APPLICATION DELIVERY IN OPENSTACK WITH AVI NETWORKS CLOUD APPLICATION DELIVERY PLATFORM

Challenge
Business-critical applications in OpenStack require:
- Real-time monitoring of applications and users
- SLA tracking and enforcement
- Elastic scalability, self-service operations, adaptive optimization

Solution: Avi Networks Cloud Application Delivery Platform (CADP)
- Analytics-driven, elastic application delivery
- Real-time, end-to-end visibility
- Software-based, fully distributed HYDRA architecture
- OpenStack Nova, Keystone, Neutron, LBaaS integration
- Fully programmable RESTful API

Benefits
- Accelerates OpenStack adoption
- Assures end-user experience
- AutoScales application performance on-demand
- 90% OpEx savings
- 50% faster application rollout and problem resolution

Consider Avi Networks CADP when:
- Starting a private cloud initiative
- Migrating business-critical applications to OpenStack
- Creating a self-serve model / DevOps initiative
- Planning for unpredictable user demands
- Reducing time to resolve application performance issues

Executive Summary
Within a few short years, OpenStack has become the de facto choice for open-source cloud orchestration. With thousands of developers actively contributing to making OpenStack more robust and feature-rich, and hundreds of enterprises and cloud service providers (CSPs) deploying OpenStack in their labs, what started as a platform for experimental projects has quickly become a reliable orchestration platform for today’s private and public cloud deployments. Despite the advantages, there are still a few shortcomings that get in the way of enterprises taking OpenStack from development stages into production environments. Specifically, there are gaps in visibility, security, self-service provisioning, and elastic scalability.

To solve these problems, Avi Networks has developed a software-based Cloud Application Delivery Platform (CADP) built on a new hyperscale and distributed architecture called HYDRA™. The Avi Networks CADP with the HYDRA architecture enables customers to advance OpenStack from their lab environments into large-scale production deployments.

OpenStack Cloud Adoption Lifecycle

Figure 1: Three Stages of OpenStack Cloud Adoption

OpenStack cloud deployment is a three-stage journey from lab experiments to a large-scale production environment:
1. Pilot: Ensure that the cloud deployment is meeting the needs by using real-time monitoring of application performance and end-user experience.
2. Initial Applications: Ensure high availability, security, and performance SLAs of business-critical applications.
3. General Adoption: Achieve operational benefits of cloud at scale. This is the hardest transition and requires elastic infrastructure, adaptive resource optimization, and self-service automation in order to guarantee SLAs in a large-scale, multi-tenant environment.
Introducing Cloud Application Delivery Platform for OpenStack

Avi Networks’ Cloud Application Delivery Platform (CADP) is the industry’s first software solution that utilizes real-time application visibility and end-user insights to optimize application delivery for OpenStack cloud. It provides elastic load balancing, application security, application acceleration, and real-time monitoring and analytics services to tenant applications.

System Components

Avi Networks’ solution is built on the HYDRA architecture, which separates the data, control and management planes into individual system components:

- **Avi Service Engines** provide distributed data-plane services
- **Avi Controller** is the centralized policy and analytics engine
- **Avi UI** offers a rich user interface built on RESTful APIs

The HYDRA architecture enables seamless scaling of network services within and across data centers and clouds, while maintaining a single point of management and control.

Plug-and-Play Integration with OpenStack

Avi CADP runs natively on virtualized x86 infrastructure within OpenStack and seamlessly deploys in both traditional networks and SDN environments. Avi Cloud Connector for OpenStack enables seamless integration with Nova, Keystone, Neutron, and LBaaS components, and offers:

- Automated provisioning of load balancing services
- Integrated multi-tenancy and role-based access control
- Elastic scaling based on application performance and end-user experience
- Real-time application monitoring and end-user transaction analytics

Delivering Robust Application Services in OpenStack Cloud

1. Real-Time Monitoring of Application Performance and End-User Experience

Challenge

Existing application and network performance monitoring solutions have several limitations when tracking SLAs in a cloud environment:

- Network performance monitoring solutions rely on a separate monitoring fabric with hardware appliances for traffic mirroring, making the solution inflexible and complex.
- Application performance management tools require changes to the applications code and installation of agents on servers – not always a viable option.
- More importantly, each of these tools provides only a subset of visibility. End-to-end correlation of application performance and end-user experience is a manual (and often an impossible) task.

