

VIDEO MONITORING AND ANALYSIS SOLUTION FOR CABLE OPERATORS

Cable Operators Improve Customer Experience While Reducing the Cost and Complexity of Ensuring Video Quality

Challenge

Subscribers measure cable operators on the quality and consistency of the video programming they deliver. The ability to centrally monitor and analyze video streams without adding to costs or complexity is essential in helping operators maintain a positive customer experience.

Solution

Juniper offers a router-integrated video monitoring and analysis solution that allows cable operators to leverage routing infrastructure to monitor video quality and streamline operations, without the need to deploy incremental network appliances.

Benefits

Cable operators can proactively monitor and troubleshoot video streams, reducing the expensive truck rolls needed to locate problems and satisfy customers. By implementing video monitoring and analysis capabilities on network routers, cable operators can also streamline operations and efficiently scale to address ever increasing video traffic with high performance and reliability.

Cable operators are delivering ever increasing amounts of video traffic, especially with the proliferation of high-definition (HD) content. Unlike data traffic, video is highly compressed and delivered in a multilayered fashion, with MPEG streams encapsulated in IP packets. The use of IP transport in video delivery networks creates new challenges related to service quality assurance. Therefore, the ability to monitor and analyze video streams for IP transport and MPEG errors in real time is critical to ensuring the quality of video services over cable networks. Traditionally, comprehensive video monitoring functionality has been provided by dedicated appliances that are challenging to implement cost-effectively without compromising performance, scalability, or network operations efficiency. It is essential that operators ensure the high value of content for which they are being paid a premium, without adding undue complexity to the network.

Subscribers are sensitive to video quality issues, and each viewer believes himself or herself an expert on video quality. Consumers investing in video services have high expectations for video quality, and cable operators that do not consistently meet those expectations will lose revenue and customers to those service providers that implement comprehensive video monitoring and analysis capabilities to ensure customer satisfaction.

The Challenge

MPEG video over IP transport is a layered distribution system, and problems can arise in any layer or can even arise concurrently in multiple layers. Waiting for subscribers to call for support results in expensive and unnecessary truck rolls, and can lead to higher churn rates and declining market share. Instead, cable operators need the ability to rapidly and efficiently locate and fix video problems before the customer calls to report viewer noticeable issues such as:

- Picture or sound is interrupted or missing.
- Subscriber has difficulty tuning the digital TV receiver.
- There are noticeable lip sync errors.
- Information is missing or inaccurate in the program guide.
- Programs or video on demand (VOD) content is not available.

Video quality problems are complex, with many possible root causes that are difficult to monitor and diagnose. Incoming content from content providers could be flawed, or errors could be introduced by encoders, ad insertion equipment, transcoders, or other devices on the network. Network errors could cause delays and packet losses leading to pixilation of images or freezes in the video stream. The transport stream could be corrupt or misaligned leading to annoying lip synchronization issues, and program clock reference or buffering issues could cause incorrect channel displays. Cable operators need the ability to identify and resolve video problems proactively by analyzing IP traffic and conducting MPEG transport and service analysis.

