



Intel and Netrounds* Bring Service Assurance to an NFV World

Netrounds,* working with Intel and other leading players in the NFV ecosystem, has developed a fully software-based, active service assurance solution that IP-Only is using to better serve its customers.



Overview

Today's telecom environment is one where data services are crucially important revenue generators and where, thanks to network functions virtualization (NFV), these new services can be established within minutes. Agile service creation and the rapid pace at which new services go from planning and design to live deployment means that service assurance has become a critical component of these services; it also means that legacy solutions need to evolve from manual processes to cloud-based and fully virtualized software to deliver the quality, portability, and data that communications service providers (CommSPs) require.

Netrounds,* working with Intel and other leading players in the NFV ecosystem, has developed a fully software-based solution that assures the whole service lifecycle, including new service activation testing, ongoing quality monitoring, and remote troubleshooting. With the Netrounds solution and its active Test Agents, service providers can generate real network traffic to analyze their services in real time, allowing them to actively test network and service quality and take action immediately should issues arise. For NFV environments, the Netrounds solution also allows CommSPs to automate their responses so that problems can be fixed as soon as they are detected.

Challenge

For wireline and mobile communications service providers (CommSPs), data, cloud, and value-added services, such as network security, routing, and network address translation, are key to revenue growth. From the enterprise customer's perspective, these services are mission critical. Managed services allow an enterprise to outsource various corporate IT functions to better manage costs and benefit from cutting-edge technology.

The drive by CommSPs to deliver agile, high-quality services is putting new emphasis on service assurance capabilities in order to ensure that services are set up and operating correctly, as well as to provide evidence that service level agreements (SLAs) are being met.

Legacy, hardware-bound service assurance processes are too manual and slow for this environment. They require service technicians to drive to remote locations with handheld devices and analyze samples of local network traffic in order to identify and isolate problems via counters and statistics, along with network inventory information.

This situation is improved dramatically for CommSPs who have transitioned to software-based test agents that run on bare metal Intel® architecture-based servers or devices and can generate network traffic 24/7 using active traffic generation methods. This solution helps CommSPs to truly understand how their customers are experiencing their services.

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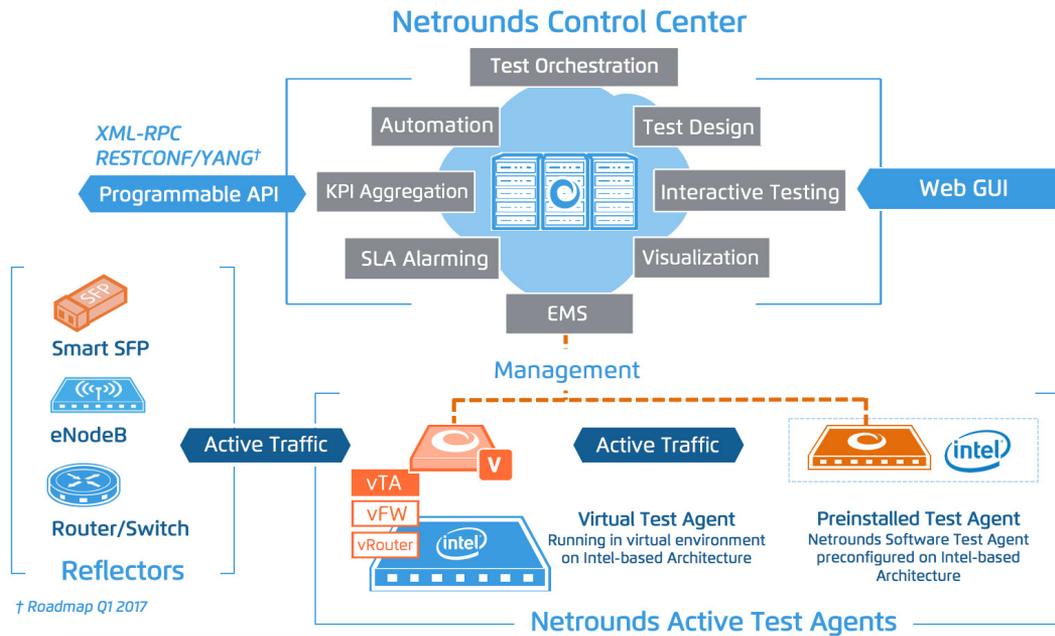


Figure 1. Netrounds Control Center and example Test Agent types, including the Preinstalled Test Agent running on Intel architecture and the Virtual Test Agent deployed in NFV environments on Intel-based infrastructure.

