SkyLIGHT™ VCX Controller

Full test set functionality in the smallest possible form factor.

Beyond Loopbacks

SAT

wire-speed test traffic generation

Beyond Reflectors

PM

full mesh, one-way performance monitoring

Beyond Counters

BW

granular per-flow bandwidth metering

Beyond Guessing

all-layer visibility: lossless remote capture

Leading the Virtual Instrumentation Revolution

SkyLIGHT™ VCX Controller is the industry's first performance assurance controller employing Network Function Virtualization (NFV) to bring advanced monitoring capabilities network-wide, without the need for expensive, high-end test equipment.

This radically more efficient approach to network performance monitoring combines all the benefits of virtualization without compromising test speed or precision. By eliminating key cost, scalability, and coverage barriers to network performance visibility, service providers can now more cost-effectively ensure a better quality of experience (QoE) for users.

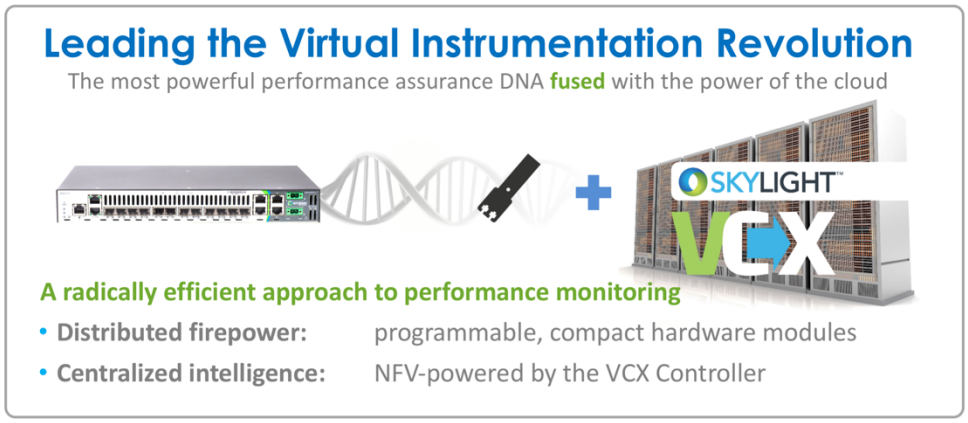
The VCX Controller works together with Accedian's Nano smart SFP (optical transponder) and compact gigabit Ethernet Modules to deliver multi-flow traffic generation and ability to monitor the performance of thousands of flows. The Modules are easy to install and cost up to 90% less than existing solutions, enabling service providers to realize the significant capital and operational efficiencies promised by an NFV architecture, while their customers benefit from a fully assured network.

Designed to fit seamlessly into a service provider's existing infrastructure and operational practices and procedures, the VCX Controller uses the same interfaces as Accedian standalone solutions to interoperate openly with standards-based network elements, management platforms, analytics platforms, and more.

The result combines centralized control with distributed firepower. This approach is unique in its scalability, and its ability to openly interface network-wide intelligence with existing infrastructure, management, and control platforms.

Don't Promise Performance. Deliver It.

The SkyLIGHT VCX Controller offers enhanced network performance, Quality of Service (QoS) and Quality of Experience (QoE) visibility—at a fraction of the cost of traditional solutions. Applications as diverse as virtualized customer premises equipment (vCPE), mobile network monitoring, and financial services transaction assurance can all be implemented simply, quickly, and ubiquitously.



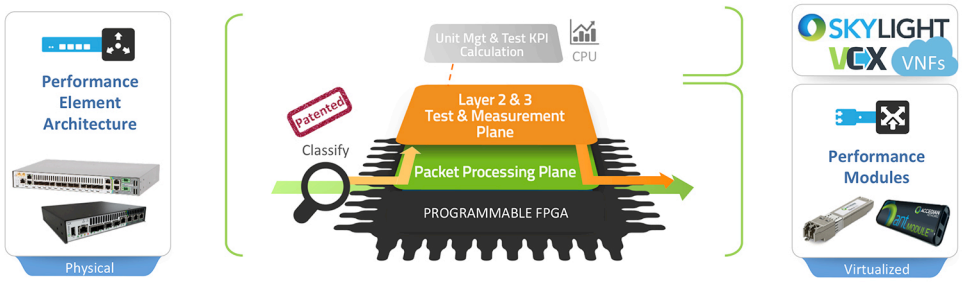
Virtualize Without Compromise

With performance assurance virtualized network functions (VNFs) powered by the VCX, hardware modules surpass the capabilities of standalone network interface devices (NIDs) without sacrificing performance or precision. Accedian Modules offer more wirespeed processing power and precision than network elements many times their price. Imagine thousands of performance monitoring sessions managed by a single module, with microsecond precision and no impact to inline traffic. It's available today.

Virtualized Performance Assurance

The VCX Controller was crafted from the code, packet processing technology, and over forty patents that Accedian introduced to transform vanilla network interface devices into fully capable Network Performance Elements.

Virtualizing these exceptional devices was a natural process. Accedian's engineering team migrated management, test control, and results processing functions—already running on Linux on each Element's CPU—to a centralized controller, while porting wirespeed processing to the latest generation of FPGA[1] programmable processors employed in Accedian modules.



In this way, the VCX Controller assumes "CPU functionality" for thousands of Performance Modules, each acting as a "remote port." The VCX also maintains synchronization information for each endpoint, permitting highly precise one-way measurements over a variety of remote locations.

Each Module can perform service activation testing (SAT), traffic conditioning, standards-based OAM, and performance monitoring (PM) under the control and command of the VCX. Accedian's patented dual-plane packet processing architecture is retained in the Module design, allowing these miniaturized devices to generate full line-rate test traffic, and maintain thousands of PM sessions per unit. The result encompasses the functionality of Accedian Performance Elements and PM Actuators in the smallest possible form factor, at a fraction of the cost.

Each module is a virtualized "port" with local wire-speed processing

Easy Operations Integration

Modules become the data plane extension of the VCX Controller, which otherwise appears to be a single Performance Element with each port representing a deployed Module. The web interface, command line interface (CLI), and other attributes are nearly identical to Accedian Performance Elements, simplifying the migration to virtualized Modules and ensuring uniform management of mixed deployments.

