



Experiment No. 12
Demonstrate the concept of Multi-threading
Date of Performance:
Date of Submission:

## Experiment No. 12

**Title:** Demonstrate the concept of Multi-threading

**Aim:** To study and implement the concept of Multi-threading

**Objective:** To introduce the concept of Multi-threading in python

**Theory:**

### Thread

In computing, a **process** is an instance of a computer program that is being executed. Any process has 3 basic components:

- An executable program.
- The associated data needed by the program (variables, work space, buffers, etc.)
- The execution context of the program (State of process)

A **thread** is an entity within a process that can be scheduled for execution. Also, it is the smallest unit of processing that can be performed in an OS (Operating System).

In simple words, a **thread** is a sequence of such instructions within a program that can be executed independently of other code. For simplicity, you can assume that a thread is simply a subset of a process!

A thread contains all this information in a **Thread Control Block (TCB)**:



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- **Thread Identifier:** Unique id (TID) is assigned to every new thread
- **Stack pointer:** Points to thread's stack in the process. Stack contains the local variables under thread's scope.
- **Program counter:** a register which stores the address of the instruction currently being executed by thread.
- **Thread state:** can be running, ready, waiting, start or done.
- **Thread's register set:** registers assigned to thread for computations.
- **Parent process Pointer:** A pointer to the Process control block (PCB) of the process that the thread lives on.

### Code:

```
import threading

def print_cube(num):

    print("Cube: {}".format(num * num * num))

def print_square(num):

    print("Square: {}".format(num * num))

if __name__ == "__main__":

    t1 = threading.Thread(target=print_square, args=(10,))

    t2 = threading.Thread(target=print_cube, args=(10,))

    t1.start()

    t2.start()

    t1.join()

    t2.join()

    print("Done!")
```



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**Output:**

```
PS C:\Users\Admin\Desktop> python exp12.py
Square: 100
Cube: 1000
Done!
PS C:\Users\Admin\Desktop>
```

**Conclusion:** The provided Python code demonstrates the implementation of multi-threading using the 'threading' module. Multi-threading is a programming concept where multiple threads (subprocesses) run concurrently within a single process, allowing for better resource utilization and improved performance, especially in tasks involving I/O operations or parallelizable computations.