Difference Between Parallel and Distributed Computing

Key Difference - Parallel vs Distributed Computing

A computer performs tasks according to the instructions provided by the human. Parallel computing and distributed computing are two computation types. This article discusses the difference between Parallel and Distributed Computing. Parallel computing is used in high-performance computing such as supercomputer development. Distributed computing provides data scalability and consistency. Google, Facebook use distributed computing for data storing. The **key difference** between parallel and distributed computing is that **parallel computing is to execute multiple tasks using multiple processors simultaneously while in parallel computing, multiple computers are interconnected via a network to communicate and collaborate in order to achieve a common goal.** Each computer in the distributed system has their own users and helps to share resources.

What is Parallel Computing?

A computer is a machine that can perform tasks according to the instructions provided by humans. Computer architecture defines the how to execute instructions provided to the computer. Earlier computer systems had one processor. The problem that has to be solved was divided into a series of instructions. Those instructions were given to the processor one after the other. In every moment, only one instruction is executed. Then the processor, processed those instructions and gave output. This was not an efficient mechanism. Speed can be improved by increasing the frequency, but it also increases the temperature. That causes more heat dissipation. Therefore, it is not easy to increase the speed of the processor. As a result of this parallel computing was introduced.

Parallel computing is also known as Parallel processing. It is a form of computation that can carry multiple calculations simultaneously. Parallel computing uses many processors. The problem to be solved is divided into discrete parts. Each part is further broken down into instructions. These instructions are divided between processors. Therefore, multiple processors are executing instructions simultaneously. Parallel computing is useful to carry out a complex calculation since processors divide the workload between them. It also saves time.
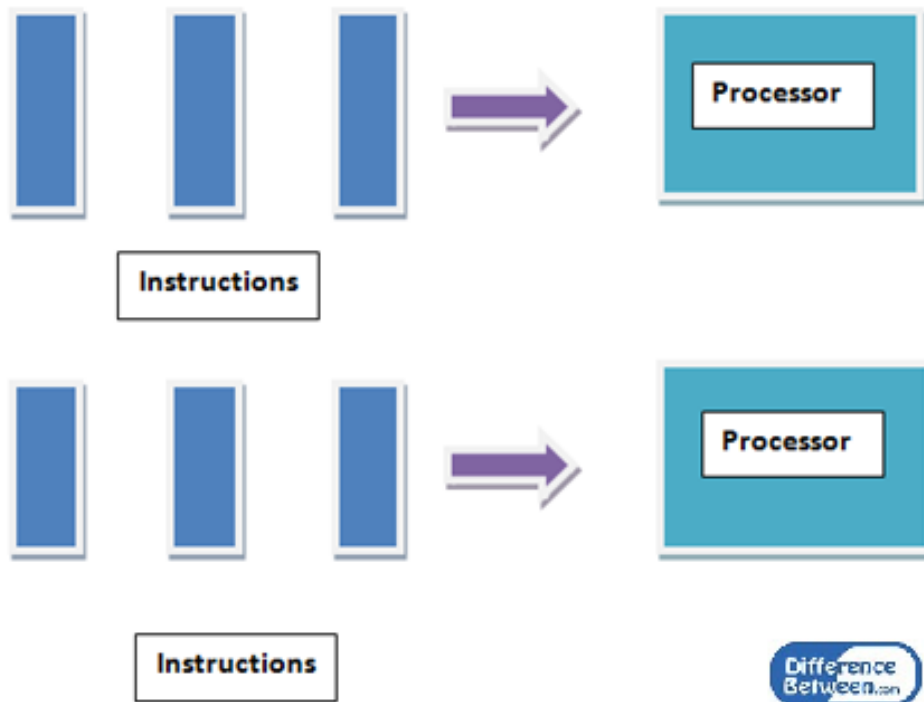
Figure 01: Parallel Computing

There can be few disadvantages of parallel systems. The instruction executed by one processor might be needed by another processor. This can cause latency. Increasing number of processors is also expensive. These facts should be considered when developing parallel systems. Overall, parallel computing helps to run multiple instructions at the same time to complete tasks.

What is Distributed Computing?

