

Landslide VoLTE/IMS Node and SIP UE Emulation

Introduction

The Landslide VoLTE/IMS Node and SIP UE Emulation feature adds Session Initiation Protocol (SIP)-based Voice over LTE (VoLTE) client emulation capabilities to LTE Mobility Management Entity (MME) and LTE Gateway Test Applications. In addition, it adds a standalone SIP proxy/IMS P-CSCF node for testing scenarios that do not require emulated UE SIP clients. Landslide's VoLTE/IMS emulation feature allows the creation of test scenarios with thousands of user equipment (UEs) placing and receiving VoLTE calls while simultaneously sending and receiving data.

Complex call modeling scenarios can be created that include UEs in various stages of activation, deactivation, handovers, data transfers, and VoLTE calling. Landslide can test against the entire Evolved Packet Core (EPC), or it can emulate most network elements based on testbed requirements. The Landslide VoLTE implementation follows GSMA IR.92, and GSMA IR.94, and is the tool of choice for testing interoperable VoLTE network and equipment implementations.

Features and Benefits

- Realistic, real-world simulations that allow equipment vendors to accurately specify the performance characteristics of their equipment under real-world conditions
- Simultaneous control and user plane that allow service providers to measure the performance of their network and to validate new features and services in the lab
- Test any ePC network element in isolation or in an end-to-end configuration using realistic data while UEs place and receive VoLTE calls
- Easily test ePC network element performance, scalability, and VoLTE call handling capability while the effects of dynamic PCC are investigated
- Use Landslide's data message flows, traffic mixer, and emulated SIP clients to determine the impact of real-world traffic profiles on VoLTE Quality of Experience (QoE)
- Unmatched scalability allows the user to simulate subscriber loads ranging from a small rural town to the largest metropolitan city
- Emulate multiple network elements to test a variety of network topologies
- Emulate key network elements to reduce capital expenditure and ongoing support costs
- Create real-world scenarios for heavy load, BHCA modeling, and long duration stability tests
- Test any ePC network element in isolation or end-to-end configuration with realistic UEs

- PSAP Node emulation to validate network's processing of emergency calls
- Use Landslide's POLQA to measure speech quality
- Measure QoE for streaming video services with Landslide's PEVQ
- Automation control for repeatable, multi-test server complex test scenarios and lab configurations
- Use higher-level test management systems and Tcl to control and monitor Landslide
- Compile combined test reports that include the emulation (Landslide) and the device under test using Landslide's Tcl interface
- Voice Codecs — AMR-NB, AMR-WB, EVRC-B, EVS, G.711, G.722, G.729, ILBC, and OPUS, plus option to change codec type during call
- Video Codecs — H.263, H.264, H.265, and VP8

VoLTE is the combination of IMS-based voice, messaging, and video services over the 4G mobile network. To ensure a successful transition, mobile carriers and equipment manufacturers must ensure that voice quality and call reliability are as good as — if not better than — existing circuit switched voice services. Keysight's Landslide VoLTE/IMS Node Emulation tests the mobile and IMS core nodes to ensure they are capable of meeting the scale, performance and stability needed for successful VoLTE product and service rollouts.

Applications

- Validate system scalability and identify capacity limits
- Measure control plane capacity
- Stress data plane performance
- Perform intra-LTE and IRAT mobility
- Characterize system before trial and delivery
- Identify performance ceilings
- Perform Busy Hour Call Attempt testing
- Evaluate SIP proxy performance and limitations
- Test EPC behavior under dynamic PCC conditions
- Determine data traffic impact on VoLTE call QoE

Landslide's flexible VoLTE/IMS solution provides numerous testing configurations including (but not limited to) SIP Client and P-CSCF emulation to test the IMS, I-CSCF, and S-CSCF isolation testing and support for Wireless Priority Service (WPS).

