ICT1010 Computer Networks

2018-2019 Trimester 2

Assignment 2:
Socket Programming

Weightage: **15%**

In teams of 1 – 4 students.
Please write your name(s) clearly on the front page of your work. Marks will be deducted for submission without name(s).

Due Date: **Friday 5 Apr 2019 by 23:59**
Submission: via **LMS Dropbox;** only one student is required to submit for the whole team.

Learning Outcomes

Upon completion of this assignment, you should be able to:

- Program network applications using socket APIs in Python
- Program TCP client and connection-oriented multi-threaded TCP server
- Follow relevant protocol specifications published in the Request for Comments (RFCs) to ensure interoperability of your programs

Socket Programming

Assume computer networks without layering. Can you imagine how difficult it will be to program a network application from scratch without the ability to reuse the services of lower layers?

Thanks to the idea of layering! Now programming network applications are simplified to just making API calls to the interface of transport layer of TCP/IP called sockets, hence called socket programming. In socket programming, you only need to focus on the application layer details, and make API calls to use the services provided by TCP/IP to send/receive messages over the network.

Today, most network applications are written using client-server paradigm consisting of a client communicating with a server. Hence, you are going to write a client program and a server program for your socket programming.

In this assignment, you will use Python for your socket programming. If you need help, refer Lecture 8: Interface to Transport Layer – Socket APIs for Programming Network Applications.

Request for Comments (RFC)

Before commencing socket programming, you'll need to know the detailed specification of the communication protocol to be used in your network application, known as application-layer protocol. Unless you are designing a new proprietary protocol for your application, you'll most likely need to refer to existing standard protocols published in the RFCs by the Internet Engineering Task Force (IETF).

All RFCs can be found at https://www.ietf.org/rfc.html. An example is the series of RFCs 7230-7235 for Hypertext Transfer Protocol (HTTP) implemented by web browsers and servers. Browse through these RFCs to have a feel. Overwhelmed?

Don't worry, as this is likely to be your first socket programming, you are going to implement one of the simplest application-layer protocols ever published, the RFC 862 Echo Protocol available at https://tools.ietf.org/html/rfc862 .