CommSPs place software test agents at strategic locations in their core networks to monitor and analyze service and network conditions that can have an impact on a large cross-section of their customer base. They can also place test agents at the network edge to test their services from a comprehensive, end-to-end perspective. Furthermore, these test agents can leverage built-in reflectors from network equipment, such as routers and switches, that is already in their networks to collect additional data through TWAMP and Y.1731 protocols.

When CommSPs adopt network functions virtualization (NFV) and software defined networking (SDN), there is a need for the service assurance solution to evolve even further. These technologies fundamentally restructure the network as virtualized infrastructure replaces proprietary service appliances (routers, gateways, firewalls, etc.) with the same functionality in software in the form of virtual network functions (VNFs) running on Intel architecture-based infrastructure. SDN further impacts the network by replacing the hop-by-hop packet processing with a central controller, reducing congestion through better data flow visibility.

In networks based on NFV and SDN, services can be deployed remotely and at the speed of software. While this is great for service deployment time to market and for meeting customer needs, it exacerbates the inadequacy of legacy service assurance solutions and makes non-portable software-based solutions insufficient.

Software-based service assurance test agents provide more data with less manual intervention than hardware-based solutions, but for next-generation networks, virtualized software test agents will be key. Deploying a test agent as a VNF that can be set up in minutes, collect data for as long as needed, and then be automatically redeployed to another customer site is the feature that will enable CommSPs to meet customer needs.

Solution

Netrounds has pioneered the industry's move to software-based test agents and is working with its customers to virtualize service assurance in their networks. The company's solution combines the multi-tenant Netrounds Control Center with traffic-generating Test Agents that can be deployed throughout the network to actively collect data, which is uploaded to the Control Center for analysis, reporting, and troubleshooting. In addition to being an early adopter of cloud technologies, the Netrounds solution also features complete APIs for external NFV and operational support system (OSS) orchestrators, enabling a degree of automation that further enhances its impact in NFV networks.

Netrounds' solution is composed of the following parts:

Control Center

The core component of the Netrounds solution is a unifying Control Center, which provides a web-based GUI for operations staff and a RESTCONF/YANG or XML-RPC-based API that can pass measurement results and control of Test Agents to NFV and OSS orchestration software. The Control Center may be hosted by Netrounds and offered as a SaaS solution, or it can be deployed on premises in a private cloud. The Control Center GUI tracks a real-time inventory of Test Agents while also providing detailed views of the service assurance data collected by the system: test results, KPIs, and SLA monitoring metrics. Each Control Center instance can manage up to 10,000 Test Agents and reflector streams.

The Control Center offers extensive automation capabilities for preconfigured tests and quality monitoring scenarios. Service assurance managers can use the Web GUI's development environment to create automation loops that can be scheduled, initiated by the OSS, or triggered by network events or traffic patterns. The Web Portal can

also be used for on-demand initiation of tests as well as for remote troubleshooting, eliminating the need for on-site field engineering resources.

The architecture of the Control Center allows developers easy access to the extensive data collected in order to identify service assurance problem areas. Via the Web GUI, a service assurance team can view aggregated reports of ongoing quality monitoring and testing, including errored second statistics and in-depth data visualization. The reports also highlight when SLA compliance has been breached. Control Center test sequences, templates, and scenarios can be shared and replicated by other departments or by the customers of Netrounds customers who are also using the multi-tenant Control Center.

