MULTITHREADING - SUBCLASSING THREAD

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run() methods

So far, we've been using a thread by instantiating the **Thread** class given by the package (threading.py (http://hg.python.org/cpython/file/3.4/Lib/threading.py)). To create our own thread in Python, we'll want to make our class to work as a thread. For this, we should subclass our class from the Thread class.

First thing we need to do is to import Thread using the following code:

```
from threading import Thread
```

Then, we should subclass our class from the **Thread** class like this:

```
class MyThread(Thread):
```

Just for reference, here is a code snippet from the package for the Thread class:

```
class Thread:
    ...

    def start(self):
        """Start the thread's activity.

        It must be called at most once per thread object. It arranges for the
        object's run() method to be invoked in a separate thread of control.

        This method will raise a RuntimeError if called more than once on the
        same thread object.

        """
        if not self._initialized:
            raise RuntimeError("thread.__init__() not called")

        if self._started.is_set():
            raise RuntimeError("threads can only be started once")
        with _active_limbo_lock:
            _limbo[self] = self
        try:
            _start_new_thread(self._bootstrap, ())
        except Exception:
            with _active_limbo_lock:
                del _limbo[self]
            raise
        self._started.wait()

    def _bootstrap(self):
        try:
            self._bootstrap_inner()
        except:
            if self._daemonic and _sys is None:
                return
            raise

    def _bootstrap_inner(self):
        try:
         ...

            try:
                self.run()
            except SystemExit:
                pass
            except:

    def run(self):
        try:
            if self._target:
                self._target(*self._args, **self._kwargs)
        finally:
            # Avoid a refcycle if the thread is running a function with
            # an argument that has a member that points to the thread.
            del self._target, self._args, self._kwargs
```

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As a Thread starts up, it does some basic initialization and then calls its **run()** method, which calls the target function passed to the constructor. The Thread class represents an activity that runs in a separate thread of control. There are two ways to specify the activity:

1. by passing a callable object to the constructor
2. by overriding the **run()** method in a subclass

No other methods (except for the constructor) should be overridden in a subclass. In other words, we only override the **__init__()** and **run()** methods of a class.

In this section, we will create a subclass of Thread and override **run()** to do whatever is necessary:

```
import threading

class MyThread(threading.Thread):

    def run(self):
        pass

if __name__ == '__main__':
    for i in range(3):
        t = MyThread()
        t.start()
```

Once a thread object is created, its activity must be started by calling the thread's **start()** method. This invokes the **run()** method in a separate thread of control.

Once the thread's activity is started, the thread is considered 'alive'. It stops being alive when its **run()** method terminates - either normally, or by raising an unhandled exception. The **is_alive()** method tests whether the thread is alive.

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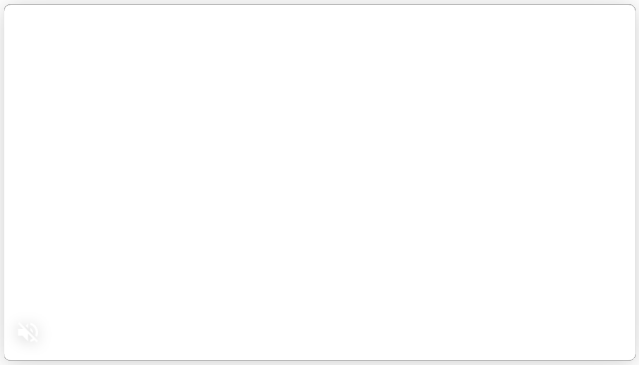

```
import threading
import time

class MyThread(threading.Thread):

    def run(self):
        time.sleep(5)
        return

if __name__ == '__main__':
    for i in range(3):
        t = MyThread()
        t.start()
        print 't.is_alive()=', t.is_alive()
        t.join()
        print 't.is_alive()=', t.is_alive()
```

Output:

```
t.is_alive()= True
t.is_alive()= False
t.is_alive()= True
t.is_alive()= False
t.is_alive()= True
t.is_alive()= False
```

As we can see from the output, each of the three thread is alive just after the start but **t.is_alive()=False** after terminated.

Before we move forward, for our convenience, let's put a logging feature into a place:

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Python Network Programming III - Echo Server using socketserver network

```
import threading
import time
import logging

logging.basicConfig(level=logging.DEBUG,
                    format='(%(threadName)-9s) %(message)s',)

class MyThread(threading.Thread):

    def run(self):
        logging.debug('running')
        return

if __name__ == '__main__':
    for i in range(3):
        t = MyThread()
        t.start()
```

Output:

```
(Thread-1 ) running
(Thread-2 ) running
(Thread-3 ) running
```

Passing args to the customized thread

Because the ***args** and ****kwargs** values passed to the Thread constructor are saved in private variables, they are not easily accessed from a subclass. To pass arguments to a custom thread type, we need to redefine the constructor to save the values in an instance attribute that can be seen in the subclass:

```
import threading
import time
import logging

logging.basicConfig(level=logging.DEBUG,
                    format='(%(threadName)-9s) %(message)s',)

class MyThread(threading.Thread):


    def __init__(self, group=None, target=None, name=None,
                 args=(), kwargs=None, verbose=None):
        super(MyThread,self).__init__(group=group, target=target,
                                      name=name, verbose=verbose)
        self.args = args
        self.kwargs = kwargs
        return

    def run(self):
        logging.debug('running with %s and %s', self.args, self.kwargs)
        return

if __name__ == '__main__':
    for i in range(3):
        t = MyThread(args=(i,), kwargs={'a':1, 'b':2})
        t.start()
```

Output:

```
(Thread-1 ) running with (0,) and {'a': 1, 'b': 2}
(Thread-2 ) running with (1,) and {'a': 1, 'b': 2}
(Thread-3 ) running with (2,) and {'a': 1, 'b': 2}
```

We overrided the **__init__()** using:

```
super(MyThread,self).__init__()
```

For Python 3, we could have used without any args within the **super()**, like this:

```
super().__init__()
```

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[Note] Sources are available at Github - Jupyter notebook files (https://github.com/Einsteinish/A Neural-Networks-with-Jupyter.git)

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