WHITE PAPER: **September 2024**

Seven Key Considerations Before Your Upcoming F5 Load Balancer Refresh

vmware® by Broadcom

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ABOUT THIS DOCUMENT

This whitepaper details how hardware load balancers and virtual appliances are inflexible, expensive, and lacking in visibility. In contrast, VMware Avi Load Balancer provides 10x reduction in managed devices, autoscaling and auto healing, built-in analytics for faster troubleshooting, and radical simplicity and elasticity. This document also outlines 7 key considerations that you should evaluate before you refresh your current load balancers:

1. Automation and Self-Service
2. Auto-Scale and Auto-Heal
3. Application Analytics and Troubleshooting
4. Container Workloads
5. Hybrid Cloud
6. Integrations with VMware Cloud Foundation
7. Simplified Operations to Reduce OpEx

EXECUTIVE SUMMARY

Modern data centers run cloud-native applications alongside traditional applications. Networking teams are under pressure to deliver services and resolve application issues quickly while lowering costs for application delivery. Your IT operations demand agile, cost-effective load balancing solutions.

Traditional application delivery controller (ADC) i.e. hardware load balancers barely address the needs of container applications and cloud use cases. Instead, they force you down the path of expensive and inflexible hardware refreshes without addressing the fundamental challenges of elasticity, automation, hybrid-cloud use, and cost. Until now, enterprises had little choice but to depreciate their ADC appliances and purchase more appliances when the time comes to refresh their load balancers.

In an IDC whitepaper, Brad Casemore advises enterprises on "the full-stack digital infrastructure, supporting distributed hybrid environments with complimentary integration of software-defined load balancing via VMware's Avi Load Balancer and the VMware Cloud Foundation platform". Before you commit to a multi-year license and maintenance contract with your appliance-based load balancing vendor, review these key considerations and their implications for your enterprise.

VMware® Avi™ Load Balancer provides a next generation ADC that delivers a flexible, analytics-driven, application services fabric with a centrally managed and software-defined architecture. Avi provides complete automation for L4-L7 services with an elastic, multi-cloud approach that provides 43% OpEx reduction[1] compared to traditional load balancing solutions.

APPLICATION DELIVERY CHALLENGES IN MODERN DATA CENTERS

Modern data centers need a paradigm shift in load balancing architecture to automate infrastructure. Traditional environments rely on box-by-box configurations for load balancing, which are fixed in scaling capabilities, lack application visibility, and have no central orchestration. Enterprises have little choice but to use these rigid appliance-based architectures, resulting in operational inefficiencies and overspending to maintain performance and availability. These legacy architectures present several challenges:

- No central policy or configuration management – inefficient operations with each device managed separately
- Not designed for dynamic scaling and elasticity in cloud and container environments
- Tightly coupled control and data planes lead to limited scalability and overprovisioning
- Inability to address per-application or per-service load balancing requirements
- Lack of application visibility to assist with issue resolution
- Cannot scale up or down (vertically) easily and cannot scale out or in (horizontally) at all
- Inconsistent architecture which result in disparate solutions for hybrid-cloud and container use cases

[1] IDC Business Value Study of VMware Avi Load Balancer: A Study of Enterprises Using Next-Generation Application Delivery

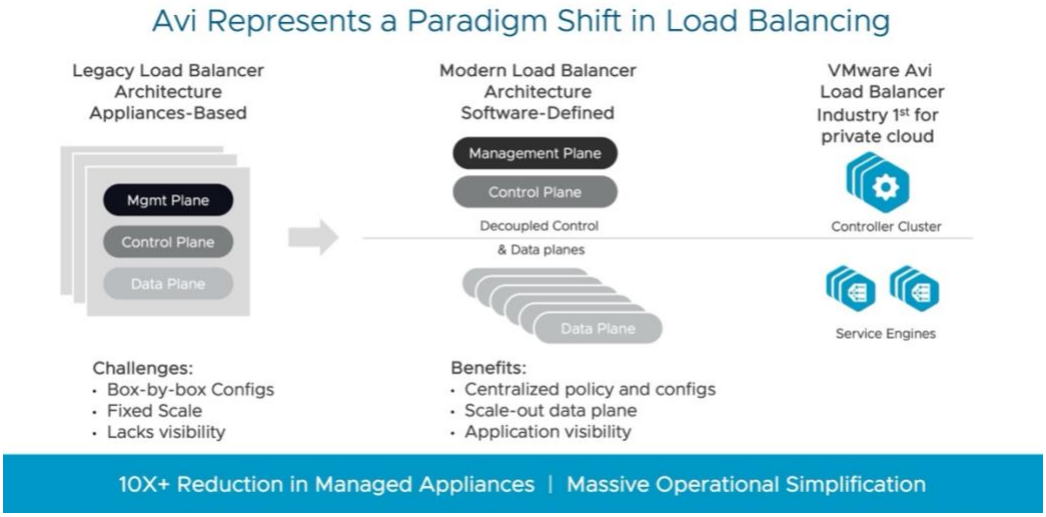

Figure 1: Legacy load balancers vs. software defined architectures in modern data centers

In contrast, a modern load balancer architecture is software-defined, featuring centralized policy and configuration management, decoupled control and data planes for elastic scale-out, and application visibility, leading to a significant reduction in managed appliances and massive operational simplification.

