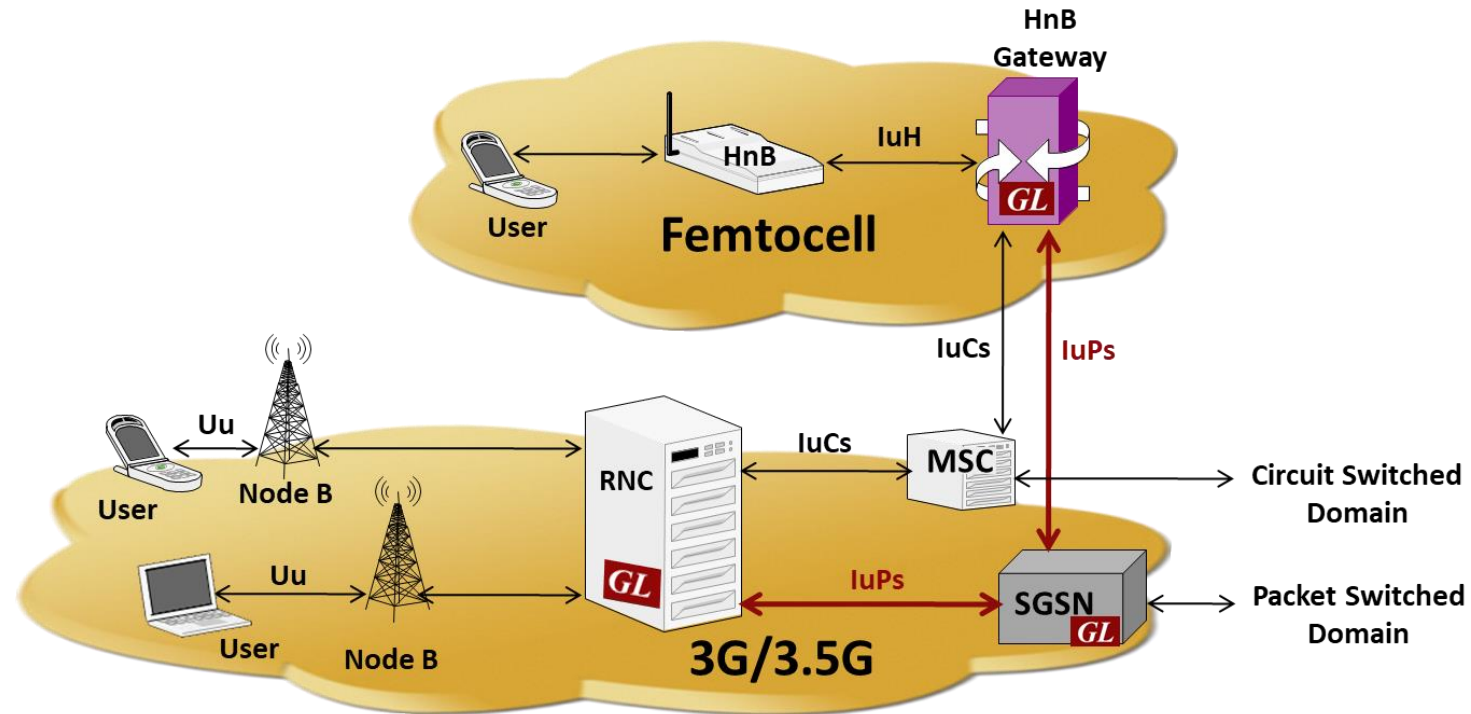

MAPS™ UMTS for IuPS Interfaces Emulator


(UMTS IuPS Emulation over IP)

 ***GL Communications Inc.***

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™ UMTS for IuPS Interfaces



 **MAPS™ UMTS-IuPS Emulator**
(Generate up to 20,000 Subscribers)
(Up to 2000 Simultaneous Calls)

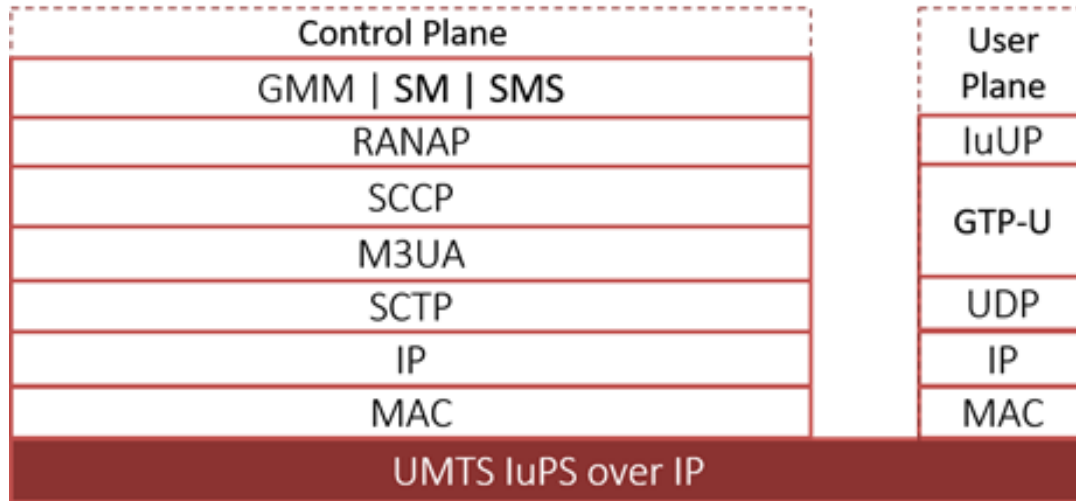


MAPS™ UMTS-IuPS Emulator
PacketLoad™ Hardware
Generates up to 40 Gbits/sec Stateful TCP/HTTP Traffic

