
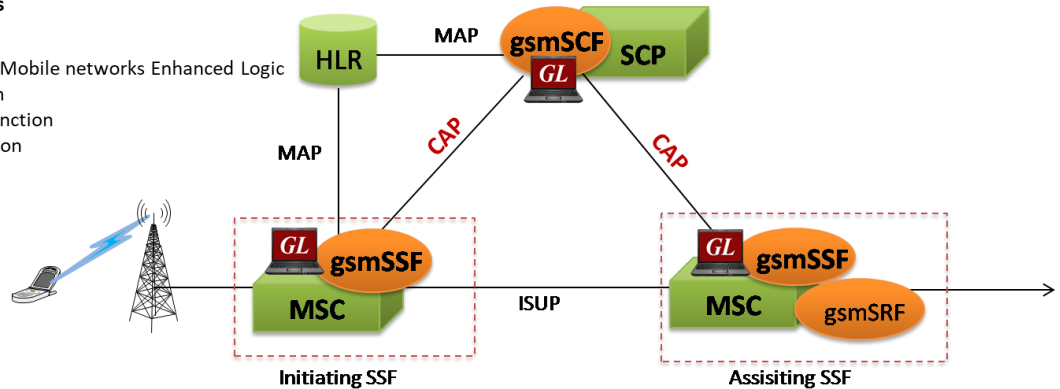


# MAPS™ CAP Emulator (over TDM,ATM, IP)

## (CAMEL Application Part)

 MAPS™ CAP Emulator (over TDM(ATM)/IP)  
in GSM, GPRS, UMTS Networks

CAP -> CAMEL Application Part  
CAMEL -> Customized Applications for Mobile networks Enhanced Logic  
gsmSCF -> GSM Service Control Function  
gsmSRF -> GSM Specialized Resource Function  
gsmSSF -> GSM Service Switching Function



## Overview

GL's MAPS™ CAP can emulate CAMEL Application Part (CAP) supplementary services such as unified messaging, prepaid, low balance, and toll-free (Freephone). CAMEL services are available in TDM, ATM and IP based GSM, GPRS, UMTS networks. CAP information flow is defined between functional entities such as Service Control Function (SCF) and Service Switching Function (SSF) entities. It is suitable for controlling telecommunication services. CAP is transported over Message Transfer Protocol (MTP) in TDM ATM and M3UA, M2PA in IP.

MAPS™ CAP ATM uses SSCOP server for establishing SSCOP links over which IN signaling will be carried further for making calls. SSCOP Server is GL's WCS based server module and provides SSCOP, and AAL5 layer services. It uses AAL5 Traffic Generator for traffic generation. Various traffic types such as Tone, Digits and File playback are supported.

The tester supports testing network elements SSF and SCF, error tracking, regression testing, conformance testing, and load testing/call generation. It can run pre-defined test scenarios against CAP interface test objects in a controlled and deterministic manner.

MAPS™ CAP emulator supports powerful utilities such as Message Editor, Script Editor, and Profile Editor which allow new scenarios to be created or existing scenarios to be modified using CAP messages and parameters.

For more information, please visit [MAPS™ CAP Protocol Emulator](#) webpage.

## Main Features

- CAP protocol simulation over TDM, ATM (T1/E1) and over IP based GSM, GPRS, UMTS networks
- Supports 3GPP variant of CAP protocol over GSM, ATM, GPRS, UMTS
- CAP messages are conveyed as the component part of TCAP messages
- Supported Procedures –
  - Apply Charging for GSM call sessions
  - Apply Charging GPRS sessions for Data transfer
  - Connect to Resource
  - Establish Temporary Connection
  - Check Balance
  - CAMEL SMS, Toll free and Initiate Call Attempt (ICA) Service
- Scripted call generation and call reception
- Access to all MTP3, M3UA, M2PA, SCTP, SCCP, and CAP protocol fields such as Routing Number, Called Party Number and more
- User controlled access to optional parameters such as timers
- Test Service Usage Charging for Voice, Data, SMS, etc
- Cost-of-call verification through balance check
- Test Premium Calling and Toll-Free Services

 **GL Communications Inc.**

818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A  
(Web) [www.gl.com](http://www.gl.com) - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) [info@gl.com](mailto:info@gl.com)

## Test Bed Setup Configuration

Test Bed Setup provides options to establish communication between MAPS™ CAP and the DUT.

MAPS™ CAMEL TDM/ATM includes MTP signalling configuration, Source and Destination Node Point Code, Subsystem Number, and End-user configurations.

MAPS™ CAMEL IP includes SCTP layer parameters configuration to transmit and receive CAP messages over M3UA and M2PA transport layers.

Once the testbed setup is configured properly, CAMEL messages can be transmitted and received over MTP, M3UA, M2PA layers. Default profile is used to configure MAPS™ CAP Emulator as end terminals SCF and/or SSF.