VMWARE AVI LOAD BALANCER

Most Versatile Load Balancer

VMware Avi Load Balancer offers software-defined load balancing, including rich application analytics, seamless auto-scaling, and automation in both private data centers and public clouds. Built on modern distributed architecture, Avi mirrors the agility required by next-generation data centers and DevOps practices, with a centralized Avi Controller and distributed Avi Service Engines (SEs) that can be deployed on Intel x86 servers, virtual machines, containers, or public clouds. Avi SEs provide real-time telemetry to the Avi Controller, which then analyzes the data to offer insights on application health, security, and client interactions, streamlining issue resolution. Additionally, Avi Load Balancer enables developers to quickly obtain load balancing through self-service, eliminating the need for filing time-consuming tickets. It also includes global server load balancing (GSLB), container ingress and web application firewall (WAF), offering a comprehensive solution in one platform, with seamless integration into VMware Cloud Foundation, Kubernetes, and public cloud environments.

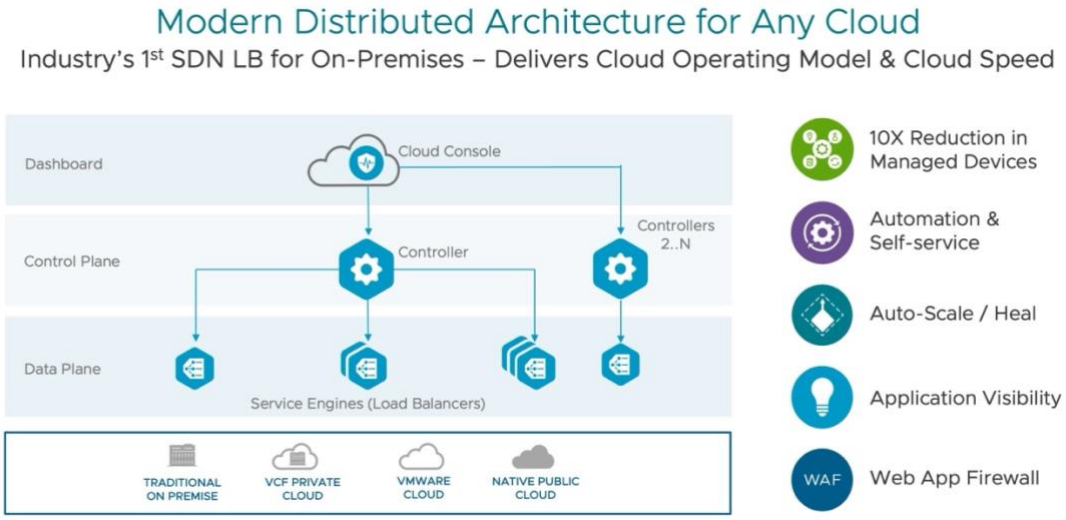

Figure 2: Avi Load Balancer – high-level architecture

With Avi Load Balancer, enterprises experience a 10x reduction in managed devices, dramatically simplifying daily operations, maintenance, and troubleshooting. Its built-in auto-scale capabilities enhance application elasticity, while application latency analytics help IT teams quickly address performance issues. Avi further accelerates deployment times by up to 90%, reduces OpEx by up to 43%, and boosts developer productivity by as much as 27%[1].

