

Delivering quality 5G voice services

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Introduction

Voice over LTE (VoLTE) has been activated in over 280 networks. With the transition to 5G, using IMS for voice is mandatory. So, voice services will continue to be delivered using an IMS-based solution, transitioning from VoLTE to Voice over New Radio (VoNR) – for providing voice services over 5G standalone (SA) networks. With VoNR starting to roll out with the deployment of 5G SA, estimates are that by the end of 2022, the number of voice service subscriptions built on IMS will exceed 4.6 billion.

Once 5G standalone networks provide good coverage, operators will begin transitioning more subscribers to VoNR. At that stage, there will be no legacy infrastructure to fall back on like in the past with VoLTE. So, VoNR will need to deliver voice services with a guarantee of high quality.

The path to VoNR

Integration of voice services in 5G can be done using one of the following methods:

1. Dual connectivity in VoLTE and 5G. VoLTE is used for voice, and 5G is used only for data.
2. EPS fallback (EPS FB), or RAT fallback (RAT FB). This means the device will be connected to the 5G or 4G network and then reconnected to 5G once the call is completed.
3. Full voice over 5G. Both voice and data go through the 5G network, and the IMS network is used for communications between the devices.

Whatever path operators take to VoNR, ultimately, what matters is the service quality customers receive. To deliver quality VoNR services, operators must deploy and gain critical end-to-end visibility. VoNR calls transverse through multiple legs and crosses numerous domains. Through the RAN, access core, data core, and IMS core. Call establishment is involved at various points, and at each point, signaling or voice quality can be degraded. All these issues can affect multiple subscribers, so it is vital to proactively detect problems, especially if they are common to many users.