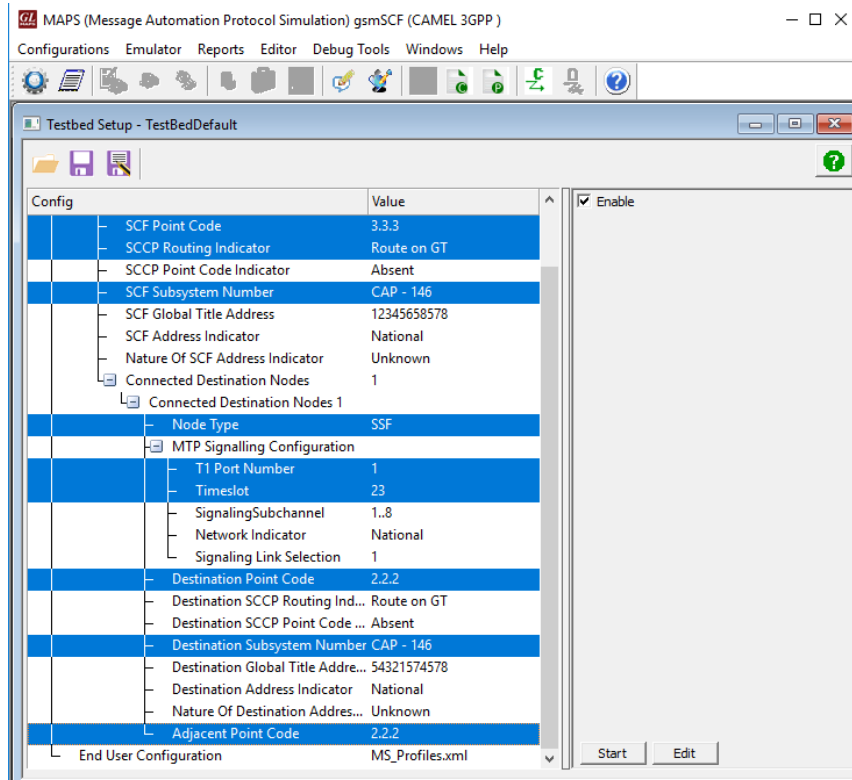


Figure: Testbed Setup Configuration over T1 E1

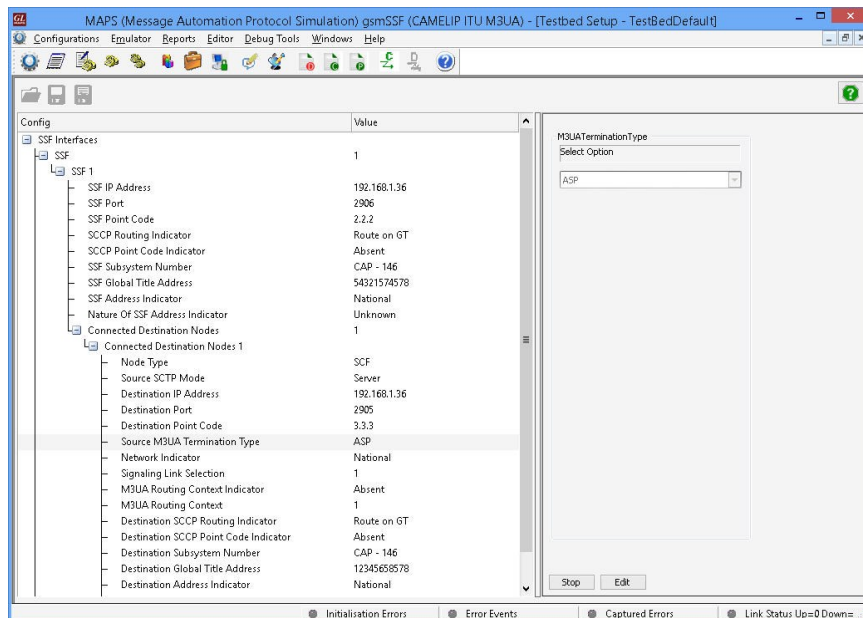
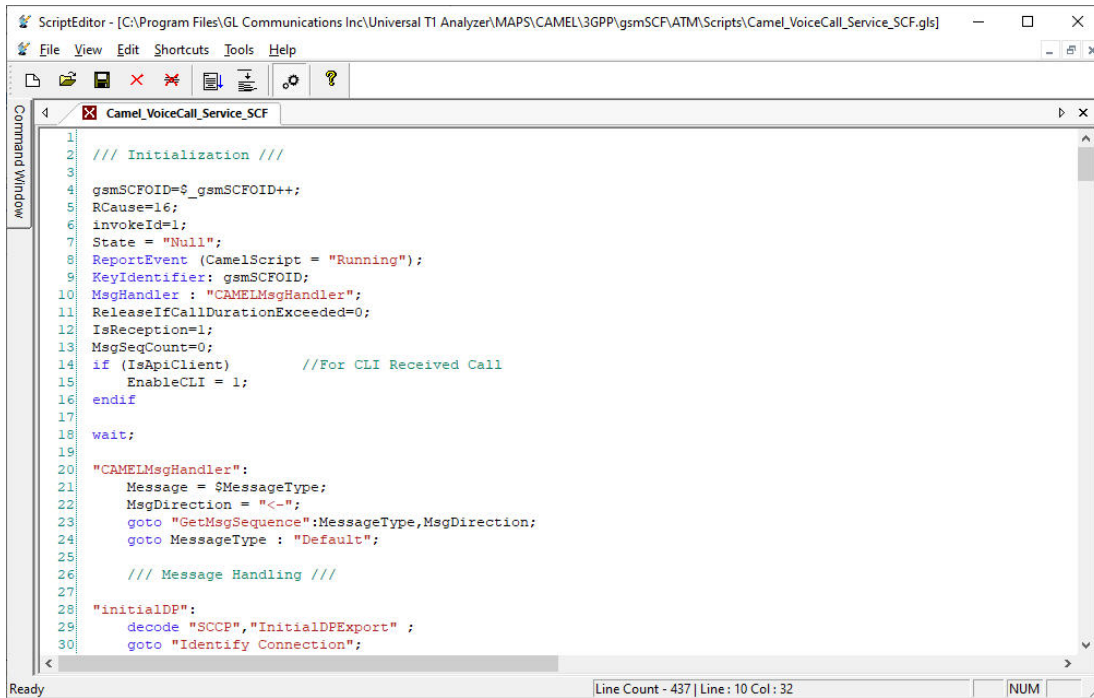