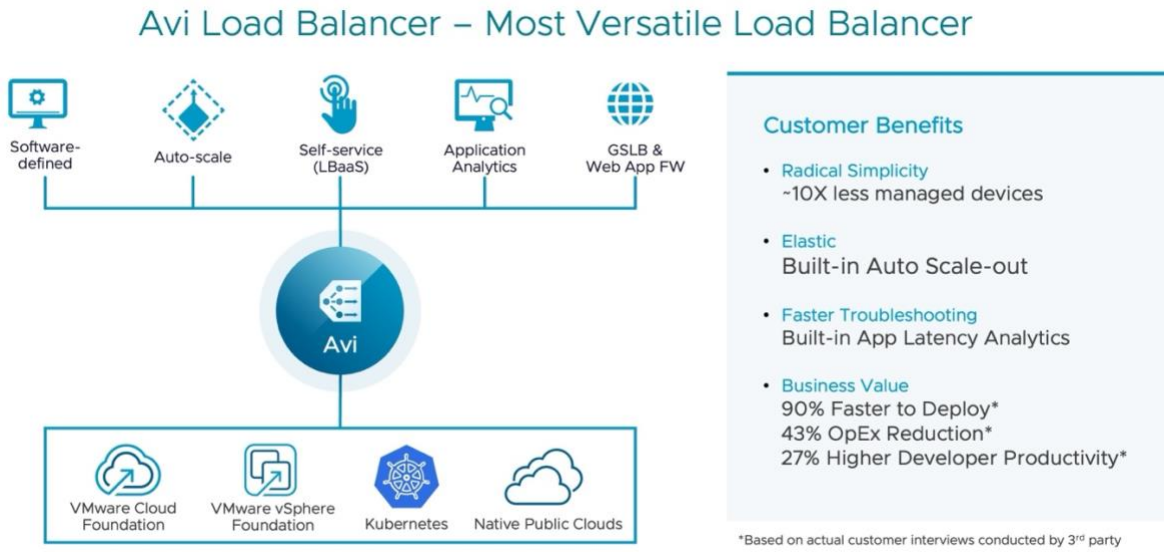

Figure 3: Avi Load Balancer – features and benefits

CONSIDERATION #1: AUTOMATION AND SELF-SERVICE

The Traditional Approach

For many enterprises, traditional load balancing architectures result in development teams waiting weeks or months for resolution of IT tickets, depending on IT teams to provision additional Virtual IPs (VIP) or rollout applications and updates. Administrators lack basic visibility of virtual services. Even today, several networking teams maintain lists of VIPs and pool members in spreadsheets! Network administrators need to consider application dependencies, perform manual capacity and tenancy assessments to decide where to place new VIPs, and if necessary, order additional hardware to manually provision application services. Once load balancers are purchased, they need to manually configure the network parameters, including physical connections, VLANs, and IP configurations before they can provision the VIP. The process often takes several weeks.

How Avi Enables Automation, Self-Service, and Visibility

The Avi Cloud Connector serves as a single point of management and automation, allowing developers to rapidly provision the necessary capacity for their applications and allow elasticity to grow with application needs. Avi provides cloud-agnostic API abstraction across on-prem bare metal, private cloud environments, and major public cloud deployments. Through a 100% REST-based approach to operational automation, Avi integrates seamlessly with solutions such as VCF Automation, Ansible, Terraform, Splunk, and code-based automation tools written in Python and Go. This end-to-end automation eliminates manual processes, enabling developers to provision new VIPs in seconds. Avi also allows administrators to offer policy-based access to the Cloud Connector for developers, facilitating troubleshooting and monitoring, while delivering a consistent application workflow that abstracts complex cloud infrastructures with a "One and Done" approach for streamlined self-service application delivery.

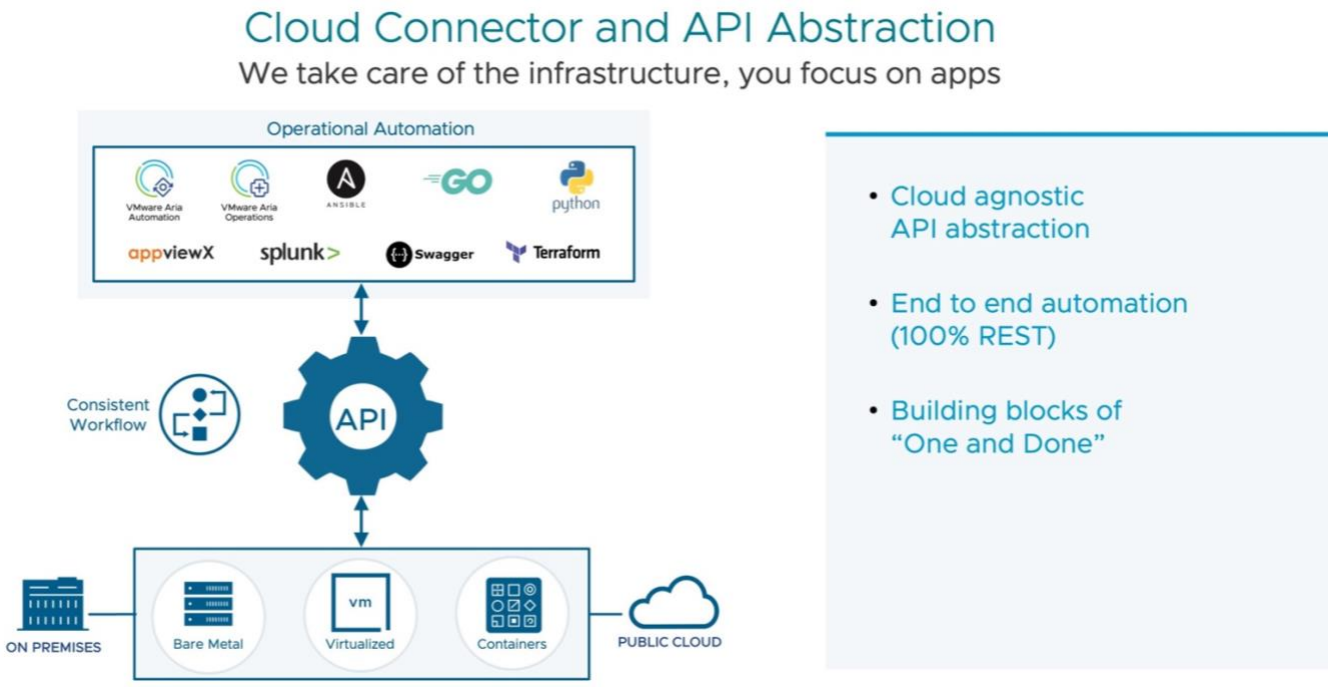

Figure 4: Avi Load Balancer operational automation is enabled by 100% API abstraction

CONSIDERATION #2: AUTO-SCALE AND AUTO-HEAL

2.1 Auto-Scale

The Traditional Approach

Enterprises are challenged with understanding and planning for peak usage, with the ability to scale up dynamically and scale down when demand recedes. With traditional load balancers, enterprises are forced to overprovision application services upfront or scramble to deploy additional appliances when they need to scale. With no visibility into application usage patterns or performance analytics, the tendency to overprovision for performance and scale is a common challenge. Enterprises end up paying a huge premium for rigid scalability. Appliance-based solutions do not offer the elasticity needed to support dynamic scale out or scale in of load balancing services.

