

17.7. `queue` — A synchronized queue class

Source code: [Lib/queue.py](#)

The `queue` module implements multi-producer, multi-consumer queues. It is especially useful in threaded programming when information must be exchanged safely between multiple threads. The `Queue` class in this module implements all the required locking semantics. It depends on the availability of thread support in Python; see the `threading` module.

The module implements three types of queue, which differ only in the order in which the entries are retrieved. In a `FIFO` queue, the first tasks added are the first retrieved. In a `LIFO` queue, the most recently added entry is the first retrieved (operating like a stack). With a priority queue, the entries are kept sorted (using the `heapq` module) and the lowest valued entry is retrieved first.

Internally, the module uses locks to temporarily block competing threads; however, it is not designed to handle reentrancy within a thread.

The `queue` module defines the following classes and exceptions:

`class queue.Queue(maxsize=0)`

Constructor for a `FIFO` queue. `maxsize` is an integer that sets the upperbound limit on the number of items that can be placed in the queue. Insertion will block once this size has been reached, until queue items are consumed. If `maxsize` is less than or equal to zero, the queue size is infinite.

`class queue.LifoQueue(maxsize=0)`

Constructor for a `LIFO` queue. `maxsize` is an integer that sets the upperbound limit on the number of items that can be placed in the queue. Insertion will block once this size has been reached, until queue items are consumed. If `maxsize` is less than or equal to zero, the queue size is infinite.

`class queue.PriorityQueue(maxsize=0)`

Constructor for a priority queue. `maxsize` is an integer that sets the upperbound limit on the number of items that can be placed in the queue. Insertion will block once this size has been reached, until queue items are consumed. If `maxsize` is less than or equal to zero, the queue size is infinite.

The lowest valued entries are retrieved first (the lowest valued entry is the one returned by `sorted(list(entries))[0]`). A typical pattern for entries is a tuple in the form: `(priority_number, data)`.

exception `queue.Empty`

Exception raised when non-blocking `get()` (or `get_nowait()`) is called on a `Queue` object which is empty.

exception `queue.Full`

Exception raised when non-blocking `put()` (or `put_nowait()`) is called on a `Queue` object which is full.

17.7.1. Queue Objects

Queue objects (`Queue`, `LifoQueue`, or `PriorityQueue`) provide the public methods described below.

`Queue.qsize()`

Return the approximate size of the queue. Note, `qsize() > 0` doesn't guarantee that a subsequent `get()` will not block, nor will `qsize() < maxsize` guarantee that `put()` will not block.

`Queue.empty()`

Return `True` if the queue is empty, `False` otherwise. If `empty()` returns `True` it doesn't guarantee that a subsequent call to `put()` will not block. Similarly, if `empty()` returns `False` it doesn't guarantee that a subsequent call to `get()` will not block.

`Queue.full()`

Return `True` if the queue is full, `False` otherwise. If `full()` returns `True` it doesn't guarantee that a subsequent call to `get()` will not block. Similarly, if `full()` returns `False` it doesn't guarantee that a subsequent call to `put()` will not block.

`Queue.put(item, block=True, timeout=None)`

Put *item* into the queue. If optional args *block* is true and *timeout* is `None` (the default), block if necessary until a free slot is available. If *timeout* is a positive number, it blocks at most *timeout* seconds and raises the `Full` exception if no free slot was available within that time. Otherwise (*block* is false), put an item on the queue if a free slot is immediately available, else raise the `Full` exception (*timeout* is ignored in that case).

`Queue.put_nowait(item)`

Equivalent to `put(item, False)`.

`Queue.get(block=True, timeout=None)`

Remove and return an item from the queue. If optional args *block* is true and *timeout* is None (the default), block if necessary until an item is available. If *timeout* is a positive number, it blocks at most *timeout* seconds and raises the `Empty` exception if no item was available within that time. Otherwise (*block* is false), return an item if one is immediately available, else raise the `Empty` exception (*timeout* is ignored in that case).

`Queue.get_nowait()`

Equivalent to `get(False)`.

Two methods are offered to support tracking whether enqueued tasks have been fully processed by daemon consumer threads.

`Queue.task_done()`

Indicate that a formerly enqueued task is complete. Used by queue consumer threads. For each `get()` used to fetch a task, a subsequent call to `task_done()` tells the queue that the processing on the task is complete.

If a `join()` is currently blocking, it will resume when all items have been processed (meaning that a `task_done()` call was received for every item that had been `put()` into the queue).

Raises a `ValueError` if called more times than there were items placed in the queue.

`Queue.join()`

Blocks until all items in the queue have been gotten and processed.

The count of unfinished tasks goes up whenever an item is added to the queue. The count goes down whenever a consumer thread calls `task_done()` to indicate that the item was retrieved and all work on it is complete. When the count of unfinished tasks drops to zero, `join()` unblocks.

Example of how to wait for enqueued tasks to be completed:

```
def worker():
    while True:
        item = q.get()
        if item is None:
            break
        do_work(item)
        q.task_done()

q = queue.Queue()
threads = []
```

```
for i in range(num_worker_threads):
    t = threading.Thread(target=worker)
    t.start()
    threads.append(t)

for item in source():
    q.put(item)

# block until all tasks are done
q.join()

# stop workers
for i in range(num_worker_threads):
    q.put(None)
for t in threads:
    t.join()
```

See also:

Class `multiprocessing.Queue`

A queue class for use in a multi-processing (rather than multi-threading) context.

`collections.deque` is an alternative implementation of unbounded queues with fast atomic `append()` and `popleft()` operations that do not require locking.