Network Performance Monitoring
Real-time views of end user experience

Netrounds Features:

- *Historical data* – Monitor quality over time and use historical data to find the root cause of problems

- *Alarms* – Work proactively, be notified of negative trends and solve problems before customers notice

- *Collaboration* – Share Test Agents and data within your own organization or with suppliers or customers

- *Versatile Test Agents* – Monitor both network-layer performance and individual services with the same Test Agents

This solution brief describes how Netrounds can be used for performance management (PM) and fault management (FM) in a service provider's network. These are the fundamental activities of Operations Managers overseeing the network from the Network Operations Center (NOC) and responsible for assuring network and service health. In this role, your responsibilities typically include obtaining an adequate view of network and service quality as perceived by end users and promptly sharing actionable insights with engineering and support teams whenever problems arise.

As you have probably noticed, the traditional method of passively observing device counters does not allow sufficient correlation to real customer perception of network quality, nor does it provide real-time alarming or triggers for the notification of problems as they arise. In addition, the resolution of data captured from device counters often has a low time resolution, so issues are not found in real-time and even finding historical information about the problem is difficult (i.e. when did the problem start, and how long did it take until it was resolved?).

With Netrounds Test Agents, network services can be actively tested from the customer perspective, and fine-grained, real-time data can be gathered to accurately reflect customer quality of experience.

The image below depicts a subset of an authentic Netrounds deployment in a Tier 1 telecom operator's network. Full-mesh monitoring is conducted between several types of Netrounds Test Agents installed in transport/core and distribution network nodes. In this particular Tier 1 operator's network, 25 Test Agents are installed in the transport/core and distribution network nodes. In full-mesh monitoring, all Test Agents types can send traffic to all of the other Test Agent types present; between each pair of Test Agents, UDP or TCP streams are sent concurrently for each of four quality-of-service classes to be tested. Any errors that occur, and that violate the configured thresholds, are reported in real time to the NOC so that its staff can take quick action – ideally before end users notice and contact the help desk.
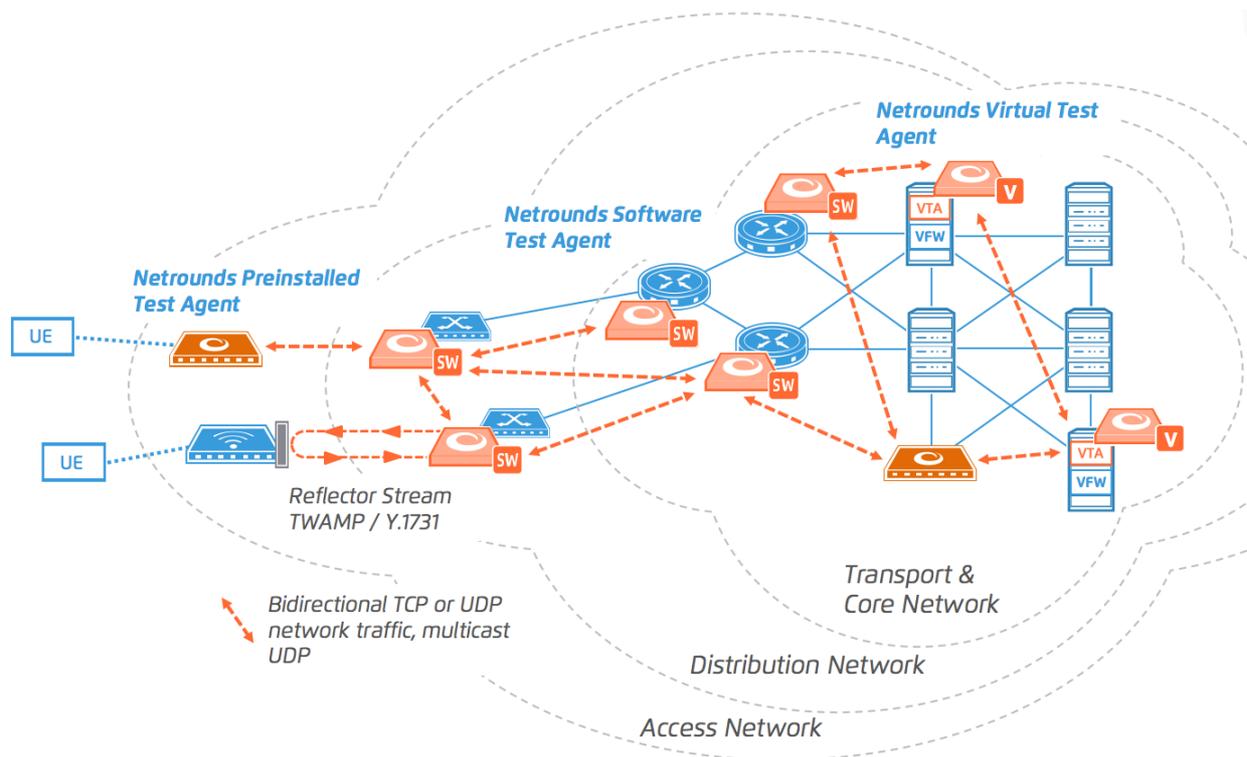
Figure 1: Example of authentic Netrounds deployment from Tier 1 telecom operator's network.

