

Parallel processing in Python

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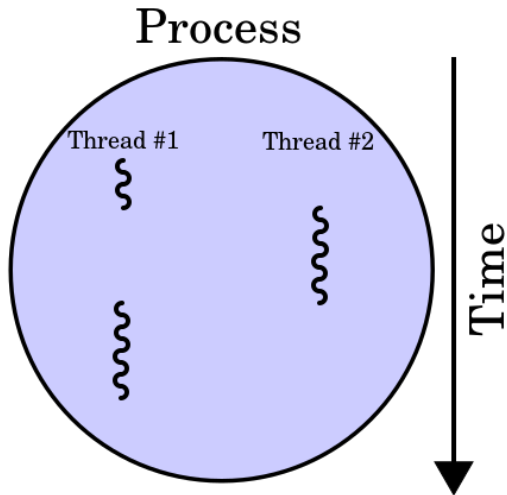
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Definition

A thread of execution is the smallest sequence of programmed instructions that can be managed independently by a scheduler, which is typically a part of the operating system.

The threads of a process share its executable code and the values of its dynamically allocated variables and non-thread-local global variables at any given time.

Threads: same source code executable, some variables located in different memory space



Threads versus Processes

- Processes are typically independent, while threads exist as subsets of a process
- Processes carry considerably more state information than threads, whereas multiple threads within a process share process state as well as memory and other resources
- Processes have separate address spaces, whereas threads share their address space
- Processes interact only through system-provided inter-process communication mechanisms
- Context switching between threads in the same process typically occurs faster than context switching between processes

Multithreading

- Responsiveness
- Faster execution
- Lower resource consumption
- Better system utilization+
- Simplified sharing and communication
- Parallelization

A semaphore with threads

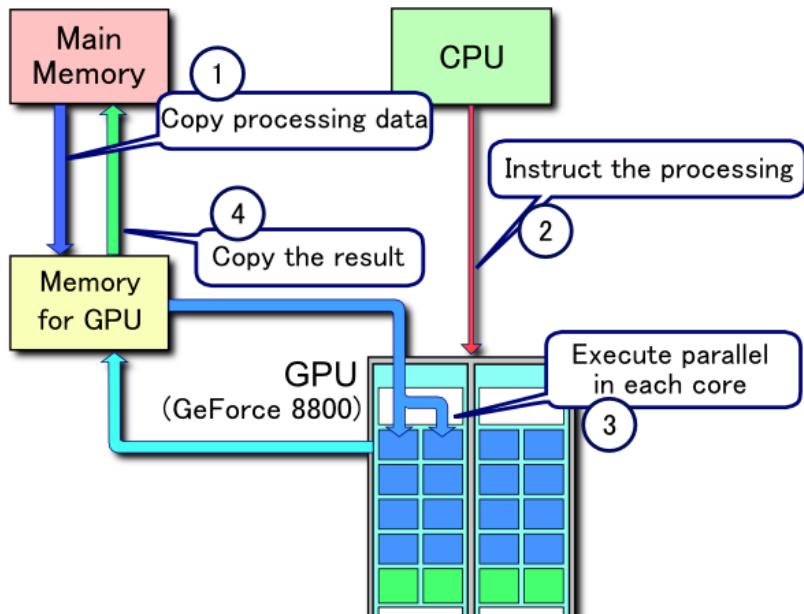
```
import threading
import time
sem = threading.Semaphore()

def fun1():
    while True:
        try:
            sem.acquire()
            print(1)
            sem.release()
            time.sleep(0.25)
        except (KeyboardInterrupt, SystemExit):
            raise

def fun2():
    while True:
```

More examples

```
$ python3 multithreading.py  
$ python3 thread-example.py  
$ python3 threading-simple.py  
$ python3 threading-timeout5.py  
$ python3 threads.py
```



NUMBA: CUDA in Python

```
$ python3 numba/pi.py
```

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