PYTHON- MULTITHREADING

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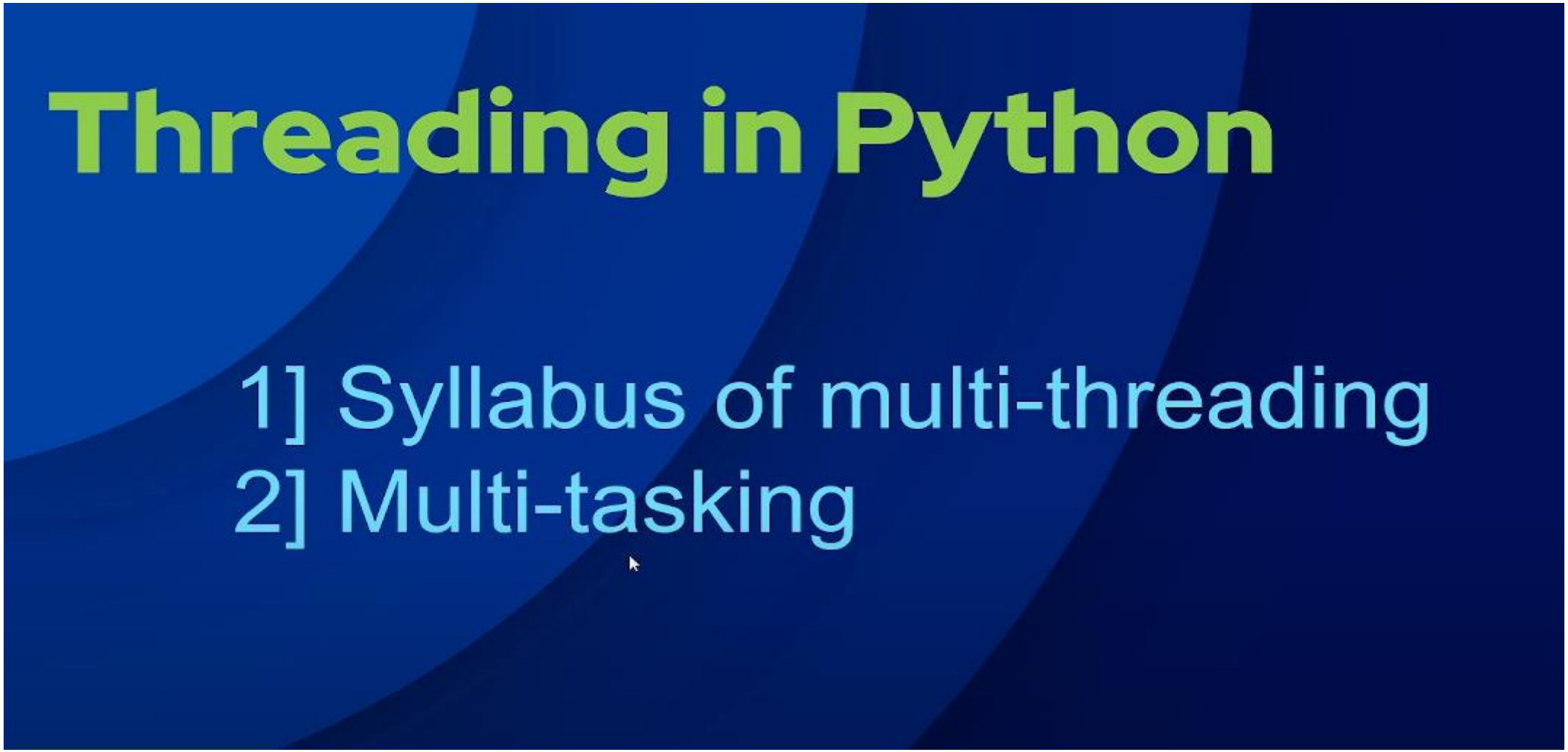
Multithreading in Python



Agenda

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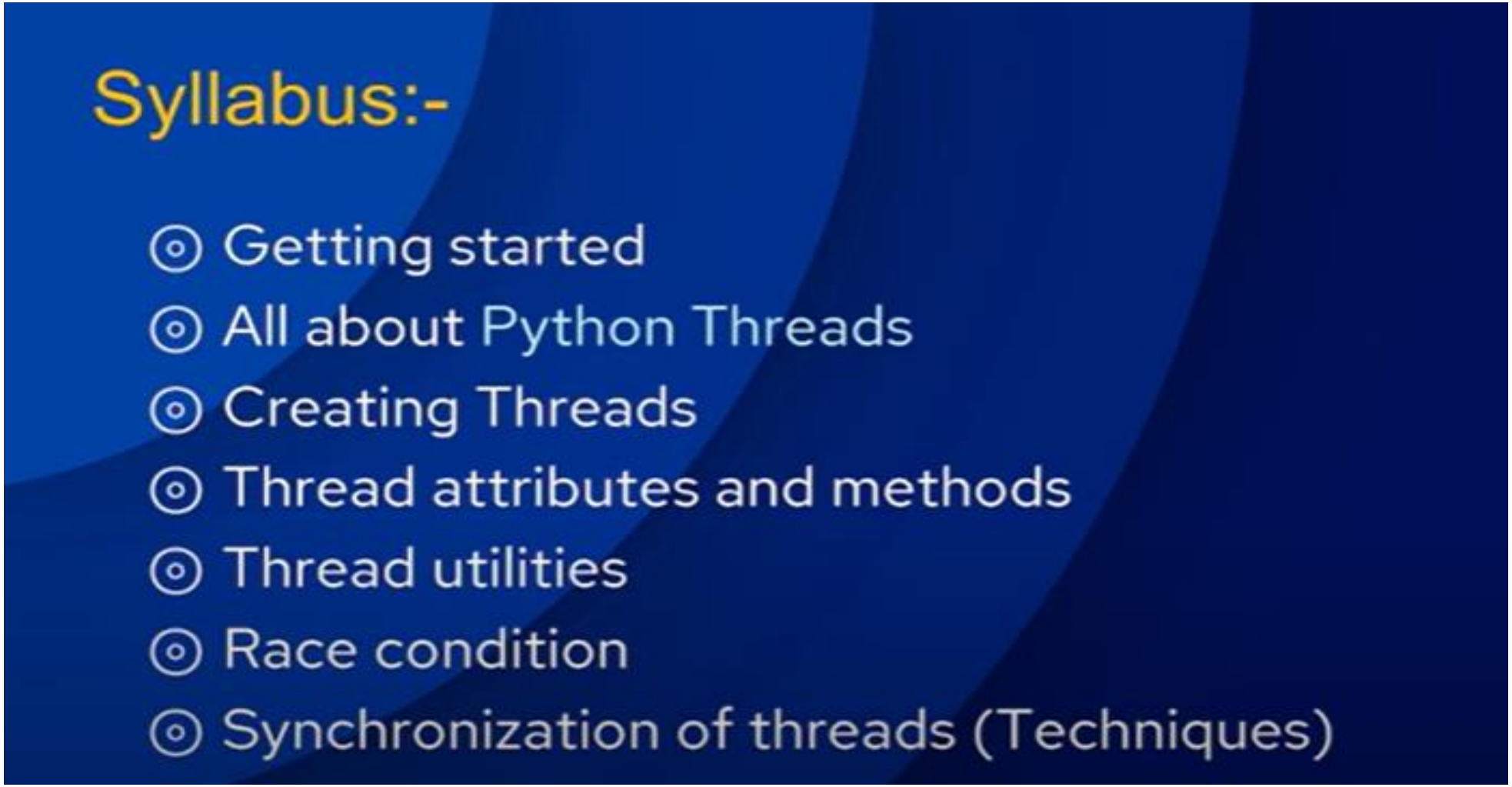
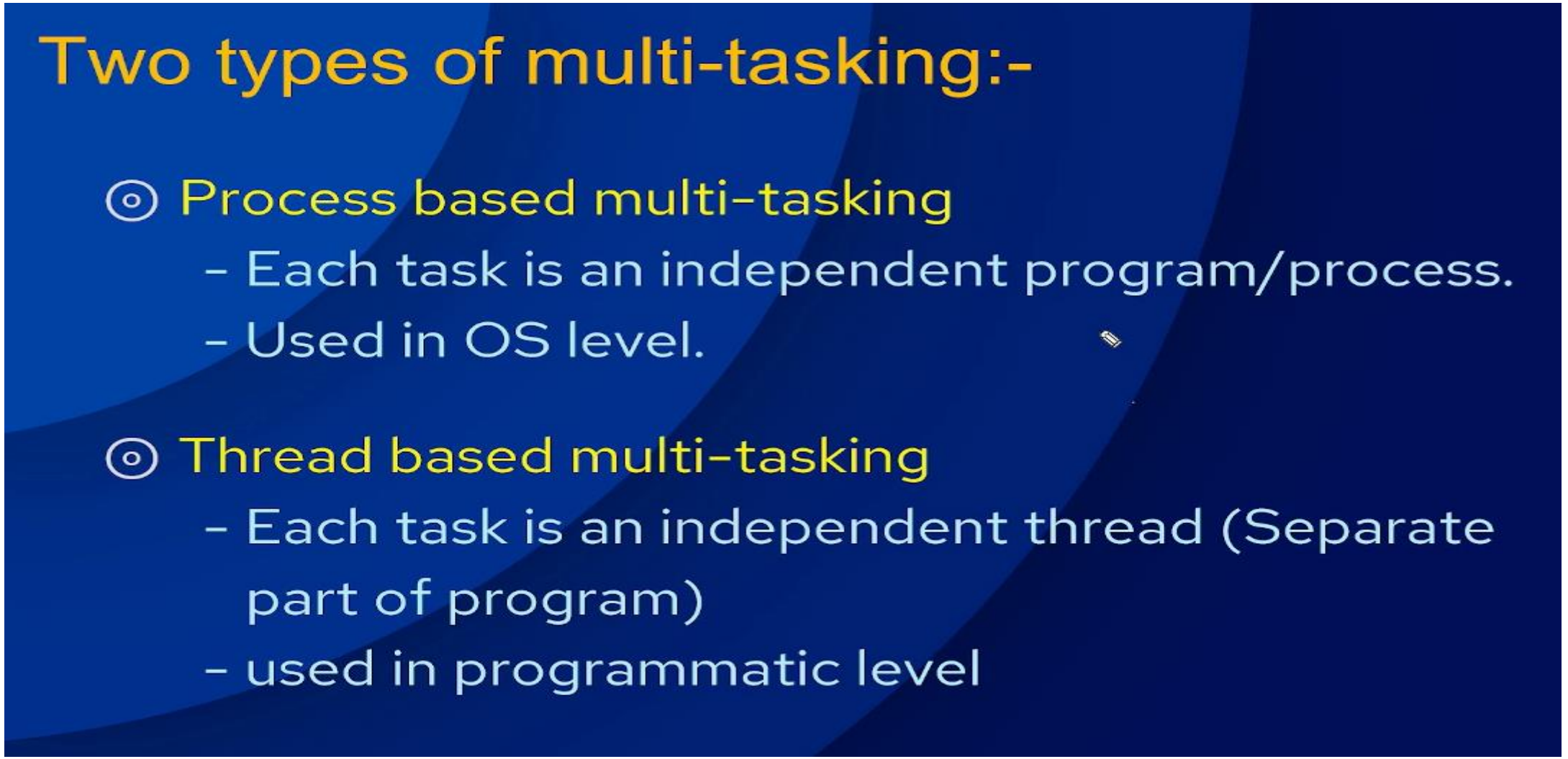


