Q1. What is multithreading in python? why is it used? Name the module used to handle threads in python

Answer :

it's an ability of central processing unit(CPU), to run multiple threads in a single program. it enhances the performance of the program. Multithreading is a way of achieving multitasking.

Multithreading can be achieved by importing threading module in python.

For Example :

In [1]:
```
import threading
```

In [2]:
```
def run_alphaX(id):
    print("run_alphaX %d" %id)
```

In [5]:
```
thread = [threading.Thread(target = run_alphaX, args = (i,)) for i in range(3)]
```

In [7]:
```
for t in thread :
    t.start()
```

```
run_alphaX 0
run_alphaX 1
run_alphaX 2
```

Q2. Why threading module used? write the use of the following functions.

1. activeCoun

2. currentThread

3. enumerate

Answer :

threading module is used to creating, controlling and managing threads in python.

1. acticeCount()

in the module threading. we have activeCount, it returns us the number of active threads

In [10]:
```
print(threading.activeCount())
```

```
6
C:\Users\theha\AppData\Local\Temp\ipykernel_32056\243721073.py:1: DeprecationWarnin
g: activeCount() is deprecated, use active_count() instead
  print(threading.activeCount())
```

2. currentThread()

currentThread return us the number of current running threads

3. enumerate()

threading.enumerate() return us the number of currently alive threads

3. Explain the following functions

1. run

~ in pyhton run() is used to execute a thread. it also helps to execute a python script from the command line.

2. start

~ start() in python helps us to invoked our code or to begin the execution of the program.

3. join

~ join() is a string function in python. it joins the elements and combined it. it cob=mbines every element of the sequence.

In [20]:
```
a = "hare"
b = "krishna"

sequence =[a,b]

final = "-".join(sequence)
final
```

Out[20]:
```
'hare-krishna'
```

In [22]:
```
final1 = "0".join(sequence)
final1
```

Out[22]: 'hare0krishna'

4. isAlive

isalive() return True if the thread is currently running. otherwise false

4. Write a python program to create two threads. Thread one must print the list of squares and thread two must print the list of cubes.

In [1]:
```
import threading
```

In [10]:
```
def sq(i):
    print(i**2)
```

In [11]:
```
def cube(i):
    print(i**3)
```

In [31]:
```
thread = [threading.Thread(target = sq, args = (i, )) for i in range(10)]
```

In [32]:
```
for t in thread :
    t.start()
```

```
0
1
4
9
16
25
36
49
64
81
```

In [33]:
```
thread1 = [threading.Thread(target = cube, args = (i, )) for i in range(10)]
```

In [34]:
```
for t in thread1 :
    t.start()
```

```
0
1
8
27
64
125
216
343
512
729
```

Q5. State advantages and disadvantages of multithreading.

Answer :

Advantages:

1. Simultaneous access to multiple applications

2. Reduced number of required servers

3. Improved performance and concurrency

4. Simplified coding of remote procedure calls and conversations

Disadvantages:

1. Code writing, debugging, managing concurrency, testing, porting existing code is difficult in multithreading and multicontexting.

2. Programmers need to remove static variables and replace any code that is not thread-safe to introduce threading into a previously non threaded application.

Q6. Explain deadlocks and race conditions.

Answer :

Deadlocks are situations where two or more threads are blocking each other's progress by waiting for a resource that is held by another thread. For example, if thread A holds lock 1 and waits for lock 2, while thread B holds lock 2 and waits for lock 1, they are in a deadlock.

A race condition is a situation where two or more threads or processes try to access or modify a shared variable or resource at the same time, leading to unpredictable or incorrect results