Figure: Testbed Setup Configuration over IP

## Pre-processing Tools

**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.



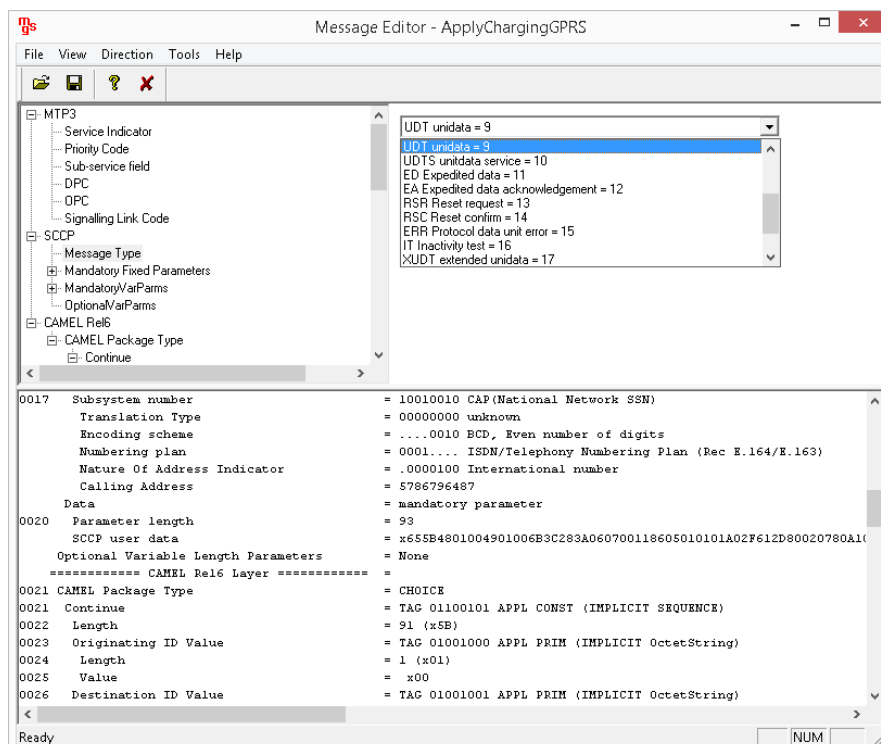
```

ScriptEditor - [C:\Program Files\GL Communications Inc\Universal T1 Analyzer\MAPS\CAMEL\3GPP\gsmSCF\ATM\Scripts\Camel_VoiceCall_Service_SCF.gls]
File View Edit Shortcuts Tools Help
Command Window
Camel_VoiceCall_Service_SCF
1
2 /// Initialization ///
3
4 gsmSCFOID=$_gsmSCFOID++;
5 RCause=16;
6 invokeId=1;
7 State = "Null";
8 ReportEvent (CamelScript = "Running");
9 KeyIdentifier: gsmSCFOID;
10 MsgHandler : "CAMELMsgHandler";
11 ReleaseIfCallDurationExceeded=0;
12 IsReception=1;
13 MsgSeqCount=0;
14 if (IsApiClient) //For CLI Received Call
15 EnableCLI = 1;
16 endif
17
18 wait;
19
20 "CAMELMsgHandler":
21 Message = $MessageType;
22 MsgDirection = "<-";
23 goto "GetMsgSequence":MessageType,MsgDirection;
24 goto MessageType : "Default";
25
26 /// Message Handling ///
27
28 "InitialDP":
29 decode "SCCP","InitialDPExport" ;
30 goto "Identify Connection";
Line Count - 437 | Line: 10 Col: 32
NUM

```

Figure: Script Editor

**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, and optional variable parameters.



Message Editor - ApplyChargingGPRS

File View Direction Tools Help

- MTP3
  - Service Indicator
  - Priority Code
  - Sub-service field
  - DPC
  - OPC
  - Signalling Link Code
- SCCP
  - Message Type
  - Mandatory Fixed Parameters
  - Mandatory/VarParams
  - Optional/VarParams
- CAMEL Rel6
  - CAMEL Package Type
  - Continue

UDT unidata = 9  
 UDT unidata = 9  
 UDT5 unidata service = 10  
 ED Expedited data = 11  
 EA Expedited data acknowledgement = 12  
 RSR Reset confirm = 13  
 ERR Protocol data unit error = 15  
 IT Inactivity test = 16  
 XUDT extended unidata = 17

0017 Subsystem number = 10010010 CAP(National Network SSN)  
 Translation Type = 00000000 unknown  
 Encoding scheme = ...0010 BCD, Even number of digits  
 Numbering plan = 0001... ISDN/Telephony Numbering Plan (Rec E.164/E.163)  
 Nature Of Address Indicator = .0000100 International number  
 Calling Address = 5786796487  
 Data = mandatory parameter  
 0020 Parameter length = 93  
 SCCP user data = x655B4801004901006B3C283A060700118605010101A02F612D80020780A1  
 Optional Variable Length Parameters = None  
 ===== CAMEL Rel6 Layer =====  
 0021 CAMEL Package Type = CHOICE  
 0021 Continue = TAG 01100101 APPL CONST (IMPLICIT SEQUENCE)  
 0022 Length = 91 (x5E)  
 0023 Originating ID Value = TAG 01001000 APPL PRIM (IMPLICIT OctetString)  
 0024 Length = 1 (x01)  
 0025 Value = x00  
 0026 Destination ID Value = TAG 01001001 APPL PRIM (IMPLICIT OctetString)

Ready NUM

Figure: Message Editor

**PROFILE EDITOR** - The profile editor 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.

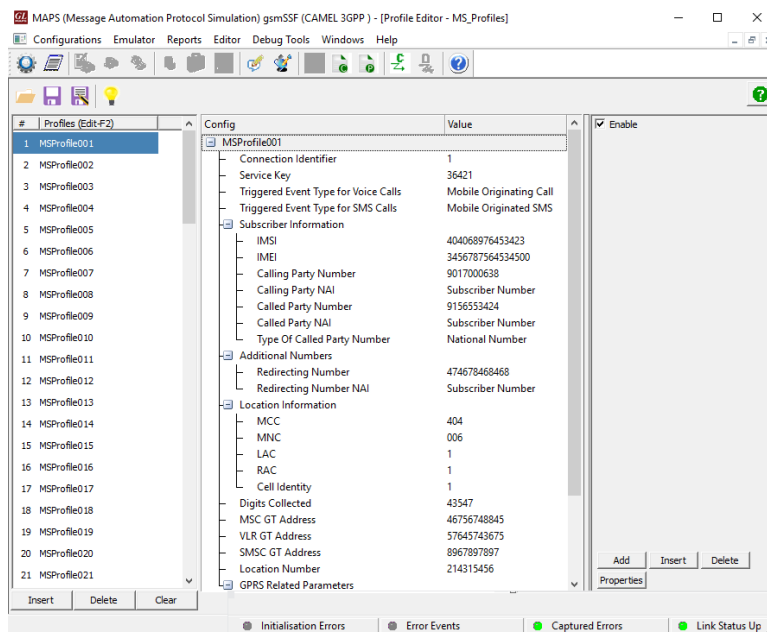


Figure: Profile Editor

## Call Generation and Call Reception

In call generation, MAPS™ CAP is configured for the out going messages, while in call receive mode, it is configured to respond to incoming messages. Tests can be configured to run once, multiple iterations and continuously. Also, allows users to create multiple entries using quick configuration feature.

