VMware NSX Advanced Load Balancer (formerly Avi Networks) powered by Intel Xeon Scalable processors distributed over 1 million SSL transactions per second

Instead of purchasing, installing, and supporting appliance-based load balancers to direct your organization's web traffic, you can turn to a software-defined solution. Organizations enjoying the benefits of the software-defined data center (SDDC) transformation, including increased agility, scalability, and security, can seek those same benefits for load balancing with VMware NSX® Advanced Load Balancer™ (formerly from Avi Networks, now part of VMware).

In the Principled Technologies data center, we used a cluster of 16 Intel® Xeon® Scalable processor-powered servers with 64 virtual load balancers to explore how many SSL transactions per second the solution could handle. Processing and offloading encrypted transactions is a computationally intensive duty, but the VMware + Intel solution rose to the task, handling an average of 1.085 million SSL transactions per second using 64 VMware NSX (Avi Networks) distributed load balancers to represent a single virtual service.

This means that even at times of heavy traffic, the elastically scalable VMware NSX Advanced Load Balancer (Avi Networks) solution on Intel Xeon Scalable processor-powered servers can keep transactions moving and web traffic flowing smoothly.

Load balance over
1 million SSL transactions per second

Respond to network traffic fluctuations on demand with
elastic load balancing software

Dealing with peak demand is vital

Though peak times vary by industry, current events, and context, many organizations experience bursts of activity with many users accessing their applications. For example, ecommerce retail sites experience heavier-than-normal demand around Black Friday and Cyber Monday sales as record numbers of users make purchases. Colleges and universities see heavy web traffic at the beginning of the semester as students register for classes and make payments. Tax season, from the start of the year through mid-April, can strain resources for accountants, online tax preparers, and the IRS.

Why is it important to consider peak web traffic when investing in data center resources? The inability to process peak-time transactions responsively can result in poor customer satisfaction and cause frustrated end users to abandon transactions, leading to lost business. While necessary, provisioning for peak times can result in an inefficient use of hardware throughout normal business cycles where hardware sits unused, taking up space and power, waiting for periods of higher usage.

What is SSL/TLS?

SSL stands for secure sockets layer, and the more modern version TLS stands for transport layer security. SSL/TLS transactions establish authenticated and encrypted links between client and server. Because they involve encryption for security, SSL/TLS transactions require more computational power to complete than those transactions that don't require encryption.

Directing web traffic with load balancers

In a distributed and complex infrastructure, how do web transactions know to spread out and use resources from all available servers rather than just bottlenecking on one and creating a traffic jam? Load balancers handle this task, diverting web traffic to various servers to keep transactions flowing so customers don't experience delays. Traditionally, active-standby pairs of appliance-based load balancers have been used for load balancing. But this results in wasteful overprovisioning with unused capacity during non-peak times. In addition, enterprises using appliance-based solutions experience delays when procuring and deploying load balancing and must also overcome the challenges of operational complexity managing individual appliances and inconsistent solutions for data centers and public clouds.

About VMware NSX Advanced Load Balancer

VMware provides a software-defined architecture for load balancing with a single point of management, the VMware NSX Advanced Load Balancer Controller, and a distributed data plane of software load balancers called VMware NSX Advanced Load Balancer Service Engines (formerly known as Avi Service Engines). This active-active fabric allows for automatic placement of load balancers when needed, delivering on-demand scalability as network demands fluctuate.

According to VMware, NSX Load Balancer architecture offers per-application or per-tenant load balancing capabilities, and uses a flexible licensing model based on the number of CPU cores used for the load balancers in the data plane.[1] VMware collects and analyzes real-time application traffic data through telemetry sent by the VMware NSX Advanced Load Balancer Service Engines to the VMware NSX Advanced Load Balancer Controller. VMware analytics provide application health and performance insights which help in troubleshooting application issues and informs automation decisions such as autoscaling load balancers and fault recovery. These analytics also include End-to-End Timing, which measures the latency of a request from the client through the load balancer to the application server, giving administrators a detailed look at system response times at each hop.

VMware states that organizations can deploy these load balancers on bare metal servers, in virtual machines, or containers in the data center or in the cloud and can automate infrastructure in conjunction with most popular cloud controllers.[2]

To learn more, visit https://www.vmware.com/products/nsx-advanced-load-balancer.html.

