Programming Assignment 2 : Bufferbloat Analysis

In this individual assignment, you will analyze bufferbloat, a phenomenon that causes high latency and packet delay variation in computer networks due to excessive buffering in network devices. To explore and understand this issue, you will utilize Mininet, a network emulation tool that allows for the creation and simulation of complex network topologies. Through this hands-on approach, you will examine how bufferbloat affects network performance. The goal of this assignment is to deepen your understanding of networking concepts, particularly congestion management and quality of service, while gaining practical experience in network simulation and analysis.

Now, let's walk through what you need to do to **succeed!**

How to download and setup the assignment:

a) Open this link and click on the download button on the top right corner to download the zip file.
b) Now unzip the zip file
c) Now follow the below steps for first setting up the VM

Note: You can also do this assignment in windows & MAC but it is highly recommended that you use a linux (Host OS) machine.

1) Steps for VM setup (you need to setup only once)

Linux Users

a) On your host machine, open the terminal and go to the assignment directory.
b) change permission for the setup.sh file using "sudo chmod +x setup.sh".
c) Execute "./setup.sh"

Windows & MAC Users

a) Download and Instal Virtualbox
b) Download and Install Vagrant (Reboot your system after installation)

2) Steps to run VM

a) On your host machine, open the terminal and go to the assignment directory.
b) Execute "vagrant up".
c) Execute "vagrant ssh".
Note: Username: vagrant, password: vagrant. (if required)

3) Steps to access jupyter notebook

Execute "**`sudo /home/vagrant/.local/bin/jupyter-notebook --allow-root`**"

OR

Execute "**`sudo /usr/local/bin/jupyter-notebook --allow-root`**"

`(above command may vary depending on the linux distribution)`

Now on your host machine, open up your browser and type "`localhost:8888`" in the address bar to access the jupyter notebook.

Note: If for linux users the provided command (accessing the jupyter notebook) does not work then try the windows command.

Steps to stop VM

The following commands will allow you to stop the VM at any point (such as when you are done working on an assignment for the day).

- Execute "`vagrant suspend`" to save the state of the VM and stop it.
- Execute "`vagrant halt`" to gracefully shutdown the VM operating system and power down the VM.

What to do next?

a) Open the folder named "**assignment 2**" in jupyter.
b) Now inside it you will find a file "**Assignment2_Notebook.ipynb**" open this file
c) Now you just go through the code cells and you will see some cells have a ***"#TODO"*** comment so fill in all the TODO and complete the code.
d) At the end there are also some questions so make sure to complete them also.
e) After when you have finished coding and answered the questions then add two more markdown cells in your file
   i) At the top: Write your name and roll number
   ii) At the bottom: Add the Anti plagiarism statement

What to deliver?

Note : Once your code has run successfully, **DO NOT clear any outputs**. The outputs will be an essential component of your evaluation.

a) You just need to deliver the completed jupyter notebook(**.ipynb**) file.
b) Make sure to rename the file in the correct format: **<Roll_Number>_Asg2.ipynb**.

Help & Support

You can reach out to your allocated TA for any help.
Find your allocated TA in this sheet: Programming Assignment 2 TA Allocation

References

- Introduction-to-mininet
- Mininet-Intro
- https://medium.com/@korhanherguner/mininet-797208ac30a1
- https://www.codecademy.com/article/how-to-use-jupyter-notebooks
- https://netbeez.net/blog/what-is-bufferbloat/

ANTI-PLAGIARISM Statement

I certify that this assignment/report is the result of my own independent work, based on my personal study and research. All sources, including books, articles, software, datasets, reports, and communications, have been properly acknowledged. This work has not been previously submitted for assessment in any other course unless specific permission was granted by the respective instructors.

I also acknowledge the use of AI tools, such as LLMs (e.g., ChatGPT), for assistance in refining this assignment, if used. I have ensured that their usage complies with the academic integrity policies of this course.

I pledge to uphold the principles of honesty, integrity, and responsibility at CSE@IITH, and understand my duty to report any violations of academic integrity by others if I become aware of them.

Name: <Your Name>
Roll No: <Your Roll Number>
Date: <Date>
Signature: <Your Initials>