MAPS™ LTE X2 Interface Emulator

(LTE X2 Application Protocol Interface Emulation)

MAPS™ X2AP in LTE network
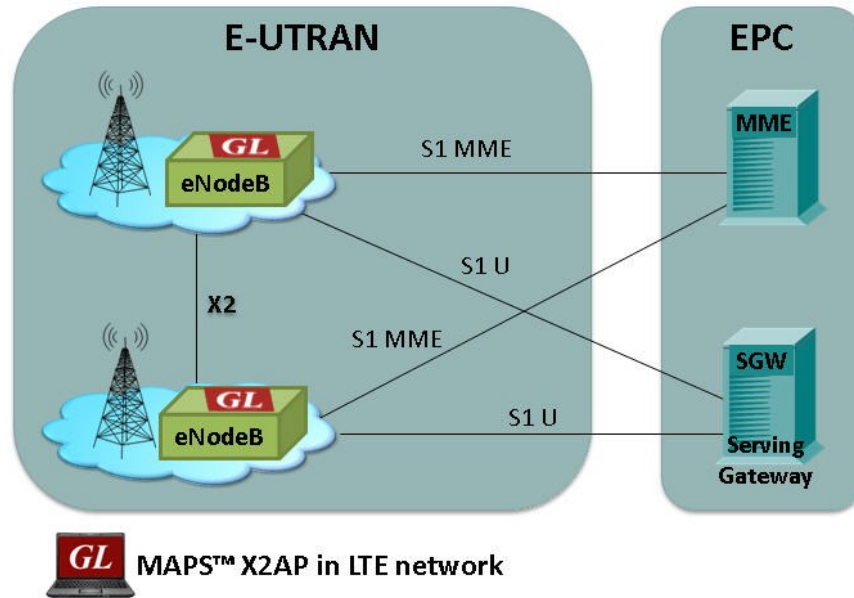
Overview

GL's MAPS™ X2 Application Protocol (X2-AP) is used to co-ordinate handovers and perform load management between eNodeB (Evolved Node B) network elements - Source eNB and Target eNB.

The MAPS™ X2-AP test tool is designed with specific test cases, as per LTE 3GPP mobile standards. MAPS™ X2, a control plane protocol handles E-UTRAN procedures.

GL's also offers MAPS™ LTE X2 conformance test suite(PKS154) designed with 50+ test cases, as per 3GPP TS 36.423 specification. It includes inbuilt conformance scripts (*.gls) for multiple eNodeB's in X2 interface.

MAPS™ LTE X2-AP interface emulator supports powerful utilities like Message Editor, Script Editor, and Profile Editor which allow new scenarios to be created or existing scenarios to be modified using messages and parameters.

For more information, please visit MAPS™ LTE X2 webpage.

Main Features

- Setup a virtual real-time network simulating 4G-LTE network elements using 'MAPS™ 4G Wireless Lab Suite'
- Simulate two eNodeB elements in LTE X2 interface.
- Supports LTE Control plane.
- Generates hundreds of UE Signaling (Load Testing).
- Generates and process X2-AP (valid and invalid) messages.
- Supports Mobility (Handover) Management, Load Management, Re-setting X2, Setting up the X2, and eNB Configuration Update procedures.
- Supports LTE X2 interface conformance test suite with 50+ test cases
- Insertion of impairments to create invalid messages.
- Supports customization of call flow and message templates using Script and Message Editor.
- Ready-to-use scripts for quick testing.
- Supports scripted call generation and automated call reception.
- Script based & protocol independent software architecture.

Testbed Configuration

The configuration window allows users to setup the required test environment with SCTP configuration in X2 interface.

SCTP Configuration parameters consists of source / destination Device under Test (DUT) IP address, port, including stream id, payload id to configure MAPS™ to simulate eNodeB [Source and Target] entities in X2 interface. MAPS™ can then generate and receive X2-AP messages to/from valid IP Address in the LTE-network.

