Department of Computer Science, Electrical and Space Engineering

Luleå University of Technology

D7030E Advanced wireless networks

LAB 0 (Introduction to NS-3)

1. Introduction

Network simulator ns-3 which supports wireless simulations will be used to perform most of the practical assignments in the course. You will not need to modify the simulator (i.e. write the C++ code), which would be required to implement new protocols for instance. You will, however, define your own simulation scenarios, run simulations, analyze the results, and write up your findings in a brief report. The simulator is freely available and mainly runs on Linux.

2. Ns-3 introduction

Ns-3 is a discrete event simulator, which is used in the research community to model the behavior of network protocols in different environments, such as wired and wireless networks. It is an open-source software and is widely used for both educational and research purposes. One of the main advantages of using a network simulation environment such as ns-3 is the ability to test protocol behaviors in situations where a real-life experiment is difficult or impossible to carry out. Ns-3 is written in C++ and consists of a set of network simulation models implemented as C++ objects and wrapped through Python. Simulation scenarios can be written on C++ or Python. When additional functionalities are needed that are not available with standard ns-3 objects, a user can write custom C++ code to implement new objects to be integrated in ns-3 library. Lab assignments for this course will use the standard ns-3 objects, so you are not required to modify the C++ code.

3. How to use ns-3 for labs

In order to use the ns-3 simulator for the course's purposes, you have two choices: either using the computers in the labs or installing ns-3 on your own

PC. To use ns-3 in the computer lab, login with your LTU login name. For this course we booked the class with Windows-machines. In order to access the network simulator do the following.

- Log in into a Windows machine with your credentials;
- Find ThinLincClient application, run it, and login to the Linux-server using again your credentials;
- Now you are inside the Linux environment (choose your favor GUI) ;
- NS-3 is located in /opt/ns3;
- The simulator is launched from a Terminal window.

In case you wish to run ns-3 on your own PC, instructions on how to compile and install the simulator on different platforms are available at http://www.nsnam.org/. For assistance, you may contact Denis Kleyko at L102. Schedule for when Denis is available for questions will be communicated at LAB sessions.

4. Getting started with NS3

To become familiar with the ns-3 simulation environment, you need to learn how it works. A good source of information is ns-3 tutorial, which is available at https://www.nsnam.org/docs/release/3.23/tutorial/ns-3-tutorial.pdf. You are required to read sections 3 to 6 and 8 of the tutorial and run the example scripts. This will allow you to learn how to prepare the basic script structure, how to set up a topology, set simulation parameters, and other useful features.

5. First report (25 points)

To pass this introduction assignments you need to submit a report. The report must to be well structured and well written. Remember: submit only ONE pdf file. All other forms of reports will be discarded. The **deadline** for this assignment is **Friday, September 11th. In the report give answers to the following questions:**

1. What are alternatives for installing NS3 under different operating systems?
2. Write a step-by-step instruction for creating a simulation scenario, i.e. first we create ….
3. If you would need to simulate a protocol which is not inside the NS3 library, what would you need to do?
4. For compiling an ns-3 executable a special build system is used. What is this system?
5. Describe the purpose of different folders of the ns3 distribution.
6. Which folder should contain your simulation scripts?

7. Write a step-by step instruction for executing an ns-3 simulation.
8. In how many formats does ns-3 saves the results of a simulation? Name them. What is the major difference?
9. Which format will be used by ns-3 by default?
10. When you run your simulation in which folder you will find the simulation traces.

Congrats, you have just become familiar with one of the most advanced network simulation facilities!