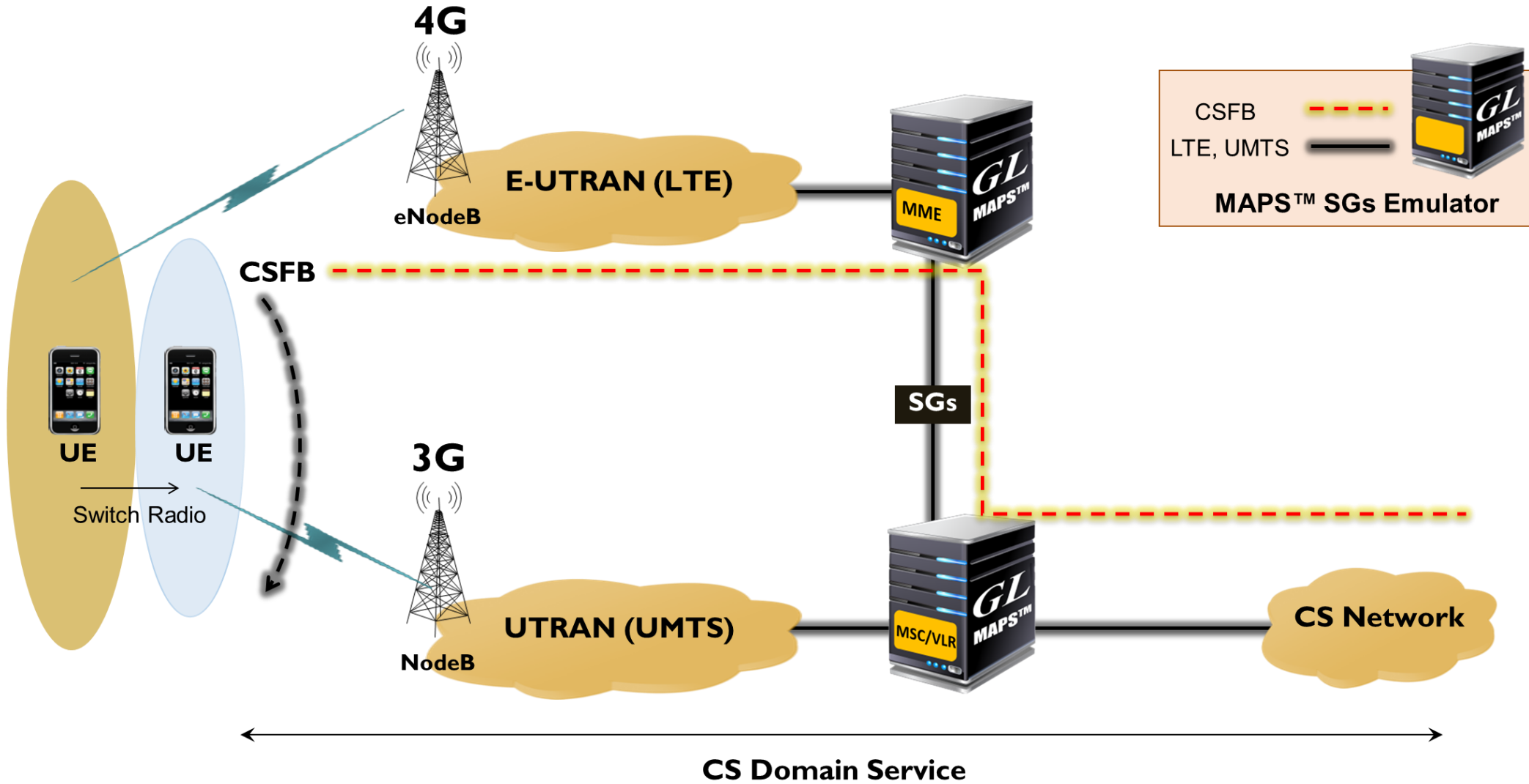

MAPS™ LTE SGs Emulator

Test LTE SMS and Fall Back over SGs



818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878
Phone: (301) 670-4784 Fax: (301) 670-9187 Email: info@gl.com
Website: <http://www.gl.com>

MAPS™ LTE SGs Interface



Main Features

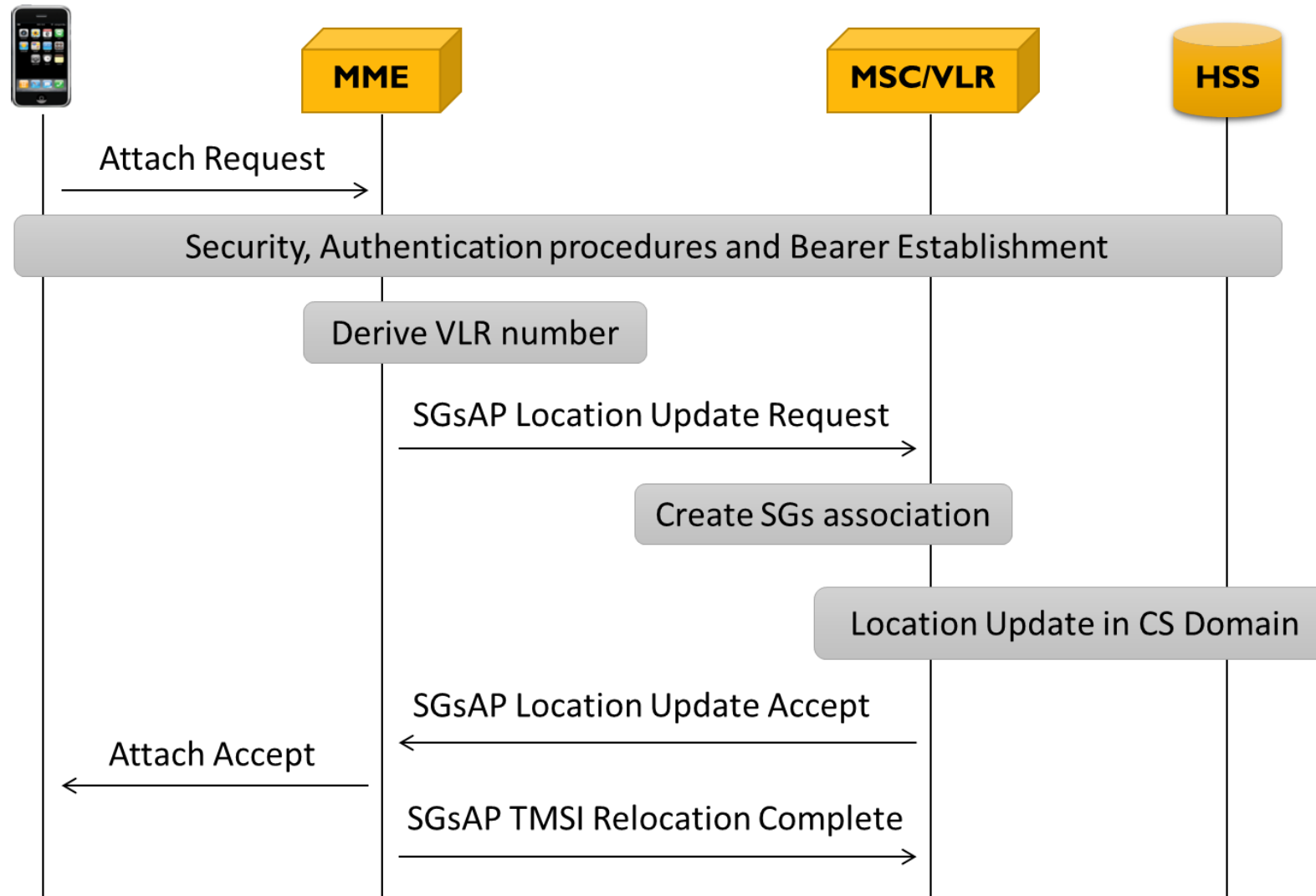
- Setup a virtual real-time network simulating 4G-Long Term Evolution (LTE) network elements using MAPS™ 4G Wireless Lab Suite
- Emulates LTE Mobile Management Entity (MME) and Universal Terrestrial Radio Access Network (UTRAN) Mobile Service Center (MSC) as defined in 3GPP TS 29.118 specifications
- SGsAP procedures when associations between an MME and a Visitor Location Register (VLR) are established:
 - Paging for Non-EPS Services
 - Location Update for Non-EPS Services
 - Non-EPS Alert
 - Explicit IMSI Detach from EPS Services
 - Explicit IMSI Detach from Non-EPS Services
 - Implicit IMSI Detach from Non-EPS services
 - VLR Failure
 - MME Failure
 - MM Information
 - Tunnelling of NAS Messages
 - Mobile Terminating and Mobile Originating SMS Services
- MAPS™ SGs emulator integration with GL's lab test solution supports the following real-time end-to-end procedures:
 - SMS sent from a roaming 3G UE to a roaming LTE UE
 - CSFB call from a roaming LTE UE and a roaming UMTS UE