How Avi Delivers Elastic Load Balancing Services

Avi Load Balancer utilizes a software-defined architecture to centrally orchestrate a resilient and self-healing fabric of load balancers. The distributed data plane components (Avi Service Engines) collect real-time telemetry from application traffic flows across the entire deployment. The Avi Controller analyzes the information to generate intuitive application performance data enable administrators to scale vertically with more CPUs or horizontally with additional Service Engines based on application needs. The Avi Controller dynamically deploys Service Engines to meet growing traffic demands and spins them down when demand decreases, ensuring elasticity of application services on x86 servers, VMs, or containers. Avi is also able to trigger the autoscaling of applications through integrations with orchestration platforms and scripting tools.

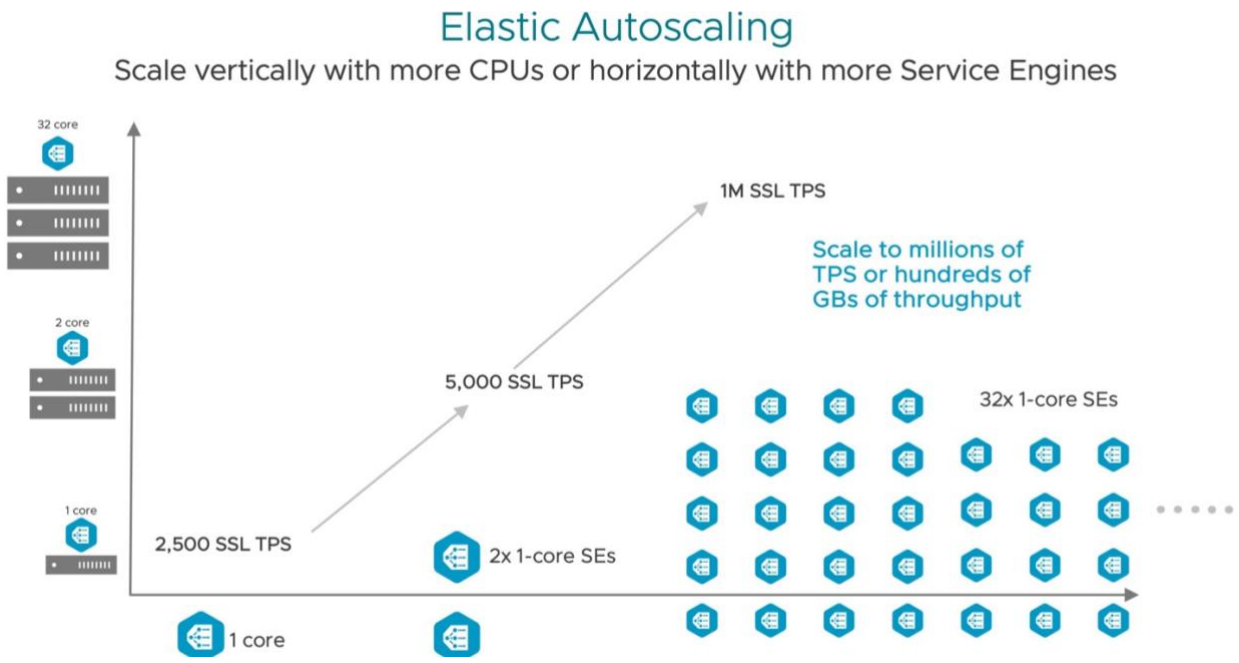

Figure 5: Avi Load Balancer predictive autoscaling and screenshot showing traffic thresholds for autoscaling

2.2 Auto Heal

The Traditional Approach

Enterprises require a robust and resilient load balancing architecture that is difficult to achieve with the provisioning challenges faced when deploying traditional hardware-based ADCs. When considering the implementation of fault tolerance and failover mechanisms, configuring traditional ADC's can take months of tedious processes due to the lack of centralized management planes, which results in having to configure each ADC individually. This results in a lack of flexibility and severe operational downtime in real-time failure handling scenarios, as administrators are forced to spend precious time and resources in diagnosing, troubleshooting and provisioning machines manually at an individual level, with no hope of automating the repetitive process.

How Avi Implements a Resilient and Fault Tolerant Architecture

Avi implements a resilient and self-healing fabric to support the fault-tolerance demands of modern enterprise applications. Avi SEs are always deployed in an Active-Active configuration with anti-affinity rules, which enables instantaneous and automatic transferring of VIPs under any failure scenario to standby SEs, allowing applications to get back up and running at full health within minutes. Avi can also be easily configured with strict per-SE Group or per-application isolation rules for easy containment and handling of failures with minimal impact to the overall application. Avi is equipped to handle streaky or fluctuating application demand with ease, automatically rerouting traffic with any moves or changes.

