

# VoLTE Call Quality – What You Need to Know

VoLTE offers the promise of crystal-clear voice calls, giving the subscriber a richer overall experience, while operators benefit from much greater spectral efficiency and capacity compared with conventional circuit-switched calls over legacy 2G and 3G networks. But with almost 90% of LTE networks yet to launch their VoLTE services, how can MNOs ensure that they fulfil this promise?

**The introduction of Voice over LTE (VoLTE) services** brings with it a whole new set of challenges for the mobile network operator. A key difference from earlier voice technologies is that the service traffic is now carried over IP networks rather than circuit-switched voice networks, which makes Quality of Service (QoS) parameters difficult both to define and to quantify. Voice services are not the sole traffic flow, as VoLTE must compete for bandwidth with other applications such as video and data. Also with more RAN functionality based at the mast head, it becomes more difficult to use traditional RF testing to predict the resulting user experience. When subscribers are moving rapidly or call handover takes place, this data is even more difficult to obtain.

VoLTE exploits the superior data capabilities of LTE to provide revenue-generating voice services on the same 4G network. While data is now the dominant service, voice remains a crucial part of the subscriber offering, and good quality voice calls are still important to the subscriber. The headline advantage of VoLTE is that call quality is superior to 3G or 2G connections because high-definition (HD) audio data can be transferred over the IP network than over 2G or 3G connections.

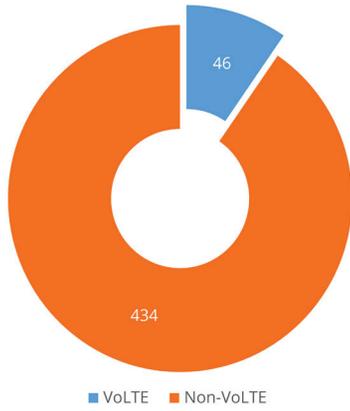
**CellMining Ltd.**

10 Topaz St., Caesarea, Israel  
+972 4 636 3142

[info@cellmining.com](mailto:info@cellmining.com)  
[www.cellmining.com](http://www.cellmining.com)

<sup>1</sup> Global mobile Suppliers Association, 25 January 2016:  
<http://gsacom.com/paper/volte-global-status-30-volte-systems-launched-2/>

<sup>2</sup> <http://solutions.amdocs.com/2016SOTR>



Source: GSA, January 2016

### LTE Networks Worldwide

VoLTE holds the promise of providing users with crystal-clear, HD call quality combined with much greater spectral efficiency and capacity compared with conventional circuit-switched calls over legacy 2G and 3G networks.

*Less than 10% of the 480 operators who have so far launched LTE or LTE-Advanced networks have started offering VoLTE services commercially*

This means that it is easier for a caller not only to hear clearly what the person at the other end of the line is saying, but also to detect their tone of voice, giving a much richer overall experience.

### VoLTE penetration

In terms of subscriber growth, LTE is proving to be the most successful mobile communications standard ever. According to the latest figures produced by Ovum for the GSA<sup>1</sup>, LTE and LTE-Advanced subscriptions worldwide reached over a billion by the end of 2015—a total of 1.068 billion, more than half of which had been added during the last year, representing a staggering 107% annual growth rate.

Set against this background, it is surprising to note that less than 10% of the 480 operators who have so far launched LTE or LTE-Advanced networks have started offering VoLTE services commercially. With carriers emphasizing a strong commitment to VoLTE as a clear evolution path for voice, backed by a sound business case, this statistic appears counterintuitive, and we need to ask why this is the case.

At least part of the answer can be found in the results of preliminary VoLTE trials and commercial deployment worldwide, which indicate that poor

VoLTE call quality is being reported, defeating one of the prime motivators for the service. This degradation can manifest itself as poor audio reception, digitization, and waterfall noise, as well as dropped calls. A recent industry report<sup>2</sup> states that the frequency of call drops on VoLTE is 4 – 5 times higher than for 2G and 3G calls, a huge number in total given the higher density of calls that it is able to handle. Some of these dropped calls may be due to a failure in handover between LTE cells, or a failure to correctly implement fallback to a legacy circuit-switched network using SRVCC (Single Radio Voice Call Continuity) where LTE coverage becomes unavailable.

These issues largely go unnoticed by conventional network monitoring and optimization systems, which only detect the integrity of the radio access network and not the actual user experience. Methods used to measure the quality of experience of circuit-switched 2G and 3G voice services are not applicable for evaluating VoLTE performance in an all-IP network. At the same time LTE validation techniques based on patterns of data usage alone cannot adequately predict the effect of network impairments on VoLTE subscribers. Dropped packets that may have minimal effect on a data transmission can seriously impair a voice call being carried over the same data network.



### Monitoring Subscriber Call Quality

### Improving VoLTE call quality

Using SON for LTE (self-organizing networks) to identify usage patterns and improve network performance through user-centric KPIs will play a large part in helping operators pave the way to a reliable VoLTE service, with the capability to give users the quality voice experience they expect. Issues that impair quality need to be detected and pinpointed in terms of both the specific network issues that are the root cause and the types of

subscribers that are being affected. A system that processes this data against KPIs via big data analytics can inform the SON decisions and actions that will automatically keep the network in a state of optimal performance.

The ability to identify which LTE cells are giving the best and worst performance, and whether any specific device models give poorer performance—or are even incompatible with the VoLTE service—will allow the operator the insight to improve the service. Also where VoLTE calls are being dropped, it is instructive to know in which direction this is happening, and whether the problem lies within the operator's network or the one that the third party is using.