The editor allows to run the added scripts sequentially (order in which the scripts are added in the window) or randomly (any script from the list of added script as per the call flow requirements).

The test scripts may be started manually or they can be automatically triggered by incoming messages.

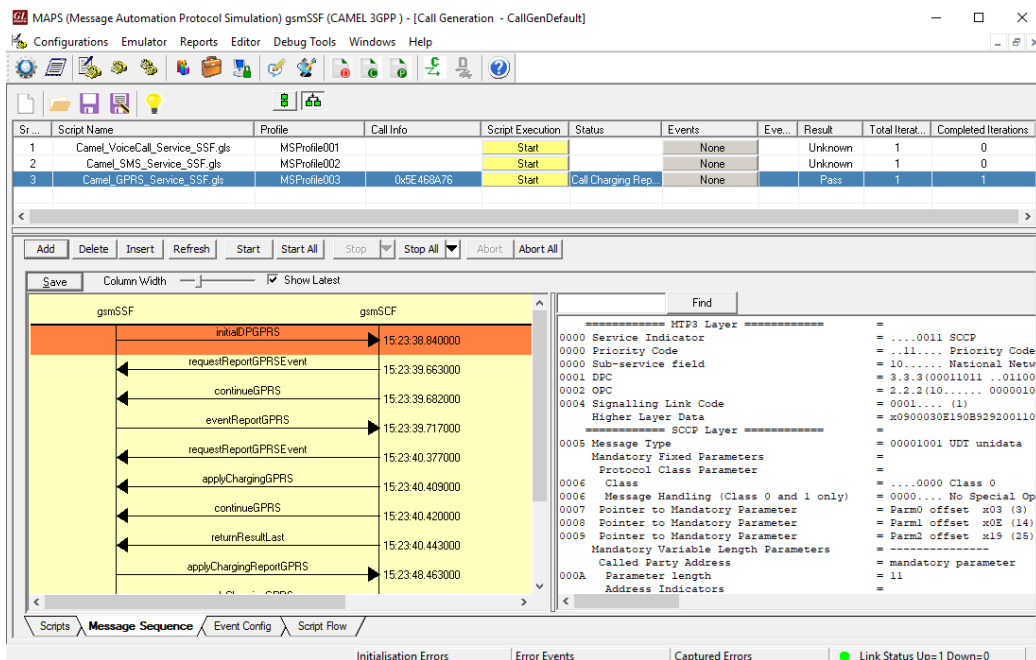


Figure: Call Generation

## Call Generation and Call Reception

The screenshot displays the 'Call Reception' window in MAPS. At the top, there is a table with columns: Sr No, Script Name, Profile, Call Info, Script Execution, Status, Events, Event..., and Results. The table contains three rows of call data.

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Event...	Results
1	SLTM.gls		3.3.3.2.2.1	Stop	MTP3 Active	Initiate SLTM		Pass
2	SCMG.gls		1	Stop	Subsystem-Allowed	Initiate SST		Pass
3	Camel_GPRS_Service_SCF.gls	MSProfile003	0xE5C09CF5	Completed	GPRS Call Released	None		Pass

Below the table, there is a 'Message Sequence' diagram showing the flow of messages between 'gsmSSF' and 'gsmSCF'. The diagram includes messages like 'initialDPGPRS', 'requestReportGPRSEvent', 'continueGPRS', 'eventReportGPRS', 'applyChargingGPRS', and 'returnResultLast' with their respective timestamps.

On the right side of the diagram, there is a 'Find' window showing a detailed view of the MTP3 Layer and SSCP Layer parameters, including Service Indicator, Priority Code, Sub-service field, DPC, OPC, Signalling Link Code, and Message Type.

Figure: Call Reception

The screenshot displays the 'Events' window in MAPS. It features an 'Event Log' table with columns: Date/Time, Captured Events, Call Trace Id, Script Name, and Script Id. The table lists various system events and call-related actions.

Date/Time	Captured Events	Call Trace Id	Script Name	Script Id
2019-5-10 15:06:37.595000	Mtp2LinkStatus: OutOfService :1			MTP2
2019-5-10 15:06:37.671000	Mtp2LinkStatus: InitialAlignment :1			MTP2
2019-5-10 15:06:46.179000	Mtp2LinkStatus: AlignedReady :1			MTP2
2019-5-10 15:06:46.896000	Mtp2LinkStatus: InService :1			MTP2
2019-5-10 15:06:46.909000	MTP3 Initiated	3.3.3.2.2.1	SLTM.gls	ProtScriptId-0-1282928946-
2019-5-10 15:06:47.317000	Stream Id = 1	3.3.3.2.2.1	SLTM.gls	ProtScriptId-0-1282928946-
2019-5-10 15:06:47.317000	MTP3 Initiation Requested	3.3.3.2.2.1	SLTM.gls	ProtScriptId-0-1282928946-
2019-5-10 15:06:47.324000	MTP3 Activated	3.3.3.2.2.1	SLTM.gls	ProtScriptId-0-1282928946-
2019-5-10 15:06:47.368000	Subsystem-Status-Test	1	SCMG.gls	ProtScriptId-1-1282938984-
2019-5-10 15:06:47.528000	MTP3 Activated	3.3.3.2.2.1	SLTM.gls	ProtScriptId-0-1282928946-
2019-5-10 15:06:47.633000	Subsystem-Allowed	1	SCMG.gls	ProtScriptId-1-1282938984-
2019-5-10 15:06:47.964000	Subsystem-Allowed	1	SCMG.gls	ProtScriptId-1-1282938984-
2019-5-10 15:23:39.346000	CAMEL Services for PDP Context initiated	0xE5C09CF5	Camel_GPRS_Service_SCF....	ProtScriptId-2-1283950991-
2019-5-10 15:23:39.369000	CAMEL Services for PDP Context Establish	0xE5C09CF5	Camel_GPRS_Service_SCF....	ProtScriptId-2-1283950991-
2019-5-10 15:23:40.040000	PDP Context Ack Event Reported	0xE5C09CF5	Camel_GPRS_Service_SCF....	ProtScriptId-2-1283950991-
2019-5-10 15:23:57.357000	Low balance, Call suspended	0xE5C09CF5	Camel_GPRS_Service_SCF....	ProtScriptId-2-1283950991-
2019-5-10 15:23:57.368000	GPRS Call Released	0xE5C09CF5	Camel_GPRS_Service_SCF....	ProtScriptId-2-1283950991-

At the bottom of the window, there is a 'Save Events' dialog box with a 'Clear' button and a checkbox for 'Capture Events to file'.

