



VOLTE TROUBLESHOOTING

Protect the Customer Experience with
Iris Session Analyzer

TROUBLESHOOT CALLS

Iris Session Analyzer (ISA) delivers the capacity and processing power required for troubleshooting both the signaling and Real-time Transport Protocol (RTP) components of the most complex VoLTE calls. When paired with GeoSoft RAN, this information is also correlated with radio interference to effectively address accessibility, retainability and voice Quality of Experience (QoE).

Address VoLTE Call Failures

- Isolate and escalate radio access network (RAN) or handset-specific issues preventing the user equipment (UE) from connecting to the LTE network.
- Investigate IMS connection and registration issues blocking default bearer assignment.
- Analyze the entire call setup process to uncover the root cause of failed session establishments or transcoding issues.
- Understand when extended setup and post dial delays are at the root of aborted call attempts.

Investigate VoLTE Call Drops

- Identify areas where radio access coverage may be lacking.
- Troubleshoot problematic LTE and fallback to 3G handovers due to interoperability complications.
- Identify timeout triggers responsible for a premature call release.

Assure VoLTE Call Quality

- Track MOS on a hop-by-hop basis to understand and characterize negative impacts to the calling experience.
 - Validate the presence of dropped, delayed or out-of-sequence packets that can introduce delay and jitter into the conversation.
 - Understand when and where one way audio occurs.
 - Pinpoint QoS class identifier (QCI) mismatches for assigned media bearers.
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Exceeding Your Subscribers' Expectations

An operator's ability to offer high quality voice calling on the LTE network will be a critical step in the fight to reclaim revenue from competitors—but it won't be easy.

Launching VoLTE requires continual tuning of both the access and core networks in order to establish, support and handover mobile voice calls as subscribers move throughout the network—all while maintaining a quality of experience that is at-or-better-than existing service alternatives.

Expectations developed over years of circuit-switched calling methods are further complicated by the variety of "free" OTT VoIP options concurrently utilizing the same LTE data network resources. In short, subscribers will be far less tolerant of a poor VoLTE calling experience, so troubleshooting teams must be ready. The following examples represent some of the most likely issues your VoLTE customers will encounter. Issues more easily addressed with ISA.

"I Can't Make Calls"

VoLTE services will ultimately thrive or dwindle based on an entirely new generation of UEs and their ability to utilize both the LTE and the IMS networks effectively. While operationally separate activities, the coordination and effectiveness of these procedures is mission critical to a subscriber's ability to place or receive calls over the LTE network.

"My Calls Drop"

Dropped calls have long been an issue for mobile subscribers. No matter the cause, the premature conclusion of a voice conversation is noticeable. And, while mobile callers are trained to try the call again, ongoing or widespread retainability issues can lead to customer dissatisfaction and churn. While network engineering and planning teams work to ensure proper coverage and capacity for VoLTE calling services, troubleshooting teams must be effective when isolating issues to minimize call drop rates.

"My Calls Sound Bad"

In order for VoLTE service to really take off and ultimately replace existing OTT VoIP options, the quality must be noticeably superior. To ensure this, network operations personnel will need to be able to identify and troubleshoot the root cause of service degradation. With performance teams focused on KPIs such as "Acceptable Call Quality", network operations personnel will need to proactively address VoLTE calls with poor MOS values and "One Way RTP."

Troubleshooting Failed Calls

Unable to Attach to the LTE Network

On the LTE side, when subscribers can't connect to the data network, voice isn't the only service that will suffer. For this reason troubleshooting teams must continue to prioritize the resolution of Attach and Authentication failures.

- With ISA, troubleshooting teams have the ability to investigate a variety of issues that occur when a UE is powered on and tries to connect to the network.
- ISA may be used to troubleshoot issues related to Attach request messages sent from a device to the Mobility Management Entity (MME) as well as the location registration messages exchanged with the Home Subscriber Server (HSS).
- Packet Data Network Gateway (P-GW) selection by the MME and bearer setup between the Serving Gateway (S-GW) and P-GW may be easily visualized with ISA's ladder diagram. Such information can help troubleshooting teams focus in on suspect elements as required.

