

Paper summary

Today's large number of network middleboxes provide us improved security, improved performance and reduced bandwidth cost, while come with high infrastructure and management cost, and create new failure modes as well. Given the benefits of cloud computing like reduced expenditure for infrastructure, personnel and management, pay-by-use, the flexibility to try new services without sunk costs, this paper focuses on a design of a practical service for outsourcing middlebox processing to the cloud, which is called APLOMB. Outsourcing eliminates most of the infrastructure at the enterprise and it reduces the complexity in the aspect of upgrading, monitoring, training and configuration. Also, it can avoid overload by enabling on-demand scaling and resolves failure with standby devices. APLOMB adopts DNS+Smart approach to redirect the traffic using multiple cloud PoPs which avoids the latency penalty and provides more control over redirection. For the control part, it uses a cloud controller to act as the control plane to determine optimal redirection strategies, manage and push middlebox policy configurations, and dynamically scale cloud middlebox capacity.

Main contributions

- (1) This paper presents a study of costs and concerns in 57 real-world middleboxes deployment across a range of enterprises, which is the first large-scale survey of middlebox deployments in the research community. Based on that, it gives a systematic exploration of the requirements and design space for outsourcing middleboxes.
- (2) APLOMB realizes the low performance overhead. Instead the direct path between two endpoints, it introduces a detour through the cloud while imposes an average latency increase of only 1 ms and a median bandwidth inflation of 3.8% on the evaluation of EC2 using real end-user traffic from a large end-user network.
- (3) APLOMB impacts the middlebox deployment of a large enterprise. The large enterprise can outsource close to 60% of the middleboxes under a CDN footprint with APLOMB+, while gains significant benefits from elastic scaling, low latency and high bandwidth utilization.

Problems

- (1) APLOMB reduces the cost of middlebox infrastructure, but it may increase bandwidth costs due to current cloud business models. Because tunneling traffic to a cloud provider necessitates paying for more bandwidth – for the enterprise network's access link, and at the cloud provider.
- (2) Adopting APLOMB will bring with it the same security questions as have

challenged cloud computing. Although APLOMB encrypts tunneled traffic to and from the enterprise to protect against man-in-the-middle attacks, and allocates each client its own set of VMs for middlebox processing, but ultimately it will not appeal to companies whose security policies restrict them from cloud computing in general.

(3) The authors adopt DNS redirection for network traffic. However, DNS-based redirection introduces a challenge in outsourcing traffic for legacy applications which provide external clients with IP addresses rather than DNS names. This may be a challenge to popular APLOMB.