Multithreading in Python

Multi-tasking in python:-

- Executing multiple tasks at the same time.

Multithreading in Python



Multithreading in Python

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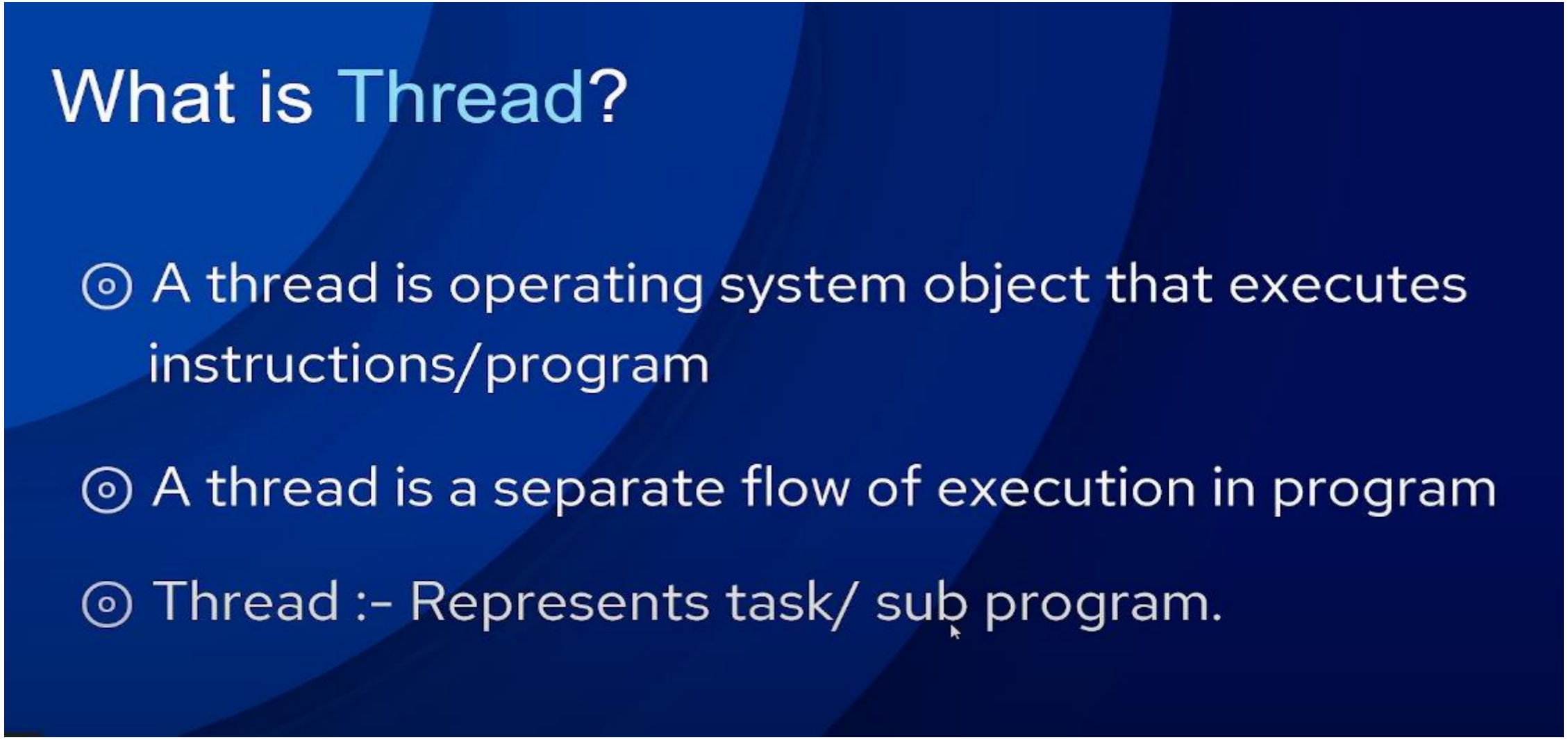

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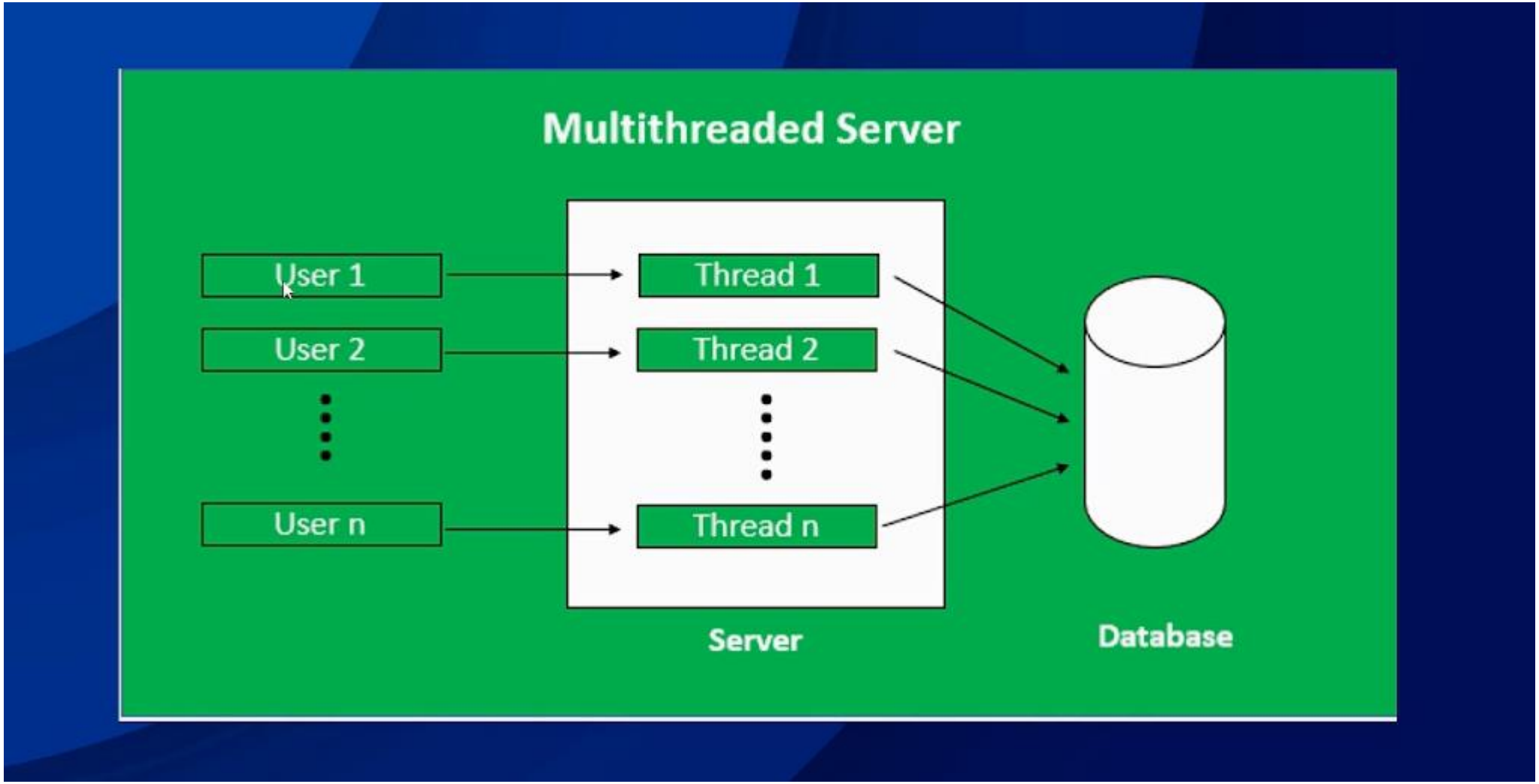

