

Bachelor-Thesis

Development of a Virtual IP Overlay Network for experimental Investigations of Routing-Protocols for Teaching Purposes

Abstract

The current Communications Network Lab ist structured into several blocks related to basic selected topics of the corresponding communications networks lecture. The aim of this thesis is to develop an new block, where students get a deeper inside of the Internet, especially of dynamic routing algorithms and protocols like "Routing Information Protocol (RIP)", "Border Gateway Protocol (BGP)"- or "Open Shortest Path First (OSPF)"-protocol.

For this objective a virtual network of nodes should be created. Each node consists of Linux operating systems. In the nodes the routing protocols will operate. The nodes will be connected with each other either by real connections or by emulated ones. In this network, students learn to configure the nodes and will experience the behavior of the routing protocol in normal operation but also in the case of link or node failures. In addition, scenarios of special conditions like network loops should be analyzed. Optionally new Internet architectures as proposed by the "Tor Project", guaranteeing security and privacy, should be investigated with regard to routing functionality and should be integrated into the virtual network.

Due to the fact, that this bachelor thesis will be used for teaching purposes, the work will be monitored by the business and employment studies faculty. This will ensure, that basis didactical approaches and concepts and are taken into consideration. This includes project-oriented methods for problem-solving learning and approaches for carrier training learning.

Content

To reach this aim the following task should be done:

- literature study of existing virtualization solutions and selection of tools for virtualization,
- literature research of routing protocols,
- definition of experiments and their learning effect,
- selection of the required network topology with respect to network size (number of nodes),
- network development and setup including possible measurements,
- testing with student volunteers and documenting their time requirements and outcome (did they catch the expected learning effect by means of report writing).
- Following documents should be written:
 - thesis documentation and
 - writing a student script (in HTML5) including animations if necessary and
 - describing sample solutions.

Requirements

- It would be preferable, that the Communications Network Lab has been attended.
- Fundamental knowledge in the programming language C or C++.
- Basic knowledge of the Linux operating system.
- Pleasure in teaching.