MAPS™ LTE X2 Interface Emulator

LTE X2 Application Protocol Interface Emulation

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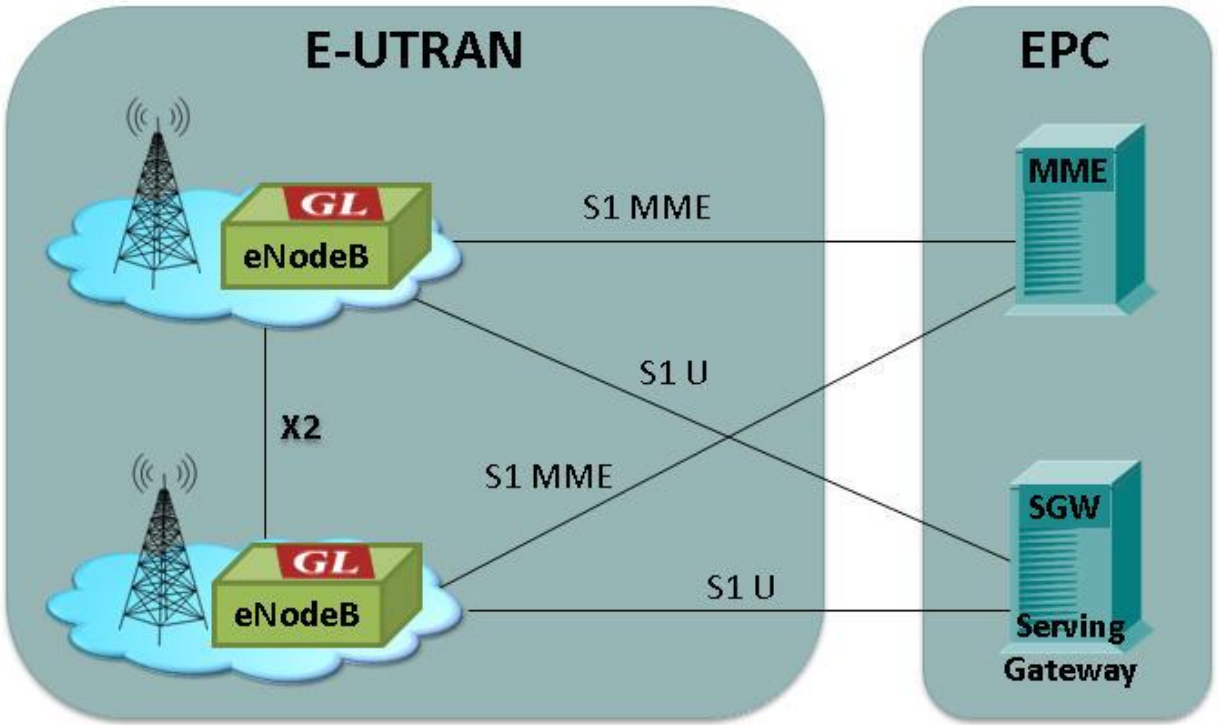
MAPS™ LTE X2-AP Architecture



GL MAPS™ X2AP in LTE network

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-AP interface
- Supports LTE Control plane
- Generates hundreds of UE signaling (Load Testing)
- Generates and process X2-AP (valid and invalid) messages
- Supports Mobility Management, Load Management, Reporting of General Error Situations, Re-setting X2, Setting up the X2, and eNodeB Configuration Update procedures
- Insertion of impairments to create invalid messages
- Supports LTE Conformance designed with 50+ test cases as per 3GPP TS 36.243 Specification

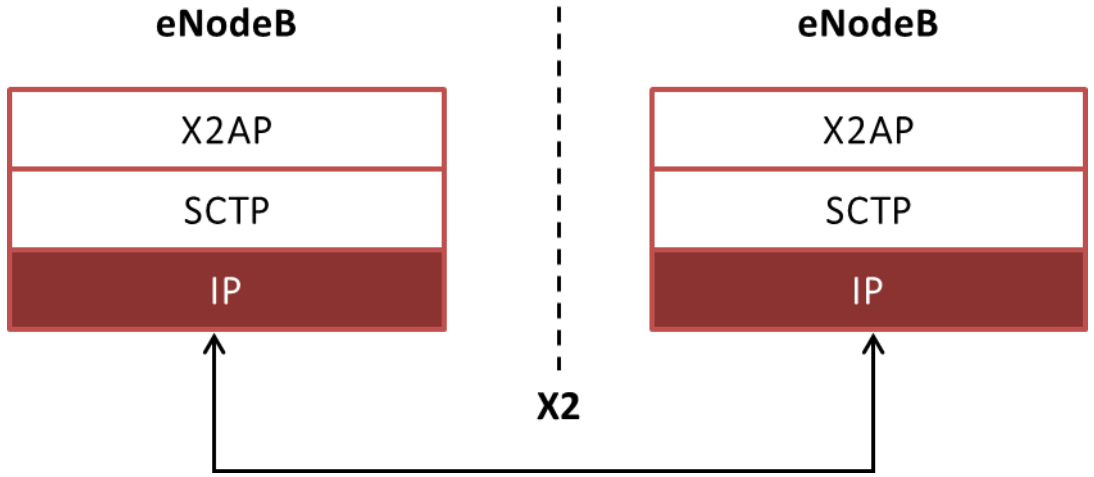
Applications

- Complete analysis and simulation capability on par with any protocol tester in the market
- Provides fault insertion, and erroneous call flows testing capability
- Functional testing, Regression testing and Conformance testing of network elements
- Ready scripts make testing procedure simpler, less time consuming and hence time to market products
- Simulate Thousands of Smartphones (UEs) powering up and down
- Authenticate and confirm security procedures
- QoS requests for greater or lesser bandwidth
- Temporary addressing management for mobility and security

Functions

- **Mobility Management** - This enables the serving eNodeB to move the specified UE responsibility to a target eNodeB
- **Load Management** - procedure to report resource status, overload indications and current traffic loading between the eNodeBs
- **Reporting of General Error Situations** - procedure to report general error situations
- **Re-setting /Setting the X2** – procedure to setup or reset X2 interface by exchanging the necessary information between the eNodeBs
- **eNodeB Configuration Update** - procedure to update the application level data required for the eNodeBs to interoperate in the network

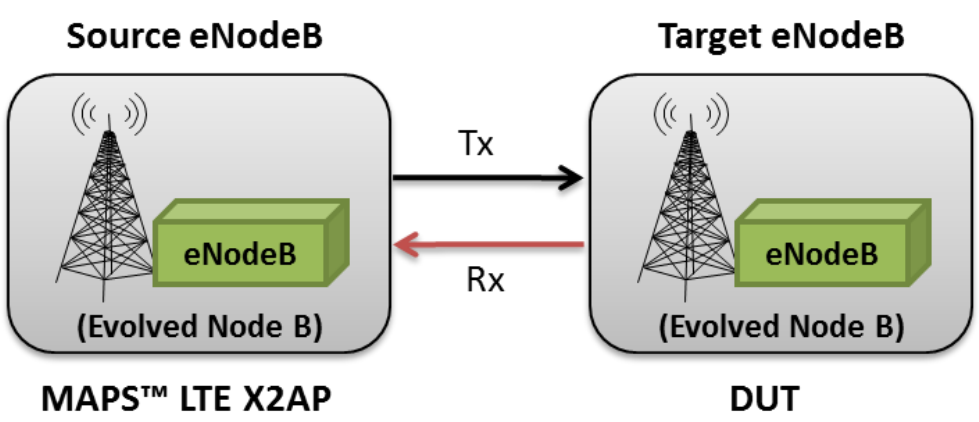
Protocol Standards



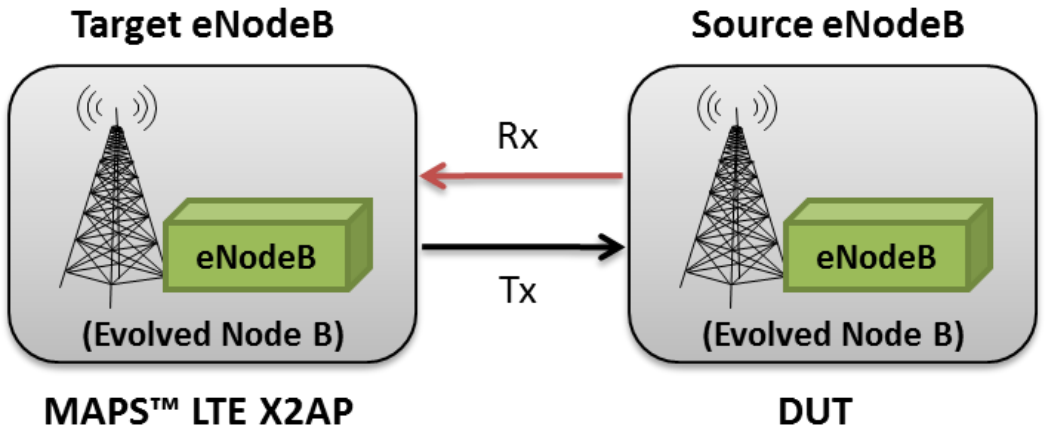
Supported Protocols	Standard / Specification Used
X2 Application Protocol (X2-AP)	3GPP TS 36423-900
SCTP	RFC 4960
Non-Access-Stratum (NAS)	3GPP TS 24.301 V9.0.0 (2009-09)