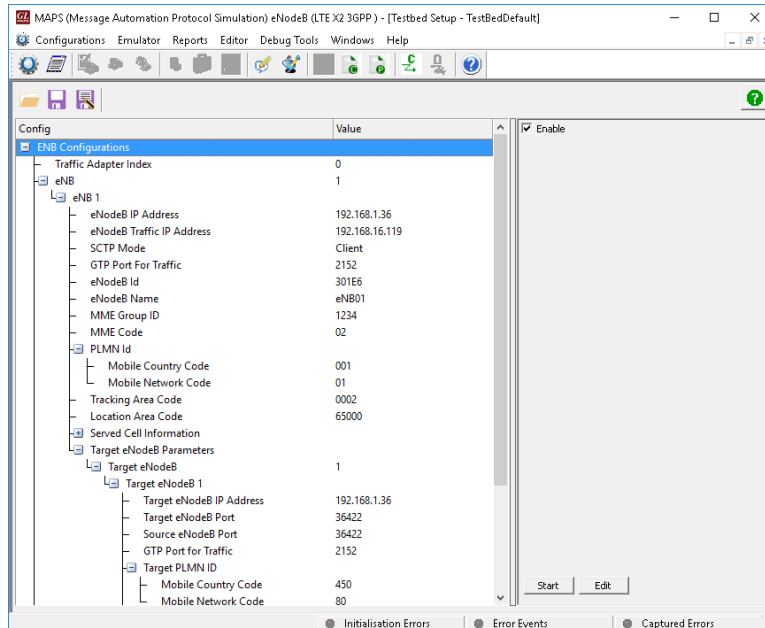Default profile used to configure MAPS™ LTE X2 with eNodeB parameters.

Figure: Testbed Setup

Pre-processing Tools

Message Editor

With message editor, users can build a template for each protocol message type. The value for each field may be changed in the message template prior to testing. The protocol fields comprises of mandatory fixed parameters, mandatory variable parameters, & optional variable parameters.
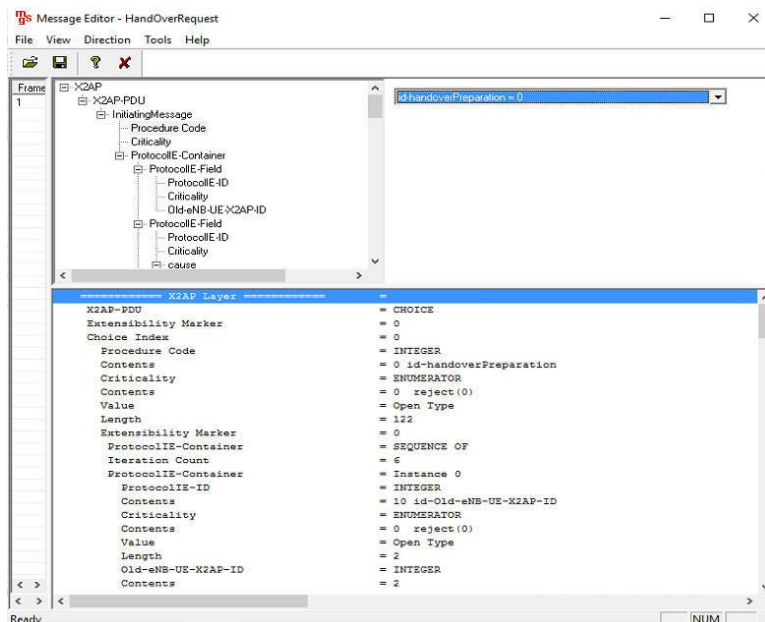

Figure: Message Editor

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Pre-processing Tools *(Contd.)*

Profile Editor

This feature allows loading profile to edit the values of the variables using GUI, replacing the original value of the variables in the message template. An XML file defines a set of multiple profiles with varying parameter values that allow users to configure call instances in call generation and to receive calls.

