

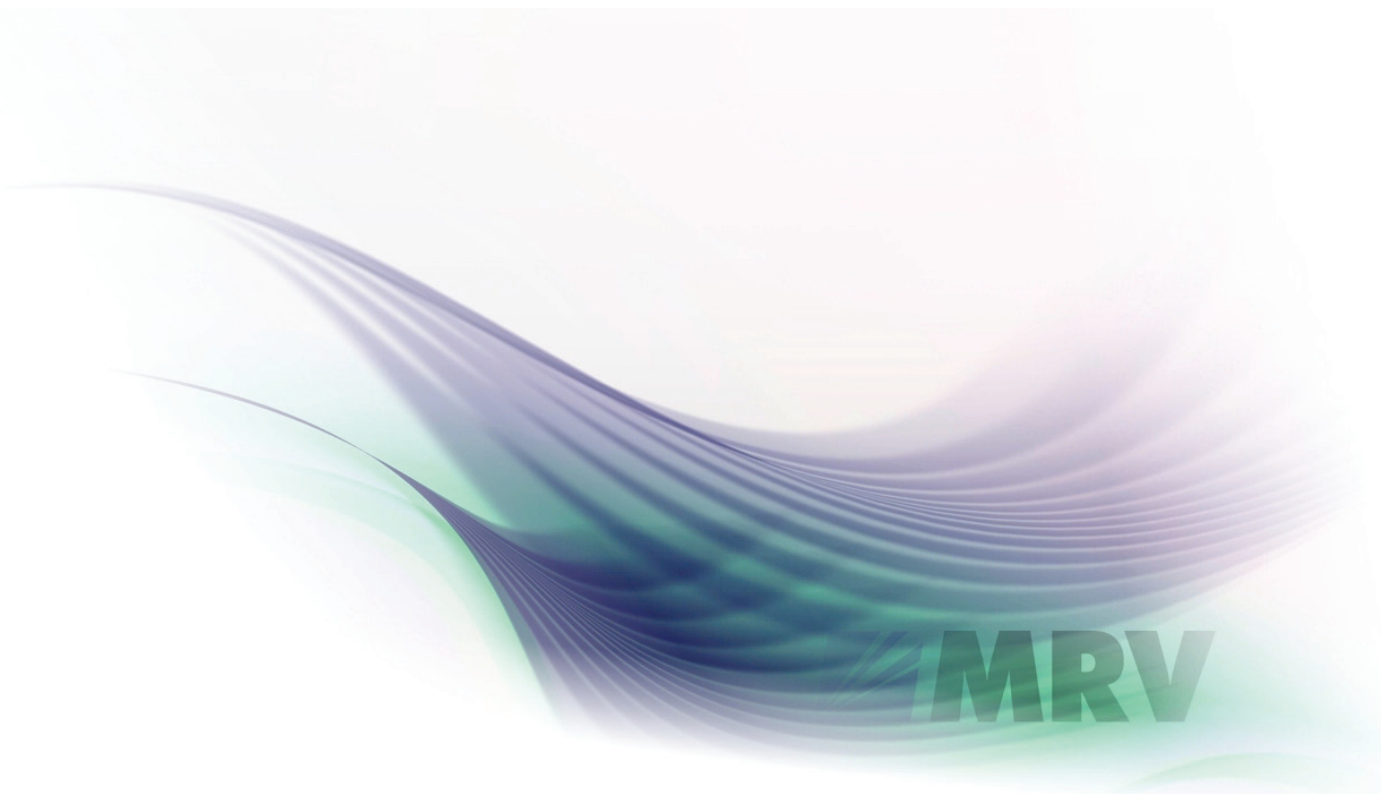


Optical Communications Systems®

OptiSwitch® Series Integrating 3rd party OAM tools

Application Note

Empowering The Optical Edge™



MRV Communications, Inc. is a leading global provider of carrier Ethernet, WDM optical transport, infrastructure management equipment and solutions, as well as network integration and managed services. MRV's solutions enable the delivery and provisioning of next-generation optical transport and carrier Ethernet services over any fiber infrastructure. MRV provides equipment and services worldwide to telecommunications service providers, enterprises, and governments, enabling network evolution and increasing efficiency, while reducing complexity and costs. Through its subsidiaries, MRV operates R&D centers in North America and Europe, along with support centers and sales offices around the world.

www.mrv.com

Leveraging OptiSwitch® Series

Extreme flexible MasterOS™ and embedded FPGA to integrate 3rd part solution

MRV's OptiSwitch® series of carrier grade switches and routers is a product line that can be traced back to the end of 1990's and it's current Linux based operation system, the MasterOS™, to the early 2000's. The MasterOS™ is celebrating these days more than 10 years of industry leadership.