Figure: Events log

## CAMEL Procedures (over IP and TDM)

MAPS™ CAP emulator can be configured to emulate procedures over IP and TDM. Supported services includes Prepaid Voice Call, Apply Charging GPRS, Low balance Voice Call, Toll-free Call, Initiate Call Attempt (ICA), and Camel SMS.

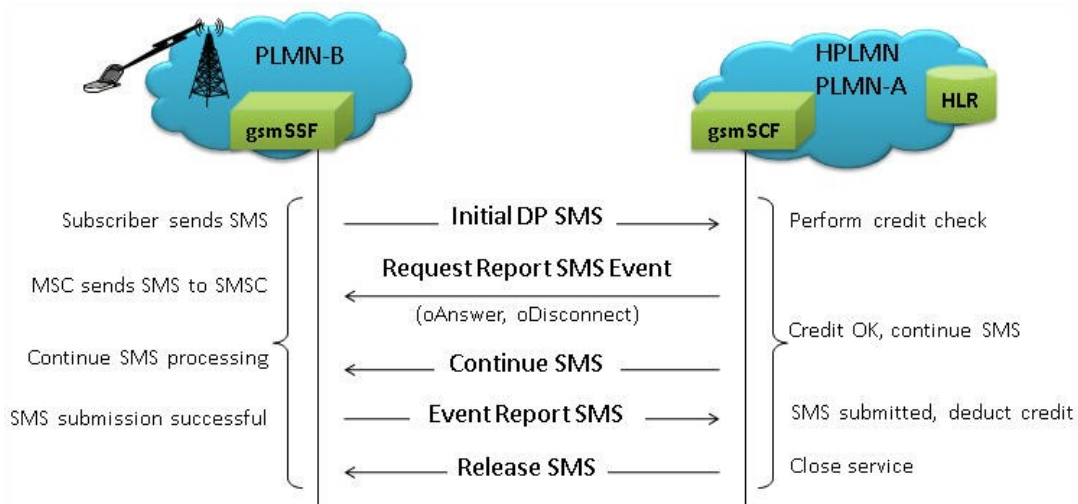


Figure: CAMEL SMS Procedure