TIME SAVERS

When troubleshooting VoLTE calls, 90% of your tasks will begin with the Scenarios Tab. From this tab, you can select standardized VoLTE scenarios from a “Common” shared library or alternatively activate more custom “Users” scenarios.

Existing “Common” scenarios enable easy and accurate selection of the most relevant VoLTE traffic sources within the network. Facilitating regional selections, users can avoid unnecessary and resource intensive network-wide queries.

With defined network selections, ISA scenarios eliminate the need for intimate deployment and domain knowledge.

- ISA scenarios shave minutes from routine troubleshooting tasks by automating instrumentation protocol and application selections.

One-click selection of an existing scenario reveals the Quick Launch window.

As a best practice, standardized “common” scenarios should include a description of the selected configuration as well as clear instructions on how to proceed and launch the query.

For ease of use, an IMSI and/ or phone number variable field could be provided for call-specific troubleshooting within seconds.

- Quick Launch scenarios are ideal when troubleshooting issues involving a specific numbers.

When more generalized VoLTE troubleshooting is desired, protocol-related criteria such as relevant Status Events, Session Types, Transaction Types and Response Codes may be specified.

- Select “Customize” from any saved scenario or “Modify” from an existing results window to fine-tune your query.

More advanced users can create entirely new scenarios using an integrated workflow option.

Inability to Register with the IMS Network

Within the IMS network, the Call Session Control Function (CSCF) plays a major role in VoLTE calling. Here, SIP messages including IMS Registration requests and User Authentications should be closely monitored.

- Use ISA to filter on SIP (non-invite) messages when focusing on the IMS Registration procedures sent from the VoLTE terminal, through the LTE/EPC to the proxy and serving CSCFs.

Inability to Setup the Media Bearer

Even with groundwork attach and registration procedures in order, VoLTE calls can still fail if a proper bearer is not established. The SIP Invite message sent from the UE to the P-CSCF contains information such as originating call services and codec support required for the call. A complementary set of terminating call information is provided in a session progress message when returned and is used to set up the voice transmission bearer with a specified QoS.

- Use ISA to filter on SIP INVITE message success and related responses when troubleshooting failed VoLTE calls that terminate prior to RTP transmissions
- Investigation of SIP messages with network ineffective release/response codes may be easily filtered when troubleshooting call setup failures with ISA.

Troubleshooting Dropped Calls

Insufficient Access Network Coverage

While every effort has been made to ensure adequate coverage for LTE and subsequent VoLTE services, gaps will likely occur due to changes in topology or neighbor cell interference. ISA can help you identify areas needing additional investigation.

- With ISA, look for a SIP BYE message with a SIP cause 503 between the Call Session Control Function (CSCF) and the Telephony Application Server (TAS).
- Access the Packet Decode Detail window and look for a “Session released – service based local policy aborted” SIP Header. CSCFs with context drops may identify candidates for an immediate signal boost or longer-term build out.

ISA: Your “one-stop shop” for VoLTE Troubleshooting

- Standardization and sharing of VoLTE trace scenarios offer “Quick Launch” access and accelerated session retrieval with minimal user input and network topology knowledge.
- Customizable displays support unique job responsibilities and routine troubleshooting tasks.
- On-the-fly scenario modifications reduce query response times by collecting only the relevant information meeting your precise criteria.
- Integrated views of signaling and media deliver follow-on functionality and minimize chair swivels.

Incompatible Software Loads and Cell-to-Cell Handovers

With the volume of eNodeBs in operation, upgrade activities are often processed in phases making them more susceptible to error. The result of software loads that are either forgotten or unsuccessful can ultimately produce an incompatible handover situation between eNodeBs. ISA can help you identify such Inconsistencies.

- With ISA, look for a Diameter Credit-ControlRequest - 10 Resource Allocation Failure cause message between the PGW and PCRF. This message can indicate that the MME initiated tear down of an associated bearer.
- Expanding the Diameter message details can identify the specific bearer released for correlation with problematic eNodeB context drop.

Actionable Information at Your Fingertips

Once you have launched your VoLTE troubleshooting query, correlated sessions meeting the specified criteria will begin to populate the Session Summary pane.

- By default, quick MPC is performed to speed retrieval of sessions of interest.
- Users can invoke full MPC by clicking on an individual session. Users may also elect to view IMS, EPC and RAN sessions together or separately if desired.

