Comp 8005 Computer Systems Technology March 2022

Network and Security Applications Development

Final Project

Due: April 5, 1200 hrs.

Objective:

- To design and develop a network application that uses advanced TCP/IP programming techniques.
- To design and implement a minimum-functionality "Port Forwarder" using any language of your choice.
- A maximum-functionality port forwarder could include a proxy server, caching, etc.

Description:

Port forwarding is a mechanism that facilitates the forwarding of network traffic (connections) from one machine to another. The most common use of this technique is to allow an access to an externally available service (such as a web server), which is running on a server in a private LAN. In this way, remote client systems are able to connect to servers offering specific services within a private LAN, depending on the port that is used to connect to the service. There will three separate machines as part of this project.

Your Mission:

Design and implement a port forwarding server that will forward incoming connection requests to specific ports/services from any IP address, to any user-specified IP address and port. For example, an inbound connection from 192.168.1.5 to port 80 may be forwarded to 192.168.1.25: port 80, or to 192.168.1.25: port 8005.

Constraints

- Your forwarder must provide the following **minimum** functionality:
    - The port forward will implement both IPv4 and IPv6 functionality.
    - Forward any **IP: port** pair to any other user-specified **IP: port** pair.
    - The application must support multiple inbound connection requests, as well as simultaneous two-way traffic.
    - Only TCP connections will be forwarded by the basic implementation.
    - The TCP connections will be secured using **TSL**.
    - You are required to provide a detailed set of test cases that will document the complete functionality of the port forwarding application. For example, beyond the basic functionality tests you may want to test and see how well your application performs under a heavy load, i.e., heavy throughput from multiple clients.
    - Your application will read the IP: port combinations to forward to from a separate configuration file.
    - As always additional work and features will be considered for **bonus marks**.

To Be Submitted Electronically:

- As part of your submission, also submit a demo video of your application (see below).
- A brief user manual that will allow a user to understand and use your application.
- A detailed test plan and document showing the results of all your test cases.
- Ensure that you clearly explain testing procedures for your programs and provide test programs if necessary.
- Submit a **zip** file containing all the code, videos, raw data, and documents as described, in the folder for this course under "**Final Project**".
- Hand in complete and well-documented design work and documents in **PDF** format.
- Also, provide all your **source code** and an **executable.**
- The zip package **must** follow the following directory structure:

    - **Documents**: Design work and documents as describe above in PDF format.
    - **Source**: All of the source code
    - **Videos**: All of the demo videos
    - **Raw Data:** All the data collected during your experiments (log files, etc.).

- Label your zipped package as follows: **FirstName_LastName-StudentID.zip**.

Demo Requirements:

- On the due date, we will go through a live demo with you sharing your desktop with me so I can observe the test.
- The demo videos **must** cover each one of your test cases. In other words, it will be similar to an actual lab demo except you will be preparing a video of each test as opposed to me standing beside you observing each test.
- You can have a separate video for each test case.
- Your video must clearly demonstrate each forwarded connection clearly and unambiguously. The video must also display the response times for each test.

Final Project Evaluation

(1). Design Work:	/ 10
(2). Testing procedures and documentation:	/ 15
(3). Testing & Confirmatory data:	/ 15
(4). Functionality as per Specs:	/ 60
Total:	/ 100