Highlights

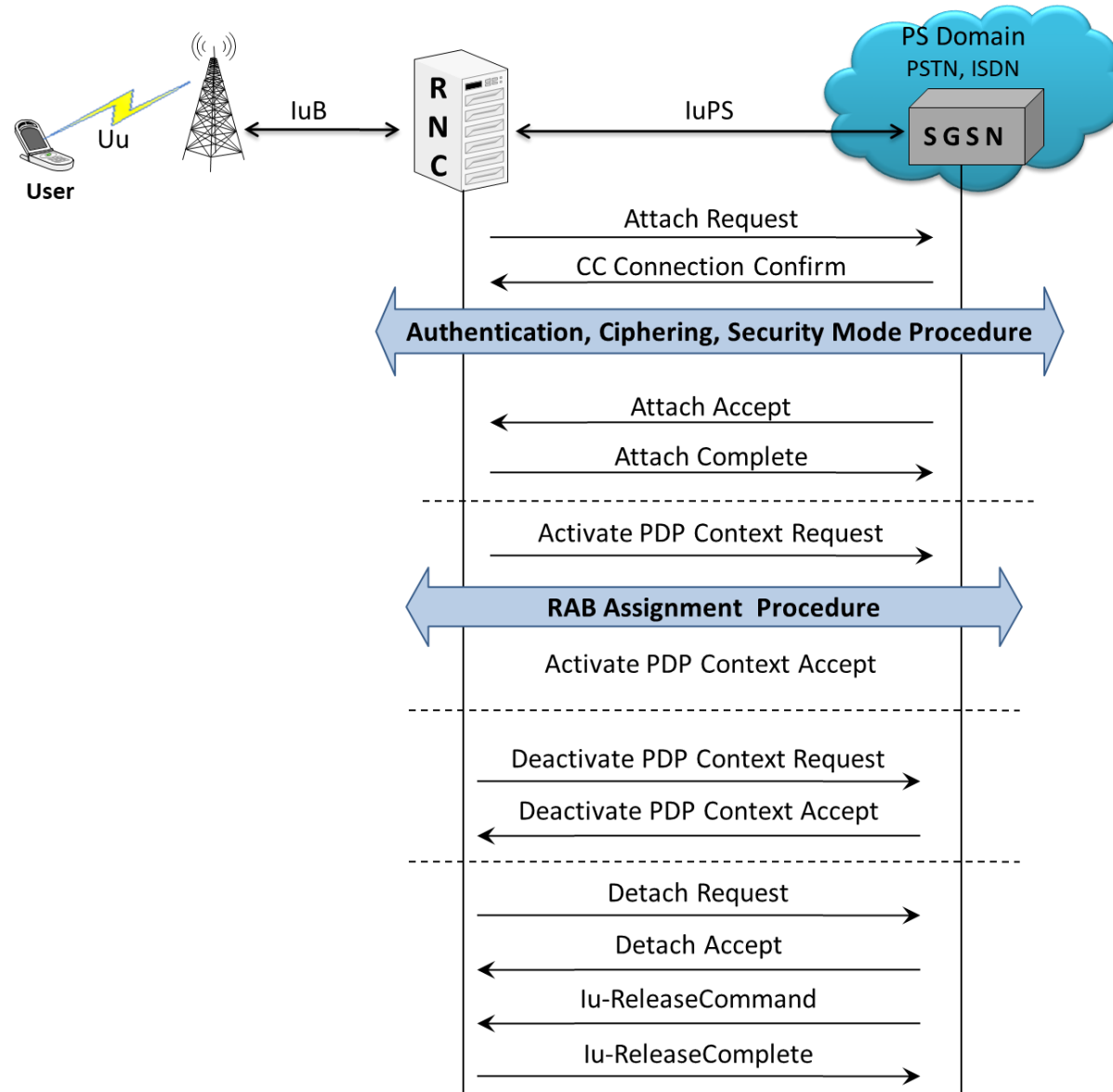
- Emulate RNC, and SGSN entities
- Generates and supports all Mobility Management, Session Management, RANAP and DTAP messages
- User controlled access to SCTP, M3UA, and SCMG (SCCP Management), RANAP, and DTAP messages
- Ready scripts for Routing Area Updating, GPRS Attach, Paging, and Handover (Relocation) procedures for quick testing
- Supports Authentication, TMSI Reallocation, Encryption, and other optional procedures
- Supports mobile traffic emulation with additional licenses
- Provides fault insertion, and erroneous call flows testing capability
- Impairments can be applied to messages to emulate error conditions
- Setup a virtual real-time network emulating 3G-UMTS network element using [MAPS™ 3G Wireless Lab Suite](#)
- Supports PS network web browsing data traffic emulation along with generation of real-world traffic in the lab
- Supports M3UA termination type as a signaling gateway process (SGP), an application server process (ASP), or an IP server process (IPSP)
- Supports Packet Traffic, Mobile Traffic, Gateway Traffic, External Gateway emulation with additional licenses

