

Solutions for Every Service at Every Stage

Virtually all service providers face the same three challenges:

- Delivering the ultimate subscriber experience
- Being first—or fast—to market with new services
- Lowering operating costs and total cost of ownership (TCO)

Virtualization, development and operations (DevOps), and other shifts are transforming the business by accelerating delivery times, promoting better return on investment (ROI) and TCO, and improving the security and monetization of services. At the same time, shifts in usage driven by the Internet of Things (IoT) and exploding volumes of mobile devices present never-before-seen challenges.

As you navigate these fast-changing market dynamics, Keysight can help you use emerging technologies to improve your business. Every service, at every stage.

From the Core to the Cloud to the Customer

For nearly two decades, Keysight has worked with leading service providers worldwide to prove and improve quality. Our solutions impact every aspect of the service life-cycle—from design and vendor selection to deployment, quality management, and day-to-day operation.

These solutions fall into two main categories:

- Network testing to improve quality
- Network visibility to defend and maintain quality

Essentially two halves of the same coin, network test and visibility work together to deliver data that fuels innovation and ensures the full benefits.

Lab-to-live testing: for the ultimate subscriber experience

Service providers worldwide rely on Keysight test solutions throughout service and infrastructure design and deployment:

IxNetwork® infrastructure testing scales to validate your network infrastructure against challenging real-world conditions. Emulating everything from routing and

switching to softwaredefined networking (SDN) and broadband access, IxNetwork generates multiple terabytes of data and analyzes up to 4 million traffic flows simultaneously.

IxLoad® network and application testing enables subscriber modeling at scale to measure the quality of Long-Term Evolution (LTE), Voice over Long-Term Evolution (VoLTE), and other wired and wireless services. Emulating web, video, voice, storage, wireless, security protocols, and more, IxLoad creates realistic scenarios for capturing critical quality of experience (QoE) metrics, validating marketing claims, and drilling down to remedy degradation issues.

Wireless testing includes both IxLoad Wireless and IxVeriWave™ for complete testing of cellular, Wi-Fi, and heterogeneous networks (HetNets) from the core to radio access networks (RAN) to the managed services that touch the customer.

BreakingPoint® security testing is the industry's gold-standard solution for hardening security defenses. BreakingPoint simulates the latest threats—distributed denial of service (DDoS) attacks, malware, fuzzing, and other techniques—along with legitimate traffic. Validating everything from vendor claims to your entire security infrastructure, BreakingPoint reduces the risk of network degradation by up to 80% while improving your readiness to fend off attack by nearly 70%.

Live-network testing continues once services roll out with the virtual edition versions of IxLoad and BreakingPoint, and IxChariot® used to re-check performance as upgrades occur, usage scales, and the threat landscape changes.

Doing it all virtually

Only Keysight offers both physical and software-based virtual versions of all performance and security test solutions. As you will see, the virtual editions (VEs) of IxNetwork, IxLoad, and BreakingPoint help fast-track delivery and safeguard security in DevOps and virtual environments. An integral part of an automated continuous integration/continuous deployment (CI/CD) pipeline, Keysight's virtual solutions allow for continuous testing along with the ability to be deployed with any instantiation of the system.

Visibility Keeps Quality in Focus

Once a service goes live, maintaining performance and security requires constant vigilance and ongoing intelligence. Service providers rely on Keysight visibility solutions to obtain the “big data” needed to efficiently monitor traffic and finetune operations.

Visibility dramatically improves ROI in security and monitoring tools. Keysight's innovative Vision network packet brokers (NPBs) reduce cost in high-density data centers by aggregating, filtering and load-balancing out -of.band monitoring data from taps and other probes in the network so that tools performing analysis see only the exact data they need. De-duplication and other advanced features help minimize the workload.



Only ixia network packet brokers

- Provide line-rate processing while running advanced features
- Did not drop packets in third-party testing
- Perform critical processing in hardware vs. Software for unrivaled performance
- Automatically manage overlapping rules
- Provide advanced layer 7 intelligence

Third-party testing by Tolly has shown the superiority of Keysight's visibility architecture and performance, with Keysight outperforming competing solutions by processing traffic at line-rate while running multiple advanced features—without dropping packets.

Keysight also delivers a full range of physical and virtual taps (vTaps) and bypass switches to promote end-to-end visibility and high availability. Bypass switches facilitate security by making it easy to bring an out-of-band security tool inline to fight unfolding threats with the flip of a switch.

Test + Visibility: Vital Intelligence Comes Full Circle

The data garnered by visibility systems provides an invaluable feedback loop for developers, equipping them with hard data on how new designs fare in live networks. This informs better quality and regression testing to find vulnerabilities early, when it costs less to do so, and works to continually improve service delivery and monetization.

Trafficrewind™: bridging the gap between the lab and live networks

Recreating production traffic in a controlled environment has been a time-consuming, complicated, and often frustrating process—until now. Keysight's new TrafficREWIND solution combines network test and visibility to speed fault isolation and prevent outages. TrafficREWIND leverages Keysight's Vision NPBs, BreakingPoint, and ATI technology to capture traffic in live networks and replay it in the lab to equip network operators to be more proactive as they manage and scale their infrastructure.