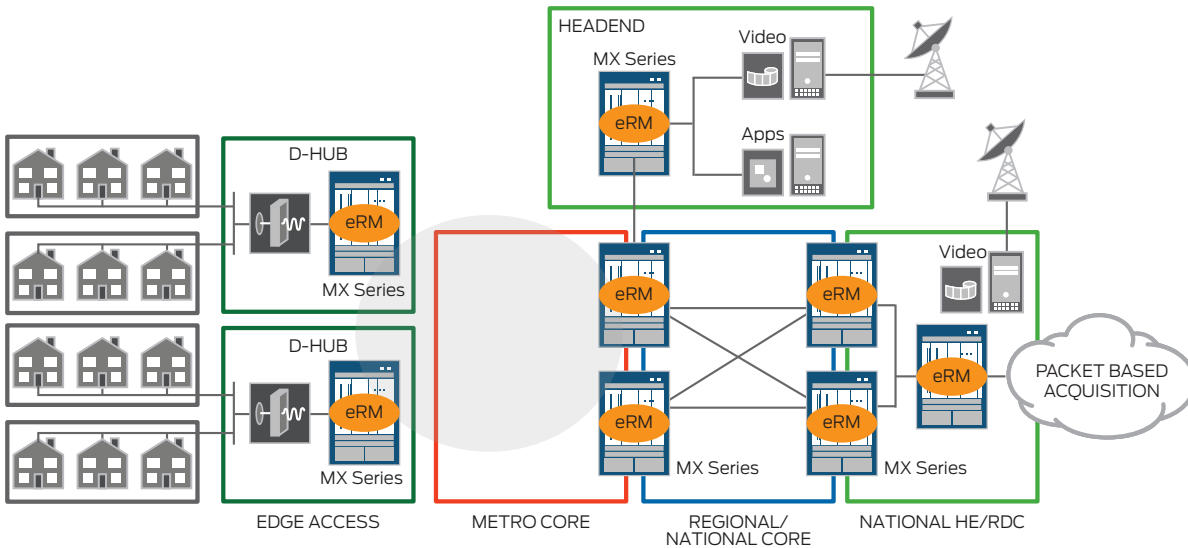


Figure 1: Cable operators can deploy StreamScope eRM on MX Series routers in the head-end, distribution hubs, acquisition sites, and network transition locations to monitor video quality and improve the customer viewing experience.

Video monitoring is an increasingly critical capability for cable operators, as customer expectations for high quality video entertainment continue to grow. Many problems can occur when manipulating video frames and delivering them encapsulated in IP across an IP network, and the video content can be negatively impacted. Video monitoring and analysis of these streams help providers identify, locate, and troubleshoot any issues that arise; the more comprehensive and pervasive the monitoring and analysis scheme, the more rapidly cable operators can correct the problem.

Swiftly addressing video problems results in greater customer satisfaction and fewer service calls. Video monitoring is currently implemented primarily by deploying separate stand-alone video probes and service-specific appliances, without integration into network infrastructure or tools. Appliance-based approaches to video monitoring are challenging to scale and manage, and they lack the carrier-class platforms needed to monitor video traffic 24x7. These approaches are also operationally expensive and inefficient, and they require cable operators to manage additional devices and applications. Integrating video analysis and monitoring into edge routing platforms achieves scale, performance, and efficiency.

The Juniper Networks Embedded Video Monitoring and Analysis Solution for Cable Operators

A Junos Ready Software application that is part of the Intelligent Services Edge portfolio, StreamScope™ eRM is an integrated video monitoring and analysis application for Juniper Networks® MX Series 3D Universal Edge Routers that enables cable operators to implement deep application layer video stream monitoring embedded within the edge routing infrastructure. This approach improves performance and scale, and can lower total cost of ownership (TCO) through simplified network design and operations. It also allows cable operators to increase power and space efficiency.

StreamScope eRM is an optional feature for MX Series routers, and is ideal for cable operators that transport MPEG encapsulated video over IP/MPLS-based infrastructure. By fully integrating comprehensive video monitoring capabilities within the high-performance MX Series platforms and leveraging Juniper Networks Junos® operating system, StreamScope eRM eliminates the need for separate video monitoring appliances—greatly improving the performance, reliability, and scalability of video monitoring solutions for cable operators. This comprehensive, router-integrated video analysis capability uniquely enables StreamScope eRM to rapidly identify potential quality issues at multiple levels, from the network layer through the MPEG layer.

Features and Benefits

By deploying StreamScope eRM, cable operators can implement router-integrated video analysis and benefit from:

- **Reduced Network Complexity.** There is no need to deploy and manage stand-alone appliances, and since Juniper's routers are already deployed in the data path, no port mirroring to external probes or appliances is required.
- **Lower OpEx.** Cable operators can rely on integrated video analysis and monitoring solutions that simplify operations. Cable operators therefore have fewer network elements they need to spare, maintain, upgrade, power, and cool, and they benefit from a reduced infrastructure footprint with fewer administrative and configuration touch points.
- **Router Intelligence.** StreamScope eRM leverages topology information already in the router, and can use Junos OS features such as multicast tree, unicast routing, reachability, and network state to simplify operations.
- **Stream Control.** Because StreamScope eRM is fully integrated with the MX Series routers and Junos OS, the routers can use video analysis feedback to make network layer decisions based on criteria beyond basic IP topology information.
- **Increased Scale and Performance.** While stand-alone video appliances are generally capped by 1GbE interfaces and offer limited system capacity, StreamScope eRM leverages the MX Series' high density GbE and 10GbE interfaces to ensure high performance and investment protection.