LTE X2AP Call Scenario

MAPS™ LTE X2AP Configured as Source eNB



MAPS™ LTE X2AP Configured as Target eNB



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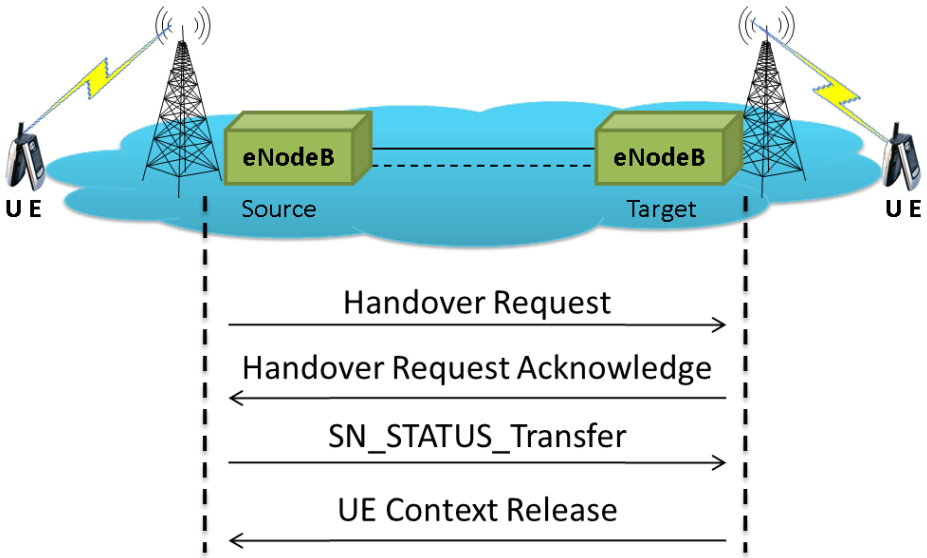
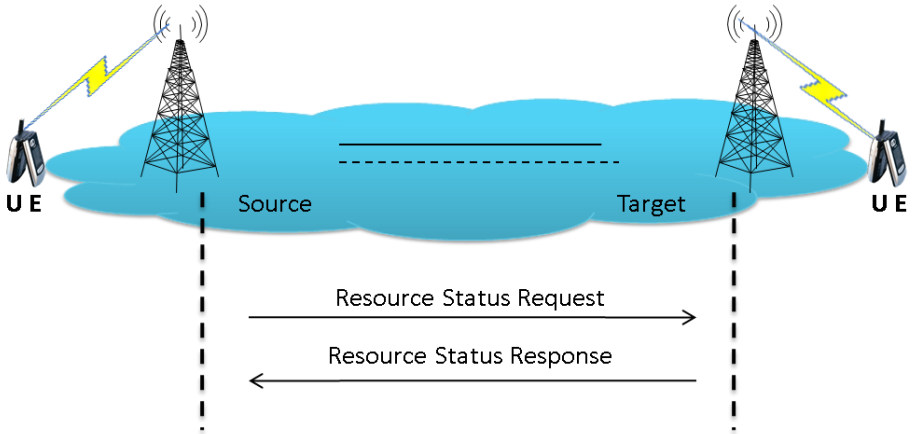
X2AP Interface Procedures



Mobility Management

- Handover Preparation
- SN Status Transfer
- UE Context Release
- Handover Cancel

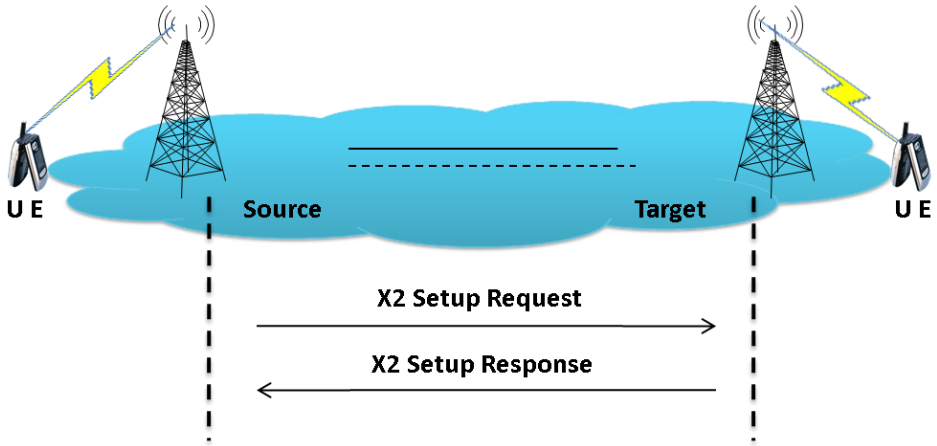


Load Management

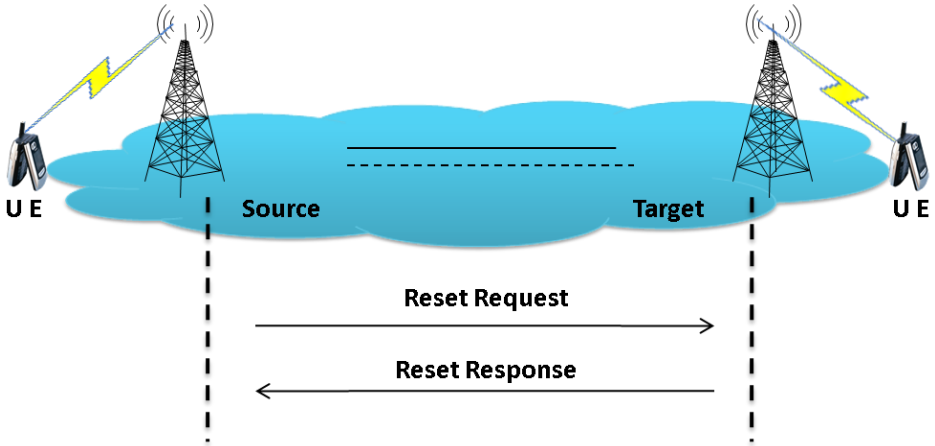
- Load Indication
- Resource Status Reporting Initiation
- Resource Status Reporting

