | size8000000 |
| cutoff : 610000 | 10times Time:14810ms | size8000000 |
| cutoff : 710000 | 10times Time:18874ms | size8000000 |
| cutoff : 810000 | 10times Time:12650ms | size8000000 |

Degree of parallelism: 8

| | | |
|---|---|---|
| cutoff : 510000 | 10times Time:14774ms | size8000000 |
| cutoff : 610000 | 10times Time:16461ms | size8000000 |
| cutoff : 710000 | 10times Time:12199ms | size8000000 |
| cutoff : 810000 | 10times Time:13024ms | size8000000 |

cutoff：910000　　10times Time:14809ms　　size8000000




## Observation/Conclusion:-

1) Initially when array size is less we can't differentiate much between the thread performance and cutoff is not playing much role.
2) As array size is increasing , single thread is taking less time as cutoff increases as there is no role of parallel sort in single thread. When cutoff increases System sort is playing its role in sorting arrays efficiently.
3) As cutoff is increasing, parallel sort with  two or more  threads is sorting efficiently.
4) As size increases, time taken for sorting also increases .