Supports Mobile Traffic parameter settings allowing simulation of offline HTTP Traffic using Mobile IP Core TCP Client Server connections. Configurations include TCP Server IP, TCP Port for HTTP and HTTP files names.
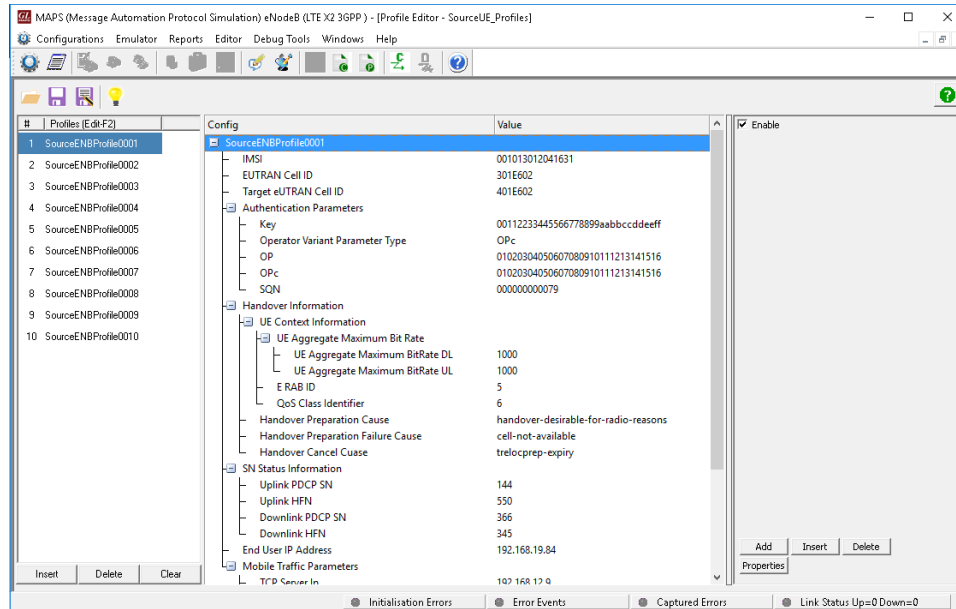

Figure: Profile Editor

Script Editor

The script editor allows the user to create / edit scripts and access protocol fields as variables for the message template parameters. The script uses pre-defined message templates to perform send and receive actions.
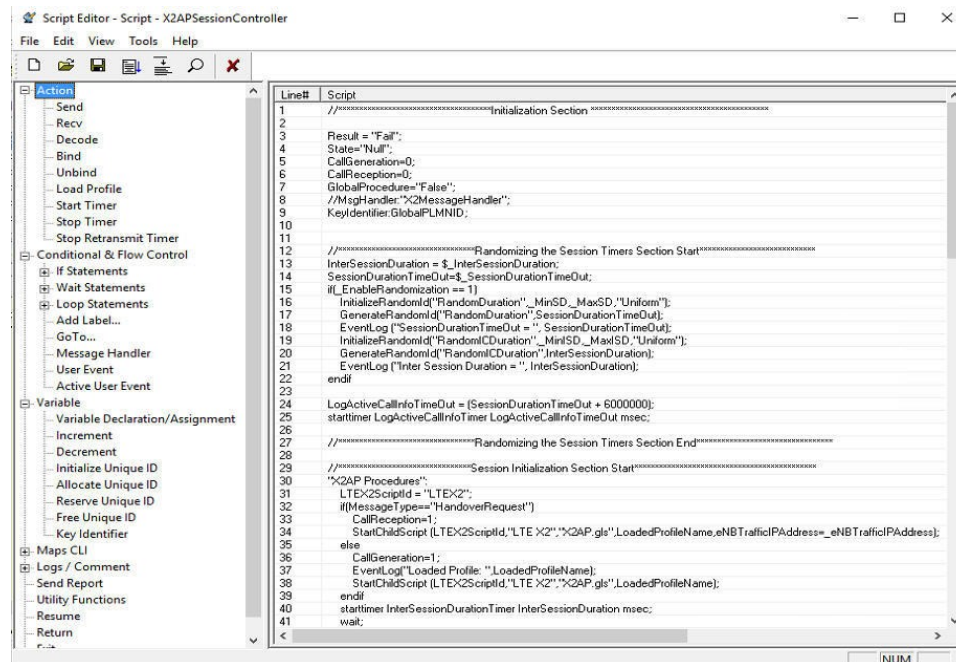

