

Video Quality Monitors

Sentry® Datasheet: VNM-SEN



Monitor your entire network with rich graphs and an easy-to-use web-based interface.

Sentry® is a comprehensive video and audio quality monitoring solution for advanced video networks. It enables video service providers to deliver services with optimum quality while reducing operational expenditures.

Key features

- Real-time 24/7 QoS and QoE monitoring and analysis of entire channel lineup
- In-depth monitoring for compliance to closed captioning standards
- Audio silence and audio-level issue detection based on ITU BS.1770 specification
- Tiling and macroblocking detection
- Perceptual video quality (eMOS) for MPEG2, H.264 and H.265 content
- PID-level IDR (Instantaneous Decoding Refresh) and EBP (Encoder Boundary Point) reporting and alerting
- Video thumbnails and Thumbnail Wall
- Comprehensive TR 101 290 measurements
- User-triggered and alert-triggered stream captures
- QoE monitoring for JPEG2000 codec
- Error second and program availability reporting
- Stream to view (video backhauling)

- Historical reporting and graphing
- Transport Stream and Program Group bandwidth graphing
- Analyzer-quality RF measuring capability
- EBIF and Data Carousel monitoring

Key benefits

- Strong correlation to the viewer experience
- Reduce operational costs
- Achieve regulatory compliance and protection from fines
- Ensure the delivery of high quality content
- Verify the delivery of ad inserts
- Ensure compliance and quality from ingress to egress

Video quality monitoring with Sentry

Monitoring digital video services in today's complex networks requires advanced monitoring equipment in order to be highly confident that the services can be correctly decoded and displayed at any time, on any device. Sentry® is a comprehensive and scalable video and audio quality monitoring solution enabling video service providers to deliver both linear and adaptive bitrate services with optimum quality while reducing operational expenditures.

Sentry is an all-purpose monitoring solution incorporating both quality of experience (QoE) and quality of service (QoS) measurements. The variety of inputs with multiple input capability allows video service providers to customize Sentry to easily integrate into any monitoring scheme.

Sentry takes the guess work out of troubleshooting issues. By providing detailed root-cause information, Sentry allows engineers to resolve problems quickly and often before subscribers experience any quality deterioration or outage.

Detection and alerting of a subscriber-impacting issue is only part of the monitoring functions of Sentry. Analysis tools coupled with historical data give service providers the ability to resolve complex and intermittent problems quickly. Advanced reporting capabilities give operators the ability to generate reports that quickly identify the top offending programs or locations.

Software options

Quality of Experience (QoE) monitoring

Quality of experience refers to the quality of the picture itself and not what caused the picture to look poor. It is how the viewer sees or perceives the video quality. Sentry's QoE monitoring stands apart from other solutions by going deep into the content looking at the sequence, GOP, picture, slice, macro-block and block layers of every video and audio service in every transport stream. Sentry's QoE measurements give a strong correlation to the actual viewer experience and Sentry is able to catch encoder specific errors regardless of network status.

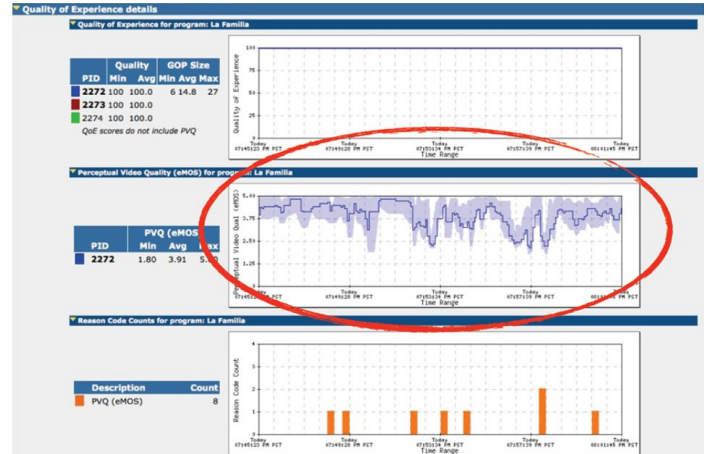
Quality of Service (QoS) monitoring

Quality of service measurements look at the transmission and health of the MPEG/IP transport network. Sentry monitors the most critical TR 101 290 Priority 1, 2 and 3 tests to offer comprehensive QoS checks and alarming. Real-time monitoring and alerting notify service providers right away if there are errors related to the priority checks they are most concerned about. This saves on operational costs related to mean time to detect (MTTD) and mean time to repair (MTTR) an issue. Sentry also offers PCR measurements including PCR Interval and PCR Accuracy.

