Towards Programmable Data Planes

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Abstract

A core problem in networking is how to define the way packets are processed through the different elements of the network. To attain an efficient processing, scientists suggested many improvements in the existing systems and each one aims to solve some limitations in the previous ones. An important direction was the decoupling of the control plane and the data plane in the forwarding elements; and this raises the need to a new architecture that ensure the functioning of the hardware under a controller implemented in software. This was implemented in Software-Defined-Networks (SDN) architecture. SDN also centralize the network management by allowing the programmability of the control plane and by using different protocols mainly: OpenFlow and ForCES (Forwarding and Control Element Separation). However, in these protocols the data plane is rigid and few protocols are only supported. To gain more flexibility and make the network independent from the different protocols Programmable Data Planes have recently been initiated. Such data planes enhance the processing and involve the content of packets in the decision of packet processing operation. This will be more general than current approaches. In this presentation, we will survey the work done, considering the previous solutions like Protocol Oblivious Forwarding (POF), Programming Protocol-Independent Packet Processors (P4), OpenFlow-Protocol Independent (OF-PI), Protocol Independent Forwarding (PIF) by analyzing their benefits and limitations of one over another. Generally, these initiatives use high-level Domain Specific Languages (DSL) and special compilers are required to generate hardware dependent network programs. This presentation will also discuss how the interconnection between these flexible data planes and the control plane is performed. Understanding and analyzing the existing approaches towards programmable data planes, will help in the proper design of reliable and flexible next generation networks.

Keywords: SDN, Protocol independent programmable data planes, Packet forwarding

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