1 Problem

This paper supports the argument that "Middlebox can **benefit from outsourcing** the cloud" with various reasons. Middleboxes are special appliances which provide security, better performance, lower bandwidth costs. However, the problem comes from huge infrastructure and management costs. To cut down the management costs, Author came up with APLOMB. Outsourcing the cloud can be beneficial for middleboxes upon meeting 3 challenges : **functional equivalence**(functionality: cloud-based MB = on-site MB) , **low complexity**(less/no supporting functionality), **low performance overhead**(minimize performance penalty).

2 Contributions

Author performed analysis of middleboxes today and highlighted several key challenges faced by administrators : management costs, fault tolerance, high maintenance. Author studied 57 middlebox deployments to understand the costs and concerns, Explored various design spaces, requirements for outsourcing. Also, Author designed and implemented a practical service(**APLOMB**) for outsourcing middlebox processing to cloud. APLOMB is a data-driven, large-scale deployment across various enterprise ranges. Author highlighted various design choices suitable in different scenarios. In the end, Author discussed a case study, describes how a system can impact deployment in large enterprise.

3 Conclusions & Support

From the analysis, It is found out that middleboxes require high maintenance, high managements costs, overload and failures. Management costs include upgrades and vendor interaction, monitoring and diagnostics, configuration, training. The cloud based MB resolves failures using standby devices, it is capable to provide resources by scaling (eliminates overprovisioning costs). Using statistics obtained from survey across 57 enterprises, most of the devices operate at medium to low utilization(active connections). Therefore, Large load balancer is used at peak hours and cheaper instance otherwise. On-site MB contains 3 key properties : **on-path**(no additional latency), **choke point**(bidirectional visibility), **local**(reduce latency). However, Cloud-based MB raises 3 questions on effective complexity, redirection architecture, type of provider footprint. 3 natural approaches in redirection are bounce redirection - [cloud PoP, middlebox, enterprise] - disadvantage : increased RTT(end-to-end latency) , IP redirection - [user, cloud PoP, enterprise] - reduces E-E latency, **DNS redirection** [user, cloud PoP via DNS, enterprise]- allows redirection using multiple cloud PoP, similar to CDNs. Of all types of redirection design choices, DNS redirection can force bidirectional traffic via same cloud PoP, which brings traffic to choke point. While choosing a footprint provider, Amazon like footprint can serve a fraction of US clients with low latency. However, Akamai like footprint is must for serving nation-wide clients. APLOMB[does not cover Proxies and WAN optimizers] upon extending compression capabilities to retain the savings in bandwidth consumption becomes APLOMB+. APLOMB design contain 3 vital components : APLOMB gateway(redirects enterprise traffic), middlebox capabilities at the cloud provider, control plane(management, configuration).

4 Likes

Large-scale academic study of 57 enterprise networks. Multiple design strategies and redirection techniques were explained with pros and cons. Detailed design & implementation of APLOMB architecture.

5 Dislikes / Disagreements

Redundancy elimination and compression might reduce bandwidth costs, but this optimization is not possible without redirection through a cloud PoP.Bandwidth costs in APLOMB for an enterprise are expensive. Unencrypted access to data/traffic flows to cloud provider is a security challenge.