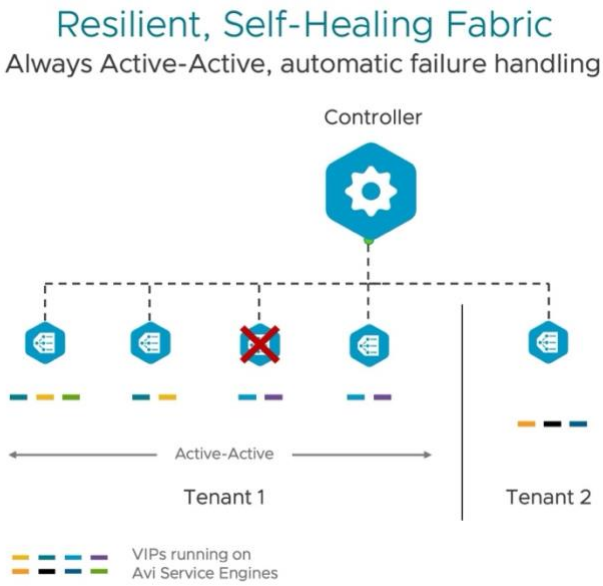

Figure 6: Avi Load Balancer implements a resilient and self-healing architecture to support the demands of modern apps

CONSIDERATION #3: APPLICATION ANALYTICS AND TROUBLESHOOTING

The Traditional Approach

Load balancers occupy a strategic location in the enterprise data center – in the path of application traffic. However, traditional ADC appliances do not take advantage of this location privilege to provide meaningful application insights. Traditional architectures lack visibility from application and end user insights or lack visibility to all virtual services. Network engineers have very few options to troubleshoot application performance issues or identify network bottlenecks. Often, they need to troubleshoot network issues with span ports, TCP dumps, and log traces in a process that might take several days. This often leads to finger-pointing between teams, putting the onus on network engineers to perform root-cause analysis and fix transient issues that may not reproducible.

How Avi Provides Analytics and Troubleshooting

Avi Load Balancer is built on software-defined principles with a central controller (Avi Controller) and a distributed fabric of software load balancers (Avi Service Engines). Along with delivering enterprise-grade application delivery services, Avi's analytics capabilities are a game changer for operations teams. The Avi Service Engines send real-time telemetry to the Avi Controller, which consolidates various important application metrics such as application performance, transaction round trip times (RTT), end user request/response latencies and security details to provide a holistic health score. Avi's end-to-end latency analytics provide a granular level, allowing admins an unprecedented level of insight into the performance of their applications, speeding up detection and troubleshooting of issues along the data path. This platform enables network administrators to delegate the application dashboard to DevOps teams, facilitating cross-team visibility and reducing the blame-game between teams when troubleshooting real-time application issues. Overall, Avi's comprehensive analytics dashboard leads to detailed and relevant insights into applications along with happier and more productive operations teams.

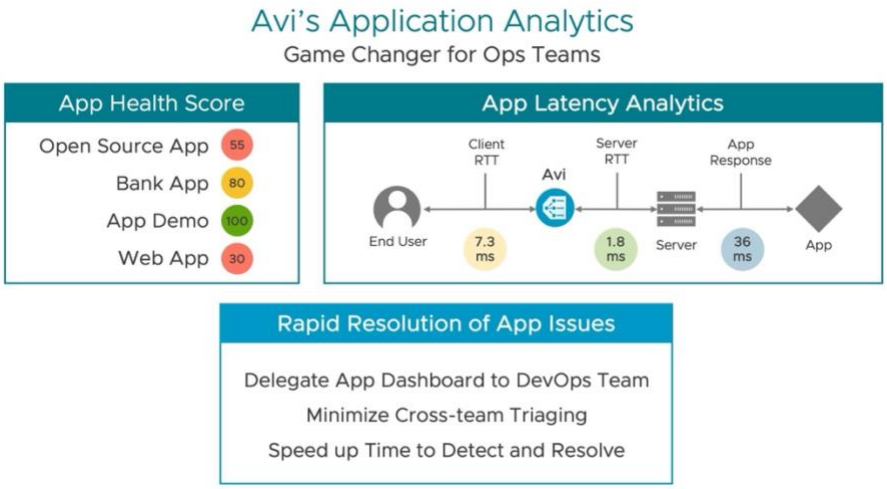

Figure 7: Avi provides detailed and granular app analytics for fast detection and troubleshooting of app issues

CONSIDERATION #4: CONTAINER WORKLOADS

The Traditional Approach

The primary challenges when deploying application services in container-based environments, such as load balancing, performance monitoring, and application security, is the reliance on multiple discrete solutions. This fragmented approach leads to complex operations, forcing IT teams to manage and troubleshoot multiple independent components from different vendors. Moreover, a lack of observability makes it difficult for DevOps teams to monitor interactions between services, hindering their ability to detect errors, security and latency issues. Partial automation further complicates operations, as multi-vendor solutions often lack full API-driven programmability and require extensive scripting knowledge to achieve even limited automation. This creates a trade-off between features, automation, and scalability, making it essential to adopt consolidated Kubernetes services from a single platform.

How Avi Provides Converged Kubernetes Ingress Services

Avi Kubernetes Ingress Services offer a comprehensive platform that converges container ingress, L4-L7 load balancing, GSLB, DNS/IPAM, WAF, and analytics into a single solution for holistic operation. With centralized policies and full lifecycle automation, Avi eliminates manual tasks, providing administrators with central control, self-service automation, and operational simplicity. Real-time telemetry and application insights are delivered across all components through closed-loop analytics and deep learning, offering end-to-end visibility into the network, security, user experience, and application performance. Additionally, Avi enables elastic autoscaling based on app analytics and decision automation, supporting diverse Kubernetes environments such as VMware Tanzu, OpenShift, Amazon EKS, Azure AKS, and Google Kubernetes Engine across both on-prem data centers and public clouds.