Netrounds Test Agents

Traffic generation and real-time measurements for the system are conducted via Netrounds Test Agents. Virtual Test Agents are available for NFV environments that run on all common hypervisors; Software Test Agents are available as downloadable software for x86 bare metal Intel architecture servers or devices; and, Preinstalled Test Agents configured by Netrounds on certified Intel architecture are also offered. Test Agents may also be embedded in networking equipment, such as OpenWRT-based residential network devices, or used as PC Test Agents installed on standard PCs as a Windows* application.

Test Agent capabilities have a wide feature set for all network and service layers and include measurement of network performance (UDP, TCP, Y.1731, TWAMP), IPTV and OTT video, and Internet (HTTP, Ping, Speedtest), as well as VoIP and SIP telephony, mobile radio, and remote packet inspection. They are used to support service activation or turn-up testing, ongoing quality monitoring, and remote troubleshooting of both fixed and wireless networks.

The Virtual Test Agent is a downloadable software image that can be run as a VNF with any hypervisor software. This allows quick and easy remote installation by the customer.

In service turn-up scenarios, the test agents can be remotely installed along with other VNFs, so that once those services are operational, their performance can be verified.

How IP-Only Evolved Its Service Assurance

The Netrounds solution is designed to help CommSPs transition from today's hardware-bound service assurance infrastructure to software-based and virtualized solutions that are programmable and able to adapt in the course of the transition from legacy to next-generation network architecture. One company that has benefited from these software-based assurance solutions is IP-Only, an internet and communications service provider based in Uppsala, Sweden, operating a fiber-optic network throughout the Nordic countries. The company's customers include other CommSPs, financial institutions, media companies, and government offices.

IP-Only upgraded to Netrounds from a handheld and hardware-based test and measurement solution in order to better serve their customers in delivering multicast traffic sensitive to latency and congestion. Their existing solution did not capture a complete network traffic history, nor did it analyze the quality adequately. If interruptions were missed by their hardware-based test equipment (whose coverage was spotty), they had difficulty pinpointing issues to find out where to begin troubleshooting. Substantial operational costs also accumulated for troubleshooting as field technicians spent countless hours in the car, driving from one test point to another and back to the office/data center.

In order to improve their network quality and decrease operational costs and resources needed for troubleshooting, IP-Only deployed Netrounds Control Center solution featuring Software Test Agents that were installed in various locations in their network. In addition to the performance and scalability of the Intel-based servers, the IP-Only IT team had a very high level of trust in the Intel-based equipment gained from years of experience with these servers.

