Massive scaling of Domain Name Server (DNS) clusters in a cloud environment

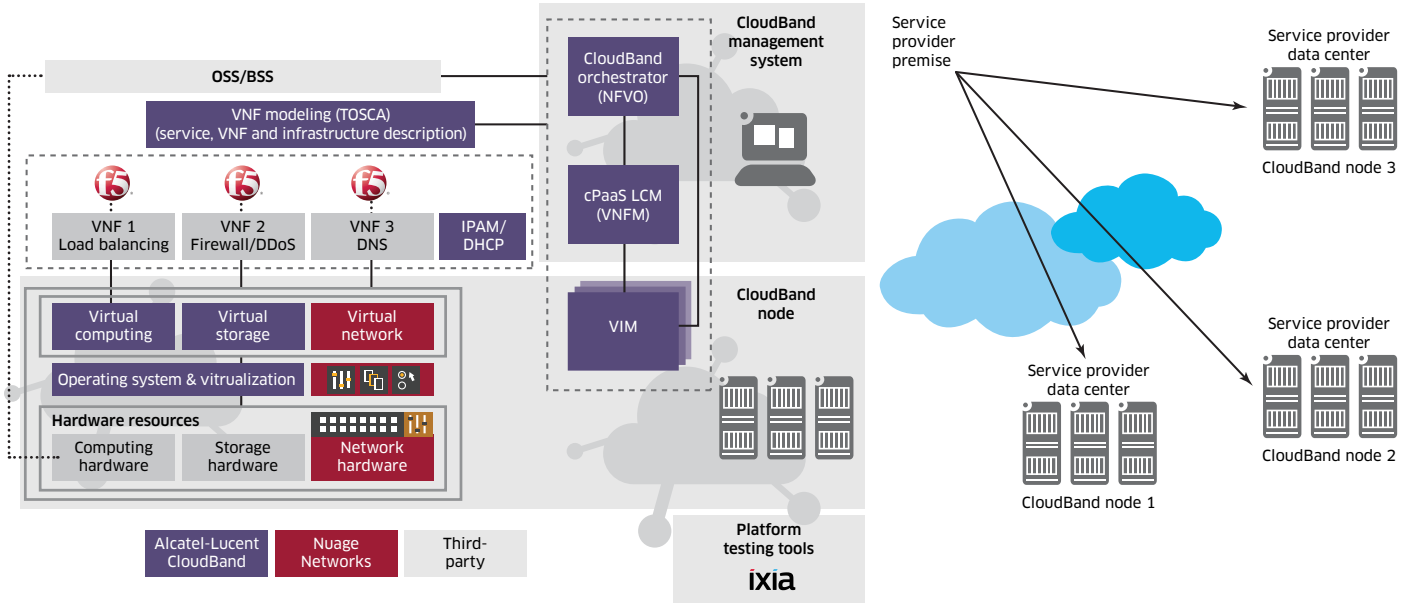
In this use case, Alcatel-Lucent, with CloudBand™ Ecosystem Program members – **F5 Networks®**, and **Ixia®** – have worked together to demonstrate how to rapidly scale and secure a DNS infrastructure across three separate data centers. This proof of concept demonstrates that virtualization can work seamlessly in a high-load environment and allows the carrier to identify optimal workload locations based on defined policies, business rules and resource availability.

Challenge

Progressive Service providers must deliver secure real-time services at scale and with high availability, making it critical to be able to scale up DNS clusters in a distributed network environment. These challenges point to the need for a zero-touch operating model.

Working together on advancing Network Functions Virtualization (NFV), Alcatel-Lucent and its CloudBand Ecosystem members help realise cloud-based services orchestration for massive scale and security of DNS clusters.

Figure 1. Joint solution architecture



How does it work?

F5 Networks contributes the BIG-IP® System with its virtual appliance and APIs for the cloud, including high-performance caching DNS servers. In addition, the use case employs Ixia's testing tools, which generate the load simulation. And, underpinning it all, Alcatel-Lucent brings its carrier-grade NFV platform – CloudBand – to enable the management and delivery of cloud computing services with guaranteed availability and response times.