Figure: Script Editor

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Typical LTE X2 Procedure

During this procedure, Source eNodeB sends HANDOVER REQUEST message to the Target eNodeB, where the necessary resources are reserved, and HANDOVER REQUEST ACKNOWLEDGE message is sent back as response.
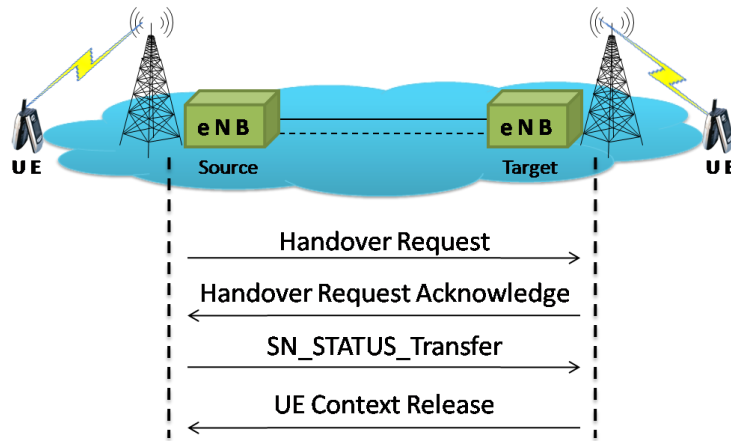

Figure: Handover Request

Supported UE and Non-UE Procedures

Function	Elementary Procedure (s)
Mobility Management	a) Handover Preparation b) SN Status Transfer c) UE Context Release d) Handover Cancel
Load Management	a) Load Indication b) Resource Status Reporting Initiation c) Resource Status Reporting
Reporting of General Error Situations	Error Indication
Resetting the X2	Reset
Setting up the X2	X2 Setup
eNB Configuration Update	eNB Configuration Update

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Call Generation and Call Reception

In call generation, MAPS™ is configured for the outgoing calls, and in call receive mode, it is configured to respond to incoming calls. Tests can be configured to run once, multiple iterations or continuously. Scripts can be set to run sequentially according to a call scenario or randomly.

The test scripts may be started manually or they can be automatically triggered by incoming messages. In receive mode, MAPS™ can be automated to respond to messages using script configuration dialog, where a receive script is preset against particular message expected to arrive.
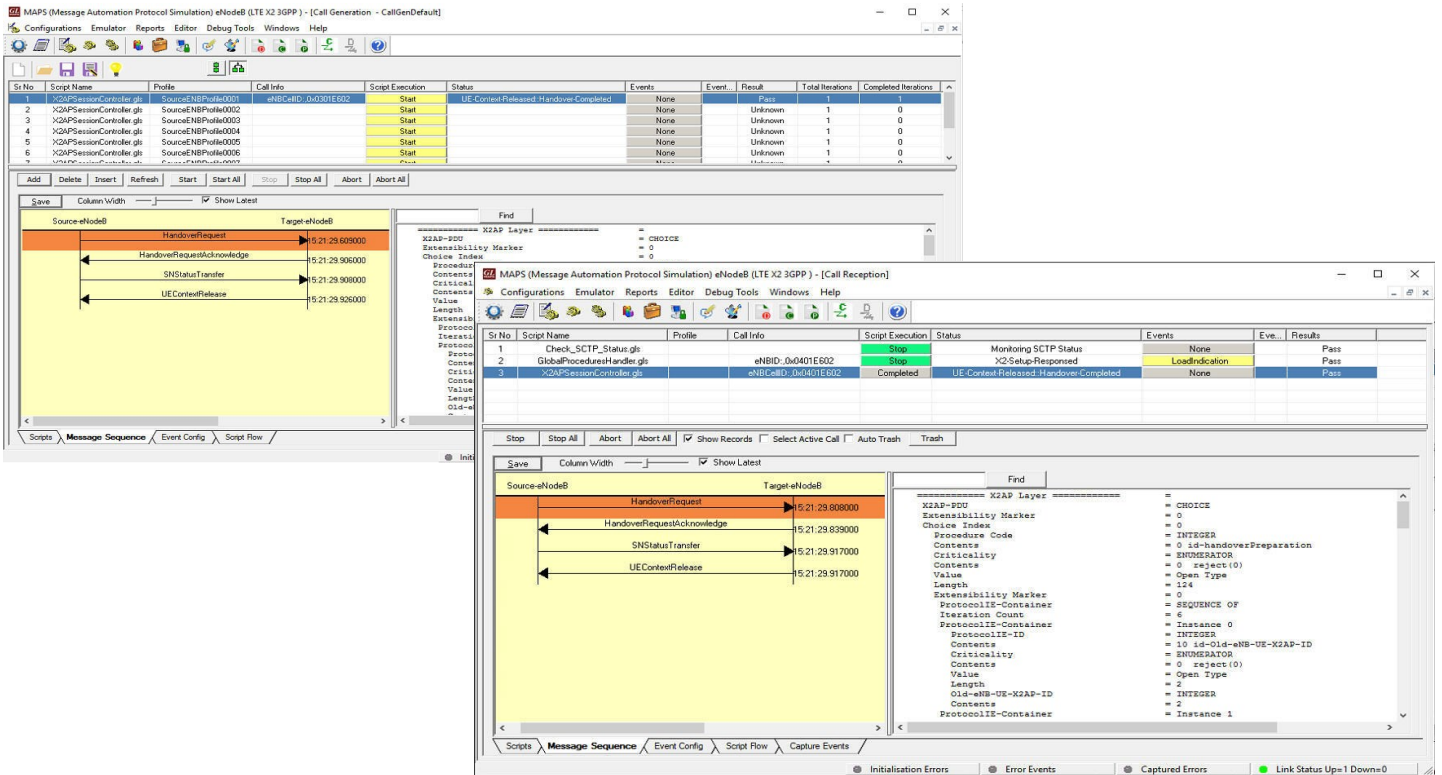

