



Remote Monitoring Solutions for Digital Video Components

Contents

| | |
|---|----|
| Introduction | 3 |
| The Need for More Robust Monitoring | 3 |
| Emerging Requirements for Central Monitoring..... | 5 |
| Relying on the Motorola SmartStream Terminal Data Collector | 6 |
| Complementary Monitoring Solutions from Motorola..... | 9 |
| Reducing Operational Costs, Improving Customer Service | 11 |
| Conclusion | 11 |

From the Headend to the Home, Motorola Offers End-to-End Solutions for Remote Monitoring that Improve Overall Service Quality and Lower Operating Costs.

Introduction

Given the right tools, network operators can monitor the delivery of digital services and remotely diagnose and resolve service delivery issues. They can reduce truck rolls and drive down operational costs by capturing information, correlating metrics from multiple device types, and implementing actionable policies that accelerate problem resolution. They can improve customer satisfaction by proactively addressing problems as they arise, being able to offer the best service experience possible to their customers. With integrated monitoring solutions, network operators can monitor operations and the health of an increasingly complex assortment of digital video equipment required to deliver high-value services.

By deploying diagnostic and monitoring solutions from Motorola, network operators can monitor the end-to-end network for health and maintenance. They can capture vast amounts of statistical information and present it in a logical manner so that customer service representatives (CSRs), operations personnel, field technicians, and installers can remotely monitor the service performance delivered to a population of subscribers or to a single customer premises equipment (CPE) platform. Service providers can turn to Motorola for highly scalable remote monitoring solutions that lead to higher and more reliable service quality. Network operators can drive down operational costs (OPEX) by reducing the need for truck rolls and enhancing and automating customer service, and they can benefit from service assurance for a broad range of digital offerings.

The Need for More Robust Monitoring

The rapid increase of emerging digital services offered by broadband network operators heightens the need to centrally monitor the complexity of the network. Subscribers are increasingly utilizing the broadband network for personal media experiences delivered throughout the home, and increased digital penetration is encouraging the use of new services and new technologies. These new services and technologies increase the average revenue per subscriber and, along with the increased revenues, drive increased subscriber expectations for service quality.

However, each new service requires the ability to monitor and integrate multiple sets of diagnostics to ensure reliable service delivery. As network operators add new services to gain a competitive advantage, the complexity of remotely monitoring the consistent high-quality delivery of diverse services becomes an even greater challenge. The many nuances of monitoring equipment and applications can be best understood by considering the diverse range of evolutionary services, each of which requires unique diagnostics:

- Digital video
- Pay per view (PPV)
- Video on demand (VOD) and other advanced on-demand offerings
- Digital video recording (DVR)
- High-definition television (HDTV)
- Switched digital video (SDV)
- Voice over IP (VoIP)
- High-speed data (HSD)

While basic video services can be reliably assured by remotely monitoring signal quality, the monitoring demands become greater as the operator adds additional equipment that enables innovative services.

For example, adding PPV requires the ability to monitor the delivery of rented video content and the collection of purchases, and VOD requires the ability to monitor the interactive communications between the set-top and the headend. DVR services require the ability to monitor and diagnose set-top hard drives that store the content, SDV services must be monitored to ensure that switched services are being reliably delivered according to customer demand, and HDTV bandwidth and service quality must be carefully monitored to ensure that subscribers receive the premium experience for which they are paying premium prices. VoIP requires the ability to capture information on real-time interactive voice services, and the downstream and upstream transport of HSD services must be monitored to ensure that subscribers are receiving acceptable performance levels.

Increasing network complexity increases the need to monitor the health of a variety of interconnected components. Operators need more robust monitoring and diagnostic capabilities so they can meet ever-increasing customer expectations—for an ever-broadening range of digital services. Competition is increasing the options available to subscribers, and those network operators that can remotely monitor and diagnose digital service delivery will gain a competitive advantage in the ever-increasingly competitive broadband marketplace. By implementing remote monitoring solutions from Motorola, service providers can:

Drive down OPEX — Service providers can centrally verify installation success and diagnose the source of an outage problem whether it is within the home of a subscriber or on the network. Central monitoring and diagnostics will improve first-time resolution of issues, and in turn reduce the frequency of truck rolls.

Provide service assurance — Monitoring video delivery is essential to delivering personal media experiences that increase revenue and market share.