The Performance Assurance Specialists

Accedian Performance Elements are installed worldwide to establish, enforce, and assure network performance.

Over 300,000 service endpoints, in hundreds of service provider networks, rely on Accedian hardware to deliver the best possible quality of service.

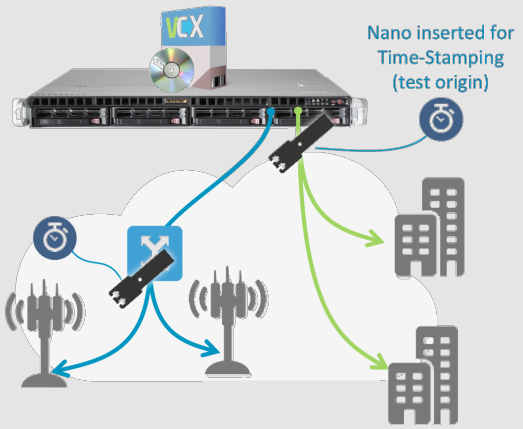
We built the VCX on expertise gained by working closely with operations, product, and technology teams at these leading operators.

[1] Field Programmable Gate Array

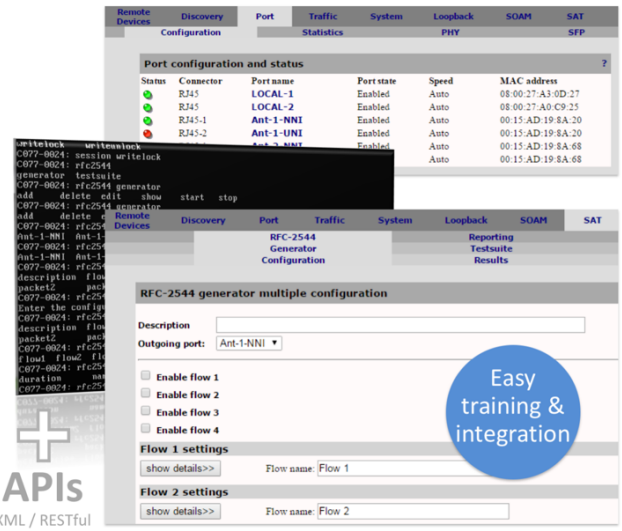
The VCX Controller as…
The Next Generation V-NID Actuator

The VCX acts as the next generation V-NID Actuator, providing higher capacity and flexible deployment options, while fully supported by existing V-NID Manager installations. In Actuator applications, one or more Modules are installed at the desired test origins, allowing a single VCX appliance to power multiple "virtual actuator" locations.

Service providers with V-NID Actuator probes installed in their networks can elect to upgrade their existing hardware to run the VCX, enhancing existing V-NID Actuator functionality and also enhancing its scalability. Ensuring existing operations are undisturbed, legacy V-NID Actuators can remain installed alongside VCX-based Actuators.



Example of COTS VCX Deployment
Each Module Acts as a Unique Actuator Test Origin



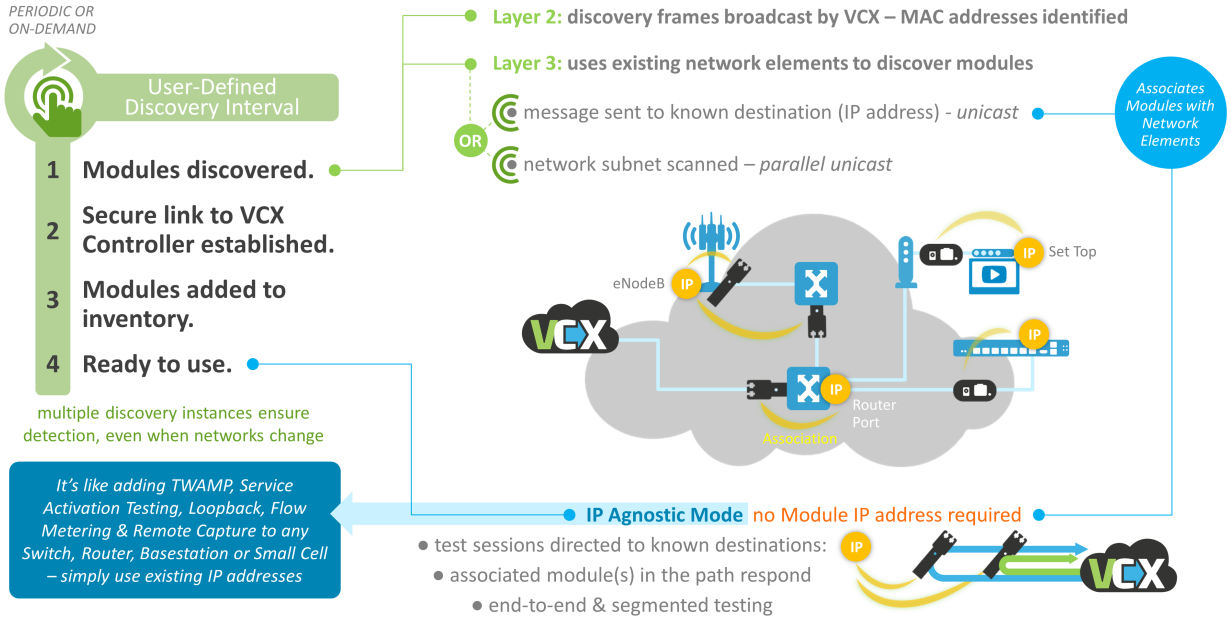
Service providers can continue to use existing management practices, platforms, and procedures without IT investment or retraining of network operations or field personnel.

Logging into the VCX, or controlling it with Accedian's proven CLI and SNMP interfaces, provides a familiar experience to personnel accustomed to deploying standalone vCPE hardware, and retains backward compatibility with scripts and procedures developed for Accedian Network Performance Elements (NIDs).

These standard interfaces are complemented by RESTful XML APIs to allow complete programmability and integration with existing analytics, fault management, NMS, and B/OSS systems.

