

MAPS™ CAP Emulator (over TDM,ATM, IP)

(CAMEL Application Part)



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

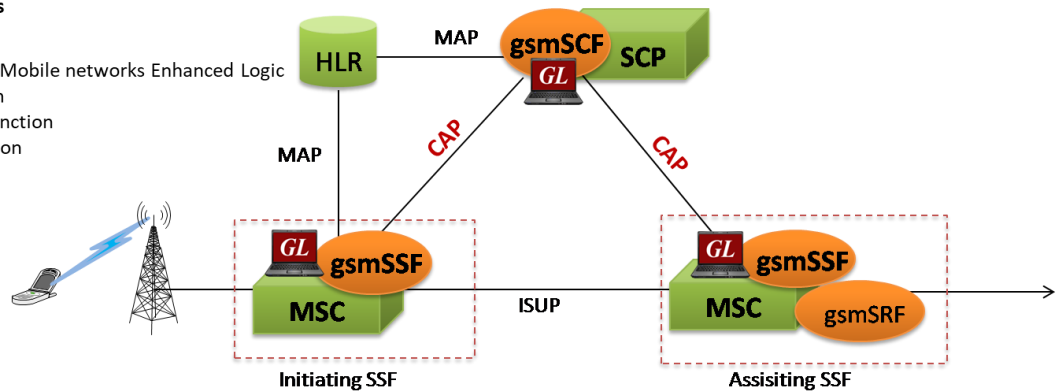
CAP -> CAMEL Application Part

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, refer to [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.

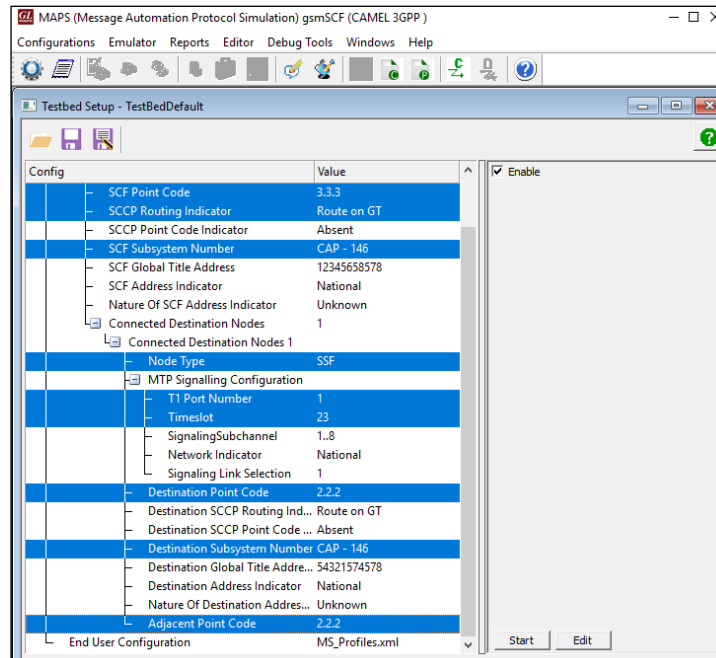
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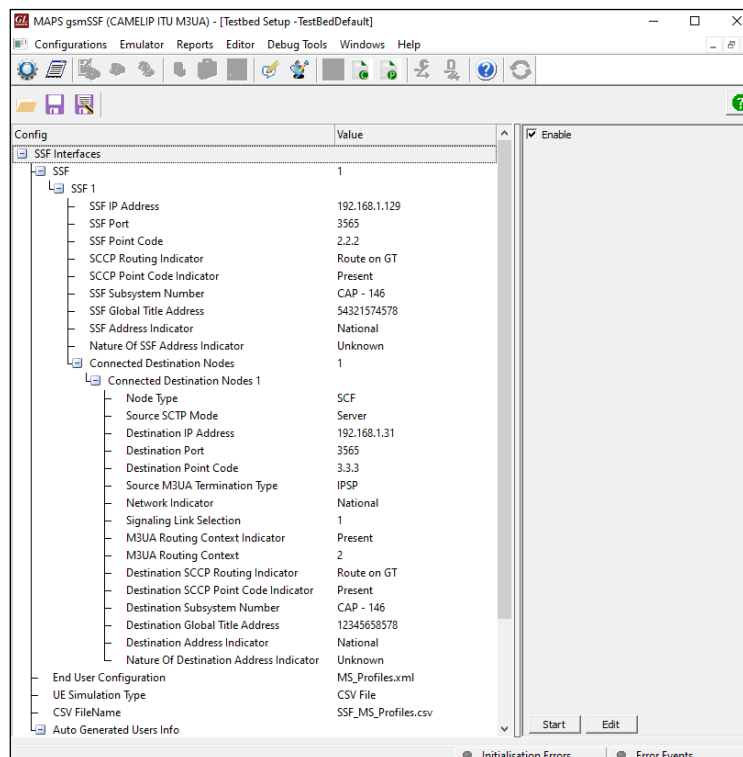
Test Bed Setup Configuration

