

## Task 8.1

### 1. Environment

CPU Threads: 14 threads

Array Size: 10,000,000 elements

Parallel Threshold:  $N/30$  (333,333 elements)

### 2. Benchmark Results

Sequential Time: 0.4703 seconds

Parallel Time: 0.2330 seconds

Speedup: 2.02x

### 3. Discussion

Threshold Strategy: Switching to sequential processing when the array size drops below  $N/30$  effectively reduced the overhead associated with excessive thread creation.

Performance Analysis: Although 14 threads were available, the speedup was limited to about 2x. This is likely due to memory bandwidth bottlenecks and the inherently sequential nature of the partitioning step itself. However, the result clearly demonstrates the benefit of parallel execution for large datasets.