In the mid of the last decade MRV has decided to enhance the OptiSwitch® product line capabilities and started to incorporate a SoftSilicon OAM dedicated processor in its devices in addition to the switching fabric it already includes. As this processor is de-facto a programmable hardware, MRV can easily modify this component to answer many immediate hardware needs without replacing the entire device.

Currently, in most deployed OptiSwitch® devices world-wide, customers have placed standard MRV OAM driven software in the dedicated processor. This software enables the device to offload OAM dedicated tasks from the CPU to this dedicated hardware.

Both mechanisms mentioned above - the Linux based MasterOS™ and its ultra flexible OAM processor, enable MRV engineers to easily integrate 3rd party softwares into the OptiSwitch® product line and in relatively short time add to it extreme functionalities that are not in the scope of the vast majority of its competitors.

In the below application note we will describe two such softwares we have integrated in our OptiSwitch® series and by doing so enable value added services to our customers. It is extremely important to disclose that every development of such project is evaluated from a business point-of-view and readers of this application note shouldn't understand it as an automatic willingness on MRV's part to integrate every software in our devices.

Mobile backhaul monitoring over Ethernet

One of MRV's long time customers is a well known Nordic tier 1 carrier. This carrier is providing Ethernet backhaul for cellular operators in its region and for the past two years is using MRV's OptiSwitch® 904 as a cell site gateway for the world's 1st 4G (LTE) network.

In order to measure the quality of the Carrier Ethernet services delivered by the backhaul MRV's customer has decided to use an already installed system that is successfully functioning in legacy parts of its network. The system, developed by Prosilient Technologies (see <http://www.prosilient.com/>), provides the operator with continuous and highly granular KPI (Key Performance Indicators) monitoring of the most important revenue generating services in real-time.

The SLA measurements from Prosilient are based on both standard ETH-OAM and proprietary protocols. A Prosilient server is located in the operator NOC and constantly transmitting synthetic traffic in the direction of cell towers installed probes, to be analyzed, modified and returned back to the server as part of the service monitoring.

Instead of deploying additional dedicated hardware (probes) at each of the network's 3000 wireless towers, to deal with Prosilient proprietary packets, the operator has decided to leverage the OAM-compliant MRV's OptiSwitch® demarcation units which are already installed at the RBS sites.

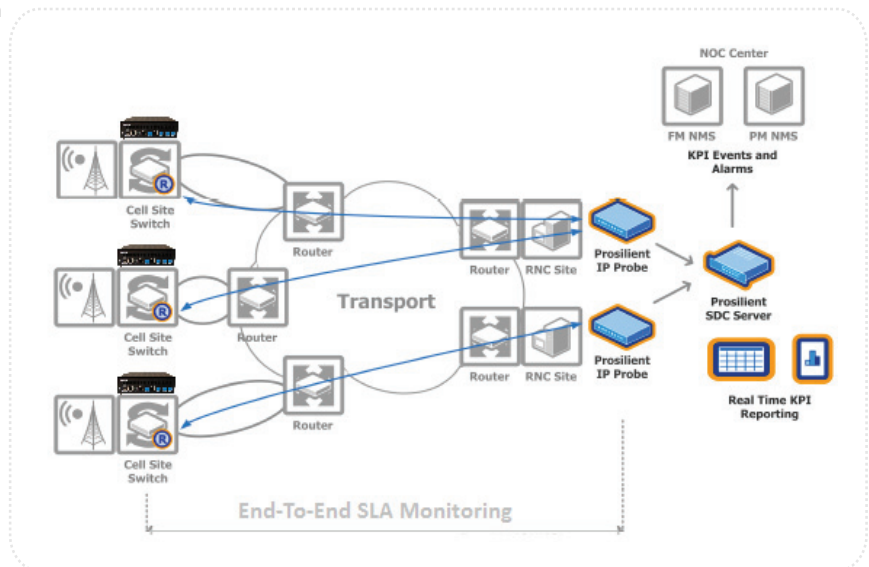


Figure 1: MRV's OptiSwitch(r) and Prosilient Technologies combined solution

MRV has integrated into its OptiSwitch® FPGA the needed Prosilient probe side implementation and thus has significantly reduced both the Capex and the Opex that the operator could have expect from the need to purchase, deploy and manage additional 3000 network devices.

The joint Service Assurance solution that was created from the combination of Prosilient Technologies server and the OptiSwitch® probe implementation and existing OAM tools (802.1ag / Y.1731 / Y.1563 / RFC 2544 / Y.1564 / IP-SLA / MEF 10.2.1), enables the network administrator to continuously collect, correlate, and analyze quality of service (QoS) and quality of experience (QoE) data throughout the services' lifecycle.