Increase customer satisfaction — Remote monitoring provides operations staff with additional diagnostic information that minimizes the direct involvement of the subscriber in troubleshooting service delivery issues. Additionally, the need for escalation of trouble calls is reduced, shortening many of the subscriber calls to support representatives.

Enhance reliability — Proactive monitoring allows network operators to avoid potential problems and more reliably deliver a wide spectrum of services from the headend to the home.

Improve responsiveness — Central access to rich diagnostic information allows CSRs to more swiftly and effectively resolve service delivery issues. Network operators can accelerate response time for customer service delivery issues and more quickly resolve any service delivery problems.

Better retain customers — Subscribers are increasingly demanding video experiences that are seamless and hassle free. Adding remote monitoring capabilities to services and equipment helps operators focus on the end-user experience in areas such as installation, support and the addition of new services, which is critical to ensuring customer satisfaction, reducing churn and increasing average revenue per user (ARPU) rates.

Emerging Requirements for Central Monitoring

Legacy management tools designed for specific services have created islands of information that are difficult to share across multiple services. Remote monitoring of diverse services requires the ability to monitor multiple devices in the headend, on the access network and in the home. Data collection, data correlation and automatic responses based on established policies are essential to reaping the many rewards of remote monitoring and diagnostics.

The ability to centrally collect data from multiple types of devices is essential. Network operators need the ability to centrally probe network platforms and CPE equipment, and they need the ability to present both aggregated information for a given service area as well as an in-depth view of a single subscriber's situation so that a CSR can take action to resolve service issues.

The collected data can be correlated so that service providers can swiftly analyze issues and take steps to resolve any service delivery problems. For example, viewing diagnostic information for a set-top or cable modem may be insufficient for resolving many subscriber problems, but the ability to correlate that data with diagnostic information on network elements can dramatically accelerate problem resolution.

Collection and correlation of data leads to efficient analysis and the ability to generate automatic responses to proactively resolve problems according to established policies. Operations staff can define policies that trigger specific actions as a result of centrally correlated data collected from multiple device types, improving customer service and reducing the demands on CSRs, field technicians, and installers. Data collection, data correlation and automatic responses are made possible when the monitoring topology collects information from all major classes of devices on the network and in the home, including:

- Video components, such as headend equipment, QAMs, and set-tops
- Network components, such as routers and switches
- Application components, such as VOD servers, VoIP infrastructure, and the network platforms required for SDV services
- Digital set-tops used for standard definition and/or HD content
- Cable modems used as the gateway for high-speed data services
- eMTAs on the customer premises that enable the delivery of voice and data services

Data collection across multiple device types and applications—and the ability to correlate the data so it can be analyzed to drive automated responses—unlocks the true potential of central monitoring. It allows network operators to improve the quality and reliability of broadband services while improving customer satisfaction and streamlining operations.

Relying on the Motorola SmartStream Terminal Data Collector

The Motorola SmartStream Terminal Data Collector (STDC) is an integrated client-server solution for remote collection of diagnostics from digital cable set-top boxes. It includes a one-RU server at the headend and client software on Motorola DCT, DCH, and DCX set-tops. The STDC gathers critical information about the set-top population as a whole, or the status of an individual set-top.



The STDC platform is already deployed for collecting diagnostic data with major cable operators in North and South America.

The diagnostic information is grouped into intuitive data sets, enabling CSRs and technical support personnel to quickly and easily debug a variety of device issues remotely. The data sets available in the STDC make it a powerful and affordable diagnostic solution, enabling quality of service assurance for broadcast video as well as interactive applications such as VOD and SDV.

The STDC includes a downloadable graphical user interface (GUI) browser applet that enables operations personnel to remotely view collected data from any user terminal at any connected location. The Northbound Interface (NBI) enables integration and sharing of data with additional OSS applications and platforms, providing a common interface for CSRs.

The STDC is a scalable monitoring solution that supports multiple simultaneous users, allowing hundreds of CSRs to access the diagnostic data concurrently. It can be configured to allow multiple user groups—such as CSRs, headend operators, field technicians and installers—to view actionable data that is relevant to their needs. The STDC supports targeted troubleshooting as well as general diagnostics on the state and status of deployed Motorola set-tops, allowing the generation of reports on a wide range of parameters, including:

- Signal-to-noise ratio (SNR)
- Automatic gain control (AGC)
- Hard drive space
- PPV info
- Set-top temperature
- Tuned frequencies
- Installed code/download errors
- Authorizations
- Video quality metrics
- Network location
- Network efficiency indicators
- Program application table/program map table (PAT/PMT) information

Formatted report templates are available for compiling and presenting the data, and the metrics are grouped into logical data sets, allowing the network operator to present only relevant data to each type of user in a way that is meaningful to them, enabling swift action based on tangible information.