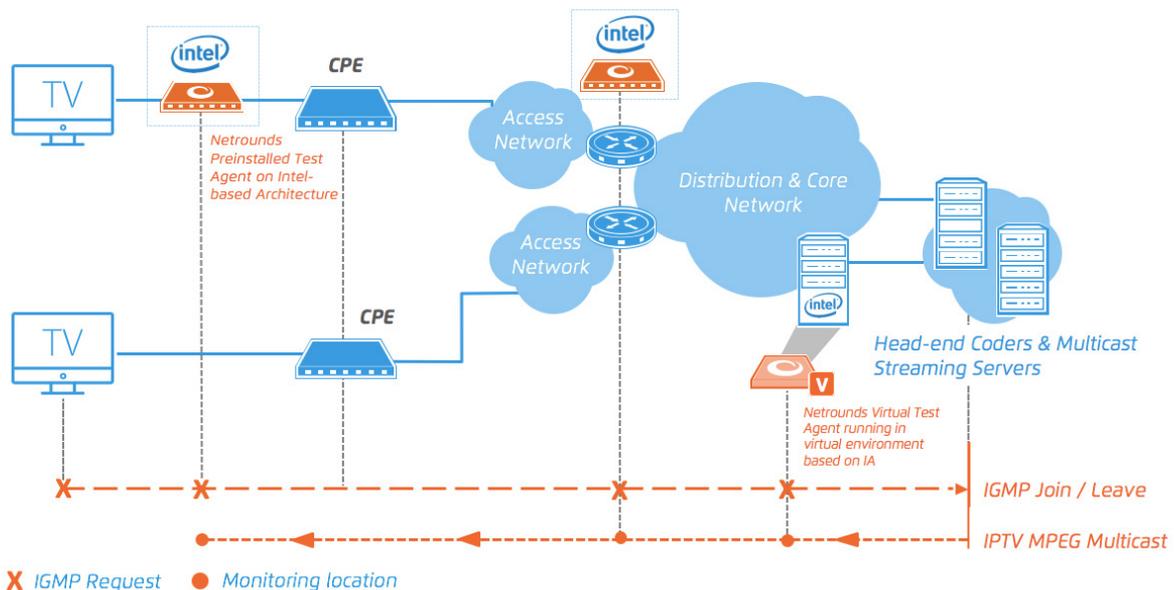


Figure 2. Netrounds Test Agents deployed in an example network, using Intel architecture-based servers and devices to monitor IPTV at various locations along the service distribution chain.



IP-Only placed one of its first Test Agents in its core network, so that it could alert customers quickly in case of packet loss

events. The company has now expanded on this foundation to broaden their network testing coverage. Performance-sensitive customers can be given web access to their own tenant account of IP-Only's multi-tenant Netrounds Control Center so that they can monitor their individual services and determine more quickly if performance issues are within their own area of responsibility or within their provider's. IP-Only is now considering moving to NFV to further decrease its network operating expenses and increase their service agility. Automating the deployment of Virtual Test Agents lowers the cost of ensuring that services are operating within their performance parameters.

Powered by Intel® Technology

Netrounds is a member of the Intel® Network Builders ecosystem and optimizes its Netrounds active Test Agents for servers and devices based on the Intel® Core™ i3 processor and Intel® Xeon® Processor E3. Preinstalled Test Agents need high-performance Ethernet connectivity and have been optimized to run on Intel® Ethernet Controller I210-AT and Intel Ethernet Controller I350 for Gigabit Ethernet applications. Support for Intel Ethernet Controllers for 25, 40, and 100 Gigabit is on Netrounds' Test Agent roadmap.

For virtual environments, Netrounds is integrating Enhanced Platform Awareness, an Intel-driven open source component of the OpenStack* cloud operating system. EPA detects platform capabilities, such as core count, and can provide performance-enhancing functions such as core pinning, which associates each VNF with a specific core that provides optimized performance.



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Conclusion

CommSPs like IP-Only stake their business reputation on the quality of their services and compete on their ability to deliver new services in a timely manner. Service assurance plays a growing role in ensuring quality of service and helping to isolate issues when they arise. With Netrounds multi-tenant Control Center and active, traffic-generating Test Agents, CommSPs can provide automated and more comprehensive service assurance for their legacy, hybrid, and virtualized networks.

About Netrounds

Netrounds was founded in 2007 to address the complexity and time-consuming nature of rolling out new, quality-assured network services that provide an excellent experience for end users and provide a high revenue return for service providers. Netrounds delivers a complete test and assurance system in which network professionals can easily obtain in-depth, end-to-end insight into network performance and service quality with the ability to troubleshoot as well as prevent problems effectively from a remote location over wide network geographies. More than 270 network operators, enterprises and consultants worldwide use Netrounds to deliver a first-class end user experience to their customers. Netrounds is headquartered in Luleå, Sweden, with offices in Stockholm, Sweden, and Boston, MA.

About Intel

Intel (NASDAQ: INTC) is a world leader in computing innovation. The company designs and builds the essential technologies that serve as the foundation for the world's computing devices. As a leader in corporate responsibility and sustainability, Intel also manufactures the world's first commercially available "conflict-free" microprocessors.¹ Additional information about Intel is available at newsroom.intel.com and blogs.intel.com and about Intel's conflict-free efforts at conflictfree.intel.com.

¹ "Conflict-free" refers to products, suppliers, supply chains, smelters, and refiners that, based on our due diligence, do not contain or source tantalum, tin, tungsten or gold (referred to as "conflict minerals" by the U.S. Securities and Exchange Commission) that directly or indirectly finance or benefit armed groups in the Democratic Republic of the Congo or adjoining countries.