UMTS IuPS Protocol Stack

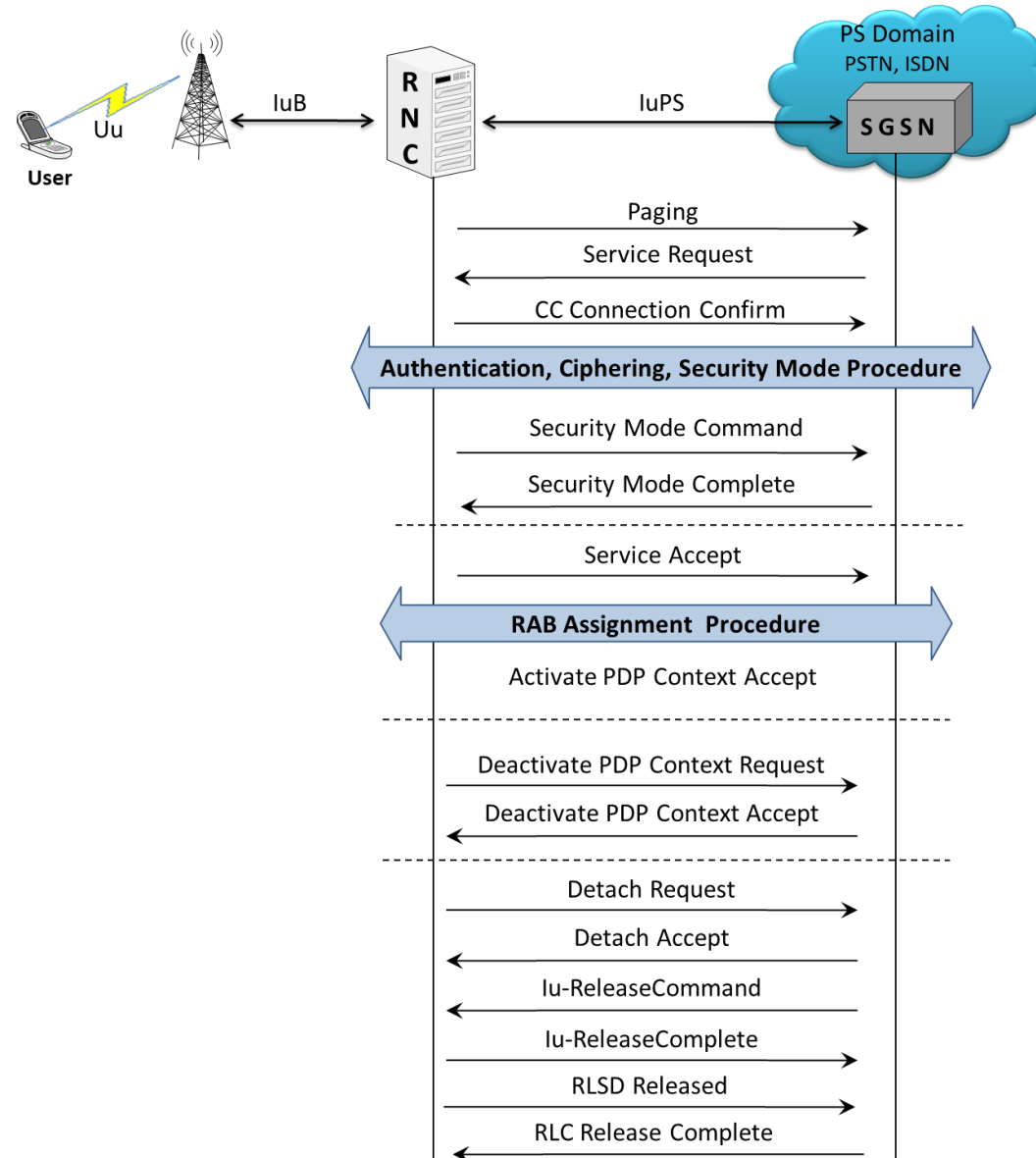


Supported Protocols	Specification Used
IuPS Interface	
SCTP	RFC 4960
SCCP	Q.713, CCITT (ITU-T) Blue Book
M3UA	RFC 3332
RANAP	3GPP TS 25.413 V9.1.0
GMM / SM	GPP TS 24.008 V5.16.0 (2006-06)
SMS	3GPP TS 03.40 V7.5.0 & 3GPP TS 04.11 V7.1.0 GSM 03.38 version 7.2.0 Release 1998

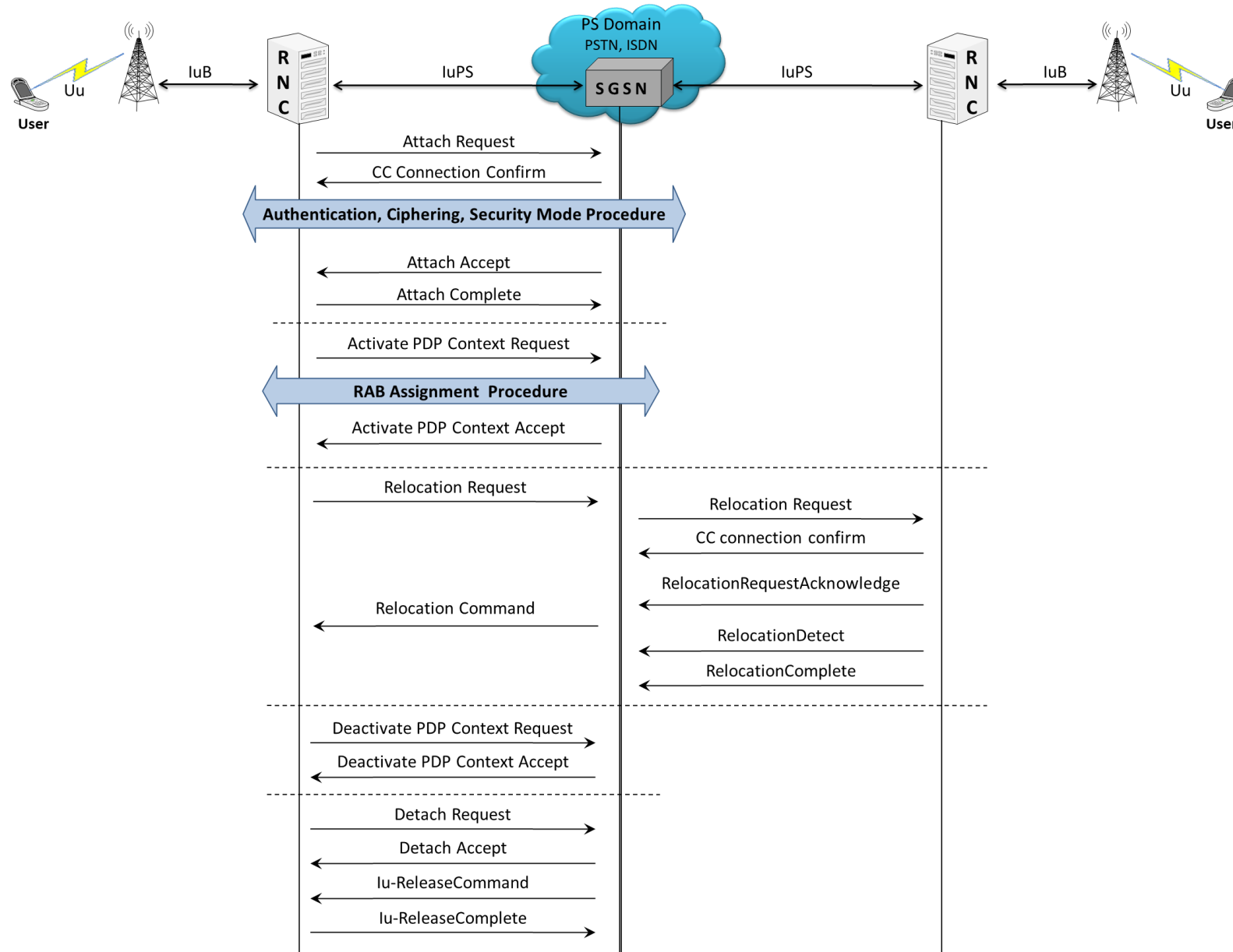
UMTS IuPS Call Flow



UMTS IuPS Paging Call Procedure



UMTS IuPS Relocation Call Flow



Testbed Configuration

Config

Config	Value	Enable
RNC Configurations		<input checked="" type="checkbox"/>
Traffic Adapter Index	2	
M3UA Termination Type	IPSP	
RNC	2	
RNC 1		
SCTP Mode	client	
RNC IP Address	192.168.1.31	
RNC GTP IP Address	192.168.12.11	
GTP Port For Traffic	2152	
RNC Port	2905	
PLMN Identifiers		
Mobile Country Code	001	
Mobile Network Code	01	
Location Area Identifiers		
Location Area Code	0001	
Service Area Code	0001	
Routing Area Code	01	
RNC ID	01	
MTP Parameters		
RNC Point Code	1.1.2	
Signaling Link Selection	1	
Network Indicator	International	
RNC Address Indicator	International	
M3UA Routing Context I...	Absent	
M3UA Routing Context	1	
M3UA Network Appearance...	Absent	
M3UA Network Appearance...	12	
SGSN Parameters		

Start Edit

Initialisation Errors Error Event

Profile Configuration

MAPS (Message Automation Protocol Simulation) RNC (UMTS IUPS 3GPP) - [Profile Editor - MS_Profiles]