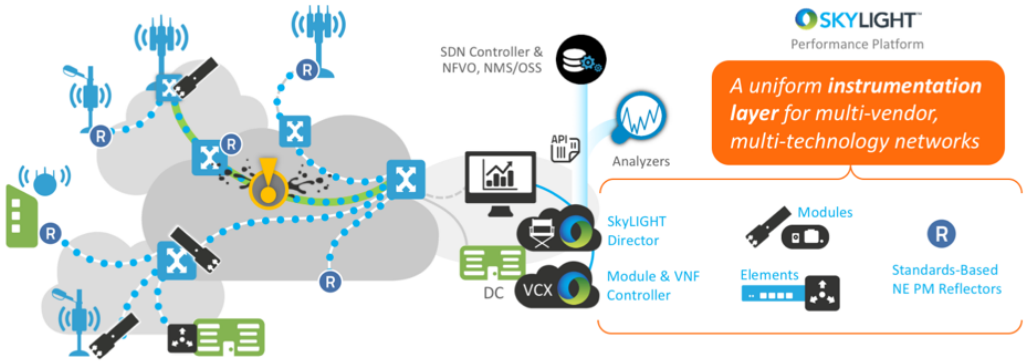
VCX-powered modules also feature the Plug & Go™ zero-touch provisioning functionality that was developed to support large-scale Element deployments over a wide range of network architectures and topologies. Zero-touch inventory management allows Modules to be discovered wherever they are in the network and put into inventory without operator intervention.

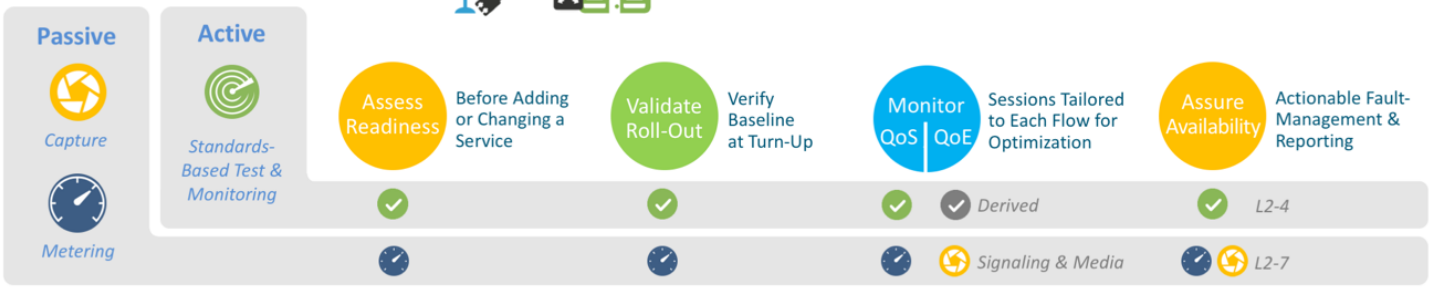
Plug & Go works over all existing Layer 2 and 3 networks, and supports all common addressing schemes, including DHCP-assigned and dynamic IP addresses. Modules also feature a patented IP-agnostic mode that "reuses" the IP address of a connected device.



Unifying Physical & Virtualized Instrumentation

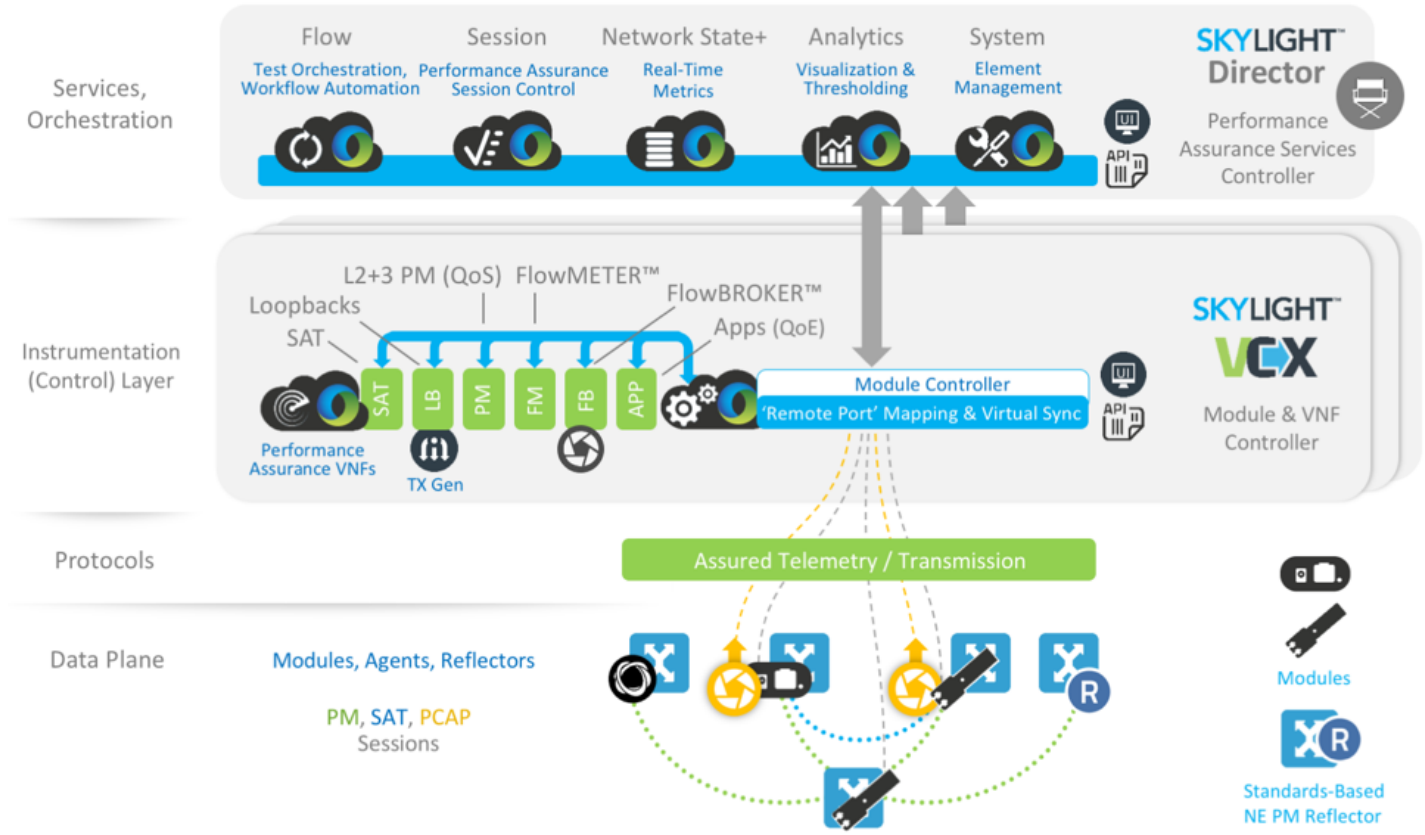
With its familiar interface and full interoperability with Accedian Performance Elements and Actuators, standards-based network elements, reflectors and software agents, Modules under control of the SkyLIGHT VCX cost-effectively contribute to network-wide performance assurance visibility over multi-vendor networks.





