Performance Assurance, Network Applications

Solutions for Wireless Operators, Service Providers & Large Enterprises

A short introduction to Accedian solutions and how service providers & enterprises use them to maintain peak performance in their networks.

Performance Assurance • Network Applications

Accedian solutions cover all QoS-critical network performance assurance applications. Their rich feature sets spans the full service lifecycle from activation to ongoing monitoring and optimization.

High-capacity performance actuators and elements, pluggable modules and virtualized instrumentation interoperate with standards-based network elements to segment and assure QoS from core-to-edge.

Interoperable, programmable and scalable, Accedian performance automation platforms orchestrate testing and monitoring to accelerate deployment, deliver granular performance monitoring, and openly interface the most comprehensive view of real-time KPIs - the Network State+ - to SDN, NMS and performance reporting platforms.

Accedian solutions are used to assure mobile backhaul and small cell performance, business services and financial networks, data center connectivity and inter-site transport optimization – applications where differentiated QoS drives growth.
Small cells come with significantly different deployment challenges than macro cells, but require the same or tighter performance. The backhaul transport and processing latency introduced by added hops and diverse technologies can easily exceed allowable delays for cell timing sync, voice and control plane traffic if the backhaul is not carefully designed and monitored. With this tighter operating envelop comes the sheer volume of small cells that must be deployed, and the fractional contribution each makes to revenue. This means greater reliance on wholesale backhaul, including shared Small Cells-as-a-Service (SCaaS) offerings.

Installation, configuration, service activation and optimization need to be nearly zero-touch, and need to be done right the first time. CapEx and OpEx pressures on small cell deployments demand it.

Small cells’ extended backhaul and dynamic traffic patterns can quickly introduce service affecting latency if not carefully monitored.

Small Cell & Mobile Backhaul Performance Assurance

Accedian’s standards-based, multi-vendor interoperable solutions have small cells and mobile backhaul performance covered. Virtualized instrumentation and NFV-enhanced pluggable Nano & ant Modules™ extend standards-based+ QoS visibility to small cells and edge-aggregation points, addressing performance assurance CapEx concerns without compromise.

Service Activation Testing

Automated service activation testing (SAT) significantly accelerates small cell deployment, keeping OpEx to a minimum with zero-touch, Plug & Go™ triggered tests for QoS-assured contractor or customer self-install. Centrally controlled test traffic generation directly from cell sites gives the most realistic backhaul performance benchmarking. There’s no need for expensive test sets or costly on-site visits.

Performance Monitoring

Open and programmable, Accedian’s one-way, microsecond-precise measurements offer sub-second sampling for the most granular view of network health available: Network State+™. Monitoring all service paths including critical inter-cell communication, Ethernet & IP layer metrics are augmented by derived statistics and VoLTE QoE metrics in real time. The SkyLight™ API interfaces Network State+™ metrics with leading 3rd party platforms for reporting and visualization, and as input to dynamic performance optimization applications.
Business Services • Performance Assurance

Accedian solutions fully assure Ethernet & IP business services’ QoS with standards-based turn up benchmarking, real-time performance monitoring and unmatched bandwidth performance optimization.

Establish
Metro Ethernet Forum (MEF) certified performance elements establish the lowest-latency Ethernet Virtual Connections (EVCs) with hierarchical QoS (H-QoS) enforcement at customer, colocation and core sites. Performance elements support G.8032v2 Ethernet rings for resilient aggregation applications.

Activate
With Accedian units' Plug & Go™ zero-touch provisioning, programmable service activation testing can be automated to follow established provisioning workflows with centralizing report generation and storage. RFC-2544 / Y.1564 layer 2 & 3 turn up tests can be triggered upon install, or scheduled for batch execution, accelerating service deployment with performance-assured customer self-install.

Monitor
Real-time, per-flow, µs-precise performance monitoring can resolve and report millisecond-level micro-bursts, one-way latency, utilization, delay variation, packet loss and availability. Easily integrated into performance, management and SDN platforms using the SkyLight™ API, Network State+™ metrics provide the most comprehensive view of end-to-end QoS for SLA reporting, planning, optimization and fault isolation.

Optimize
Accedian’s 1ppm packet processing delivers the smoothest micro-shaping in the industry - with no impact to priority flows. Tame microbursts and improve TCP throughput up to 800%. Differentiate services with QoS-optimized off-net and data center connectivity.