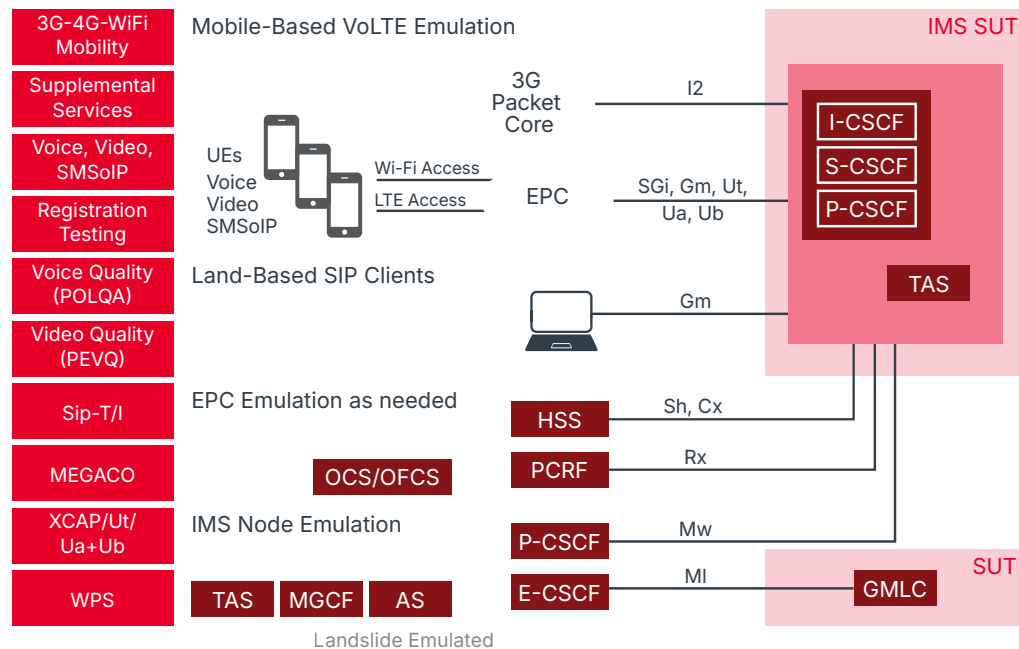


Figure 1. Landslide testing configurations diagram

The Landslide LTE Gateway Test Application, combined with the VoLTE/IMS feature, provides a means of testing LTE gateway performance using data traffic, VoLTE calls, or both. Integrated support for the Rx interface from the IMS node or SIP Proxy provides a means of testing PGW and/or PCRF operation and performance when using dynamic policy and charging control for dedicated bearer creation, modification, and deletion.

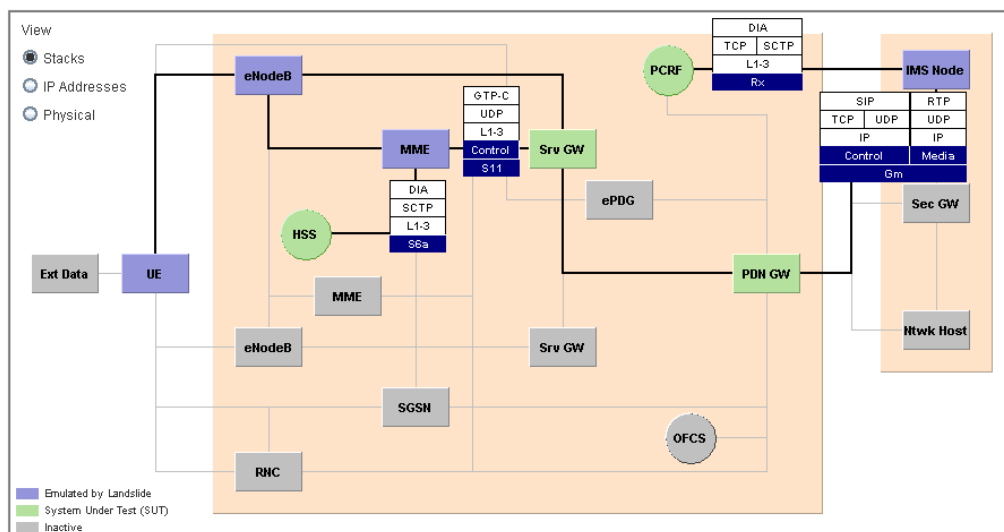


Figure 2. Landslide LTE Gateway Test Application diagram

SIP subscribers, emulated SIP clients, and endpoints are simple to configure using the Phonebook. Test data files provide a “define once and use many times” capability and facilitate defining heterogeneous user populations for modeling real-world UEs.

