Title: On the mitigation and resolution of classic IXPs model problems using SDN and OpenFlow: a first step towards SDX.
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Internet eXchange Points (IXP) are the natural successors of the four Network Access Points (NAP) responsible for interconnecting different networks in the early stages of today's Internet. The benefits achieved regarding performance and security are the main reason for the key role that the IXPs plays in the present Internet ecosystem.

Although the dynamics of operation, criticality, and security aspects of an IXP are well-known and quite often under discussion in the network operator's community, only recently the scientific community began to delve into this subject. Notwithstanding the clear benefits and advances brought by large-scale IXP's deployments seen in a number of countries, the current model poses several problems, in the vast majority derived from its own architecture.

These issues and architectural limitations have been known to affect the control, data and management planes, and might end up affecting at different levels the IXP security, scalability, and resiliency. The occurrence of network events or security incidents can compromise all or part of its operation, creating damages to its image and mission. In these cases, insecurity and instability set up in the routing environment contribute to the increase in distrust among the participants, as well as distancing possible new members.

On the other hand, along with the novel Software-Defined Networking (SDN) paradigm emerged the concept of Software-Defined Internet Exchange (SDX), an internetworking model that could potentially allow the addition of compute, storage and networking capabilities to multiple domains for traffic exchange, providing them more flexibility and possibilities when compared to the traditional IXP model.

Nevertheless, as occurred with the SDN definition in the early stages, the SDX meaning has different connotations for different individuals, and quite often it depends on the background of this observer. There's an ongoing effort in the academic community to understand the SDX concept and benefits, and more recently (Chung, J. et all, 2016) broke up the SDX definitions into three distinct categories, to have a better picture of each problem solved by the usage of SDX: (1) Layer-3 SDX, which exchange BGP updates in Internet exchange points; (2) Layer-2 SDXs which exchange multi-domain Ethernet circuits in R&E networks; and (3) SDN SDXs which interconnect SDN islands.

While this classification of SDX cover a wide range of ideas and use cases, especially for research and education communities, these definitions don't cover the mitigation and resolution of the aforementioned basic issues and limitations of current industrial IXPs.

This presentation is the first report of an ongoing MSc work and the main contribution is to bring a Survey of the technical requirements and weaknesses of public IXPs in Brazil, along with the mitigation and or resolution process of such identified issue/limitation using the SDN/OpenFlow

approach. The employment of such concepts can be the first step in the transformation of an industrial IXP into a lightweight version of SDX.

Despite the focus on Brazil, this study may contribute to better understand the limitations and improvements that can be adopted in other IXPs using similar models, including the ones serving the R&E community.

References:
- Chung, Joaquin, et al. "SDX architectures: A qualitative analysis." SoutheastCon, 2016. IEEE, 2016.
 - Gupta, Arpit, et al. "An industrial-scale software defined internet exchange point." 13th USENIX Symposium on Networked Systems Design and Implementation (NSDI 16). 2016.
- Hermans, Siem, et al. "On the feasibility of converting AMS-IX to an Industrial-Scale Software Defined Internet Exchange Point."