11/07/2023

Introduction

- Purpose of the Assignment: The purpose of this assignment is to augment a raw socket implementation of ICMP pings to improve accuracy and create a legible trace route.
- Scope of the Assignment:
 - 1. Compare and validate received ICMP reply packets with originals, and test the validity of them.
 - 2. Show the user if the response is valid and report if there is an error.
 - 3. Calculate and report the minimum, maximum, and average RTT, as well as the packet loss rate in percentage.
 - 4. Display corresponding error codes in human readable format.
- o Technical Background:
 - 1. Used comparison logic to update __validatelcmpReplyPacketWithOriginalPingData(). If they match then show the user that the validation is successful or if it failed.
 - 2. Update the printResultToConsole() function to check if the echo response is valid and report the details to the user.
 - 3. Update the sendPing() function to calculate, and report min, max and average RTT, and packet loss and report it to the user.
 - 4. Implement the traceroute() function to perform the trace routes, utilizing the logic updated in __sendlcmpTraceRoute() function.
- Development Environment:
 - 1. Python3
 - 2. Written in python
 - 3. IDE's used to create: VS Code, GitHub CodeSpace, PowerShell
 - 4. If using linux or github, the user may need to use the sudo command to enter admin level program
 - Otherwise, open the command line as admin (on Windows)
 - 5. User may need to update firewall rules and exceptions to allow for ICMPv4 and ICMPv6 connections.
- Expected Results:
 - The expected result are the pings along with the necessary information to include min, max and avg RTT, packets lost aand the trace route itself.
 - 2. My results show the initial ping(s), timeouts and the RTT information needed once the keyboard interrupt is triggered.

Instructions

- Note: These are python3 instructions
 - 1. Save the lcmpHelperLibrary.py document locally
 - 2. Adjust your systems firewall setting to handle ICMP tracing (this step differs amongst different systems)

- 3. Open a terminal or command prompt (with administrative privileges)
- 4. In the terminal, map to the location of the saved lcmpHelperLibrary.py file
- 5. Open the file and uncomment the line of code in the __main__ that you want to run the ping trace test for
 - Just one of them can be uncommented at a time
- 6. In the terminal, run the program "python3 lcmpHelperLibrary"
- 7. Review the output in the terminal response window.
- Alternate instructions, if you do not want to adjust your system's firewall:
 - 1. Save and open the file locally
 - 2. Copy the file or the contents into a github codespace
 - 3. Ensure it is copied over correctly and it is aware you are running a in python
 - 4. In the terminal provided in the browser, enter "sudo python3 lcmpHelperLibrary.py"
 - This should running it in the window using "admin" privileges.
 - 5. Review the output in the response window.
- Include screenshots of running your trace route code for four different hosts with at least two on different continents.
 - Screenshot of running locally

```
DS C:\Users\khrys\bnochrive\School\CS 372> python3 IcmpHelperLibrary.py

Pinignig (209.233.126.254) 209.233.126.254

Pinignig (209.233.126.254) 209.233.126.254

Pinignig (209.233.126.254) 209.233.126.254

Validation failed for Identifier: (False, 25020), Received Identifier=1096

Error: Expected Identifier=(False, 25020), Received Identifier=1096

Error: Expected Identifier=(False, 25020), Received Identifier=1096

Error: Expected Identifier=(False, 25020), Received Identifier=10961

Error: Expected Identifier=(False, 25020)

Error: Expected Sequence Mumber=1, Received Identifier=10961

Error: Expected Sequence Mumber=1, Received Identifier=10961

Error: Expected Identifier=(False, 25020)

A invalid argument was supplied

Error: Expected Identifier=(False, 25020)

Error: Expected Identifi
```

Screenshot of the program running normally

```
DS C. (Ukers\Mchry\OnoPrivo\School\C5 372> python3 IcmpHelperLibrary.py
Pinping (gaia.cs. umass.edu)
Pi
```

Screenshots showing 2 different continents

```
Administrator: PowerShell
PS C:\Users\Khrys\OneDrive\School\CS 372> python3 IcmpHelperLibrary.py
Pinging (www.govt.nz) 45.60.17.134

TTL=1 RTT=1 ms Type=11 Code=0 :

ICMP Error: Time to live exceeded in transit
                                                             192.168.1.1
Error receiving ICMP echo reply: [WinError 10022] An invalid argument was supplied
Pinging (www.govt.nz) 45.60.17.134
TTL=2 RTT=46 ms Type=11 Code=0
ICMP Error: Time to live exceeded in transit
                                                              66.174.27.193
Error receiving ICMP echo reply: [WinError 10022] An invalid argument was supplied
Pinging (www.govt.nz) 45.60.17.134

TTL=3 RTT=58 ms Type=11 Code=0

ICMP Error: Time to live exceeded in transit
                                                             69.83.157.64
Error receiving ICMP echo reply: [WinError 10022] An invalid argument was supplied
Pinging (www.govt.nz) 45.60.17.134
O Administrator: PowerShell × + v
PS C:\Users\Khrys\OneDrive\School\CS 372> python3 IcmpHelperLibrary.py
Pinging (www.govt.uk) 209.126.123.11
TTL=1 RTT=1 ms Type=11 Code=0 :
ICMP Error: Time to live exceeded in transit
                                                             192.168.1.1
Error receiving ICMP echo reply: [WinError 10022] An invalid argument was supplied
Pinging (www.govt.uk) 209.126.123.11
TTL=2 RTT=29 ms Type=11 Code=0
ICMP Error: Time to live exceeded in transit
                                                             66.174.27.193
Error receiving ICMP echo reply: [WinError 10022] An invalid argument was supplied
Pinging (www.govt.uk) 209.126.123.11
TTL=3 RTT=34 ms Type=11 Code=0
ICMP Error: Time to live exceeded in transit
                                                             69.83.157.64
Error receiving ICMP echo reply: [WinError 10022] An invalid argument was supplied
Pinging (www.govt.uk) 209.126.123.11
Traceback (most recent call last):
File "C:\Users\Khrys\OneDrive\School\CS 372\IcmpHelperLibrary.py", line 616, in <module>
     main()
  main()
File "C:\Users\Khrys\OneDrive\School\CS 372\IcmpHelperLibrary.py", line 612, in main
icmpHelperPing.traceRoute("www.govt.uk")
File "C:\Users\Khrys\OneDrive\School\CS 372\IcmpHelperLibrary.py", line 598, in traceRoute
self.__sendIcmpTraceRoute(targetHost)
File "C:\Users\Khrys\OneDrive\School\CS 372\IcmpHelperLibrary.py", line 507, in __sendIcmpTraceRoute
icmpPacket.sendEchoRequest()
   File "C:\Users\Khrys\OneDrive\School\CS 372\IcmpHelperLibrary.py", line 226, in sendEchoRequest
     whatReady = select.select([mySocket], [], [], timeLeft)
```

I could not get the international ppings to work within my logic

- Include comments / questions (optional)
 - The WinError 10022 was my worst enemy throughout the whole process. I finally got some of the necessary information returned to the user interface.
 - I spent a lot of my time to traversing the updated firewall settigns within windows 11.

0	This was a very fun and challenging project. I hope I close to the intended outcome. My understanding of the trace route logic and innerworkings has definitely been expanded, pushed, and tested.