POSITION PAPER:
Advanced Peering with a Software-Defined Knowledge Plane

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Abstract

This position paper presents our research vision on advanced peering scenarios between Software Defined Networking (SDN) domains by means of a so-called Knowledge Plane. Ongoing research efforts are devoted to the investigation of SDN-SDN communication options that allow SDN networks in different administrative domains to achieve advanced peering agreements beyond pure packet routing, for instance by integrating best placement of content and applications. Among the identified use cases, we are working on enabling distributed NFV (Network Functions Virtualization) offerings where SDN peering mechanisms allow resource trading (computation, storage, network) between different domains to support optimized VNF Infrastructures-as-a-Service models.

1 VISION

Our research project seeks to research, design and experimentally validate a Knowledge Plane approach, inspired by the seminal work by Clark *et al* [1], to Software Defined Networking (SDN) [2] to provide advanced peering capabilities between SDN controlled domains beyond pure packet routing (see Fig.1). The resulting architecture will be exercised in the context of Internet Exchange Points (IXP) scenarios where participants implement SDN technologies inside their domains and wish to collaborate beyond the peering capabilities of the traditional BGP routing protocol [3]. One target scenario we envision is to extend peering by integrating best placement of content, applications, and virtualized network processing functions (NFV - Network Functions Virtualization).

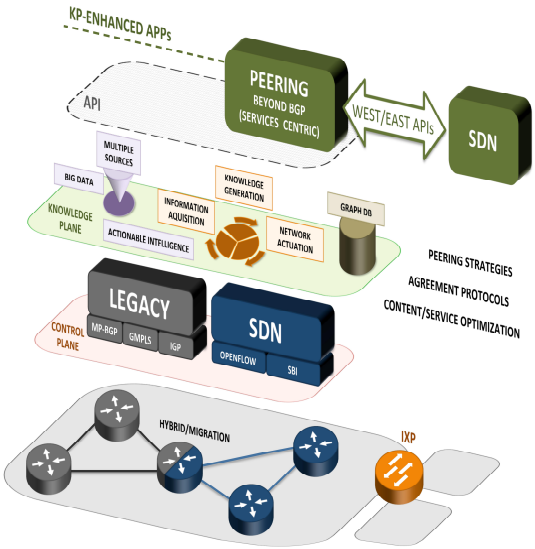

Figure 1: Big picture of SDN architecture with knowledge plain for advanced peering

2 RESEARCH CHALLENGES

There are a number of challenging research issues when aiming at interconnecting SDN islands and trying to conceive and introduce the notion of a (shared) Knowledge Plane. Security, economics and performance are candidate objectives at IXPs worth to explore under the possibilities of SDN and Big Data technologies.

In this context, among the main research questions is how to allow rich peering among SDN domains to differentiate by optimizing content/application placement between and by enabling new peering services to exchange resources beyond best-effort packet routing in a trading-like as a service model. One candidate set of resources to be exchange among SDN domains are the infrastructure capabilities to host virtual network functions (VNF) to effectively deliver VNF-as-a-service across peering domains.

This research scenario unfolds in a number of research questions such as how should SDN networks in different administrative domains communicate with the objective of enabling richer peering beyond plain packet routing? There are a number of open questions towards operating an Internet of SDN networks, including the rethinking of peering policies, the incentives to share “knowledge”, and the underlying mechanisms that allow sharing per-domain abstractions in a usable and trustful way while allowing to keep and do not expose.

A core research challenge itself is the notion and representation of “knowledge” of a SDN domain, including possible embodiments in suitable data structures (e.g. graph-oriented databases) and adequate inter-domain proto cols towards the optimization of content and application placement.

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