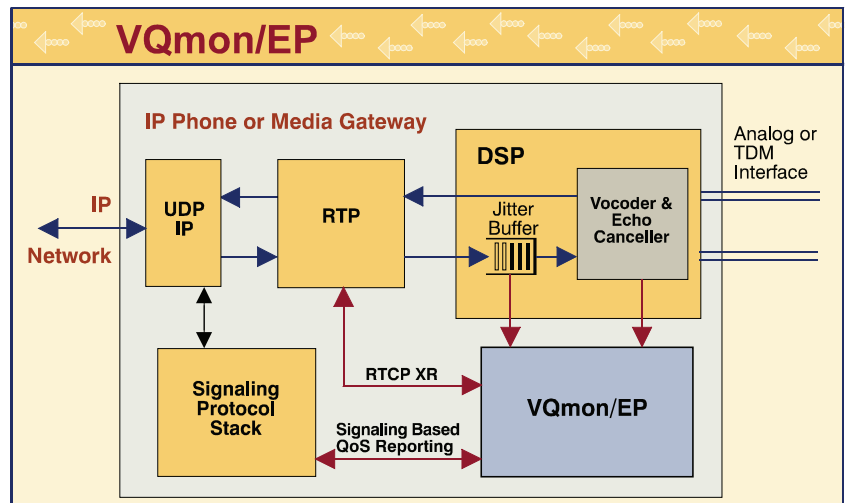


VQmon® is the leading Voice over IP Performance Management Technology used in IP phones, gateways, probes, analyzers, switches, and routers to provide real-time monitoring of service quality. VQmon is the first technology to detect and measure transient IP problems and to assess their effect on perceptual quality.

VQmon/EP (End Point) is designed for integration into IP phones and media/trunking gateways, providing the metrics needed to support management and QoS reporting protocols and to diagnose problems. VQmon/EP is available as fast, compact, and efficient ANSI C source code.

Key Features:

- Call quality metrics generated in real time
- Listening and conversational quality MOS and R-factor scores
- Supports key international standards including ITU-T P.564, ITU-T G.107, ITU-T G.1020, ETSI TS 101 329-5 Annex E and IETF RFC 3611
- MOS-LQ and MOS-CQ with ACR, ITU, and Japanese TTC scaling
- Average metrics for whole call, differentiating separate metrics for good and bad periods
- RTCP XR payload generation and parsing
- Metrics for H.460.9 Annex B, H.248.30, G.799.1, and key QoS reporting protocols
- Alerts generated in real time if quality degrades
- Compact, efficient, portable ANSI C source code (or object code library)



VQmon/EP comprises two modules: the VQmon Core Module and VQmon Markov Model (VMM) .

The VQmon Core Metrics Module is typically integrated with the protocol stack and controller software. This module uses packet metrics obtained from the VMM module along with signal, noise, and echo level information obtained through typical DSP APIs to calculate a rich set of metrics and diagnostic data. The module only needs to be executed when a QoS report is required—typically every 20-30 seconds, or at the end of a call. VQmon calculates listening quality and conversational quality metrics using a highly optimized algorithm that

considers time-varying IP impairments (typically caused by network congestion), providing greater accuracy and more insight into the effects of transient IP network problems.

