



Voice Quality Assurance

Ditech Platforms

Ditech's VQA technology is available on the following platforms:

- Packet Voice Processor™
- BVP Flex f600
- BVP Flex f400
- QVP E800
- QVP T800

Voice Quality Assurance (VQA™) technology blends Ditech Networks' core competency of hybrid and acoustic echo cancellation with an advanced set of voice quality improvement features to create a clear calling experience for users of any phone or handset in any ambient environment. Integrated into Ditech's voice processor platforms, VQA technology enables service providers to select the right mix of features to improve, measure, and manage the user's experience of voice quality in their networks.

Ditech's VQA technology delivers the most advanced voice enhancement features on the market:

Bidirectional Noise Cancellation

Eliminates background noise from a caller's environment by up to an industry-leading 21 dB while maintaining voice quality. Maintains a provisionable comfort noise floor for an excellent conversational quality.

Bidirectional Acoustic Echo Control

Adaptively converges on nonlinear echoes from handsets and handsfree units arriving with network delays of up to 400 ms, canceling echoes with path losses as strong as an industry-leading 15 dB, without double-talk clipping.

Bidirectional Level Control

Automatically adjusts voice volume to a comfortable listening level as determined by the network operator and the listener's environment, with the ability to amplify only speech, not the background noise, for improved signal-to-noise ratio.

Enhanced Voice Intelligibility

Dynamically tunes incoming speech's spectral characteristics in response to the noise characteristics of the listening environment, allowing the listener to more easily distinguish and understand the human voice in loud environments.

Hybrid Echo Cancellation

Completely eliminates wireline-network-induced hybrid echo with tail delays of up to an industry-leading 192 ms, guaranteeing echo coverage for converged networks.

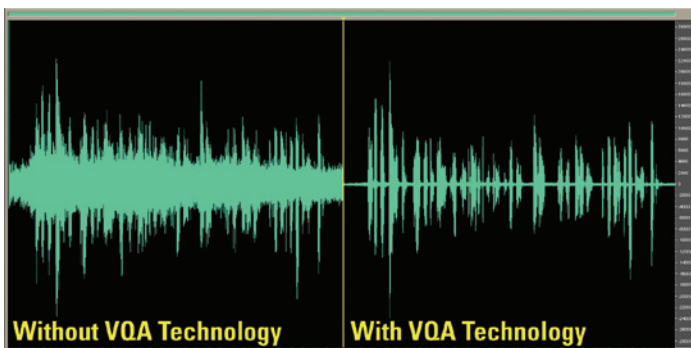
Voice Quality Monitoring

Provides continuous, non-intrusive measurement and reporting of a full range of voice quality metrics on every call.



APPLICATIONS USING VQA TECHNOLOGY

Ditech's VQA features are customized to fit a variety of networks and applications, including the following:

- **Capacity Enhancement**
 - GSM
 - CDMA
 - iDEN
- **Voice Enhancement**
 - GSM
 - CDMA
 - iDEN
 - 3G Wireless
 - Wireline
 - Conferencing
 - VoIP-PSTN Gateway
 - VoIP Network
- **Advanced Echo Cancellation**



Speech Before and After Processing with Ditech's VQA Technology

Ditech's VQA solutions are tested and proven to dramatically improve voice quality by enhancing speech intelligibility and removing impairments, such as background noise, acoustic echo, and level mismatch, through the use of specialized DSP algorithms.  Measurements in live networks using test systems compliant with the emerging ITU-T G.160 specification show significant improvement in signal-to-noise ratio (SNR) and total noise reduction, well in excess of values recommended by G.160. These measurements correspond with the results of subjective user tests, proving the perceived voice quality is significantly improved with Ditech's VQA technology.  Ditech's VQA solutions are available in packages with features specific to network and application needs. Not all of the features that follow are available for all network applications.

Noise Cancellation Features

Reduces background noise without suppressing voice volume to improve the sound quality of calls.

Industry-Leading Performance: Advanced multi-band spectral processing techniques remove up to 21 dB of noise during both speech and pauses, providing a dramatic increase in quality for calls placed from noisy environments.

Bidirectional Operation: Operates in both uplink and downlink directions simultaneously, providing excellent speech quality for both parties.

Excellent Speech Quality: Advanced noise suppression techniques function only when noise is present, resulting in excellent clean speech performance with no speech degradation.

Rapid Convergence: Dynamically adapts to changes in noise spectrum, in real time, converging or re-converging in less than 200 ms.

SNR Adaptive Noise Cancellation: Automatically adjusts noise reduction performance to match changing noise levels, providing callers with consistent noise reduction for both tandem (on-net mobile to mobile) and off-net (mobile to PSTN) calls.

