HIGH PERFORMANCE COMPUTING

Assignment-4

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Barrier Synchronization (Two-Phase Computation)

Scenario

Perform a computation in two phases ensuring correct synchronization between phases.

Objective

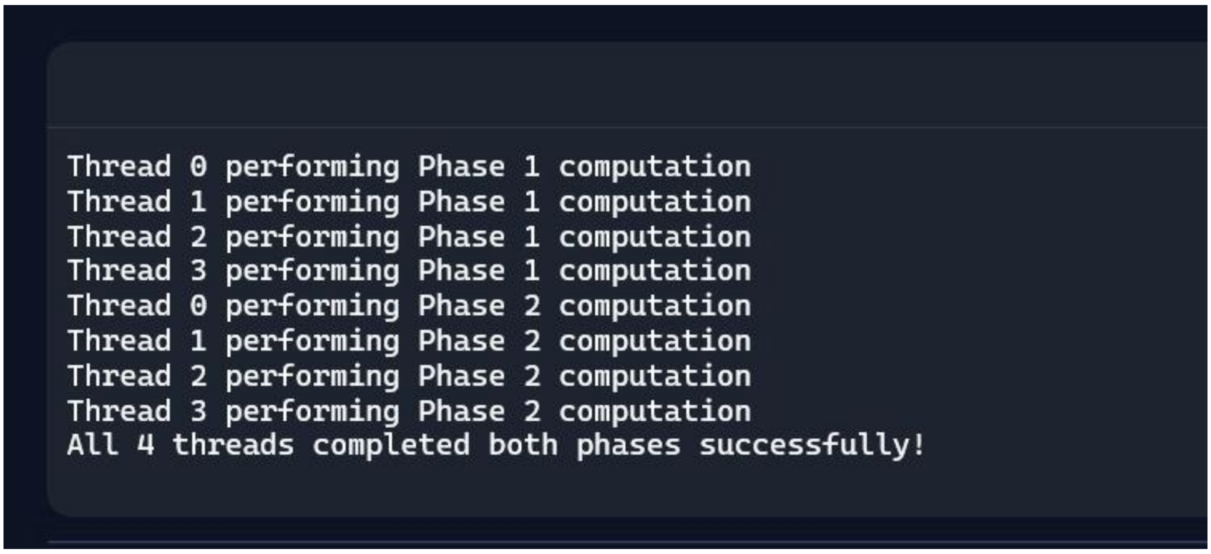
To demonstrate barrier synchronization in parallel execution.

Tasks

1. Perform computation in Phase 1.
2. Synchronize all threads.
3. Perform computation in Phase 2.
4. Display completion message.

Code :

```
#include <stdio.h>
#include <omp.h>
int main()
{
    int num_threads;
    #pragma omp parallel
    {
        int tid = omp_get_thread_num();
        num_threads = omp_get_num_threads();
        // Phase 1 computation
        printf("Thread %d performing Phase 1 computation\n", tid);
        // Barrier synchronization
        #pragma omp barrier

        // Phase 2 computation

        printf("Thread %d performing Phase 2 computation\n", tid);

        // Barrier again (optional, ensures all threads finish Phase 2 before completion
message)

        #pragma omp barrier

        // Only one thread prints completion message

        #pragma omp single

        {

            printf("All %d threads completed both phases successfully!\n", num_threads);

        }

    }

    return 0;

}
```



```
Thread 0 performing Phase 1 computation
Thread 1 performing Phase 1 computation
Thread 2 performing Phase 1 computation
Thread 3 performing Phase 1 computation
Thread 0 performing Phase 2 computation
Thread 1 performing Phase 2 computation
Thread 2 performing Phase 2 computation
Thread 3 performing Phase 2 computation
All 4 threads completed both phases successfully!
```

Learning outcomes :

- Understood barrier synchronization in parallel computing.
- Implemented multi-phase parallel programs.
- correct execution order using synchronization techniques.
- understood role of barriers in OpenMP-style parallel execution.