Extend
NFV-based SFP and GbE performance modules extend distributed turn-up testing and performance monitoring to branch offices connected over broadband. MSOs and ISPs can now deliver premium, SLA-assured business services to small and medium enterprise sites, and offer last-mile connections to service providers seeking reliable wholesale access.
**Business Services, vCPE • An Overview**

As managed services may employ a number of appliances at the CP – a router, network interface device (NID), firewall, SIP PBX, etc. – Virtualized Network Functions (VNFs) can provide a competitive edge. Simplifying the CPE saves capital as well as OpEx related to installation, maintenance, troubleshooting and orchestration between appliances.

Service providers often refer to the virtualization of functions performed at the CP as a ‘virtual CPE’ strategy. Although approaches and definitions vary, it’s clear that on-site, provider-owned equipment won’t completely vanish into the cloud. Some form of CPE is required to provide service demarcation, OAM and QoS mapping functions, and to deliver what ‘merchant silicon’ and software can’t deliver: precise packet time stamping for latency and delay variation measurements, scheduling for seamless test-traffic generation, traffic filtering and policing.

In general, the vCPE implies virtualizing as many CPE functions as possible, replacing racks of equipment with the minimum hardware required to establish, monitor and maintain the service. Areas targeted for virtualization include most layer 3-7 functions (e.g. NAT, routing, DPI, etc.). With these centralized in provider-owned NFV Infrastructure (NFVI: a datacenter or device capable of hosting virtual machines (VMs) and therefore VNFs), the service provider gains significant economy of scale, simplified management, extensible shared compute resources, increased reliability, and many other advantages.

**vCPE Architectures**

The most common vCPE approaches seek to virtualize layer 3 networking and higher layer functions, separating the IP demarcation point from the layer 2 edge - which remains at the customer premise. Offloaded functions can be assigned to other network elements such as aggregation or edge routers, or may be deployed as Virtual Network Functions (VNFs) hosted in aggregation sites, x86 blades in core routers or centralized in data centers. With routing functions displaced from the customer premise, layer 2 broadcast domains extend directly to the customer equipment (CE); it’s critical that Ethernet OAM and layer 3 performance monitoring (e.g. TWAMP) extend to the vCPE to maintain last-mile visibility.
Ideally, the vCPE should also be able to map VLANs, set layer 2 & 3 flow priorities, filter and police outbound traffic to ensure performance-sensitive application requirements are respected between the vCPE and VNF-hosting locations (the NFV Infrastructure, NFVI).

With VNFs handling many network functions, providers realize the benefits of accelerated, simplified service chaining, application deployment and policy enforcement. If the vCPE also includes automated provisioning and Service Activation Test (SAT) functionality, the provider also benefits from truck roll-free customer self-install and automated SLA validation.

Where to Virtualize? NFVI Location & Performance Considerations

VNFs can be hosted pretty much anywhere a provider has equipment: from the vCPE itself to network elements or servers in the access, edge or core, to centralized, large-scale data centers.

In general, most virtualized functions have little effect on service performance. Network Address Translation (NAT), firewall, and other session-based applications are well suited to centralized NFVI. As a general practice, VNFs are ideally hosted in data centers and locations closer to the core, when latency requirements permit. Hosting directly at the customer premise is rarely a choice that leads to scale, security and efficient NFV management and chaining.
vCPE Options

From Programmable Elements to Virtual Instrumentation

Accedian offers traditional network interface devices (NIDs, a.k.a. Performance Elements) and NFV-powered Modules to address common vCPE installations. Based on a programmable FPGA architecture, both form factors are ideal for low-latency services and precision SLA assurance, covering layer 2 and 3 demarcation functions, full support for layer 2 service OAM (Y.1731), layer 3 TWAMP performance monitoring and per-flow utilization metering. They also support integrated RFC-2544 & Y.1564 Service Activation Testing with multi-flow traffic generation, line-rate loopback, service test sequence automation and reporting.

Network Performance Elements (NIDs), ideal for multi-tenant installations, also include layer 2-4 traffic filtering, QoS mapping, and MEF 10.3 certified hierarchical bandwidth policing (H-QoS). With multiport, switch-free aggregation, the industry’s fastest micro-shaping and integrated remote troubleshooting tools, Accedian Elements have been a preferred CPE solution for nearly a decade.

Nano smart SFP and GbE ant Modules employ NFV to offer the same suite of performance assurance features. When orchestrated by the SkyLIGHT™ VCX – a virtualized performance assurance VNF – Modules also offer layer 2-4 traffic conditioning functions. With the smallest possible footprint, Accedian Performance Modules are the most cost-efficient, performance-optimized vCPE solution for direct fiber and broadband business service connections.