Moving load balancing into the software-defined data center with VMware on 2nd Generation Intel Xeon Scalable processor-powered servers

To show that a software-defined solution with VMware NSX Advanced Load Balancers on servers powered by 2nd Generation Intel Xeon Scalable processors can handle many SSL transactions per second (TPS), we used a large configuration and recorded the SSL transactions per second that the solution distributed.

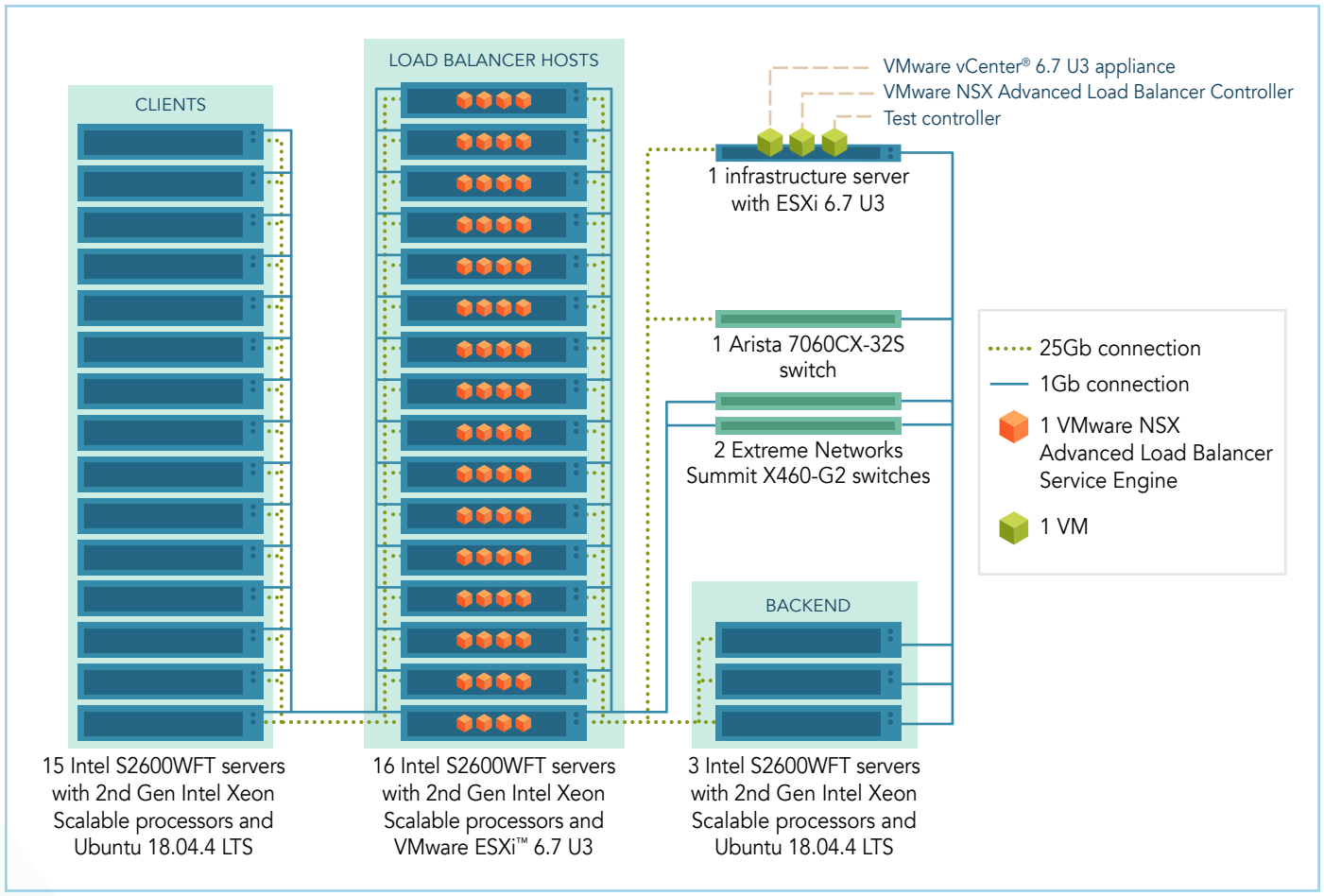

Figure 1: Diagram of the solution we tested. Source: Principled Technologies.