The screenshot shows a window titled "Immediate Setup Data Request Reports" with a sidebar on the left containing a tree view of data categories: Core Data, Inband Data, Code Object, Aloha Data, Decryptor Tier, Decryptor Unit, Decryptor Diag, Decryptor Resp, Memory Usage, Time Data, Count of Chans, Message Type, Service Data, Operating Sys, Home Status, Home Link, DOCSIS Gateway, MAC Address, Harddrive Usage, and DOCSIS System. The main area displays several data sections:

- Core Data:** A tree view on the left.
- Setup State:** A table of status indicators such as OOB Capable, OOB Hunting, OOB SNR Quality, OOB Sig Quality, Ctrl Chan Locked, Connect State, DVB Setup, Unackd Purchases, Timeout Armed, Timed Out, and Remodulation.
- Setup Parameters:** A table of technical parameters including ERM Refresh, DCT Config, CSNs Loaded, Suite List ID, Suite Version, Code Version, Objects Loaded, Peak Temp, Current Temp, OOB Frequency, OOB SNR, OOB Signal, OOB Lock Lost Cnt, Int HD Space (mb), Ext HD Space (mb), IP Network Entries, Aborted UStream Msgs, ALOHA D-Stream ID, ALOHA U-Stream ID, Service Power (dBmV), Polling Power (dBmV), DVB Network ID, Fatal Errors, and System Up Time.
- Feature Sets:** Three tables (Set #1, Set #2, Set #3) showing authorization and failure status for various features like 1394, USB, DVI, EMet, HSI, DOCSIS, RIP, SPDIF, Int HD, Ext HD, DVR, HD Dec, RF Byp, AB Srv, Smart, TV Pass, IR, Telco, HMA Bas, HMA Ad, HDMA, MoCA, and Resrv.

External text labels with blue arrows point to specific data points:

- "Verify STB Code Version" points to the Code Object section.
- "Check Available Memory" points to the Memory Usage section.
- "Verify STB State & Status" points to the Setup State section.
- "Check PPV Purchase Info" points to the Unackd Purchases parameter.
- "Check DVR Temp & HD Space" points to the Peak Temp, Current Temp, and Int HD Space (mb) parameters.

Formatted report templates can be customized to present relevant information to operational and support staff.

The STDC gathers critical information about the set-top population as a whole or the status of an individual set-top, enabling the scalable collection of client diagnostic data—from a single client or the entire client population.

The system is scalable to multiple set-tops in a home as well as multiple output locations for report viewing. The captured information is organized into data sets to support troubleshooting productivity, and the use of operator-customized data sets minimizes traffic on the network so that operators can focus on capturing the most relevant information. The initial STDC data sets include Core Diagnostic, In-band Diagnostic, Decryptor Tier Report, Download Object Diagnostic, Aloha Diagnostic, and Service Information Diagnostic, and additional data sets are currently in development.

| Inband Data | | | |
|-------------------------------|----------|----------------|----------|
| STDC Client - 010.101.000.001 | | | |
| Tuner #1 | | | |
| Frequency | : 627000 | Carrier Lock | : LOCKED |
| Transport ID | : 2 | PCR Lock | : LOCKED |
| Signal Lvl | : 63 | Signal Quality | : N/S |
| SNR | : 34 | SNR Quality | : POOR |
| Short Errors | : 37539 | Modulation | : 256QAM |
| Long Errors | : 240115 | Tuner Number | : 1 |

Remote CSRs can review and correlate data to better understand the customer experience. In this example, poor SNR and high short-term errors indicate poor picture quality.

| Inband Data | | | |
|-------------------------------|----------|----------------|----------|
| STDC Client - 010.101.000.001 | | | |
| Tuner #1 | | | |
| Frequency | : 627000 | Carrier Lock | : LOCKED |
| Transport ID | : 2 | PCR Lock | : LOCKED |
| Signal Lvl | : 63 | Signal Quality | : N/S |
| SNR | : 34 | SNR Quality | : GOOD |
| Short Errors | : 0 | Modulation | : 256QAM |
| Long Errors | : 139765 | Tuner Number | : 1 |

Conversely, a CSR can also diagnose from the good SNR and no short-term errors that the consumer is likely experiencing good picture quality.