StreamScope eRM extends the ability to monitor video stream quality over the IP network, and allows cable operators to identify and troubleshoot complex video quality issues at multiple layers. Cable operators can reduce operational costs by eliminating the need for stand-alone video monitoring platforms, which are typically offered in appliance form factors that are insufficient for the carrier class demands of video services. Since the router is already deployed in the data path, there is no need to dedicate cabling and interfaces to mirror the video traffic to external equipment. Fewer potential failure points improve reliability, and StreamScope eRM can also use the router's topology information to simplify operations and streamline configuration tasks.

Juniper's router-integrated video monitoring and analysis is based on deploying StreamScope eRM on MX Series routers and integration with Junos OS. This embedded video monitoring and analysis solution allows cable operators to identify and correct video problems before customers call to complain about them, allowing cable operators to proactively identify, isolate, and address video quality problems before they distract or inconvenience subscribers.

Solution Components

StreamScope eRM

Because StreamScope eRM can be seamlessly integrated into MX Series routers, cable operators can leverage deployed MX Series platforms to deliver integrated video monitoring and analysis capabilities, providing investment protection and lower TCO while ensuring superior scalability. With support for 10GbE links, StreamScope eRM is offered with up to 10 times the scalability of many typical video monitoring appliances (100GbE interfaces, when available, will further increase this advantage). Additionally, the tight coupling with Junos OS forwarding and control planes ensures simple, unified device and network management. Cable operators can leverage StreamScope eRM to quickly identify video quality issues at multiple packet layers. This embedded, real-time network application helps cable operators simplify operations while delivering an enhanced level of customer satisfaction through improved responsiveness and service quality.

Support for Multiple Video Formats

StreamScope eRM offers flexible support for multiple video formats, including:

- MPEG 2 encoding using MPEG 2 transport streams
- MPEG 4/H.264/AVC encoding using MPEG 2 transport streams
- MPEG 4/H.264/AVC encoding using Real-Time Transport Protocol (RTP) transport

StreamScope eRM also supports link-level Media Delivery Index MDI analysis, and also allows operations staff to view thumbnails of I-frames to monitor and analyze video quality problems. MPEG and MDI analysis assist in identifying and troubleshooting video impairments. While MDI performs network layer monitoring of IP encapsulated video to identify video impairments caused by IP packet loss, delay, and jitter, it does not look into the MPEG packet itself. MPEG analysis is needed to monitor stream layer information and I-frame details to verify the integrity and quality of the MPEG video and to identify MPEG layer issues. This is a much deeper layer of analysis than MDI alone provides.

Both MDI monitoring and MPEG monitoring are important components of video quality analysis. MDI is designed for packet loss, delay, and jitter analysis to identify network layer issues impacting video. MPEG analysis helps identify video stream impairments so that operators can detect incoming video traffic received with errors from content providers, and errors injected into video by network platforms such as ad-insertion devices and video servers.

Video Monitoring Without Impacting Router Performance

Upon entering the router, the video stream is internally replicated using multicast for traditional TV or mirroring for VOD. The original stream is not affected and continues to its destination, while the copied stream is forwarded to StreamScope eRM for analysis. StreamScope eRM runs on the Multiservices Dense Port Concentrator (MS-DPC) on the MX Series router, which provides dedicated processing resources to ensure deterministic high performance for StreamScope eRM and other advanced applications, such as session border controller (SBC) and Dynamic Application Awareness. StreamScope eRM runs concurrently with all other router-supported functions without degrading the throughput of network traffic.

StreamScope eRM provides operators with a comprehensive analysis of all packets, streams, and content, and it filters impairments by severity and presents advanced performance graphs and views. Customizable filters allow operations personnel to quickly get the right information to the right personnel to quickly and proactively troubleshoot and resolve problems. Router integration also permits automated actions based on operator-defined triggers, allowing cable operators to define and implement policy-based automated monitoring of video traffic without degrading router performance. Cable operators can automate network layer actions based on monitoring results, streamlining workflows and functionally integrating video monitoring and routing.