1. CloudBand employs Ixia's testing tools to generate load simulation.
2. CloudBand deploys a third-party DNS pool.
3. CloudBand deploys the F5 Load Balancer (LTM) and DNS plus GSLB services and updates it with the pool of members while also providing automatic licenses through the F5 BIG-IQ system.
4. CloudBand deploys the F5 Firewall (AFM) and creates business rules and policies to only allow DNS traffic to pass through to the F5 Load Balancer and DNS services.
5. CloudBand continuously monitors KPIs such as queries per second on the DNS pool.
6. When thresholds are met CloudBand automatically adds new members to the DNS pool and updates the F5 Load Balancer and DNS services with the new pool of members.
7. A similar process is automated in CloudBand for a event that requires scaling in. The system removes the pool members and updates F5 Load Balancer and DNS services.
8. Ixia's BreakingPoint security test suite validates the scaling of the distributed DNS cluster. The tests identify network security vulnerabilities in the lab.

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Virtual Network Function and Platform Vendor solution components

F5 Networks

F5 Networks contributes the BIG-IP® Application Delivery Controller (ADC) System with its virtual appliance and APIs for the cloud, while providing high-performance authoritative DNS, caching and resolving LDNS, infrastructure DNS, and load balancing of DNS and app servers. In addition, the use case employs Ixia's testing tools, which generate the load simulation. And, underpinning it all, Alcatel-Lucent brings its carrier-grade NFV platform – CloudBand – to enable the management and delivery of cloud computing services with guaranteed availability and response times.

As illustrated in Figure 1, elements of the NFV solution include the BIG-IP System – a DNS and, application services platform capable of securing and delivering services and applications handling the heaviest traffic loads over Layer 4–Layer 7. By providing a high-performance hybrid architecture, BIG-IP offers the flexibility needed to make in-depth service or application decisions without introducing bottlenecks. The Local Traffic Manager™ (LTM) streamlines the network architecture, optimizes network performance with service load balancing and policy-based routing.

In addition, BIG-IP with DNS services enables highly scaleable authoritative DNS with tens of millions of responses per second for subscriber QoE, DNS DDoS protection, and increased ARPU. For LDNS, high performance caching and intuitive resolving delivers low latency responses for fast browsing. With Infrastructure DNS from BIG-IP, automation in the mobile core of Packet Gateway selection improves response times for best service availability. Finally, DNS server load balancing delivers maximum performance for service responses to subscribers.

At the same time, the Advanced Firewall Manager™ (AFM) simplifies security configuration with firewall and DDoS policies starting at the network and extending to the applications themselves, tailored to speed up application deployment. In addition, BIG-IQ® serves as an Element Manager (EM) providing licensing, pre-configuring the DNS secure validation and delivery services.

To learn more about the CloudBand Ecosystem Program or to become a member, visit: http://ecosystem.cloud-band.com

For more information about the participants in this use case, visit:

- F5 Networks
- Ixia

Ixia

Once the proof of concept was set up, Ixia's BreakingPoint security test suite validated the scaling of the distributed DNS cluster. The tests identified any network security issues in the lab prior to deployment hence saving carriers time and money.

CloudBand

Alcatel-Lucent's CloudBand Management System considers factors, such as server load, network congestion and latency to ensure service-level agreements are met. The other element is the CloudBand Node – a set of computing, storage, virtualization and cloud management components for each cloud facility on the network. With these CloudBand components, Tier 1 operators can establish nodes near the edges of their networks. This gives customers quicker access to cloud resources, thus minimizing network load by shortening the distance to the subscriber and by offloading traffic as early as possible.

Table 1. Key benefits of each solution

CLOUDBAND ECOSYSTEM PARTNER SOLUTIONS	KEY BENEFITS
Alcatel-Lucent CloudBand and CloudBand Nodes	• Enhances automation • Improves operations • Scales on demand for simplicity and speed • Hosts and orchestrates multiple VNFs contiguously • Enables automatic or manual scripting of business logic • Provides resiliency • Delivers scale-out/scale-in logic • Self-heals in case of failure • Manages distributed resources
F5®, BIG-IP® System, LTM®, DNS services, AFM™	Provides Software Define Application Services, scaling, and securing DNS with authoritative, caching, and resolving servers, while load-balancing applications and services
Ixia®	Delivers standardized testing for network device validation

Summary

As this use case demonstrates, carriers can virtualize their infrastructure to massively scale DNS clusters and reduce service provisioning cycle-time from months to minutes. By turning on services more quickly with a NFV-based, zero-touch operational model, a an operator can accelerate time to market. This use case also shows how the orchestration process can be more efficient, and can be managed more effectively. Using this approach, Tier 1 operators can manage DNS clusters in a distributed environment, making it as simple to deploy ten locations as it is to deploy one.

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