The STDC supports real-time, on-demand queries as well as scheduled queries implemented at operator-defined frequencies. It enables remote data collection to a centralized server, with autonomous periodic reporting of set-top populations and the ability to conduct on-demand querying of targeted set-tops. The service providers retain maximum flexibility for scheduling automatic data collections and enabling personnel to query individual set-tops or groups of set-tops to diagnose service quality.

CENTRALLY DIAGNOSING DIGITAL VIDEO

By centrally deploying the Motorola STDC, network operators can efficiently diagnose video delivery and improve customer service. For example, installation validation could be implemented to ensure that set-tops are functioning within acceptable limits at the time of installation. Set-top diagnostic information can be automatically recorded at the time of installation, and this “birth certificate” record can be used to enhance any subsequent troubleshooting.

Network operators can improve operations by allowing the central server to aggregate data from distributed services and automatically detect any outages and generate notification alarms. They can also automate the provisioning of new services, and improve call handling and reduce call escalation levels by allowing CSRs to easily access diagnostic information.

Service providers can avoid unnecessary truck rolls by centrally ensuring that set-tops are performing within acceptable parameters, and they can centrally ensure that each set-top receives updated code suites to ensure smooth operations.

Centralized video quality monitoring with the STDC provides remote visibility into the video quality diagnostics for a given set-top—or group of set-tops—allowing network operators to more consistently deliver high-quality video that engages subscribers and builds brand loyalty.

The data is stored in the server and operations staff can generate periodic or tailored reports. For example, a service provider could generate a weekly SNR report to determine that a population of consumers received consistently strong signal levels, and operations staff could generate reports in the event of a service outage to diagnose thresholds that have been exceeded and provide information to accelerate the restoral of service.

This approach allows service providers to proactively monitor multiple metrics and develop and implement troubleshooting policies and business rules based on the correlation of multiple measurable thresholds. The STDC allows service providers to measure the health of video delivery to the home, with diagnostic information grouped into intuitive data sets so that CSRs and technical support personnel can quickly and easily debug a variety of device issues remotely—without the cost and the downtime of truck rolls.

Extending the STDC to a centralized architecture expands the possibilities for adding further value to the diagnostic data, and it delivers comprehensive device management capabilities—saving service providers on operating expenses and increasing consumer satisfaction.

Complementary Monitoring Solutions from Motorola

The STDC is complemented by the following monitoring solutions from Motorola, allowing service providers unprecedented abilities to monitor the end-to-end delivery of triple-play services.

Motorola SmartStream Device Manager (SDM)

Service providers can also turn to Motorola solutions for monitoring headend equipment. The SmartStream interactive digital cable system consists of an integrated set of high-performance stream-processing elements necessary for the successful deployment of advanced services like VOD and digital ad insertion.



To accommodate various deployment strategies and network architectures, the elements of the SmartStream system have been designed to simplify and optimize the management of headend system resources, affordably address exploding stream count, provide a secure content delivery environment, and deliver a scalable architecture to allow the system to grow with subscriber additions.

The Motorola SmartStream Device Manager (SDM) configures digital video headend devices for proper operation and monitors and interfaces with headend network management systems to display and relay health, status, and configuration information. It can be used to interface Motorola headend products with existing network management systems to relay the health, status, and configurations of the increasing number of complex headend operating elements. The combination of the Motorola STDC and the SDM provides network operators with the ability to monitor headend equipment as well as set-top boxes, enabling a rich array of diagnostic information for monitoring network health and ensuring the reliability of digital video services.

Motorola EDGE Manager Remote Management Software Platform

Motorola EDGE Manager is the cornerstone of the Motorola EDGE Service Assurance Software Suite, providing cable and telecom operators with a family of customer care applications for the evolving home network. The STDC joins with the Motorola EDGE Manager Remote Management Software Platform to deliver device, service, and subscriber management capabilities across the broadband-connected home through the entire device lifecycle, including installation, configuration, bulk modifications, and trouble resolution. It allows network operators to expand the monitoring solution beyond the set-top to include the monitoring of CPE platforms throughout the connected home.