In our tests, we used 35 servers: 15 acting as clients, 16 VMware ESXi™ hosts for VMware NSX Advanced Load Balancers, three backend web servers, and one infrastructure server (see Figure 1). Client machines generated TCP connections to the backend server using OpenSSL on Ubuntu. Each backend server ran a web server on Ubuntu and hosted a simple website for the clients to target. The ESXi servers each hosted four VMware NSX Advanced Load Balancer Service Engines that handled the load balancing distribution. The infrastructure server ran ESXi and hosted the vCenter server, the test controller VM, and the VMware NSX Advanced Load Balancer Controller.

up to
1.17 MILLION SSL
transactions per second*

*steady state at 1.085 million

About 2nd Generation Intel Xeon Scalable processors

The 2nd Generation Intel Xeon Scalable processor platform offers multiple tiers of performance to support specific workloads, labeling them Bronze, Silver, Gold, and Platinum to help customers fit their needs. According to Intel, the 2nd Generation Intel Xeon Scalable platform can handle a variety of workloads, including enterprise, cloud, HPC, storage, and communications.[3] This new processor line also supports a new memory and storage technology to further accelerate workloads, Intel Optane™ DC persistent memory.

To learn more about the 2nd Generation Intel Xeon Scalable processor family, visit https://www.intel.com/content/www/us/en/products/processors/xeon/scalable.html.

The VMware and Intel Xeon Scalable processor-powered solution we tested handled a steady 1.085 million SSL TPS, proving that this software-defined load balancing solution can handle encrypted web traffic even during heavy usage. As the screenshot from our test shows (see Figure 1 in the science behind the report), RTT latency for clients was at 2 milliseconds, RTT latency for servers was 7 milliseconds, and app response was under 1 millisecond. These response times reflect that the configuration was able handle the goal of 1 million TPS that it was designed to achieve. According to VMware, leveraging Intel Xeon processors with AES-NI[4] to offload more cryptographic workloads into dedicated rather than general-purpose instructions could enhance VMware NSX Advanced Load Balancer performance. For maximum performance on a single SE, VMware recommends using the latest Intel NICs that support DPDK for fabric elasticity without loss of capacity and linear scale from Intel 2nd Generation Intel Xeon Scalable processors.[5]

Conclusion

VMware NSX Advanced Load Balancers, powered by 2nd Generation Intel Xeon Scalable processors, directed over 1 million SSL TPS. This strong performance indicates that an VMware-Intel solution could handle large numbers of encrypted transactions.

Moving from appliance-based load balancers to software-defined VMware NSX Advanced Load Balancers could enable your organization to modernize load balancing services with efficient use of standard computing infrastructure and reduce overprovisioning. Because VMware can elastically scale load balancing capacity up or down based on demand, your applications can better utilize available compute power from Intel Xeon Scalable processors.

For enterprises moving to software-defined data centers, the combination of VMware NSX Advanced Load Balancer deployed on servers with Intel Xeon Scalable processors represents a high-performance solution to load balance large volumes of encrypted traffic.

1 VMware, "VMware NSX Advanced Load Balancer (Avi Networks)," accessed March 10, 2020, https://www.vmware.com/products/nsx-advanced-load-balancer.html.

2 VMware, "VMware NSX Advanced Load Balancer (Avi Networks)," accessed March 10, 2020.

3 Intel, "Intel Xeon Scalable processors," accessed March 10, 2020, https://www.intel.com/content/www/us/en/products/processors/xeon/scalable.html.

4 Intel, "Intel Data Protection Technology with AES-NI and Secure Key," accessed March 23, 2020, https://www.intel.com/content/www/us/en/architecture-and-technology/advanced-encryption-standard-aes/data-protection-aes-general-technology.html.

5 VMware, "SSL Performance," accessed March 23, 2020, https://avinetworks.com/docs/18.2/ssl-performance/.

Read the science behind this report at http://facts.pt/tfxbbec ▶

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