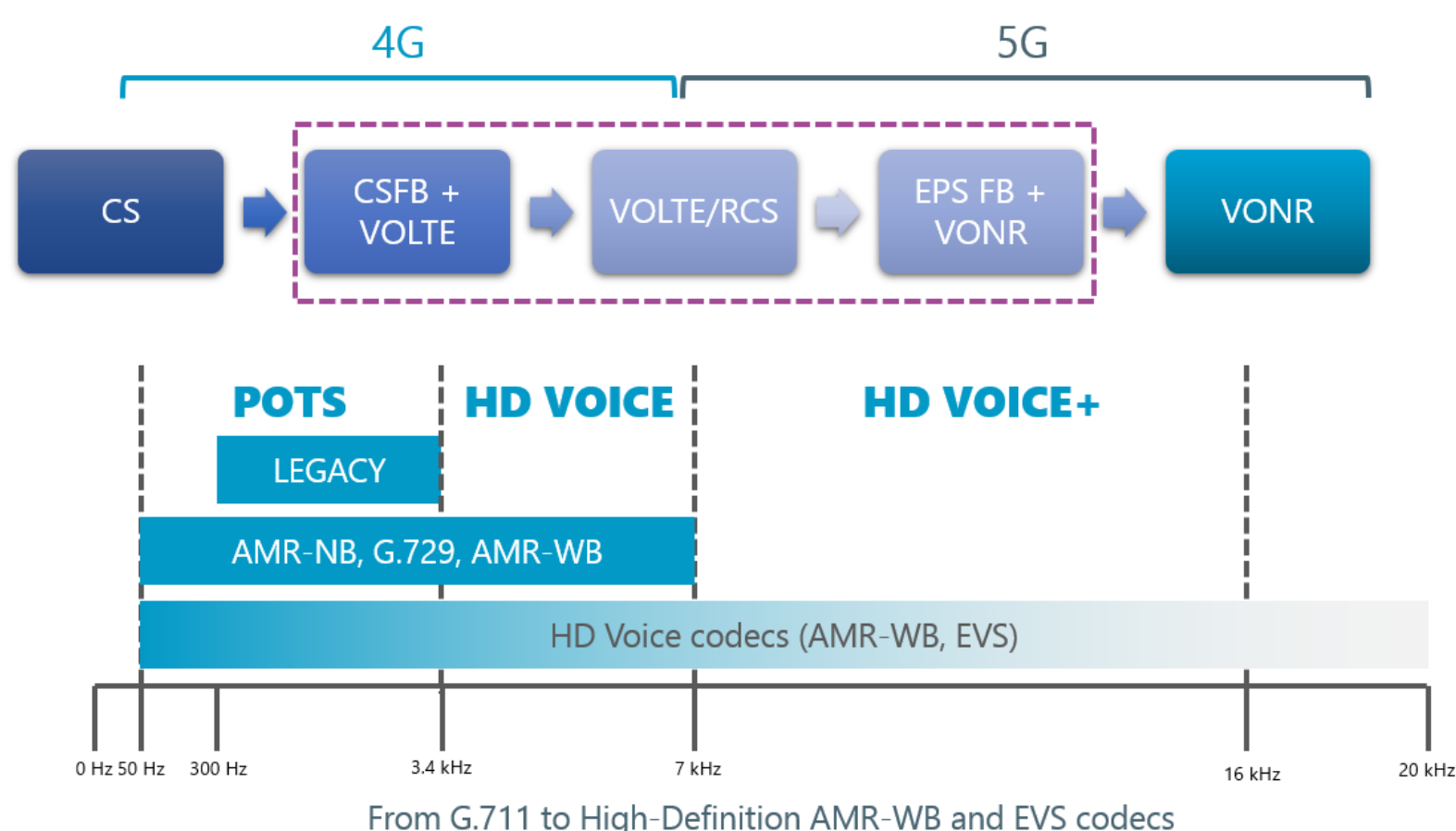


Figure 1 – Evolution of voice services

Benefits of VoNR

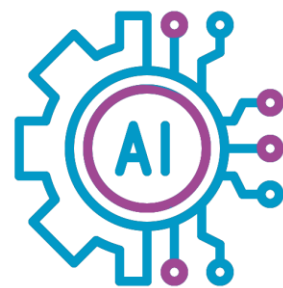
- Improves customer experience (HD quality calls, guaranteed service levels, etc.)
- Generates new revenue opportunities for additional voice-based (and data) services
- Provides future services like AR/VR/XR, as well as spatial conversations such as surround sound technology
- Supports higher spectral efficiency for a better customer experience
- Saves OPEX from consolidation and optimization
- Allows for better performance and low latency services (high speed, shorter delays and faster call set-up times)

Business benefits of deploying RADCOM ACE*

RADCOM ACE ensures that operators can deliver top-quality VoNR services by:



Enhancing the VoNR customer experience by 30%



Detecting 35% of VoNR degradations using AI/ML



Improving time to resolution by up to 40%

Further benefits include:

- Providing a service-level view of the VoNR service quality
- Utilizing AI/ML to detect network anomalies for VoNR automatically
- Pinpointing customer-impacting degradations proactively
- Enabling the operator to see the end-to-end service layer with real-time subscriber analytics and advanced troubleshooting for VoLTE and VoNR

*Data is based on customer testimonies and can vary depending on the network

Advanced built-in AI and ML

Our AI and ML capabilities are built into the solution, allowing for a variety of AI-based use cases, such as anomaly detection, predictive and prescriptive customer experience analytics, predictive and dynamic slice quality KPIs, and more. Using AI allows for problems in the network to be detected and resolved even before the end user experiences a problem.

With built-in AI technology, RADCOM ACE allows you to:

- Use predictive analytics that can forecast issues before they occur
- Be proactive in identifying VoNR performance issues
- Smartly monitor KPIs and KQIs using automated anomaly detection
- Optimize the customers' quality of experience and overall quality of service in the most efficient way, accumulating expertise over time and enabling an intelligence data feed to reduce manual actions

Advanced troubleshooting capabilities

RADCOM ACE performs end-to-end cross-domain correlation and root cause analysis across RAN, backhaul, Core, IMS, and the VoNR application server. Correlating end-to-end VoNR sessions with SIP signaling analysis and multimedia quality measurements based on RTP/RTCP protocol analysis such as perceptual MOS (PMOS), jitter, packet loss, and R-factor. Monitors handovers from Voice over NR (VoNR) to VoLTE when crossing into service areas lacking sufficient 5GNR coverage. This is critical for isolating network performance issues that cause QoS degradation and avoiding call drops.

Within the 5G area, there is an increase in the number of handovers between cells, which may cause a higher packet loss and impacts voice quality. As with any new technology, there will always be challenges to overcome. Therefore, paying extra attention to monitoring and quality assurance will be required, especially in IMS access.

RADCOM ACE provides a complete view of the network and pinpoints which areas require more bandwidth or capacity. Suppose there is a heavy concentration of traffic on one cell. In that case, RADCOM ACE will detect this and trigger an alarm alerting the operator to consider optimizing the network, catching the issue before it becomes a problem.