Configurations Emulator Reports Editor Debug Tools Windows Help

#	Profiles (Edit-F2)	Config	Value	Enable
1	MSProfile0001	MSProfile0001		<input checked="" type="checkbox"/>
2	MSProfile0002	AttachType	GPRS attach	
3	MSProfile0003	Enable Auto SMS	Disable	
4	MSProfile0004	Mobile Identity		
5	MSProfile0005	Type Of Identity	IMSI	
6	MSProfile0006	IMSI	001013014041741	
7	MSProfile0007	IMEI	012345678902132	
8	MSProfile0008	PTMSI	12340001	
9	MSProfile0009	MSISDN		
10	MSProfile0010	Called Number	6597002548	
11	MSProfile0011	Calling Number	6597002542	
12	MSProfile0012	Authentication Configuration		
13	MSProfile0013	Authentication Key	0123456789abcdef0123456789abc...	
14	MSProfile0014	Operator Variant Parameter Type	OP	
15	MSProfile0015	OPc	01020304050607080910111213141...	
16	MSProfile0016	OP	01020304050607080910111213141...	
17	MSProfile0017	Authentication Algorithm Type	Milenage	
18	MSProfile0018	Location Area Identifiers		
19	MSProfile0019	Location Area Code	0001	
20	MSProfile0020	Service Area Code	0001	
21	MSProfile0021	Routing Area Code	01	
		RNC ID	2	
		Old Routing Area information		
		SMS Call Parameters		
		PDP Context Parameters		
		Traffic Parameters		
		Mobile Traffic Parameters		

Insert Delete Clear

Add Insert Delete Properties

Initialisation Errors Error Events Captured Errors

Incoming Call Handler Configuration

The screenshot displays the MAPS (Message Automation Protocol Simulation) RNC (UMTS IUPS 3GPP) - [Incoming Call Handlers Configuration - default] window. The window title bar includes the GL logo and the text "MAPS (Message Automation Protocol Simulation) RNC (UMTS IUPS 3GPP) - [Incoming Call Handlers Configuration - default]". The menu bar contains "Configurations", "Emulator", "Reports", "Editor", "Debug Tools", "Windows", and "Help". The toolbar includes icons for various functions such as settings, help, and file operations.

The main area is divided into two panes. The left pane contains a table with the following data:

Message Name	Script Name
ASP Up	M3UA.gls
ASP Down	M3UA.gls
ASP Active	M3UA.gls
ASP Inactive	M3UA.gls
Reset	M3UA.gls
SSP subsystem-prohibited	SCMG.gls
SST subsystem-status-test	SCMG.gls
SDR subsystem-out-of-service-request	SCMG.gls
RelocationRequest	CallControl_Attach.gls
Paging	CallControl_Attach.gls

The right pane is titled "Scripts" and contains a list of scripts, with "CallControl_Attach.gls" selected. Below the list are radio buttons for "Sequence" (selected) and "Random". There are also "Up" and "Down" buttons for navigating the list.

At the bottom of the window, there are "Add" and "Delete" buttons, and a status bar with three indicators: "Initialisation Errors", "Error Events", and "Captured Errors".

Global Configuration

The screenshot shows the Global Configuration window in MAPS. The window title is "MAPS (Message Automation Protocol Simulation) RNC (UMTS IUPS 3GPP) - [Global Configurati...". The menu bar includes "Configurations", "Emulator", "Reports", "Editor", "Debug Tools", "Windows", and "Help". The toolbar contains various icons for file operations and simulation control.

The main area displays a tree view of configuration parameters under "Global Configuration". The parameters are listed in a table with columns "Config" and "Value".

Config	Value
Global Configuration	
Call Parameters	
Detach Timer in msec	2
ActivatePDPContext in msec	2
Session Duration in msec	60000
User Inactivity Timer in msec	360000
Inter Call Duration in msec	100
Randomization Parameters	
Enable Randomization in msec	Disable
Distribution Type	Uniform Distribution
Minimum SessionDuration in msec	10000
Maximum SessionDuration in msec	60000
Minimum InterCallDuration in msec	1000
Maximum InterCallDuration in msec	3000
Simulate Requested PDP Context Activation Fa...	
SCMG Timers	
SCCP Timers	
Tiar Timer in msec	360000
Tias Timer in msec	110000
M3UA Parameters	
M3UA Specific Timers	
Relocation Timers	
IuPS Specific Timers	
T3310 in msec	15000
T3321 in msec	15000
T3380 in msec	30000
T3390 in msec	8000
T3330 in msec	15000

On the right side of the window, there is a checkbox labeled "Enable" which is checked. At the bottom right, there are "Apply" and "Edit" buttons. At the bottom of the window, there are two status indicators: "Initialisation Errors" and "Error Events".

IuPS over IP Call Generation

Active Calls Call Status Call Events

Loading Scripts and Profiles

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Ev...	Result	Total Iterations	Completed Iterations
1	CallControl_Attach.gls	MSPProfile0001		Stop		None		Pass	1	0
2	CallControl_Attach.gls	MSPProfile0002		Start		None		Pass	1	0
3	CallControl_Attach.gls	MSPProfile0003		Start		None		Pass	1	0

Time	Direction	Message
17:30:22.798000	RNC → SGSN	ATTACH REQUEST
17:30:22.816000	SGSN → RNC	CC connection confirm
17:30:22.816000	RNC → SGSN	AUTHENTICATION AND CIPHERING REQ
17:30:22.817000	SGSN → RNC	AUTHENTICATION AND CIPHERING RESP
17:30:22.835000	RNC → SGSN	SecurityModeCommand
17:30:22.836000	SGSN → RNC	SecurityModeComplete
17:30:22.856000	RNC → SGSN	ATTACH ACCEPT
17:30:22.857000	SGSN → RNC	ATTACH COMPLETE
17:30:22.897000	RNC → SGSN	Activate PDP Context Request
17:30:22.916000	SGSN → RNC	RAB-AssignmentRequest
17:30:22.916000	RNC → SGSN	RAB-AssignmentResponse
17:30:22.936000	SGSN → RNC	Activate PDP Context Accept


```

===== MTP3 User Adaptation Layer =====
0000 Version = 00000001 Release 1.0
0002 Message Class = 00000001 Transfer
0003 Transfer Message Type = 00000001 Payload Data
0004 Message Length = 136 (x00000088)
      Protocol Data
0008 Tag = x0210 Transfer Protocol Data
000A Length = 126 (x007E)
      Originating Point Code
000E Point Code = 3.3.3(..011000 00011011)
      Destination Point Code
0012 Point Code = 4.4.4(..100000 00100100)
0014 Service Indicator = ...0011 SCCP
0015 Network Indicator = .....00 International network
0016 Message Priority = .....01 Priority Code 1
0017 Signalling Link Selection = 1 (x01)

      Parameter Padding = x0000
===== SCCP Layer =====
0018 Message Type = 00000001 CR connection request
      Mandatory Fixed Parameters
      Source Local Reference Parameter
0019 Source Local Reference = 8 (x000008)
      Protocol Class Parameter
001C Class = ...0010 Class 2
001C Message Handling (Class 0 and 1 only) = 0000... No Special Options
001D Pointer to Mandatory Parameter = Parm0 offset x02 (2)
001E Pointer to optional parameters = x06 (6)
    
```