Programming Web Proxy Server

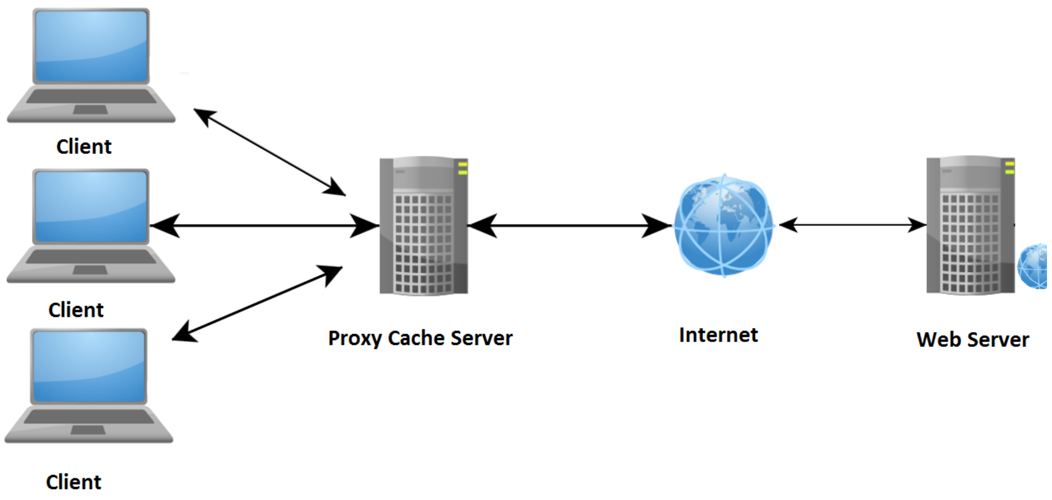
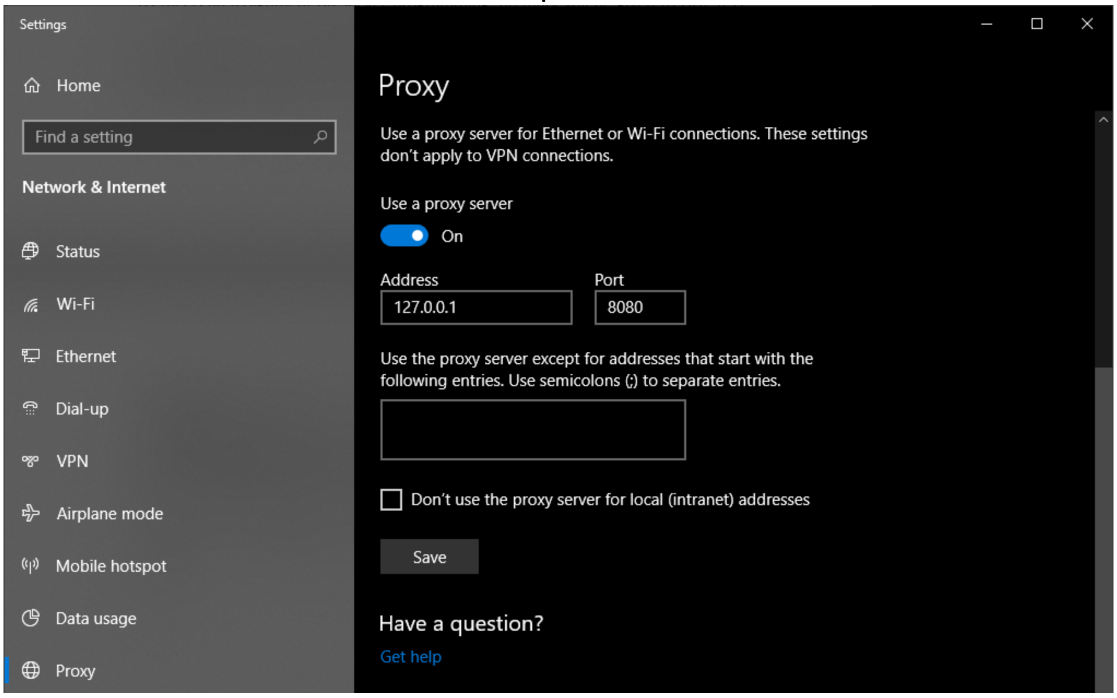


Figure 1. Web proxy for Internet connection

Follow the protocol specification in RFC 862, write a TCP-based **HTTP** proxy server.

Correspondingly, write a connection-oriented multi-threaded TCP-based **HTTP** proxy server, which will simply receive and forward the HTTP request to the web server. Figure 2 and Figure 3 shows how you can configure the web proxy for Internt conncetions. If your proxy server works, you should be able to access the website like www.time.com as shown in Figure 4.



Proxy

Use a proxy server for Ethernet or Wi-Fi connections. These settings don't apply to VPN connections.