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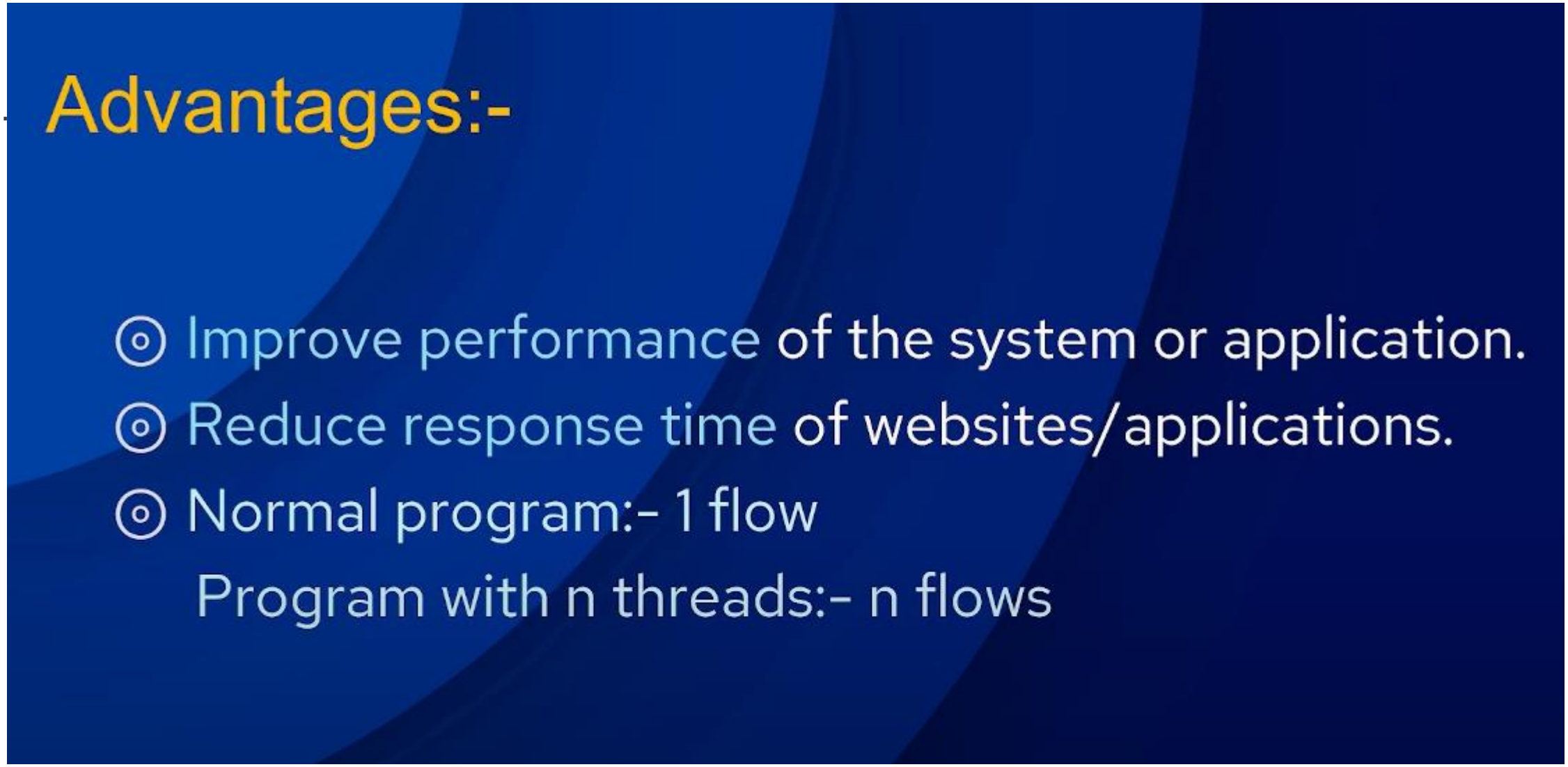

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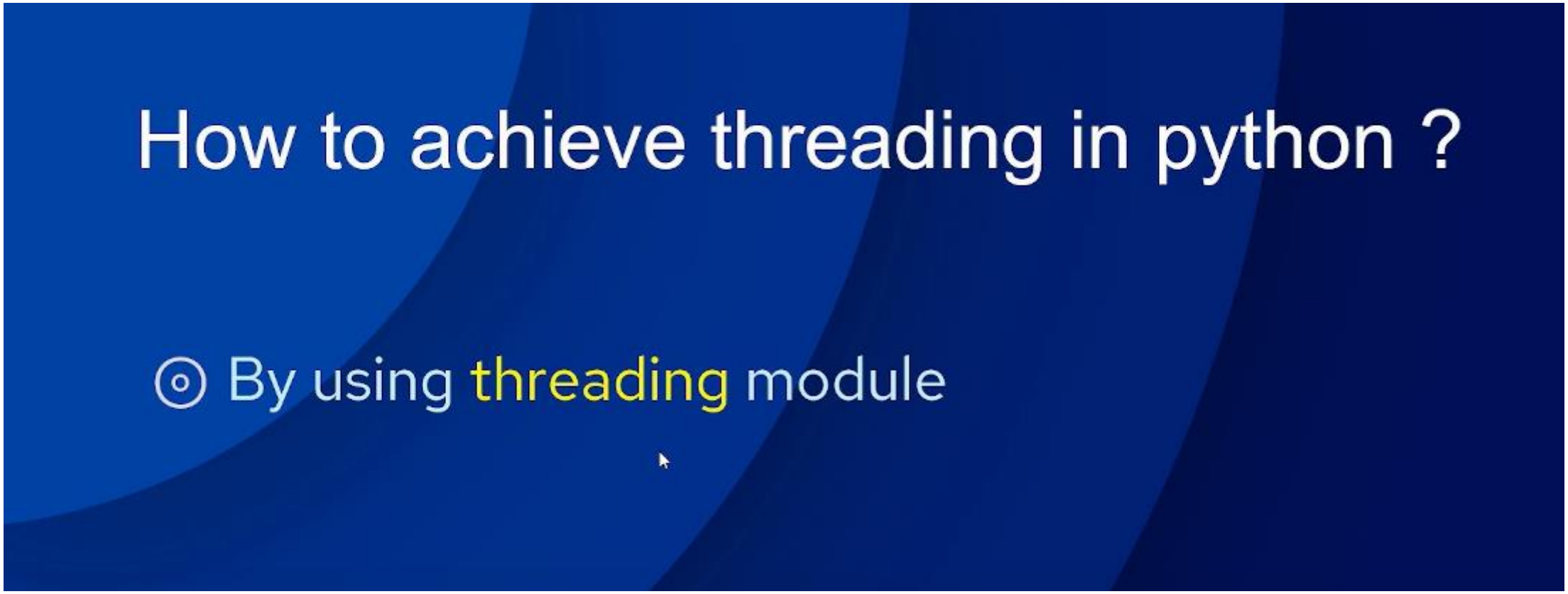

Multithreading in Python

Multithreading in Python

What is Main Thread?

