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FOUR WEEK REPORT

Simulating and Enhancing Network Protocols in NS-3

Abstract

Protocols play a major role in determining how entities can communicate across computer networks. Network analysis is important to monitor the data transfer, identify traffic patterns and weaknesses in the network infrastructure to ensure Quality of Service (QoS). All these activities can be monitored with the help of a network simulator like NS-3. The main goal here is to use NS-3 to assess the performance of existing protocols, identify bottlenecks and make informed decisions about protocols' improvements.

Nature of Work carried out

NS-3 is an open-source, discrete-event network simulator specifically designed for internet systems being a popular choice for researchers and educators due to its ease of use, speed and accuracy compared to other simulators. While the core simulation scripts are written in C++, NS-3 provides Python scripting support as well.

Having understood the basics, I've reviewed multiple research papers and have implemented different protocols from application layer, transport layer and network layer. Below is the breakdown of my work during these four weeks,

- NS-3 emulation modes, packet tags, smart pointers, Data collection framework, general components like nodes, application, helper API, protocol stack, net devices, channels and the steps for a simulation script.
- Implemented the client and server model of the HTTP application, studied the TCP models in NS-3 and implemented its working by simulating a TCP transfer over a network between two nodes.
- Implemented the Point-to-Point network in NS-3 along with wired and wireless networks.
- Implemented the MANET routing program to draw a comparison between four protocols namely AODV, OLSR, DRDV, DSR.
- Simulated a network with IPV6 routing and sent ping requests between two nodes.
- Used statistics modules in NS-3 such as Flow Monitor to collect flow level statistics, trace sources to collect information about specific events that occur during simulation, packet captures (PCAP) that can be read and analyzed using

tools like wireshark or tcpdump and ASCII traces for debugging and generating custom reports.

- Visualized the obtained output using NetAnim which animates packets over wired and wireless-links based on trace files. Alternatively, PyViz can be used.

References

1. Rudra, A. R., Somayaji, S. L., Singh, S., Mokashi, S. D., Rakshit, A., Khan, D., & Tahiliani, M. P. (2023, June). Linux-like Socket Statistics Utility for ns-3. In *Proceedings of the 2023 Workshop on ns-3* (pp. 121-126).
2. https://www.nsnam.org/