SkyLIGHT Performance Platform Architecture

The VCX Controller hosts critical management and virtualization functions within the overall SkyLIGHT architecture. Performance assurance VNFs are hosted within VCX Controller instances, permitting simplified chaining of functions as well as distributed NFV (D-NFV) hosting options.



Virtualization Speeds Innovation

The SkyLIGHT Architecture is the future of Accedian solutions. It's an innovation platform, easily extended with new Virtual Network Functions (VNFs) from Accedian and best-in-class vendors. VNFs can be developed rapidly, then transparently distributed by the VCX.

Accedian will continue to introduce exceptional new monitoring capabilities on this platform, covering application-specific QoE, lossless remote packet brokering, sync monitoring and delivery, SLA-assured web application delivery, and more. VCX Controller is future-proofed—join us for the journey.

Multiple VCX appliances, whether physical or virtual, can be controlled concurrently by the SkyLIGHT services and orchestration Director—a unified migration of Accedian's Vision EMS and the V-NID Manager, integrating the V-NID Analyzer application and Vision SP automation capabilities within a single platform. Director capabilities extend to orchestrate standalone Performance Elements and legacy V-NID Actuators when installed in a hybrid deployment, providing a harmonized open API and a "single pane of glass" interface to rapidly configure, automate, and visualize network performance assurance between diverse endpoints. A lossless telemetry method provides an assured, secure 'tunnel' to modules, carrying control and synchronization messages, as well as VNF-specific traffic and metrics for results processing.

Network Performance Modules

Accedian performance modules combine small footprint & pluggable hardware with NFV-powered test control, computation, and analysis to bring standards-based+ performance assurance to all corners of the network.

The Nano smart SFP and the GbE ant Module share the same programmable processor & NFV-based functionality

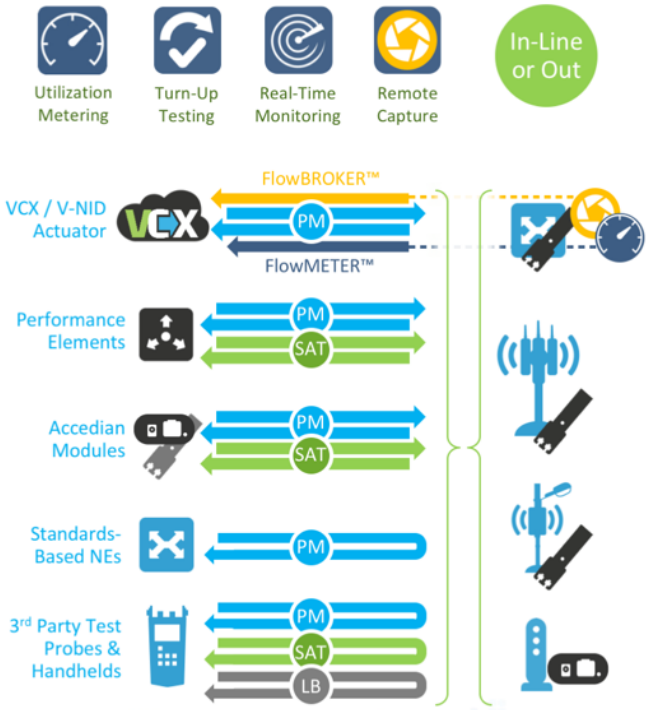
Segment and Extend Full-Service Validation & Visibility from Core-to-Edge

Modules are cost effective enough that they can be installed at all key points along the service path to provide per-hop as well as end-to-end service visibility. A patented segmented test method provides per-segment results using a single test packet, eliminating errors in calculated results measured from test sessions.

Right-sized for cost-competitive small cell backhaul, cost-competitive vCPE and broadband business services applications, modules are fully interoperable with third-party test probes and handhelds, as well as standards-based network elements supporting Ethernet OAM (Y.1731, 802.3ag) and Layer 3 TWAMP (RFC-5357) performance monitoring (PM) protocols.

Accedian modules provide one-way latency measurements with exceptional precision, along with path-segmented metrics for rapid fault isolation.

Adding a performance module to legacy and enterprise-grade network elements, small cells or cable, FTTx or xDSL modems adds Ethernet OAM and PM feature support bringing ubiquitous QoS visibility to every service edge. Units can be installed in-line or out, ensuring they are never a single point of failure when installed in critical network locations.

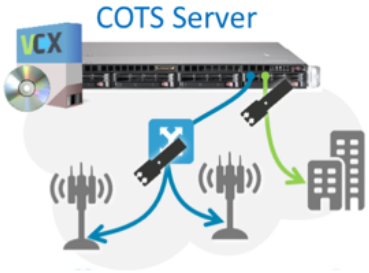


With multiple, programmable feature banks, new capabilities can be loaded into modules remotely to keep pace with evolving standards and new applications. As VNFs evolve, Accedian performance modules will deliver complete Layer 2-7 visibility, while providing hardware-assist for critical edge functions in the smallest possible package.

Scalable Deployment Options

The SkyLIGHT VCX can be deployed on hosted cloud resources running VMware ESXi or KVM hypervisors as a virtual appliance, or can be installed on commercial off-the-shelf (COTS) servers running the Ubuntu Linux O/S, offering providers a variety of highly scalable options that adapt to their existing compute resource strategies, including D-NFV deployment approaches. Accedian also offers a turn-key physical appliance version of the VCX Controller on company-supported and warranted hardware. These options, combined with support for distributed NFV deployment models, ensure capabilities scale economically as platform use increases.