Perceptual Video Quality (PVQ monitoring)

Sentry ranks picture quality in real time on SD, HD, and UHD programs (MPEG2, H.264 and H.265), so service providers can understand how video compression artifacts such as blocking video are affecting the viewer's experience with the picture. These problems are extremely difficult to detect and are becoming a critical issue to monitor as video content continues to grow while bandwidth is becoming more limited than ever. Sentry's eMOS is the industry's first and only highly scalable "non-reference" perceptual quality score that correlates closely with the Tektronix PQA - the industry standard for picture quality test and measurement, used by leading encoder manufacturers worldwide.

Sentry accurately detects video artifacts and scores them as PVQ (or eMOS), which ranks video quality in a similar way as a Mean Opinion Score (MOS). eMOS can be used, in the case when there are no technical "errors" in the transport stream, to measure perceptual video quality in the compressed domain. Sentry's PVQ scoring is sensitive to certain artifacts caused by over-compression that specifically affect chroma detail.



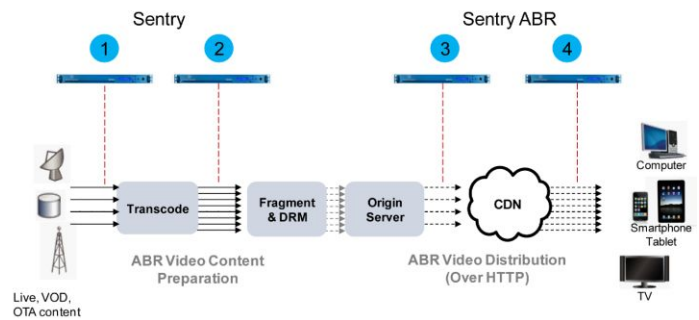
Perceptual Video Quality (eMOS) Measurement.

Adaptive bitrate monitoring for TV Everywhere/OTT

The underlying technology used with TV Everywhere/OTT content is adaptive bitrate streaming (ABR). This involves the segmentation of video into small fragments of compressed content for transmission to viewing devices such as TVs, smart phones and tablets.

Within the ABR workflow, Sentry is used from ingest all the way through the critical transcode process to perform comprehensive QoE analysis, artifact detection and compliance checks on each stream at each bitrate in real time. Sentry quantifies and compares video quality across profiles and also provides IDR/EBP alignment verification and IDR/EBP presence/cadence.

Multi-Screen Multi-Point Video Monitoring



Ad verification

Sentry provides the most complete digital ad insertion monitoring solution by combining real-time monitoring and alerting with historical auditing across the entire channel lineup in all advertising zones. Sentry delivers extensive data that improves digital ad insertion on any platform, allowing engineering teams to ensure proper function of insertion technology by identifying and correcting system errors when they occur.

In addition, the ad insertion verification capability allows ad sales groups to provide higher levels of customer service, resulting in greater revenue potential. Using the web-based interface you can monitor digital ad insertion across your entire network. By strategically placing Sentry in each of your ad zones, you can monitor and be alerted on all insertion opportunities network-wide, as well as issues that arise from problems.



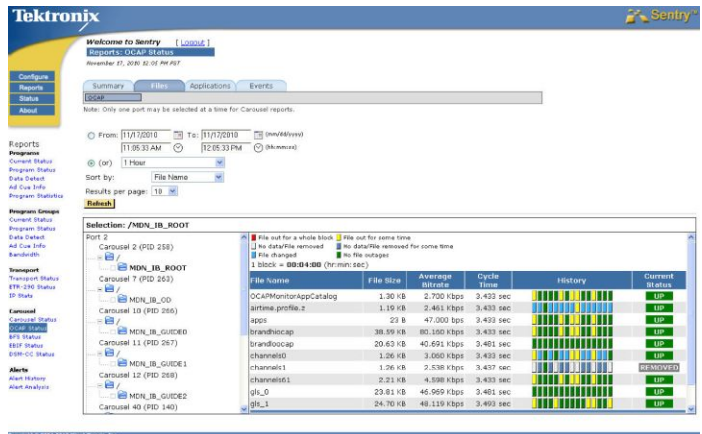
Monitoring Ad Insertion.