Intuitive Management

StreamScope eRM includes eRM Manager, an embedded web-based client for simple configuration, troubleshooting, and analysis. It allows operations staff to perform stream visualization by looking at unencrypted I-frames via any Web browser. StreamScope eRM can be configured by the standard Juniper command-line interface (CLI) or via the eRM Manager, and operations personnel can view statistical data with standard violations highlighted to encourage quick action to resolve problems. Management data can also be exported to NMS/OSS systems through a variety of open interfaces.

Flexible Deployment

StreamScope eRM can replace or complement pre-existing stand-alone video monitoring appliances, which can stay in place, be redeployed, or retired. It is ideally deployed wherever video streams are acquired, inserted, or processed, such as in the video head-end at distribution hubs and at edge locations where MPEG layer errors are often introduced, and where deep MPEG layer analysis capabilities pay the greatest dividends. These locations include:

- The point where the MPEG stream is first received into the IP network
- Locations where ads are inserted
- Locations where video is processed
- Locations immediately downstream from where the MPEG stream is multiplexed/demultiplexed

Furthermore, StreamScope eRM's MDI capabilities are ideal for transit routers where no video is forwarded without further processing, insertion, or manipulation. The MDI specifications provide IP layer loss and jitter analysis that help operators understand network characteristics. Cable operators need both comprehensive network and MPEG-level analysis to locate problem areas and identify incoming traffic received with errors from content providers, as well as errors introduced by encoders, ad insertion equipment, and other devices on the network. While MDI and MPEG analysis are often deployed on separate probes, StreamScope eRM provides an integrated solution that enables flexible deployments that avoid the cost and complexity of deploying additional network appliances.

Capturing and Leveraging Historical Data

Statistical information is captured by StreamScope eRM and stored locally on the MS-DPC, where operational staff can access it to analyze video quality trends over time. This data can also be optionally uploaded to operations support systems (OSS) applications to enable historical analysis and support proactive modeling of future video network upgrade requirements.

Developed Through the Junos SDK

Developed using the Junos SDK, StreamScope eRM builds on technology developed by Triveni Digital, a leading provider of digital signal monitoring and analysis solutions and subsidiary of LG Electronics (LGE), to deliver a comprehensive MPEG analysis solution that is qualified, sold, and supported by Juniper Networks. As a Junos SDK development partner, Triveni Digital was provided powerful tools and resources, including a software development kit (SDK) with intelligent and secure interfaces to Junos OS routing and service functions that allowed Triveni Digital's technology to functionally integrate with Junos OS and the MS-DPC.

The Junos SDK enables customers and partners to develop specialized value-added applications on Junos OS. These applications can be used in individual customer networks or, as in the case of StreamScope eRM, sold and supported as Juniper products after undergoing extensive validation testing by Juniper Networks. By delivering applications that are tightly integrated with Junos OS and that run directly on Juniper routing platforms, Junos SDK enables cable operators to efficiently deploy a broader portfolio of end-to-end solutions. The introduction of the StreamScope eRM exemplifies the value of Junos SDK by providing cable operators with best-in-class video monitoring and analysis technology that is fully integrated with the router infrastructure.

Leveraging the Intelligent Services Edge

StreamScope eRM is supported on MX Series routers, and is an important element of Juniper's Intelligent Services Edge portfolio, which leverages Juniper Networks' unmatched architectural integrity to support flexible services and service velocity with enhanced operational efficiency. The Intelligent Services Edge is a fully integrated portfolio of hardware and software features that address business challenges for cable operators building and expanding high-performance networks. Leveraging the architectural integrity of Juniper's powerful Junos OS and advanced edge routing platforms, the Intelligent Services Edge enables cable operators to deliver a comprehensive range of services over a single operating system with maximum scale.

These advances facilitate intelligent convergence at the edge, which drives network monetization by speeding deployment of new services and reducing operational costs and complexity. As cable operators continue to rapidly expand their service portfolios, the ability to converge services across a set of intelligent edge routing platforms will greatly enhance scale, performance, and operational efficiency. The Intelligent Services Edge addresses technical and business challenges facing cable operators. It leverages a single, consistent operating system and high-performance hardware to flexibly deliver many service types—including broadband routing, voice, and multimedia services—and it offers integrated security as well as application-level awareness.

MX Series Routers

MX Series 3D Universal Edge Routers provide Ethernet switching capabilities and carrier class routing features. The MX Series provides high performance with high port density routing and switching functionality. MX Series routers feature high density GbE and 10GbE interfaces to enable cost-effective scalability of video services and investment protection for network infrastructure.