Figure: Call Generation & Reception

Incoming Call Handler Configuration

Incoming Call Handlers configuration option is used to preset the script required to handle all possible signaling and call processing messages for responding to the call requests during call reception.
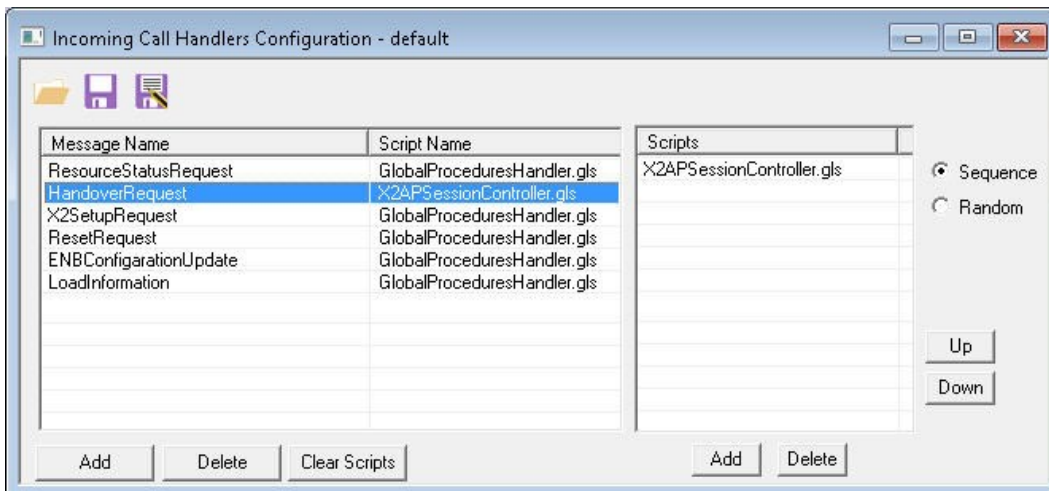

Figure: Incoming Call Handler

LTE X2 Conformance Suite

MAPS™ LTE X2 emulator can be configured as **Source eNodeB** connected to DUT (Target eNodeB). The conformance script can simulate various procedures conforming success/failure test cases and automating the entire Target eNodeB (DUT) testing. This conformance test suite requires additional license (PKS154) to perform testing.