Data carousel and EBIF monitoring

Sentry monitors tru2way™, OCAP/MHP and DSM-CC carousels. Detailed reports of carousel performance and activity are based on their real-time behavior and data output. Service providers are able to identify the root cause of errors and make necessary changes to eliminate issues and guarantee rapid application deployment.

The reports show detailed source and file structures and carousel changes in real time while observing streaming metrics such as cycle time, bandwidth utilization, and stream packet continuity. Real-time alerting notifies users of critical situations, enabling them to resolve issues such as outages, cycle-time fluctuations, and unauthorized changes.

eTV applications and metadata are prone to errors introduced during transport, ad splicing and multiplexing. Sentry's EBIF module decodes the application data and signaling information enabling proactive eTV monitoring and fast troubleshooting.



Monitoring tru2way™/OCAP Carousels.

Compliance monitoring

For Closed Caption compliance monitoring, Sentry has the ability to monitor, alert and report on the availability and quality of closed captions across all channels in real time. Sentry will verify that the captions are present and not in error. When errors do occur, Sentry will let you know how long they were in error and the reason for the error. Data and syntax anomalies within the closed captioning data stream are detected to allow for an accurate closed captioning quality of experience (QoE) measurement. This applies to SCTE20 and ATSC transported caption data.

For Audio Loudness monitoring, Sentry helps video service providers ensure compliance with its advanced audio level detection and analysis based on the ITU-R BS 1770 specification. Sentry monitors the loudness of every audio element on every program in every transport stream in real time. The thumbnail timeline feature captures thumbnail images to help visually confirm the relative location of audio issues in programming or commercials. Sentry offers 60-day historical reporting to help service providers with documents needed to prove compliance or to show when violations have occurred.



Monitoring Audio Loudness compliance.

RF measurements and characteristics

QAM demodulator characteristics

Modulation format

QAM A	16QAM, 64QAM, 256QAM compliant with ITU J-83 Annex A and DVB-C ETS 300 429
QAM B	64QAM, 256QAM compliant with ITU J-83 Annex B, SCTE07 compliant
QAM C	16QAM, 64QAM, 256QAM compliant with ITU J-83 Annex C

Modulation rate

QAM A	5 Mbaud/s min to 6.952 Mbaud/s max
QAM B	5.057 Mbaud/s, 5.360 Mbaud/s
QAM C	5 Mbaud/s min to 5.5 Mbaud/s max

Input signal level

–50 dBm to –15 dBm

QAM demodulator RF measurements

RF lock indication

RF lock is indicated by a LED on the rear panel and a status indicator on the UI

Frequency range

Minimum	44 MHz
Maximum	1 GHz

Input signal strength (channel power)

Range	–55 dBm to –15 dBm
Resolution	0.1 dBm

Error Vector Magnitude (EVM)

Range, 64QAM	0.6% to 5% RMS
Range, 256QAM	0.6% to 2.5% RMS
Resolution	0.1%

Modulation Error Ratio (MER)

Range	22 dB to 41 dB
Resolution	0.1 dB

Carrier-to-Noise Ratio (CNR)

Range	22 dB to 41 dB
Resolution	1 dB

Pre-Reed Solomon (RS) BER

Pre-RS BER is displayed

Post-FEC Uncorrectable TS packet rate

Post-FEC Uncorrectable TS packet rate is displayed

Carrier offset

Carrier offset is displayed

Resolution	1 Hz
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I/Q Constellation

I/Q Constellation is displayed

DVB-S/S2 interface characteristics

Input frequency range	950-2150 MHz (center frequency), step size of 1 MHz
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Input signal amplitude range	-60 dBm to -30 dBm
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Modulation format

DVB-S	QPSK
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DVB-S2	QPSK, 8PSK
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Symbol rate	2-40 MSps
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FEC modes