Landslide mobile SIP clients are able to place and receive mobile-to-mobile calls as well as mobile-to-network calls. In the mobile-to-mobile scenario, one emulated UE calls a different emulated UE on either the same or different PLMNs. Mobile-to-network calls provide a means of testing UEs placing or receiving calls to or from the PSTN.

The screenshot shows the 'Phonebook' tab in the Landslide software. The 'SIP Subscribers' section contains fields for Public User Name, Private User Name, Secret Key, Realm Network Domain Name, Home Network Domain Name, Signaling Port, IMSI, Secured Client Port, Secured Server Port, Client SPI, and Server SPI. Below this is a table titled 'Auto Incremented Parameter Preview (First 500)' showing a list of subscribers with their respective parameters.

Public User Name	Private User Name	Secret Key	Home Network Domain	Realm Network Domain	Signaling Port	IMSI
user0	user0	password0	spirent.com	spirent.com	5060	50502410121507
user1	user1	password1	spirent.com	spirent.com	5060	50502410121508
user2	user2	password2	spirent.com	spirent.com	5060	50502410121509
user3	user3	password3	spirent.com	spirent.com	5060	50502410121510
user4	user4	password4	spirent.com	spirent.com	5060	50502410121511
user5	user5	password5	spirent.com	spirent.com	5060	50502410121512
user6	user6	password6	spirent.com	spirent.com	5060	50502410121513
user7	user7	password7	spirent.com	spirent.com	5060	50502410121514
user8	user8	password8	spirent.com	spirent.com	5060	50502410121515

Figure 3. Landslide software screenshot: Phonebook window

The IMS Node emulation provides a standalone SIP proxy/P-CSCF emulator that can emulate SIP endpoints or the proxy function and drive the Rx interface to the PCRF.

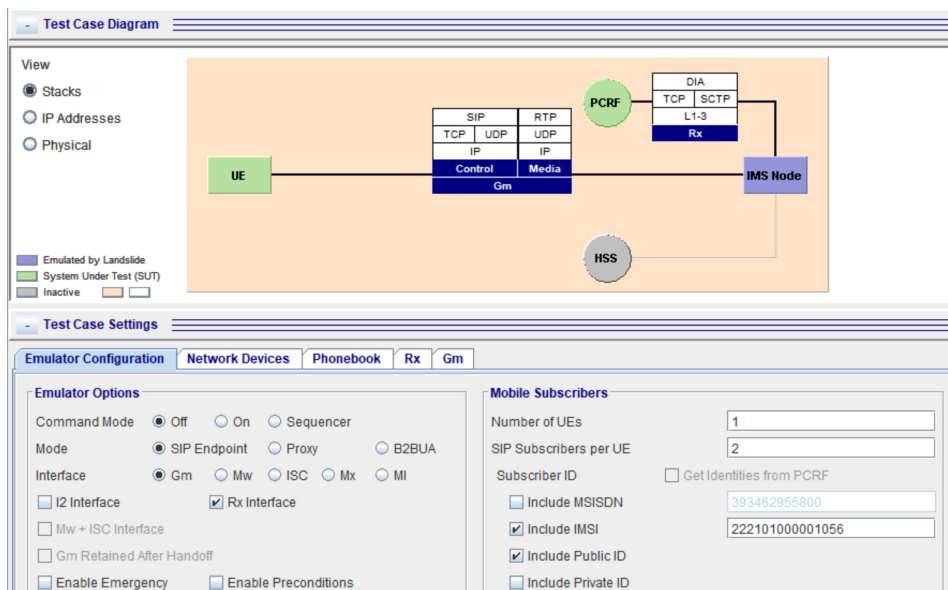


Figure 4. Landslide software screenshot: Emulator Configuration tab

The Landslide P-CSCF Test and Emulation application provides a P-CSCF emulator for SBC and Roaming testing.