VoIP Health-checks for Carrier Ethernet Networks

In Carrier Ethernet networks, packets originated from different applications will be assigned different QoS levels based on the application frames and the networks' administrators policies. Simple web surfing, email exchanges or file transfers, would probably get medium level QoS treatment as for these applications traffic delays or loss of data packets will cause no significant reduction in users' Quality of Experience (QoE). On the other hand, time critical applications like Voice over IP (VoIP) or video streaming, e.g. Skype and ICQ, will probably get the highest QoS levels as for them poor throughput or loss of data can result in extreme deterioration of customers' experience. To deliver such QoS many network elements' parameters must be adjusted as required by the respective applications. Examples can be remarking of applications' frames p-bits or DSCP values, configuring the proper policing or shaping parameters and designing proper queue scheduling mechanism for each network element. To guarantee that these adjustments were done properly and that customers can get the quality-of-experience (QoE) needed for real-time applications it is essential to actively test and monitor the network behavior for such applications.

Nextragen® (see <http://www.trafficlyser.de/hp3/>) is a company specialized in active measurement systems designed for end-to-end speech quality analysis in Carrier Ethernet (CE) networks. The idea is to actively test the infrastructure by generating synthetic VoIP conversations between a Nextragen's® sophisticated client located at the NOC and application specific probes/agents located in strategic network areas through which customers' real-time traffic is usually passing.

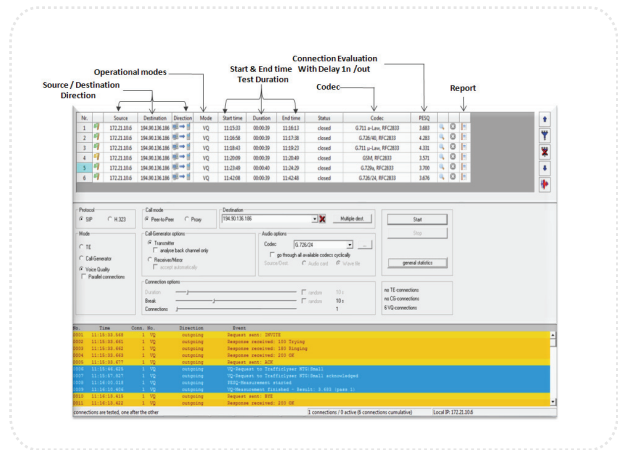
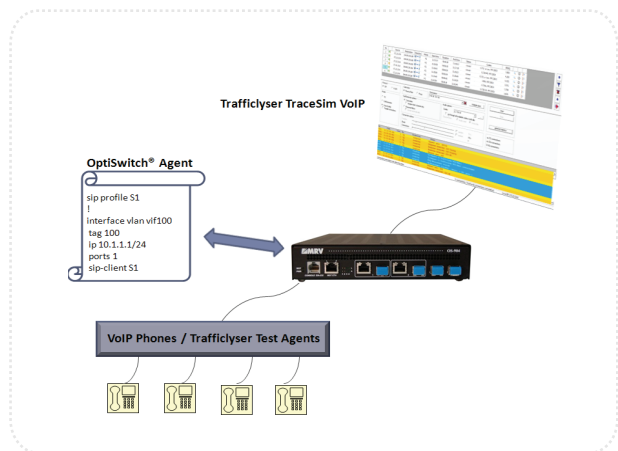


Figure 2: TrafficLyser TraceSim(TM)

Nextragen's TrafficLyser TraceSim™ is a powerful software tool that simulates VoIP connections at Ethernet access nodes. The software is especially optimized for VoIP systems and it includes a number of specific functions for VoIP measurements such as: list of connections, gathering of quality parameters and many more. The software supports simulation of 3 VoIP related protocols: SIP, H.323 and STUN, 6 audio codecs: G.711 (A-Law, μ-Law), GSM, G.721, G.729A, G.723.1, iLBC . See the full list of TrafficLyser TraceSim™ features and benefits below.

In order to carry out measurements with Nextragen's TraceSim™ VoIP tool it is necessary to integrate the aforementioned probes into the network. Since in CE networks the necessary connections for installing the probes are not available it was impossible, in the past, to carry out a comprehensive inspection of the network's VoIP quality. Thanks to the integration of Nextragen's Trafficlyser TraceSim™ VoIP agent in MRV's OptiSwitch® 900, one can easily perform these inspections as MRV devices are already integral part of many CE networks. The MRV OptiSwitch® devices are actually used as remote test points for TraceSim™ VoIP and additional probes are no longer necessary. Nextragen's software is integrated as part of the OptiSwitch® OAM (Operations Administration and Maintenance) functionality.

