Paper Evaluation, Taking the Edge off with Espresso: Scale, Reliability and Programmability for Global Internet Peering

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1. Paper summary

The paper explains the idea of Espresso that driven from the need to exponentially scale the Internet edge with low cost and to enable application-aware routing. The flexibility, availability and cost efficiency of the peering edge was limited by there Internet-routers. Therefore, Espresso utilizes the benefit of hierarchical architecture of control plane that split between local and global controllers. It implements TE system in the global controller to enable application-aware routing and mitigate DoS attacks. In the local control plane, it runs the combination of a commodity MPLS switch that support forwarding/tunneling rules and ACLs, and BGP speakers, and the management part, Peering Fabric Controller, to apply programming rules and application-specific traffic routing that computed by the global controller.

2. Top 3 contributions

1. It is the first paper to propose Espresso, Google's SDN-based Internet peering edge routing infrastructure, which provides Google a scalable peering edge and serves over 22% of Google's total traffic to the Internet.

2. This paper contributes Espresso with the feature of testability. Testing each feature through fully automated end-to-end testing, it can achieve feature velocity without sacrificing reliability and availability and release frequently while staying within reliability budget.

3. Espresso replaces the concept of a individual routing box with a distributed system so that it can support more complex traffic analysis than the thousands of discrete routers can get due to the Google's large-scale computing facility.

3. Problems

1. There is no analysis of dependencies and failures. The failures of TE system in global plane and the Peering Fabric Controller should be taken into consideration.

2. To redefine the routing and make the router wiser, it needs customized routers or chips. And the rest 80% of percent of the traffic is still running by traditional vendor gear. It takes time and money for Espresso to roll through traditional gear and replace it.

3. To run Espresso on the basic infrastructure, it needs servers that run software to manage these edge routers and the cost of the server is not negligible.