X2AP Interface Procedures

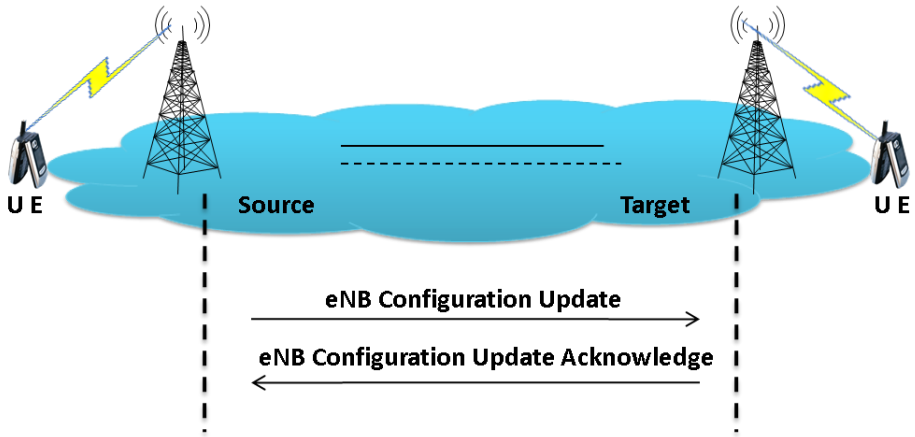
Resetting the X2



Setting up the X2



eNB Configuration Update



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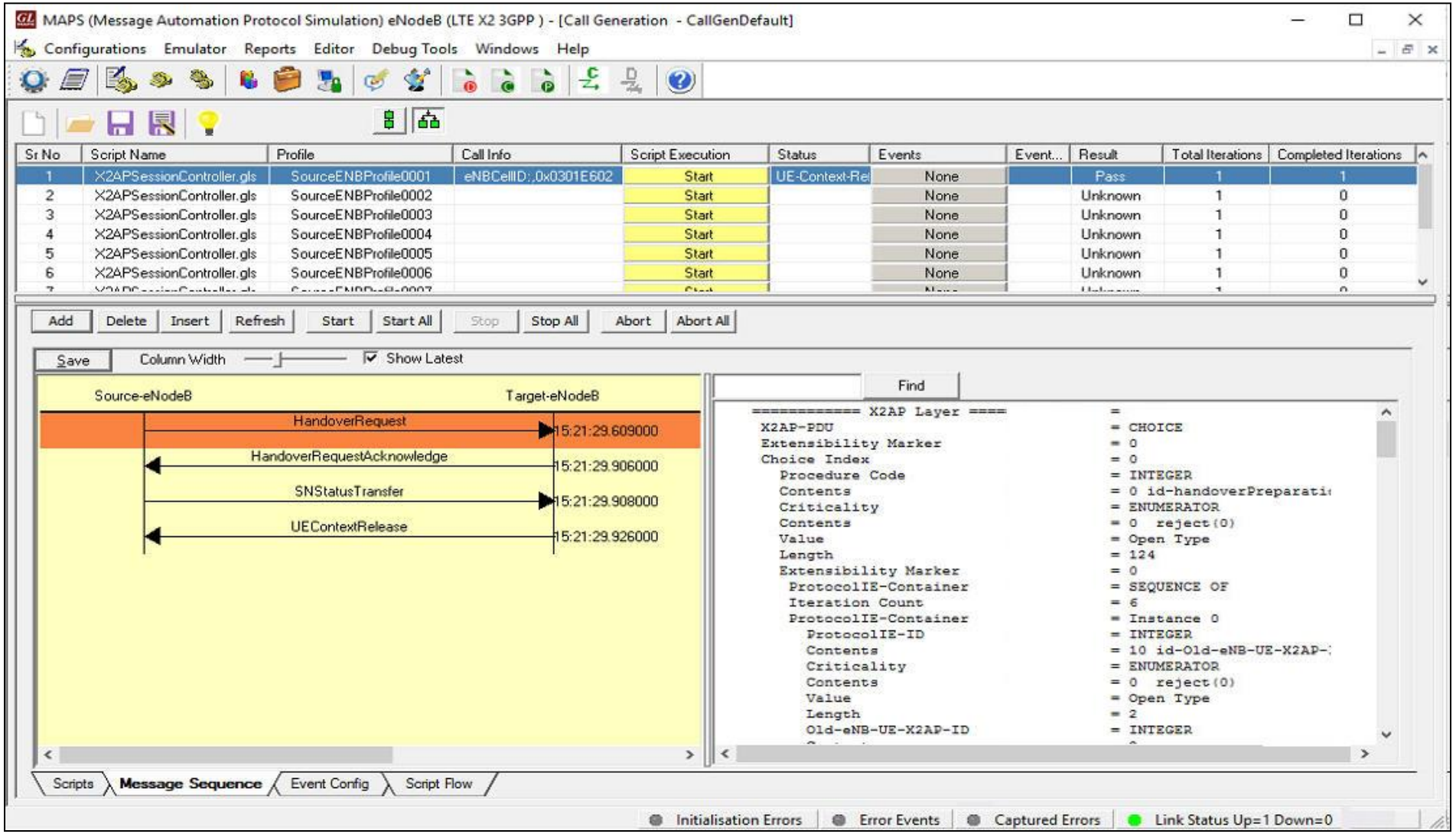
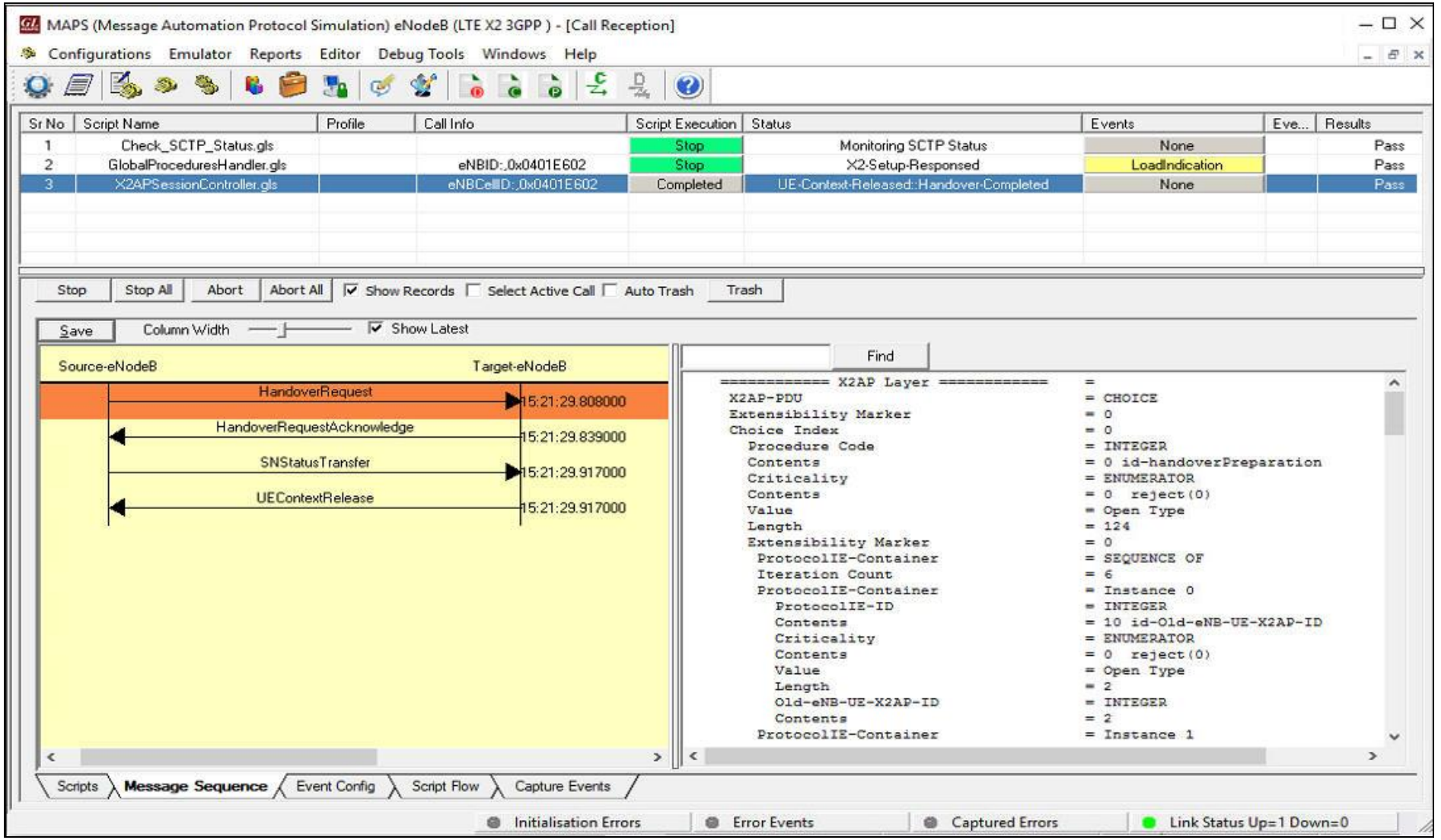
Call Generation

Call Generation (Source eNodeB)