Message Sequence

Decode Message

IuPS over IP Call Reception

MAPS (Message Automation Protocol Simulation) SGSN (UMTS IUPS 3GPP) - [Call Reception]

Sr No	Script Name	Call Info	Script Execution	Status	Events	Results
1	DatabaseHandler.gls		Stop		None	Unknown
2	Check_SCTP_Status.gls		Stop		None	Unknown
3	GTPSessionInit.gls	0	Stop	GTP User Session Started	StopGTP Session	Unknown
4	M3UA.gls	1001	Stop	ASP Active	None	Pass
5	SCMG.gls	1001	Stop	Subsystem-Allowed	None	Pass
6	CallControl_Attach.gls	PTMSI_0x00000002	Stop	GTP-U Mobile-Traffic Started	Stop Traffic	Pass

Message Sequence: RNC ↔ SGSN

- ATTACH REQUEST (RNC to SGSN) 17:30:22.807000
- CC connection confirm (SGSN to RNC) 17:30:22.808000
- AUTHENTICATION AND CIPHERING REQ (RNC to SGSN) 17:30:22.810000
- AUTHENTICATION AND CIPHERING RESP (SGSN to RNC) 17:30:22.826000
- SecurityModeCommand (RNC to SGSN) 17:30:22.826000
- SecurityModeComplete (SGSN to RNC) 17:30:22.846000
- ATTACH ACCEPT (RNC to SGSN) 17:30:22.846000
- ATTACH COMPLETE (SGSN to RNC) 17:30:22.866000
- Activate PDP Context Request (RNC to SGSN) 17:30:22.906000
- RAB-AssignmentRequest (SGSN to RNC) 17:30:22.907000

Decode Message: MTP3 User Adaptation Layer

```
0000 Version = 00000001 Release 1.0
0002 Message Class = 00000001 Transfer
0003 Transfer Message Type = 00000001 Payload Data
0004 Message Length = 136 (x00000088)
Protocol Data =
0008 Tag = x0210 Transfer Protocol Data
000A Length = 126 (x007E)
Originating Point Code =
000E Point Code = 3.3.3(..011000 00011011)
Destination Point Code =
0012 Point Code = 4.4.4(..100000 00100100)
0014 Service Indicator = ....0011 SCCP
0015 Network Indicator = .....00 International network
0016 Message Priority = .....01 Priority Code 1
0017 Signalling Link Selection = 1 (x01)
Pdu = x01000008020206044324208E0404431B188E0F590013405
Parameter Padding = x0000
===== SCCP Layer =====
0018 Message Type = 00000001 CR connection request
Mandatory Fixed Parameters =
Source Local Reference Parameter =
0019 Source Local Reference = 8 (x000008)
Protocol Class Parameter =
001C Class = ....0010 Class 2
```

Call Results

Message Sequence

Decode Message

Events and Traffic Log

Events Log

Date/Time	Captured Events	Call Trace Id	Script Name	Script Id
2015-1-2 10:46:11.414000	Traffic=Enabled		MapsInIt.gls	
2015-1-2 10:46:11.423000	SCTP Up On ConnectionId = 1		Check_SCTP_Status.gls	ProtScriptId_19_1381780118-6442-6740
2015-1-2 10:46:12.475000	ASP UP Sent	1	M3UA.gls	ProtScriptId_21_1381781179-6444-6740
2015-1-2 10:46:12.487000	ASP Acknowledged	1	M3UA.gls	ProtScriptId_21_1381781179-6444-6740
2015-1-2 10:46:12.487000	AS Status Notified	1	M3UA.gls	ProtScriptId_21_1381781179-6444-6740
2015-1-2 10:46:12.497000	ASP Active Ack Received	1	M3UA.gls	ProtScriptId_21_1381781179-6444-6740
2015-1-2 10:46:12.497000	AS Status Notified	1	M3UA.gls	ProtScriptId_21_1381781179-6444-6740
2015-1-2 10:46:12.497000	M3UA Up on ConnectionId = 1		Check_SCTP_Status.gls	ProtScriptId_19_1381780118-6442-6740
2015-1-2 10:46:12.498000	Subsystem-Status-Test	1	SCMG.gls	ProtScriptId_22_1381781201-6445-6740
2015-1-2 10:46:12.511000	Subsystem-Allowed	1	SCMG.gls	ProtScriptId_22_1381781201-6445-6740
2015-1-2 10:46:13.318000	GTP User Traffic Session Started on Task Id :: 2		GTPSessionInit.gls	ProtScriptId_20_1381780122-6443-6740
2015-1-2 10:46:42.723000	MobileStatus=Attached			
2015-1-2 10:46:42.723000	Attach Accepted, GMM Registered			
2015-1-2 10:46:42.839000	RAB Assignemnt Complete			
2015-1-2 10:46:42.853000	PDP Context Accepted			
2015-1-2 10:46:42.854000	FileName = img5a.flixcart.com			
2015-1-2 10:46:42.854000	FileName = ibnlive.in.com			
2015-1-2 10:46:42.855000	FileName = icdn.raaga.com			
2015-1-2 10:46:42.855000	GTP-U Mobile-Traffic Started			
2015-1-2 10:46:45.949000	GTPTEID 2 MICConnectionID 2 EventType TrafficS			
2015-1-2 10:46:45.949000	GTPTEID 2 MICConnectionID 3 EventType TrafficS			
2015-1-2 10:46:45.953000	GTPTEID 2 MICConnectionID 4 EventType TrafficS			

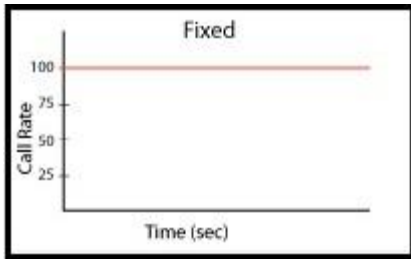
Traffic Log

```
Connected: client #916 at 127.0.0.1
916(1): end tasks on disconnect;
916(2): run task "MobileIpCoreSrv:StartServer ";
512(3): inform task "CONFIGURE Server HTTP 0 GTP 192.168.15.2 2152 192.168.15.4 2152 ";
512(4): inform task "CREATESERVER 192.168.48.60 80 ";
512(5): inform task "ADDGTPSTREAM 192.168.12.1 2 ";
916(3): inform task "CONFIGURE Client HTTP 0 GTP 192.168.15.4 2152 192.168.15.2 2152 ";
512(9): inform task "ADDGTPSTREAM 192.168.12.5 6 ";
916(12): inform task "ADDGTPSTREAM 192.168.12.5 6 ";
916(13): inform task "ADDCONNECTION 6 5 192.168.48.160 80 192.168.12.5 img5a.flixcart.com ";
916(14): inform task "DELETECONNECTION 6 5 ";
512(10): inform task "DELETEDGTPSTREAM 192.168.12.5 6 ";
```

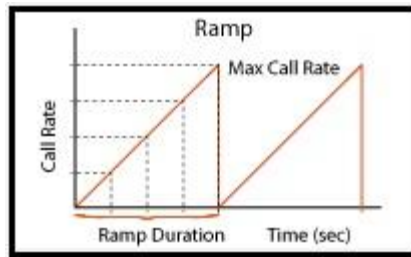
Load Generation

- 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.

