

Program Structures and Algorithms  
Spring 2023(SEC – 08)

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**Task: Assignment 5 (Parallel Sorting)**

**Relationship Conclusion:**

When cut times is zero, which is using the system sort directly without any partition, the time cost is the largest.

When do the parallel sorting, there is a cut times point that the parallel sorting shows the best efficiency. The time cost decrease with the cut times increments before the best efficient cut times, then the time cost increase after the best efficient cut times.

**Evidence to support that conclusion:**  
**(The best efficient cut times data are bold and italic)**

**Degree of parallelism: 16**

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Array size: 1000000

cut times: 0	cutoff: 1000000	10times Time:905ms
cut times: 1	cutoff: 500000	10times Time:532ms
cut times: 2	cutoff: 250000	10times Time:379ms
<b>cut times: 3</b>	<b>cutoff: 125000</b>	<b>10times Time:356ms</b>
cut times: 4	cutoff: 62500	10times Time:361ms
cut times: 5	cutoff: 31250	10times Time:361ms
cut times: 6	cutoff: 15625	10times Time:580ms
cut times: 7	cutoff: 7812	10times Time:365ms
cut times: 8	cutoff: 3906	10times Time:369ms
cut times: 9	cutoff: 1953	10times Time:394ms

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Array size: 2000000

cut times: 0	cutoff: 2000000	10times Time:1691ms
cut times: 1	cutoff: 1000000	10times Time:1061ms
cut times: 2	cutoff: 500000	10times Time:759ms
cut times: 3	cutoff: 250000	10times Time:702ms
cut times: 4	cutoff: 125000	10times Time:710ms
<b>cut times: 5</b>	<b>cutoff: 62500</b>	<b>10times Time:692ms</b>
cut times: 6	cutoff: 31250	10times Time:708ms
cut times: 7	cutoff: 15625	10times Time:727ms
cut times: 8	cutoff: 7812	10times Time:767ms
cut times: 9	cutoff: 3906	10times Time:762ms
cut times: 10	cutoff: 1953	10times Time:816ms

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Array size: 4000000

cut times: 0	cutoff: 4000000	10times Time:3511ms
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cut times: 1	cutoff: 2000000	10times Time:2194ms
cut times: 2	cutoff: 1000000	10times Time:1569ms
cut times: 3	cutoff: 500000	10times Time:1537ms
<b>cut times: 4</b>	<b>cutoff: 250000</b>	<b>10times Time:1469ms</b>
cut times: 5	cutoff: 125000	10times Time:1478ms
cut times: 6	cutoff: 62500	10times Time:1544ms
cut times: 7	cutoff: 31250	10times Time:1553ms
cut times: 8	cutoff: 15625	10times Time:1675ms
cut times: 9	cutoff: 7812	10times Time:1976ms
cut times: 10	cutoff: 3906	10times Time:1898ms
cut times: 11	cutoff: 1953	10times Time:1788ms

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Array size: 8000000

cut times: 0	cutoff: 8000000	10times Time:7272ms
cut times: 1	cutoff: 4000000	10times Time:4594ms
cut times: 2	cutoff: 2000000	10times Time:3223ms
<b>cut times: 3</b>	<b>cutoff: 1000000</b>	<b>10times Time:2842ms</b>
cut times: 4	cutoff: 500000	10times Time:2860ms
cut times: 5	cutoff: 250000	10times Time:2860ms
cut times: 6	cutoff: 125000	10times Time:2957ms
cut times: 7	cutoff: 62500	10times Time:2978ms
cut times: 8	cutoff: 31250	10times Time:3155ms
cut times: 9	cutoff: 15625	10times Time:3192ms
cut times: 10	cutoff: 7812	10times Time:3268ms
cut times: 11	cutoff: 3906	10times Time:3695ms
cut times: 12	cutoff: 1953	10times Time:4017ms

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Array size: 16000000

cut times: 0	cutoff: 16000000	10times Time:15348ms
cut times: 1	cutoff: 8000000	10times Time:9571ms
cut times: 2	cutoff: 4000000	10times Time:6851ms
cut times: 3	cutoff: 2000000	10times Time:6024ms
<b>cut times: 4</b>	<b>cutoff: 1000000</b>	<b>10times Time:5810ms</b>
cut times: 5	cutoff: 500000	10times Time:5900ms
cut times: 6	cutoff: 250000	10times Time:6084ms
cut times: 7	cutoff: 125000	10times Time:6200ms
cut times: 8	cutoff: 62500	10times Time:6410ms
cut times: 9	cutoff: 31250	10times Time:6571ms
cut times: 10	cutoff: 15625	10times Time:6512ms
cut times: 11	cutoff: 7812	10times Time:7049ms
cut times: 12	cutoff: 3906	10times Time:9128ms
cut times: 13	cutoff: 1953	10times Time:8701ms