As a result, the operator gains a unified approach to assuring 5G voice services by delivering network insights that span engineering, quality assurance, and customer care. From engineering tools (online and historical call tracing, in-depth protocol analysis) up to cell analysis and VoNR service dashboards for Network Operations Centers, RADCOM lets operators keep a finger on the VoNR service pulse. RADCOM ACE detects and classifies the different flow types within the operator's voice services by creating correlated sessions and using them for KPIs.

With complete visibility into the entire service and network performance, operators can better understand areas that need to be optimized. Flow-type classification can also segment flows within the network and the IMS core to provide key performance indicators (KPIs) for proactive troubleshooting and network planning.

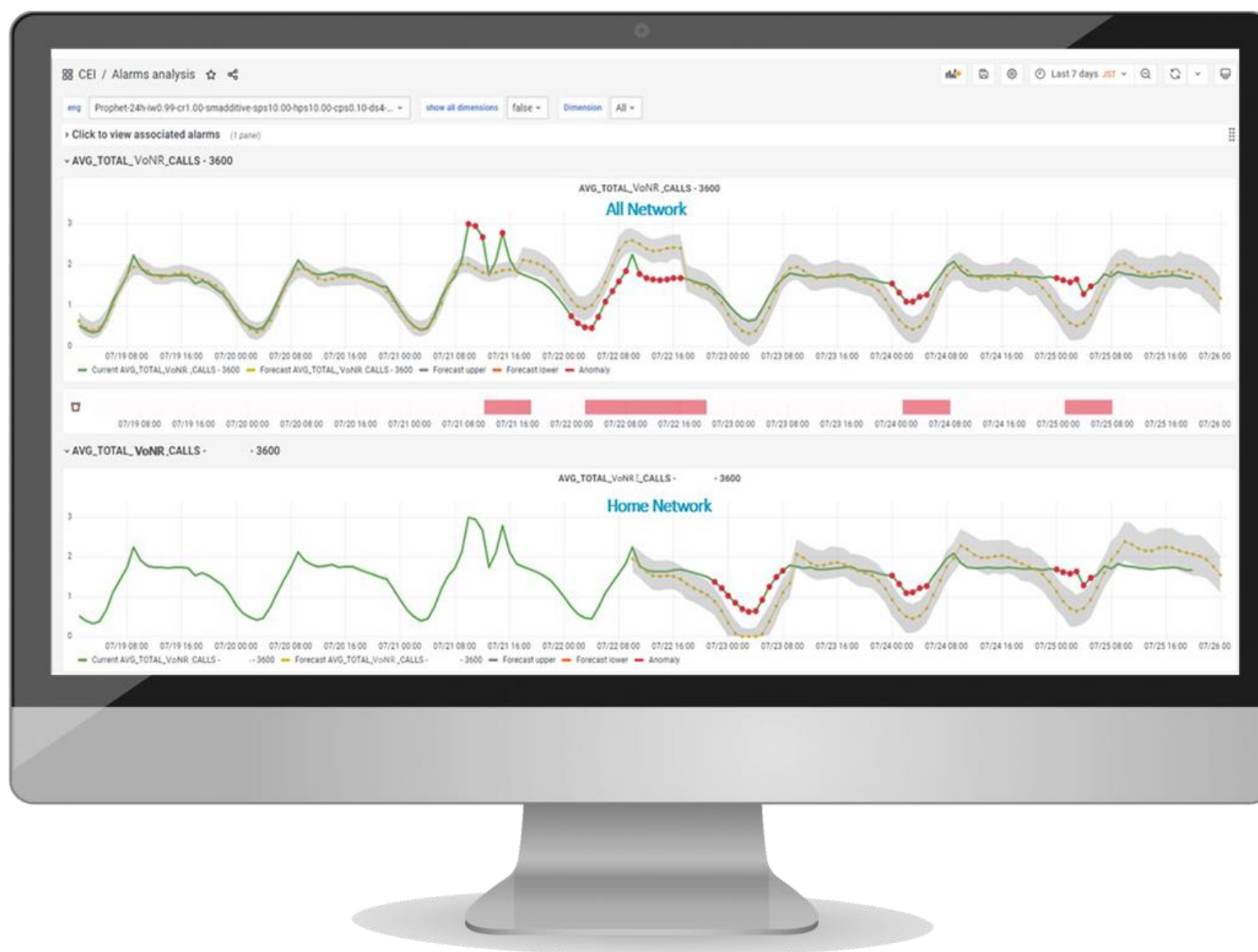


Figure 2 - AI detecting VoNR degradations automatically

RADCOM ACE features

Online, Historical Call Tracing and Analytics

Session-based call tracing for a detailed analysis of the service with any combination of flexible filters, providing an end-to-end correlated view of the subscriber or network sessions for root cause analysis quick resolution of issues. An end-to-end signaling ladder is provided for all IMS, VoIP, SMS over IP, and video sessions.