- Run – Python Interpreter starts
  - Python Interpreter request OS for creating one Thread called as Main Thread.
- Any process have at least one default thread called as main thread.
- Main Thread is created by PVM (Interpreter)

Multithreading in Python

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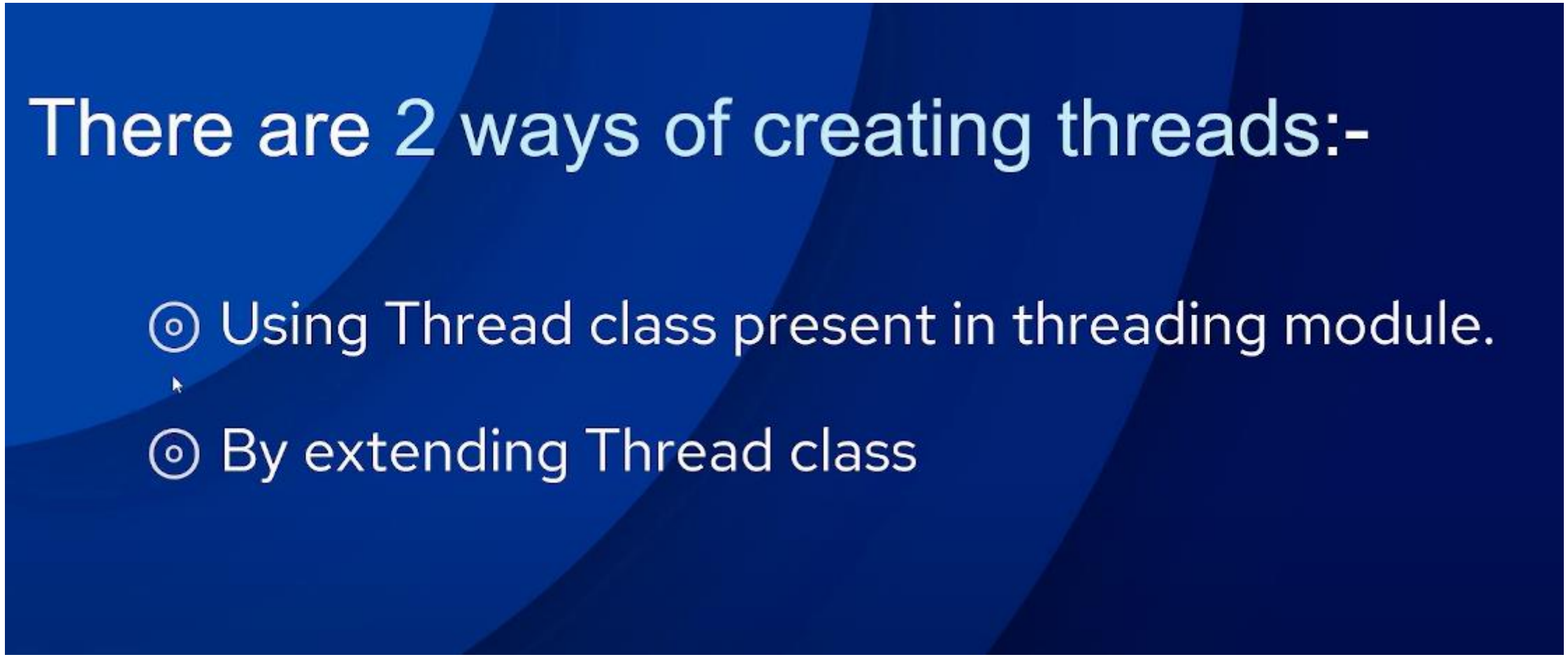

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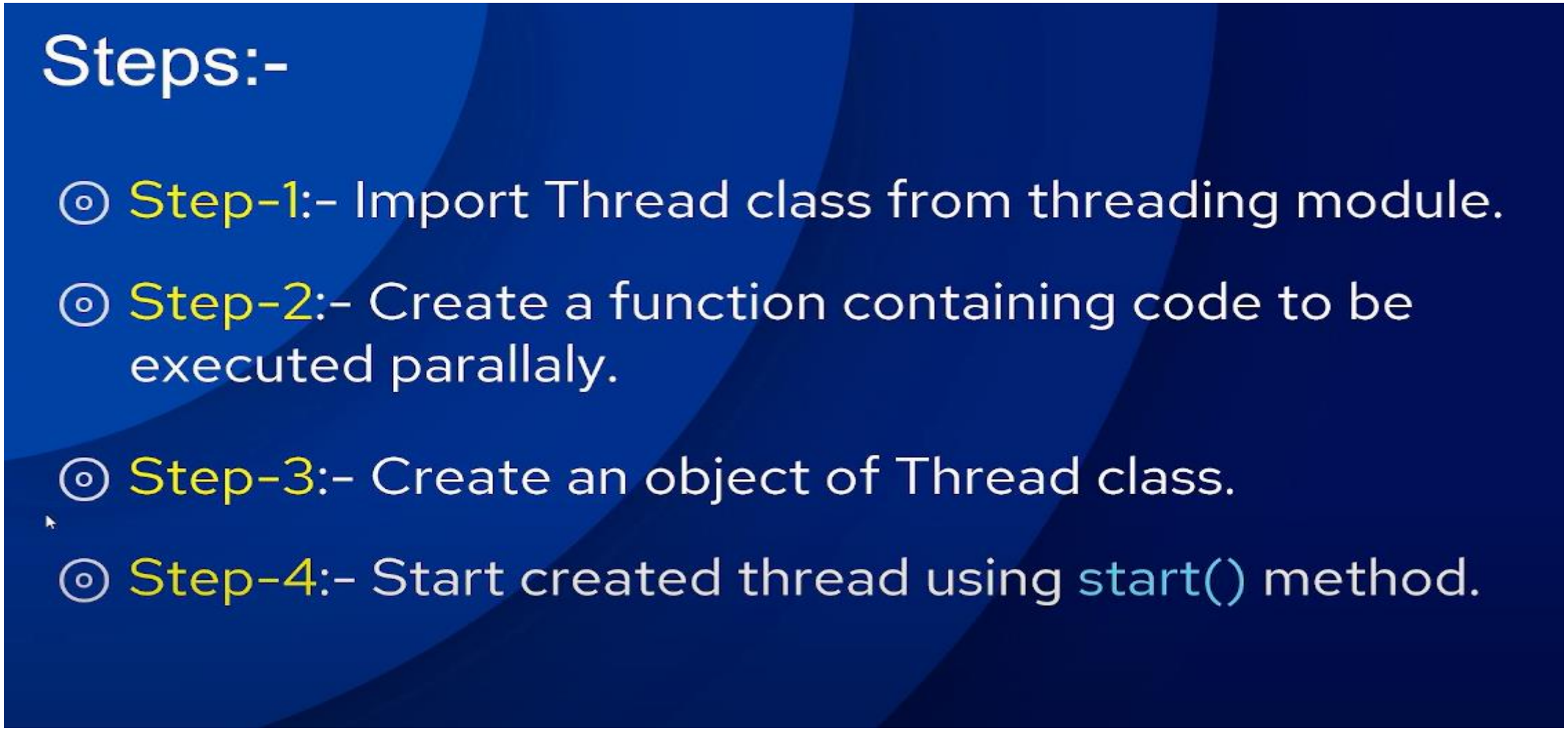


Multithreading in Python

Multithreading in Python

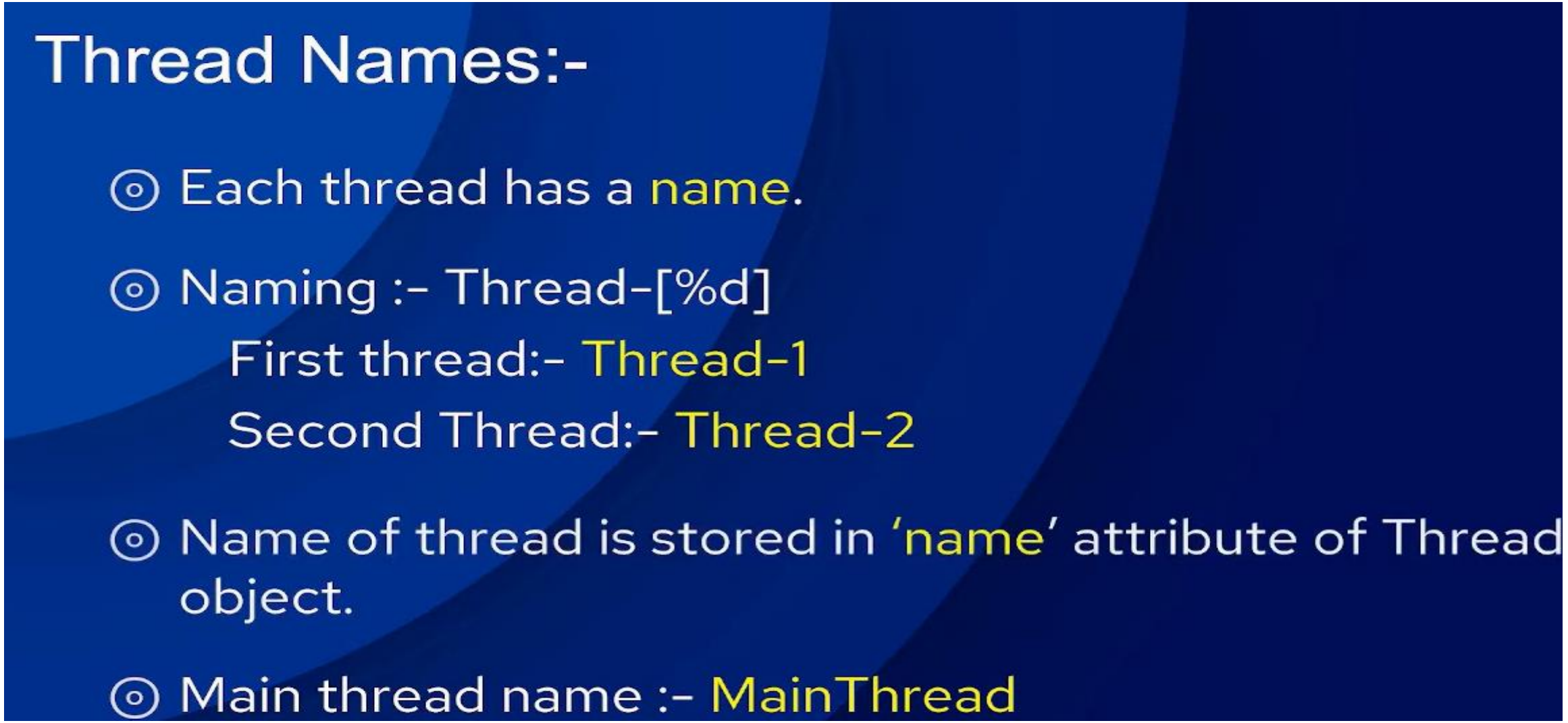
```
from threading import Thread

class MyThread(Thread):
    def run(self):
        #code

t1=MyThread()
t1.start()
```