Protocol Stack and Supported Standards

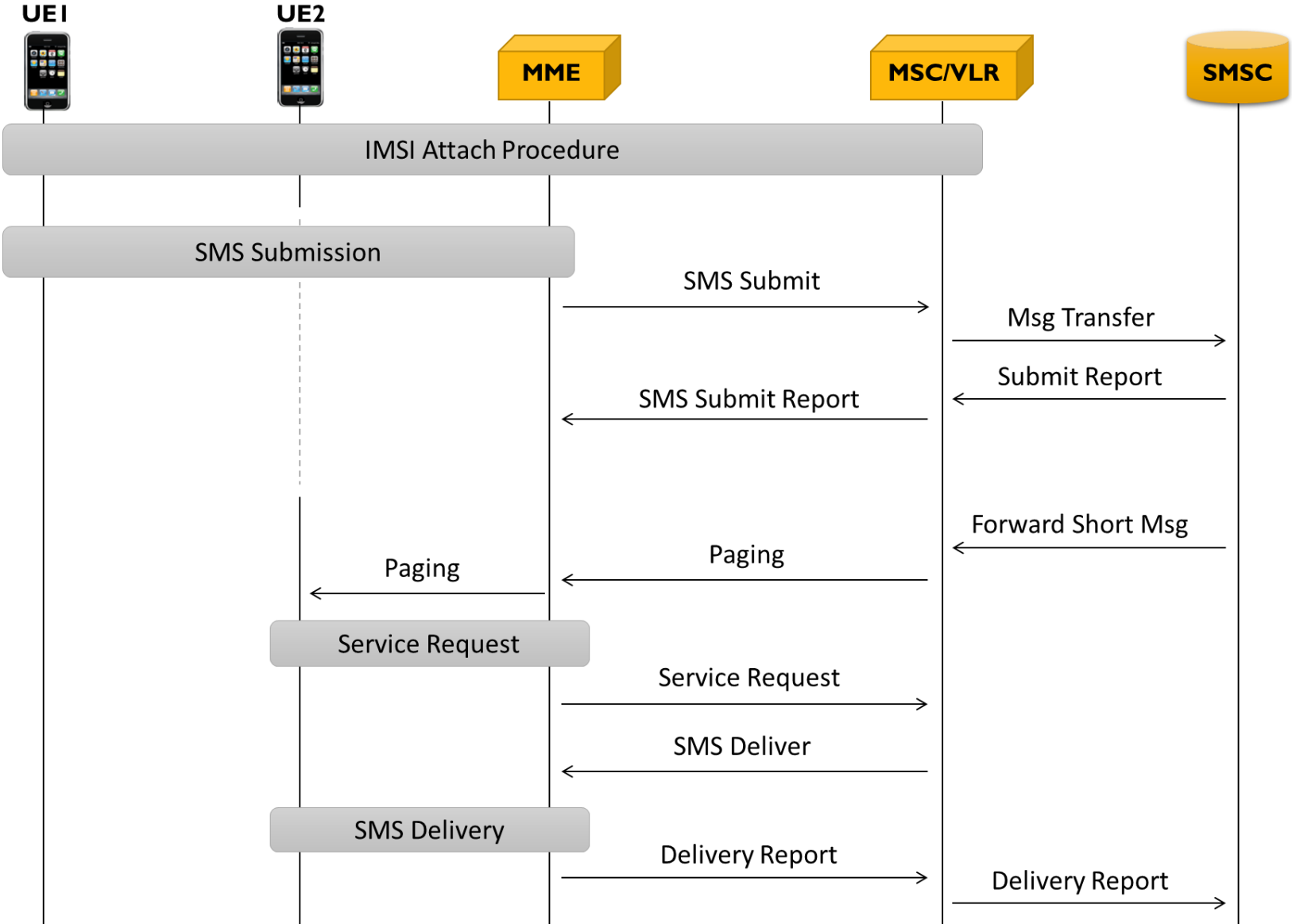
SGsAP
SCTP
IP
Ethernet
SGs

Supported Protocols	Standard / Specification Used
Circuit Switched Fallback in Evolved Packet System	3GPP TS 23.272
SGs Application Part (SGsAP)	3GPP TS 29.118
SCTP	RFC 4960

