1. Study about the educational possibilities of the OPNET IT Academic Edition

Abstract

In this paper we propose a study based on OPNET IT Academic Edition 9.1. Furthermore, a comparison with Opnet Modeler 10 will be established. Also a lab with new scenarios to initiate students into the use of the simulator will be created. The goal of this project is to develop a complete lab for Networking students of Telecommunications Engineering. This lab aims to introduce students who have never used OPNET on this complete network simulation tool, but the main purpose is to help the students to understand the theory through practice cases. This project will start from the basis that students who are using the documentation included have never used this tool before, neither other similar tools available in the market.

Introduction

The design and configuration of new communication networks is becoming more and more complicated due to the increasing offer of new products to renew and increase networks. Hence, for these reasons, it is necessary to use such a simulation tool with the characteristics of Opnet.

By simulating changes such as technology migration, traffic growth and failures, OPNET users can fix existing performance problems and solve new problems before they occur. OPNET provides a virtual network environment where it is possible to analyze and optimize network applications, configurations, and traffic flow in a nearly limitless range of "what if" scenarios. To accomplish the goals of this project, comprehensive, real time views of the network will be generated.

Objectives

The main goal of this project is to evaluate OPNET IT Academic Edition 9.1 possibilities and compare it with Opnet Modeler 10. Several scenarios there will be configured in both versions in order to analyze the differences and design a trial test for telecommunications students to assure their communications knowledge (a basic knowledge of networks behavior) and initiate them into the use of the simulator.

Overview

The project will include a small guide to show the basic use of the simulator and help users on the product installation.

In the theoretical part the following subjects will be revised: VLANs, routing, routing tables, default gateway, static routes, subnetting, routing protocols (RIP, OSPF, differences between them...) and WLAN.

Practical section

Some scenarios will be evaluated to show students how some node attributes changes affect simulation results. Scenarios will also show the devices working in the same way as explained in the theoretical section.
Contains of the lab

The lab will cover the following chapters:

**An introduction to some important networking topics:**

VLANS, Routing, Routing Tables, Default Gateways, Static routing, Subnetting and Routing protocols (RIP, OSPF...). The purpose of this first chapter is far from explaining all these concepts deeply, but to have a quick start guide to networking, assuming that students have studied these topics deeper before. Furthermore, the main goal is that the student achieves a better understanding of the theory through OPNET. (For instance, creating scenarios to face OSPF vs. RIP and understanding the differences between classful and classless routing protocols).

**An introduction to network security**

This project will focus on ACL’s, Packet Screeners, Proxies, Security Schemes and NAT.

**Labs**

This part will be similar to the 7 Lab Files available at the OPNET website, but the studied topics will be explained before. It is expected to develop pedagogic scenarios, where the student will change the node attributes and thus learn to work in a what-if basis.

**This Lab will guide users to:**

- Modify the attributes of a node
- Configure servers and workstations (IP, subnet mask, Default Gateway, Profiles...)
- Configure routers and router’s interfaces
- Quick guide to generate traffic
- How to use the ping tool

The scenarios of the labs will be implemented using IT-Guru Academic Edition 9.1 and OPNET Modeler 10. The differences between the two products will be explained to students (e.g. differences while configuring the attributes).

**Advanced scenarios**

At last, some Advanced Scenarios will be proposed to the student (just following the same idea of the official Lab Files). To complete these scenarios, for instance, the student will be told to capture the log files and the graphic results. As an interesting exercise, the student could to analyze routing tables to trace the nodes where pings go through.

All the scenarios will have templates where the results of the last simulation will be loaded on. This will let the student compare averaged graphics among different scenarios.

Some of these scenarios will be intentionally wrong designed, to force students to “debug” the simulation analyzing the log files. These design errors can be erroneous static routes, wrong configured default gateways, non-activated services on servers and so on.
Avoiding fraud

An important issue to be accomplished is to develop a way to ensure that students do not copy the exercises from other students. For example, the seed for each student can be modified, using their student identifier (which is unique for each and every of them). Thus, all the results will be different for every student. Another way to avoid fraud is to modify the start time of the application of the profiles by using a distribution which is different for each and every student identifier.