Threading module:-

```
class Thread:
    def run(self):
        display()
```

Multithreading in Python

Multithreading in Python



Multithreading in Python

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Multithreading in Python

Thread Identifier(ident):

- Assigned by the Python interpreter.
- It's a unique integer used to identify a thread within the Python runtime.
- It has no direct relationship to the underlying operating system's thread identifier.
- Primarily used for internal Python threading management and is accessible using threading.get_ident() or threading.current_thread().ident.

Multithreading in Python

Native Identifier(native_id):

- Assigned by the operating system's kernel.
- It's an integer that uniquely identifies a thread at the system level.
- It can be used to identify the thread even outside of the Python process.
- In Python, you can access this using threading.current_thread().native_id (available since Python 3.8).

Multithreading in Python

Key difference between Thread & Native identifier:

- **Scope**: Thread identifiers are Python-specific, whereas native identifiers are system-wide.
- **Assignment:** Python interpreter assigns thread identifiers, while the operating system's kernel assigns native identifiers.
- **Purpose**: Thread identifiers are mainly used internally by Python's threading module for management. Native identifiers are used to uniquely identify threads at the operating system level.
- **Portability**: Thread identifiers might not be consistent across different Python implementations, while native identifiers are generally consistent within the same operating system.

Multithreading in Python

Thread & Native identifier in simple terms:

- Imagine you have employees within a company (Python process).
- Each employee has an employee ID (thread identifier) that's unique within the company.
- However, they also have a social security number (native identifier) that's unique across the entire country.

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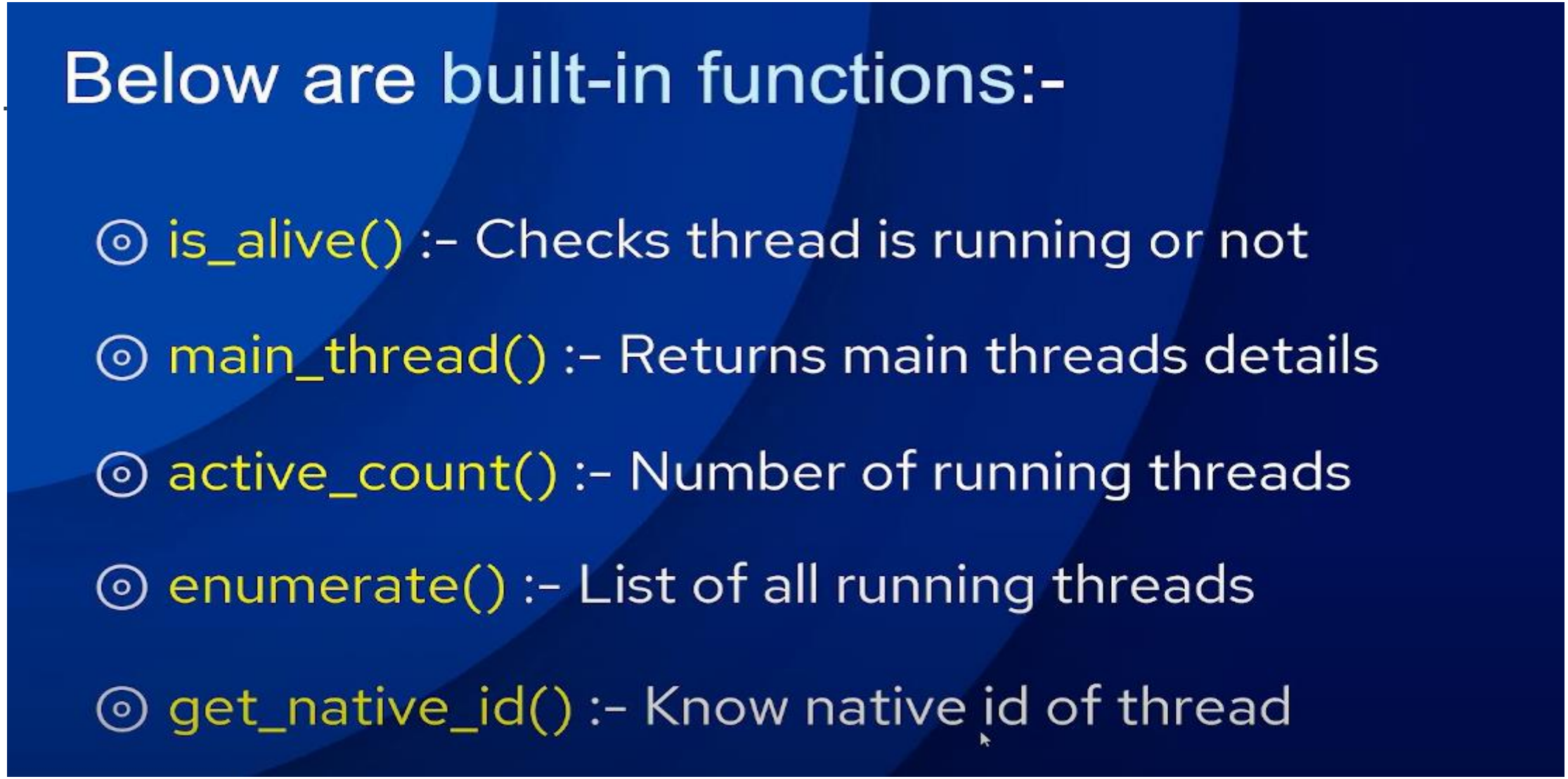

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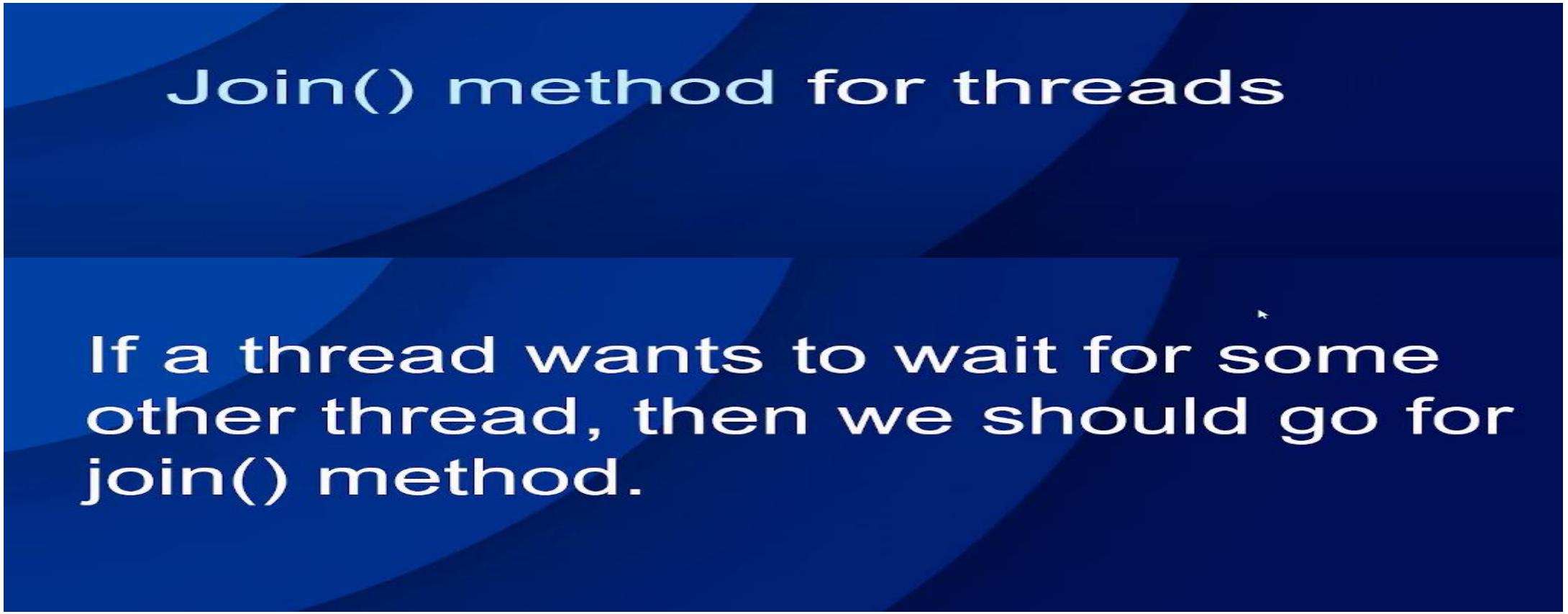