Location Update for Non-Evolved Packet System (EPS) Services

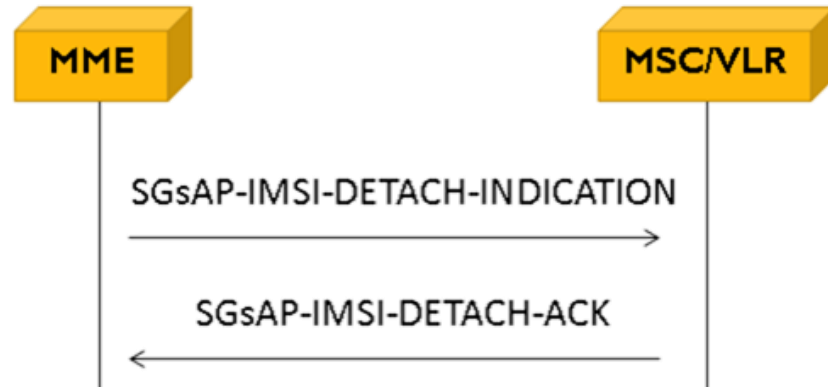


End to End SMS Procedures

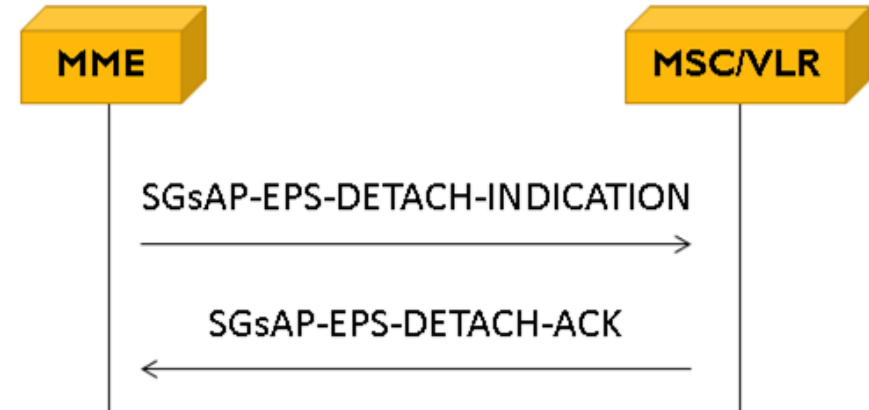


Supported Procedures

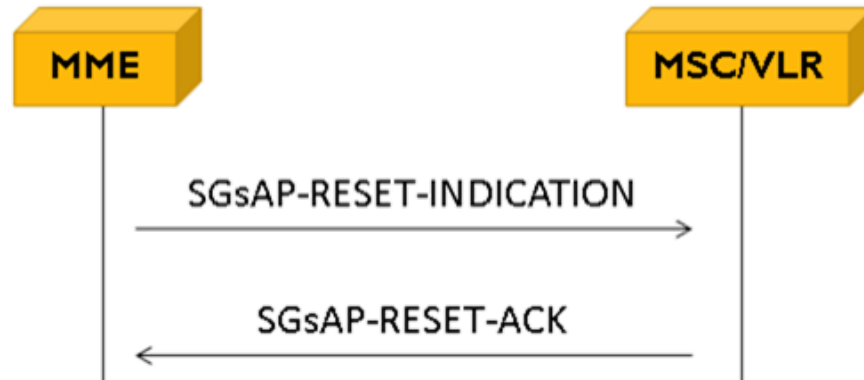
IMSI Detach Services



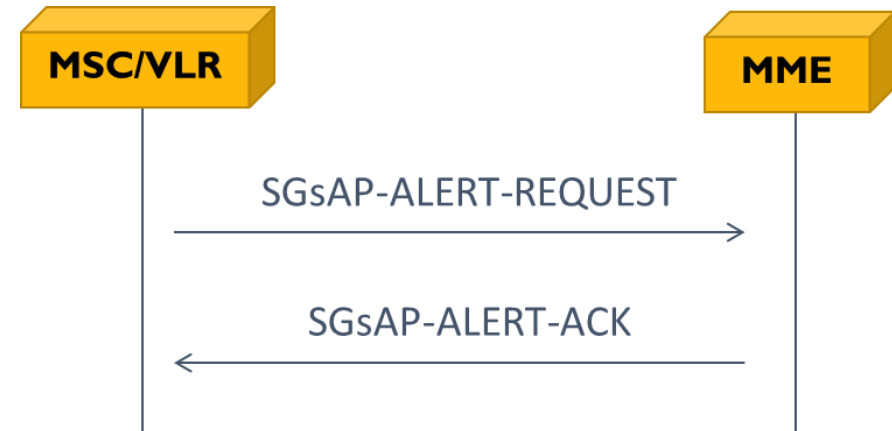
EPS Detach Services



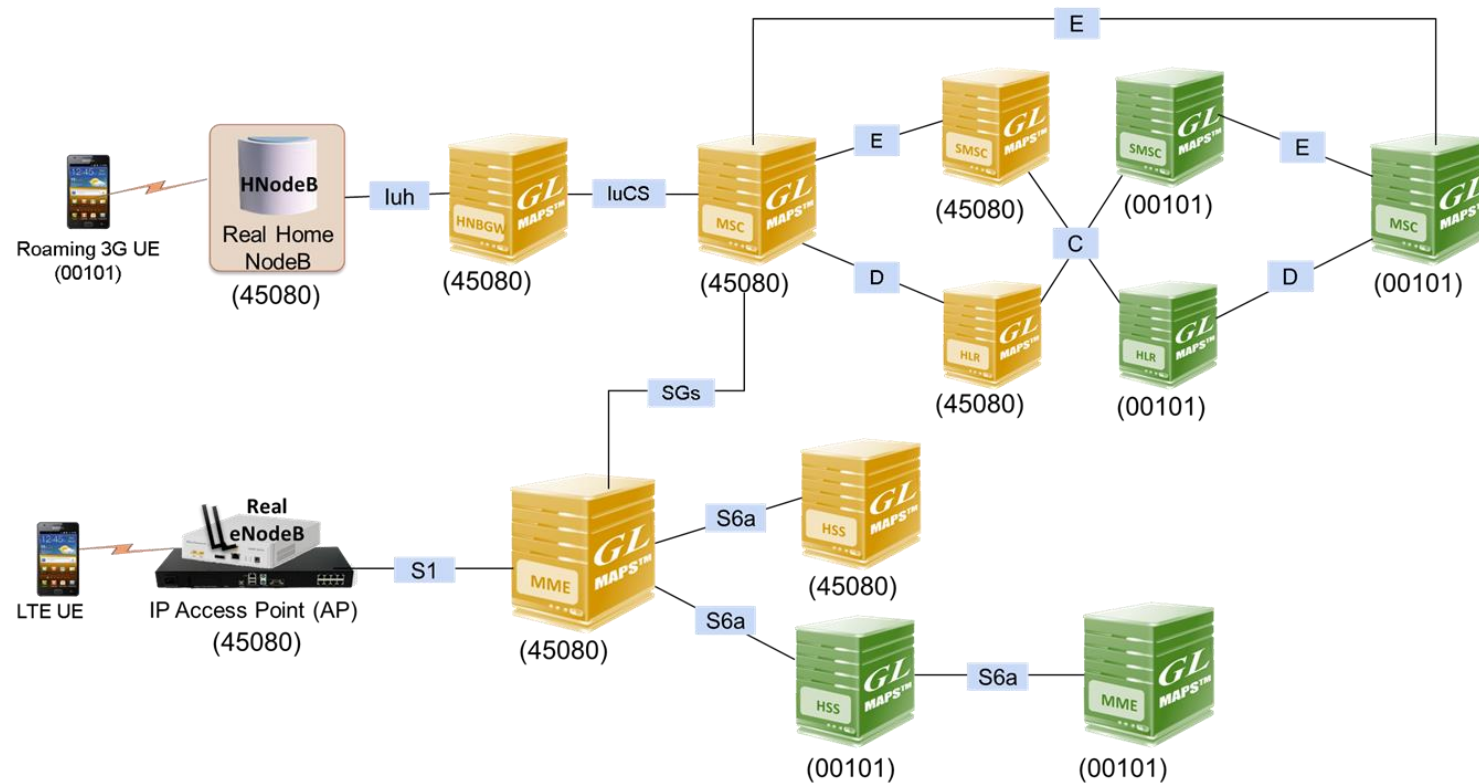
VLR/MME Failure



Non EPS Alert



3G-to-4G SMS Service (SGs) - Lab Scenarios



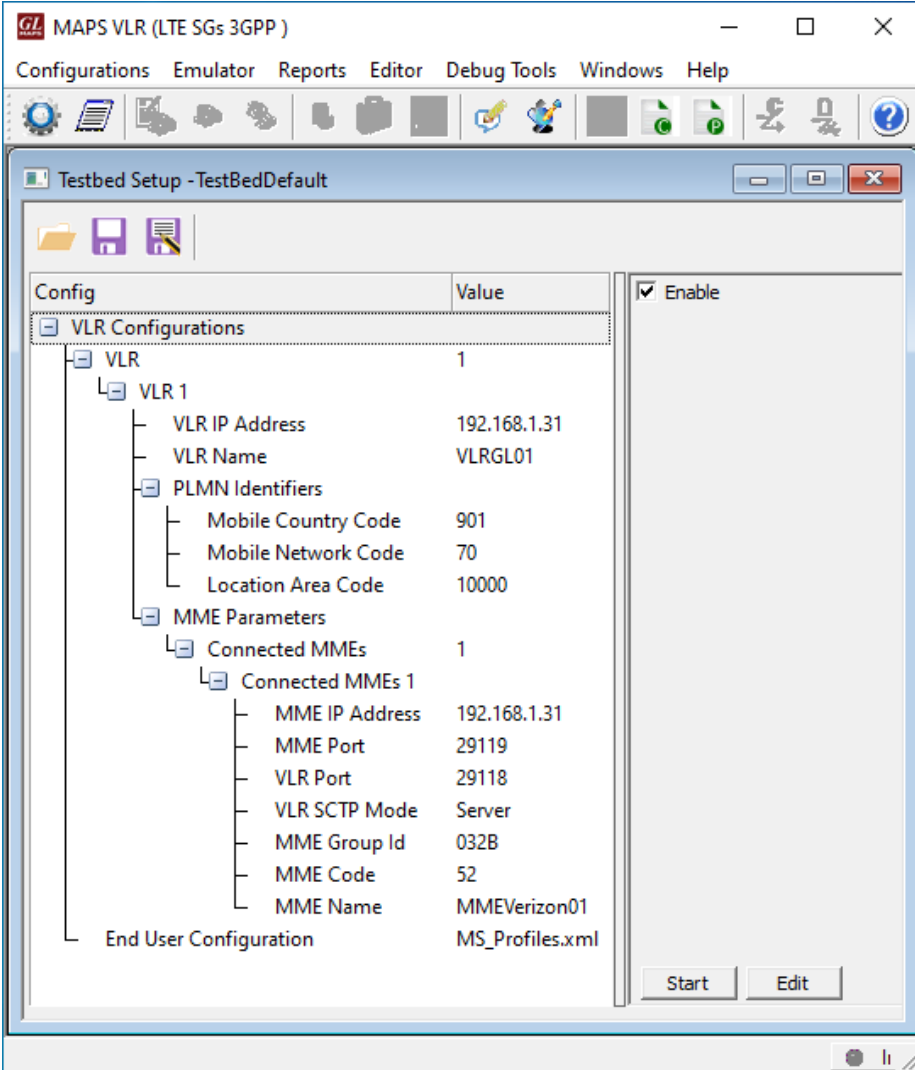
Roaming 3G SMS

- **Real NodeB**
 - IP Access NodeB
 - Mobile Phones
 - SIM cards
- **Iuh**
 - PKS160 MAPS™ IuCS IuH
- **IuCS**
 - PKS160 MAPS™ IuCS IuH
 - PKS102 RTP Core (only @ MSC)
- **C, D, and E**
 - PKS132 MAPS™ MAP IP

Roaming 4G SMS

- **Real eNodeB**
 - IP Access eNodeB
 - Mobile Phones
 - SIM cards
- **S1 MME**
 - PKS140 MAPS™ LTE S1
- **S6a**
 - PKS139 MAPS™ Diameter
- **SGs**
 - PKS146 MAPS™ SGsAP

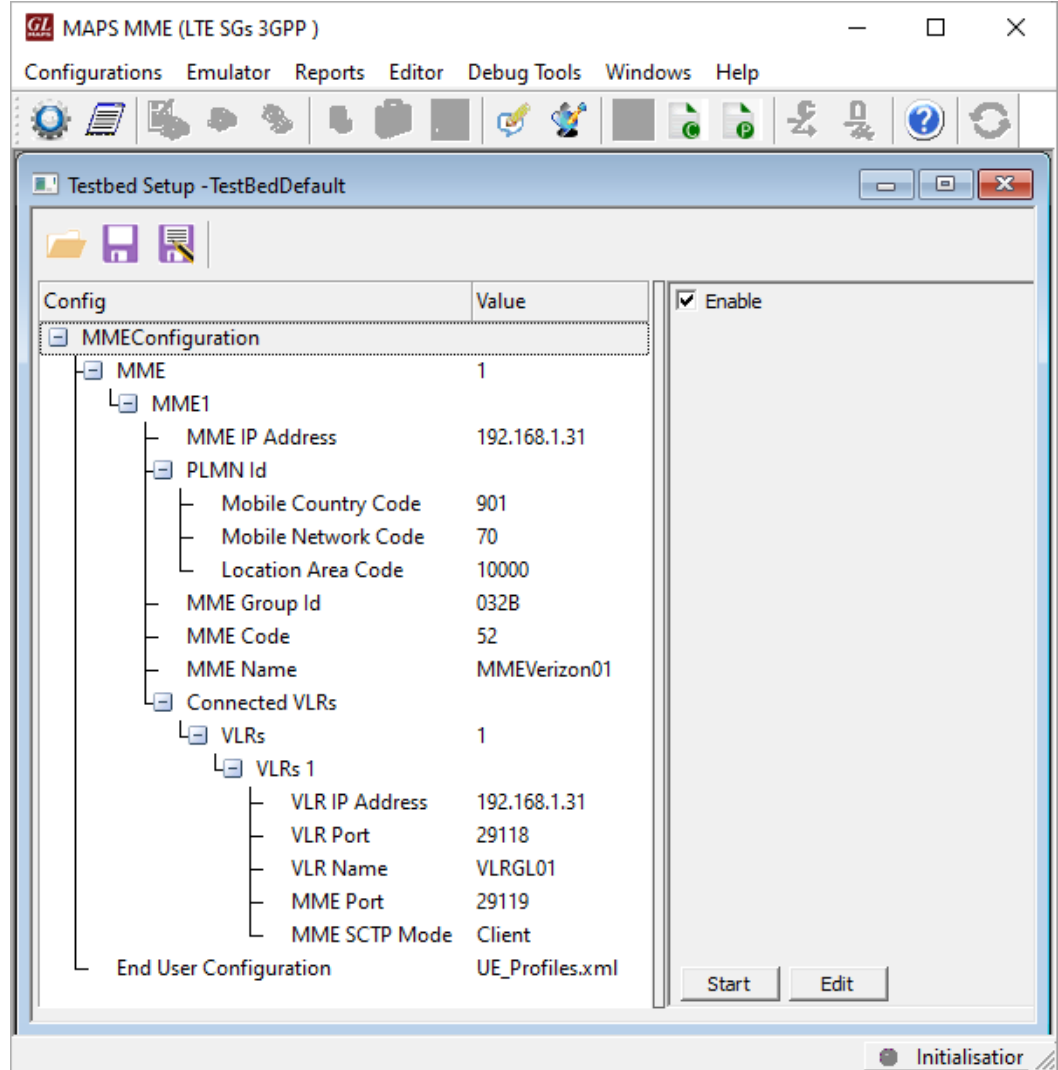
Testbed Setup



The screenshot shows the 'MAPS VLR (LTE SGs 3GPP)' application window. The title bar includes 'Configurations', 'Emulator', 'Reports', 'Editor', 'Debug Tools', 'Windows', and 'Help'. The main window is titled 'Testbed Setup - TestBedDefault' and contains a tree view of configuration parameters. The 'VLR' section is expanded, showing 'VLR 1' with the following settings:

Config	Value	Enable
VLR	1	<input checked="" type="checkbox"/>
VLR 1		
