

Hybrid P4 Switch

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Abstract

P4 language introduces a much needed Domain Specific Language (DSL) for programmable packet forwarding. It exposes the inner workings of programmable switches to network designers and allows them to alter data plane behavior using programmable parsers and match+action tables.

Despite the popularity of P4 language, a small number of P4 targets - in the form of stand-alone P4 switches - are available for network designers to use. Namely, PISA and PISCES stand out as the most prominent options, designed to meet particular objectives. The former is an application-specific 100G-capable switch more suited for core networks, while the latter is a software switch intended to be used in hypervisors. As a result, network operators do not have a wide range of options as P4 targets, especially at networks' edge where most NFV applications are implemented, and there is a high demand for P4 applications.

In this talk, we propose a hybrid hardware/software approach to transform commodity X86 servers into Modular, Programmable, and Protocol-independent Switches (MoPPetS) that can serve as a new family of P4 targets geared towards edge networks. In particular, we use P4-compatible Network Interface Cards (NICs), the PCI Express Interface, and an X86 processor to virtualize the functions of line cards, switch fabric, and fabric controller of the switch, respectively. An NFV application is created to turn PCI Express Interface into a non-blocking switch fabric that can perform hundreds of billions of transfers between line cards per second and thus achieving a throughput of hundreds of Gigabits per second. We show that a 40-port 10G P4-compatible switch can be built on a single-socket X86 server.

Compared to existing P4 targets, MoPPetS offers modularity in hardware and software as well as a higher degree of programmability by supporting a superset of P4 language, at a very low cost.

About The Speaker



Ashkan Aghdai is a PhD candidate in Electrical Engineering at NYU Tandon School of Engineering. His research interests include Network Function Virtualization (NFV), Software-Defined Networking (SDN), and data center networking.

Ashkan received his B.Sc. in Electrical Engineering from Sharif University of Technology in Tehran, Iran in June 2012 and started working in NYU Tandon's High Speed Networking Lab under supervision of Professors H. Jonathan Chao and Yang Xu in September 2012.