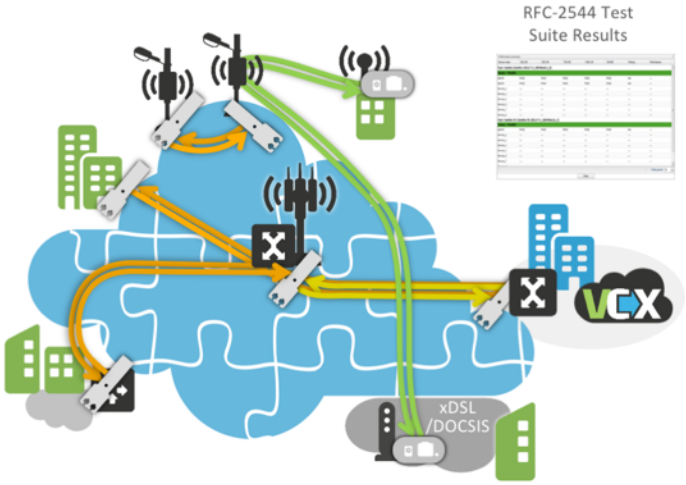
Accedian's unique assured telemetry protocol ensures that remotely installed modules can reliably communicate with SkyLIGHT control, VNFs, and management tools. Performance assurance session control and results are transmitted in a secure, lossless manner. This capability means that NFV-based functions offer the same integrity, granularity, and precision as physical, standalone instrumentation.

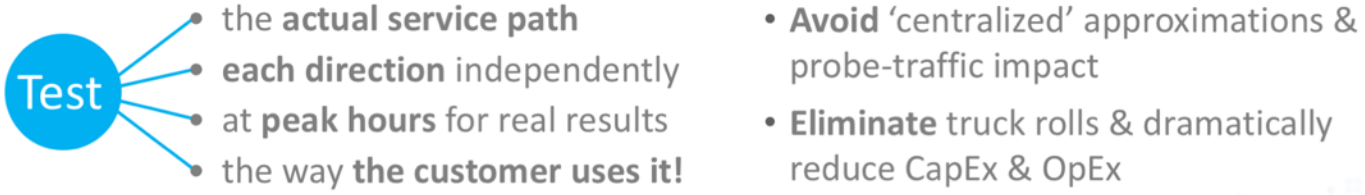


SkyLIGHT VCX Controller Applications

Service Activation Testing

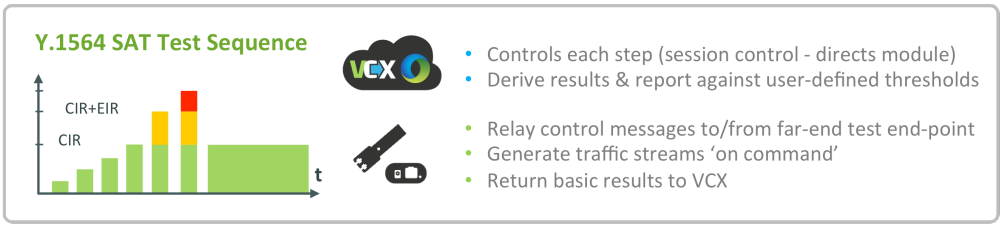
Unique to Accedian, Performance Modules are capable of full line-rate test traffic generation, able to create and analyze up to four unique flows, or run four concurrent RFC-2544 / Y.1731 service activation tests to multiple service endpoints. This allows service providers to test the actual service path at peak hours, without impacting the network more than the service itself would.



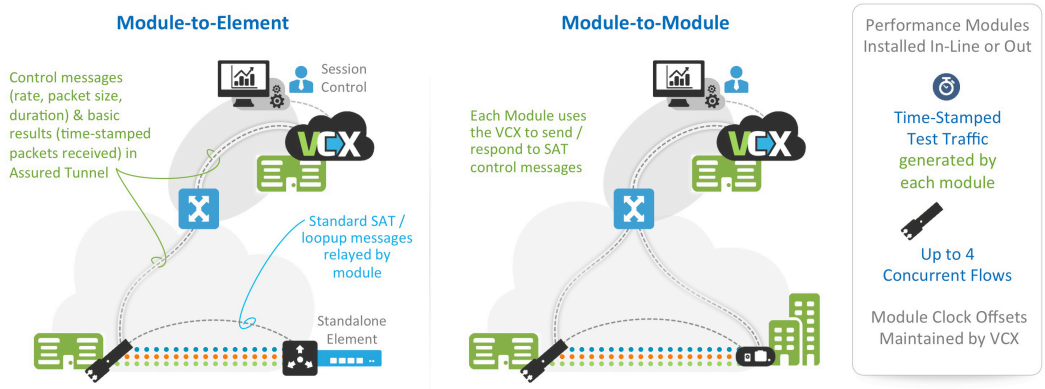


Distributed traffic generation can be easily orchestrated and automated by the SkyLIGHT Director platform or using an open API, permitting flexible site-to-site testing, on demand or triggered service validation and troubleshooting. Truck-rolls and on-site use of labor and test sets is eliminated with Modules customers can self-install, retained for their complementary performance monitoring capabilities once the service is activated. Limitations of head-end, probe-based solutions are also eliminated: high cost, network traffic load, scheduling limitations, and the inability to test directly between sites.

The VCX Controller assumes all session setup, control, and sequencing functions, as well as results analysis and reporting. Modules respond to traffic generation commands (rate, number of packets, flow characteristics) to conduct tests, and pass base-level metrics back to the VCX for results processing.