VLR IP Address	192.168.1.31	
VLR Name	VLRGL01	
PLMN Identifiers		
Mobile Country Code	901	
Mobile Network Code	70	
Location Area Code	10000	
MME Parameters		
Connected MMEs	1	
Connected MMEs 1		
MME IP Address	192.168.1.31	
MME Port	29119	
VLR Port	29118	
VLR SCTP Mode	Server	
MME Group Id	032B	
MME Code	52	
MME Name	MMEVerizon01	
End User Configuration	MS_Profiles.xml	

Buttons for 'Start' and 'Edit' are visible at the bottom right of the configuration pane.



The screenshot shows the 'MAPS MME (LTE SGs 3GPP)' application window. The title bar includes 'Configurations', 'Emulator', 'Reports', 'Editor', 'Debug Tools', 'Windows', and 'Help'. The main window is titled 'Testbed Setup - TestBedDefault' and contains a tree view of configuration parameters. The 'MME' section is expanded, showing 'MME1' with the following settings:

Config	Value	Enable
MMEConfiguration		
MME	1	<input checked="" type="checkbox"/>
MME1		
MME IP Address	192.168.1.31	
PLMN Id		
Mobile Country Code	901	
Mobile Network Code	70	
Location Area Code	10000	
MME Group Id	032B	
MME Code	52	
MME Name	MMEVerizon01	
Connected VLRs		
VLRs	1	
VLRs 1		
VLR IP Address	192.168.1.31	
VLR Port	29118	
VLR Name	VLRGL01	
MME Port	29119	
MME SCTP Mode	Client	
End User Configuration	UE_Profiles.xml	

Buttons for 'Start' and 'Edit' are visible at the bottom right of the configuration pane. The status bar at the bottom right shows 'Initialisator'.

