

Carrier Scale Visibility & Monitoring

Visibility and monitoring of Service Provider networks are key components of the feedback loop for maintaining high levels of service and customer retention, while providing valuable security information ensuring the efficacy of these networks. Due to the rapid consumption of 100G links, carriers have been challenged in scaling the critical feedback loop due to the low density and high cost of legacy packet broker platforms, risking loss of visibility.

The accelerated speed transition to 100G happened due to factors, such as 3rd party content caching, service provider based content/application streaming and NFV services. These new services dictate that the bulk of the bandwidth is shifting from a few large Internet peering points to many Central Office links. At the same time, regional access networks such as GPON, DOCSIS 3.1 and mobile networks are rapidly driving link bandwidth through 25G to 100G. The result of distributing content and applications as close to the customers as possible is driving a distributed datacenter model based on proven cloud-scale architectures. This ensures that the delivery of services and applications is more efficient and scalable, yet it puts enormous pressure on the carrier's ability to properly monitor these new networks. The current visibility and monitoring framework has not kept up with these infrastructure transformations and is mired in legacy technologies.

Carrier Specific Visibility Requirements

Providing visibility and monitoring at 100G links speeds requires solutions to scale in multiple dimensions, while keeping the corresponding cost down. A capable 100G monitoring solution must provide:

- **High Performance Monitoring:** Aggregation of 100G digital/mirrored and physical taps with line rate mirroring of the applications and customer traffic, including flow export in hardware for trending analysis
- **Custom Filtering Capabilities:** Custom filtering capabilities to track specific application traffic flowing as part of overlay traffic, using truncation, header stripping, frame offset filtering, and/or time-stamping
- **Real-time Telemetry:** Aggregation of events from dense 100G platforms to build on modern analytics framework and overcome SNMP's shortcomings for 100G platforms
- **CapEx & OpEx Efficiencies:** A merchant silicon based solution ensuring port costs are disruptively low. The use of common 100G forwarding and visibility platforms provides reduction in hardware and software certifications (which make up a large part of a service provider operational budget), additionally providing a consistent operational model with increased efficiency of local sparring inventory.

Arista Solution for Carrier Grade Visibility & Monitoring

Arista offers a new approach to TAP Aggregation that delivers security, availability and data analysis for high-density, non-blocking 10/25/40/50/100GbE networks at any scale – all powered by Arista EOS® software, delivering an order of magnitude improvement in the economics of building cloud-scale visibility.



Figure 1: Arista 100G DANZ Portfolio

High Performance Monitoring

The Arista DANZ portfolio makes it possible to cost-effectively and losslessly monitor all service provider datacenter and WAN network traffic, while capturing and analyzing only the traffic that is needed. DANZ is a precision visibility architecture that can scale to thousands of access points and hundreds of terabits bandwidth. With increased cost efficiency, service providers can then increase the visibility of data in the network.

Arista CloudVision® provides real-time visibility into thousands of entities in a network, while Arista's DANZ provides precision visibility for selected traffic, to monitor and record in real-time without packet loss, corruption or distortion.

In addition, for traditional deployments using sFlow, the Arista 7280R universal leaf and 7500R series universal spine support accelerated sFlow with high rate sampling up to 1:1000 across all ports providing advanced network monitoring and traffic engineering solutions with granular control. For the new high performance 100G fabrics, a high sampling rate is required to provide a robust visibility solution compared to the legacy solutions.



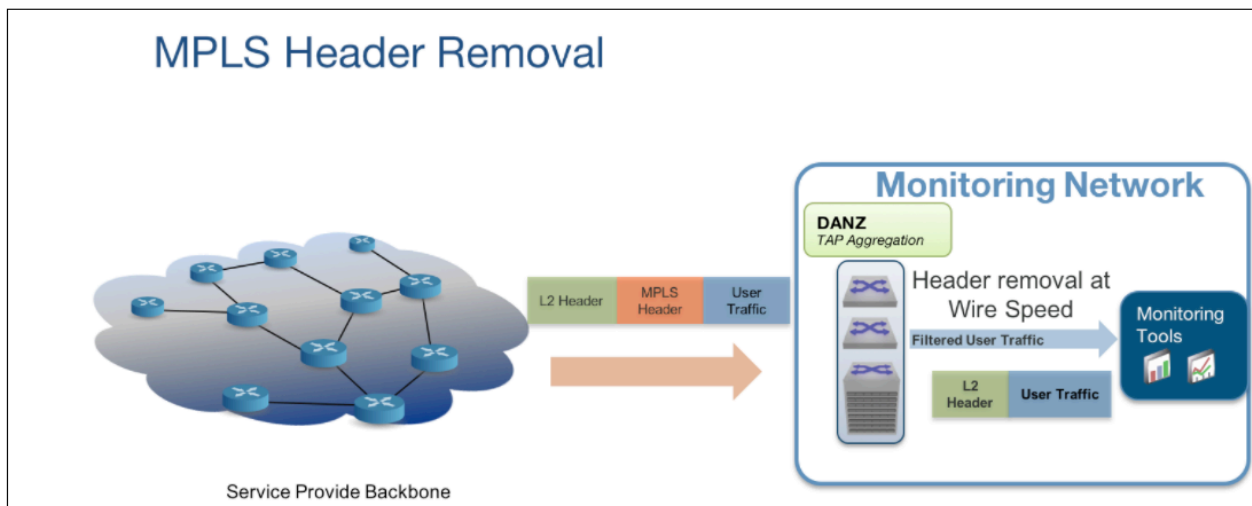
Figure 2: Arista TAP Aggregation Manager