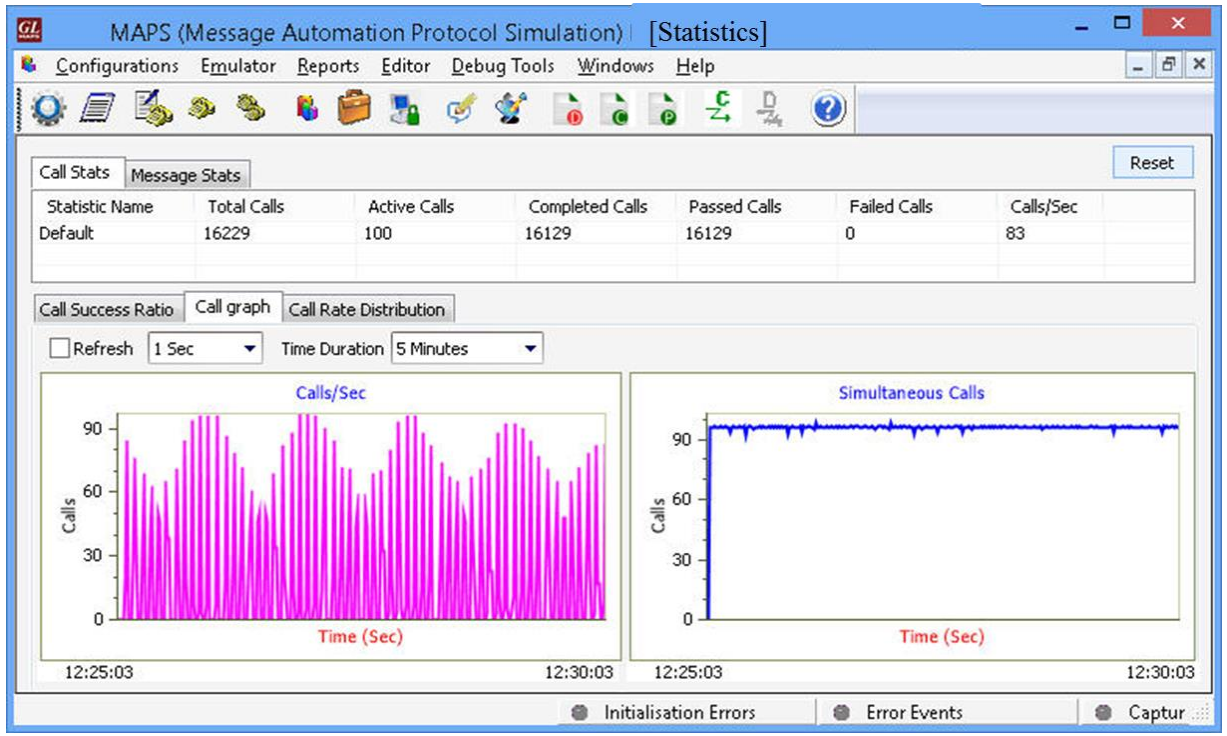
Call Generation and Reception

Call Reception (Target eNodeB)

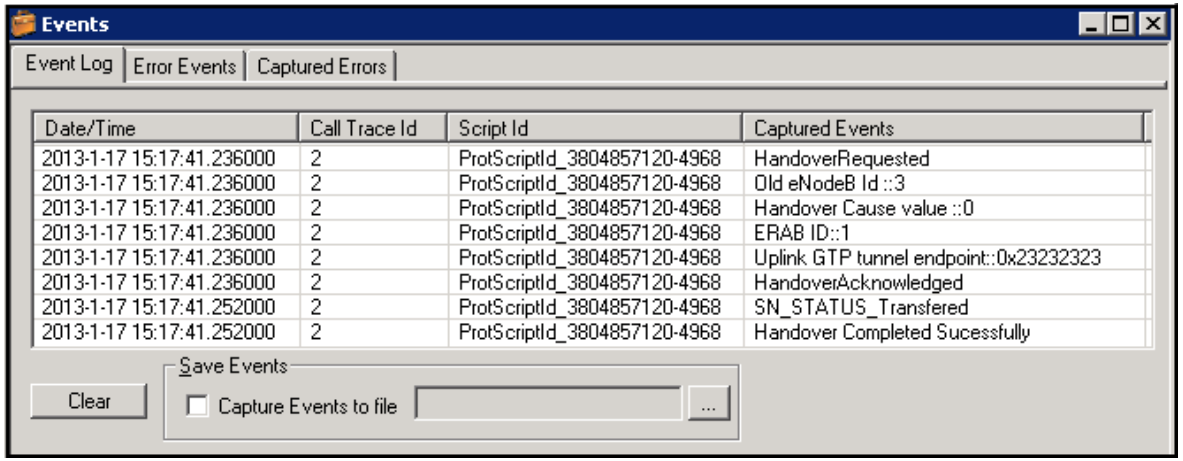


Call Statistics and Event Log

Call Statistics



Event Log



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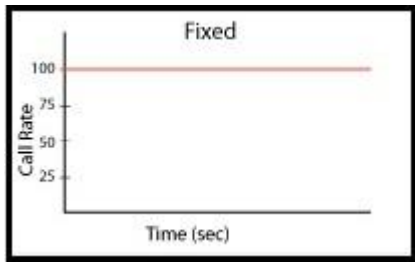
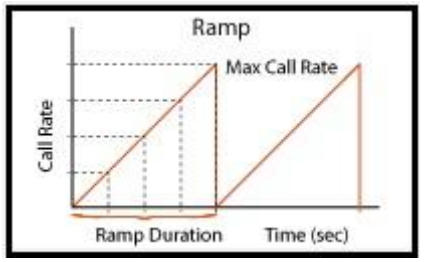
Load Generation

- Stability/Stress and Performance testing using Load Generation
- Different types of Load patterns to distribute load
- User can load multiple patterns for selected script
- User configurable Test Duration, CPS, Maximum and Minimum Call Rate etc