Profile Configuration

MAPS VLR (LTE SGs 3GPP) - [Profile Editor -MS_Profiles]

Configurations Emulator Reports Editor Debug Tools Windows Help

#	Profiles (Edit-F2)	Value
1	MSPProfile0001	
2	MSPProfile0002	
3	MSPProfile0003	
4	MSPProfile0004	
5	MSPProfile0005	
6	MSPProfile0006	
7	MSPProfile0007	
8	MSPProfile0008	
9	MSPProfile0009	
10	MSPProfile0010	
11	MSPProfile0011	
12	MSPProfile0012	
13	MSPProfile0013	
14	MSPProfile0014	
15	MSPProfile0015	
16	MSPProfile0016	
17	MSPProfile0017	
18	MSPProfile0018	
19	MSPProfile0019	
20	MSPProfile0020	
21	MSPProfile0021	
22	MSPProfile0022	

Config

- MSPProfile0001
 - VLR Identifier: 1
 - MME Identifier: 1
 - Mobile ID
 - IMEISV: 3215465897456321
 - IMSI: 901700000000638
 - MSISDN
 - Called Number: 90888
 - Calling Number: 90638
 - TMSI: 11110001
 - Paging Service Indicator: SMS Indicator
 - Location Identifiers
 - MCC: 901
 - MNC: 70
 - Location Area Code: 10000
 - Tracking Area Code: 12
 - EUTRAN Cell Id: 1
 - SMS Call Parameters
 - SMS Call Type: Terminate MO SMS
 - SMS Character Set: Default
 - SMS Data for Default and 8 Bit Data: GL Test SMS 0001
 - SMS Data for UCS2: 00540065007300740073006...
 - Originating SC: 885643722311

Initialisation Errors

MAPS MME (LTE SGs 3GPP) - [Profile Editor -UE_Profiles]

Configurations Emulator Reports Editor Debug Tools Windows Help

#	Profiles (Edit-F2)	Value	Enable
1	MSPProfile0001		<input checked="" type="checkbox"/>
2	MSPProfile0002		<input type="checkbox"/>
3	MSPProfile0003		<input type="checkbox"/>
4	MSPProfile0004		<input type="checkbox"/>
5	MSPProfile0005		<input type="checkbox"/>
6	MSPProfile0006		<input type="checkbox"/>
7	MSPProfile0007		<input type="checkbox"/>
8	MSPProfile0008		<input type="checkbox"/>
9	MSPProfile0009		<input type="checkbox"/>
10	MSPProfile0010		<input type="checkbox"/>
11	MSPProfile0011		<input type="checkbox"/>
12	MSPProfile0012		<input type="checkbox"/>
13	MSPProfile0013		<input type="checkbox"/>
14	MSPProfile0014		<input type="checkbox"/>
15	MSPProfile0015		<input type="checkbox"/>
16	MSPProfile0016		<input type="checkbox"/>
17	MSPProfile0017		<input type="checkbox"/>
18	MSPProfile0018		<input type="checkbox"/>
19	MSPProfile0019		<input type="checkbox"/>
20	MSPProfile0020		<input type="checkbox"/>
21	MSPProfile0021		<input type="checkbox"/>
22	MSPProfile0022		<input type="checkbox"/>

Config

- MSPProfile0001
 - MME Identifier: 1
 - VLR Identifier: 1
 - Location Update Type: Normal location updating
 - Mobile ID
 - IMSI: 901700000000638
 - IMEISV: 3215465897456321
 - TMSI: 11110001
 - MSISDN
 - Called Number: 90888
 - Calling Number: 90638
 - Location Area Identifiers
 - MCC: 901
 - MNC: 70
 - LAC: 10000
 - TAC: 231
 - EUtran Cell Id: 1
 - Old Location Area Identifiers
 - MCC: 901
 - MNC: 70
 - LAC: 10
 - TAC: 123
 - IMSI Detach Service Type for Non EPS Services: Explicit UE Initiated IMSI ...
 - IMSI Detach Service Type for EPS services: UE Initiated EPS Detach
 - SMS Parameters
 - SMS Character Set: Default
 - SMS Data for Default and 8 Bit Data: GL Test SMS 0001
 - SMS Data for UCS2: 0054006500730074007300...
 - Destination SC: 885643722311

Add Insert Delete Properties

Initialisation Errors Error Events Captured Error

Incoming Call Handler Configuration

The screenshot displays the 'Incoming Call Handlers Configuration' window in the MAPS VLR (LTE SGs 3GPP) software. The window title is 'MAPS VLR (LTE SGs 3GPP) - [Incoming Call Handlers Configuration - default]'. The menu bar includes 'Configurations', 'Emulator', 'Reports', 'Editor', 'Debug Tools', 'Windows', and 'Help'. The toolbar contains various icons for configuration and execution.

The main configuration area consists of a table with two columns: 'Message Name' and 'Script Name'. The first row is highlighted in blue:

Message Name	Script Name
SGsAP-LOCATION-UPDATE-REQUEST	Location_Update_VLR.gls
SGsAP-EPS-DETACH-INDICATION	EPS_Detach_Indication_VLR.gls
SGsAP-IMSI-DETACH-INDICATION	IMSI_Detach_Indication_VLR.gls
SMS-SUBMIT	MO_SMS_VLR.gls
SGsAP-RESET-INDICATION	Reset_Indication_VLR.gls

To the right of the table is a 'Scripts' list containing 'Location_Update_VLR.gls'. Below this list are radio buttons for 'Sequence' (selected) and 'Random'. There are 'Up' and 'Down' buttons for reordering, and 'Add' and 'Delete' buttons for managing the script list.

At the bottom of the window, there are 'Add' and 'Delete' buttons for the table, and 'Apply Scripts' and 'Clear Scripts' buttons. The status bar at the bottom right shows 'Initialisation Errors' and 'Error Events'.

Global Profile

The image displays two screenshots of the GL MAPS configuration interface. The top window is titled "GL MAPS MME (LTE SGs 3GPP) - [Global Configuration - Globalprofile]" and shows the "Global Configuration" section expanded to "Protocol Specific Timers". The bottom window is titled "GL MAPS VLR (LTE SGs 3GPP) - [Global Configuration - Globalprofile]" and shows the "Global Configuration" section expanded to "Call Parameters", "Location Area Update Parameters", and "SGs Specific Timers".

GL MAPS MME (LTE SGs 3GPP) - [Global Configuration - Globalprofile]

Config	Value	Enable
Global Configuration		<input checked="" type="checkbox"/>
Protocol Specific Timers		
Ts6 1 in msec	10000	
Ts8 in msec	4000	
Ts9 in msec	4000	
Ts10 in msec	4000	
Ts12 1 in msec	60000	
Ts12 2 in msec	4000	
Ts13 in msec	4000	

GL MAPS VLR (LTE SGs 3GPP) - [Global Configuration - Globalprofile]

Config	Value	Enable
Global Configuration		<input checked="" type="checkbox"/>
Call Parameters		
Call Answer Time in msec	1000	
Call Duration in msec	900000	
Inter Call Duration in msec	1000	
Location Area Update Parameters		
TMSI Allocation	Allocate New TMSI	
Location Accept Criteria	Accept any UE	
SGs Specific Timers		
Ts5 in msec	10000	
Ts6 2 in msec	40000	
Ts7 in msec	4000	
Ts11 in msec	4000	
Ts14 in msec	10000	
Ts15 in msec	10000	

Call Generation - Location Update Procedure

GL MAPS MME (LTE SGs 3GPP)

Configurations Emulator Reports Editor Debug Tools Windows Help

Call Status Call Events

Call Generation - CallGenDefault

Sr No	Script Name	Profile	Call Info	Script Execut...	Status	Events	Events Profile	Result	Total Iterations	Completed Iterations
1	Location_Update_MME.gls	MSPProfile0001	901700000000638	Start	SGsAP TMSI Relocation Completed	None		Pass	10	10
2	Location_Update_MME.gls	MSPProfile0002		Start		None		Unknown	10	0
3	Location_Update_MME.gls	MSPProfile0003		Start		None		Unknown	10	0

