

# Making Middleboxes Someone Else's Problem: Network Processing as a Cloud Service

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## I. PAPER SUMMARY

**T**HIS paper introduces *APLOMB*: Appliance for Outsourcing Middleboxes. It talks about enterprises outsourcing the processing of their traffic to third-party middlebox service providers running in the cloud.

The paper starts with a study of 57 enterprise networks describing the nature of real-world middlebox deployments, issues faced by network administrators, and failure modes revealing that middleboxes do impose significant infrastructure and management overhead across a spectrum of enterprise networks. In proposed solution the enterprise gateway registers itself with the cloud controller which supplies it with a list of cloud tunnel endpoints in each PoP and forwarding rules for redirection. For security reasons, it uses encrypted tunnels and for reducing bandwidth costs it enables protocol-agnostic redundancy elimination. For scalability and fault tolerance, it relies on traditional load balancing techniques. The core components at the cloud PoP include tunnel endpoints to encapsulate/decapsulate traffic from the enterprise (and to encrypt/decrypt and compress/decompress if enabled), Middlebox Instances to process the customers traffic, and NAT Devices to translate between publicly visible IP addresses and the clients internal addresses.

As per shown in the evaluation done by the authors, *APLOMB* succeeded in outsourcing the vast majority of middleboxes without 'significantly' impacting performance, making scalable, affordable middlebox processing accessible to enterprise networks of every size.

## II. SIGNIFICANT CONTRIBUTIONS

- The paper proposes a complete solution for the enterprise owners to get rid of the technical and managerial complexity of managing middleboxes in their network. They can simply specify the required policies and then cloud based middleboxes (mostly) will implement them.
- Survey done by the authors show that most sites in enterprise networks were provisioned 2 to 12 times their typical load! *APLOMB* helps in overcoming

this baggage of over-provisioning of resources for the network owners. Cloud based middleboxes can be provisioned as per the requirement thus allowing pay per use model of resource allocation.

- Unlike many of the other SDN applications, *APLOMB/APLOMB+* is quite scalable. The controller tracks CPU utilization of each middlebox instance and adds additional capacity when existing instances exceed a utilization threshold. Depending on the footprint of the cloud servers, this multi-POP service can scale even for larger networks without adding much to the latency.

## III. UNRESOLVED ISSUES

- As with many cloud services, security is a concern in exporting all the enterprise data to third party servers. *APLOMB* does try to dissiminate the fear by using client data isolation techniques, encryption and tunneling. However companies are often not convinced to route their internal communications and data to external cloud based platforms. Hacking of such databases is *not* a rare phenomenon and thus enterprises tend to not rely on them with their company secrets.
- Cost is another area of concern. The extra headers which need to be put due the tunneling to the cloud increases bandwidth consumption. Also, tunneling rates are almost double as compared to normal routing. Thus, both factors might lead to less economic viability of this solution.
- *APLOMB* does not remove all the hardware middleboxes. Even in the test networks they were able to replace a fraction of the middleboxes, and this fraction varies with complexity of the network. If there are some hardware middleboxes left which cannot be replaced, the enterprise would have to anyway hire expertise for its maintenance. This, in a way might just defeat the entire purpose of the solution.