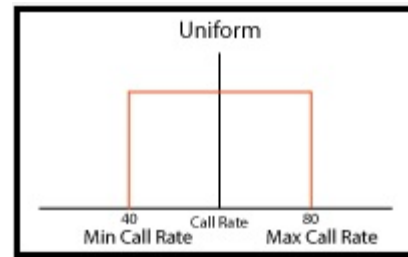
Fixed



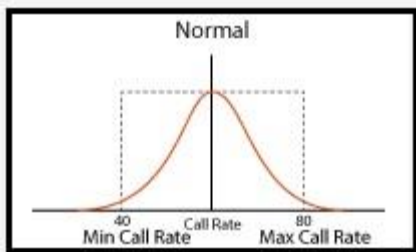
Ramp



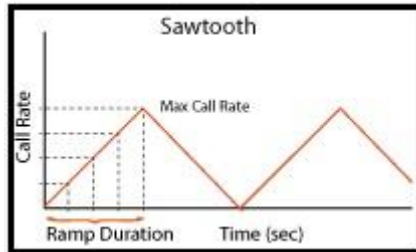
Uniform



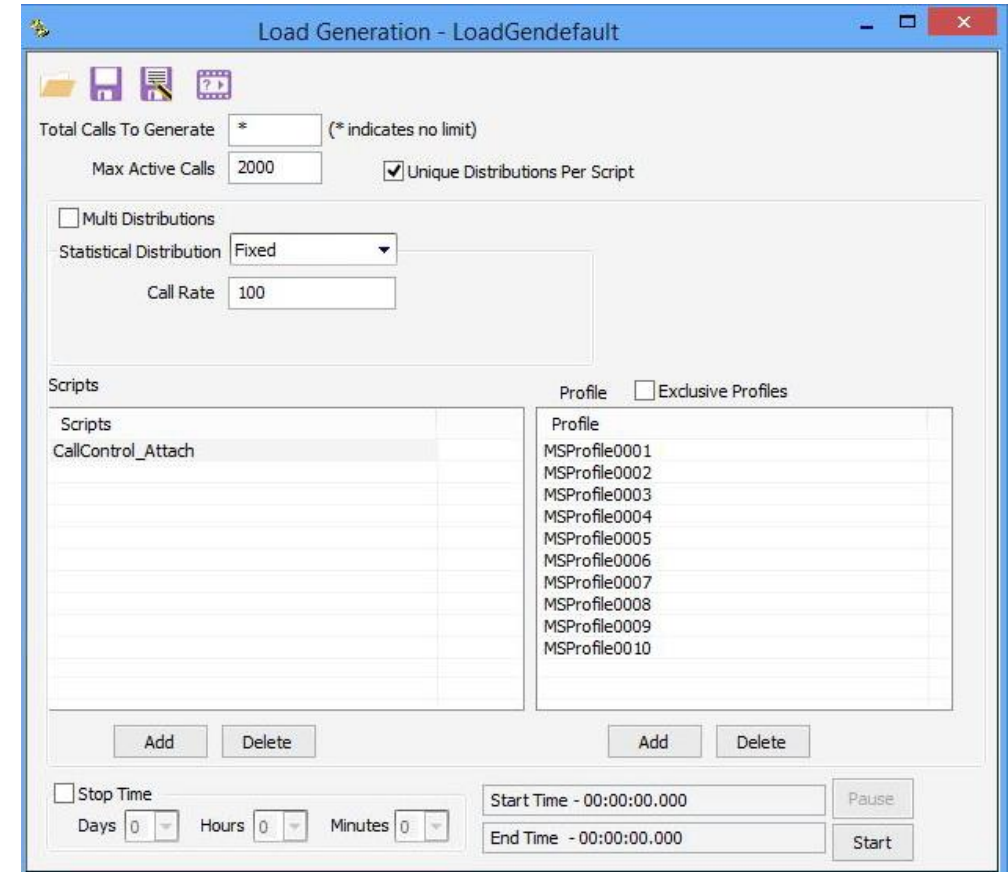
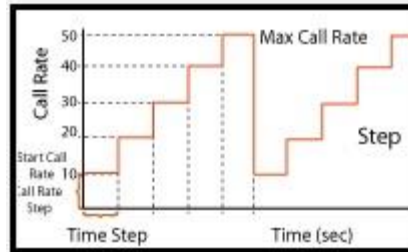
Normal



Saw-tooth



Step



Bulk Call Generation

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Ev...	Result	Total Iterations	Completed Iterations
1	CallControl_Attach.gls	MSPProfile0001		Start		None		Unknown	10	0
2	CallControl_Attach.gls	MSPProfile0002		Start		None		Unknown	10	0
3	CallControl_Attach.gls	MSPProfile0003		Start		None		Unknown	10	0
4	CallControl_Attach.gls	MSPProfile0004		Start		None		Unknown	10	0
5	CallControl_Attach.gls	MSPProfile0005		Start		None		Unknown	10	0
6	CallControl_Attach.gls	MSPProfile0006		Start		None		Unknown	10	0
7	CallControl_Attach.gls	MSPProfile0007		Start		None		Unknown	10	0
8	CallControl_Attach.gls	MSPProfile0008		Start		None		Unknown	10	0
9	CallControl_Attach.gls	MSPProfile0009		Start		None		Unknown	10	0
10	CallControl_Attach.gls	MSPProfile0010		Start		None		Unknown	10	0

