Link : <https://github.com/id4516/Secondproject/wiki/Second-assignement>

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Intro To Cis

# Multi-Threading in Operating Systems: <br>

## Abstract : <br>

What is Multi-threading in an operating system?

![What is multithreading](https://github.com/id4516/Secondproject/blob/master/Assignment%20%232/Documentation/What-is-multithreading.jpg)

## Introduction : <br>

I will talk about Multi-threading in operating systems, how it operates, what are the advantages and disadvantages of Multi-threading, the Difference between Multi and single threading, And What are the types of Multi-threading.

### What is Multi-threading in an operating system? :

Multi-threading is close to multitasking but it has an Added option which it enables to the Central Processing Unit (CPU) the processing of different tasks at the same time, Multithreaded operating system run various background tasks <br>

### How Multi-threading Operates ? :

It can run more than one thread at the moment, in a multicore computer or machine, two threads can run again doing double the work of a single thread. <br>

### Advantages of Multi-threading :

If the cache is missed in one of the threads, the other thread can take over and finish the work and can cause a fast execution in the machine and that's one of the best advantages of Multi-threading permitting the machine to work with high performance and avoid crashes or cash misses. <br>

### Disadvantages of Multi-threading :

Anything has advantages and disadvantages and the disadvantages of Multi-threading is you can face a difficulty writing your code, the multithreaded applications are hard to write, also it's hard to debug, and it's hard to manage concurrency. <br>

### This Picture shows the difference between Multi and single threading: <br>

![Difference between Multi and single Threading ](https://github.com/id4516/Secondproject/blob/master/Assignment%20%232/Documentation/4\_01\_ThreadDiagram.jpg)

And this picture explains how A multi-threading can run three tasks at the same times while single threading run it once at a time <br>

### Types of multi-threading :

There are Three types of Multi-threading :

The first one is many to many: It means that in this model we have multiple threads to the same level of kernel threads. and The advantage of this model is if one thread is blocked, the machine orders other thread to work and the system does not lag or block when one thread crash. <br>

![A picture that shows what is the first type](https://github.com/id4516/Secondproject/blob/master/Assignment%20%232/Documentation/First%20type.jpg)

The second type is Many to one and it means that we have multiple threads that draw their way to one kernel and then when a thread makes a blocking call the entire process is blocked because we only have one kernel and one thread that is available at a time so multi-threads can't access the Multiprocessor at the same time. <br>

![A picture of the second type](https://github.com/id4516/Secondproject/blob/master/Assignment%20%232/Documentation/seconf.jpg)

The third type is One to one model and in this type, multi-threads can work on a multi-processor and the only problem with this thread is when a thread is created the corresponding kernel is needed. <br>

![these pictures show the third type ](https://github.com/id4516/Secondproject/blob/master/Assignment%20%232/Documentation/thir.jpg)

## Methodology:

I researched how Multi-threading works and how it operates in a machine, and that different types of Multi-threading differ one from the other and also differ from the way they operate, many to many, many to one, one to one Multi-threading. <br>

## Result :

Found the way to run multiple tasks at the same time without crashes and the way is the use Multi-threading instead of using a single threading method because it allows multiple threads to find their way to the kernel and to run without any problems.

![Multi threading](https://github.com/id4516/Secondproject/blob/master/Assignment%20%232/Documentation/1\_KZYlc0wj2E3w-YiAbfYTnQ.png)

## Conclusion :

Multi-threading is better than single threading because it allows you to run multiple threads at the same moment while single threading only allows one thread at a time and can crash if there's more than one thread. <br>

## Future Works :

try to find the way to use single-threading without crashes like the crashes that happen in the second type of multi-threading which is Many to one threading where Multiple Threads find their way to one kernel and crashes the whole process. <br>

![threads in python](https://github.com/id4516/Secondproject/blob/master/Assignment%20%232/Documentation/threads-multithreading-in-python-edureka-528x274.png)

## References :

“Multithreading (Computer Architecture).” Wikipedia, Wikimedia Foundation, 29 Sept. 2020, en.wikipedia.org/wiki/Multithreading\_(computer\_architecture).

“Multi-Threading Models in Process Management.” GeeksforGeeks, 16 Aug. 2019, www.geeksforgeeks.org/multi-threading-models-in-process-management/.