The “Killer Applications:” DevOps, Virtualization, Security, and IoT

Keysight works with carriers on the front lines as they usher in new technologies and enact new business models. Our test and visibility solutions provide unrivaled value in overcoming the hurdles and delivering on the promise of today's highest-impact initiatives.

Devops and ci/cd

Delivery times continue to shrink from years and months to days and minutes. To speed a steady stream of innovations to market, providers need to migrate the same caliber of testing conducted in the lab to the production network. Keysight's virtual test solutions support CI/CD as new builds are introduced.

Sophisticated automation delivers the constant regression testing needed to validate both new software and its impact on the existing network—without requiring dedicated hardware. Our newly launched performance monitoring solution, Hawkeye™, adds active monitoring of the live subscriber network to verify that new additions perform as expected and do not introduce new risk to infrastructure.

Virtualization

Increasingly virtualized networks require increasingly virtualized test and visibility. Providers need both virtualized versions of traditional testing and the ability to validate performance of individual virtual network functions (VNFs) and environments.

Keysight's test and visibility solutions combine to lower cost and ensure scalability in SDN and network functions virtualization (NFV) initiatives. The virtual editions of IxLoad, IxNetwork, and BreakingPoint bring software-based testing to the production network to validate the performance and scalability of SDN, NFV, and cloud-based services.

Keysight's recently announced CloudLens™ platform assures unprecedented visibility across public, private, and hybrid clouds. CloudLens Private supports intelligent monitoring of virtual traffic in OpenStack KVM, VMWare ESXi and NSX environments, and Microsoft Hyper-V. Tunneling options include generic routing encapsulation (GRE), virtual local area network (VLAN), and encapsulated remote switched port analyzer (ERSPAN) for maximum coverage across private cloud deployments.

In addition, CloudLens Public provides a Software as a Service (SaaS) visibility solution for the opaque public clouds. Built as a cloud-native platform, CloudLens Public scales elastically as services scale. For providers who may utilize an aspect of public clouds as part of their service offerings, having this visibility is critical to assure QoE.

IOT

Imagine trying to guarantee quality with 100M mobile devices connecting wirelessly. Or better yet, model it.

IxLoad, Keysight IoT, Hawkeye, and other solutions help you to proactively meet the challenges created by hyperconnectivity by allowing providers to simulate usage by exponentially more users and devices running demanding applications, all before going live with new systems and services.

360° security

Nothing undermines subscriber retention like allowing privileged data to be hacked, but you cannot stop what you cannot see. With Keysight's 360° security solutions, you see it all.

Our test and visibility solutions help improve defenses at every stage as carriers develop, train, monitor, and defend their networks, paid services, and subscriber data. BreakingPoint and Keysight's Application and Threat Intelligence (ATI) provide ongoing testing, while Vision NPBs, Taps, vTaps, and other visibility elements prevent dangerous blind spots.

Keysight's innovative ThreatARMOR™ appliances helps turn down the noise and sharpen security in managed services by automatically keeping unwanted traffic off the network. And last but not least, our Cyber Range Training helps defenders refine best practices.

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	Test	Visibility
Wireless	<ul style="list-style-type: none"> • IxNetwork and IxNetwork VE testing of L2/3 networks • IxLoad and IxLoad VE – subscriber modeling LTE core to edge • IxVeriWave gold-standard Wi-Fi test for vendor selection, offload, hetnets • BreakingPoint and BreakingPoint VE • TrafficREWIND • Ixia IoT 	<ul style="list-style-type: none"> • Hawkeye active live-network testing • TrafficREWIND
Virtualization (SDN/NFV)	<ul style="list-style-type: none"> • IxLoad and IxLoad VE • IxNetwork and IxNetwork VE • BreakingPoint and BreakingPoint VE • TrafficREWIND 	<ul style="list-style-type: none"> • Vision portfolio of network packet brokers • ThreatARMOR • Virtual taps • CloudLens architecture • TrafficREWIND • Hawkeye active live-network testing
Security	<ul style="list-style-type: none"> • IxLoad • BreakingPoint • TrafficREWIND 	<ul style="list-style-type: none"> • Physical and virtual taps • Vision portfolio of network packet brokers • iBypass Switches • ThreatARMOR • TrafficREWIND
IoT	<ul style="list-style-type: none"> • IxLoad • IxVeriWave • TrafficREWIND • Ixia IoT 	<ul style="list-style-type: none"> • Physical and virtual taps • Vision portfolio of network packet brokers • ThreatARMOR • Hawkeye active live-network testing • TrafficREWIND
DevOps and CI/CD	<ul style="list-style-type: none"> • IxNetwork VE • IxLoad VE • BreakingPoint VE • TrafficREWIND 	<ul style="list-style-type: none"> • Physical and virtual taps • Vision portfolio of network packet brokers • CloudLens architecture • TrafficREWIND

Stay In The Lead

For service providers, change itself keeps changing, growing faster and more intense as the stakes rise. Whatever your strategy for working faster, smarter, and with greater confidence, partnering with Keysight will help speed the transformation through technology, expertise, and results.

The measure of change is results. We can help you design, deliver, defend, and demonstrate the value of market-leading services every step of the way.

Innovate and invest with confidence. Innovate with Keysight.

Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