Test Bed Setup provides options to establish communication between MAPS™ CAP and the DUT. MAPS™ CAMEL TDM/ATM includes MTP signaling 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.



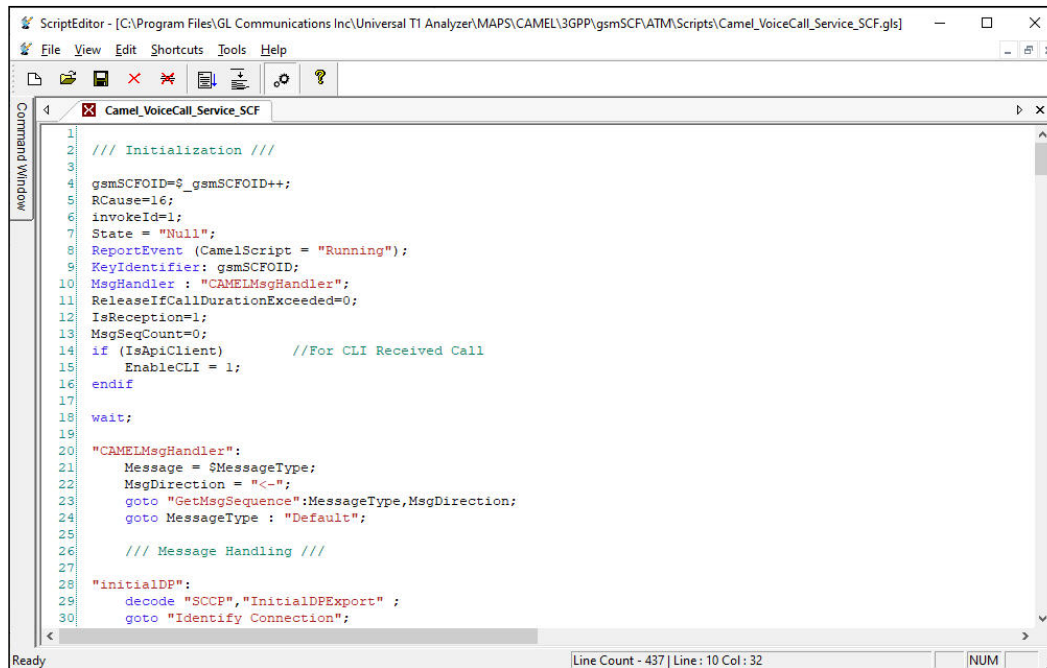
Testbed Setup over T1 E1



Testbed Setup 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.



```

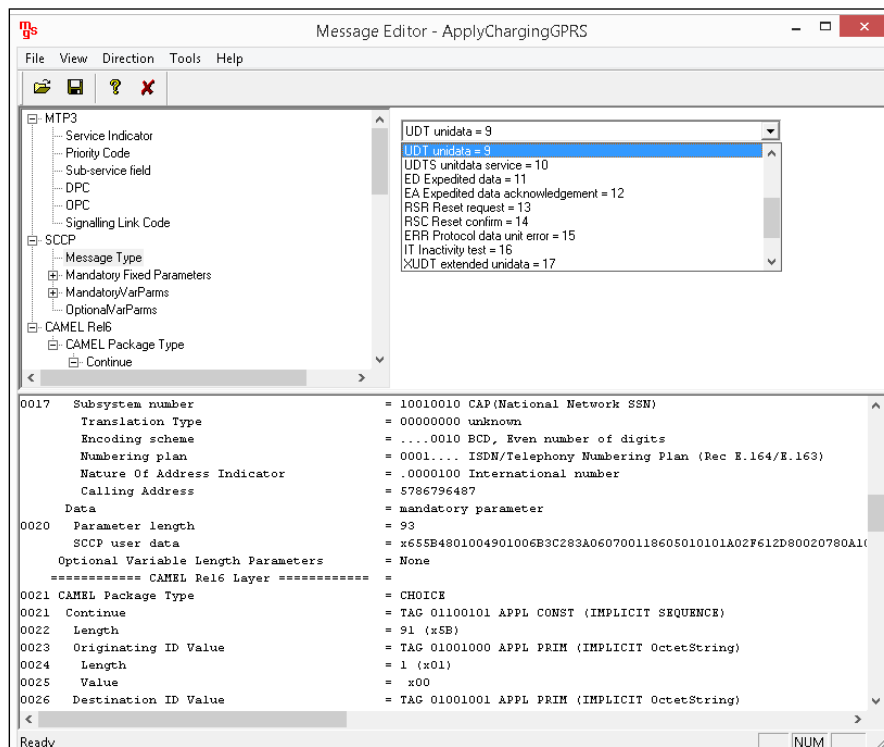
1  // Initialization //
2
3  gsmSCFOID=$_gsmSCFOID++;
4  RCause=16;
5  InvokeId=1;
6  State = "Null";
7  ReportEvent (CamelScript = "Running");
8  KeyIdentifier: gsmSCFOID;
9  MsgHandler : "CAMELMsgHandler";
10 ReleaseIfCallDurationExceeded=0;
11 IsReception=1;
12 MsgSeqCount=0;
13 if (IsApiClient) //For CLI Received Call
14     EnableCLI = 1;
15 endif
16 wait;
17
18 "CAMELMsgHandler":
19     Message = $MessageType;
20     MsgDirection = "<-";
21     goto "GetMsgSequence":MessageType,MsgDirection;
22     goto MessageType : "Default";
23
24 // Message Handling //
25
26 "initialDP":
27     decode "SCCP","InitialDPExport" ;
28     goto "Identify Connection";
29
30

```

Line Count - 437 | Line: 10 Col: 32

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

UDT unidata = 9

UDTS unidata service = 10

ED Expedited data = 11

EA Expedited data acknowledgement = 12

RSR Reset request = 13

RSC Reset confirm = 14

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 (x5B)