Add Delete Insert Refresh Start Start All Stop Stop All Abort Abort All

Save Column Width Show Latest

MME VLR

```

    SGsAP-LOCATION-UPDATE-REQUEST      16:39:16.665000
    SGsAP-LOCATION-UPDATE-ACCEPT      16:39:16.686000
    SGsAP-TMSI-REALLOCATION-COMPLETE  16:39:16.687000
  
```

Find

```

===== SGsAP Layer =====
0000 Message Type                = 00001001 SGsAP-LOCATION-U
      IMSI                        =
0001 Information Element Id      = 00000001 IMSI
0002 Length                      = 8 (x08)
0003 Bits 3,2,1                 = .....001 (1)
0003 Parity                      = .....1... Odd number of ID
0003 IMSI Digits                 = 9017000000000638
      MME name                    =
000B MME NAME Field Value        = 00001001 MME name IEI
000C Length                      = 13 (x0D)
      MME name                    = MMEVerizon01
      EPS location update type     =
001A Information Element Id      = 00001010 EPS location upc
001B Length                      = 1 (x01)
001C EPS location update type value = 00000000 Shall not be ser
      New location area identifier =
001D Information Element Id      = 00000100 Location Area Ic
001E Length                      = 5 (x05)
001F MCC digits                  = 901
0020 MNC digits                  = 70
0022 LAC                        = 10000 (x2710)
      Old location area identifier =
  
```

Scripts Message Sequence Event Config Script Flow

Initialisation Errors Error Events Captured Errors Link Status Up=1 Down=0

Loading Scripts and Profiles

Message Sequence

Decode Message

Call Reception - Location Update Procedure

The screenshot displays the MAPS VLR (LTE SGs 3GPP) - [Call Reception] interface. At the top, a menu bar includes Configurations, Emulator, Reports, Editor, Debug Tools, Windows, and Help. Below the menu is a toolbar with various icons. A table at the top shows the results of two call attempts:

Sr No	Script Name	Profile	Call Info	Script Execut...	Status	Events	Events Profile	Results
1	Location_Update_VLR.gls	MSProfile0001	901700000000638	Completed	SGsAP TMSI Relocation Completed	None		Pass
2	Location_Update_VLR.gls	MSProfile0001	901700000000638	Completed	SGsAP TMSI Relocation Completed	None		Pass

A red box highlights the 'Results' column, with a red arrow pointing to the text 'Call Results' above it. Below the table is a control bar with buttons for Stop, Stop All, Abort, Abort All, Show Records, Select Active Call, Auto Trash, and Trash. The main area is divided into two panes. The left pane, titled 'Message Sequence', shows a sequence of messages between MME and VLR:

- SGsAP-LOCATION-UPDATE-REQUEST (MME to VLR) at 16:39:16.109000
- SGsAP-LOCATION-UPDATE-ACCEPT (VLR to MME) at 16:39:16.128000
- SGsAP-TMSI-REALLOCATION-COMPLETE (MME to VLR) at 16:39:16.171000

The right pane, titled 'Decode Message', shows the decoded details of the first message (SGsAP-LOCATION-UPDATE-REQUEST):

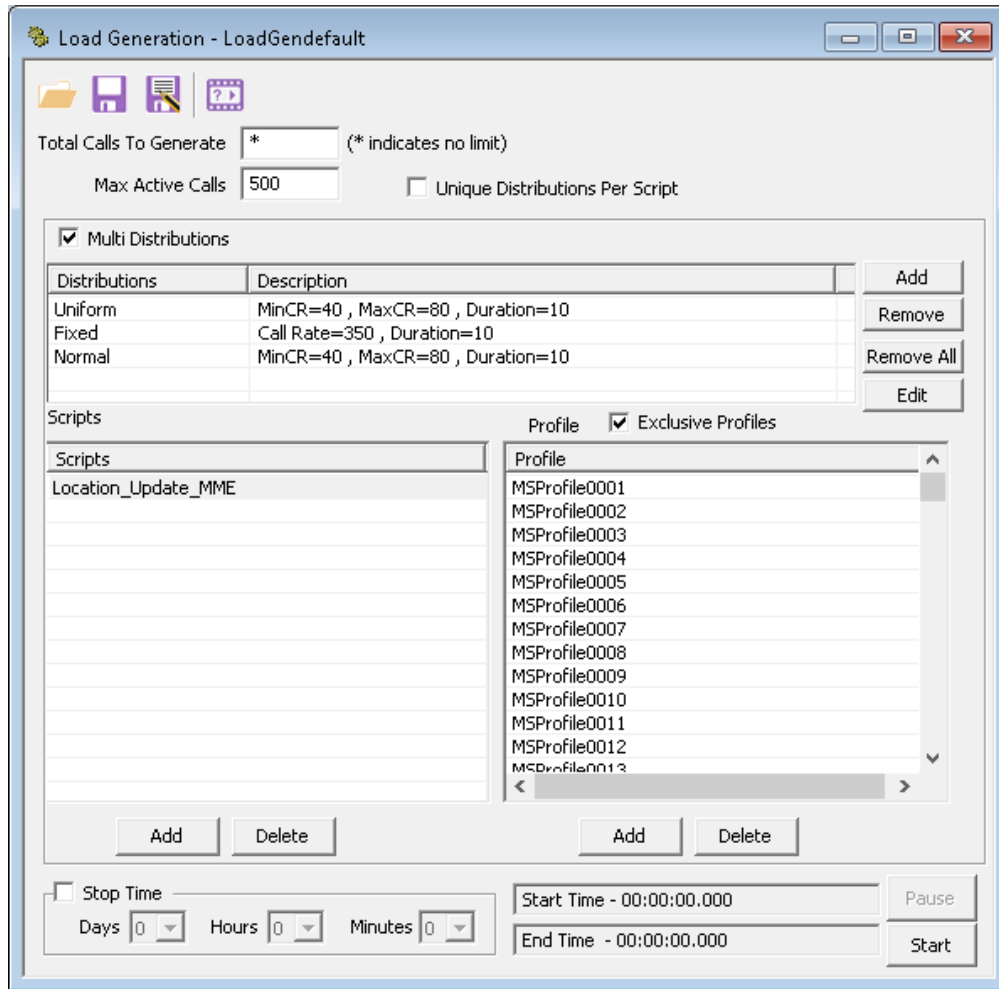
```
=====  
SGsAP Layer  
=====  
0000 Message Type = 00001001 SGsAP-LOCATION-UPDATE-REQUEST  
IMSI =  
0001 Information Element Id = 00000001 IMSI  
0002 Length = 8 (x08)  
0003 Bits 3,2,1 = .....001 (1)  
0003 Parity = ....1... Odd number of IMSI digits  
0003 IMSI Digits = 901700000000638  
MME name =  
000B MME NAME Field Value = 00001001 MME name IEI  
000C Length = 13 (x0D)  
MME name = MMEVerizon01  
EPS location update type =  
001A Information Element Id = 00001010 EPS location update type  
001B Length = 1 (x01)  
001C EPS location update type value = 00000000 Shall not be sent in this versi  
New location area identifier =  
001D Information Element Id = 00000100 Location Area Identifier  
001E Length = 5 (x05)  
001F MCC digits = 901  
0020 MNC digits = 70  
0022 LAC = 10000 (x2710)  
Old location area identifier =  
0024 Information Element Id = 00000100 Location Area Identifier  
0025 Length = 5 (x05)  
0026 MCC digits = 901  
0027 MNC digits = 70  
0029 LAC = 10 (x000A)  
IMEISV =  
002B Information Element Id = 00010101 IMEISV
```

At the bottom, there are tabs for Scripts, Message Sequence, Event Config, and Script Flow. The status bar at the very bottom shows: Initialisation Errors, Error Events, Captured Errors, and Link Status Up=1 Down=0.

