Introduction to Computer Networks

Assignment 2: Web Server Imitation

1. Goal

- Develop a simple web server using socket programming.

2. Development environments

- TA will evaluate your results on multiple Linux (virtual) machines.
- You have to describe your development environment information in detail in the report.
  If TA cannot run your program, and you will get zero points.

3. Functionalities to implement

- Server
  - Develop a standard web server program.
  - The web server program runs with the port number of **10080**, and waits to receive HTTP requests from web browsers that **run on another (virtual) machine**.
  - When receiving HTTP request messages, the web server program sends HTTP response messages back to the browser.
  - Users can request **html** or **image** files which are located in the same directory where web server program runs.
  - The web server must be able to handle concurrent HTTP request messages from browsers. (Commercial browsers open multiple TCP connections.)
  - You can extend your web server program to provide a "log in" functionality. (see below)
  - You can extend your web server program to be persistent HTTP mode. (see below)

- Client
  - Use an existing browser that follows the HTTP standard.
  - Write a URL in the browser address bar;
    - http://server_IP:port_number/html_file (e.g. http://115.145.x.x:10080/secret.html)
    - http://server_IP:port_number/object_file (e.g. http://115.145.x.x:10080/1.jpg)

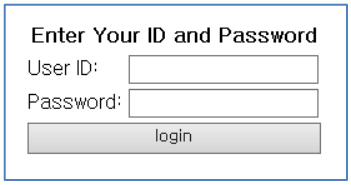
4. Evaluation Scenario (total 100 points)

4.1 Basic HTTP requests & responses (60 points)

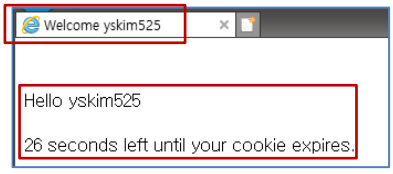
- User requests HTML or image files.
  If the HTML file includes embed images, the browser requests them automatically. Therefore, your web server program must handle those subsequent requests.
- Image file size can be up to O(10) Mbytes.
- User can repeatedly access / request any content in Web server.
- If you request a file that is not present in the web server machine, the web server should return a "404 Not Found" error message.
- The web server program can work in a non-persistent or a persistent HTTP mode.

4.2 Log-in functionality (20 points)

- If you add 'Log-in functionality', users must access "http://serverIP:10080" for the first time, and the web server sends "index.html".
- The "index.html" file shows the following input forms;



- If a user enters ID & password (and push the login button), the server returns "secret.html".
  - You prepare your own "secret.html" file that includes any interesting story (text) about you and related image files (more than 3 images).
- Without the login process, if users try to access any (even non-existing) URL directly, the web server program must return a "403 Forbidden" error message.
  - Once you logged in, you can access any content in the web server for 30 seconds. After 30 seconds, your cookie will be expired.
  - After expiration, you have to log in again to access another content in the web server.
- When accessing "cookie.html", you can see "User_ID" in the browser title bar, and display how many seconds left before the cookie expires.



4.3 Persistent HTTP mode (10 points)

- Upgrade your web server program to be persistent HTTP mode.

4.4 Write your Report precisely (10 points)

- Describe your development environment information in detail. (Versions of operating systems, programming languages, compilers/interpreter versions, compile options…)
- Present how to design your assignment such as data structures and algorithms.
- Indicate which functionalities were successfully implemented (with evidence / screenshots). If you do NOT mention, TA will NOT evaluate.

5. Submission

- The deadline is 4.19(Sun) 23:59.
  - For delayed submissions, a penalty of -15 points applies every 24 hours. After 72 hours, you get zero points.
  - In the case of plagiarism, you will receive 0 points for the first time and ***F*** for the second.
- Submit a zip file in iCampus. The zip file must include a **report**, a **source code**, **HTML and image** files for your demonstration
  - For C++, submit both a source code and **Makefile** to produce StudentID.out (ex: 2018001.out)
  - For Python, submit a source code named StudentID.py (ex: 2018001.py)
  - Name the zip file as follows StudentID_Name.zip (ex: 2018001_홍길동.zip)

Notes:

1) You need to know the standard HTTP request & response message format.
2) Learn the HTML syntax to create HTML files for this assignment.
3) Study how to transfer the input values in HTML to Web Server (GET or POST method)
4) Apply Cookie for the Log-in functionality
5) For providing a Persistent HTT mode, study how to implement it first.
6) Use wireshark or tcpdump to check incoming and outgoing HTTP & TCP traffic