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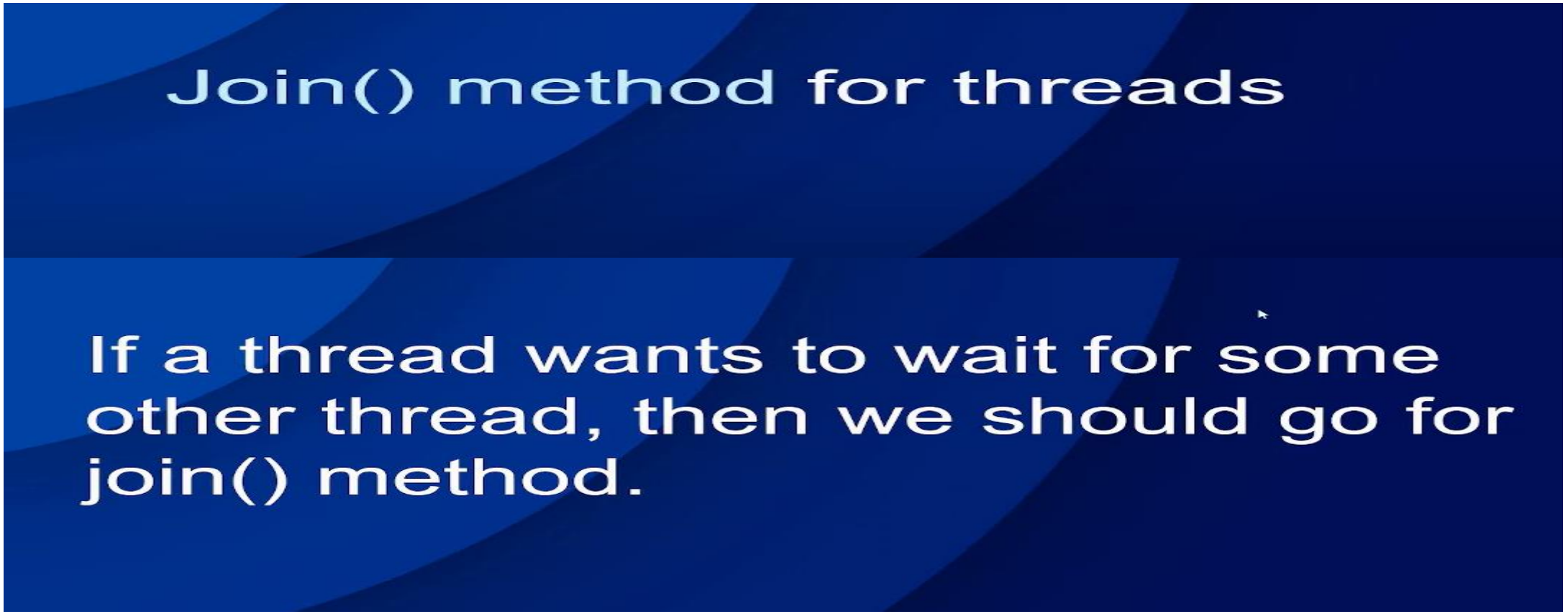


Multithreading in Python

Join() Method:

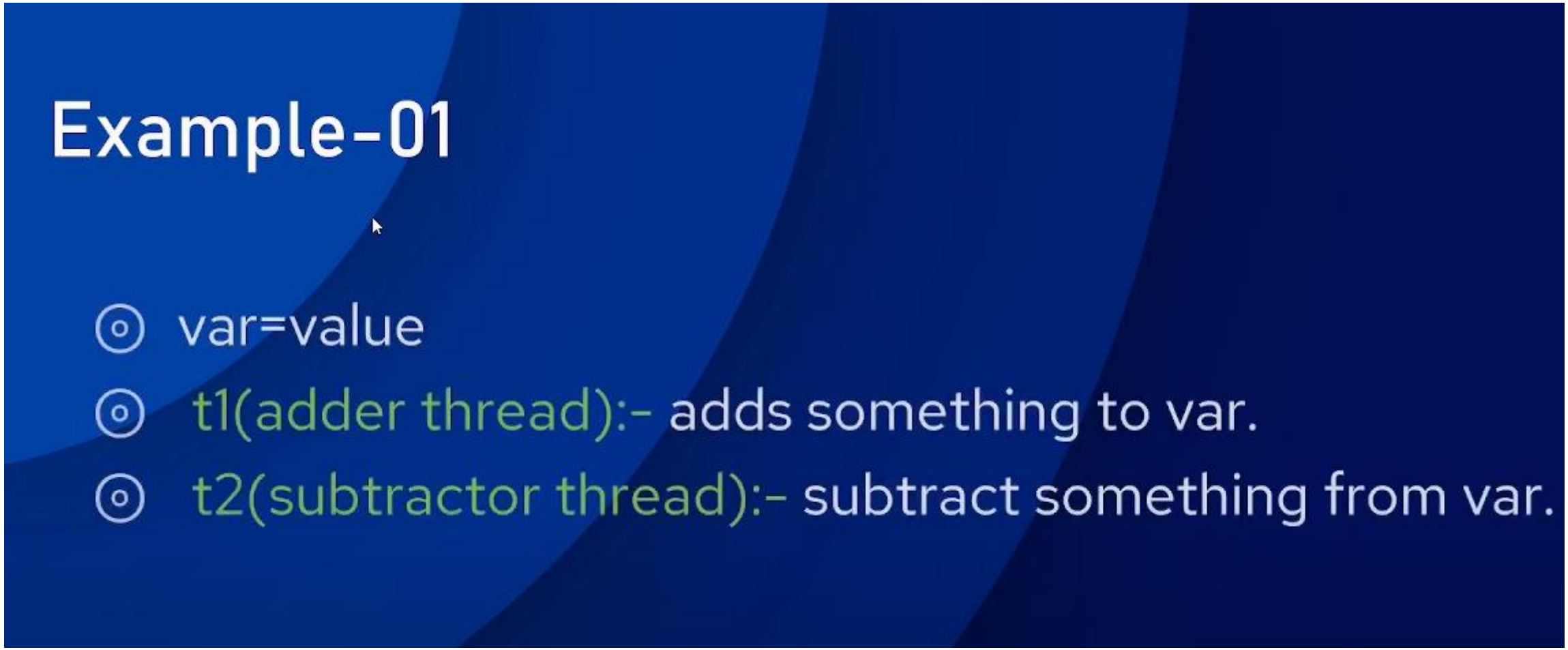
- The join() method is used to wait for a thread to complete its execution before proceeding further in the main thread.
- It essentially blocks the calling thread (usually the main thread) until the thread on which join() is called has finished.

Multithreading in Python

1. **Join() Method Steps:**
    1. **Import modules**: threading for threads and time for pausing execution.
    2. **Define a function**: my_function represents the thread's task.
    3. **Create and start a thread**: A thread is created and started, executing my_function.
    4. **Call join():** The join() method is called on the thread object. This blocks the main thread until the created thread completes its execution.
    5. **Main thread continues**: After the created thread finishes, the main thread resumes and prints a message..