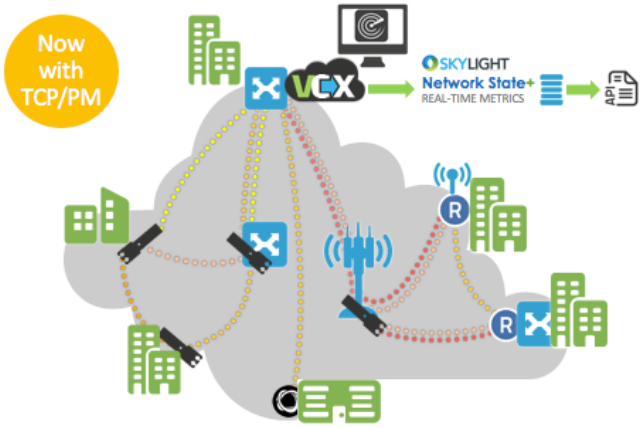
SAT tests can be conducted between a VCX-controlled Nano Module and a standalone Performance Element (vCPE)—or any other standards-compliant test set or NID. To the far-end test device, the Module appears the same as any other standards-based test endpoint. Any SAT protocol messages received by the Module are mediated by the VCX.

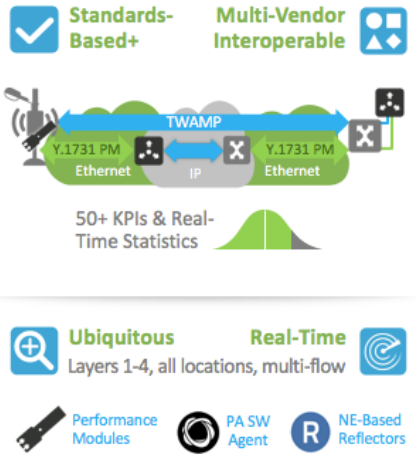


In a similar fashion, tests can be conducted between modules, with the VCX Controller acting as each Modules' CPU in the interaction. Modules can be installed in-line or out. One-way test results are realized by the virtualized synchronization feature of the VCX, which keeps precise clock-offsets between Modules to derive directional metrics.

Real-Time Performance Monitoring

Standards-based TWAMP and Service OAM (SOAM) performance monitoring can be conducted in real-time over multi-vendor, multi-domain, and multi-layer networks using any combination of Accedian Elements, Modules, software agents, and multi-vendor networking hardware supporting standards-based reflectors. Thousands of sessions can be maintained by a VCX Controller amongst its virtualized Modules. Real-time statistical derivatives of key metrics, including percentile and min/max/average values are calculated by the VCX in real time as results are processed, eliminating querying delays when using these higher-level KPIs in fault management and reporting applications.



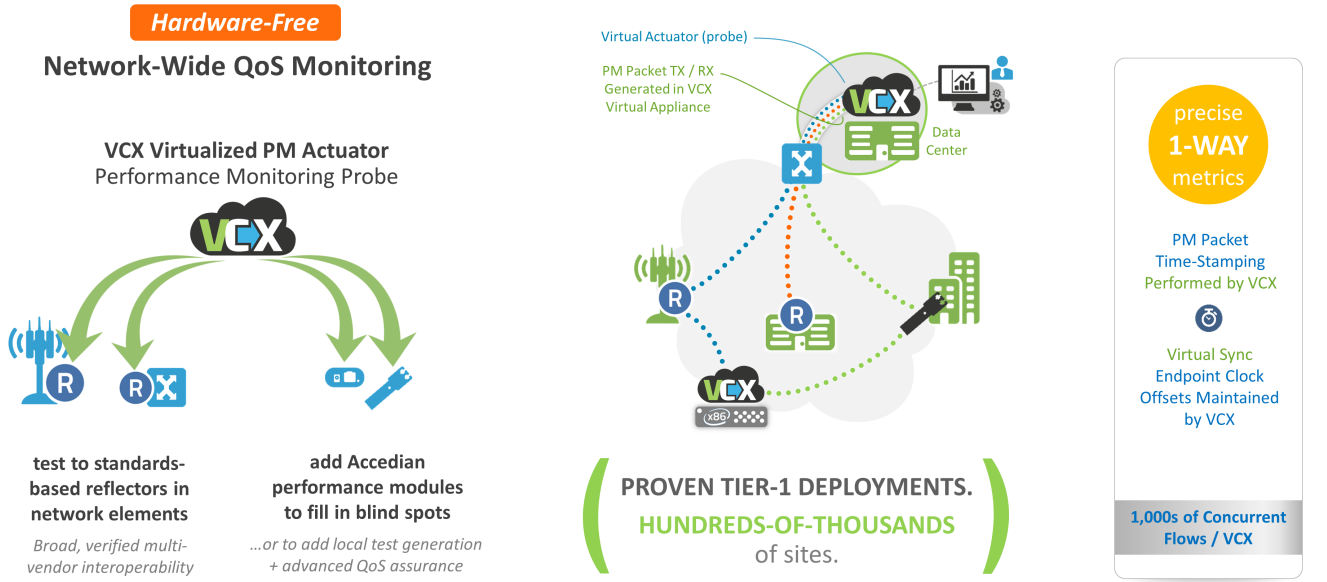


The VCX assumes control over test session setup, inventory and results processing, as well as test packet generation using the PM VNF. Test packets are delivered to the Modules at the respective test origins, where they are time-stamped and relayed to the session endpoint. Upon receiving a PM packet, the Module stamps its time of arrival before sending related information to the VCX Controller for result calculation.

The VCX Controller also separates out operator or domain-specific OAM results; for example, differentiating separate Management Entity Groups (MEG levels) and providing the corresponding session details and alarms. The Modules minimize telemetry bandwidth by providing a certain degree of autonomous processing, by automatically responding to Ethernet OAM delay measurement messages (DMMs) with the appropriate DMR message, for example.

Fully Virtualized PM Actuator (probe)

The VCX Controller can actuate thousands of sessions directly, acting as a virtual probe on a standalone server or virtual machine, without any additional hardware required.