View Executing Line

Script Contents

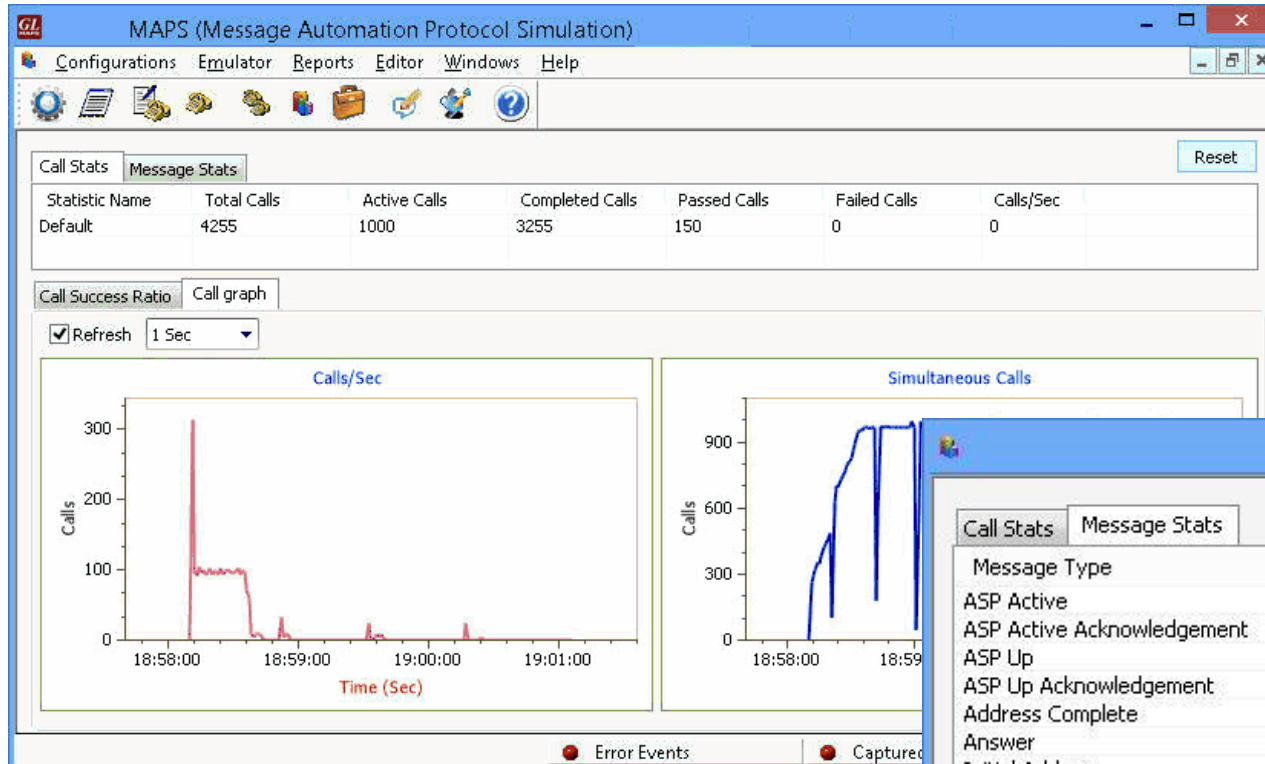
```
ActivatePDPContextTimeout = $_ActivatePDPContextTimeout;  
DetachTimeOut=$_DetachTimeOut;  
SessionTimeOut=$_SessionTimeOut;  
CallDurationTimer = "Idle";  
InterCallDuration = $_InterCallDuration;  
DistributionType = $_DistributionType;  
UserInactTimeOut=$_UserInactTimeOut;  
TrafficState="Null";  
IsReception=0;  
TxCount=0;  
RxCount=0;  
nFileCount=0;  
File_TxCount=0;  
File_RxCount=0;
```

Scripts | Message Sequence | Event Config | Script Flow | Capture Events

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

Call and Message Statistics

Call Statistics



Message Statistics

The screenshot shows the "Statistics" window in the MAPS software. The title bar reads "Statistics". The window contains a table with the following data:

Message Type	Tx Count	Rx Count	Retransmit Count
ASP Active	1	0	0
ASP Active Acknowledgement	0	1	0
ASP Up	1	0	0
ASP Up Acknowledgement	0	1	0
Address Complete	174	0	0
Answer	174	0	0
Initial Address	0	174	0
Notify	0	2	0
Release	0	146	0
Release Complete	177	31	0
Reset Circuit	31	31	0

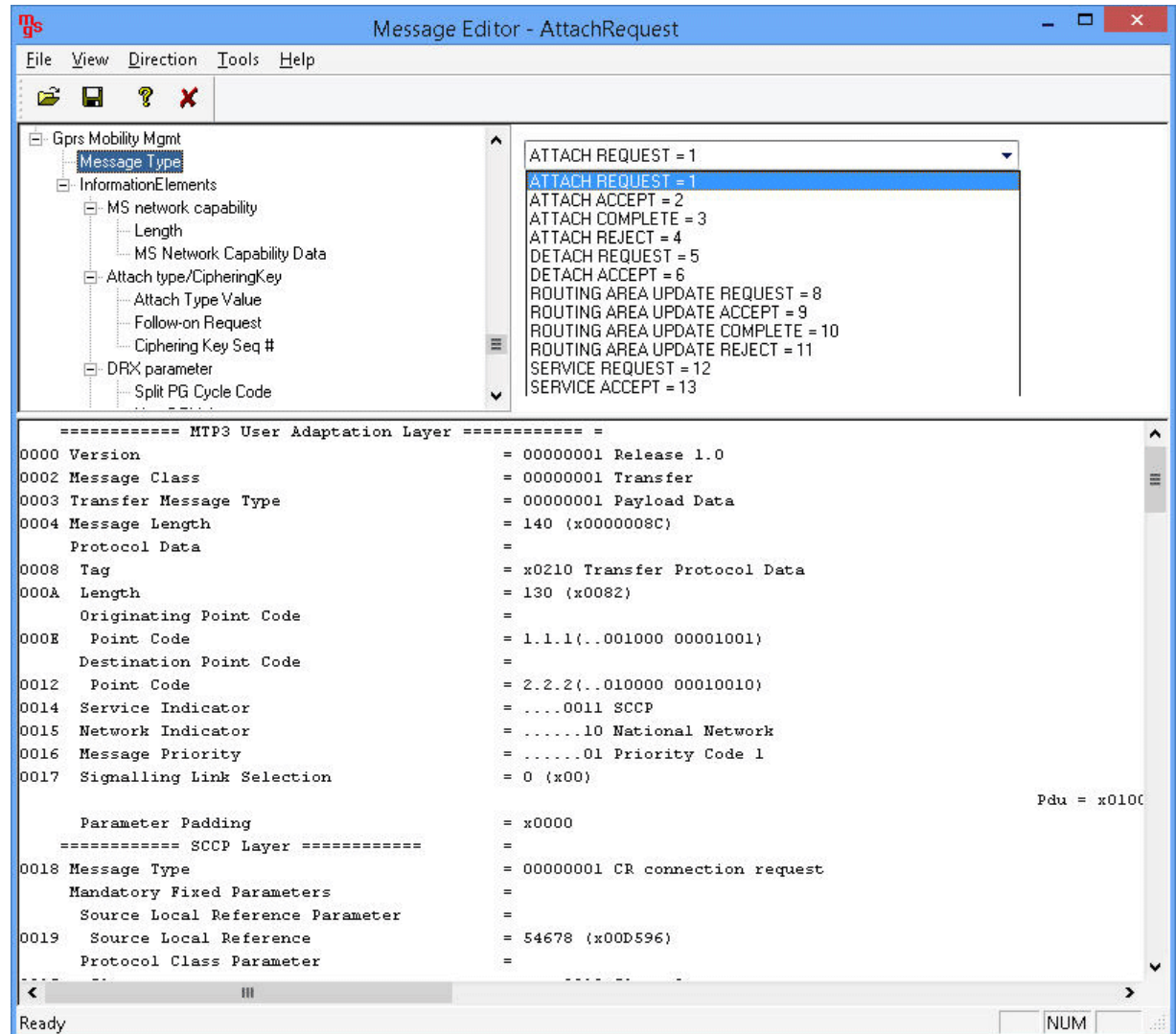
Customizations - Call Flow (Scripts)

