Tkinter Thread

Summary: in this tutorial, you'll learn how to use multiple threads in Tkinter applications to make the applications more responsive.

When to use Thread in Tkinter applications

In a Tkinter application, the main loop should always start in the main thread. It's responsible for handling events and updating the GUI.

If you have a background operation that takes time, you should execute it in a separate thread (https://www.pythontutorial.net/tkinter/tkinter-thread/) .

Otherwise, the application won't be responsive. In the worst case, it will freeze while the operation is running.

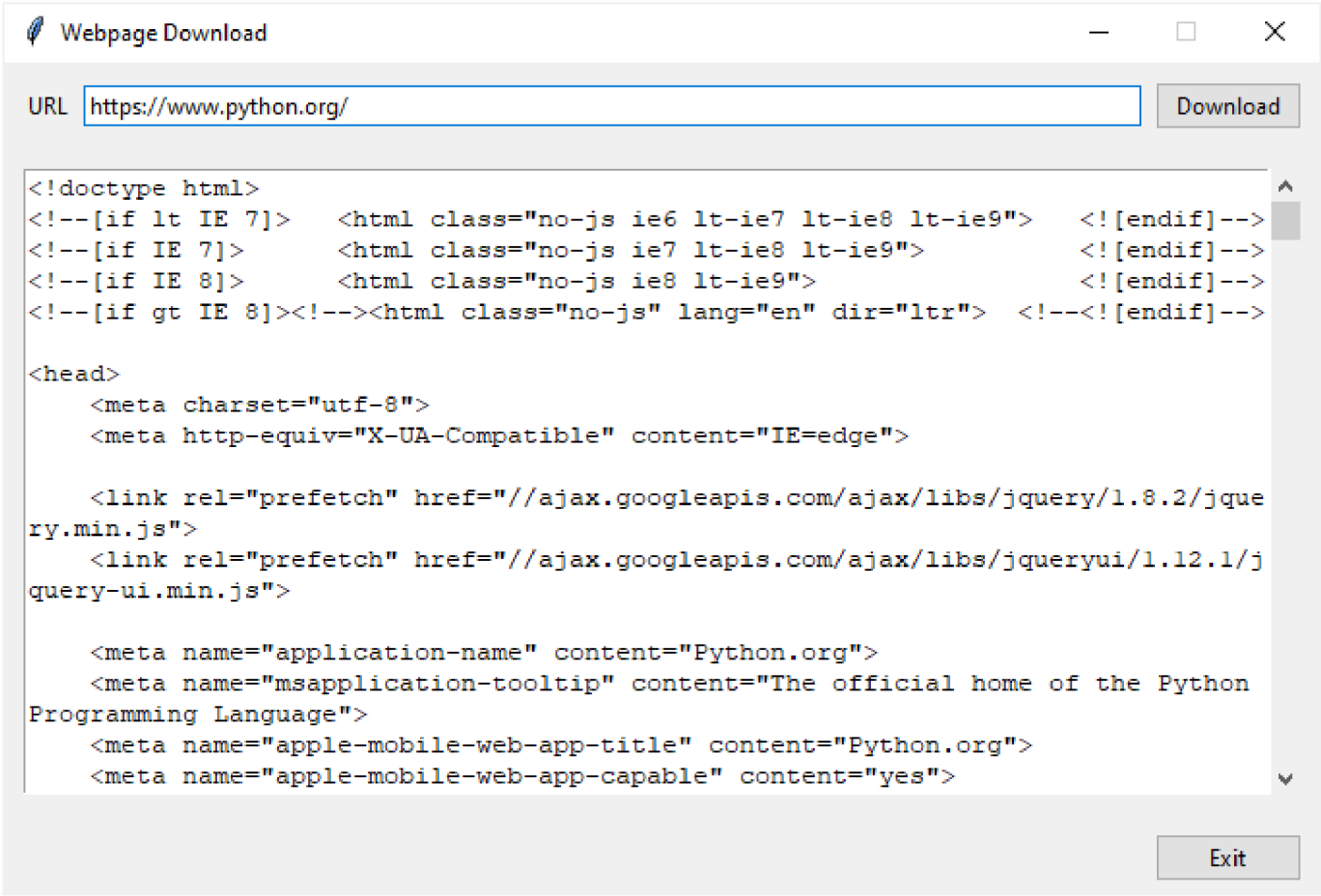
To create and control multiple threads in Tkinter applications, you can use the Python `threading` (https://www.pythontutorial.net/advanced-python/python-threading/) module.

The `threading` module is included in Python's standard library so you don't need to install it.

For more information on how to use the threading module, you can follow the Python threading tutorial (https://www.pythontutorial.net/advanced-python/python-threading/) .

Tkinter thread example

We'll build a simple program that downloads a webpage specified by an URL and displays its contents in a `Text` widget:



To download a webpage, we'll use the requests module (https://pypi.org/project/requests/) .