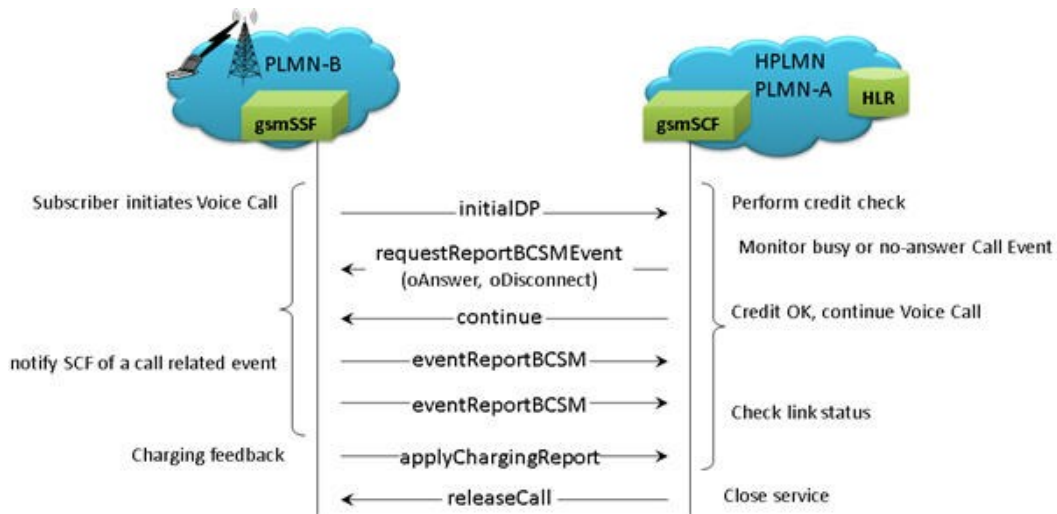


Figure: Prepaid Voice Call Service

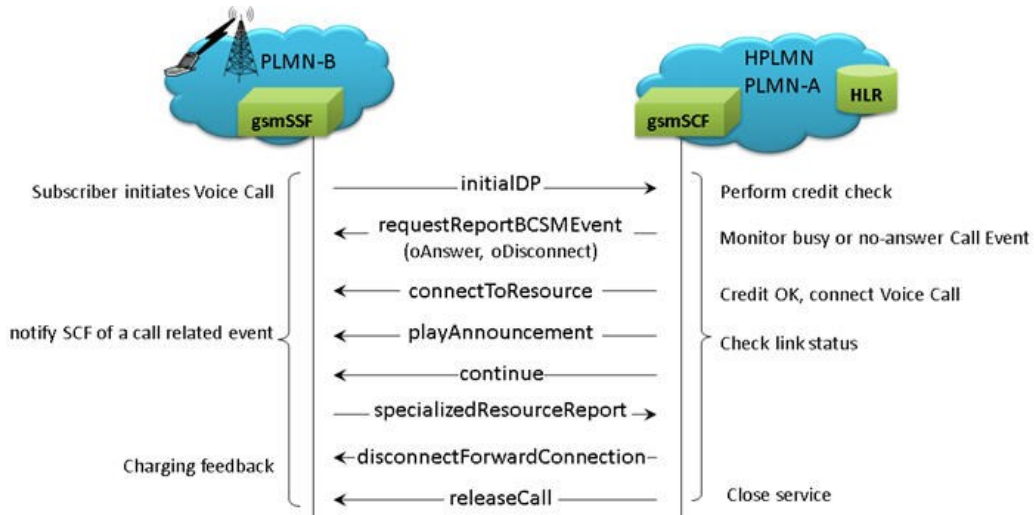


Figure: Low Balance Voice Call Service

## CAMEL Procedures (over IP and TDM)

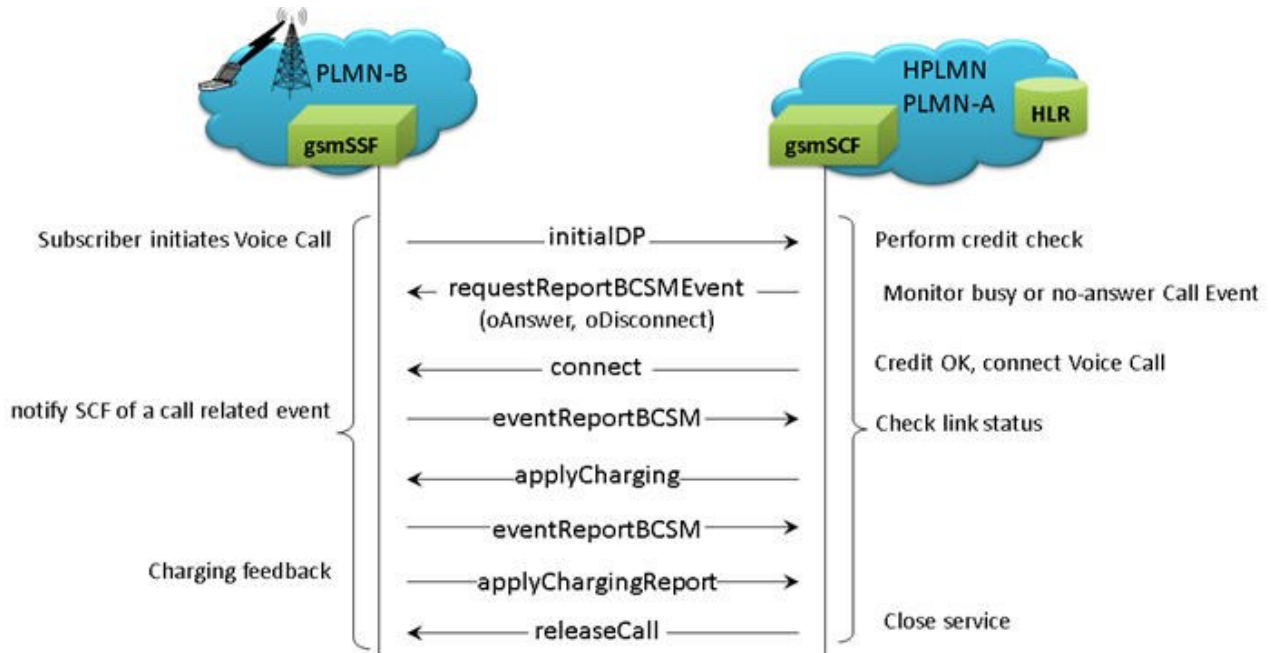


Figure: Toll Free Voice Call Service

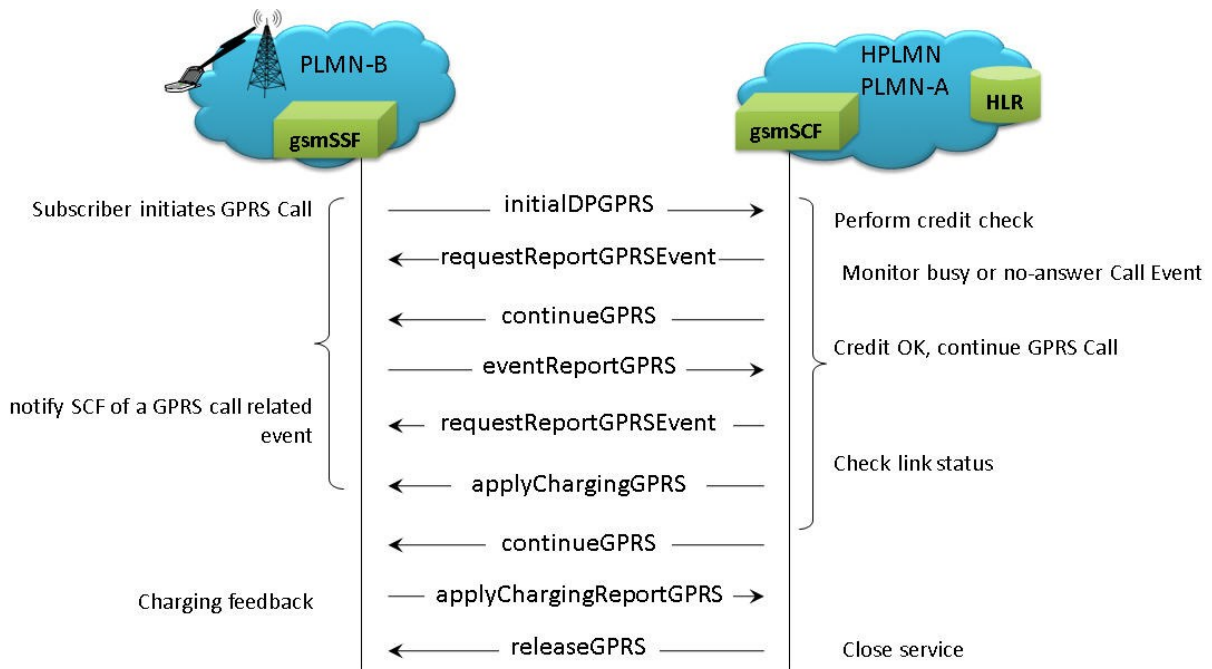
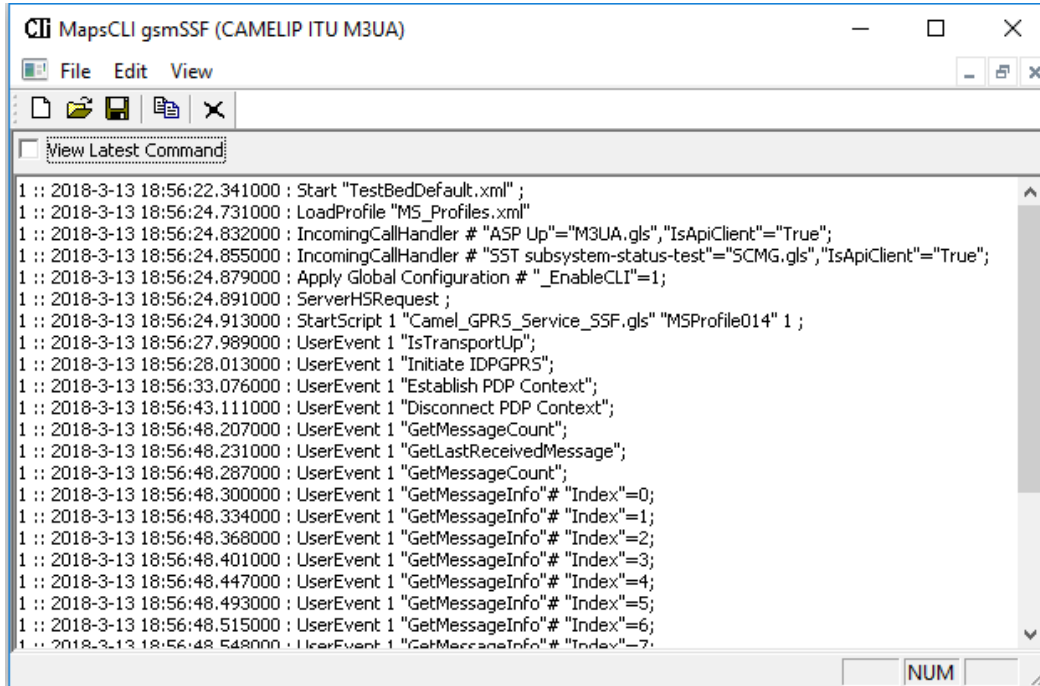