By deploying the Motorola Motorola EDGE Manager Platform, service providers can not only manage the broadband gateway but also understand the status of devices on the home network. Motorola EDGE Manager provides a comprehensive, unified solution for managing next-generation set-top boxes as well as an evolutionary approach to implementing whole-home video service assurance. The IP world is becoming increasingly complicated, and Motorola offers innovative solutions that allow service providers to assure the delivery of services—including video—to the customer premises.

Motorola EDGE Manager serves the function of being the gatekeeper for monitoring and interpreting the IP video events on the subscriber's home network, and it ensures that the set-top and the home gateway are configured correctly. It also provides a migration path toward monitoring and managing devices throughout the customer's home network. Motorola EDGE Manager is a software solution for monitoring, maintaining and troubleshooting subscriber equipment.

It is a scaleable, carrier-grade software platform that enables operators to remotely access, configure, monitor, and troubleshoot a full portfolio of consumer devices, home networks, and services, including gateways, modems, webcams, and set-tops. The Motorola EDGE Manager platform allows network operators to increase revenue by accelerating new service introduction, and service-aware provisioning capabilities simplify the activation of new IP video services.

Motorola eCare Remote Control

Service providers can gain further visibility within the connected home by also deploying Motorola eCare, a web-based interactive call center application that enables remote support for a subscriber's Windows and/or Macintosh PCs. It enables CSRs to assist customers anywhere in the world by providing a powerful diagnostic and resolution toolset that includes remote control, text based chat, integrated customer surveys, file transfer, Managed Scripts and more.

From diagnostic sweeps to complex installations and configurations, Managed Scripts provide a more versatile and efficient approach to incident resolution, further limiting the duration of the support session and improving both the agent and customer experience. Using just an Internet connection and a web browser, the CSR can see what the customer sees, operate the computer remotely, and push scripts to resolve support issues quickly and securely—the first time.

Reducing Operational Costs, Improving Customer Service

From the headend to the home, Motorola offers extensible monitoring and diagnostic solutions that allow service providers to drive down OPEX while enhancing customer service. For costs that amount to only pennies per subscriber for deploying Motorola remote monitoring solutions, network operators can provide a more reliable and consistent experience for broadband video, data, and voice services.

They can minimize OPEX by reducing truck rolls and providing CSRs with easy access to actionable diagnostic information, and they can automate responses to typical support issues by collecting and correlating data, and by defining automated response policies based on diagnostic information. Service providers can improve customer service by increasing the reliability and consistency of triple-play services, and they can more swiftly troubleshoot and resolve support issues so that subscribers can spend more time enjoying their broadband services and less time on the phone troubleshooting them.

Motorola offers integrated monitoring and diagnostic solutions that help service providers monitor the health of the network and proactively identify and address service delivery issues so network operators can increase retention rates and build longer-lasting relationships with subscribers.

Conclusion

Motorola has developed diagnostic and monitoring solutions based on a deep understanding of service provider environments and requirements. Our leading-edge monitoring technology leverages industry standards and has been field-proven in commercial implementations worldwide. Motorola offers a unique understanding of subscriber and service provider requirements—from the headend to the gateway to the desktop and throughout the broadband home.

Value-added monitoring and management of subscriber services can differentiate one service provider from another, and network operators need the ability to deploy and monitor devices and services while resolving service issues and delivering service-aware video application support. Motorola provides the products, systems and professional services that enable efficient and reliable visibility into the digital services delivered to the connected home.

Service providers can proactively monitor the delivery of digital services and address customer expectations by remotely diagnosing and resolving service delivery issues. They can reduce truck rolls and drive down operational costs by aggressively capturing information, correlating metrics from multiple device types and implementing actionable policies that accelerate problem resolution and improve customer satisfaction.

Motorola also provides the professional services expertise to help carriers and cable operators manage the end-to-end delivery of video services to the connected home. Carriers and cable operators can swiftly deliver high-quality video services to increase revenues, increase ARPU levels, improve service and streamline troubleshooting, and they can build closer bonds with subscribers by enabling service assurance for robust video services delivered throughout the home.

For more information about monitoring and diagnostic solutions from Motorola, please **visit www.motorola.com** or contact your Motorola account representative



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