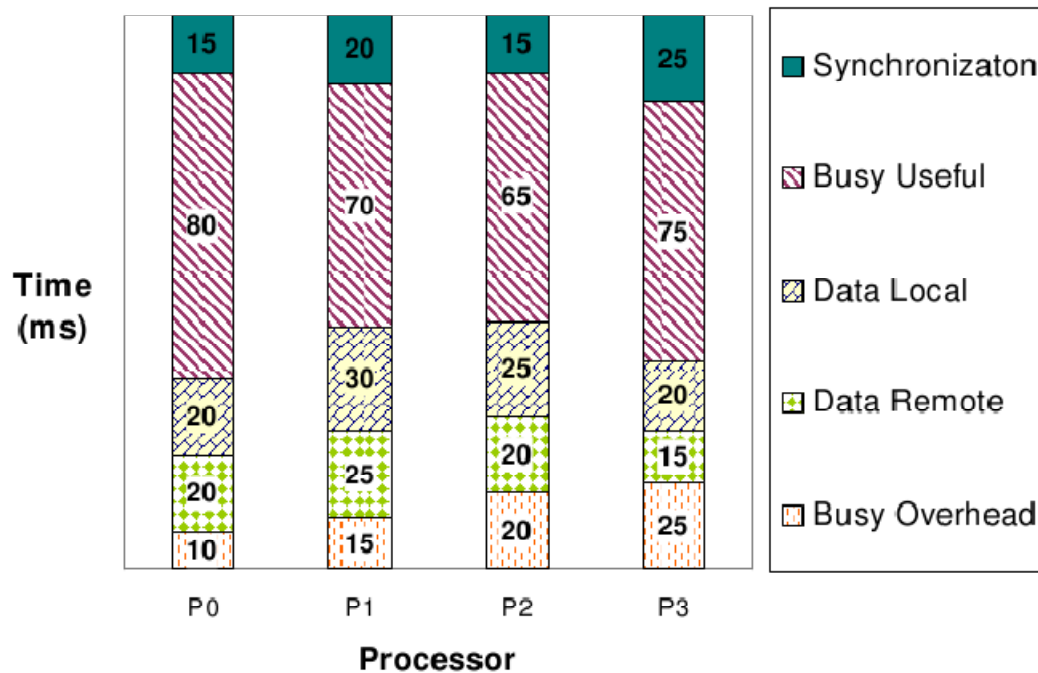


ECSE 420-Parallel Computing Assignment 2

1- A uniprocessor application is parallelized for 4 processors, yielding a 3.8x speedup. Given the time breakdown of the various function seen in the graph, what is the minimum total time that the uniprocessor application spent while Busy and in performing Data Access?



2-Consider transposing a matrix in parallel from a source matrix to a destination matrix.

- a- How might you partition the two matrices among processes? Discuss some possibilities and the trade-off. Does it matter whether you are programming a shared address space or message-passing machine?
- b- Why is interposes communication in a matrix transpose called all-to-all personalized communication?
- c- Write simple pseudo code for the parallel matrix transposition in a shared address space and in message passing (just the loops that implement the transpose).

3- Consider a bus-based shared memory multiprocessor system. It is constructed using processors with speed of 10^6 instructions, and a bus with a peak bandwidth of 10^5 fetches. The caches are designed to support a hit rate of 90%.

(a) What is the maximum number of processors that can be supported by this system?

(b) What hit rate is needed to support a 20-processor system?

4- You are given a simple 3D Array of integer which consist of n^3 elements and p processors as a system specification. Using the Domain Decomposition technique, you can be able to varyingly parallelize operations of P processors on this 3D array. What are two different ways of decomposition and the concerning computation and computation overhead of each way.

5-Consider a bus-based machine with 4 processors, each running at a 0.5 GIPS and running a workload that consists of: 60% ALU operations, 10% loads, 10% stores and 20% branches. Suppose that the cache miss rate at each processor is 1% for instruction cache and 2% for data cache, and that the cache sharing among 2 processors is 40% and zero otherwise. The system bus bandwidth is 8GB/s. Assuming that the cache line is 32 bytes large, and a snooping protocol, determine the bandwidth used. How many processors could the bus accommodate?