Multithreading in Python

Multithreading in Python



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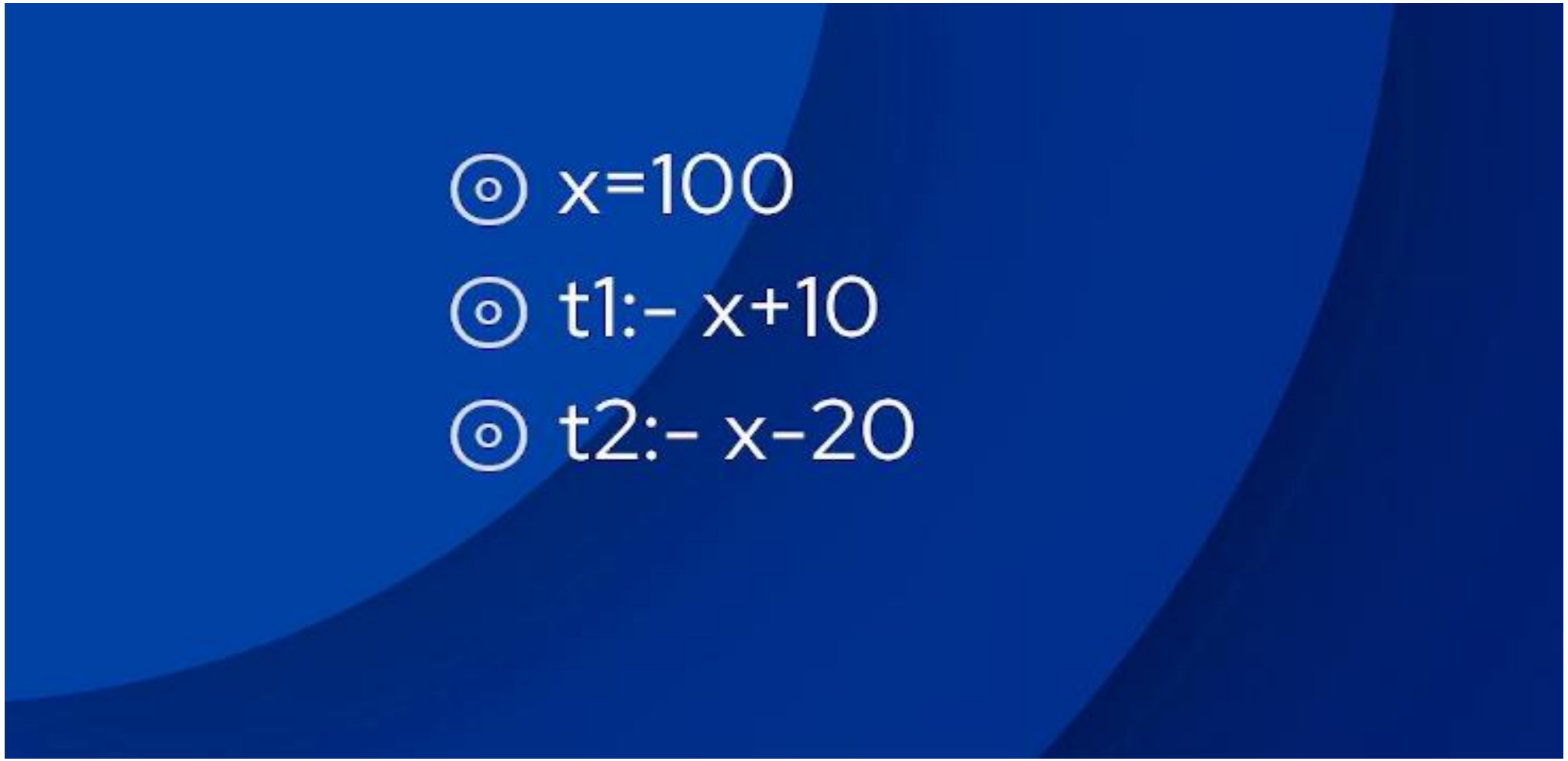
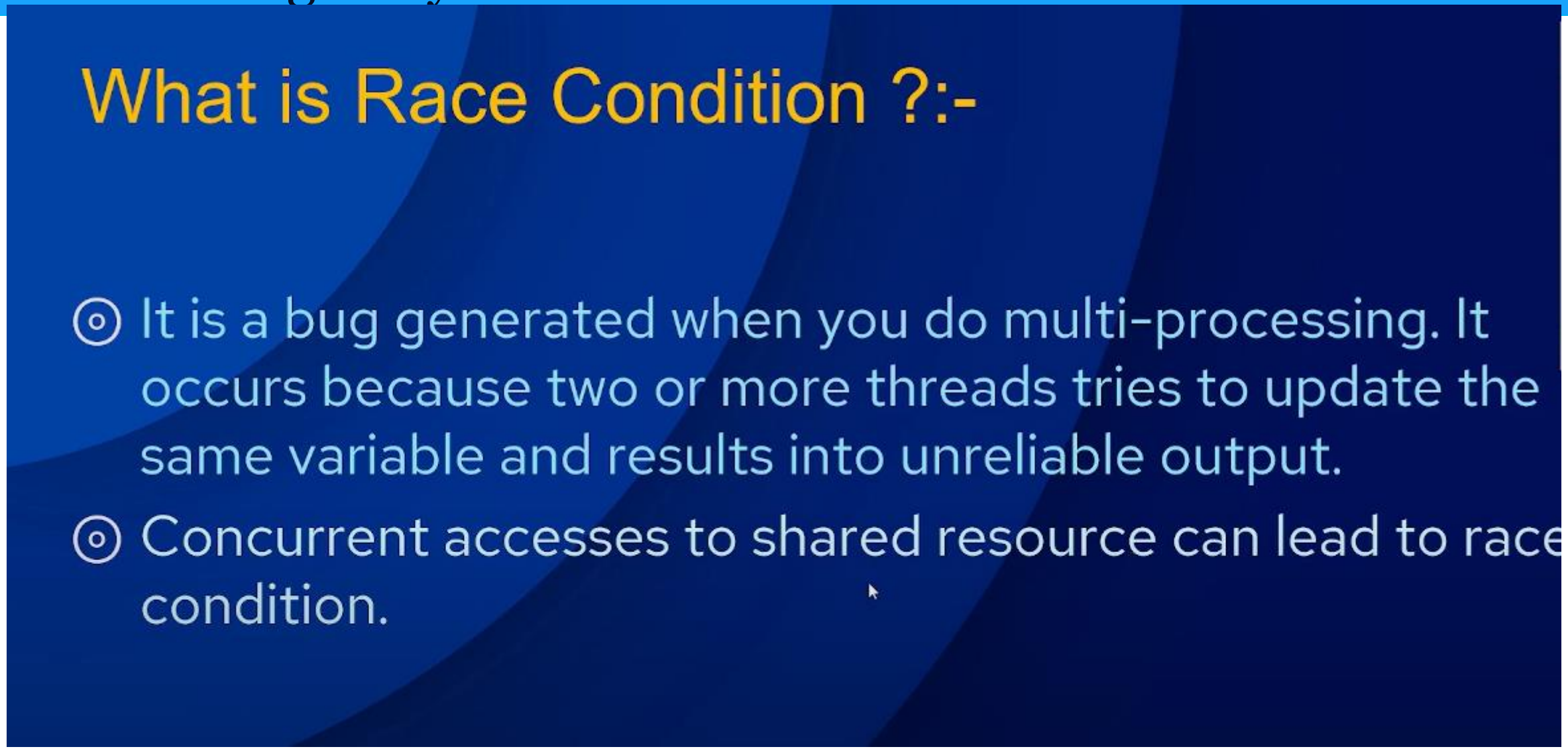


Multithreading in Python



Multithreading in Python

Thread synchronization Technique :-

- Thread synchronization is defined as a mechanism which ensures that two or more concurrent threads do not simultaneously execute some particular program segment known as critical section.

- We have following thread synchronization techniques.
  - i) Using Locks.
  - ii) Using R-Lock
  - iii) Using Semaphores.

Multithreading in Python

Locks in Python:-

- threading module provides a Lock class to deal with the race conditions.

Lock has two states:-

1) Locked :- The lock has been acquired by one thread and any thread that makes an attempt to acquire it must wait until it is released.

2) Unlocked:- The lock has not been acquired and can be acquired by the next thread that makes an attempt.

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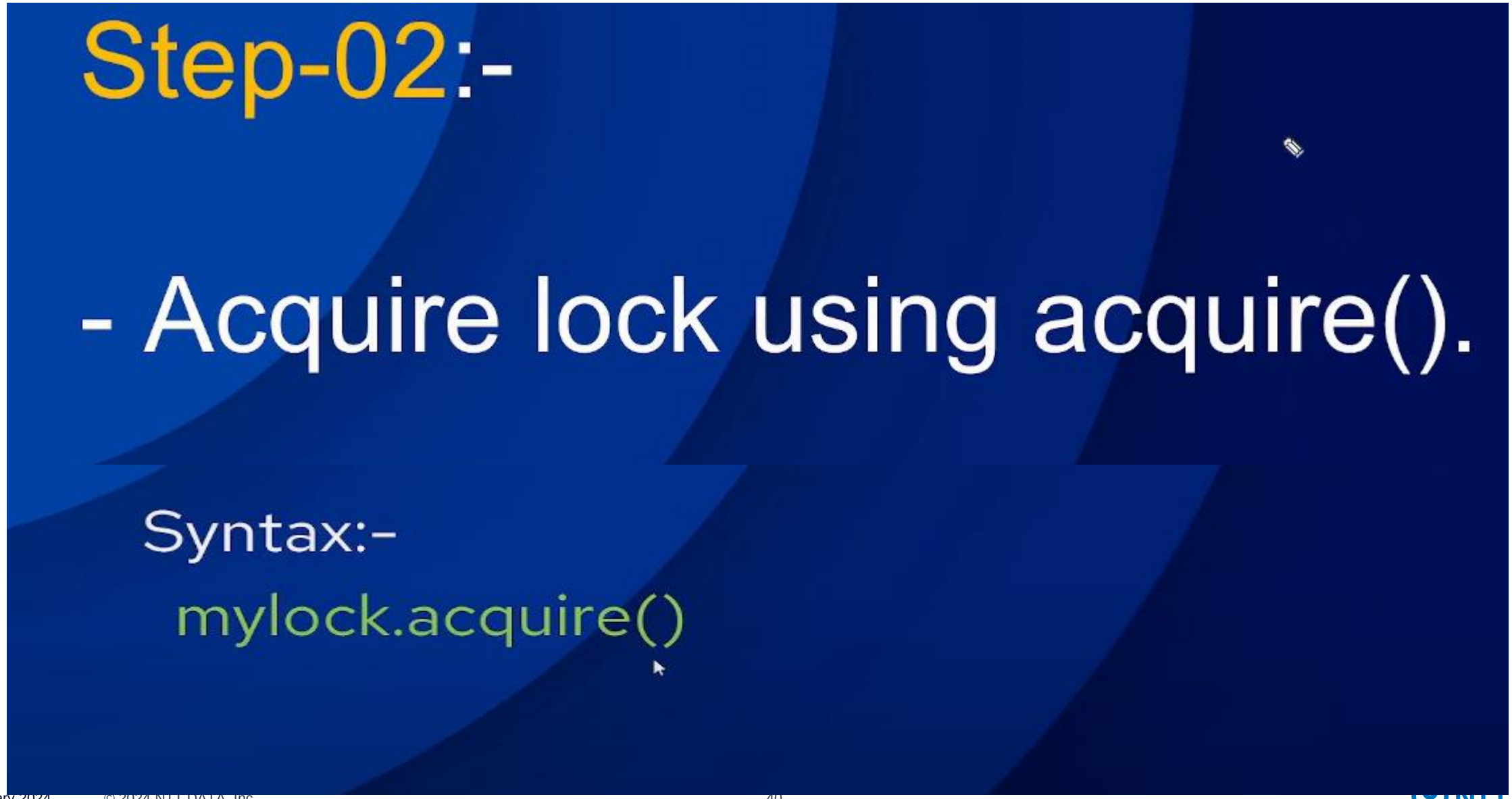
Multithreading in Python



Step-03:-

- Release lock using release().

