Homework#1

Due date:

2020.04.02/09(Reading and Report)

2020.04.09(Programming Problems)

Homework Policy:(Read before you start to work)

1. 作業請勿抄襲，如果被發現，作業以零分計算
2. 如果作業上遇到困難可以討論，但是報告和程式碼的部分必須是你自己完成，並且請在作業的 pdf 檔註明討論的同學姓名及學號
3. 程式作業請於期限內至 ceiba 作業區上傳，格式為 zip 檔，解壓縮後應恰為一個以學號為名的資料夾，資料夾內有一以學號為黨名的 pdf 檔和一個子資料夾，如下所示

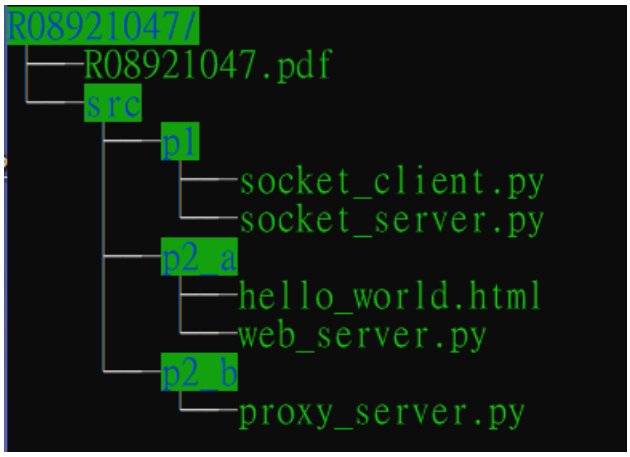

Figure 1: folder tree

4. 逾期繳交一天內，分數 $\times\frac{2}{3}$，超過一天未滿兩天，分數 $\times\frac{1}{3}$，超過兩天則不予計分，請務必盡早開始，並努力完成。
5. 如有任何問題歡迎來信，並請在郵件的標題註明課程。範例:[2020ICN] 作業一問題
   - 學號末號　mod 3 = 0 林芹學 R08921047@ntu.edu.tw
   - 學號末號　mod 3 = 1 林宛霓 R08921055@ntu.edu.tw
   - 學號末號　mod 3 = 2 連潔琳 R08942159@ntu.edu.tw

Programming Problems:
Due:2020.04.09 - 11:59 pm

1. [**Socket Programming - TCP**] – 40%
   We are going to construct a TCP server and client system. Fig 2 describes the messages sent between client and server. Please refer to the following steps:

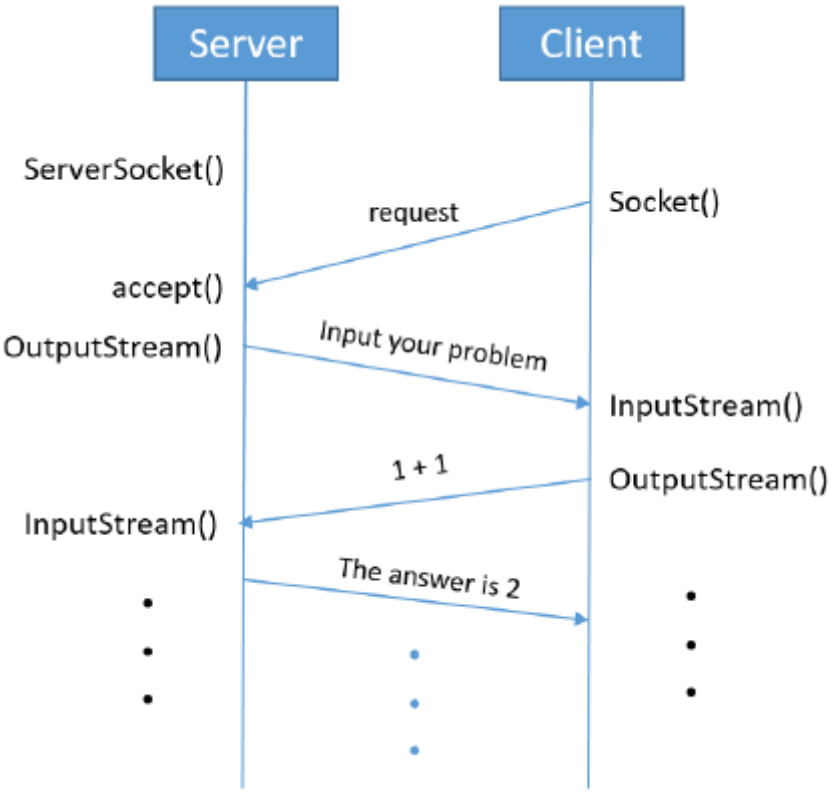

Figure 2: Message flow between client and server

   (a) Read the source of socket_server.py (works on python3 environment), try your best to understand it.

   (b) Add some code at "TODO" part of socket_server.py. Let the server to work as a calculator that support basic "+","-","×","÷" operations.

   (c) Write your own socket_client.py such that it can (1)Read the message sent from server and (2)Send the user-input message to the server to check if the server works as you expect. The message flow between client and server is shown in Fig 2.

   (d) Compile and run the socket_server.py first, and then run your socket_client.py.

   (e) Test it under your local machine. If you do it correct, the execution should be like Fig 3.

   (f) It really works! Try to run your socket_client.py and connect to TA's computer with TA's IP address 140.112.42.100 and port 7777.

```
connected to 127.0.0.1
Receive server message:
Welcom to the calculator server. Input your problem ?
1 + 2
Receive server message:
The answer is 3.
Do you have any question? (Y/N)
y
Receive server message:
Welcom to the calculator server. Input your problem ?
5 * 3
Receive server message:
The answer is 15.
Do you have any question? (Y/N)
y
Receive server message:
Welcom to the calculator server. Input your problem ?
12 / 3
Receive server message:
The answer is 4.0.
Do you have any question? (Y/N)
n
```

Figure 3: Connect to server on local machine(127.0.0.1)

(g) (Bonus–5%)You can also implement other math function. For example, matrix multiplication, integral, and Laplace's transform. Each function you add, you get extra 1 point in this problem. However, the existing math libraries are not allowed. You should write these steps by your own and specify how to call these functions in README!

(h) Please print-screen the result and attach it to *.pdf and put your source code(including socket_server.py and socket_client.py) under [student_id]/src/p1. If you have some other function done in (f), you should also put README.md under [student_id]/src/p1.

2. [**Web server**] – 60%(Chap 2 Programming Assignment#1,#4 in textbook) a(25%). In this assignment, you will develop a simple Web server in python that is capable of processing simple request. There should be at least two html files. There is one homepage that navigate to other pages, and clients can access the other pages through the homepage. Clients can also access thest pages directly, and go back to the homepage through these pages.

   Please refer to the following steps:

   (a) Run the Web server on the local machine and create a connection socket

   (b) Receive the HTTP request from this connection when contacted by a client(browser)

   (c) Parse the request to determine the specific file being requested

   (d) Get the requested file from the server's file system

   (e) Create an HTTP response message consisting of the requested file preceded by header lines

   (f) If the client send HTTP request for the other pages through the homepage, the web server will go back to the step (ii)

(g) Send the response over the TCP connection to the requesting browser. If a browser requests a file that is not present in your server, your server should return a "404 Not Found" error message

The message flow between client and web browser and web server is shown in Fig 4.