First, install (https://www.pythontutorial.net/python-basics/python-pip/) the `requests` module by executing the following command:

```
pip install requests
```

Next, import `tkinter` , `threading` , and `requests` modules:

```
import tkinter as tk
from tkinter import ttk
from tkinter.messagebox import showerror
from threading import Thread
import requests
```

Then, define a new class (https://www.pythontutorial.net/python-oop/python-class/) called `AsyncDownload` that inherits from the `Thread` class:

```
class AsyncDownload(Thread):
    def __init__(self, url):
        super().__init__()
        self.html = None
        self.url = url

    def run(self):
        response = requests.get(self.url)
        self.html = response.text
```

How the `AsyncDownload` class works:

- In the `__init__()` method of the `AsyncDownload` class, we initialize the `html` and `url` attributes.
- In the `run()` method, we call the get the `get()` function to download the webpage specified by the URL and assign the HTML source code to the `html` attribute.

After that, create the `App` class inherits from the `Tk` class. The App class represents the root window.

The root window consists of three frames that hold all the widgets. We won't focus on how to create widgets and place them on the window using the grid geometry manager (https://www.pythontutorial.net/tkinter/tkinter-grid/) .

When you click the download button, the program executes the `handle_download()` method of the `App` class.

In the `handle_download()` method, we check if the url is provided. If yes, we create a new instance of the `AsyncDownload` class and start the thread. Also, we disable the download button and clear the contents of the `Text` widget.

In addition, we call the `monitor()` method to monitor the status of the thread.

```
def handle_download(self):
    url = self.url_var.get()
```

```
        if url:
            self.download_button['state'] = tk.DISABLED
            self.html.delete(1.0, "end")

            download_thread = AsyncDownload(url)
            download_thread.start()

            self.monitor(download_thread)
        else:
            showerror(title='Error',
                      message='Please enter the URL of the webpage.')
```

In the `monitor()` method, we schedule an action that will run the `monitor()` method after 100ms if the thread is still alive.

If the download completed, we update the contents for the `Entry` widget and re-enable the download button:

```
    def monitor(self, thread):
        if thread.is_alive():
            # check the thread every 100ms
            self.after(100, lambda: self.monitor(thread))
        else:
            self.html.insert(1.0, thread.html)
            self.download_button['state'] = tk.NORMAL
```

Finally, run the application's main loop:

```
if __name__ == "__main__":
    app = App()
    app.mainloop()
```

The following show the complete program:

```
import tkinter as tk
from tkinter import ttk
from tkinter.messagebox import showerror
from threading import Thread
import requests


class AsyncDownload(Thread):
    def __init__(self, url):
        super().__init__()

        self.html = None
        self.url = url

    def run(self):
        response = requests.get(self.url)
        self.html = response.text


class App(tk.Tk):
    def __init__(self):
        super().__init__()

        self.title('Webpage Download')
        self.geometry('680x430')
        self.resizable(0, 0)

        self.create_header_frame()
        self.create_body_frame()
        self.create_footer_frame()

    def create_header_frame(self):

        self.header = ttk.Frame(self)
        # configure the grid
```

```
        self.header.columnconfigure(0, weight=1)
        self.header.columnconfigure(1, weight=10)
        self.header.columnconfigure(2, weight=1)
        # label
        self.label = ttk.Label(self.header, text='URL')
        self.label.grid(column=0, row=0, sticky=tk.W)

        # entry
        self.url_var = tk.StringVar()
        self.url_entry = ttk.Entry(self.header,
                                   textvariable=self.url_var,
                                   width=80)

        self.url_entry.grid(column=1, row=0, sticky=tk.EW)

        # download button
        self.download_button = ttk.Button(self.header, text='Download')
        self.download_button['command'] = self.handle_download
        self.download_button.grid(column=2, row=0, sticky=tk.E)

        # attach the header frame
        self.header.grid(column=0, row=0, sticky=tk.NSEW, padx=10, pady=10)

    def handle_download(self):
        url = self.url_var.get()
        if url:
            self.download_button['state'] = tk.DISABLED
            self.html.delete(1.0, "end")

            download_thread = AsyncDownload(url)
            download_thread.start()

            self.monitor(download_thread)
        else:
            showerror(title='Error',
                      message='Please enter the URL of the webpage.')
```

```
    def monitor(self, thread):
        if thread.is_alive():
            # check the thread every 100ms
            self.after(100, lambda: self.monitor(thread))
        else:
            self.html.insert(1.0, thread.html)
            self.download_button['state'] = tk.NORMAL

    def create_body_frame(self):
        self.body = ttk.Frame(self)
        # text and scrollbar
        self.html = tk.Text(self.body, height=20)
        self.html.grid(column=0, row=1)

        scrollbar = ttk.Scrollbar(self.body,
                                  orient='vertical',
                                  command=self.html.yview)

        scrollbar.grid(column=1, row=1, sticky=tk.NS)
        self.html['yscrollcommand'] = scrollbar.set

        # attach the body frame
        self.body.grid(column=0, row=1, sticky=tk.NSEW, padx=10, pady=10)

    def create_footer_frame(self):
        self.footer = ttk.Frame(self)
        # configure the grid
        self.footer.columnconfigure(0, weight=1)
        # exit button
        self.exit_button = ttk.Button(self.footer,
                                      text='Exit',
                                      command=self.destroy)

        self.exit_button.grid(column=0, row=0, sticky=tk.E)
```

```
        # attach the footer frame
        self.footer.grid(column=0, row=2, sticky=tk.NSEW, padx=10, pady=10)


if __name__ == "__main__":
    app = App()
    app.mainloop()
```

Summary

- Do execute background tasks in separate threads to make the Tkinter application responsive.