In daily life, an individual can use a computer to work with applications such as Microsoft Word, Microsoft PowerPoint. Complex problems may not be accomplished by using a single computer. Therefore, the single problem can be divided into multiple tasks and distributed to many computers. These computers can communicate with other computers through the network. They all perform similarly to a single entity. The process of dividing a single task among multiple computers is known as distributed computing. Each computer in a distributed system is known as a node. A set of nodes is a cluster.

Distributed computing is used in many applications today. Some examples are Facebook and Google. They consist of millions and millions of users. All users communicate with others, share photographs etc. This large amount of data is stored using distributed computing. Automated teller machines in banks, telephone networks, cellular networks, distributed databases also use distributed computing.
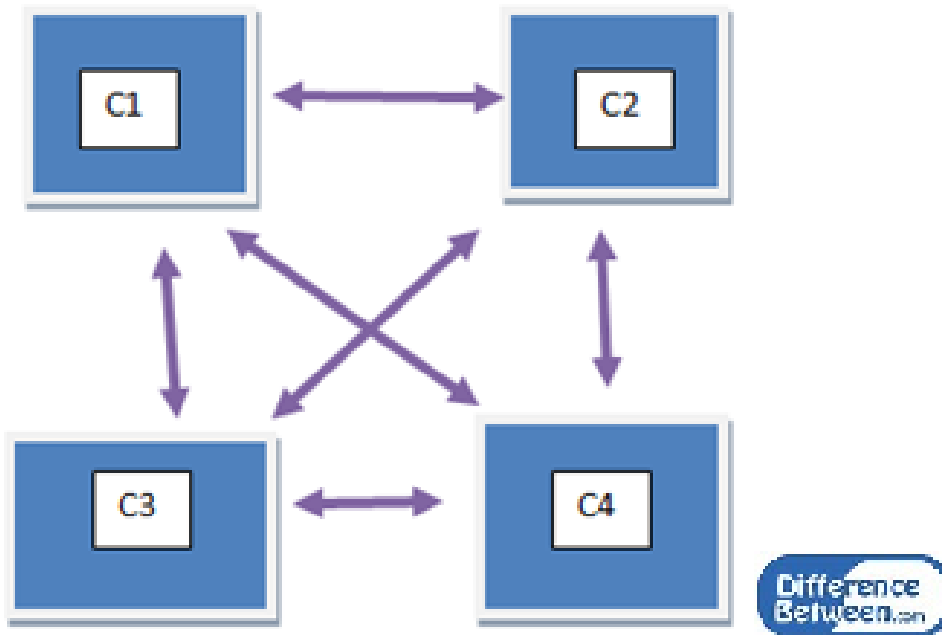
Figure 02: Distributed Computing

Distributed computing provides multiple advantages. Distributed systems are extendable to the increasing growth. It provides scalability, and it is easy to share resources. Some disadvantages are there can be network issues, and it is difficult to develop distributed software.

What is the Similarity Between Parallel and Distributed Computing?

- Both are types of computation.

What is the Difference Between Parallel and Distributed Computing?

Parallel vs Distributed Computing	
Parallel computing is a computation type in which multiple processors execute multiple tasks simultaneously.	Distributed computing is a computation type in which networked computers communicate and coordinate the work through message passing to achieve a common goal.

Number of Computers Required	
Parallel computing occurs on one computer.	Distributed computing occurs between multiple computers.
Processing Mechanism	
In parallel computing multiple processors perform processing.	In distributed computing, computers rely on message passing.
Synchronization	
All processors share a single master clock for synchronization.	There is no global clock in distributed computing, it uses synchronization algorithms.
Memory	
In Parallel computing, computers can have shared memory or distributed memory.	In Distributed computing, each computer has their own memory.
Usage	
Parallel computing is used to increase performance and for scientific computing.	Distributed computing is used to share resources and to increase scalability.

Summary - Parallel vs Distributed Computing

Parallel computing and distributed computing are two types of computation. This article discussed the difference between Parallel and Distributed Computing. The difference between parallel and distributed computing is that parallel computing is to execute multiple tasks using multiple processors simultaneously while in parallel computing, multiple computers are interconnected via a network to communicate and collaborate in order to achieve a common goal. Parallel computing is mainly used for increasing performance. Distributed computing is used to coordinate the use of shared resources or to provide communication services to the users.

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