Avi Networks Solution

Avi Networks has integrated the analytics functions with application delivery into a single unified solution. Avi SEs serve as distributed probes in the network, capturing hundreds of application metrics and transaction log data. Avi SEs perform a smart-reduce function on terabits of streaming transactions to achieve a 1000x reduction before sending this data to Avi Controller. Avi Controller runs the Big-Analytics engine that correlates this data with server and network infrastructure logs, and offers real-time, highly granular insights into application performance and end-user experience, without any application changes, server agents, or network taps.
Application Health Score: A single, unified health score captures application health summary and detects any performance or resource exhaustion issues in the infrastructure.

End-to-End Timing: Avi measures client and server network latency, application response time, and data transfer time for every transaction. This powerful visualization tool helps benchmark user interactions with applications, flags deviations, and quickly identifies bottlenecks.

Real User Metrics (RUM): Browser-based metrics for details on page load times, image download and display times, and JavaScript execution times provide a real-time view on the end-user experience.

Client Logs: Avi offers full HTTP session logs in real time, with integrated search capabilities to analyze traffic patterns and detect problems.

Client Insights: A geo-map of end users to analyze application performance by geography and location; insights into top resources accessed; and top browsers, client operating systems, and devices used provide detailed insights into end-user experience.

2. Delivering Application Resiliency – Availability, Security, Acceleration

Challenge
The next set of challenges is associated with robust application delivery that comprises application availability, security and application acceleration. The customers have a choice to pick between an open-source solution and a traditional ADC appliance, but both options fall short for the following reasons:

- Virtual (and physical) appliances from existing ADC vendors are deployed as shared devices across multiple tenants, providing no data-plane or control-plane isolation, nor SLA guarantees. An option could be to deploy one appliance per tenant, but that quickly becomes economically and operationally cost-prohibitive.
- Open-source load-balancing solutions offer only best-effort services to tenant applications and cannot provide SLA guarantees. With solutions such as HAProxy, the solution itself is not natively highly available.

Avi Networks Solution
Avi Networks offers a comprehensive suite of availability, security, and acceleration services for applications in OpenStack. With an analytics-driven approach and dedicated Service Engine resources for each tenant, Avi Networks CADP can make automatic changes to the application delivery infrastructure in order to continuously maintain SLAs in a multi-tenant cloud.

Application Availability: Avi Networks CADP is a fully featured load balancer with support for L4–L7 protocols including SPDY/HTTP 2, a comprehensive suite of load-balancing algorithms including patented Avi ServerSaver™, session persistence, server monitoring, and content switching/rewrite features, as well as a policy-based L4–L7 rules engine.
Application Security: Avi CADP offers high-performance SSL termination capabilities with support for Elliptic Curve Cryptography (ECC)-based Perfect Forward Secrecy (PFS), Strict Transport Security, SSL server re-encryption, DDoS mitigation, access control, client tracking, protocol validation, and connection and throughput-based rate-control features.

Application Acceleration: Avi CADP is a full TCP proxy with an optimized TCP stack, and supports TCP and HTTP connection multiplexing, compression, and content-caching capabilities. With SPDY/HTTP 2 support, mobile users benefit from accelerated application performance, even with legacy applications.

Multi-Tenancy: Avi CADP is fully multi-tenant. Avi Controller runs in the OpenStack administrator context and manages the Avi Service Engines in each of the tenant contexts to provide application delivery services. Avi Controller enforces strict control-plane and data-plane isolation to guarantee SLAs for each tenant.