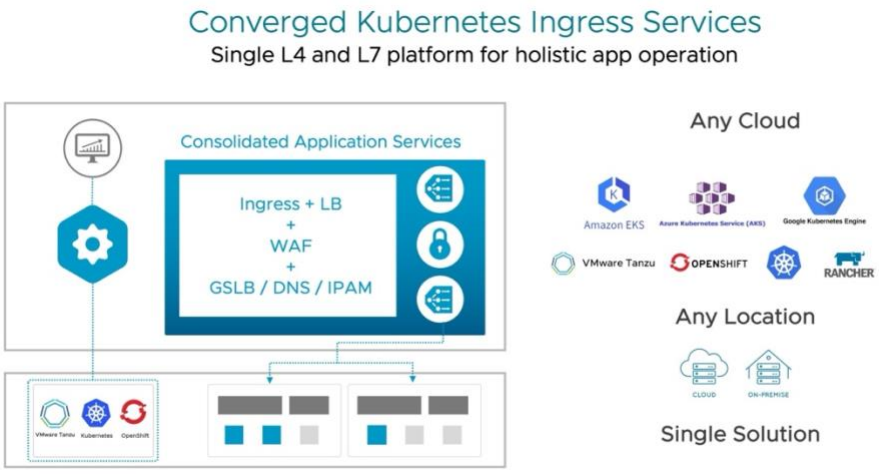

Figure 8: Avi provides a single consolidated platform for Kubernetes Ingress Services across any location and cloud environment

CONSIDERATION #5: HYBRID CLOUD

The Traditional Approach

Load balancers were built for use in data centers prior to the public clouds, and private clouds. As virtualization, cloud and container technologies emerged, load balancer vendors began to force fit their solutions for these environments with virtual editions of their appliances. While these virtual appliances are offered as software that can run on VMs, they inherit the same disadvantages of the hardware appliances with disparate management, lack of automation, and elasticity. They are bolted on to existing architectures that are not designed for the new eras of applications. Therefore, these solutions are cost prohibitive to run the public cloud and do not offer centralized management or enable hybrid cloud operations. Enterprises often end up with completely different application delivery solutions for their data center and cloud applications.

How Avi Supports Hybrid-Cloud Use Cases

With its infrastructure-agnostic architecture, the Avi Load Balancer natively supports hybrid cloud environments. Avi delivers a consistent software-defined architecture through a single pane of glass for application services with visibility, security, orchestration, management and unique application analytics that are common across these environments. The performance and elasticity of the platform is also consistent across different data center and cloud environments. With Avi, enterprises can use intelligent hybrid cloud traffic management and application scaling across their data centers and the public cloud with central management. Enterprises developing container-based microservices applications get full stack L4-L7 services, including service discovery.

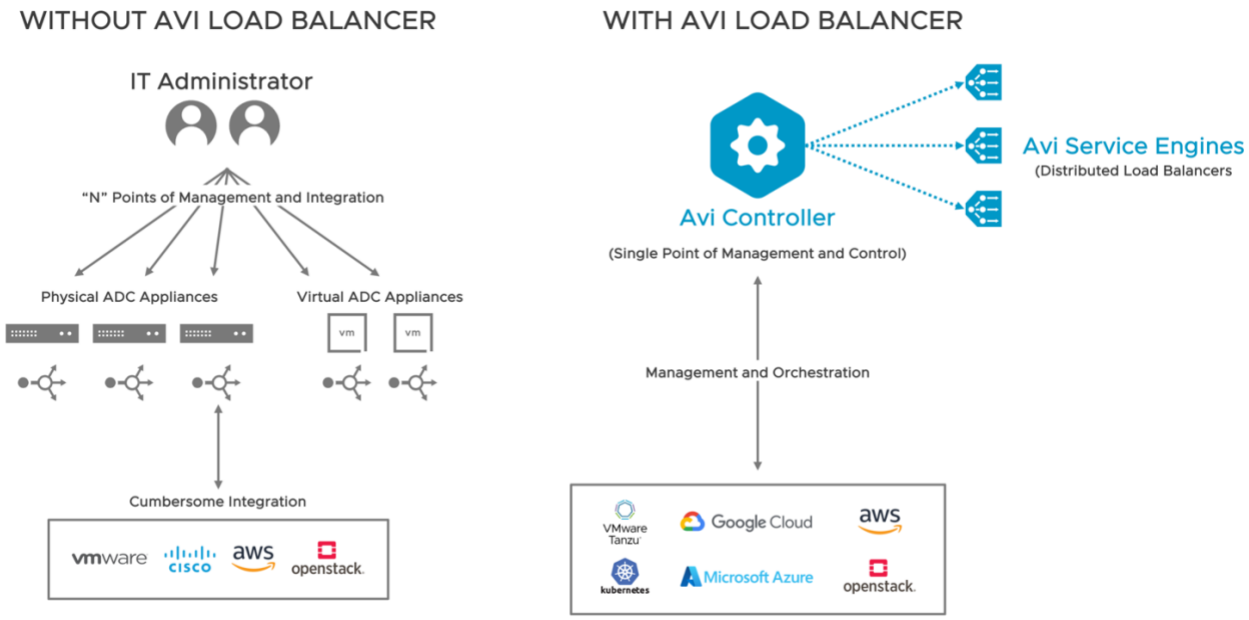

Figure 9: Hybrid cloud intelligent traffic management and scaling with VMware Avi Load Balancer