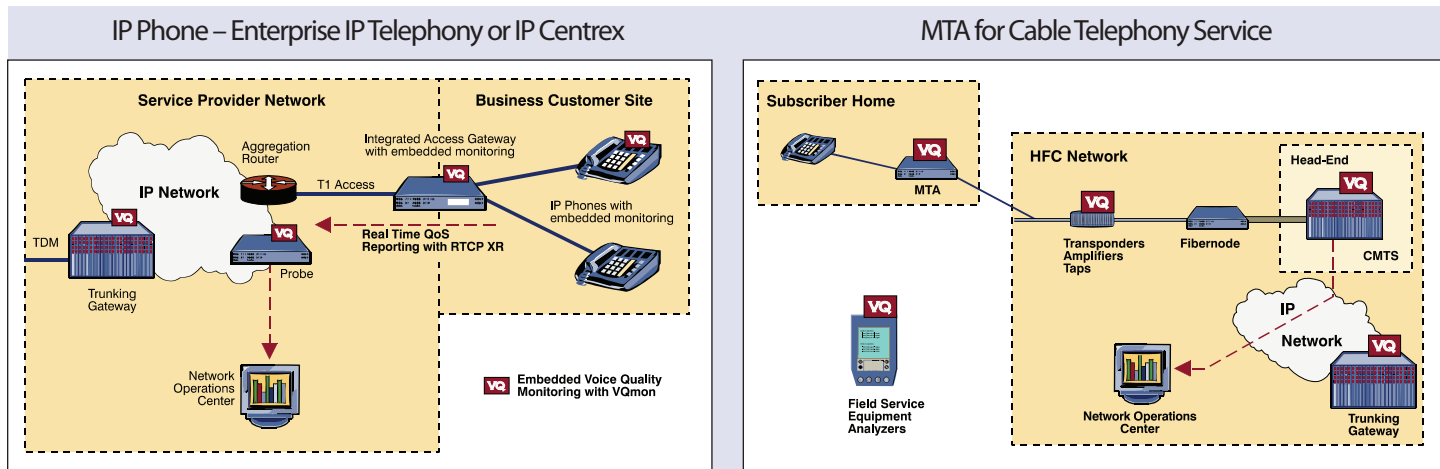
The VQmon Markov Model (VMM) interacts with the jitter buffer, monitoring packet loss and discard events and measuring their distribution using a 4-state Markov Model. The VMM may be directly integrated with the jitter buffer in either DSP or controller software or may interact with the jitter buffer on a polled basis. VQmon Enabled™ DSP software, available from several leading codec vendors, has the VMM preinstalled to make VQmon integration quick and easy.

VQmon/EP generates and interprets RTCP XR (RFC3611) payloads and provides the metrics needed for signaling-based QoS reports such as H.460.9 Annex B. These metrics support key management requirements for service provider and enterprise IP telephony applications. The powerful combination of VQmon/EP with RTCP XR exposes problems related to echo, network congestion, endpoint configuration, and other system problems, making problem diagnosis faster and easier.

VQmon/EP supports real-time thresholding and generates internal function callbacks when call quality degrades below threshold for a specified time interval. IP phone and gateway designers can use this feature to generate external events such as SNMP traps or to trigger configuration changes that automatically resolve quality problems.

Fast, efficient, and highly portable, VQmon/EP minimizes implementation time and cost. It is fully compatible with VQmon/SA and a wide range of VoIP test equipment.

Applications



VQmon/EP is ideal for integration into IP phones to support Enterprise or IP Centrex applications. VQmon monitors the quality of each call and provides real-time feedback on service quality through RTCP XR or signaling-system-based reporting.

Cable service providers need to monitor service quality in subscriber homes to minimize “truck rolls.” VQmon/EP can be integrated directly into MTAs to monitor live or test calls and provide feedback through RTCP XR.

Technical Specifications

- Supports key international standards including ITU-T P.564, ITU-T G.107, ITU-T G.1020, ETSI TS 101 329-5 Annex E and IETF RFC 3611
- Measures perceptual effects of burst packet loss and reency
- Supports Japanese TTC JJ201.01 VoIP monitoring requirements
- Produces and interprets RTCP XR (RFC3611) VoIP metrics payloads
- Produces VoIP metrics for:
 - ITU-T H.460.9 Annex B, QoS Reporting for H.323
 - ITU-T H.248.30, QoS Reporting for Megaco
 - ITU-T G.799.1 VoIP Trunking Gateway
 - IETF SIP rtcp xr Events draft
 - IETF RTCP XR MIB draft

Call Quality Metrics

- Listening and conversational quality MOS scores with ACR, ITU and TTC scalings – MOS-LQ, MOS-CQ
- Listening and conversational quality R-factors – R-LQ, R-CQ
- Estimated PESQ scores – MOS-PQ
- Separate R-factors for burst and gap conditions – R-Burst, R-Gap

IP/RTP Metrics

- Packet loss rate, packet discard rate, burst length/density, gap length/density

Degradation Factors

- Percentage degradation due to loss, jitter, codec, delay, signal level, noise level, echo, reency

Codecs Supported

- G.711, G723.1, G.726, G.728, G.729/A, GSM, FR, EFR, etc.

Implementation Requirements

- Software language – ANSI C
- Code size – Approximately 40 kilobytes
- API – VQmon/EP API
- OS/RTOS – Minimal OS dependency
- Processor – Generic 32-bit integer processor
- CPU load – Approximately 200 IPS per active call, at 1% packet loss rate
- RAM – Approximately 500 bytes per active call



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