Figure: Camel GPRS Service

## Command Line Interface

MAPS™ can be configured as server-side application, to enable remote controlling of the application through multiple command-line based clients. Supported clients include TCL, Python, VBScript, Java, and .Net.

Clients can remotely perform all call control functions various traffic using commands. This client application is distributed along with MAPS™ Server application.

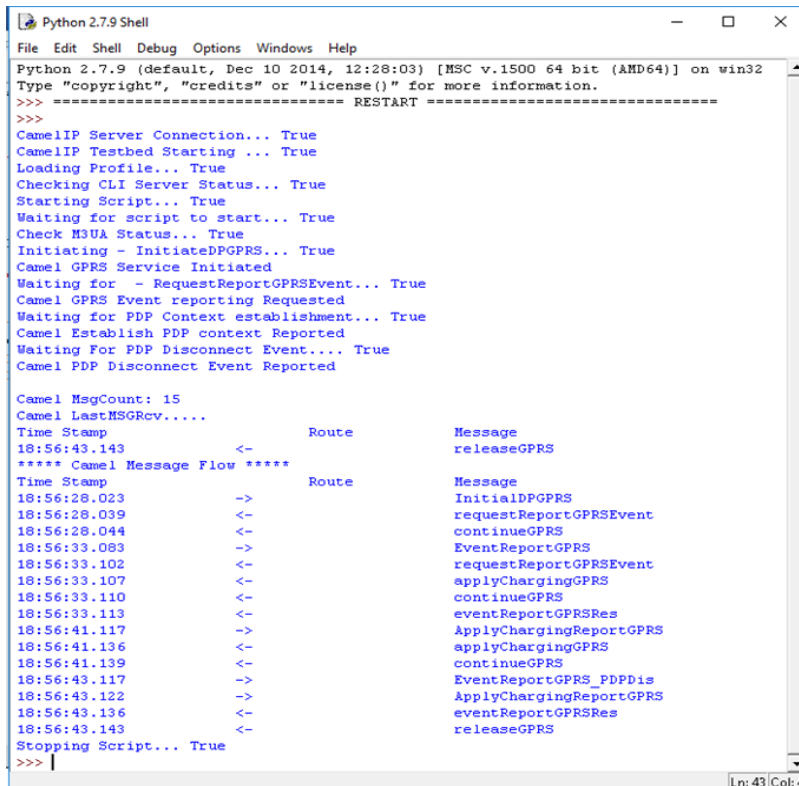


```

CLI MapsCLI gsmSSF (CAMELIP ITU M3UA)
File Edit View
View Latest Command
1 :: 2018-3-13 18:56:22.341000 : Start "TestBedDefault.xml" ;
1 :: 2018-3-13 18:56:24.731000 : LoadProfile "MS_Profiles.xml"
1 :: 2018-3-13 18:56:24.832000 : IncomingCallHandler # "ASP Up"="M3UA.gls", "IsApiClient"="True";
1 :: 2018-3-13 18:56:24.855000 : IncomingCallHandler # "SST subsystem-status-test"="SCMG.gls", "IsApiClient"="True";
1 :: 2018-3-13 18:56:24.879000 : Apply Global Configuration # "_EnableCLI"=1;
1 :: 2018-3-13 18:56:24.891000 : ServerHSRequest ;
1 :: 2018-3-13 18:56:24.913000 : StartScript 1 "Camel_GPRS_Service_SSF.gls" "MSProfile014" 1 ;
1 :: 2018-3-13 18:56:27.989000 : UserEvent 1 "IsTransportUp";
1 :: 2018-3-13 18:56:28.013000 : UserEvent 1 "Initiate IDPGPRS";
1 :: 2018-3-13 18:56:33.076000 : UserEvent 1 "Establish PDP Context";
1 :: 2018-3-13 18:56:43.111000 : UserEvent 1 "Disconnect PDP Context";
1 :: 2018-3-13 18:56:48.207000 : UserEvent 1 "GetMessageCount";
1 :: 2018-3-13 18:56:48.231000 : UserEvent 1 "GetLastReceivedMessage";
1 :: 2018-3-13 18:56:48.287000 : UserEvent 1 "GetMessageCount";
1 :: 2018-3-13 18:56:48.300000 : UserEvent 1 "GetMessageInfo"# "Index"=0;
1 :: 2018-3-13 18:56:48.334000 : UserEvent 1 "GetMessageInfo"# "Index"=1;
1 :: 2018-3-13 18:56:48.368000 : UserEvent 1 "GetMessageInfo"# "Index"=2;
1 :: 2018-3-13 18:56:48.401000 : UserEvent 1 "GetMessageInfo"# "Index"=3;
1 :: 2018-3-13 18:56:48.447000 : UserEvent 1 "GetMessageInfo"# "Index"=4;
1 :: 2018-3-13 18:56:48.493000 : UserEvent 1 "GetMessageInfo"# "Index"=5;
1 :: 2018-3-13 18:56:48.515000 : UserEvent 1 "GetMessageInfo"# "Index"=6;
1 :: 2018-3-13 18:56:48.548000 : UserEvent 1 "GetMessageInfo"# "Index"=7;
NUM