CONSIDERATION #6: INTEGRATIONS WITH VMWARE CLOUD FOUNDATION

The Traditional Approach

In traditional ADC architectures, each load balancer is a distinct appliance (whether hardware or virtual) that needs to be configured and managed individually and manually, with both control and data planes residing on the same box. They do not offer native integration with VCF infrastructure, which results in tramboning or hairpinning to access, resulting in slow performance and long latency. Deploying legacy or traditional hardware-based load balancers often leads to overprovisioning and idle capacity, hence high-cost wastage. As enterprises seek to automate IT operations and enable DevOps self-service to achieve cloud-like flexibility, Avi emerges as the only solution for the operational automation and management initiatives used by infrastructure teams.

How Avi Load Balancer Offers a Plug-and-Play Load Balancing Experience for VCF

VMware Avi Load Balancer provides a true plug-and-play load balancing experience for VMware Cloud Foundation (VCF). It is the only load balancer on the market with one-click integration with VCF's SDDC Manager, directly communicating with VCF components like vCenter, NSX-T and VCF Automation, simplifying Day 0-2 operations. Avi offers increased operational visibility, automates Service Engine (SE) deployments in VCF workload domains, and provides efficient lifecycle management with automation tools, including password rotation, certificate management, and upgrade checks through a simple GUI. VCF integration enables automated workflows for application deployment and changes, ensuring application resiliency and elasticity through advanced analytics and closed-loop automation. Developers can self-service their load balancing needs with Avi's native integration with VCF Automation, streamlining self-service and automating load balancing solutions. Avi also automates network connectivity for VCF Workloads with automated discovery of vSphere objects such as ESXi hosts, datastores, and networks, including automatic configuration of virtual NICs to connect SEs to the appropriate networks.

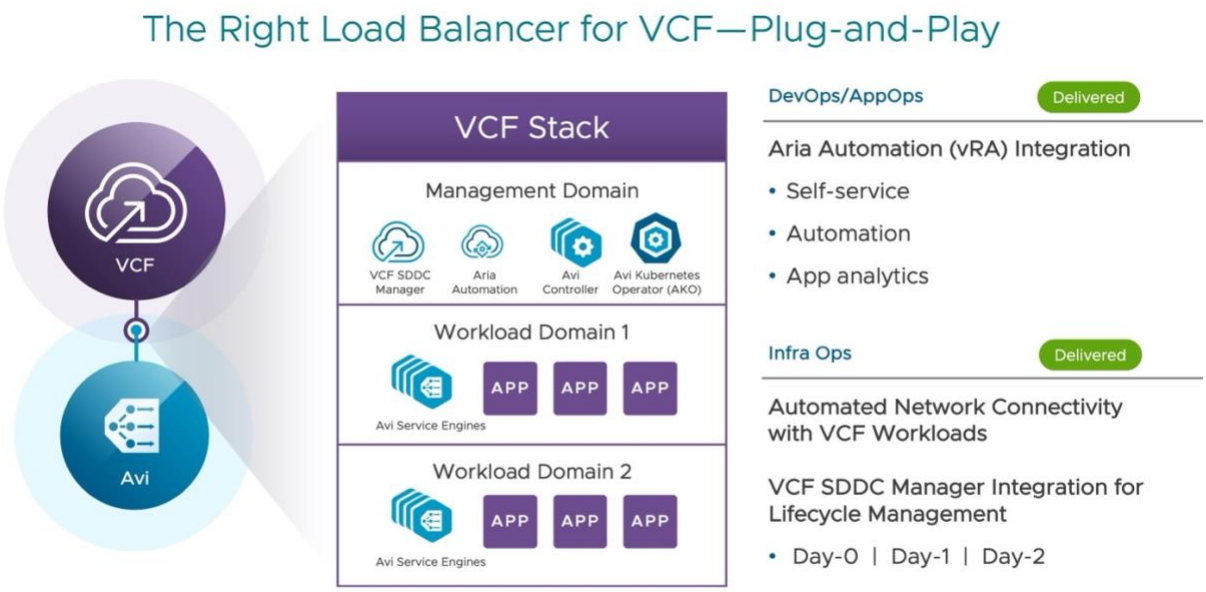

Figure 10: Avi is the #1 and only Plug-and-Play load balancing solution for VMware Cloud Foundation

CONSIDERATION #7: SIMPLIFIED OPERATIONS TO REDUCE OPEX

7.1 Total Cost of Ownership Impact

The Traditional Approach

As new cloud-native applications and data center automation initiatives have emerged, many leading appliance-based load balancers have become cost prohibitive for enterprises. While the price/performance ratio of Intel x86 servers continues to decrease in accordance with Moore's law, these costs savings are never available to enterprises choosing appliance-based ADCs. Each hardware refresh from ADC vendors, such as F5 Networks, cost more than the previous version, and businesses still must choose different point solutions to address different use cases. In addition, new appliances or virtual editions need to be purchased to scale applications.

