

2018 Research Interest/Project Ideas

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AUTOP4: Auto Generating Network Functions and Services Using P4

Many large corporations have adopted Software Defined Networking (SDN) as the paradigm used to manage their network infrastructure. Traditional SDN uses protocols such as OpenFlow to configure switches. The cutting edge has moved on from the earlier match-action paradigm to use Programmable Data Planes (PDPs) that allow network operators to deploy new protocols quickly and to simplify the infrastructure by dropping unused protocols and features. PDPs move expensive middlebox functions into the network and allows network administrators to monitor their networks using Inband Network Telemetry (INT). To support the PDP approach, a set of network programming languages (such as P4) have been designed, implemented, and are starting to be deployed. Unlike OpenFlow, which assumes that a network switch has fixed and well known behavior, P4 allows a network manager to define and switch behavior. Although it provides powerful functionality, P4 does not make specifying the functionality easy -- because a programmer must deal with low-level switch control functions, writing P4 programs is time consuming, and the resulting software is error prone.

The AUTOP4 project seeks to automate the generation of P4 programs. We will implement a framework that can orchestrate the automatic generation of a set of related P4 programs from a set of high-level network policies.

The project has the following goals:

- * Provide network-wide services and high-level APIs that automate programming of network devices and orchestrate P4 programs under a unified framework.
- * Generate P4 programs in much less time and with fewer compilation and runtime errors than conventional programming.
- * Allow managers to specify policies in a high-level language without resorting to a specification of switch details (e.g., send all incoming email through a virus scanner before delivering it to the email server).
- * Eliminate repetitive coding of well-known components found in P4 programs, such IP header parsing and traffic classification.

The results of our project will be directly applicable to most corporate networks.
