**Assignment 4 (Parallel Sorting)**

**Name : Ganesh Dharani**

**Nuid : 002191922**

**Solution:**

* Parallel sort for 3 different array sizes has been implemented for 2 million, 4 million, and 10million.
* Thread counts incremented as a power of 2 (1,2,4,8,16,32)
* For each array size, taken 6 different cut-off values to analyze the efficiency of parallel sorting algorithm
* Optimal cut-off value seems to be around 30-50% of the given array size.
* When we reach the array size (30-50% ) of the given array’s size, moving to system sort from the recursive program will gives us optimal results.
* The time duration in the entire report is in ms (milli Seconds)

**Observation:**

**(1) For 2 million** array size, the cutoffs chosen are:

(30000, 60000, 120000, 240000, 480000, 960000)

* As the 2million size is smaller in comparison, it was observed a little inconsistent with the cut-offs, but not in the case of larger array sizes**(4million and 8million)**
* On an average, 9,60,000(around 1 million cut-off) seems to be optimal for 2M sized array.

Graphical user interface, application

Description automatically generated

**(2) For 4 million** array size, the cutoffs chosen are:

(120000, 240000, 480000, 960000, 1920000, 3840000)

* The minimum time taken occurred at 1920000 (1.92 mil i.e around 2million) cutoff
* Observed the minimum average time when the thread count is 8

Graphical user interface, application

Description automatically generated

**(2) For 8 million** array size:

* The minimum time taken occurred at 3840000 (3.4mil i.e around 4 million) cutoff
* Observed the minimum average time when the thread count is 32

Graphical user interface, application, Excel

Description automatically generated

**Array Size vs Thread Count :**

when the array size significantly high using more number of threads improves performance.

Chart, line chart

Description automatically generated

**Conclusion:**

* The cut-off value after which the system sort is to be used is around 30-50% of the total size of the array
* When we reach the array size (30-50% ) of the given array’s size, moving to system sort from the recursive program will gives us optimal results.
* Using more number of threads will help the parallel sorting algorithm to work more efficiently when the array size ki significantly high