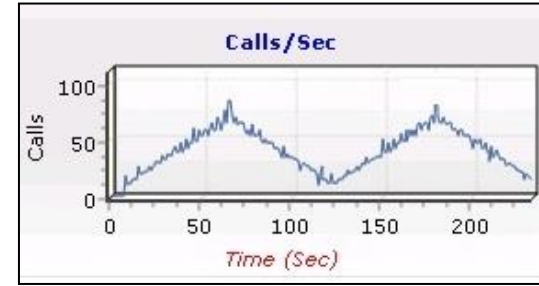
Message Sequence

Decode Message

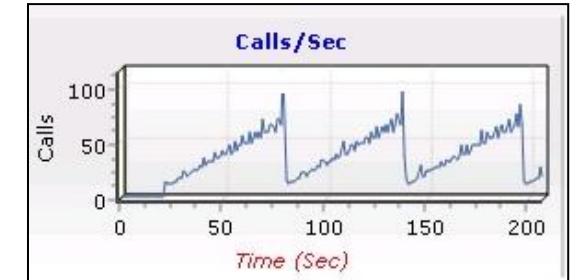
Load Generation



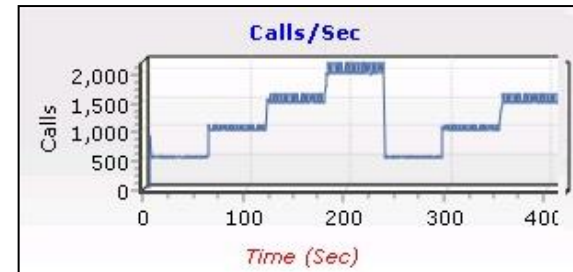
Saw-tooth Statistical Distribution



Ramp Statistical Distribution



Step Statistical Distribution



- 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.

Bulk Call Generation

GL MAPS MME (LTE SGs 3GPP) - [Call Generation]

Configurations Emulator Reports Editor Debug Tools Windows Help

Sr No	Script Name	Profile	Call Info	Script Execut...	Status	Events	Events Profile	Result	Total Iterations	Completed Iterations
1	Location_Update_MME.gls	MSProfile0001	901700000000638	Start	SGsAP TMSI Relocation Completed	None		Pass	10	10
2	Location_Update_MME.gls	MSProfile0002	901700000000639	Start	SGsAP TMSI Relocation Completed	None		Pass	10	10
3	Location_Update_MME.gls	MSProfile0003	901700000000640	Start	SGsAP TMSI Relocation Completed	None		Pass	10	10
4	Location_Update_MME.gls	MSProfile0004	901700000000641	Start	SGsAP TMSI Relocation Completed	None		Pass	10	10
5	Location_Update_MME.gls	MSProfile0005	901700000000642	Start	SGsAP TMSI Relocation Completed	None		Pass	10	10
6	Location_Update_MME.gls	MSProfile0006	901700000000643	Start	SGsAP TMSI Relocation Completed	None		Pass	10	10
7	Location_Update_MME.gls	MSProfile0007	901700000000644	Start	SGsAP TMSI Relocation Completed	None		Pass	10	10
8	Location_Update_MME.gls	MSProfile0008	901700000000645	Start	SGsAP TMSI Relocation Completed	None		Pass	10	10
9	Location_Update_MME.gls	MSProfile0009	901700000000646	Start	SGsAP TMSI Relocation Completed	None		Pass	10	10
10	Location_Update_MME.gls	MSProfile0010	901700000000647	Start	SGsAP TMSI Relocation Completed	None		Pass	10	10

Add Delete Insert Refresh Start Start All Stop Stop All Abort Abort All

Save Column Width Show Latest

MME VLR

```

sequenceDiagram
    participant MME
    participant VLR
    Note over MME,VLR: 13:00:57.333000
    MME->>VLR: SGsAP-LOCATION-UPDATE-REQUEST
    Note over MME,VLR: 13:00:57.353000
    VLR-->>MME: SGsAP-LOCATION-UPDATE-ACCEPT
    Note over MME,VLR: 13:00:57.353000
    MME->>VLR: SGsAP-TMSI-REALLOCATION-COMPLETE
    
```

Find

```

===== SGsAP Layer =====
0000 Message Type = 00001001 SGsAP-LOCATION
      IMSI =
0001 Information Element Id = 00000001 IMSI
0002 Length = 8 (x08)
0003 Bits 3,2,1 = .....001 (1)
0003 Parity = ....1... Odd number of
0003 IMSI Digits = 901700000000638
      MME name =
000B MME NAME Field Value = 00001001 MME name IEI
000C Length = 13 (x0D)
      MME name = MMEVerizon01
      EPS location update type =
001A Information Element Id = 00001010 EPS location u
001B Length = 1 (x01)
001C EPS location update type value = 00000000 Shall not be s
      New location area identifier =
001D Information Element Id = 00000100 Location Area
001E Length = 5 (x05)
001F MCC digits = 901
0020 MNC digits = 70
0022 LAC = 10000 (x2710)
      Old location area identifier =
0024 Information Element Id = 00000100 Location Area
    
```

Scripts Message Sequence Event Config Script Flow

Initialisation Errors Error Events Captured Errors Link Status U

Events Log

GL MAPS MME (LTE SGs 3GPP) - [Events]

Configurations Emulator Reports Editor Debug Tools Windows Help

Event Log | Error Events | Captured Errors

Date/Time	Captured Events	Call Trace Id	Script Name	Script Id
2022-5-10 12:52:33.186000	SCTP Up On ConnectionId = 1		Check_SCTP_Status.gls	ProtScriptId-0-1827230086-1...
2022-5-10 12:52:50.000000	SGsAP-LOCATION-UPDATE-REQUEST S...		SGsHandlerMME.gls	CGProtScriptId-0-182724652...
2022-5-10 12:52:50.177000	TMSIRelocated	9017000000000638	Location_Update_MME.gls	CGProtScriptId-0-182724652...
2022-5-10 12:52:56.723000	SGsAP-IMSI-DETACH-INDICATION Sent		SGsHandlerMME.gls	CGProtScriptId-1-182725355...
2022-5-10 12:52:56.723000	MME Name : MMEVerizon01		SGsHandlerMME.gls	CGProtScriptId-1-182725355...
2022-5-10 12:52:56.723000	IMSI Detach ServiceType : 1		SGsHandlerMME.gls	CGProtScriptId-1-182725355...
2022-5-10 12:52:59.463000	SGsAP-EPS-DETACH-INDICATION Sent		SGsHandlerMME.gls	CGProtScriptId-2-182725627...
2022-5-10 12:52:59.463000	MME Name : MMEVerizon01		SGsHandlerMME.gls	CGProtScriptId-2-182725627...
2022-5-10 12:52:59.463000	EPS Detach ServiceType : 1		SGsHandlerMME.gls	CGProtScriptId-2-182725627...
2022-5-10 12:53:07.987000	SGsAP-RESET-INDICATION Sent		SGsHandlerMME.gls	CGProtScriptId-4-182726481...
2022-5-10 12:53:08.095000	SGsAP-RSEST-Ack Received		SGsHandlerMME.gls	CGProtScriptId-4-182726481...