Custom Filtering - TAP Aggregation for Application Visibility

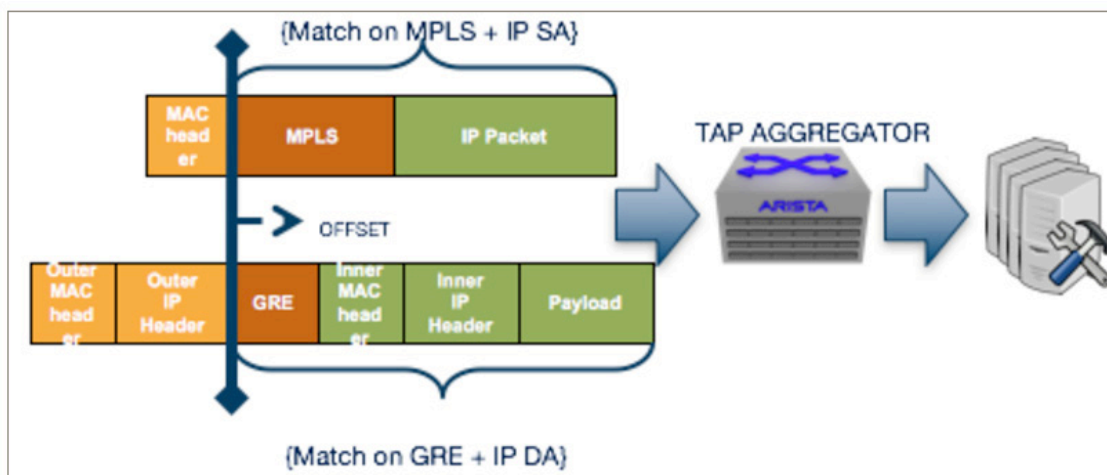
Providing high-scale, 100G dense TAP Aggregation is now a requirement and must not come at the expense of lack of packet broker features or high cost. Service providers need to apply a single TAP Aggregation solution to multiple diverse areas of the network including datacenter switching, MPLS WAN links and mobility backhaul links.

Some examples are:

1. MPLS network monitoring with filtering and header removal. Traffic from physical TAPs on a provider backbone will typically have MPLS tags that may need to be removed before the tool software can properly analyze the data. However, this also needs to be combined with IP and MAC filtering at the aggregation layer to deliver targeted information.



- Advanced Custom Filtering - Ability to look deeper into the packet header (ex. MPLS or GRE) for complex policy decisions, while retaining the original packet. In this case, a service provider may desire to retain the MPLS tag structure for QoS or VPN identification, but it still requires a fine grained IP, MAC or VLAN based filter that looks into the header without removing the encapsulation.



Real-Time State Telemetry & Buffer Analysis for Device Visibility

The ability to access network state in real time has now emerged as the next indispensable piece of the visibility puzzle, replacing the arcane SNMP environments that have served network operators over a number of years.

The SNMP model of constantly polling devices to retrieve limited state is expensive for both the device and the collector. Instead, the collector needs to be able to subscribe to the device's state, so it can be notified as soon as that state changes. This also enables the collector to react significantly faster, typically a few milliseconds after the value of interest has changed, rather than calculating the difference in the next collection interval (which is typically several seconds later, or often minutes away). The support of vendor agnostic models such as openconfig, for requesting telemetry data, is also important to providers who typically operate multi-vendor networks.

Service providers also require real-time latency and buffer analysis to provide early warning and fine grain reporting of transient congestion events and microbursts that occur under bursty or heavily loaded conditions (even when traffic loads are not saturating links). The reporting of real-time queue depths at peak loads, along with start and end points of the congestion event, any resulting packet loss, and identification of devices and applications affected by the congestion, is invaluable for detecting content delivery issues.