```

Figure: MAPS CLI Server



```

Python 2.7.9 Shell
File Edit Shell Debug Options Windows Help
Python 2.7.9 (default, Dec 10 2014, 12:28:03) [MSC v.1500 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>> ===== RESTART =====
>>>
CamellIP Server Connection... True
CamellIP Testbed Starting ... True
Loading Profile... True
Checking CLI Server Status... True
Starting Script... True
Waiting for script to start... True
Check M3UA Status... True
Initiating - InitiateDPGPRS... True
Camel GPRS Service Initiated
Waiting for - RequestReportGPRSEvent... True
Camel GPRS Event reporting Requested
Waiting for PDP Context establishment... True
Camel Establish PDP context Reported
Waiting For PDP Disconnect Event.... True
Camel PDP Disconnect Event Reported

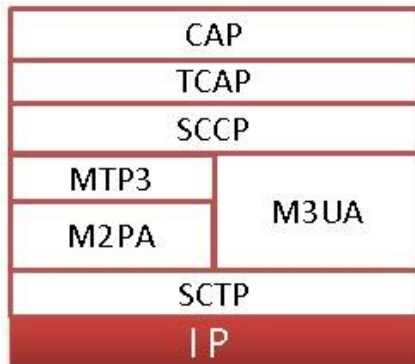
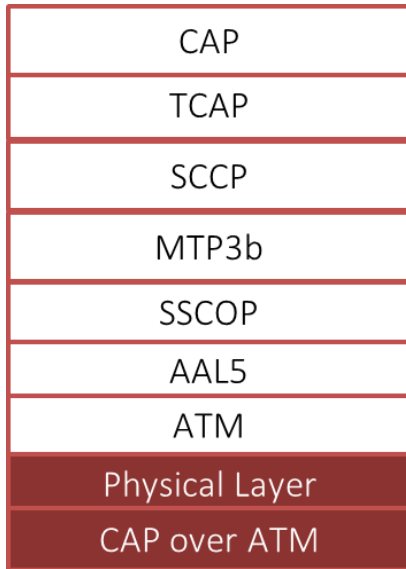
Camel MsgCount: 15
Camel LastMSGrcv.....
Time Stamp          Route      Message
18:56:43.143        <-        releaseGPRS
***** Camel Message Flow *****
Time Stamp          Route      Message
18:56:28.023        ->        InitialDPGPRS
18:56:28.039        <-        requestReportGPRSEvent
18:56:28.044        <-        continueGPRS
18:56:33.083        ->        EventReportGPRS
18:56:33.102        <-        requestReportGPRSEvent
18:56:33.107        <-        applyChargingGPRS
18:56:33.110        <-        continueGPRS
18:56:33.113        <-        eventReportGPRSRes
18:56:41.117        ->        ApplyChargingReportGPRS
18:56:41.136        <-        applyChargingGPRS
18:56:41.139        <-        continueGPRS
18:56:43.117        ->        EventReportGPRS_PDPDis
18:56:43.122        ->        ApplyChargingReportGPRS
18:56:43.136        <-        eventReportGPRSRes
18:56:43.143        <-        releaseGPRS
Stopping Script... True
>>> |
Ln: 43|Col: 4

```

Figure: Sample Python Client



## Supported Protocols and Specifications



Supported Protocols	Standard / Specification Used
<b>TDM</b>	
CAP	3GPP TS 29.002 V4.18.0 (2007-09)
TCAP	ANSI T1.114-1996
SCCP	Q.713, CCITT (ITU-T) Blue Book
MTP3	Q.703, ITU-T Blue Book
<b>ATM</b>	
CAP	3GPP TS 29.002 V4.18.0 (2007-09)
TCAP	ANSI T1.114-1996
SCCP	Q.713, CCITT (ITU-T) Blue Book
MTP3b	ITU-T Q.2210
SSCOP	ITU-T Q.2110
AAL5	Class C & D (ITU-T I.363.5)
ATM	ITU-T I.361

Supported Protocols	Standard / Specification Used
CAP	3GPP TS 29.078 6.3.0 (2004-09)
TCAP	ANSI T1.114-1996
SCCP	Q.713, CCITT (ITU-T) Blue Book
M2PA	RFC 4165
M3UA	RFC 3332
SCTP	RFC 4960

## Buyer's Guide

Item No	Product Description
<a href="#">XX696</a>	MAPS™ CAP Emulation (CAMEL Application Part)
<a href="#">PKS151</a>	MAPS™ CAP IP Emulation (CAMEL Application Part)

Item No	Related Software
<a href="#">XX694</a>	MAPS™ MAP Emulation (B, C, D, E, F, G, and H interfaces)
<a href="#">PKS132</a>	MAPS™ MAP IP Emulator

Item No	Related Hardware
<a href="#">PTE001</a>	tProbe™ Dual T1 E1 Laptop Analyzer (Require Basic Software)
<a href="#">FTE001</a>	QuadXpress T1 E1 Main Board (Quad Port)
<a href="#">ETE001</a>	OctalXpress T1 E1 Daughter boards (Octal Port)
<a href="#">XTE001</a>	Dual Express (PCIe) T1 E1 Boards
<a href="#">TTE001</a>	tScan16™ T1 E1 Boards

For more information, please visit [MAPS™ CAP Protocol Emulator](#) webpage.



***GL Communications Inc.***

818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A  
 (Web) [www.gl.com](http://www.gl.com) - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) [info@gl.com](mailto:info@gl.com)