Session Summary columns allow for quick filtering and sorting of captured sessions. In addition, any column may be re-ordered or hidden to improve user productivity and at-a-glance analysis. Upon selection of a particular session, the Ladder Diagram and PDU Messages pane will populate with the selected session messages.

- Message types are color coded for quick identification of PDU by type (SIP, RTP, DNS or Diameter) and corresponding direction. This allows users to quickly isolate the location of failures or QoS degradation.
- For RTP, hop-by-hop MOS is reported on the RTP flow arrow.

The PDU Messages pane provides a tabular representation of the Ladder Diagram display. As with the Session Summary pane, columns may be used for filtering and sorting to hone in on specific information.

- Selection of a specific message in the PDU Messages pane will highlight the corresponding message in the ladder diagram. The reverse selection method is also supported.

For further analysis, the user can double-click on a message in either the Ladder Diagram or PDU Messages pane to launch a corresponding Packet Decode or Flow Details window

- Packet Decode Detail windows display the network elements that are involved and the entire decode of the PDU. For supported SIP messages, users can use the SIP Summary tab to view all of the relevant information from a SIP message without scrolling through multiple node expansions.
- Flow Detail windows allows users to view the session characteristics, including the response code, start and end time for the message flow, the link name, and uplink and downlink statistics.

SBC Selection Error Example

Even when MOS is acceptable, audio quality may be at risk when RTP is not flowing optimally. This can happen when an incorrect MRFP, SBC selection is made.

Looking at the RTP flow between named nodes in ISA's ladder diagram can provide a quick indication of a less than direct route. Such discoveries can be shared quickly with VoLTE engineering teams before MOS is negatively impacted.

Backhaul Quality Impact Example

By design, a flattened IP architecture allows for multiple paths when delivering the signaling and RTP of a VoLTE call. In some cases, a backhaul network will be used to expedite delivery.

While lessening the burden on the network, the backhaul may be responsible for poor quality. Using ISA, troubleshooting team can quickly review the MOS scores at the ingress and egress S-GWs to look for potential issues.

Troubleshooting Call Quality

Looking for the cause of a poor audio experience is akin to searching for the needle in the haystack. With so many points of failure, Network Operations teams need to accelerate investigations in order to stay on top of MTTR targets. ISA's intuitive ladder diagrams serve a critical role in the battle against poor VoLTE call quality.

Packet Delivery Issues

In VoLTE, digitized voice must share network resources with a variety of other bandwidth-hungry services. While LTE uses a QoS Class Identifier (QCI) to prioritize the delivery of less tolerant media such as voice and video, congestion, misconfigurations and conflicting priorities can arise. When this happens, packet loss, jitter, delay and sequencing errors can surface resulting in a poor audio experience for the subscriber. ISA can help you identify the precise point of service degradation with clear hop-by-hop and message-by-message MOS reporting.

- When analyzing a call with ISA, look for changes in reported MOS between elements. Suspect RTP flows may be expanded to show details including contributing jitter, packet delay, packet loss and out of sequence packet measurements. This information in turn can better characterize the issues causing a less than stellar MOS score.

Cross-Domain Codec Translations

For calls placed between LTE and 3G networks, the MRFP node in IMS is responsible for translation of the codecs to ensure quality across the disparate domains. ISA monitors the ingress and egress of this node to identify where such conversions may be negatively impacting MOS.

- Using ISA's ladder diagram look for drops in MOS on either side of the MRFP.

One Way Audio

While not a contributing factor for MOS or Acceptable Call Quality KPIs, One Way Audio can have a major impact on the subscribers' VoLTE calling experience. One Way Audio occurs when RTP flows in only one direction.

- Clearly visible in ISA's ladder diagram, troubleshooting teams can proactively look for any "One Way RTP Session" flows based on a threshold set for less than 11% of the number of packets in the opposite flow direction.

LEARN MORE

We invite you to get more familiar with ISA's time-saving features that can help you boost your productivity and reduce the MTTR. More information about ISA is available in an accompanying product data sheet. In cases, where additional specialized assistance is required, ISA's flexible export options help to facilitate cross-department or external vendor communications

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