- 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, i.e., if you place 500 calls in parallel you will actually have 500 script instances running at once. If you place 500 calls in series the same script will execute and terminate 500 times
- It is possible to create your own scripts, but almost never necessary! We attempt to provide all necessary scripts out of the box

```
1 //-----Initializing Parameters-----
2 ActivatePDPContextTimeout = $_ActivatePDPContextTimeout;
3 DetachTimeOut=$_DetachTimeOut;
4 SessionTimeOut=$_SessionTimeOut;
5 CallDurationTimer = "Idle";
6 InterCallDuration = $_InterCallDuration;
7 DistributionType = $_DistributionType;
8 UDPSrcPort=$_UDPSrcPort;
9 UDPDstPort=$_UDPDstPort;
10 IsReception=0;
11 ReqPDPActRejectCause=$_RejectCause;
12 TxCount=0;
13 RxCount=0;
14 nFileCount=0;
15 File_TxCount=0;
16 File_RxCount=0;
17 DeleteConnection="Null";
18 Traffic="Unsuccessful";
19 TrafficStatus="Null";
20 EndUserIPAddress="0.0.0.0";
21 PDPState="Null";
22 RoutingTimer="NotSet";
23 RelocState="Null";
```

Customizations - Protocol Messages

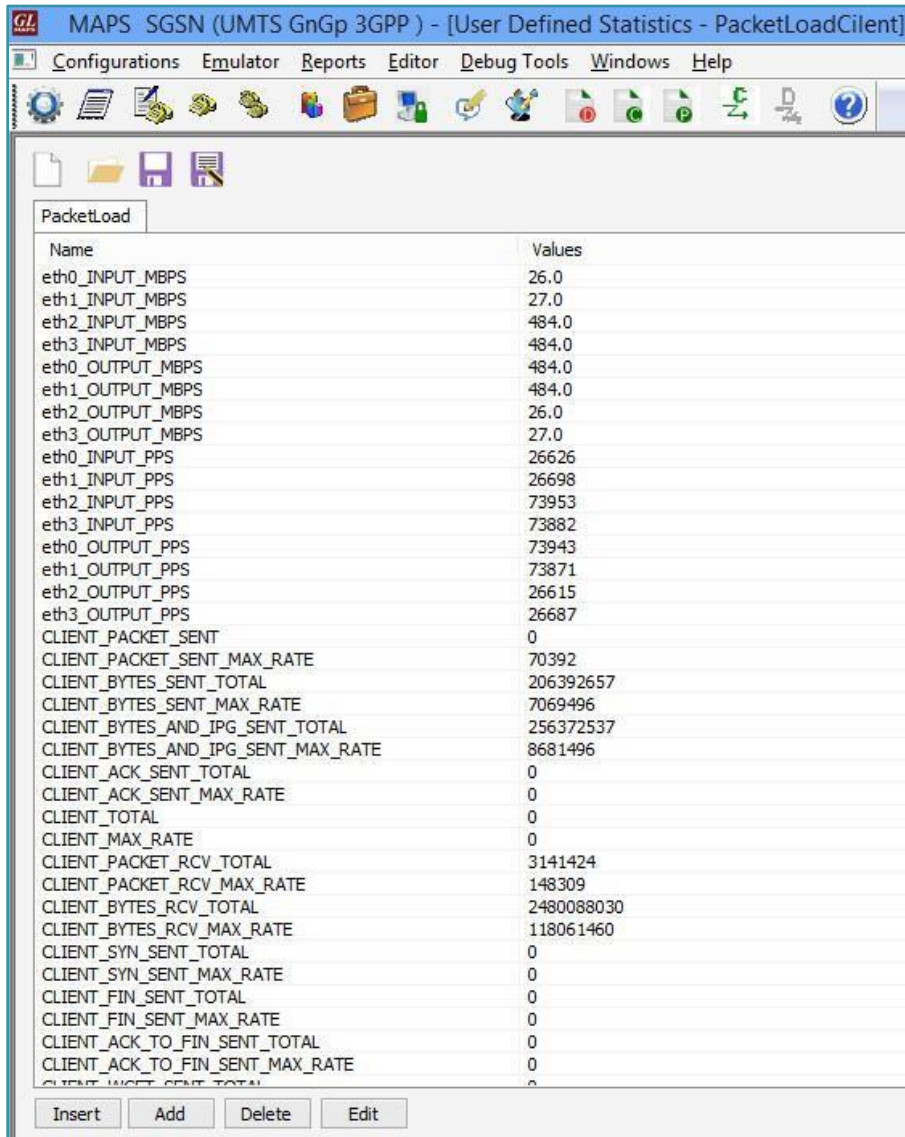
- When the script actually sends a message it does so by loading a hdl file template from disk (“AttachRequest.hdl” in the right-hand screenshot)
- These message templates provide the actual structure of the message, the script simply populates it with values contained in its variables
- These messages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



The screenshot shows the 'Message Editor - AttachRequest' window. The left pane displays a tree view under 'Gprs Mobility Mgmt' with 'Message Type' selected. The right pane shows a list of message types, with 'ATTACH REQUEST = 1' selected. The main area displays the message structure in a key-value format:

```
===== MTP3 User Adaptation Layer ===== =
0000 Version = 00000001 Release 1.0
0002 Message Class = 00000001 Transfer
0003 Transfer Message Type = 00000001 Payload Data
0004 Message Length = 140 (x0000008C)
Protocol Data =
0008 Tag = x0210 Transfer Protocol Data
000A Length = 130 (x0082)
Originating Point Code =
000E Point Code = 1.1.1(..001000 00001001)
Destination Point Code =
0012 Point Code = 2.2.2(..010000 00010010)
0014 Service Indicator = ....0011 SCCP
0015 Network Indicator = .....10 National Network
0016 Message Priority = .....01 Priority Code 1
0017 Signalling Link Selection = 0 (x00)
Pdu = x0100
Parameter Padding = x0000
===== SCCP Layer =====
0018 Message Type = 00000001 CR connection request
Mandatory Fixed Parameters =
Source Local Reference Parameter =
0019 Source Local Reference = 54678 (x00D596)
Protocol Class Parameter =
```

Packet Statistics and Reports



TCP/IP	<ul style="list-style-type: none"> • SYN , SYN_ACK • ACK, FIN, RST • HTTP POST / RESPONSE • TCP/IP Checksum Errors
PCAP Replay	Packets Sent and Received
UDP	Packets Sent and Received
URL	<ul style="list-style-type: none"> • Connections Established • FW Addresses Not Blocked • URL HTTP Wrong Response RX

Thank you