All of this real-time state of network events is streamed instantaneously to CloudVision's central state database for both the Universal Cloud Network and the visibility infrastructure.

CapEx & OpEx Efficiencies

The R-Series platforms are part of the standard Arista datacenter offering and are based on the same cost effective merchant silicon and highly mature and resilient EOS software. The R-series platforms can be equally adapted to a pure TAP Aggregation solution or a standard high speed Ethernet datacenter environment. For this reason, the 7280R and 7500R systems have been adopted by many large service providers as a familiar and future-proofed design.

The Arista 7280R series universal leaf provides the greatest interface flexibility with 10/25/40/50/100GbE interfaces, for the highest performance environments. The “R” Series delivers rich layer 2, layer 3, EVPN, MPLS and segment routing features with wire speed performance from 1.44 Tbps to 10.24 Tbps, while the 7500R universal spine scales up to 150 Tbps. The Arista 7280R and 7500R Series offer a virtual output queue architecture combined with ultra-deep packet buffers that eliminate head of line blocking and absorb microbursts under sustained congestion and the most demanding application loads. The R-Series also provides double the amount of hardware resources for storing visibility policy over the previous generation and brings the capability of 100G monitoring starting in a 1RU form factor.

Centralized Management with CloudVision Portal

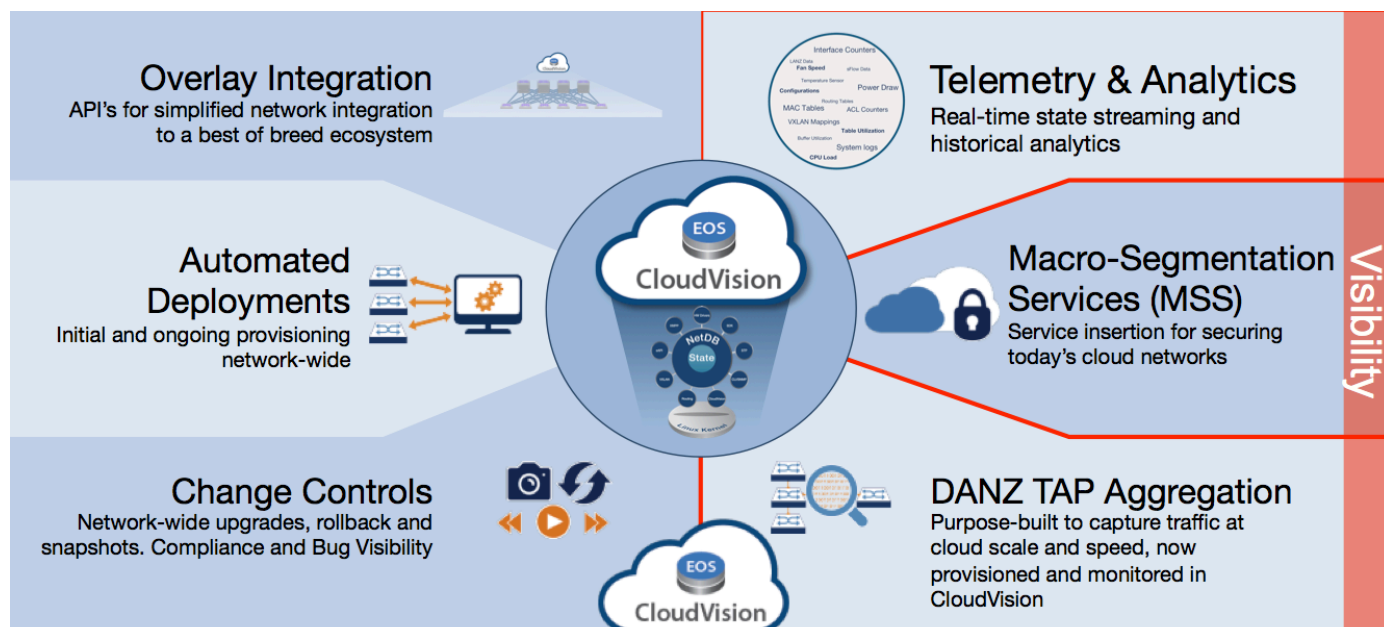
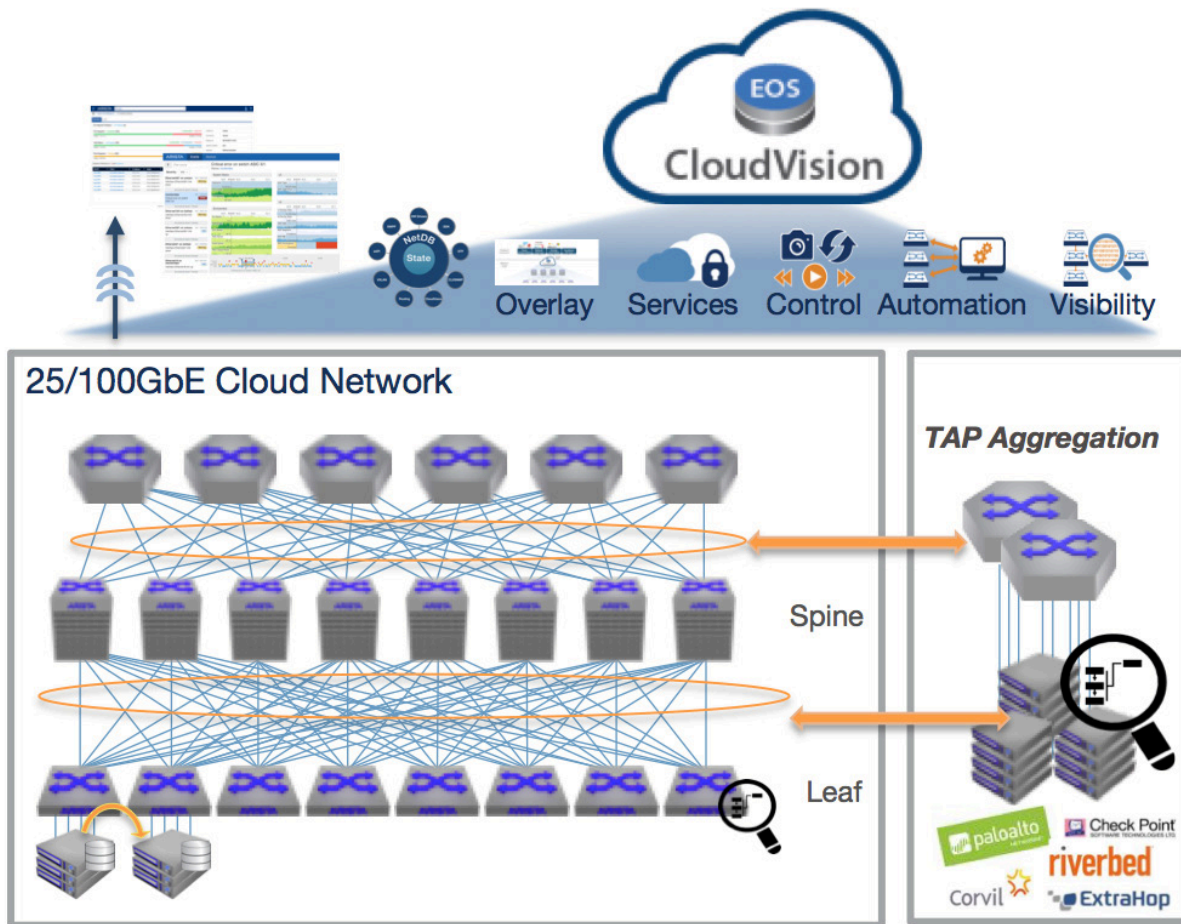