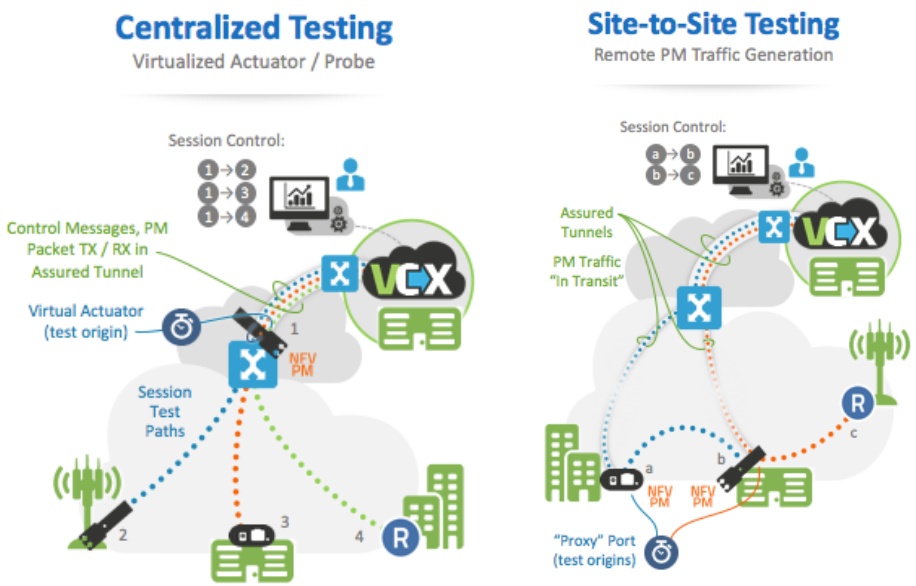


NFV-PM - Module-Enhanced Virtual PM Actuators

The SkyLIGHT VCX can also employ a Module—like the Nano smart SFP—to provide hardware-precise time-stamping, and to relocate the test origin separate from the location of the VCX.

In this mode—what Accedian calls NFV-PM—each module can process thousands of sessions at full wirespeed, whether installed in-line or out.

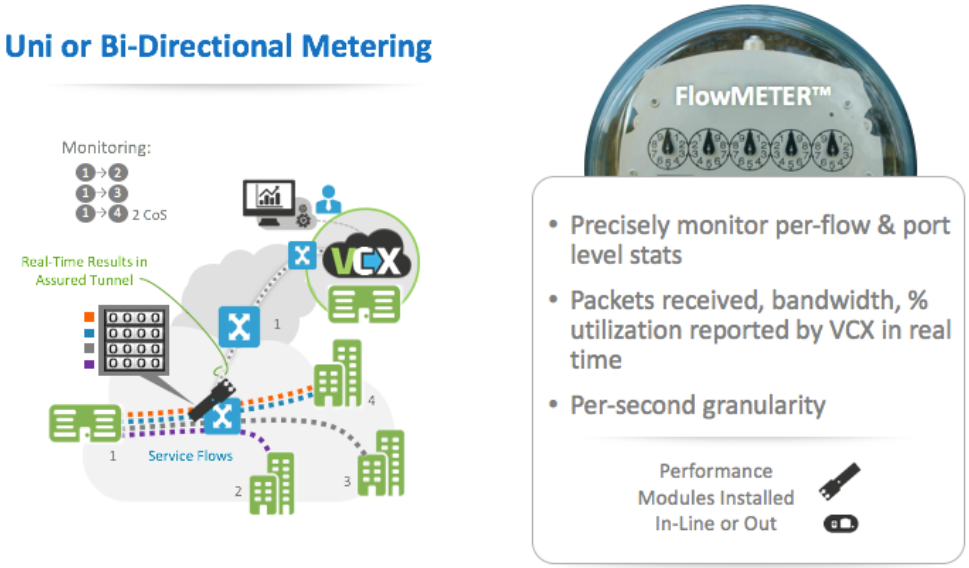
Multiple modules can be served by a single SkyLIGHT VCX, allowing multiple virtual actuator locations to be instantiated at strategic locations throughout the network, and permitting site-to-site and full mesh testing by turning any remote endpoint into a test origin.



Bandwidth Utilization

Bandwidth utilization, when precisely measured, can reveal transient micro-bursts leading to TCP throughput impairments. Per-service metering also permits usage-based billing, including on-demand and excess information rate (EIR) burst consumption pricing models.

The VCX Controller processes per-flow bandwidth utilization metrics from Modules under its control, using time-stamps to accurately report throughput as well as consumption. When used in conjunction with packet loss and other measurements, service providers can detect network bottlenecks and estimate available capacity—key metrics to assure and enforce the delivery of offnet services. Upload and download usage statistics can be monitored separately. The VCX Controller can record granular utilization with per-second sampling.

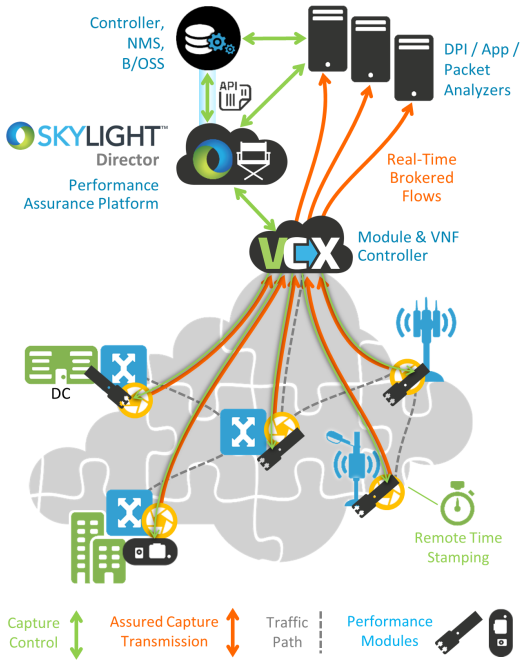


Example of multi-service, multi-site utilization metering

FlowBROKER™: Distributed Packet Capture

FlowBROKER — SkyLIGHT VCX enabled function — is a disruptive technology that extends high-definition visibility to all network locations, significantly enhancing the efficiency, granularity, fidelity and completeness of QoE monitoring, security, policy enforcement and compliance applications.

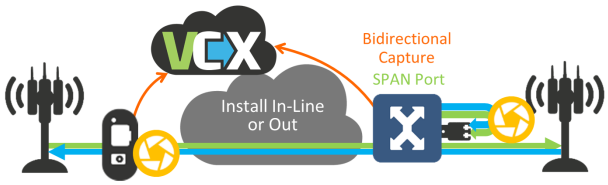
The industry's first distributed packet broker solution, FlowBROKER extends Accedian's virtualized instrumentation from network quality of service (QoS) assurance to all-layer performance monitoring for direct insight into application performance, network behavior and user experience.



