

## Integrated Performance Analysis Technology for Data, Video, Voice & Audio

**VQmon**® is an embedded software agent that monitors and analyzes the performance of network data, video, voice and audio in real time. It is non-intrusive, highly compact and resource-efficient, and can integrate into various environments such as routers, mobile devices, residential and business networking and telecom equipment, soft clients and test equipment.

**Industry-Proven Technology** — VQmon is the most widely used embedded performance analysis technology, with over 600 million agents deployed across a diverse range of network, telecommunications, silicon solutions and test devices.

**Real-Time Application Performance Analysis** — analyzes data, video, voice and audio applications and reports detailed analytics, performance metrics, key performance indicators (KPIs) and user quality of experience scores.

**Accurate User Experience Measurement** — provides precise video, audio and voice Mean Opinion Scores (MOS) that have been thoroughly benchmarked against subjective test data to ensure accuracy. VQmon incorporates Telchemy’s advanced perceptual quality algorithm, which models the impact of time-varying and transient impairments on the user experience.

**Modular Architecture** — supports Data, Video Streaming/ Adaptive Bit Rate, IPTV, Videoconferencing, Voice over IP, Fax over IP, Real-Time Text (RTT) or a combination of these services.

**Compact, Efficient Design** — processes millions of packets per second on an Intel core, or monitors video and voice streams in a consumer device using only a fraction of the CPU.

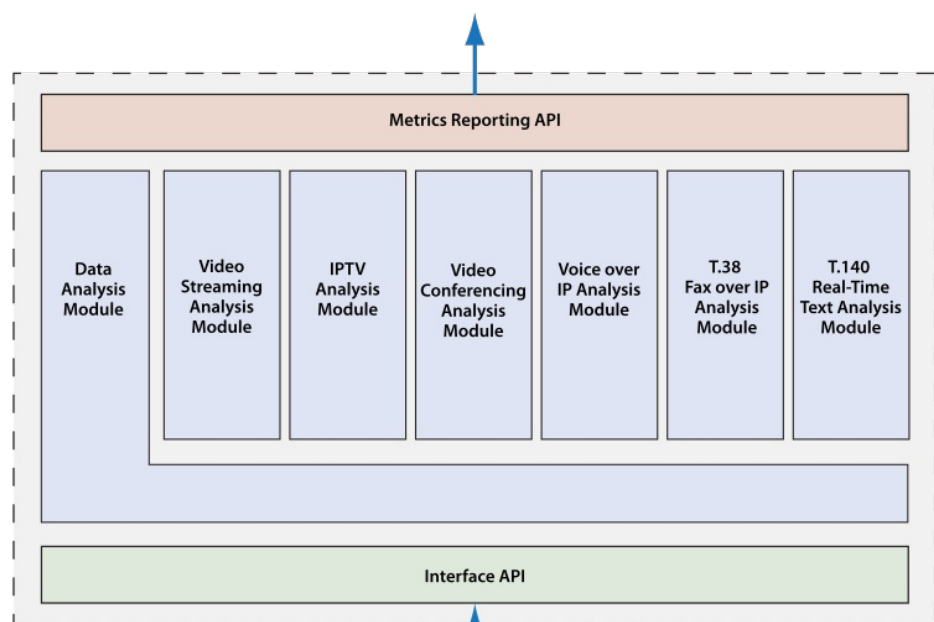
**Extensive Codec Support** — supports the broadest range of video, voice and audio codecs, including ITU, mobile, industry standard and proprietary codecs. VQmon supports adaptive and variable rate codecs, codecs with error correction, and sessions with multiple codecs.

**Analyzes Encrypted Streams** — uniquely able to evaluate the performance of encrypted streams for video streaming, VoIP, Videoconferencing and IPTV broadcast/studio applications without decryption.

**Confirmed Security and Reliability** — hardened and rigorously field-tested to ensure consistent performance, security and stability.

