

Remote Central Queensland

Spurious DTMF events on Fixed Wireless Access Network



Spurious DTMF Digit Events

After installation of the Fixed Wireless Access network for rural areas the network operator soon became aware of a problem with spurious DTMF digit events. Customers began complaining that sometimes when they were talking on the phone they would hear short bursts of tones.

When a number is pressed on the keypad of a telephone a DTMF digit is generated. This digit gets transmitted to the local exchange or through to the other person on the call (the B-party). During normal use of a telephone DTMF digits are used to dial the number of B-party and to interact with automated services like phone banking or customer service centers.

In the case of the network operator's Fixed Wireless Access network the customers sometimes heard these tones during normal conversation. These events were distracting, and undermined the customer confidence in the telephone service being delivered.

But how do you track down a problem that is intermittent and that does not occur when you send a skilled technician out to investigate?

Beethoven offered the solution.

The Already Running Field Trial

In the middle of 2005 the network operator began a field trial of the Beethoven Voice Quality Assurance solution in remote central Queensland. The voice quality of the Fixed Wireless Access network was being put under the microscope by Calyptech.

With this in mind the network operator asked Calyptech to extend the breadth of the field trial to include the detection of DTMF digits. Beethoven was enhanced to record the total number of DTMF digits made during a call.

Caught In the Act

Beethoven discovered that 11.5% or 13978, of the 121814 calls analysed contained DTMF digits coming from the remote callers phone. Of these calls 30.4% (4253) had only one DTMF digit dialed and were considered as candidates for the spurious DTMF events being witnessed.

- **CUSTOMER:**
Tier 1 Network Operator
- **LOCATION:**
Remote Australia
- **RESULT:**
Implementation of Interface Module to eradicate spurious DTMF

“Beethoven allowed the Network Operator to rapidly isolate an intermittent and bewildering fault”

The data indicated that the problem was happening to most customers with a few appearing to be more susceptible than others. But more information was needed. The network needed to be “caught in the act” and again Beethoven was brought to bear on the problem.

Test calls were made from a service that exhibited the problem frequently, and recordings made of the voice data. Beethoven was targeted at the service and every time a call was made the complete conversation was analysed by Beethoven. Eventually an actual DTMF event was recorded.

The falsely triggered DTMF can be seen nested between two sections of speech in the waveform shown in Figure 1. This listener can hear a tone instead of the speech, interrupting their conversation, generating confusion.

And the Culprit Is...

The speech was analysed to identify the cause of the problem. The culprit turned out to be a piece of equipment in every customer's premises. It was their own Fixed Wireless Terminal (FWT).

The FWT plays a crucial role in the transmission of DTMF digits through the network. Given that the DTMF digits are generated from the keypad on the telephone you would be forgiven for expecting them to simply be passed on. But this does not work on wireless networks using sophisticated voice compression technologies, including EVRC codec devices. The DTMF must be transmitted out of band.

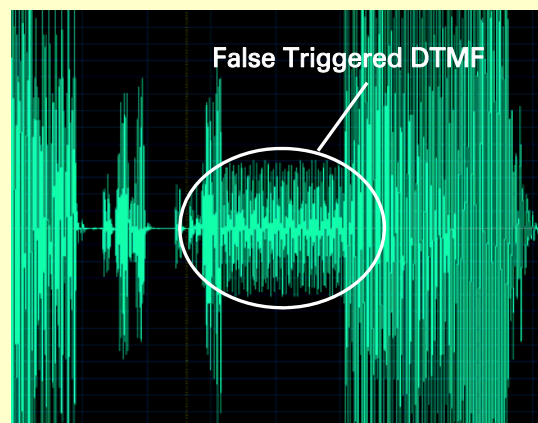


Figure 1 DTMF event in normal speech

The FWT intercepts the DTMF digits as they are pressed on the keypad and sends them via a different path alongside the speech. It does this because the wireless path distorts them and they become too distorted to be recognised. The FWT intercepts the DTMF, sends silence through instead and relies on a device on the other side of the wireless link called the Base Station Controller (BSC) to regenerate and forward. The DTMF digits arrive at the far end machine, switch or phone banking system, in perfect condition, uncorrupted during the traverse of the network.

The detection mechanism in the FWT, based on standard off the shelf technology, exhibited problems due to the configuration and wiring at the Customer premises.

False Triggering

Sometimes the FWT registers the human speech as a DTMF digit. The FWT did not have fine enough differentiation between human speech and keypad generated DTMF digits. This causes it to assume a key has been pressed and it goes through the scenario of putting silence on the line and sending an out of band signal to the BSC. This results in the interruption of the conversation with a burst of tones.

The Solution

Initially the settings on FWT were altered in an attempt to make it behave correctly in all deployed conditions. This effort did improve the situation, and again Beethoven was used to demonstrate this. A more robust solution was chosen, based on the Calyptech Field Robot. When placed inline with the FWT, the Field Robot pre-processes the speech signal with its internal digital signal processor, and ensures that true DTMF digits are reproduced, with no false triggers.

Beethoven Voice Quality Assurance Solution

The Beethoven Voice Service Assurance solution gives you a scalable, configurable set of hardware and software components that fully instrument your network to assure the quality of the voice service. Beethoven offers a customizable suite of voice monitoring and analysis capabilities that enables you to optimally manage and control your network from a customer experience perspective.

You save money by quickly identifying and resolving issues resulting in increased network reliability, and a reduction in the cost of maintaining the high level of service demanded by end customers and regulatory authorities.

Increased revenues result from reduced customer churn through better customer service management, and higher customer satisfaction.

About Calyptech

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