A mix of Modules and Elements can be seamlessly managed, right-sized to each site’s unique service assurance requirements. Both feature Plug & Go™ auto provisioning, realizing the highest-possible operational efficiency with customized workflow automation, tailored to a providers’ existing deployment practices.
Eliminating truck-rolls and long, technical installs, Accedian solutions uniquely allow operators to perform in-service testing, without waiting for maintenance windows to troubleshoot and isolate service issues. A range of components address all corners and cost points in the network, delivering ubiquitous instrumentation & QoS visibility.

Financial Services • Network Performance Assurance

Accedian assures the performance of some of the world’s largest financial networks, where inter-site and exchange access connectivity require ultra-low latency, near-zero packet loss and reliable throughput without compromise. Automated, distributed Service Activation Testing ensures links meet performance SLAs from the moment they are commissioned.

Accedian understands that in trading, time is money. Our solutions for service providers and financial institutions offer 10ms micro-burst detection and µs-precise, one-way latency measurements. With per-second reporting, it's the most granular performance monitoring available. Featuring 50+ real-time metrics and derived statistics, Accedian’s Network State+™ gives a complete end-to-end QoS feed that openly integrates with leading network management, SDN optimization, performance reporting and other platforms.

Financial Services • Network Coverage

Accedian’s unique fast-sampling FS element’s FlowMETER™ technology detects micro-bursts while providing per-second KPIs in real-time via the Vision Collect module. GbE and 10GbE FS models provide coverage from the largest trading sites & colo facilities to smaller branch offices. Units have been deployed in global financial services firms, installed in over 100 countries, to assure market information transmission and trading transaction performance over large scale WANs.
IP Core Monitoring

Accedian core-to-edge QoS monitoring to Accedian Elements, Modules, Agents and standards-based network elements easily extends to assure the IP core. Continuous layer 3 TWAMP (Y.5357) performance monitoring sessions can be established between actuator pairs. Dual-gateway support allows multi-flow test sessions to concurrently validate redundant paths.
Service Provider SDN

User-Defined Network Cloud Services & vCPE

SDN controllers with customer self-service apps allow enterprise virtual network connections to be established or changed in near real-time. But services defined over virtual networks, supported by Virtual Network Functions (VNFs), over ever-changing, shared physical infrastructure introduces many new factors that can affect performance.

By integrating Accedian’s distributed, programmable, non-disruptive Service Activation Testing (SAT) into user-driven service setup and chaining, both the operator and customer know that performance meets expectations – and SLAs – as soon as the service is up – no downtime or maintenance windows required.

With pluggable modules the customer can self-install into their own CPE, providers gain end-to-end service QoS visibility at turn up, as well as standards-based+, real-time performance monitoring and reporting – no truck roll required. By instrumenting the virtual customer edge (vCE), providers can shift to cloud / virtual CPE (vCPE) architectures with confidence. Triggered performance benchmarking and monitoring help deliver the promise of SDN & NFV-based services: dramatically reducing OpEx and time-to-revenue, without compromising QoS.
Data Center Connectivity

Cloud customers rely on low-latency, consistent data center connectivity for hosted storage, applications and desktops. The cloud provider’s services are perceived through the performance of these connections.

Connectivity Performance Assurance

Enterprises and cloud-providers both benefit from assured performance. Service providers delivering connectivity can differentiate offerings when exceptional quality of service can be guaranteed and reported on customer portals. With the ability to validate the service at activation, then monitor performance in real-time, Accedian solutions fully assure the dynamic cloud connectivity service lifecycle.

Cloud connections increasingly traverse virtual networks, employing virtual network functions (VNFs) and shared physical infrastructure, orchestrated over a hybrid mix of legacy and SDN-aware network elements. Performance can shift or degrade, subject to interfaces, interoperability and dynamic changes within layers of virtualization in the network. Accedian solutions provide a comprehensive QoS view, segmenting physical network performance to allow operators to quickly isolate issues, from both physical and virtual vantage points.

Bandwidth Performance Optimization

TCP traffic limits usable capacity and easily impacts latency with burst retransmission and TCP window reduction. Intolerant to overage, policed connections discard excess packets, resulting in buffering delays and decreased ‘willingness to transmit’ both uplink and down. Accedian’s micro-shaping is the fastest available, with 1ppm, per-packet processing in programmable hardware. With true Zero-Impact to latency-sensitive flows, hierarchical prioritization maximizes bandwidth use over all service classes. The results are dramatic: micro-bursts are tamed, and actual throughput can be improved by up to 800%, depending on traffic mix. A simple, single-ended solution: micro-shaping is the ultimate WAN-optimization approach, at a fraction of the cost of dedicated appliances, and no far-end equipment required.

To learn more about our solutions and the components that they are built from, please visit our resource library at Accedian.com

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