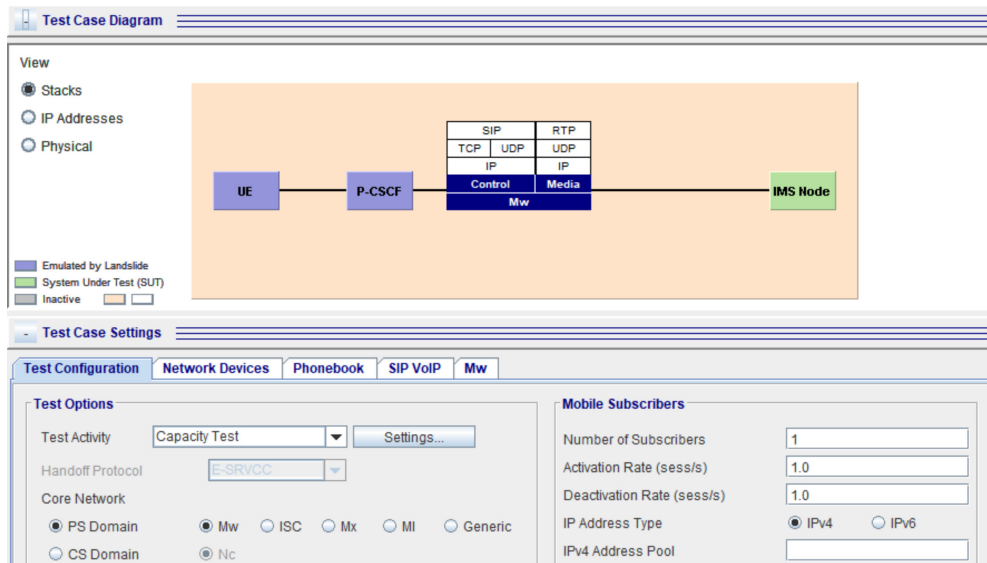


Figure 5. Landslide software screenshot: P-CSCF emulator

Landslide supports numerous VoLTE IMS interfaces (Cx, Gm, I2, ISC, MI, Mw, Mx, Rx, Sh, SIP-I/T, Ua/Ub, Ut, etc.). Furthermore, the Landslide Generic IMS Trunk Interface emulation allows the user to emulate any SIP interface between IMS sub-components by creating a new SIP call flow using existing Landslide SIP Supplementary actions and adding new headers and/or fields to the SIP messages as required.

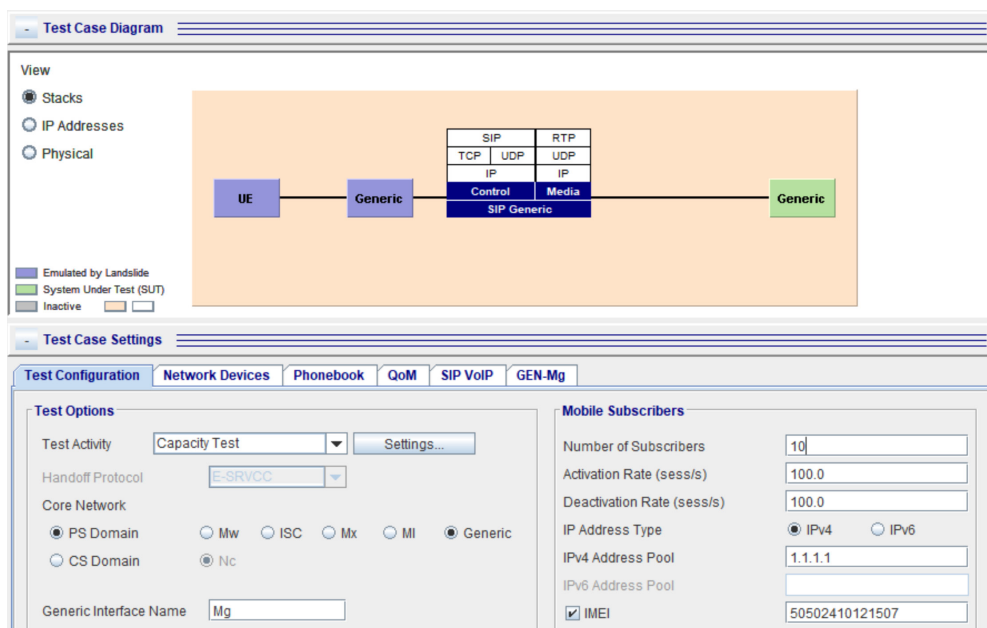


Figure 6. Landslide software screenshot: Generic IMS Trunk Interface emulation

Landslide's MCPTT testing capabilities and feature set enable testing of Private Calls (on network), Group Calls (on network), MCPTT Client authentication using OIDC (OpenID Connect), MCPTT Configuration Management, and MCPTT Floor control as defined by 3GPP MCS framework. Supported interfaces include: CSC-1, CSC-4, MCPTT-4, MCPTT-7, and Rx for MCPTT.