### SON that detects user experience

What is needed is a SON system that detects the experience that the subscriber is actually seeing, by identifying usage patterns and improving network performance through user-centric KPIs. While most SON vendors use RF network traces to feed into their SON algorithms, the CellMining approach is to take actual call data from the network, processed against KPIs via big data analytics, to inform the SON decisions and actions that the solution performs to automatically keep the network in optimal performance state.

CellMining's Behavior-Based SON™ is able to report against a whole range of categories, including which individuals, VIPs and corporate accounts are being affected, which LTE cells are giving the best and worst performance, and whether any specific device models give better or worse performance, or are incompatible with the VoLTE service. The VoLTE call drop direction feature enables a unique analytical capability to optimize highway VoLTE service quality.

### Advantages of Behavior-Based SON™

LTE operators should not take the risk that poor quality could undermine their VoLTE launch, thus defeating their main objectives and compromising customer loyalty and satisfaction. Using a customer-experience based SON solution can assist RF planning teams in deploying and trialing with VoLTE on their existing LTE infrastructure. It can complement pure network planning products by

introducing the unique ability to analyze subscriber experience data to make planning and optimization methods much more accurate. With the right choice of SON solution, detecting and mitigating low quality VoLTE calls requires no additional effort and can be an integral part of the network optimization process.

*The ability to identify which LTE cells and which device models give poorer performance will allow the operator the insight to improve the service*

CellMining's Behavior-Based SON™ is the only fully-fledged SON solution that reads and analyzes subscriber experience data to identify usage patterns and improve network performance through user-centric KPIs. It detects poor quality VoLTE Calls in which subscribers experience poor audio, digitation, waterfall noise etc. These issues go unnoticed by network monitoring and optimization systems, but CellMining's SON solution detects the calls and maps the problems as they relate to subscriber location, serving network cell, handset model and many other parameters.

### VoLTE call quality module

CellMining's Low Call Quality module detects quality-impairing issues that assist network optimization teams in pinpointing specific network problems, and provides reports against the following categories:

- Affected individuals and VIPs
- Affected corporate accounts
- Best and worst LTE cell performance
- Best and worst (incompatible) device models
- VoLTE call drop direction—a unique analytical capability to optimize VoLTE service quality on traffic highways

The KPIs in the reports are used by the SON solution to take decisions and perform actions to automatically keep the network in a state of optimal performance.

## VoLTE optimization and planning features

A number of features are provided to assist RF planning teams in the deployment and trialing of VoLTE on their existing LTE infrastructure. The features listed below complement pure network planning products by offering a unique ability to analyze subscriber experience data in order to deliver more accurate planning and optimization methods.

- PCI and RSI duplication resolution—detects LTE PCI/RACH duplication, prioritizes and recommends a new clear PCI/RACH, and automatically applies the change to the new PCI/RACH.
- iRAT neighbor relation additions
- INTER, INTRA and iRAT neighbor relation deletions
- TAC dimensioning—resizes LTE TAC in order to minimize inter TAC mobility.
- Parameter Change Control—an interface to define rules for optimal site parameter values.
- Reduction of LTE-UMTS Ping-Pong hand over effect

## VoLTE coverage optimization

Closed- and open-loop features provided by CellMining’s SONATA platform in support of continuous RAN and VoLTE service coverage and optimization include:

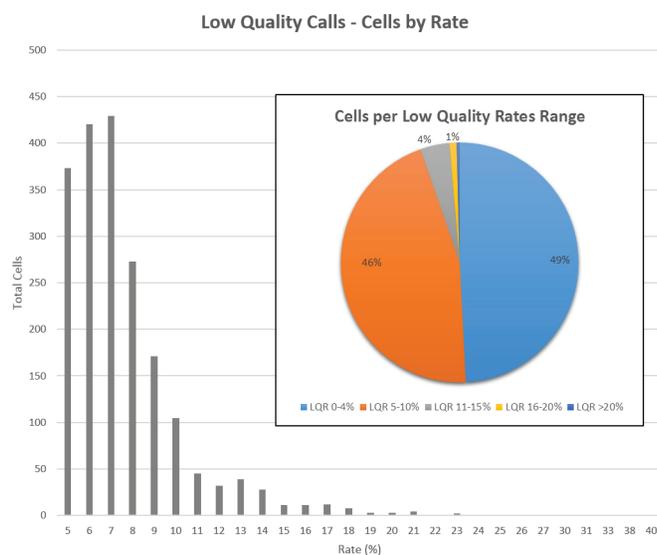
- C-SON Load Balancing - automated LTE site load balancing via RF configuration. The analytics include self-learning algorithms to ensure continuous optimization.

- Over-coverage resolution – detection of cells causing pilot pollution, following which the module recommends or automates tilt change of electronic antennas.
- Real-Time Congestion Resolution (INTER, INTRA and iRAT) and Predictive Congestion Resolution (scheduling of coverage changes based on an identification of a recurring sector/site congestion pattern)

## Conclusion

Mobile network operators have understandably been cautious about launching VoLTE as part of their 4G service offering until they can be sure that they can provide the superior call quality that their subscribers demand. Poor quality voice calls would undermine their VoLTE launch and potentially precipitate churn, which would defeat the original purpose of introducing it.

The technology exists today to detect and mitigate low quality VoLTE calls, without any additional effort. With CellMining’s SONATA platform and Behavior-Based SON™, VoLTE call optimization is included as a standard feature, empowering MNOs to provide a measurably better call experience to their subscribers.



## VoLTE Cell Quality Analytics