

# Multithreading vs Multiprocessing Difference Between Them

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🕒 Updated February 3, 2024



## Key Difference Between Multithreading and Multiprocessing

- A multiprocessing system has more than two processors whereas Multithreading is a program execution technique that allows a single process

to have multiple code segments

- Multiprocessing improves the reliability of the system while in the multithreading process, each thread runs parallel to each other.
- Multiprocessing helps you to increase computing power whereas multithreading helps you create computing threads of a single process
- In Multiprocessing, the creation of a process, is slow and resource-specific whereas, in Multiprogramming, the creation of a thread is economical in time and resource.
- Multithreading avoids pickling, whereas Multiprocessing relies on pickling objects in memory to send to other processes.
- Multiprocessing system takes less time whereas for job processing a moderate amount of time is taken.

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## What is Multiprocessing?

A multiprocessing system has more than two processors. The CPUs are added to the system that helps to increase the computing speed of the system. Every CPU has its own set of registers and main memory.

However, because each CPU are separate, it may happen that one CPU may not have anything to process. One processor may sit idle, and the other may be overloaded with the specific processes. In such a case, the process and resources are shared dynamically among the processors.

## What is Multithreading?

Multithreading is a program execution technique that allows a single process to have multiple code segments (like threads). It also runs concurrently within the “context” of that process. Multi-threaded applications are applications that have two or more threads that run concurrently. Therefore, it is also known as concurrency.

## Characteristics of Multiprocessing

Here are the essential features of Multiprocessing:

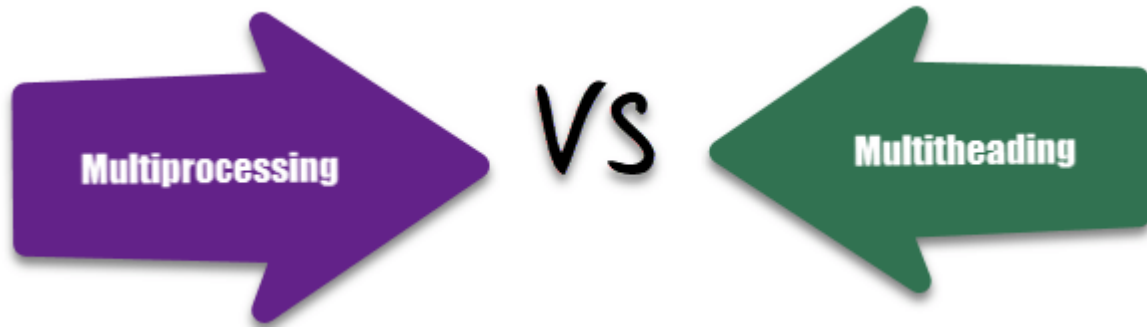
- Multiprocessing are classified according to the way their memory is organized.
- Multiprocessing improves the reliability of the system
- Multiprocessing can improve performance by decomposing a program into parallel executable tasks.



- In the multithreading process, each thread runs parallel to each other.
- Threads do not allow you to separate the memory area. Therefore it saves memory and offers a better application performance

## Difference Between Multiprocessing and Multithreading

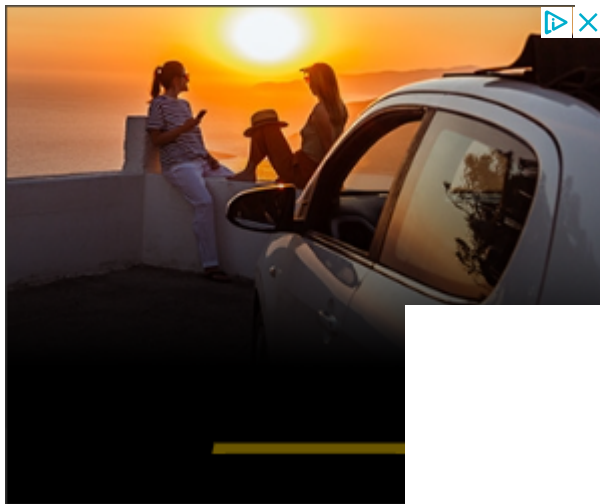
Here are important differences between Multithreading vs Multiprocessing



Parameter	Multiprocessing	Multithreading
Basic	Multiprocessing helps you to increase computing power.	Multithreading helps you to create computing threads of a single process to increase computing power.
Execution	It allows you to execute multiple processes concurrently.	Multiple threads of a single process are executed concurrently.
CPU switching	In Multiprocessing, CPU has to switch between multiple programs so that it looks like that multiple programs are running simultaneously.	In multithreading, CPU has to switch between multiple threads to make it appear that all threads are running simultaneously.
Creation	The creation of a process is slow and resource-specific.	The creation of a thread is economical in time and resource.



Classification	symmetric or asymmetric.	classified.
Memory	Multiprocessing allocates separate memory and resources for each process or program.	Multithreading threads belonging to the same process share the same memory and resources as that of the process.
Pickling objects	Multithreading avoids pickling.	Multiprocessing relies on pickling objects in memory to send to other processes.
Program	Multiprocessing system allows executing multiple programs and tasks.	Multithreading system executes multiple threads of the same or different processes.
Time taken	Less time is taken for job processing.	A moderate amount of time is taken for job processing.



## Advantage of Multiprocessing

Here are cons/ pros of Multiprocessing:

- The biggest advantage of a multiprocessor system is that it helps you to get more work done in a shorter period.



- Remove synchronization primitives unless if you use shared memory.
- Child processes are mostly interruptible/killable
- It helps you to get work done in a shorter period.
- These types of systems should be used when very high speed is required to process a large volume of data.
- Multiprocessing systems save money compared to single processor systems as processors can share peripherals and power supplies.

## Advantage of Multithreading

Here, are pros/benefits of multithreading:

- Threads share the same address space
- Threads are lightweight which has a low memory footprint
- The cost of communication between threads is low.
- Access to memory state from another context is easier
- It allows you to make responsive UIs easily
- An ideal option for I/O-bound applications
- Takes lesser time to switch between two threads within the shared memory and time to terminate
- Threads are faster to start than processes and also faster in task-switching.
- All Threads share a process memory pool that is very beneficial.
- Takes lesser time to create a new thread in the existing process than a new process

## Disadvantage of Multiprocessing

Here, are cons/drawback by using Multiprocessing operating system

- IPC(Inter-Process Communication) a quite complicated with more overhead
- Has a larger memory footprint

## Disadvantage of multithreading

Here, are cons/ drawbacks of using multithreading system :



- Code is usually harder to understand and increases the potential for race conditions increases dramatically



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