How NSX Advanced Load Balancer Lowers TCO

VMware Avi Load Balancer is an enterprise-grade ADC which runs on standard x86 servers, VMs, containers, and the public cloud. Subscription is based on the number of vCPUs on which the distributed load balancers run. The solution enables enterprises to size their load balancers based on application needs (instead of overprovisioning upfront) and scale horizontally, on demand as the application need grows, achieving 90% faster scaling capacity than traditional load balancers. The platform eliminates the need for custom hardware and reduces operational challenges by providing application/network analytics capabilities, resulting in 54% fewer outages. Customers save up to 43% over the cost of the leading appliance-based ADCs, which results in a measurable impact of $13.6M average higher revenue per year, leading to a payback on the initial subscription in just 6 months[1].

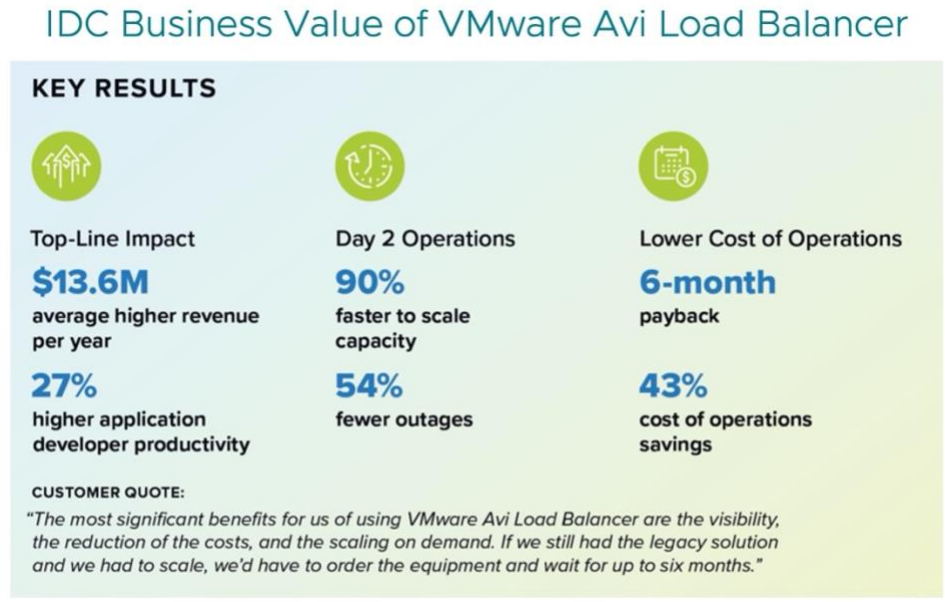

Figure 11: Snapshot showing Business Value of Avi Load Balancer

7.2 Flexible, Non-Disruptive Upgrades

The Traditional Approach

Enterprises running their applications on traditional hardware-defined ADCs often experience cumbersome and time-consuming upgrade cycles. Administrators are required to manually upgrade each box due to the lack of a centralized management plane. This leads to a disruptive and frustrating user experience, as applications experience longer maintenance windows and rollout times. Additionally, any deployment related issues that require rollbacks also become a major source of stressful and manual work for admins

How Avi Load Balancer Seamlessly Enables Flexible Upgrades

Additionally, Avi supports flexible, non-disruptive upgrades, allowing select Controllers or Service Engine Groups (SEG) to upgrade without impacting other applications or infrastructure. With the separation of the control plane and data plane, easy and automated rollback of upgrades is also supported from a central controller.

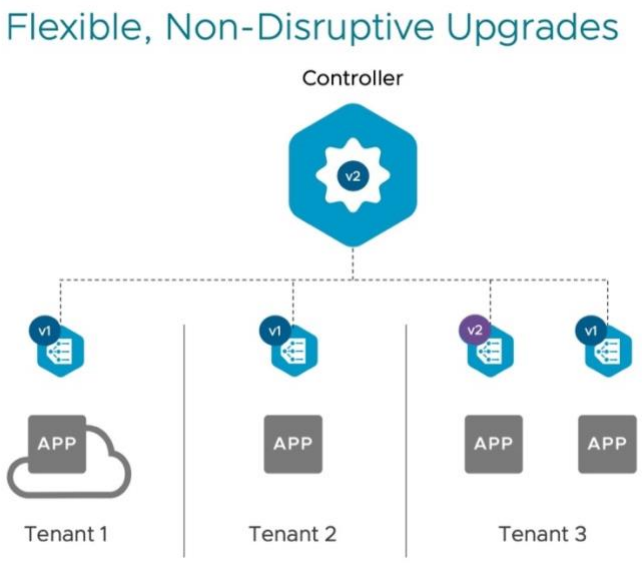

Figure 12: Avi enables a flexible and non-disruptive upgrade experience for enterprise applications

CONCLUSION

Enterprises looking to refresh their F5 load balancing appliances now have an opportunity to get an enterprise-grade load balancer with better capabilities at significant cost savings. Contact Avi for a custom demo and more information about the product.

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