### KEY FEATURES

- Real-time application performance analysis for Data, Video, Voice/Audio, Fax and Text
- Accurate user QoE (MOS) scores
- Monitors thousands of concurrent IP video and voice streams at rates exceeding 2 million PPS per core
- Automatically detects a comprehensive range of video, voice and audio codecs
- Supports H.265/HEVC and H.266/VCC video up to 4K and video frame rates up to 120 fps
- Analyzes the media quality of encrypted TCP streams (HTTPS/TCP) and QUIC streams without decryption
- Supports SMPTE ST 2110-20/30 uncompressed video/ audio streams and Dante Audio/Video over IP
- Analyzes LTE Multicast content (eMBMS/FLUTE)
- Performance analysis for Push To Talk over Cellular (PoC) calls, T.38 Fax over IP (FoIP) transmissions, and T.140 Real-Time Text (RTT) sessions
- Embeds into routers, IP phones, mobile devices, test equipment, soft clients, and more
- Supports IPv4, IPv6, Stacked VLANs, RTP, MPEG Transport, HTTP/ABR



VQmon's Modular Architecture

<b>Network Data Analysis</b>	<p>VQmon integrates network diagnostics, performance, usage and demographics into a single efficient module that can process up to two million packets per second on a single processor core. It captures every Ethernet frame and IP packet, supports various network protocols (including IoT protocols like MQTT and CoAP), and produces metrics and diagnostic data for each packet flow, interface and VLAN in networks with IPv4, IPv6 and stacked VLANs. VQmon measures and reports data metrics at intervals set by the host system or application.</p>
<b>Video Streaming</b>	<p>VQmon analyzes OTT media content—both encrypted and unencrypted—streamed over HTTP-based adaptive bitrate protocols from Adobe, Apple, and Microsoft and the QUIC protocol from Google. It evaluates the quality and buffering of video and audio streams in real time and provides detailed metrics on performance and QoE for each video streaming session.</p>
<b>IPTV Broadcast &amp; Studio Production</b>	<p>VQmon non-intrusively monitors multiple RTP or MPEG2-TS streams and provides real-time feedback on quality of experience for viewers, as well as diagnostic data for troubleshooting. It can analyze scrambled/encrypted video streams without decoding, preserving DRM and copyright requirements.</p> <p>VQmon provides real-time quality analysis for broadcast, live performance and professional media production environments by monitoring high data rate uncompressed video and audio streams (SMPTE 2110) and AV media content transported over IP using Dante.</p>
<b>Voice Fax Real-Time Text</b>	<p>VQmon efficiently analyzes multiple parallel packet voice streams and provides estimated call quality scores (MOS and R-factor) and detailed diagnostics for each RTP stream, at the end of or during a call. It can export the data in various formats, such as raw metrics, RTCP XR reports (RFC 3611) and SIP session quality reports (RFC 6035).</p> <p>VQmon offers versatile solutions for VoIP and network service providers, including performance monitoring for calls made using Push-to-talk over Cellular (PoC) mobile applications, T.38 Fax over IP (FoIP) transmissions, and T.140 Real-Time Text (RTT) sessions.</p>
<b>Videoconferencing</b>	<p>VQmon is a powerful tool for ensuring high-quality videoconferencing and telepresence sessions. It can monitor multiple RTP or MPEG-2 video and audio streams in real time and measure their quality of experience (QoE) with MOS scores and other performance indicators.</p> <p>VQmon supports various video telephony applications, codecs, and protocols, including popular Cloud-based services like Microsoft Teams, Zoom and WebRTC. It can handle encrypted video sessions without decryption, preserving security and privacy.</p>

## TECHNICAL SPECIFICATIONS

### Data Analytics

- Network diagnostics, network performance analysis, network usage and demographics for IPv4, IPv6 and stacked VLANs

### Video/Audio Performance Monitoring

- Video/audio quality analysis of RTP and MPEG-2 Transport streams

### Voice over IP Performance Monitoring

- VoIP quality analysis using Telchemy's advanced perceptual model - supports ITU-T P.564, ITU-T G.107, ITU-T G.1020, ETSI TS 101 329-5 Annex E, IETF RFC 3611, and IETF RFC 6035

### Implementation Requirements

- Software Language – ANSI C
- Code size – variable depending on licensed features and host environment
- API – VQmon API
- OS/RTOS – Minimal OS dependency
- Processor – Generic 32/64-bit integer processor
- CPU load – 1-4 million packets per second per core
- RAM – Approximately 1000 bytes per active call/video session

### Supported Codecs

- VQmon supports a broad range of video, audio and voice codecs that cover current mobile, communications and entertainment industry requirements.



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*For a complete list of VQmon performance metrics and supported codecs, please contact Telchemy.*