

# HPC CUDA C TUTORIAL 8 REPORT

CS22B2015 – HARSHITH B

## **1. Introduction**

This report analyzes the performance of serial and parallel implementations for calculating the vector addition and multiplication of 1.5 million floating-point double numbers. A serial code written in C and a parallel code written in CUDA (.cu) were developed to perform this computation, and their execution times are compared to evaluate efficiency and potential speedup.

## **2. Serial Code Snippet**

ADDITION:

```
printf("Parallel Vector Addition\n");
int j;
clock_t start = clock();

for(j=0;j<count;j++){
    vec.sum_result[j] = vec.arr1[j] + vec.arr2[j];
}
clock_t end = clock();
```

MULTIPLICATION

```

printf("Parallel Vector Multiplication\n");
int j;
clock_t start = clock();

for(j = 0; j < count; j++) {
    vec.product_result[j] = vec.arr1[j] * vec.arr2[j];
}

clock_t end = clock();
double time_taken = ((double)(end - start)) / CLOCKS_PER_SEC;
printf("Time: %lf\n", time_taken);
fprintf(f_mul, "%lf\n", time_taken);

```

### 3. Parallel Code Snippet

ADDITION KERNEL

```

__global__ void add(double *d_arr1, double *d_arr2, double *d_sum, int n){
    int tid = threadIdx.x + blockIdx.x * blockDim.x;
    if (tid < n){
        d_sum[tid] = d_arr1[tid] + d_arr2[tid];
    }
}

```

MULTIPLICATION KERNEL

### 4. Terminal Output Screenshot

ADDITION

```

• (venv) harshith@harshithb:~/Projects /SEM 6/HPC/tutorial-9$ ./serial_add
Parallel Vector Addition
Time: 0.119181
• (venv) harshith@harshithb:~/Projects /SEM 6/HPC/tutorial-9$ nvcc -o parallel_add parallel_addition.cu
• (venv) harshith@harshithb:~/Projects /SEM 6/HPC/tutorial-9$ ./parallel_add
Time: 0.024147

```

MULTIPLICATION

```
(venv) harshith@harshithb:~/Projects /SEM 6/HPC/tutorial-9$ ./serial_mul
Parallel Vector Multiplication
Time: 0.117243
(venv) harshith@harshithb:~/Projects /SEM 6/HPC/tutorial-9$ nvcc -o parallel_mult parallel_multiplication.cu
(venv) harshith@harshithb:~/Projects /SEM 6/HPC/tutorial-9$ ./parallel_mult
Time: 0.016264
```

### ***5. Serial and Parallel Code Execution Time and Speedup Calculation***

- **Addition Serial Code Execution Time:** 0.119181 seconds
- **Addition Parallel Code Execution Time:** 0.024147 seconds
- **Multiplication Serial Code Execution Time:** 0.117243 seconds
- **Multiplication Parallel Code Execution Time:** 0.016264 seconds

**Speedup Calculation:**

**Speedup = Serial Execution Time / Parallel Execution Time**

**Addition Speedup = 4.935**

**Multiplication Speedup = 7.2**