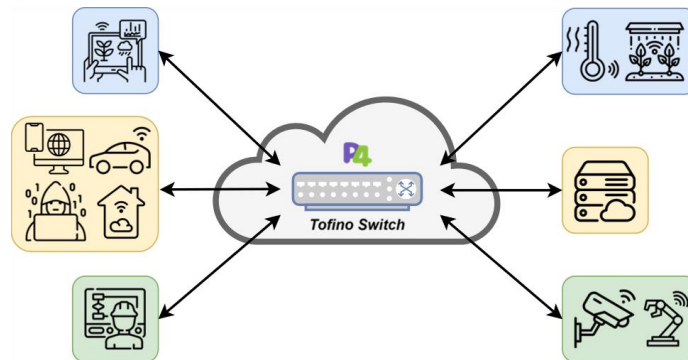




Task Description for Student/Diploma/Master Thesis

Topic: Enhancing Traffic Classification with Programmable Data Plane Switches



Task description:

Machine learning has become an essential tool for solving networking challenges, such as traffic classification, anomaly detection, and network configuration. By leveraging machine learning algorithms, networks can dynamically manage data traffic and optimize overall performance. Recently, in-network machine learning solutions have emerged, driven by the evolution of network devices that are both high-performance and programmable. Technologies like Switch-ASICs, network interface cards (NICs), and FPGA-based network devices now utilize P4, a domain-specific language that enables the definition and customization of network protocols and processing functions directly within the data plane. This level of programmability opens new possibilities for offloading traffic classification tasks to network hardware. In this project, students will identify an appropriate machine learning algorithm suited for network communication scenarios and deploy it on a Switch-ASIC (Tofino Switch) testbed. The goal is to enable real-time detection and classification of network traffic conditions directly within the switch hardware.

Tasks:

- Conduct a comprehensive review of traffic classification techniques.
- Explore Decision Trees (DT) and Random Forests (RF) models.
- Implement the selected DT and RF classification models on the Tofino switch using P4.
- Develop an effective evaluation method and metrics.
- Evaluation of the implemented model's performance with metrics.
- Complete thesis writing and presentation.

Requirements:

- Familiarity with Linux
- Programming skills in C and Python

Language: English

Our offer that helps students focus on their work: Testbed, Example source code with P4

Keywords: Programmable Data Plane, SDN, Traffic Classification

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