Enhanced VAD Post-Processor: Unique two-pass algorithm provides an extremely accurate determination of speech vs. noise, providing excellent noise reduction performance under all noise conditions.

Adjustable Noise Floor: Spectrally-matched comfort noise can be customized by the operator to provide high or low levels of residual comfort noise in accordance with subscriber preferences.

DTX Performance Improvement: Specially tuned comfort noise signature ensures maximum performance of DTX VAD, decreasing average transmit power for improved wireless network performance and capacity.

Frame Loss Handling: Voice quality enhancement features automatically accommodate for frame erasure in wireless networks to ensure consistent sound quality before and after the loss condition.

Acoustic Echo Control Features

Addresses the echo that is common from handsets and hands free units.

Bidirectional Echo Cancellation: Unique bi-directional solution removes acoustic echo from both near- and far-end sources, resulting in excellent conversational quality for both parties.

Industry-Leading Performance: Selectable WAEPL from 45 dB to an industry-leading 15 dB ensures protection from even the strongest echo sources, while maintaining excellent double-talk performance.

Converged-Network Ready: Effectively removes acoustic echo with delays up to 400 ms in each direction, providing maximum performance for wireless, wireline, and VoIP environments.

Adaptive Delay Mode: Automatically adjusts to actual detected delay on a per-call, per-channel basis, avoiding the need to configure a fixed bulk delay for each channel in advance.

Spectral Comfort Noise Match: Automatically generates comfort noise to match actual background noise levels and spectral characteristics, providing improved conversational call quality without an annoying "dead air" effect.

Level Control Features

Automatically adjusts volume to bring voice to a comfortable listening level.

Adaptive Level Control: Automatically adjusts input signal levels up to ± 15 dB to meet configured target level of between -3 and -24 dBm0.

Dynamic Level Control: Advanced design provides amplification of speech independently of noise, providing increased SNR and improved subjective speech quality compared to traditional linear gain control methods.

High Level Compensation: Prevents clipping or codec distortions by automatically attenuating input signal levels that are too high, while maintaining integrity of low-level signals.

Low Level Compensation: Automatically raises low-level input signals by up to 15 dB to ensure a comfortable listening level.

Automatic Listener Enhancement: Applies up to 9 dB gain to output signal level in response to high background noise level in the listener's environment, automatically increasing volume in loud listening environments.

Voice Intelligibility Features

Enables callers to more easily distinguish and understand voice in loud environments.

Enhanced Voice Intelligibility: Rebalances spectral signature of input signals to enhance critical speech formants, providing increased clarity and improved speech recognition.

Unvoiced Speech Enhancement: Selectively enhances unvoiced speech formants (soft sounds such as "th", "f", etc.) for improved subjective speech quality, especially in the presence of high ambient noise environments.

Low Bitrate Codec Enhancement: Improves speech clarity and overall subjective quality by enhancing second-order speech formants commonly attenuated by low bitrate codecs.

Ambient Noise Level Adaptation: Dynamically adjusts the degree of spectral enhancement to compensate for the ambient noise characteristics of the listener's environment.

Hybrid Echo Cancellation Features

Completely eliminates hybrid echo from wireline sources.

Industry's Longest Tail Delay: Leading hybrid echo cancellation solution compensates for network delays up to 192 ms, ensuring consistently clear, echo-free calls, even in the face of network migration of TDM to VoIP.

Fast, Stable Convergence: Less than 50 ms, with 30 dB or better ERL+ERLE.

Industry-Leading Performance: Cancels echo with ERL up to 0 dB; >35 dB ERLE (with 6 dB ERL) at -10 dBm0 input.

Residual Echo Control: >65 dB ERLE, with NLP enabled.

Voice Quality Monitoring Features

Ditech's Experience Intelligence™ (EXi) delivers an essential set of voice quality statistics, including:

- Speech and noise levels
- Echo delay and return loss
- R Factors
- Mean Opinion Scores (MOS)

The data are collected continuously and non-intrusively on a per-call basis, providing the industry's most comprehensive assessment of call quality.

Standards Compliance

- G.164
- G.165
- G.168-2002
- G.169
- DTMF Transparency
- GSM TFO (ETSI 101 504, 3GPP TS 28.062)
- GSM HSCSD (3GPP TS 48.020)
- 3G Streaming Video Transparency (ITU H.324)
- Designed for G.160 Compliance

For more information about features for a specific VQA application, contact your local sales representative or Ditech's headquarters at the phone number and address below.



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