Vidyavardhini’s College of Engineering & Technology

Department of Computer Engineering

Experiment No. 12
Demonstrate the concept of Multi-threading
Date of Performance: 02/04/2024
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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)**:

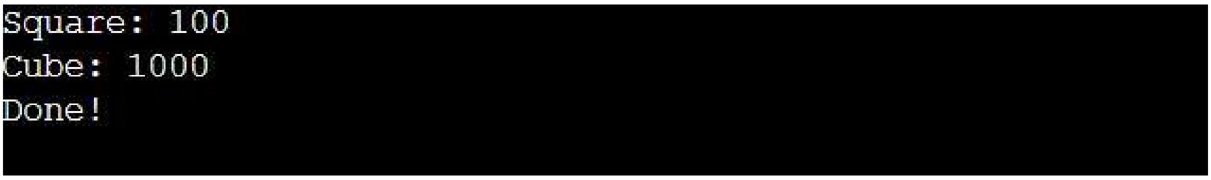
- **Thread Identifier:** Unique id (TID) is assigned to every new thread
- **Stack pointer:** Points to thread's stack in the process. Stack contains the local variables under thread's scope.
- **Program counter:** a register which stores the address of the instruction currently being executed by thread.
- **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 :

```
# Python program to illustrate the concept

# of threading

# importing the threading module

import threading


def print_cube(num):

 """

 function to print cube of given num

 """

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

def print_square(num):

 """

 function to print square of given num

 """

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


if _name_ == "_main_":

 # creating thread

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

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


 # starting thread 1
```

```
t1.start()
# starting thread 2
t2.start()


# wait until thread 1 is completely executed
t1.join()
# wait until thread 2 is completely executed
t2.join()


# both threads completely executed
print("Done!")
```

Output :



```
Square: 100
Cube: 1000
Done!
```

Conclusion:

Multithreading in Python enables concurrent execution of multiple tasks within a single process, enhancing program efficiency and responsiveness. While beneficial for I/O-bound operations, Python's Global Interpreter Lock (GIL) can limit performance gains in CPU-bound tasks. Nonetheless, multithreading remains a valuable tool for improving application performance and scalability in various scenarios.