Computer Networks Theory + Lab

Summary

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Lab04: Ethernet and WiFi Exploration

Objective: Get acquainted with commands and wireshark traces that give insight into the concept of Framing, Ethernet and WiFi technology. Warmup to ns3 simulator which will be used for simulating WiFi topologies

Reference Material:

1. Overview and Framing: https://mayur.bodhi.cse.iitb.ac.in/concept/578/
2. Ethernet Technology: https://mayur.bodhi.cse.iitb.ac.in/concept/585/
3. WiFi Technology: https://mayur.bodhi.cse.iitb.ac.in/concept/587/
4. Ethtool: https://www.linuxjournal.com/content/fun-ethtool
5. iw: https://wireless.wiki.kernel.org/en/users/documentation/iw
6. Capturing WiFi packets: https://wiki.wireshark.org/CaptureSetup/WLAN
7. ns3 Installation : https://docs.google.com/document/d/1cov90Ygg7xU24d-9rR766JrscwThvkdPVmB9l7CxbqQ/edit?usp=sharing

Requirements:

1. Linux Command Terminal
2. Wireshark

Lab instructions:

Part-1: Ethernet and WiFi Command Line Tools

1. Watch the video “Digging Deeper into the Link Layer” first
2. Download the files associated with this lab by right clicking the “View Documents” button at the bottom.
3. Play around will all the tools you learnt:
    i. Ethtool: This explores your Ethernet interface. Hence, may not typically work with laptops but will work with desktops. If not installed by default, you can install it via “sudo apt-get install ethtool” (inside docker, wsl or linux terminal). In case you are not able to explore it on your own, look at files ethtool-properties (ethtool eno1), ethtool-driver (ethtool -i eno1) and ethtool-statistics (ethtool -S eno1) as provided.
    ii. iw: Requires a WiFi interface. Hence may not work on desktops. Will typically work on “Linux” laptops. If not installed by default, you can install it via “sudo apt-get install iw” (wsl or linux terminal). In case you are not able to explore it on your own, look at files iw-link (iw dev wlp1s0 link) and iw-scan (iw dev wlp1s0 scan) as provided.
    iii. WiFi Trace: This is difficult to generate on your own, even if you have a linux laptop. Hence explore the trace file “wifi-wireshark-join-nokia”.

Now attempt the quiz titled “Lab04-Ethernet-wifi”.

Part-2: NS3 Simulator

In this exercise, we will just execute a simple script called wifi-simple-infra. It will generate some pcap files. Go through the pcap files and answer the SAFE quiz. This is a simple warm-up to more ns3 exercises in the upcoming lab that will explore WiFi protocols in more detail.

Enter the directory: ns-allinone-3.30.1/ns-3.30.1

Run your first ns3 script: ./waf - -run wifi-simple-infra

(You do not need to learn how to write ns3 scripts. It however doesn’t hurt to go through them to understand how they look. As far as the labs are concerned, we will view them as black-boxes which will produce relevant pcap files when configured accordingly. We will analyze protocol behavior based on these output files.)

Now attempt the quiz titled “Lab04-NS3”.

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