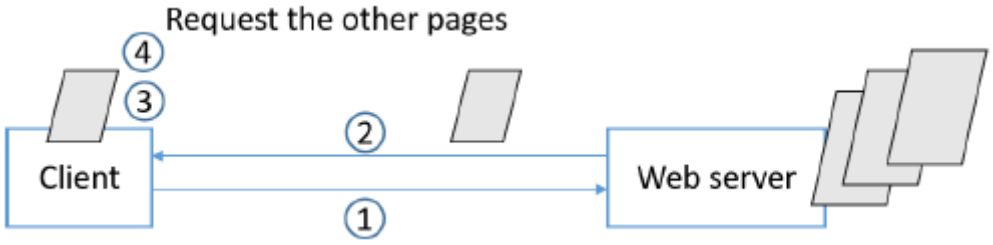

Figure 4: Message flow between the client and the web server

Read the source code web_server.py, and try your best to understand it. Add some codes to the "TODO" part to complete the function of web server. Put html files under the directory that web server is running, and get the file through the browser.
Get your IP address of your web server, and try to connect to the web server by another device instead of the local machine such as your cellphone. Check if you can get the file in another device through browser.
Please print-screen the result and attach it to *.pdf. Finally, put your source code(web_server.py) and html file under [student_id]/src/p2_a.

b(35%). In this assignment, you will develop a Web proxy. The message is shown if Fig 5. Followings are the things that you have to do.

(a) Create a socket on the proxy server and receive data(request) from the client

(b) Parse the request to determine the specific file being requested

(c) Create another socket on the proxy server and connect to the web server

(d) Ask for the file requested by the client

(e) Read the response and send it to the client

(f) If the file is not found, return an error message

(g) This proxy will be multi-threaded, so that it will be able to handle multiple requests at the same time.

The skeleton code is provided to you in the attached file with file name proxy_server.py. Your job is to complete the code in the "TODO" part, and then test it by having different browsers request Web objects via your proxy. Please print-screen the result and attach it to *.pdf. Finally, out your source code(proxy_server.py) under [student_id]/src/p2_b.

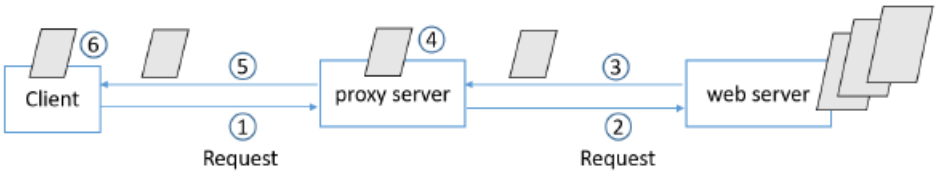

Figure 5: Messge flow among Client-Proxy-Server

Reading and Report:
The Nerwork Edge
Due: 2020.04.02 - 11:59pm

1. 請閱讀課本 Chap1.2(The Network Edge)
2. 每人錄一段長約10-15 分鐘左右的影片，內容須包含一個 Access Networks 和一個 Physical Media 的內容。必須將影片上傳至 YouTube來做為評分依據。
3. 每人必須上傳一份pdf 檔書面報告至 Ceiba 作業區，內容包含學號、姓名、影片 YouTube 連結。
4. 評分

指標	比重	備註
書面報告內容是否正確、扎實	50%	
書面呈現方式是否清楚	20%	必要時以圖文說明
影片表達清楚且流暢	30%	

5. Extra: 報告優良者願意分享其影片和報告給同學，可加分。

The Web and HTTP
Due: 2020.04.09 - 11:59pm

1. 請閱讀課本 Chap2.2(The Web and HTTP)
2. 每人錄一段長約10-15 分鐘左右的影片，內容敘述相關協定的運作方式，並舉例做說明。必須將影片上傳至 YouTube來做為評分依據。
3. 每人必須上傳一份pdf 檔書面報告至 Ceiba 作業區，內容包含學號、姓名、影片 YouTube 連結，通訊協定運作機制與例子等。
4. 評分

指標	比重	備註
書面報告內容是否正確、扎實	50%	
書面呈現方式是否清楚	20%	必要時以圖文說明
影片表達清楚且流暢	30%	

5. Extra: 報告優良者願意分享其影片和報告給同學，可加分。