



Capacity Enhancement for GSM Networks

Ditech Platforms

Ditech's GSM Capacity solution is available with or without Hybrid Echo Cancellation (HEC) on the following platforms:



BVP Flex f600
OC-3/DS-3/STS-1/STM-1



QVP E800/T800 Carrier Shelf
E1/T1

Ditech Networks' Voice Quality Assurance (VQA™) technology enables the capacity promise of GSM HR and AMR-HR codecs by improving the overall voice quality of these low bitrate codecs. Until now, carriers that have deployed half-rate codecs have done so at the cost of increased customer complaints, reduced call times, and churn due to the codecs' poorer-than-planned voice quality. This is because, in practice, HR and AMR-HR voice quality degrades quickly to unacceptable levels in conditions where impairments such as background noise, acoustic echo, and level mismatches occur, and these conditions are typical at peak calling times, exactly when it is most desired to employ the lowest bitrate codec.

GSM HR and AMR-HR Voice Quality Issues

The GSM industry developed GSM HR and AMR-HR to deliver twice the channel capacity per BTS as full-rate codecs. The codecs used by these half-rate modes perform reasonably in ideal clean speech conditions, but their voice quality performance degrades significantly in the presence of external impairments.

Because the voice quality of HR and AMR-HR is lower than for EFR or AMR-FR, even under controlled conditions, the degradation created by external impairments results in delivered voice quality that is frequently well below minimum thresholds. Ditech's voice quality audits in live networks show that 40% of mobile calls typically suffer from significant noise and echo impairments.

What initially appeared to be an opportunity for GSM carriers to dramatically reduce cost did not ultimately materialize because of concerns about the voice quality delivered by GSM HR and AMR-HR. As a result, these half-rate codecs have been deployed less frequently than would be economically optimal, as measured in return on investment.

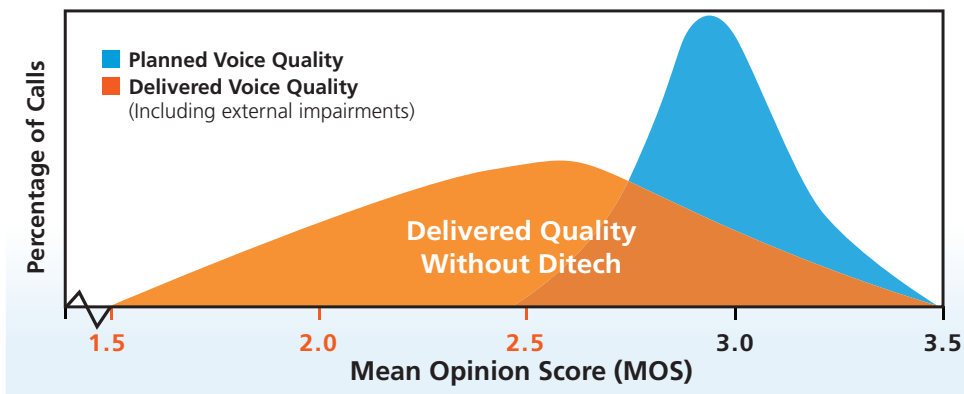


Figure 1 :: Planned versus Delivered Voice Quality

Taking into account the impact of external impairments such as background noise, acoustic echo, and level mismatch, voice quality that is delivered to subscribers is significantly lower and more variable than planned. [Based on live network audits performed by Ditech Networks.]

Enabling High Voice Quality with GSM HR and AMR-HR

Ditech's voice quality solution is designed to remove the majority of external impairments from calls and, at the same time, provide audit data of all calls showing the level of voice quality degradation in the network. This ensures that a carrier delivers voice quality that, for the first time, meets planned quality limits (see Figure 2).

Ditech provides two tools necessary to increase the usage of HR and AMR-HR without decreasing delivered voice quality.

- **Experience Intelligence™ (EXi)** technology makes it possible to engineer for delivered voice quality by providing comprehensive statistical data on the voice quality degradation that is being introduced by external impairments.
- **Voice Quality Assurance (VQA™)** technology leads the industry in its ability to remove external impairments from the network, resulting in higher and more consistent delivered voice quality.

These tools effectively increase the delivered voice quality budget by shifting the worst

calls by 0.7 MOS points on average, allowing carriers to more aggressively utilize both GSM HR and AMR-HR for improved capacity and equipment utilization, while maintaining acceptable delivered call quality.

Ditech Deployment in a GSM Network

Ditech's solution is deployed on the standardized A-Interface and is compatible with all codec types – HR, FR, EFR, and AMR, providing carriers with a voice quality and capacity solution with the flexibility required by today's multi-vendor networks.

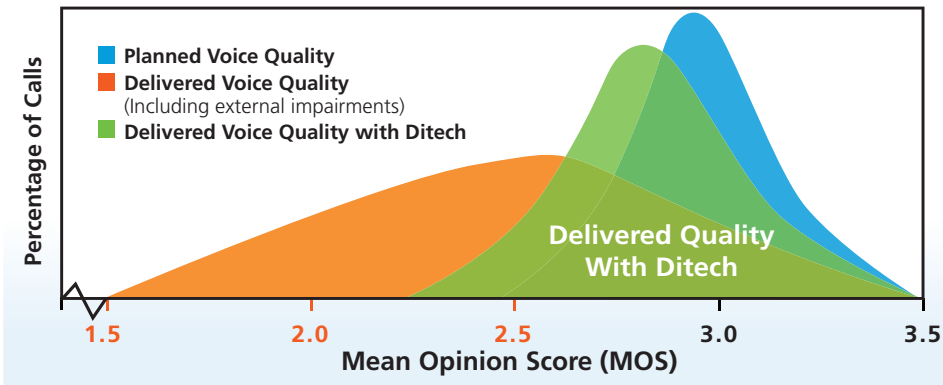


Figure 2 :: Ditech Delivers Higher, More Consistent Voice Quality

By removing the majority of external impairments from the speech signal itself, Ditech Networks makes it possible to deliver near-planned voice quality levels. [Based on live network audits performed by Ditech Networks.]

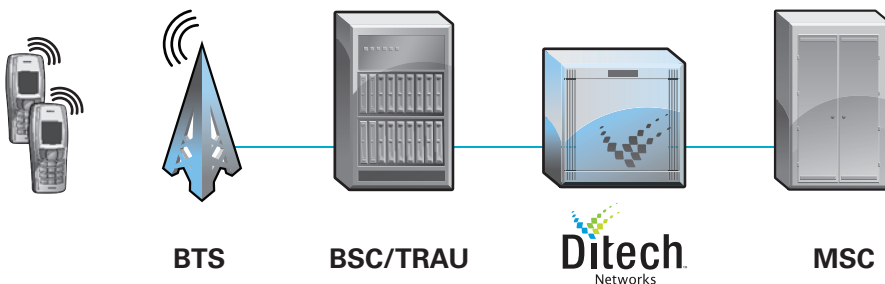


Figure 3 :: Ditech's GSM Capacity Solution at A-Interface

Situated at the A-Interface, Ditech Networks' Capacity solution improves speech quality in both call directions. Hybrid Echo Cancellation is optional.



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