- Data-plane isolation: Each tenant gets a dedicated group of SEs, which are auto-provisioned based on the tenant’s policies. Each tenant can independently scale its application delivery and analytics services without affecting performance of other tenants.
- Control-plane isolation: Each tenant gets complete policy control over and visibility into its applications. Within each tenant, role-based access control further limits the access of different users.

3. Guarantees at Scale: Elastic, Self-Serve, and Adaptive Solution

Challenge
As more applications are deployed across multiple tenants, guaranteeing SLAs requires an intelligent and fully automated as-a-service model. The legacy solutions, with a device-centric operational model, are not suitable for large-scale cloud deployments:

- Traditional models have long wait times for installation and configuration. As a result, when there are increases in application scale, user demand, or resource availability, the legacy solutions get in the way of IT agility. The problem is exacerbated because each device needs to be individually configured, managed, and troubleshooting in case of failures.
- Today, application visibility and application delivery are two completely siloed worlds with different teams and their various tools. The task of taking the outputs of application visibility and applying the necessary changes to application delivery is still a manual process, making the solution error-prone, unreliable, and expensive, especially at large scale.

Avi Networks Solution
Avi Networks CADP, with the HYDRA architecture, offers an intelligent application delivery and analytics-as-a-service solution with elastic scaling, self-service automation, and adaptive optimization capabilities to guarantee SLAs in a large-scale, multi-tenant OpenStack cloud.

Closed-Loop Application Delivery: Avi CADP constantly analyzes the end-to-end application environment and uses the analytical insights to dynamically adapt application delivery services.

Auto Placement and Migration: As applications are added, Avi Controller automatically places virtual services (VIPS) on the SEs based on application SLAs and infrastructure resource utilization. As more applications are added and their load changes, Avi Controller automatically rebalances the workload by migrating the VIPS to more optimal locations.

AutoScale: Avi Controller continuously monitors performance and resource utilization, and automatically adds new SEs to increase performance. AutoScaling allows both individual application performance (VIP throughput) and overall system performance to scale linearly with new SEs. AutoScaling simplifies capacity planning and eliminates overprovisioning of application delivery services.

Single Point of Control & Management: Avi Controller is the single point of control, management, and integration for any number of tenants, applications, and users, allowing practically unlimited scalability for OpenStack cloud. Avi Controller itself is a multi-node, active-active cluster, eliminating any single point of failure.

N-way active redundancy: Avi provides not just Active-Standby or Active-Active High Availability, but also N-Way Active redundancy to ensure availability not only at server or rack level, but also at a data center level.
Conclusion

Avi Networks Cloud Application Delivery Platform (CADP) was designed from the ground up to thrive in an OpenStack cloud environment. As enterprises and Cloud Service Providers struggle to take OpenStack from their pilot/lab environments into production deployments, Avi Networks CADP fills in critical gaps for application delivery, security, acceleration, and real-time visibility and analytics services. With a unique analytics-based and distributed architecture, Avi Networks CADP enables enterprises and CSPs to:

1. Get real-time visibility into application performance and end-user experience
2. Ensure availability, security, and performance SLAs for business-critical applications
3. Guarantee the SLAs at scale and achieve dramatic improvement in operational efficiency

For more information on Avi CADP, go to https://avinetworks.com. To start a free trial, go to https://tryavi.com.

About Avi Networks

Avi Networks, is the Cloud Application Delivery Company. The Avi Networks Cloud Application Delivery Platform (CADP) brings the benefits of hyperscale application delivery to enterprises at any scale. With a unique analytics-driven and distributed application delivery architecture – HYDRA™, the Avi Networks solution guarantees end-user application experience for on-premise and cloud-based applications. The company’s founding team has previously delivered products that today run in over 80% of the world’s data centers. Avi Networks is backed by Greylock Partners, Lightspeed Venture Partners and Menlo Ventures. Please visit us at www.avinetworks.com or follow us on twitter @avinetworks.