For VoNR/VoLTE, end-to-end correlation is applied to combine all the various legs and protocols, comprising the voice, SMS, or video session from the 4G or 5G radio interface to the IMS core. It allows for intra and inter-protocol correlation for complex scenarios, such as conference calls, inter-technology handovers, call forwarding, as well as additional customizations per operator. Analysis can be performed in real-time and on historical data covering each subscriber's interactions with the network. Operators can:

- Correlate the end-to-end customer experience with network, device, cell, and service performance in real-time
- Analyze call establishment process to inspect bearers and QCI
- Present network element issues with quick drilldowns to KPI analysis over time and easy analysis of other related KPIs
- Allow for cross-protocol visibility into the call to ensure all call legs, including signaling, subscriber registration, identification, authentication, policy and charging, networks interconnectivity, and others, all function correctly

- Analyze real-time traffic to examine calls as they take place using versatile call trace filtering
- Record historical calls to inspect traffic disturbance events, screening by signaling information, QoS, subscriber information, legs information, and dozens of other filtering capabilities
- Ensure end-users perceptual voice call quality – P-MOS, R-Factor, packet loss, and jitter to provide voice service customer satisfaction
- Track multiple KPIs for optimizing the network performance for VoLTE such as worst-performing elements, low-performing functions using continuous calls and signaling analysis overtime, network-wide performance insights
- Support advanced HD codecs such as EVS (Enhanced Voice Services) to gain visibility into the complete voice service offering



Figure 3- End-to-end correlation is critical for VoNR service optimization

In-depth packet analysis

Due to the significant network changes with operators transitioning to cloud-native architectures, low-level tools such as packet-based protocol analyzers are a must-have solution. They are becoming more and more critical for engineers who want to troubleshoot and optimize underlying network issues, debug new services, and view the health of network links between nodes. RADCOM engineers can view any packet flowing through the network for any selected subscriber or period and produce a full user-plane PCAP trace perfect for testing new technology rollouts and in-depth troubleshooting, including having the ability to decipher encrypted traffic.

With RADCOM Packet Analyzer seamlessly integrated into RADCOM ACE, an engineer can quickly drill down with a click of the mouse from RADCOM's Customer Care and network analytics applications, that monitor the overall VoNR service quality, to facilitate in-depth root cause analysis at the packet-level.

RADCOM Packet Analyzer monitors traffic at all levels, both call/session-related and non-call/session-related, as well as online or historical data, with all protocols displayed in a single view. Operators can filter protocol data separately or in combination with network element ID, transport layer parameters, protocol types, and additional filters such as IMSI and MSISDN. Users can then view a full decode of the captured frame, search and filter by any field and save the trace results for further analysis.

Summary

While 5G NSA and SA will coexist in most operators’ 5G networks, the combinations between the network architecture options (NSA and SA) and UE capabilities (NSA, SA with EPS-FB, SA with VoNR) will lead to different paths for delivering voice services. So, a phased approach of 5G deployment and voice services will be the path forward for most operators.

As 5G SA coverage continues to expand, new use cases like VR/AR (virtual reality/augmented reality), Industrial IoT, and URLLC (ultra-reliable low latency communication) will drive innovation for new and exciting new services that will require real-time analytics to smartly monitor quality. Voice services is one of the critical services for 5G’s successful technology migration, evolution, and innovation. Therefore, it is essential to deliver high-quality services to compete with over-the-top providers and satisfy paying customers.

RADCOM ACE provides operators with an automated, cloud-native assurance solution for VoLTE and VoNR. The solution smartly monitors these complex services from the RAN to the core, provides subscriber analytics and real-time advanced troubleshooting to ensure subscribers receive great voice service experiences. In addition, with the built-in artificial intelligence capabilities operators can move to a more proactive and automated approach to managing VoNR and VoLTE services that will prevent churn and ensure top-quality services are delivered to customers.



Figure 4- RADCOM ACE proactively improves voice services for 5G

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