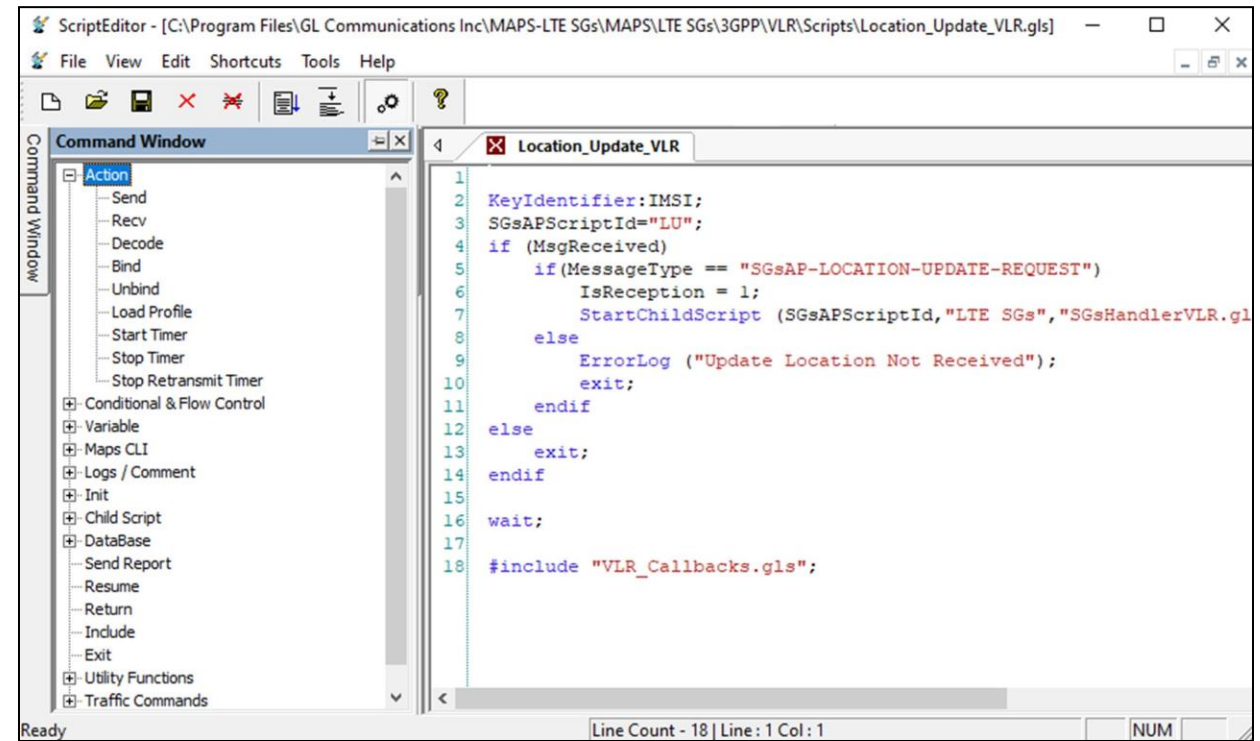
Save Events

Capture Events to file

Initialisation Errors Error Event:

Customizations - Call Flow (Scripts)

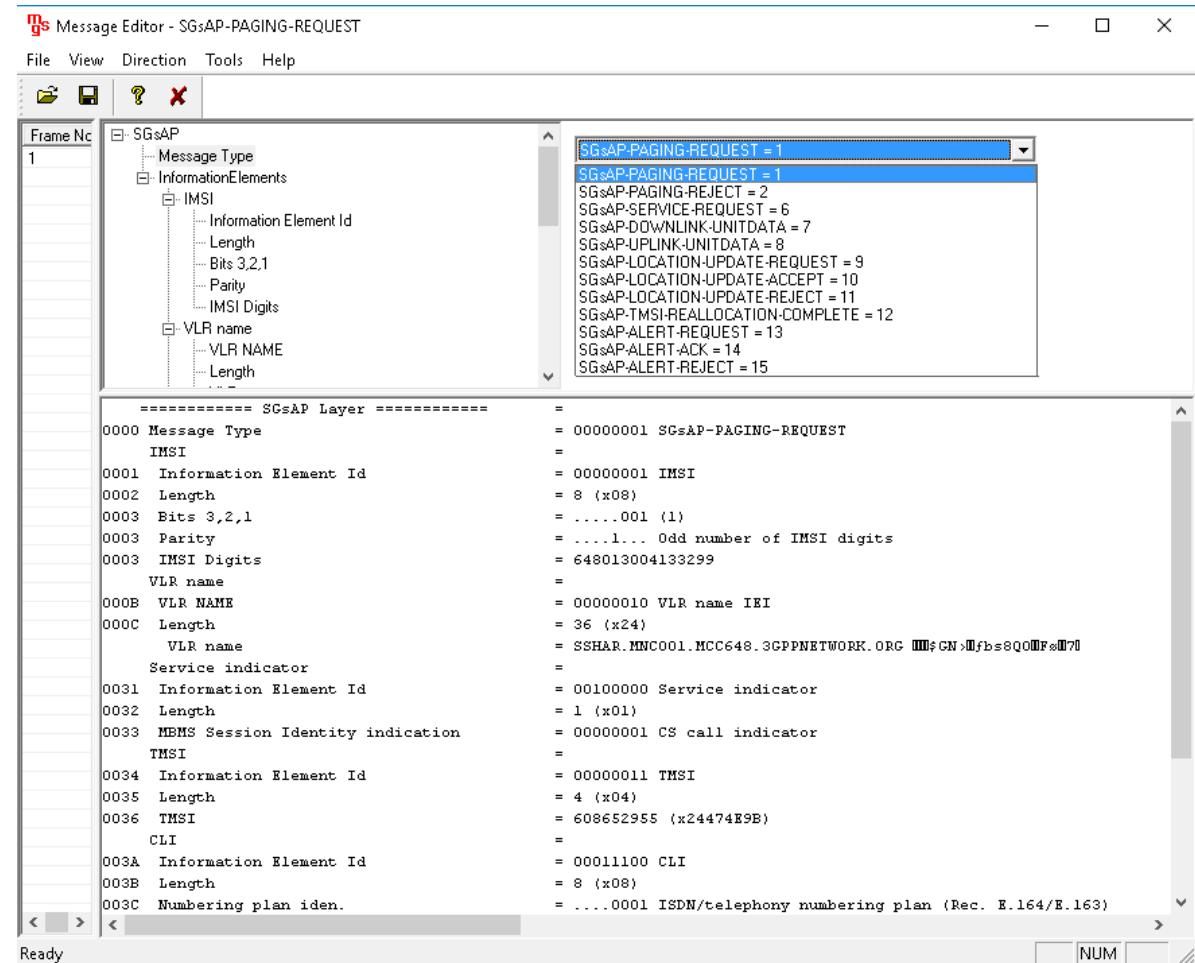
- Scripts are written in our proprietary *.gls scripting language
- They represent generic state machines intended provide protocol/signaling logic for a call and establish bearer traffic
- Each instance of a script corresponds to a single transaction/call



```
ScriptEditor - [C:\Program Files\GL Communications Inc\MAPS-LTE SGs\MAPS\LTE SGs\3GPP\VLR\Scripts\Location_Update_VLR.gls]
File View Edit Shortcuts Tools Help
Command Window
Action
  Send
  Recv
  Decode
  Bind
  Unbind
  Load Profile
  Start Timer
  Stop Timer
  Stop Retransmit Timer
  Conditional & Flow Control
  Variable
  Maps CLI
  Logs / Comment
  Init
  Child Script
  DataBase
  Send Report
  Resume
  Return
  Include
  Exit
  Utility Functions
  Traffic Commands
4 Location_Update_VLR
1
2 KeyIdentifier:IMSI;
3 SGsAPScriptId="LU";
4 if (MsgReceived)
5     if(MessageType == "SGsAP-LOCATION-UPDATE-REQUEST")
6         IsReception = 1;
7         StartChildScript (SGsAPScriptId,"LTE SGs","SGsHandlerVLR.gls");
8     else
9         ErrorLog ("Update Location Not Received");
10        exit;
11    endif
12 else
13    exit;
14 endif
15
16 wait;
17
18 #include "VLR_Callbacks.gls";
Line Count - 18 | Line: 1 Col: 1 NUM
```

Customizations - Protocol Messages

- When the script sends a message it does by loading a hdl file template from disk as shown in the screenshot
- These message templates provide the actual structure of the message, the script simply populates it with values contained in its variables
- These messages are customizable by the user, header fields can be altered and removed. Binary-based messages are edited in our provided message editor



Thank you