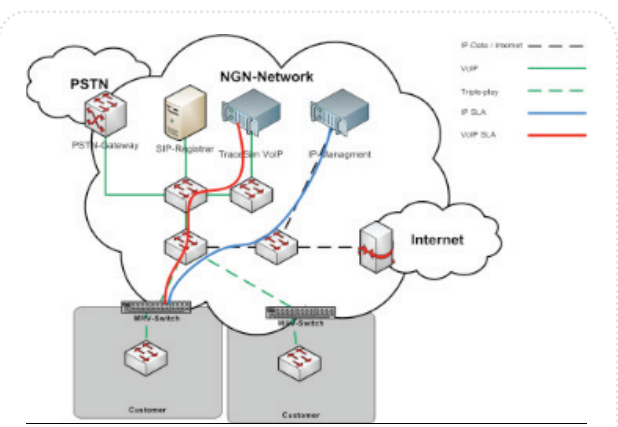


TrafficLyser TraceSim(TM) Network Topology

The implementation of Nextragen's VoIP testing features in the OptiSwitch® enables service providers and carriers to constantly monitor their entire network, including the network segments of their customers. A Trafficlyser TraceSim™ testing system that is installed in the NOC automatically tests all relevant VoIP parameters in all switches in the communications path. The VoIP quality testing includes also the CPE (Customer Premise Equipment) and documents/records the pre-defined SLAs in detail.

The Advantages of the combined MRV/Nextragen's solution are

- Monitoring and documenting the VoIP quality including the end users' segments.
- Permanent and inexpensive monitoring of the relevant VoIP parameters.
- Automatic alerts if the pre-defined VoIP qualities are not met.
- End-to-end testing of the entire VoIP infrastructure of providers and carriers.
- Quick analysis of VoIP quality to identify occurrences such as crackling, hissing, echo, etc.



Network Topology with Nextragen TraceSim(TM)

TrafficLyser TraceSim™ Features and Benefits:

- TE-Mode to simulate an end device
- Call-Generator-Mode to build up or receive up to 150 parallel connections
- VQ-Mode to determine the speech quality according to PESQ (ITU-T P.862) for up to 50 parallel or serial connections
- Automated Test of a network, to determine the max. possible number of parallel VoIP connections with a good quality
- Integrated Job-Planer for an automated execution of tests
- Incoming and outgoing connections
- Operating in Peer-to-Peer – and Proxy-Mode
- Six differ Audio-Codecs
- SIP protocol to build up a connection
- Clearly arranged and comfortable User interface
- Comprehensive connection list with additional connection details
- Connections, that have problems, are marked with a red flag
- Filter function for the connection list, to make searching for noticeable problems easy
- Log window for logging of connection activities
- Comprehensive statistic function
- Broad range of settings
- Print option for connection list and statistics
- Print option for connection data (Source-IP, Destination-IP, Direction, Starttime, Duration, Endtime, Status, Cause, used Codecs, Jitter, Delay, Packet Loss, PESQ-Value etc. per connection, that were selected for print out)
- Export of connection data (Source-IP, Destination-IP, Direction, Starttime, Duration, Endtime, Status, Cause, used Codecs, Jitter, Delay, Packet Loss, PESQ-Value etc. per connection, that were selected for export)
- Export of all important measurement data to a XML file for further processing
- Generate a measurement/test report for documentation on client side
- Included client program for incoming calls for use as remote station
- Additional PDA solution to make quality measurements with a PDA
- With the use of the SQ2500 (Speech Quality Test Box) and the software PESQScope additional quality measurements towards ISDN and analog end devices are possible.

About Prosilient (www.prosilient.com)

Prosilient Technologies is the leading provider of application aware E2E (end-to-end) service performance management, QoS measurement and SLA supervision systems for multiplay communication networks.

Prosilient Technologies was founded in January 2003 by highly skilled engineers and business developers with extensive knowledge of and experience in data and telecommunications. Prosilient Technologies is a Swedish company with head-quarter in Stockholm

About Nextragen (www.nextragen.com)

Nextragen is a leading vendor of testing solutions for protocols and network analysis for triple-play applications. The leading Trafficlyser testing tool facilitate safe and comfortable operation and troubleshooting of triple-play connections, is adjustable to the user's practical needs and is extremely easy to use.

Nextragen is specialised in ensuring service quality (QoS, QoE) for Next Generation Networks (NGN) and triple play services. In addition to the Trafficlyser products, Nextragen offers other services, such as training, workshops, VoIP Readiness Checks (VoIP pre-measurement) and technical support for real-time applications, such as VoIP, IPTV, etc.

MRV has more than 50 offices throughout the world. Addresses, phone numbers, and fax numbers are listed at www.mrv.com. Please e-mail us at info@mrv.com or call us for assistance.

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