LEVEL 2

How does parallel programming/computing works? What do you think will be the advantage of utilizing parallel approach?

Parallel programming/computing works in the way that it makes use of several computers or processors within a Central Processing Unit (CPU) to solve a particular problem. In doing so, it greatly reduces the time required to finish a single task by dividing the problem into subproblems, similar as to how Divide-And-Conquer algorithms work.

It is an extremely efficient approach compared to linear methods where processes are only being done one at a time.

The advantage of utilizing the parallel approach is that in doing so, we are able to maximize the potential of the resources available to us, as well as being able to save invaluable time and, in some cases, costs.

LEVEL 3

Differentiate between Multiprocessing and Multithreading. Explain.

The difference between multiprocessing and multithreading is that they follow a hierarchy.

First, let’s cover what multithreading does, in order for us to understand this very hierarchy. Threads contain what we call a "process”; these processes are a set of instructions that we give to the computer to carry out. There may be multiple threads utilized in a single processor (emphasis on this, as it is essential to understanding multiprocessing later), which then gives us this concept of making use of multiple threads on a single processor in order to make the process of carrying out instructions faster, which is the essence of both multithreading and parallel computing.

Multiprocessing, on the other hand, is done by utilizing the several cores that exist within a processor in order to solve problems that require heavy computational power. As mentioned earlier, processors can hold one or more threads, so imagine that we have multiple processors with multiple threads in each processor, we then have an extremely rapid way of dealing with huge amounts of instructions by dividing the given task into multiple processors, which in turn also divide the set of instructions as “threads”, thus, making computations easy by combining both multiprocessing and multithreading.

Of course, it is also important to note that we do not necessarily have to make use of multithreading each time multiprocessing is used, but in cases where huge computational power is required, it is optimal to make use of both.

Explain the difference between Serial Computing and Parallel Computing.

The difference between Serial Computing and Parallel Computing is that Serial Computing is much slower than parallel computing. This is because in Serial Computing, processes are done one at a time, similar to how linear-runtime algorithms work. Serial Computing does not utilize the many processors that can be used for executing processes.

On the other hand, Parallel Computing utilizes multiple processors in order to carry out processes in a faster manner. The way Parallel Computing works is that it divides the workload between multiple processors, similar to how Divide-and-Conquer algorithms work where problems are divided into subproblems, and the goal is achieved by combining all the completed sub-processes.