The combination of MCPTT with Enhanced Multimedia Broadcast Multicast Service (eMBMS) capitalizes on the Point to Multi-point broadcast provided by eMBMS which is well suited for group communication, a major part of Public Safety-related communication. The MB2 interface provides access to the MBMS bearer service from a GCS AS. Landslide supports the MB2-C and MB2-U interfaces between the GCS AS and BM-SC, as well as the GC1 interface between the UE and the GCS AS.

A Public Safety Answering Point (PSAP) is the call center responsible for answering calls to the emergency telephone number for police, firefighting, and ambulance services. The PSAP facility runs 24/7 and trained operators dispatch the required emergency services. The network will route emergency calls to the most applicable PSAP (usually the closest).

Landslide's PSAP Node emulator answers emergency SIP calls and validates routing decisions made by the network. The PSAP Node emulator supports the Mm and Mb interfaces between the PSAP node and the IBCF, and the Le interface between the PSAP node and the external Location-Based Services provisioning.

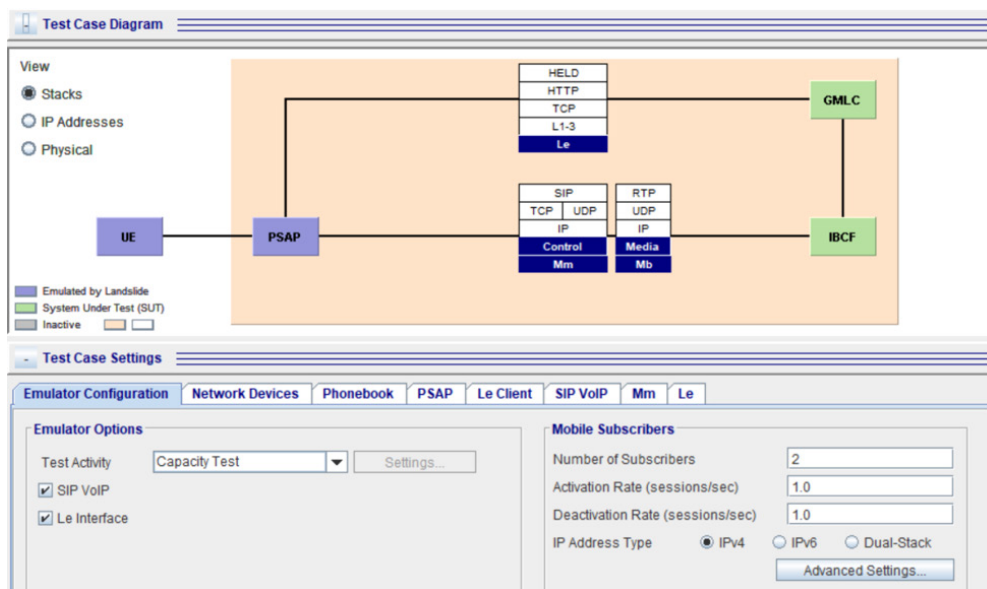


Figure 7. Landslide software screenshot: PSAP Node emulator

Referenced Standard (Partial List)

- GSMA IR.92 IMS Profile for Voice and SMS
- GSMA IR.94 IMS Profile for Conversational Video Service
- 3GPP TS 23.401 General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access
- 3GPP TS 23.402 Architecture enhancements for non-3GPP accesses
- 3GPP TS 24.229 Stage 3 IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP)
- 3GPP TS 29.212 Technical Specification Group Core Network and Terminals; Policy and Charging Control (PCC) over Gx/Sd reference point
- 3GPP TS 29.214 Policy and Charging Control over Rx reference point
- 3GPP TS 29.272 Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol
- 3GPP TS 29.274 Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunneling Protocol for Control plane (GTPv2-C)
- 3GPP TS 29.275 Proxy Mobile IPv6 (PMIPv6) based Mobility and Tunneling protocols
- 3GPP TS 29.281 General Packet Radio System (GPRS) Tunneling Protocol User Plane (GTPv1-U)
- 3GPP TS 36.413 (E-UTRAN); S1 Application Protocol (S1AP)
- IETF RFC-2617 HTTP Authentication: Basic and Digest Access Authentication
- IETF RFC-1889 RTP: A Transport Protocol for Real-Time Applications
- IETF RFC-2960/4960 Stream Control Transmission Protocol
- IETF RFC-2069 An Extension to HTTP: Digest Access Authentication
- IETF RFC-3261 SIP: Session Initiation Protocol
- IETF RFC-3264: An Offer/Answer Model with the Session Description Protocol (SDP)