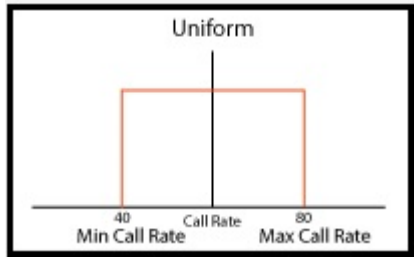
Fixed



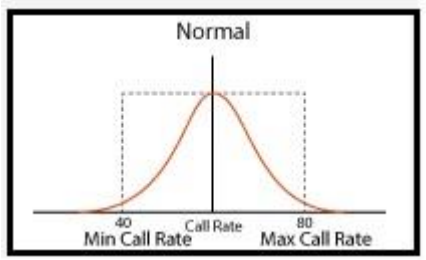
Ramp



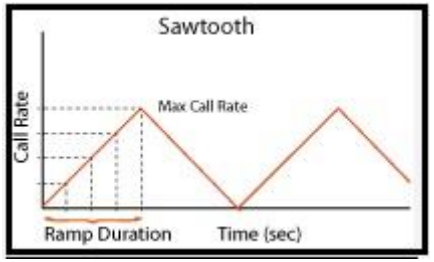
Uniform



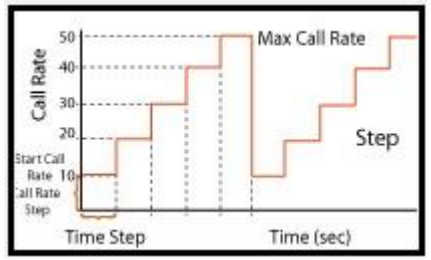
Normal

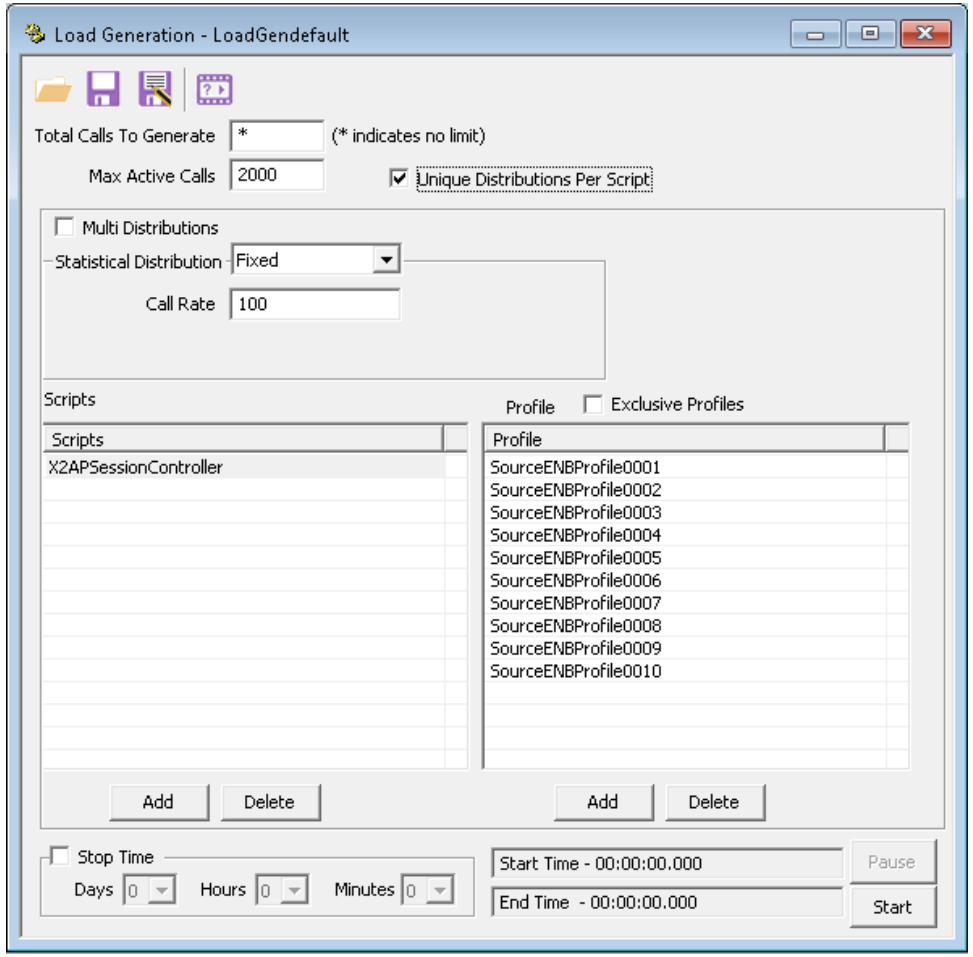


Saw-tooth

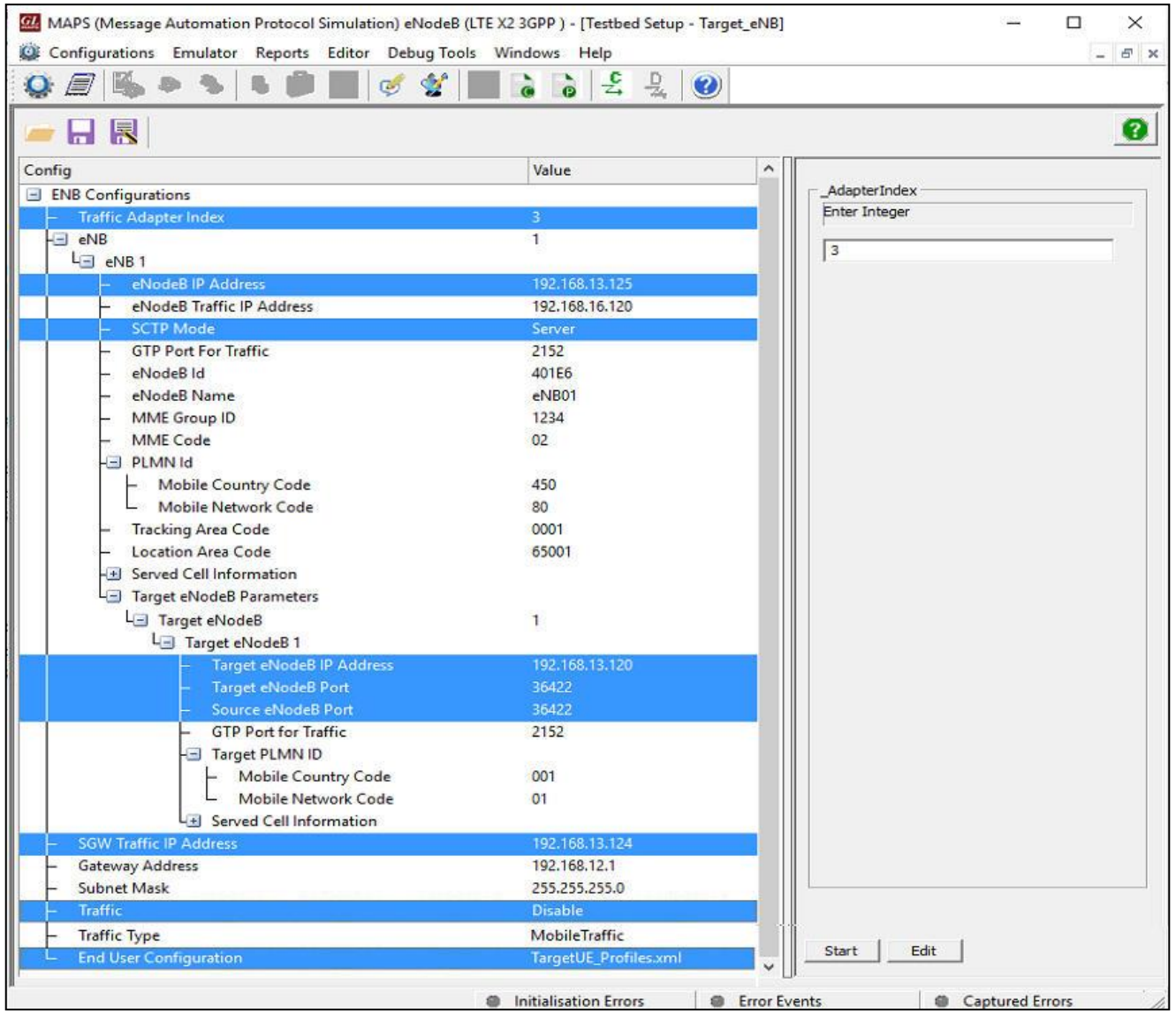


Step

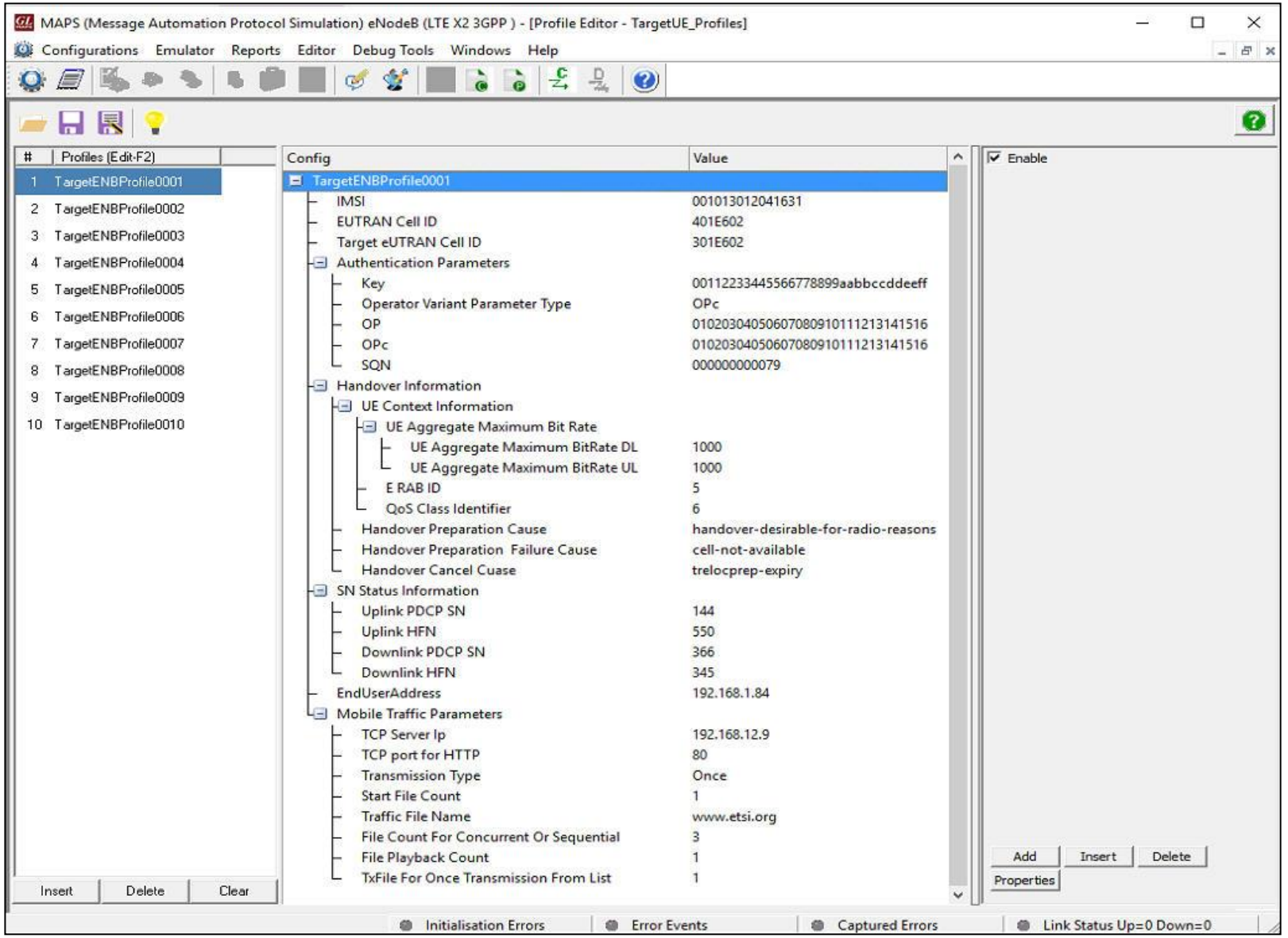