Syntax:-

```
mylock.release()
```

Multithreading in Python

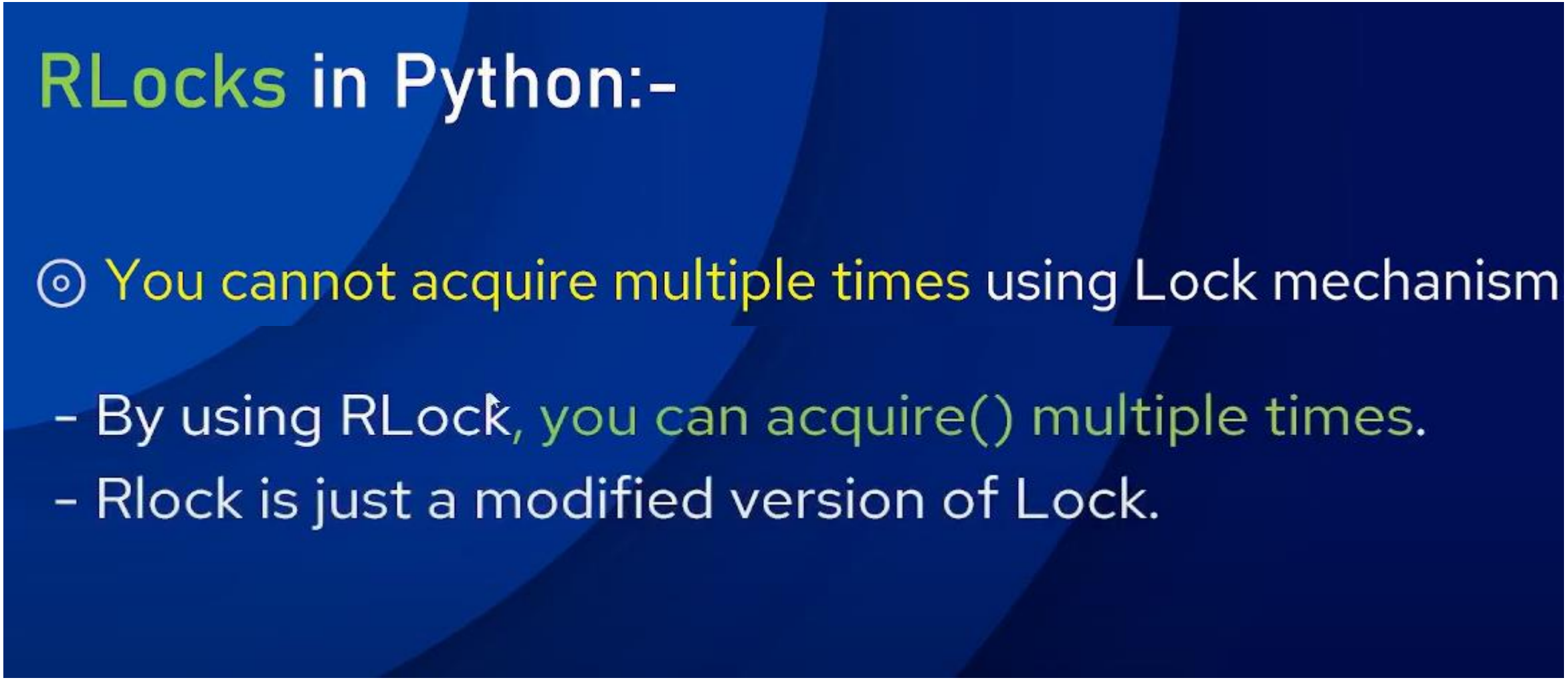
acquire() method

- change the state of code to locked.
- other threads have to wait until lock is released by curren working thread.

syntax:-

```
lock_object.acquire([blocking=True],timeout=-1)
```

Multithreading in Python



Multithreading in Python

Necessity of Rlock:

In Python's threading module, both Lock and RLock are used for synchronization between threads. However, they differ in their behavior and usage.

Lock: A Lock can be acquired only once by a thread. If the same thread tries to acquire the lock again before releasing it, it will result in a deadlock. This is because the thread will be blocked waiting for itself to release the lock.

RLock: An RLock is a type of lock that allows a thread to acquire the lock multiple times before releasing it. This is useful in scenarios where a function needs to call itself recursively or where a thread needs to acquire the lock multiple times within a block of code.

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- In Lock and RLock, at a time only one Thread is allowed to execute.
- but sometimes our requirement is to execute a particular number of Threads at a time.

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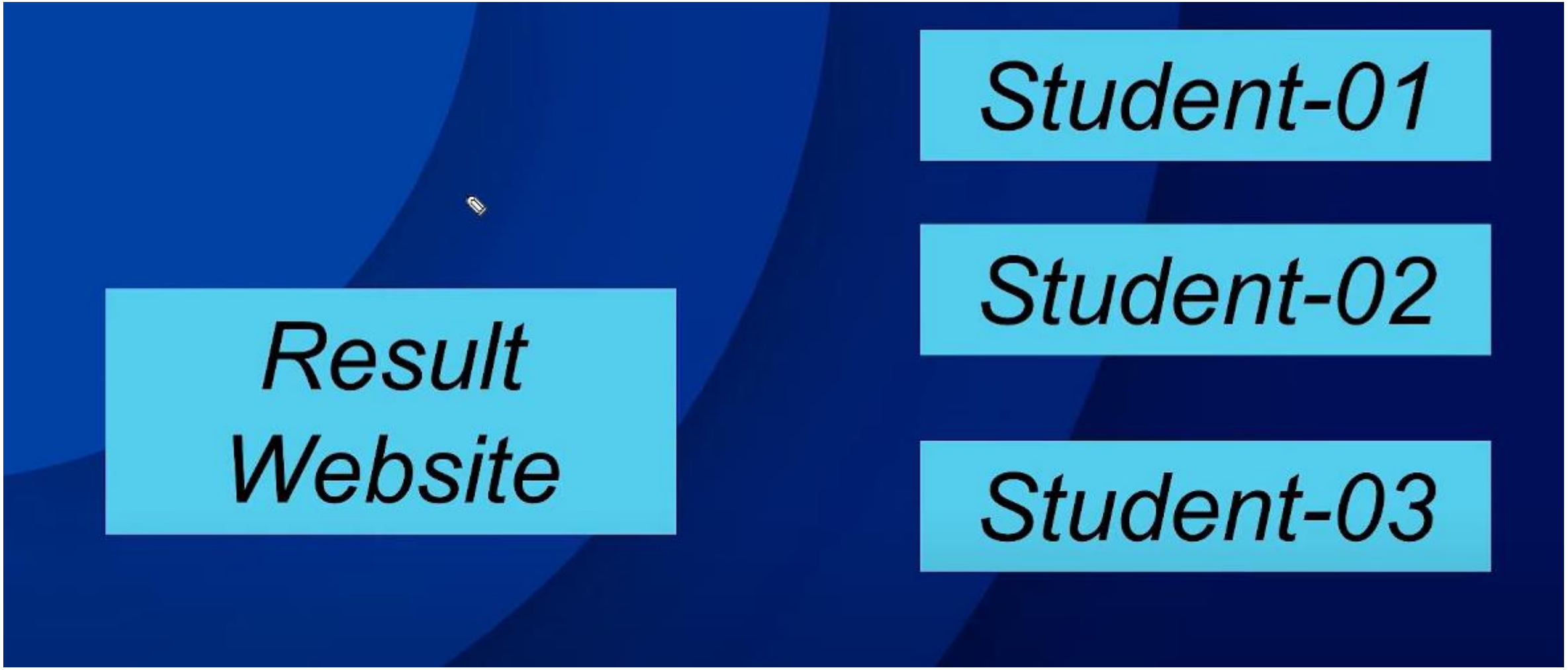

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