S1 QPSK	1/2, 2/3, 3/4, 5/6, 7/8
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S2 QPSK	1/4, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
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S2 8PSK	3/5, 2/3, 3/4, 5/6, 8/9, 9/10
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Roll off

DVB-S	35%
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DVB-S2	20%, 25%, 35%
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Connector style	Dual F-type (dual tuners)
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Input termination impedance	75 Ω
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Input return loss	>10 dB from 0 to 1 GHz >4 dB from 1 to 2 GHz
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LNB

Power	Off, 13 V, 14 V, 18 V, 19 V (DC)
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Supply maximum current	150 mA
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22 kHz signaling frequency	On or Off
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22 kHz signaling amplitude	DiSEqC compliant (0.65 V _{p-p} typical)
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DVB-S/S2 RF measurements

RF lock indication	RF lock is indicated by a LED on the rear panel and a status indicator on the UI
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Input level range	-60 dBm to -30 dBm
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Signal strength resolution	0.01 dBm
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Modulation Error Ratio (MER) with equalizer

Display range	0 dB to 40 dB with equalizer
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Resolution	0.01 dB
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Carrier-to-Noise Ratio (CNR)

Display range	0 dB to 40 dB
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Resolution	0.01 dB
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DVB-S/S2 RF measurements**Signal-to-Noise Ratio (SNR)**

Display range 0 dB to 40 dB

Resolution 0.01 dB

Pre-Reed Solomon (RS) BER Pre-RS BER is displayed**Post-RS BER and Transport Error Flag (TEF)** Post-RS BER (TEF ratio), TEF rate, and number of Transport**Constellation** The RF constellation is displayed on the UI**DVB-T/T2 interface characteristics****Connector style** F-type, female**Input termination impedance** 75 Ω **Input frequency range** 42 MHz to 880 MHz**Input signal amplitude range** -90 dBm to -20 dBm**Input return loss** >8 dB**Bandwidth** 1.7 MHz, 5 MHz, 6 MHz, 7 MHz, 8 MHz**Standards****DVB-T** EN 300 744**DVB-T2** EN 302 755 v1.3.1 (including T2-Lite profile), DTG6.2/7, NorDig-U v2.2**DVB-T2 demodulation** Single PLP, SISO, and MISO**DVB-T/T2 RF measurements**

Available measurements Signal strength
 Modulation Error Ratio (MER)
 Pre-Reed Solomon (RS) BER

Platform specifications

All specifications apply to all models unless noted otherwise.

Platform characteristics

Browser support	Firefox, Safari, Google Chrome and Internet Explorer
MPEG/IP input port	
Single input Sentry	1000BASE-T Ethernet interface, 1- or 4-port ASI interface, 10GBASE-(LR or SR) interface, 4- or 8-tuner QAM A/B/C interface, DVB S/S2 or DVB T/T2 interface, QAM Annex B (ITU-T J.83)/8VSB interface
Dual input Sentry	1000BASE-T Ethernet interface (standard) plus optional 1000BASE-T Ethernet interface, 10GBASE-(LR or SR) interface, 1- or 4-port ASI interface, 4- or 8-tuner QAM A/B/C interface, DVB S/S2 or DVB T/T2 interface, QAM Annex B (ITU-T J.83)/8VSB interface
Management port	1000BASE-T Ethernet interface

Supported protocols

Video	MPEG-2, H.264, H.265 (HEVC), VC-1, JPEG2000
Audio	Dolby AC-3 (5.1 Surround), E-AC-3 MPEG-1 Layer II (Mono, Stereo) AAC, HE-AAC, and HE-AAC v2
Carousel	tru2way™, BFS MHP / DSM-CC
Digital program insertion	SCTE-35 (local ads), SCTE-35 2012
Misc. support	HD/SD programs, SPTS or MPTS, multicast (IGMP v3) and unicast MPEG-PSI, DVB-SI, ATSC-PSIP table support SNMP trap and MIB support

Physical characteristics

Dimensions	
Height	50.8 mm (2 in.)
Width	432 mm (17 in.)
Depth	381 mm (15 in.)
Weight (net)	9.2 kg (20.2 lb.)
Power supply	100-240 V AC, 50-60 Hz

Environmental characteristics

Max storage temperature 70 °C

Max operating temperature 35 °C

Max humidity 85%



Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.

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