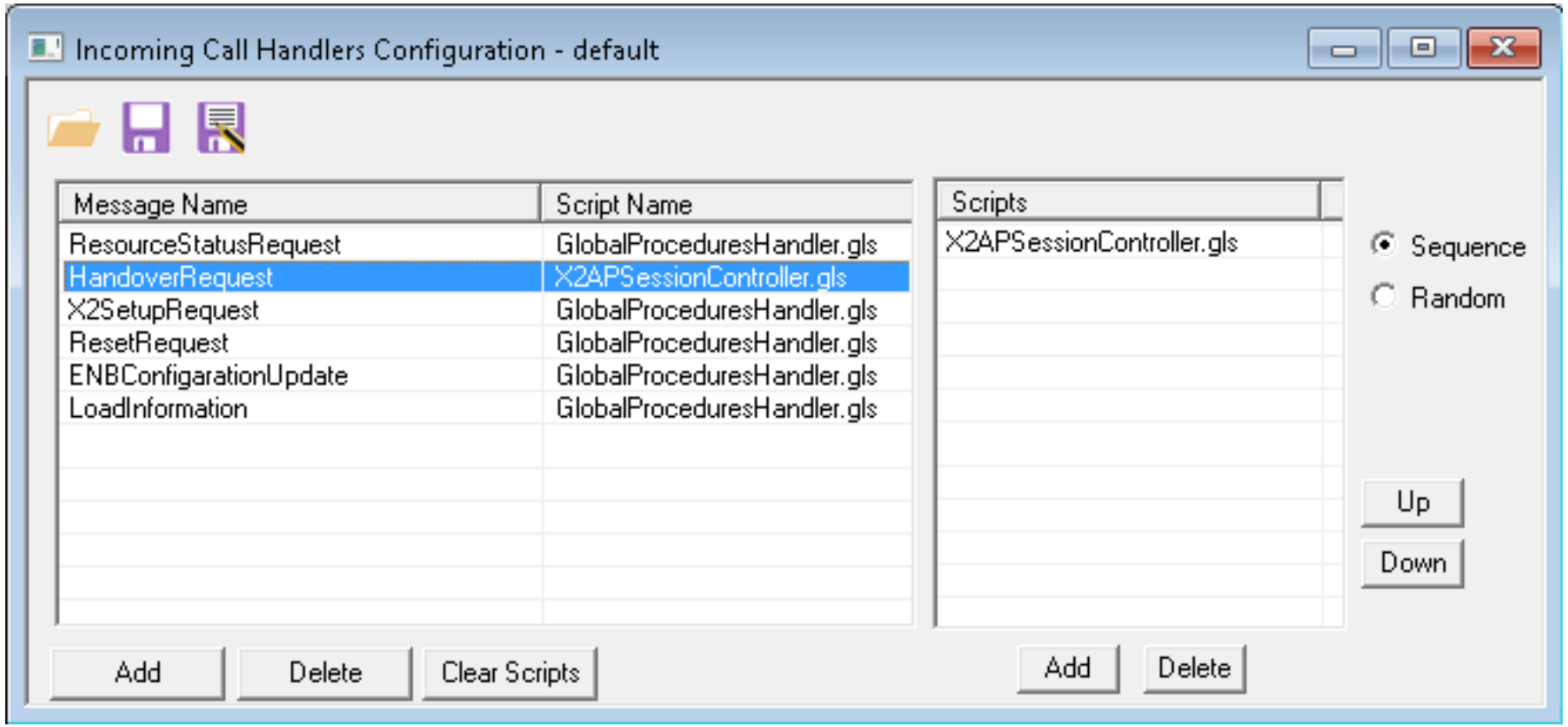
Testbed Configuration



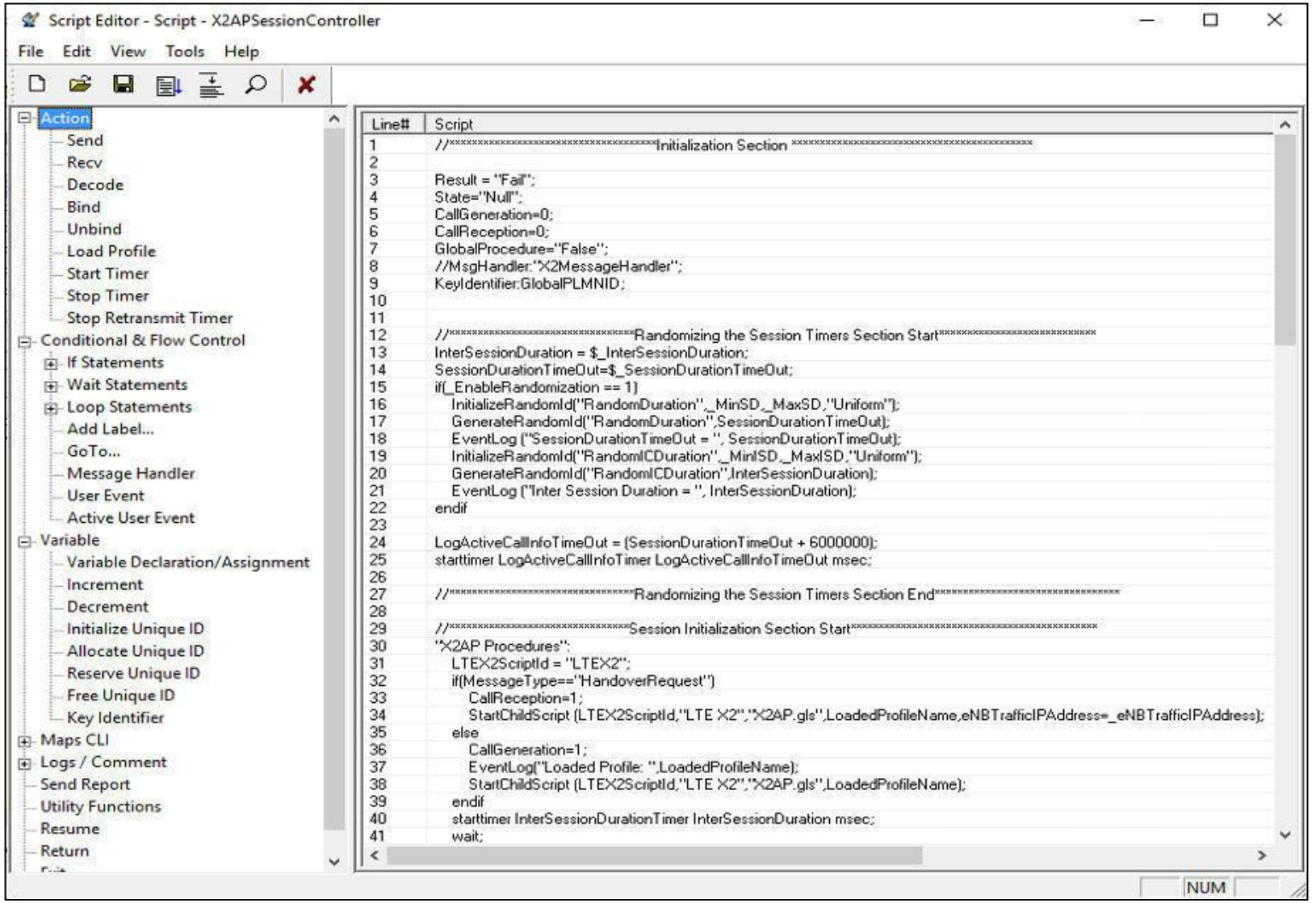
Profile Configuration



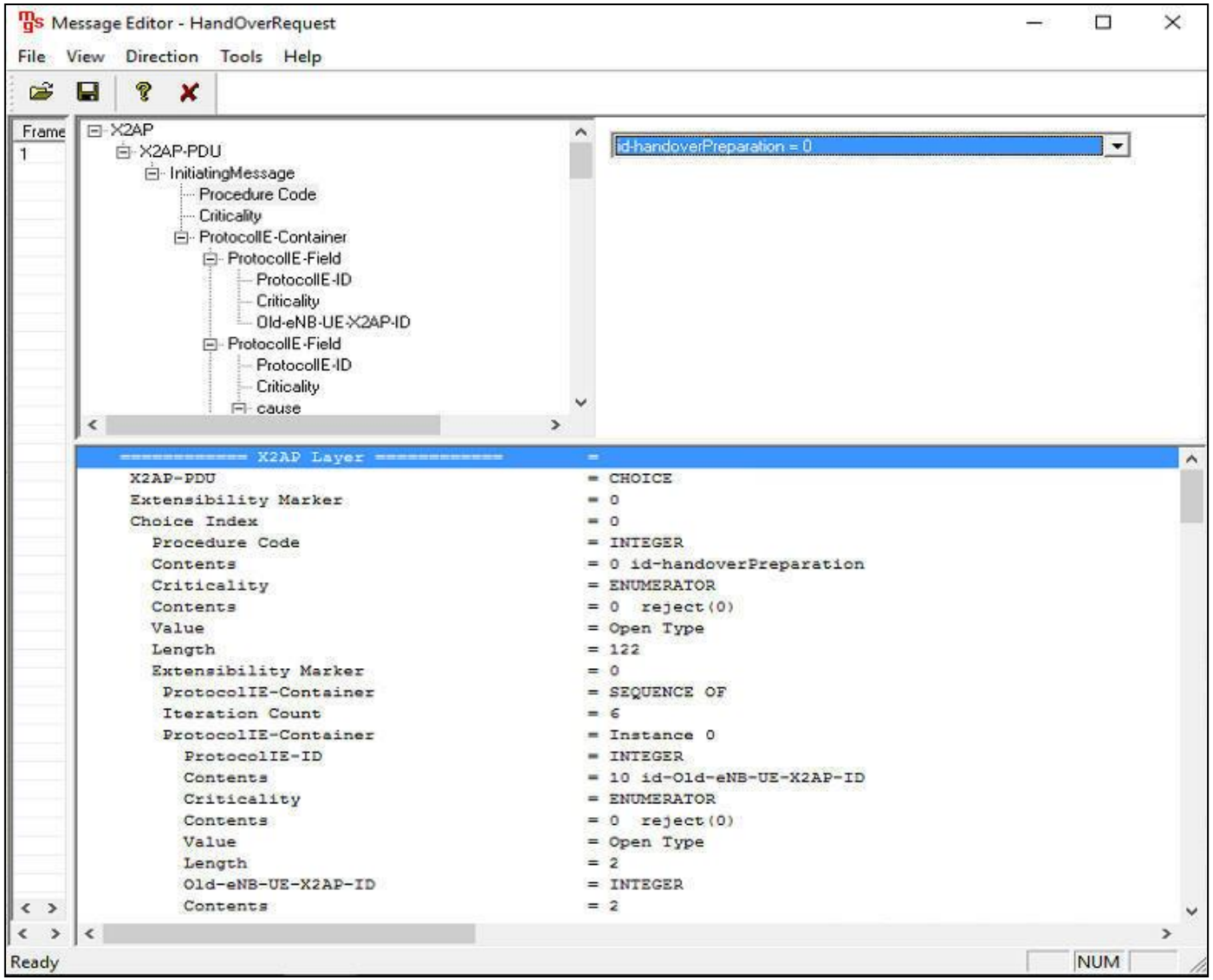
Incoming Call Handler Configuration



Customizations - Call Flow (Scripts)



Customizations - Protocol Messages



Customizations - Statistics and Reports

MOS, R-Factor