Running FlowBROKER, Accedian's NFV-powered smart SFPs and modules become remote, lossless intelligent taps that surgically capture flows of interest, time-stamp packets with microsecond precision, reduce them to the minimum required for analysis, then efficiently transport tailored streams to analyzers and security appliances.

The virtualized SkyLIGHT™ VCX controller manages each step of the process: defining filters and packet-processing rules, maintaining time synchronization between capture points, ensuring packets are losslessly collected, recorded, analyzed and then brokered to appliances for analysis.

FlowBROKER extends the reach, utility and scale of established DPI, security, policy and QoE analyzers by separating traffic access from analysis, much the way SDN separates control and data planes. FlowBROKER allows centralized tools to analyze traffic at any location, without compromising data integrity, granularity or timing precision.

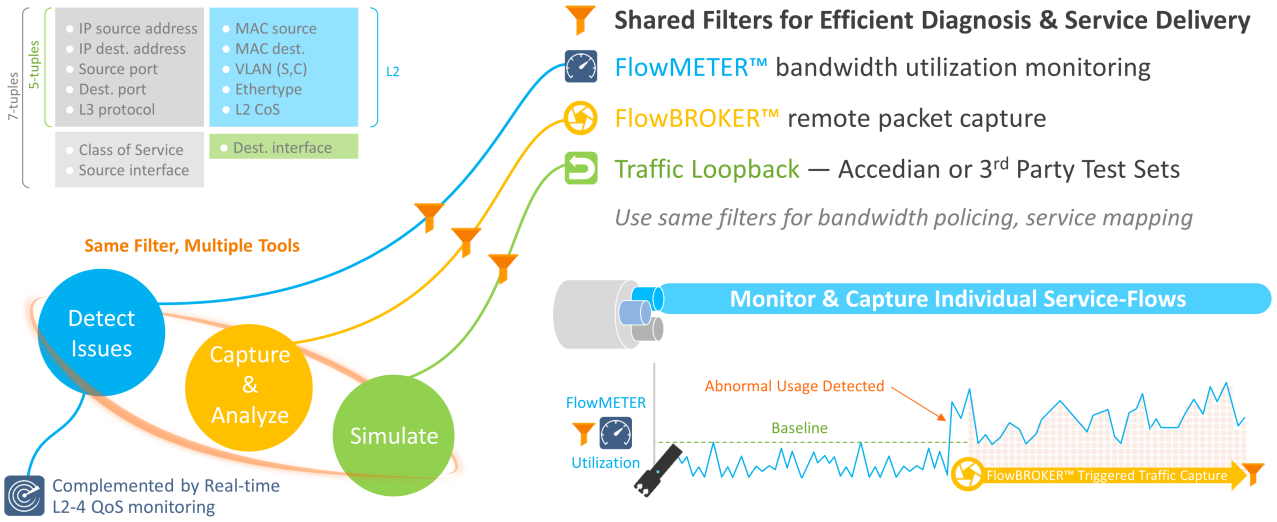


Troubleshooting with FlowBROKER

When QoS issues arise, operators need information to make a swift root-cause diagnosis, and tools to confirm that service has been restored as expected. FlowBROKER's remote capture capabilities complement network layer monitoring and active test tools by affording protocol and QoE analyzers access to any point of interest, without the cost and delays of a technician dispatch.

By adding remote capture into Accedian Modules that also provide bandwidth utilization metering, continuous end-to-end performance monitoring, traffic loopbacks, and turn-up testing, service providers can rapidly detect, isolate, and analyze network and QoE impairments—then test and validate resolution—all from the SkyLIGHT performance platform.

Eliminating the manual configuration of many separate tools, commonly defined filters are shared by FlowMETER™, FlowBROKER, and L2-4 loopbacks. Problems can be quickly detected, flows of interest captured, and active tests conducted, knowing that results reflect consistent traffic classification across all functions.



Dynamic Performance Assurance for Dynamic Networks

Assuring Bandwidth-on-Demand & Elastic Cloud Services

Realizing the full potential of dynamic connectivity services controlled through customer portals, the open programmability of the SkyLIGHT VCX Controller provides dynamic performance assurance functionality that adapts to changing service attributes. Monitoring sessions can immediately be activated to assure new services, setting thresholds, alerts, and reporting consistent with customer QoS expectations and Service Level Agreements (SLAs).

Big Analytics Meets Network State+ Visibility

On-demand, all-layer real-time monitoring and remote packet capture can likewise be triggered via the VCX Controller's northbound interface (NBI) by third-party platforms, deep packet inspection (DPI) analyzers and network management systems to provide contextual, full-layer, high-resolution visibility into suspected problem areas. Hundreds of comprehensive performance metrics and KPIs—the Network State+—provide the most granular, actionable performance feed for all facets of forensic diagnostics and trend analysis.

Having the right data at the right time is one key tool in rapid root cause determination and localization. The programmability of the VCX Controller makes this an integrated, automated part of existing troubleshooting and policy enforcement processes.

Learning More

Accedian's SkyLIGHT Controller provides an architecture that unifies physical and virtualized instrumentation, employing private cloud or COTS hardware-based NFVI to efficiently provide scale up to address national-scale network footprints.

For more information about using the VCX Controller in vCPE, mobile network monitoring, financial services and data center connectivity applications, consult our wide range of white papers, instructional videos, technology primers, and other resources at Accedian.com/library

Solution scale and sizing information is detailed in the SkyLIGHT VCX Controller Data Sheet & Dimensioning Guide, available directly from your Accedian sales professional.

Professional Services

We welcome service providers to the virtual world, and offer expert advice to help them make the smoothest transition to the significant cost savings and operational gains NFV-based virtualized instrumentation offers.

Accedian's PASSPORT Professional Services team assures successful deployments within existing operational practices and systems, with solution integration, networking engineering, analytics interpretation, and network optimization services adapted to each provider's particular needs.

Accedian Certified Engineers (ACE) are also MEF Carrier Ethernet Certified Professionals (CECPs), with extensive experience that has led Accedian to become known as the Network Performance Assurance Specialists.