



Advanced Echo Cancellation for Mobile and PSTN Networks

Ditech Platform

Ditech's Advanced Echo Cancellation solution is available on the BVP Flex f400.



BVP Flex f400
OC-3/DS-3/STS-1/STM-1

Due to the changes in the telecommunications marketplace, providing good voice quality is becoming increasingly difficult for wireline and wireless carriers. Voice networks are migrating from circuit to packet technologies, making latency greater and more variable, and customer terminal equipment options continue to expand rapidly, making acoustic isolation less dependable. These trends place more demands on hybrid and acoustic echo cancellation equipment. In addition, as carriers increase the use of leased transport, the quality of the service delivered to customers is not fully controlled.

Ditech Networks' Advanced Echo Cancellation for Mobile and PSTN Networks solution is designed to assist carriers in maintaining voice quality in their networks as they face these factors.

Migration from Circuit to Packet Voice Technologies

Ditech's industry-leading 192 ms hybrid echo tail feature and unique bidirectional acoustic echo control allow carriers to migrate from circuit to packet voice technologies without sacrificing voice quality. Legacy hybrid echo cancellers only support 128 ms tail delays, which is not sufficient in today's network architectures.

Hybrid echo is a well understood problem that is caused by the 4-wire to 2-wire convergence point in wireline networks. Wireless networks must also be protected against hybrid echo because they interconnect with wireline networks.

Over the years, equipment vendors developed a variety of echo cancellation solutions to address the effects of hybrid echo. The relatively short round-trip delays associated with circuit-switched wireline networks meant that echo cancellers only needed to support tail delays of 64 to 128 ms (Figure 1).

As IP-based voice technologies have matured, carriers have started using these technologies in their networks to reduce operational expenses. However, a carrier must convert from circuit to packet, and most likely reverse that, prior to handing back off to another customer. This conversion adds delay, and

more delay is added due to the probabilistic nature of forwarding in packet-switched networks. VoIP technology experts estimate that round-trip delays can extend to 240 ms, considerably longer than what legacy echo cancellers were designed to handle (Figure 2).

The added delay associated with IP voice networks means that hybrid echo tail delays will extend far beyond 128 ms.

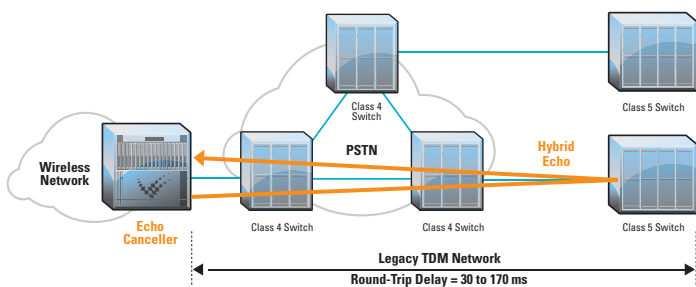


Figure 1 :: Hybrid Echo in Legacy Networks

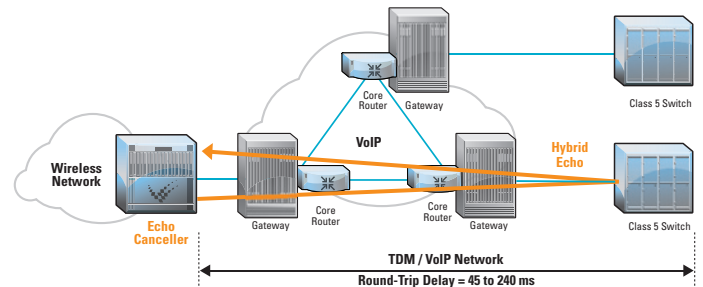


Figure 2 :: Hybrid Echo in Today's Networks

Proliferation of Customer Terminal Equipment

The wide variety of customer terminal equipment has created another type of voice quality problem for wireline and wireless carriers: acoustic echo. This type of echo occurs when signals from the terminal's speaker are reflected back into the network through the terminal's microphone. The amount of acoustic echo varies from device to device, as the competitive nature of the handset marketplace often results in a sacrifice of acoustic echo protection to keep hardware prices low.

The problem of acoustic echo is exacerbated by the wireless codec delay of 160 ms round-trip, which is on top of the delay through the remainder of the call path. Even worse for carriers is that acoustic echo can be generated by both the calling and called party, and legacy solutions can only provide unidirectional acoustic echo control.

Not only does Ditech's acoustic echo cancellation solution support acoustic echo tails of up to 400 ms, but it is also bidirectional, so both the calling and called party are protected against acoustic echo (Figure 3).

The Use of Leased Transport

Customers demand connectivity locally, nationally, and globally. No single carrier can build a ubiquitous network, so carriers routinely lease transport to support service demands. No matter how well a carrier protects its customers from hybrid and acoustic echo problems, its transport partner might not.

Ditech's voice quality monitoring helps carriers understand the types and severity of echo in their networks. With this performance information, a carrier can address voice quality issues in its own network as well as verify the level of service that its partners are providing.

Acoustic Echo Control Features

Addresses the echo that is common from handsets and handsfree units.

Bidirectional Echo Cancellation: Unique bidirectional 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.

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.

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.

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

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 Quality Monitoring

Ditech's Experience Intelligence™ (EXi) provides live call monitoring of the types and severity of network echo, as well as other voice quality metrics. The tool provides statistics that allow carriers identify the sources of echo in their networks.

Standards Compliance

- G.164
- G.165
- G.168-2002
- G.169
- DTMF Transparency
- Designed for G.160 Compliance

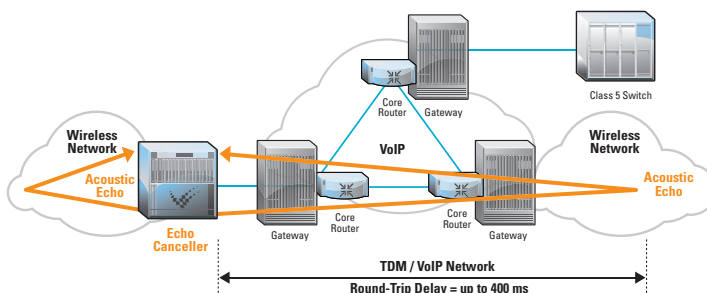


Figure 3 :: Acoustic Echo in Today's Networks