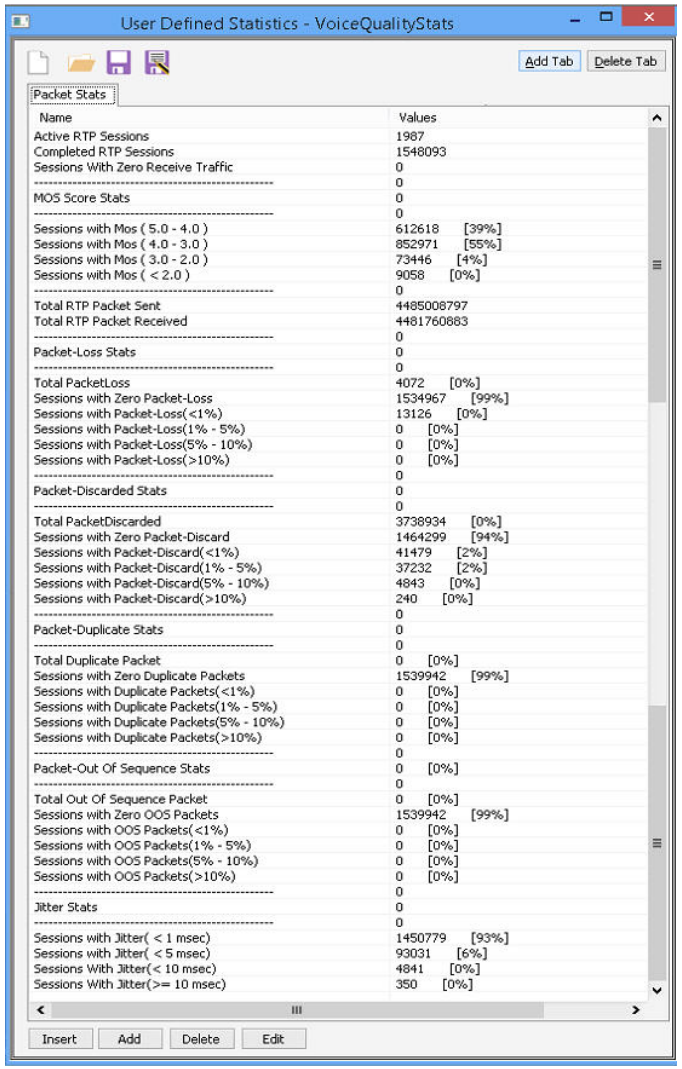
Packet Loss

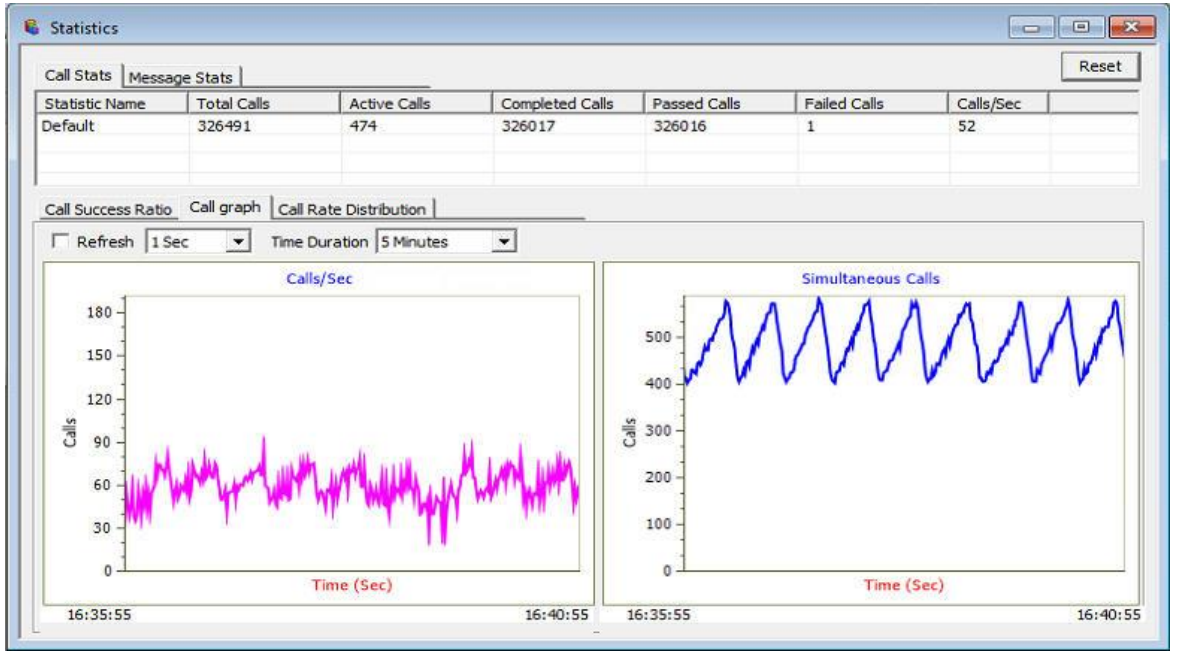
Packets Discarded

Duplicate Packets

Out-Of-Sequence Packets

Jitter Statistics





Call Stats provide a running tabular log of system level stats, tracked stats include: Total Calls, Active Calls, Completed Calls, Passed Calls, Failed Calls, Instantaneous Calls/Sec