Junos Operating System

Junos OS is the trusted network operating system fueling Juniper's leadership in high-performance networking, and is the industry's only network operating system delivering the Power of One: one software release train, one modular architecture, and one operating system across multiple routing, switching, and security platforms. The inherent security and stability of Junos OS, combined with its modular architecture and single source code, provides a proven foundation for delivering best-in-class performance, with an attractive TCO. With continuous systems availability, intelligence, and automated operations efficiency, Junos OS offers cable operators a unique view of the services and network availability their customers require, helping them to deliver an enhanced user experience.

Summary—Streamlining Operations While Improving the Customer Video Experience

StreamScope eRM adds unobtrusive and comprehensive video monitoring functions to Juniper edge routers, allowing cable operators to efficiently monitor and analyze video traffic to improve the quality and consistency of their video services. Cable operators increase customer satisfaction with the viewing experience and avoid the OpEx charges of qualifying, integrating, sparing, powering, cooling, and maintaining stand-alone video analysis appliances.

This unique router-embedded video analysis and monitoring solution provides cable operators with a scalable, reliable, and cost-effective solution for ensuring the quality of video delivered to residential subscribers. It combines Juniper's proven IP networking expertise with Triveni Digital's extensive video monitoring expertise to provide a solution that monitors the IP transport of MPEG streams, as well as the MPEG encoding itself, and any associated audio and video streams. StreamScope eRM enables comprehensive analysis at multiple Open Systems Interconnection (OSI) layers, including network interface, IP/MPLS, transport stream, MDI, MPEG packet, and baseband (I-frame) layers. Cable operators can leverage StreamScope eRM to proactively monitor and improve video quality. Operators can also use it to collect statistics for historical data analysis that helps operations teams make informed network upgrade and network reconfiguration decisions to optimize video quality over IP networks.

With StreamScope eRM, cable operators can now efficiently monitor video traffic without the cost and complexity of deploying stand-alone monitoring appliances, and can streamline operations with centralized management and control of video services. With StreamScope eRM, cable operators can avoid investing in video probe appliances by deploying router-integrated video quality monitoring and analysis that proactively identifies multilayer IP-through-MPEG issues. StreamScope eRM extends the performance, scalability, and reliability of Juniper's routers to video quality monitoring, and allows cable operators to deploy a reduced footprint solution with fewer touch points and streamlined network management. Cable operators can confidently integrate multilayer video quality monitoring into their existing routing infrastructure to proactively monitor video quality and improve the customer viewing experience.

Next Steps

For more information on Juniper Networks Video Monitoring and Analysis Solution for Cable Operators, contact your Juniper Networks sales representative or visit us at www.juniper.net/cable.

About Juniper Networks

Juniper Networks, Inc. is the leader in high-performance networking. Juniper offers a high-performance network infrastructure that creates a responsive and trusted environment for accelerating the deployment of services and applications over a single network. This fuels high-performance businesses. Additional information can be found at www.juniper.net.

Corporate and Sales Headquarters

Juniper Networks, Inc.
1194 North Mathilda Avenue
Sunnyvale, CA 94089 USA
Phone: 888.JUNIPER (888.586.4737)
or 408.745.2000
Fax: 408.745.2100
www.juniper.net

APAC Headquarters

Juniper Networks (Hong Kong)
26/F, Cityplaza One
1111 King's Road
Taikoo Shing, Hong Kong
Phone: 852.2332.3636
Fax: 852.2574.7803

EMEA Headquarters

Juniper Networks Ireland
Airside Business Park
Swords, County Dublin, Ireland
Phone: 35.31.8903.600
EMEA Sales: 00800.4586.4737
Fax: 35.31.8903.601

To purchase Juniper Networks solutions, please contact your Juniper Networks representative at 1-866-298-6428 or authorized reseller.

Copyright 2010 Juniper Networks, Inc. All rights reserved. Juniper Networks, the Juniper Networks logo, Junos, NetScreen, and ScreenOS are registered trademarks of Juniper Networks, Inc. in the United States and other countries. All other trademarks, service marks, registered marks, or registered service marks are the property of their respective owners. Juniper Networks assumes no responsibility for any inaccuracies in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.