Use a proxy server: On

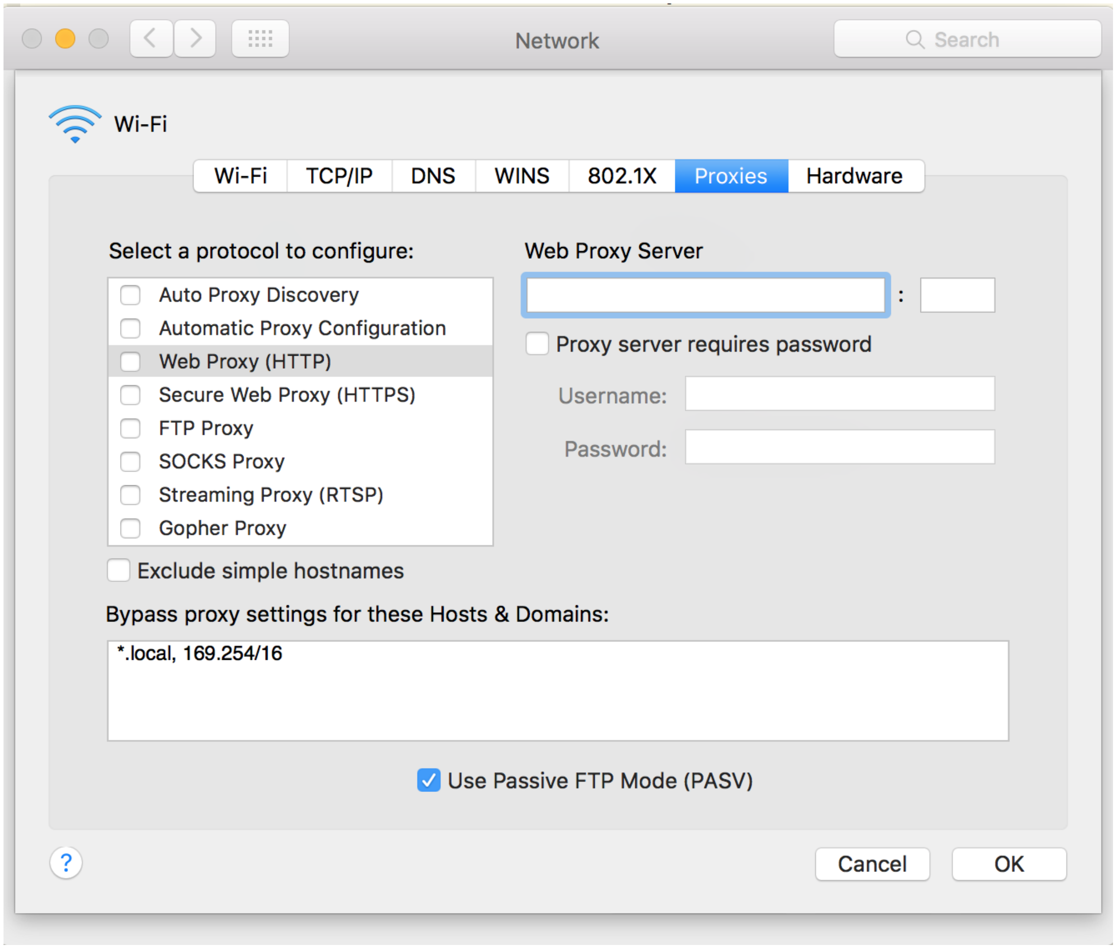
Address: 127.0.0.1

Port: 8080

Use the proxy server except for addresses that start with the following entries. Use semicolons (;) to separate entries.

☐ Don't use the proxy server for local (intranet) addresses

Figure 2. Proxy configuration of Windows 10



Select a protocol to configure:

☐ Auto Proxy Discovery
☐ Automatic Proxy Configuration
☐ Web Proxy (HTTP)
☐ Secure Web Proxy (HTTPS)
☐ FTP Proxy
☐ SOCKS Proxy
☐ Streaming Proxy (RTSP)
☐ Gopher Proxy

Web Proxy Server

☐ Proxy server requires password

Username:

Password:

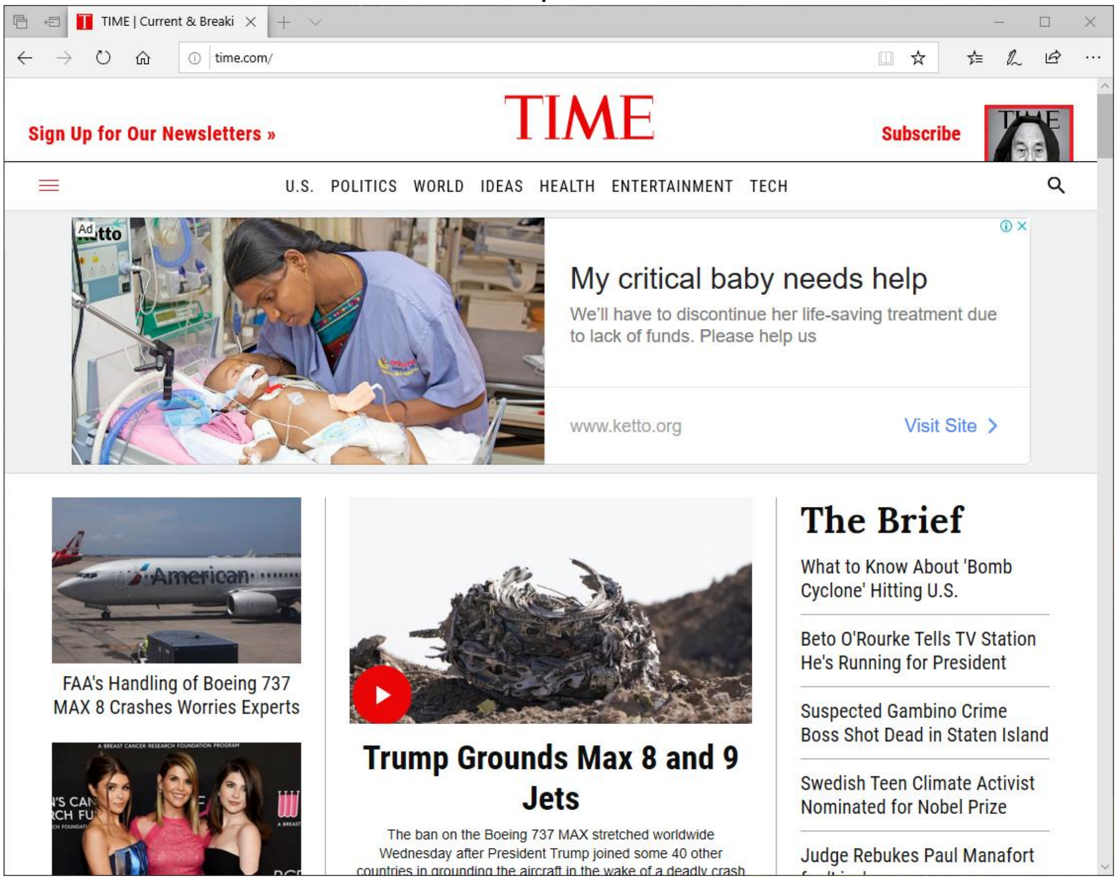
☐ Exclude simple hostnames

Bypass proxy settings for these Hosts & Domains:

*.local, 169.254/16

☑ Use Passive FTP Mode (PASV)

Figure 3. Proxy configuration of MacOS



My critical baby needs help

We'll have to discontinue her life-saving treatment due to lack of funds. Please help us

FAA's Handling of Boeing 737 MAX 8 Crashes Worries Experts

Trump Grounds Max 8 and 9 Jets

The ban on the Boeing 737 MAX stretched worldwide Wednesday after President Trump joined some 40 other countries in grounding the aircraft in the wake of a deadly crash

The Brief

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Figure 4. Access www.time.com after setting the proxy.

As this is an assignment on socket programming, no mark will be given to GUI. It is sufficient that your programs are run directly from the command prompt.

Note: Your proxy server must allow users to specify the listening port without the need to edit or recompile your program, i.e. do NOT 'hardcode' port.

Testing and Submission

Test your proxy program to ensure that the web browser can access to internet using your proxy. In addition, test your proxy program developed by your friends and vice versa to ensure that you've implemented them correctly.

Once you have completed, submit the source codes of your proxy program via the ICT1010 dropbox at LMS by due date.

Enjoy!