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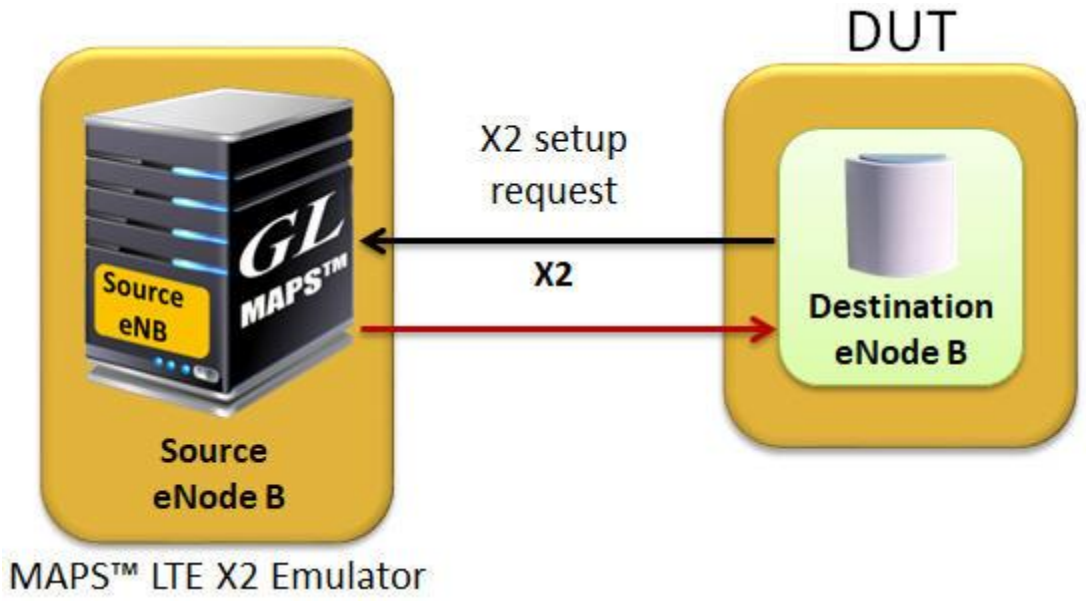
LTE-X2 Conformance Suite

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.

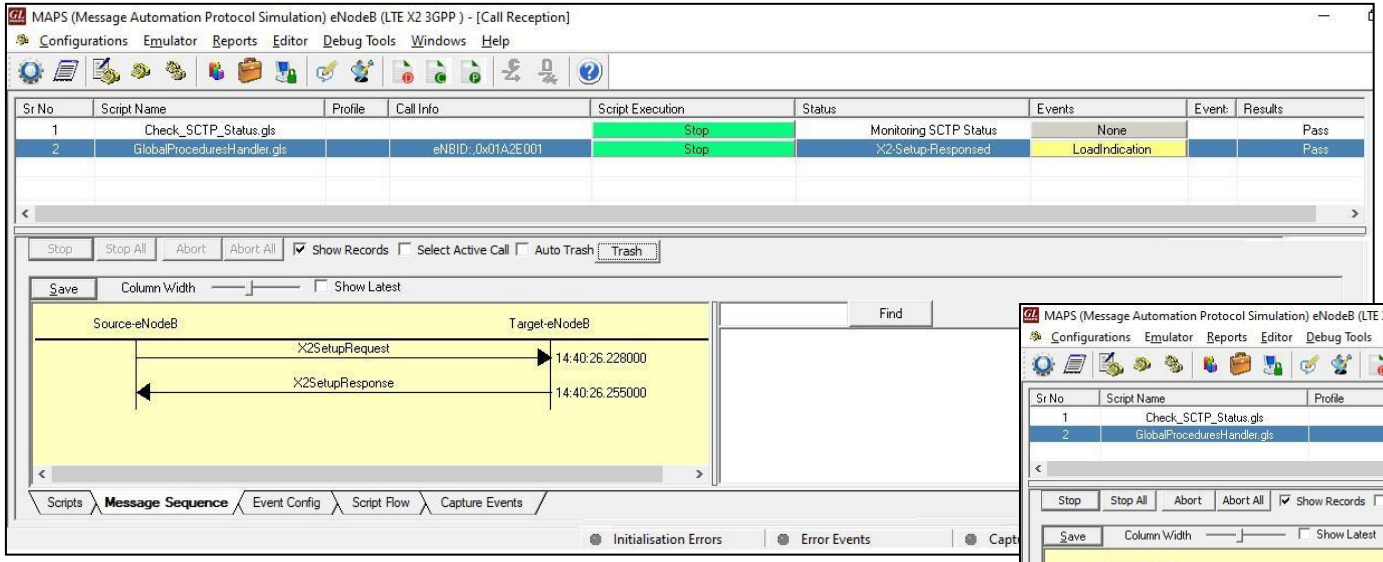
Following are the supported test cases -

- 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

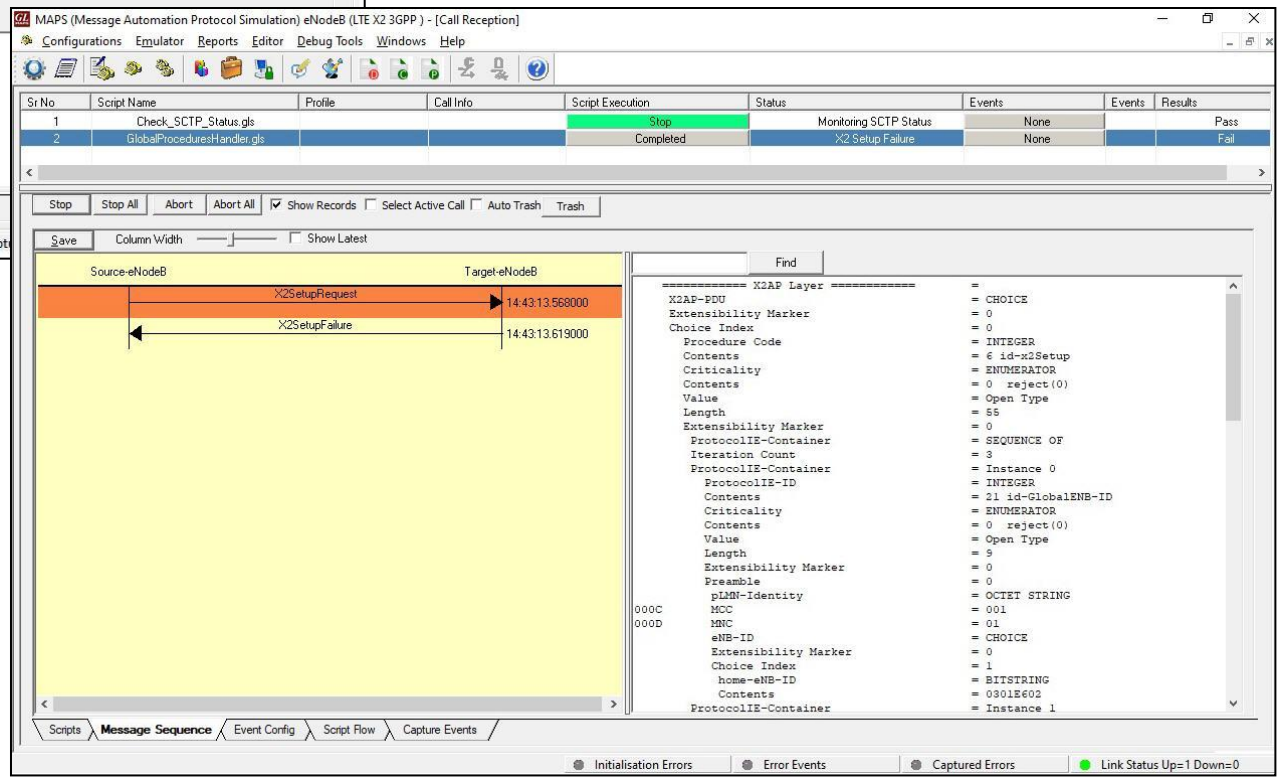


LTE-X2 Conformance Suite

X2 Setup Success Conformance



X2 Setup Failure Cause Conformance



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THANK YOU