Figure 3: CloudVision, Multi-Function Platform Focused on Visibility

The Arista TAP Aggregation solution can be centrally managed through the CloudVision portal, which provides a role based stakeholder access and single pane of glass to TAP Aggregation configurations, a key requirement in a service provider environment. With CloudVision, network operators can leverage Zero-Touch Provisioning & Replacement (ZTP/ZTR) to manage the entire lifecycle of a fully-automated visibility network. Change control management provides powerful capabilities for managing and automating changes to configurations, software images and scripts across EOS devices in any network role. CloudVision also provides a central point of management to view, configure and monitor Arista TAP Aggregation devices.

Conclusion

Service providers are in the midst of large network transformations towards 100G as it relates to applications, content and services to their customer base. Carrier-grade visibility and monitoring of those networks incorporates a number of critical requirements that simply cannot be addressed by point solutions like network packet brokers or other legacy technologies. End-to-end visibility for today's network starts with embedded instrumentation at the device level, extending visibility into workloads across hybrid environments at any scale and real-time monitoring and analytics for the entire service provider network.



The Arista EOS state sharing architecture is a proven foundation in high-scale production monitoring networks, with a primary focus on software quality. Along with the R-Series as a DANZ visibility platform and CloudVision, service providers now have a modern solution for monitoring cost-effectively, conducting continuous and precise analysis at scale, and providing key information metrics on how services are being delivered in the next generation central office and datacenter.

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