To supplement the full-mesh monitoring, a further 300 Test Agents are deployed across less central locations in the Tier 1 operator's network, mainly in the distribution and access nodes. These peripheral Test Agents are located on spokes going out from each of the Test Agents next to the core nodes.

Test coverage can be enhanced further by reflecting traffic generated by your active Test Agents off of existing network elements using the Y.1731 and TWAMP protocols (on Layer 2 and Layer 3 respectively) which are built into many of today's eNodeBs, SmartSFPs, switches and routers. In this manner, even more pathways in the network can be tested and you can leverage previous infrastructure investments by making further use of network equipment already deployed.

Data storage and presentation

All collected data is consolidated and visualized in the Netrounds Control Center, which is either hosted as a cloud service or deployed on-site on your premises.

Accessible via the Web Portal GUI, data is presented in a real-time view that can also be distilled into on-demand or scheduled periodic reports. Measured data can be presented down to 1 second resolution, with a historical timespan adjustable from the last 15 minutes to years backward in time. In addition, data can be extracted by OSS or NFV orchestrators through a complete API and correlated with data from other sources in your OSS environment, such as alarm logs or events.

Example metrics collected/analyzed in Netrounds Control Center
Packet loss ratio (PLR)
Packet delay (PD)
Packet delay variation (PDV), also known as jitter
Packet reordering
Packet duplication

Service-specific testing

The same Test Agents used for the network-layer performance measurements described here can also be employed to concurrently gauge the **performance of specific services** such as VoIP, IPTV, multicast UDP, or other business-critical services. Most competing active measurement solutions today are tailored to specific services. In order to test multiple services, or even across hybrid network, service providers need to place several systems in parallel in their networks to effectively test the range of service demanded by their customers, driving unnecessary capital costs initially, but also operational costs as management of multiple systems requires significant resources. The versatility and affordability of Netrounds Test Agents make them uniquely cost-efficient.

Targeted tests

Continuous quality monitoring can be complemented by **periodic or one-off tests**. You can have such targeted testing triggered by alarms: for example, whenever the jitter exceeds the SLA "Bad" threshold, you can run a test checking QoS scheduler behavior with and without excessive load. One reason for severe jitter is that priority headers have been corrupted. Garbled priority headers will distort QoS classification and cause the traffic to be incorrectly prioritized. A diagnostic test automatically exposes the root cause of these problems.

It is well known that targeted tests are more intrusive and can affect end users' experience of the network, however, continuous quality monitoring is largely unnoticeable to end users.

Summary

Netrounds supports network performance monitoring through full-mesh monitoring of the transport/core network and in the form of TWAMP/Y.1731 measurements bounced off reflectors in the access and distribution networks. The reflectors can be supplied by Test Agents or SmartSFPs, or existing reflectors built into network elements can be used.

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