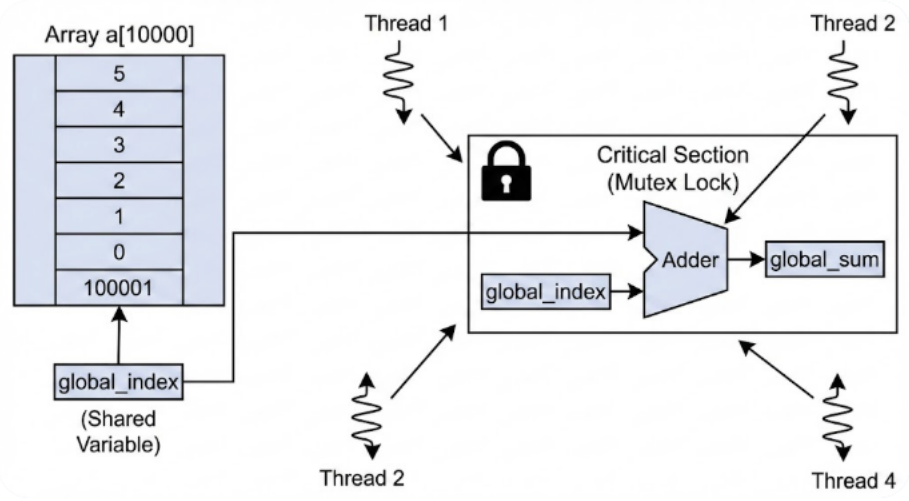
Kennesaw State University

HPC & Parallel Programming

Project - Pthread

Instructor: Kun Suo
Points Possible: 100
Difficulty: ★★★★☆

Part 1: (40 points)

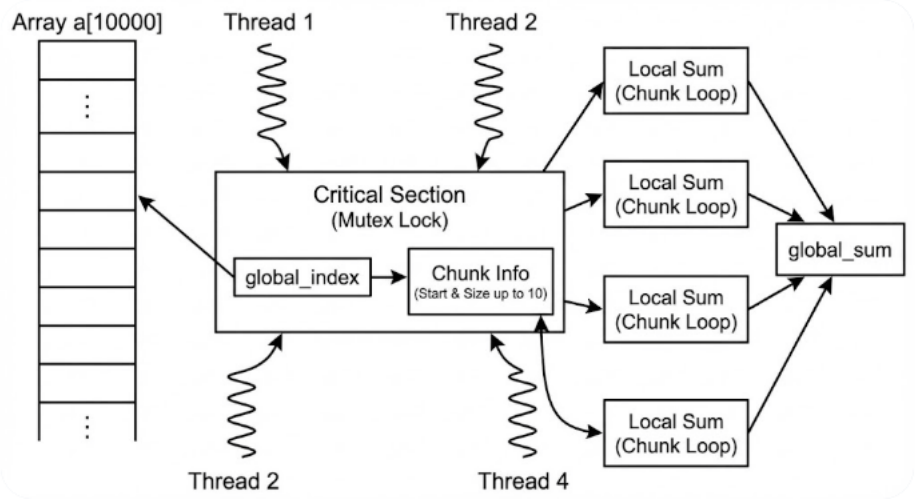


Suppose an array a[i]=2*i.

Write a program that demonstrates the use of Pthreads by summing the elements of an array a[10000] using multiple threads. Create N threads, where each thread retrieves the next unadded element of array a[] through a shared variable global_index. Note that the global index global_index should not be accessed outside the critical section. Please output the total running time and the global_sum, when number of threads is from 1 to 10.

threads num	global_sum	total running time
1		
2		
…		
10		

Part 2: (40 points)



Rewrite the example above so that each thread can retrieve a maximum of 10 consecutive numbers at a time, summing them in groups. Please output the total running time and the global_sum, when number of threads is from 1 to 10.

threads num	global_sum	total running time
1		
2		
…		
10		

Part 3: (20 points)

Based on the results of tasks 1 and 2, please analyze the differences between single-threaded and multi-threaded execution and explain the reasons. Additionally, for locking mechanisms, analyze the overhead of using both spinlocks and sleep_and_work locks, and compare the performance differences between these two methods under extremely frequent contention.

Submission

Submit your assignment file through D2L using the appropriate link.
The submission must include the ***source code***, and ***a report describe your code logic***. ***Output screenshot of your code*** should be included in the report.