Technical Specifications

- Test Activities
 - Capacity test
 - Session loading
 - Command mode/Command sequencer
 - Session loading with mobility (MME and SGW Nodal)
 - Intra-LTE mobility scenarios
 - Inter-technology/I-RAT mobility scenarios
- Landslide Manager
 - Up to 128 user accounts
 - Up to 48 simultaneous users
 - Up to 64 Landslide test servers
- Landslide Test Server
 - More than 4 million UEs with ultra extreme capacity license
 - Up to 11 bearers per subscriber
 - Up to 400,000 bi-directional RTP flows
 - Up to 32,000 activations/deactivations per second
 - Up to three simultaneous users per test server
 - Emulate up to 2,000 eNBs and 2,000 serving gateways
- Landslide Test Server Ethernet test ports:
 - 1 GbE
 - 10 GbE
 - 25 GbE
 - 40 GbE
 - 100 GbE
- Supported Platforms:
 - Landslide E10
 - Landslide C50
 - Landslide Virtual

Table 1. Ordering Information

Description	Part number
Landslide VoLTE/IMS Node Emulation Feature: Adds VoLTE SIP client UE emulation capabilities to LTE MME and LTE Gateway Test Applications and standalone IMS P-CSCF/SIP Proxy node emulation. Provides the means of testing VoLTE call support capabilities in the EPC	L-FT-055
Landslide VoLTE/IMS Command Mode: Adds Tcl and GUI accessible on-demand commands and command sequencer for VoLTE call modeling	L-FT-064
Landslide VoLTE Supplemental Services: Adds 3GPP TS 22.173 supplementary services to VoLTE/IMS emulation	L-FT-071
Landslide P-CSCF Test and Emulation: Adds P-CSCF Test and Emulation to an existing Landslide system	L-APP-047
Landslide IMS TAS Testing: Adds IMS Telephony Application Server Testing to an existing Landslide system	L-FT-097
Landslide SIP-I/T Test and Emulation: Adds SIP-T/SIP-I interface testing to an existing Landslide system	L-APP-040
Landslide IMS Sh and Cx Interfaces: Adds the IMS Sh and Cx interfaces and related functions to various test applications	L-FT-079
Landslide VOIP TLS and SRTP: Adds TLS & SRTP for secure SIP VoIP signaling and RTP media	L-FT-084
Landslide Generic IMS Trunk Emulation: Adds the Generic IMS Trunk emulation to the IMS Nodal testcase	L-FT-118
Landslide Ut Interface Emulation: Emulates UE using XCAP to configure and manipulate supplementary services over the Ut interface	L-FT-102
Landslide MCPTT Support: Adds MCPTT call flows for emulated UEs in LTE and 5G test cases; enables MCPTT AS emulation in IMS node test case	L-FT-107
Landslide PSAP Node Emulator: Adds PSAP Node emulator to an existing Landslide system, terminates incoming emergency calls	L-APP-703
Landslide NG911 Add-on to PSAP Emulator: Upgrades PSAP Node emulator to be compatible with 5G, enables optional Le interface GMLC	L-FT-703
Landslide WebRTC Call Flows: Adds WebRTC call flow support for emulated UEs	L-FT-108
Landslide POLQA Voice Quality Analysis: Adds 12 effective channels of POLQA Voice Quality measurements, including MOS scores	L-FT-077
Landslide PEVQ Video Quality Analysis: Allows PEVQ video quality analysis on up to five channels	L-FT-092
Landslide VoIP/VoLTE EVS Codec: Adds EVS Codec to Landslide VoIP/VoLTE	L-FT-089
Landslide VoIP G.729 Codec: Adds G.729 codec to Landslide VoLTE/VoIP	L-FT-090

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