Following are the supported test cases -

- Handover Test Case
  - Handover success
  - Handover failure (invalid GTP-TEID, duplicated E-RAB ID)
- Load Indication (send load to and receive load from target eNodeB)
- Error Indication (send error to and receive error from target eNodeB)
- X2 Setup
  - X2 Setup Success
  - Setup failure and resend setup
- Configuration update
  - Send/receive configuration update
  - Configure update success after re-send
  - Resend Configuration update after failure
  - Response Configuration update failure
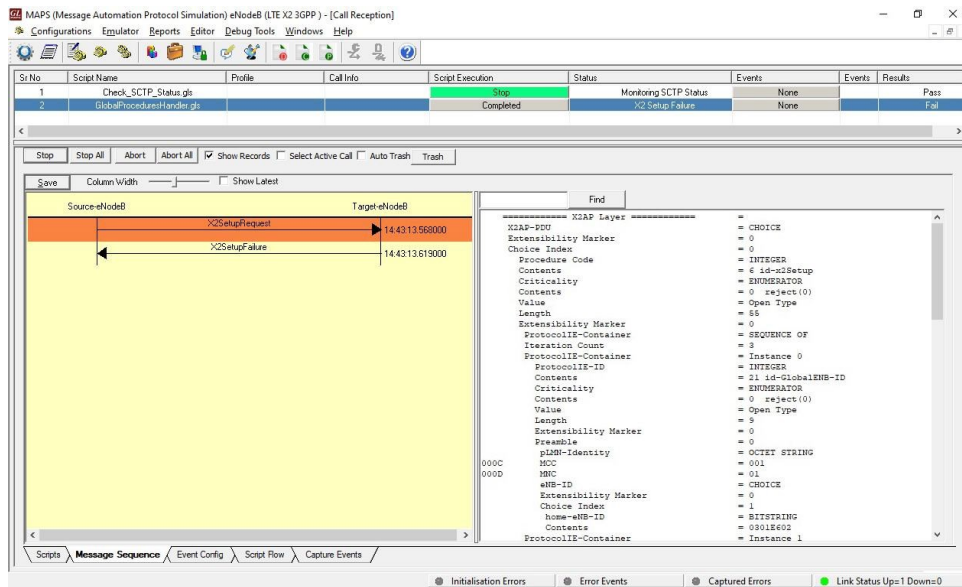
Test cases include general Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP) messaging and call flow scenarios over LTE network. Logging and pass/fail results are also reported. Test cases verify conformance of various actions as listed above.

Supported Protocols and Specifications
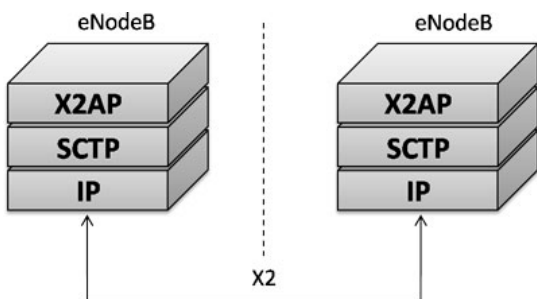
Supported Protocols	Specification Used
X2 Application Protocol (X2-AP)	3GPP TS 36423-900
SCTP	RFC 4960
Non-Access-Stratum (NAS)	3GPP TS 24.301 V9.0.0

Buyer's Guide

Item No	Product Description
PKS141	MAPS™ LTE X2-AP Interface Emulator
ETH100	Mobile Traffic - PacketCheck™
ETH101	MobileTrafficCore - GTP
ETH102	MobileTrafficCore - Gateway
PKS154	LTE X2 Conformance test Suite

Item No	Related Software
PKS140	MAPS™ - LTE S1 Interface
PKS142	MAPS™ - LTE eGTP (S3, S4, S5, S8, S10, S11 and S16) Interfaces
PKS164	MAPS™ - UMTS – Iu-PS Interface Emulation
PKS160	MAPS™ - UMTS – Iu-CS and Iuh Interface Emulation
XX165	T1 or E1 UMTS Protocol Analyzer
PKS130	MAPS™ - SIGTRAN (SS7 over IP)
PKS135	MAPS™ - ISDN SIGTRAN (ISDN over IP)

For more information, please visit Signaling and Traffic Simulator webpage.