SOLUTION BRIEF

DART AI

VoLTE/VoNR Observability

EXECUTIVE SUMMARY

Voice services in modern mobile networks—VoLTE (Voice over LTE) and VoNR (Voice over 5G NR)— depend on complex interactions between signaling systems, radio access networks, transport infrastructure, and mobile core user-plane gateways. When voice quality degrades, operators must determine whether the issue originated in the device, radio network, transport layer, core infrastructure, or external services.

Traditional monitoring platforms struggle to identify the true root cause because they rely primarily on logs, counters, or sampled flow telemetry rather than observing the actual voice packets and signaling interactions.

Cirries DART AI™ provides deterministic VoLTE and VoNR observability by analyzing packet-derived behavioral metadata from both the signaling and user planes. By correlating SIP signaling, SDP session descriptors, and GTP-U tunnel identifiers (TEIDs), DART AI maps voice packets to subscriber sessions.

Through an integrated operational workflow and AI-driven analytics, DART AI automatically identifies anomalies, isolates the root cause of service degradation, and recommends remediation actions for operations teams. This dramatically reduces investigation time and enables faster restoration of voice service quality.

THE CHALLENGE OF VOLTE AND VONR TROUBLESHOOTING

Voice services in mobile networks traverse multiple infrastructure domains:

- UE (device)
- RAN (gNodeB / eNodeB)
- Transport network
- Mobile core user-plane gateways (UPF / SGW)
- IMS infrastructure
- External voice networks

While signaling platforms and network monitoring tools provide visibility into individual domains, few systems can simultaneously correlate subscriber sessions across both the signaling and user planes.

As a result, operators often struggle to answer critical operational questions:

- Which subscribers are experiencing voice degradation?
- Which cell sites are involved in the affected sessions?
- Which user-plane gateways handled the traffic?
- Did packet loss originate in the transport, radio network, or core?
- Is the issue affecting voice traffic specifically or general data services?

Without subscriber-level correlation, troubleshooting becomes slow, fragmented, and operationally expensive.

SUBSCRIBER CORRELATION USING SDP

In VoLTE and VoNR calls, the Session Description Protocol (SDP) contained within SIP signaling messages describes the media streams used during the call.

SDP includes key information such as:

- media IP addresses
- RTP port numbers
- codec parameters
- session timing information

DART AI analyzes SDP messages within SIP signaling exchanges to identify the RTP media streams associated with each voice call. By extracting these parameters, the platform maps RTP packets observed in the network to the corresponding subscriber voice session, without decrypting payload data.

This enables the platform to continuously analyze:

- RTP packet loss
- jitter
- latency variation
- voice quality characteristics

Because this correlation is derived from signaling metadata rather than payload inspection, DART AI maintains full compatibility with encrypted traffic and privacy requirements.

DART AI APPROACH

DART AI solves this problem by combining three sources of packet-derived intelligence:

1. SIP signaling analysis
2. SDP session descriptors
3. GTP-U tunnel identifiers (TEIDs)

Together, these elements allow the platform to correlate the lifecycle of a voice session. This architecture enables DART AI to provide subscriber-centric observability while simultaneously correlating infrastructure behavior across the network.

NETWORK PATH IDENTIFICATION USING TEID

While SDP identifies the subscriber voice session, TEID values in GTP-U headers identify the infrastructure path that carries that session through the network.
In LTE and 5G networks, user-plane traffic between the RAN and core network is transported through GTP-U tunnels. Each tunnel contains a Tunnel Endpoint Identifier (TEID) that uniquely identifies the subscriber session at the gateway.

By extracting TEIDs from packet headers, DART AI associates each voice packet with the specific infrastructure handling the session.

This allows the platform to determine:

- which cell site or RAN node originated the session
- which SGW or UPF gateway processed the traffic
- which network segments experienced packet degradation

Because all packets belonging to a subscriber session share the same TEID, DART AI can analyze performance characteristics across the entire call path.

END-TO-END CALL VISIBILITY

By combining SDP-based subscriber correlation with TEID-based tunnel identification, DART AI correlates network elements with the path of a voice session.

- Subscriber Session
- Cell / RAN node
- Transport network segment
- SGW or UPF gateway
- IMS service platform
- External voice network

This allows operations teams to understand whether a voice issue originated in the radio layer, transport network, user-plane gateway, IMS infrastructure, or external services.

AI-DRIVEN WORKFLOW AUTOMATION

DART AI integrates packet-derived intelligence with an AI-driven operational workflow designed to automate network investigations. The platform continuously analyzes packet behavior across signaling and user-plane traffic to identify anomalies such as:

- RTP packet loss bursts
- jitter spikes affecting voice streams
- transport congestion or microbursts
- tunnel imbalance across gateways
- signaling storms in IMS infrastructure

Once anomalies are detected, DART AI uses AI-assisted reasoning to correlate packet behavior with infrastructure telemetry and operational events. The system then automatically identifies the most probable root cause. Through this automated workflow, DART AI can:

- detect service degradation in real time
- isolate the affected subscriber sessions and network elements
- determine the infrastructure domain responsible for the issue
- generate recommended remediation actions for network operations teams

This approach transforms troubleshooting from a manual investigative process into an AI-assisted operational workflow.

EXAMPLE ROOT CAUSE SCENARIO

A VoLTE call experiences degraded audio quality. DART AI analysis shows:

- RTP packet loss is affecting the subscriber's media stream
- SDP correlation identifying the affected session
- TEID mapping revealing the session passed through a specific UPF gateway
- transport telemetry indicating queue drops on the aggregation router serving that gateway

The platform determines that the voice degradation originated from congestion in the transport network feeding the UPF rather than from radio conditions or IMS infrastructure.

DART AI then recommends remediation steps such as traffic redistribution, congestion mitigation, or routing adjustments.

BENEFITS FOR MOBILE OPERATORS

Deploying DART AI for VoLTE and VoNR observability provides several operational advantages.

- **Deterministic root cause analysis -** Packet-derived intelligence reveals the exact moment and location where performance degradation occurs.
- **Automated operational workflows -** AI-driven correlation automatically identifies anomalies, root causes, and recommended remediation actions.
- **Improved voice service reliability -** Early detection of transport congestion, packet loss, or signaling instability helps operators maintain high-quality voice services.
- **Carrier-scale analytics -** The platform analyzes large volumes of voice traffic across national networks without requiring full packet storage.

DESIGNED FOR CARRIER-SCALE DEPLOYMENTS

DART AI is built to operate in large mobile networks where millions of subscriber sessions occur simultaneously. Packet Sensors positioned nearby:

- RAN aggregation interfaces
- IMS infrastructure
- user-plane gateways
- transport interconnects

Extract behavioral metadata for analysis by the DART AI analytics platform.
This distributed architecture enables continuous analysis of voice traffic across large geographic networks while maintaining real-time operational insight.

ENABLING AI-DRIVEN VOICE OBSERVABILITY

By combining packet-derived intelligence, cross-plane correlation, and AI-driven operational workflows, DART AI transforms how operators monitor VoLTE and VoNR services.

Instead of relying on fragmented telemetry or manual packet-capture investigations, network teams gain continuous visibility into subscriber voice session behavior.
The result is faster root cause identification, automated operational insight, and improved reliability for mission-critical voice services across modern mobile networks.

For more information, contact us at sales@cirries.com