0023 Originating ID Value = TAG 01001000 APPL PRIM (IMPLICIT OctetString)

0024 Length = 1 (x01)

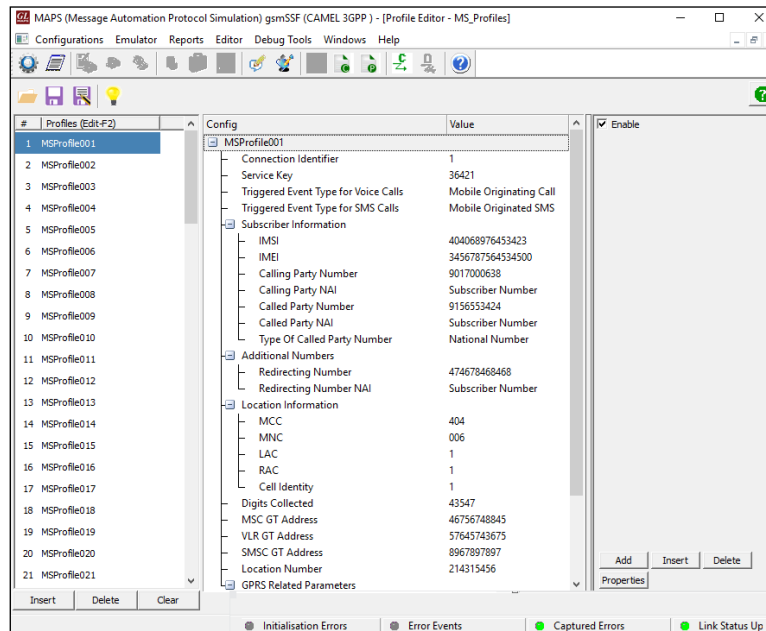
0025 Value = x00

0026 Destination ID Value = TAG 01001001 APPL PRIM (IMPLICIT OctetString)

Ready

Message Editor

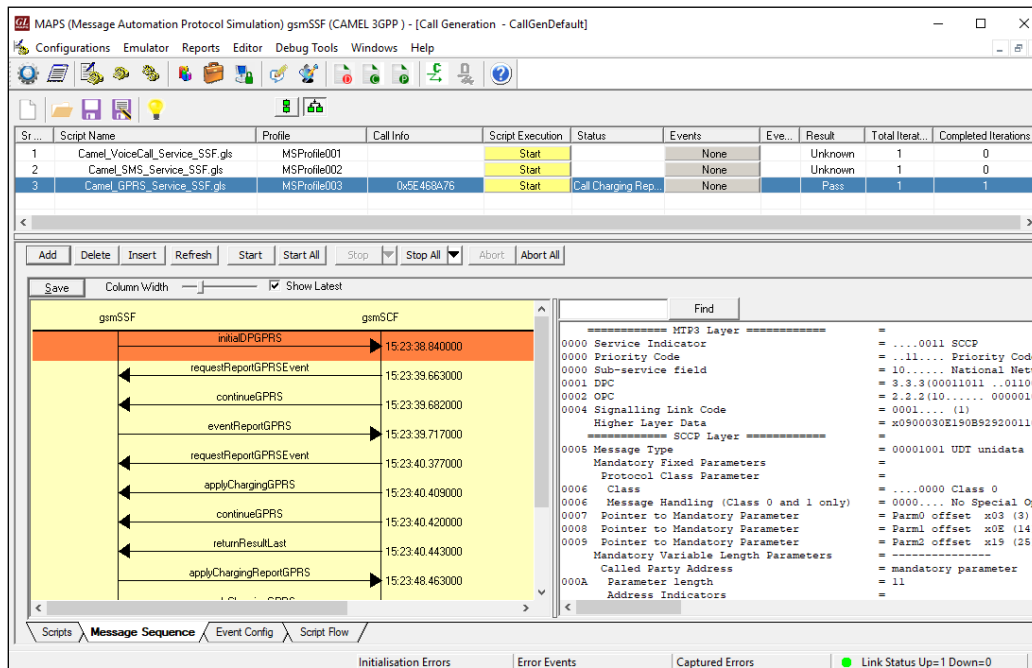
PROFILE EDITOR - The profile editor feature allows loading profile to edit the values of the variables using GUI, replacing the original value of the variables in the message template. An XML file defines a set of multiple profiles with varying parameter values that allow users to configure call instances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



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.



Call Generation

Call Generation and Call Reception (Contd.)

MAPS (Message Automation Protocol Simulation) gsmSCF (CAMEL 3GPP) - [Call Reception]

Configurations Emulator Reports Editor Debug Tools Windows Help

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

Stop Stop All Abort Abort All ☒ Show Records ☐ Select Active Call ☐ Auto Trash Trash

Save Column Width ☐ Show Latest

gsmSSF gsmSCF

Find

0000 Service Indicator =0011 SSCP
 0000 Priority Code = ...11.... Priority Code 3
 0000 Sub-service field = 10..... National Network
 0001 DPC = 3.3.3(00011011 ..011000)
 0002 OPC = 2.2.2(10..... 000001000
 0004 Signalling Link Code = 0001.... (1)
 Higher Layer Data = x0900030E1908292001100214365
 ===== SSCP Layer =====
 0005 Message Type = 00001001 UDT unidata
 Mandatory Fixed Parameters =
 Protocol Class Parameter =
 0006 Class =0000 Class 0
 0006 Message Handling (Class 0 and 1 only) = 0000.... No Special Options
 0007 Pointer to Mandatory Parameter = Parm0 offset x03 (3)
 0008 Pointer to Mandatory Parameter = Parm1 offset x0E (14)
 0009 Pointer to Mandatory Parameter = Parm2 offset x19 (25)
 Mandatory Variable Length Parameters =
 Called Party Address = mandatory parameter
 000A Parameter length = 11
 Address Indicators =
 000B Point Code Indicators =0 Address does not con
 000B SSN Indicators =1. Address contains sub

Scripts Message Sequence Event Config Script Flow

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

Call Reception

MAPS (Message Automation Protocol Simulation) gsmSCF (CAMEL 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
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-

Save Events

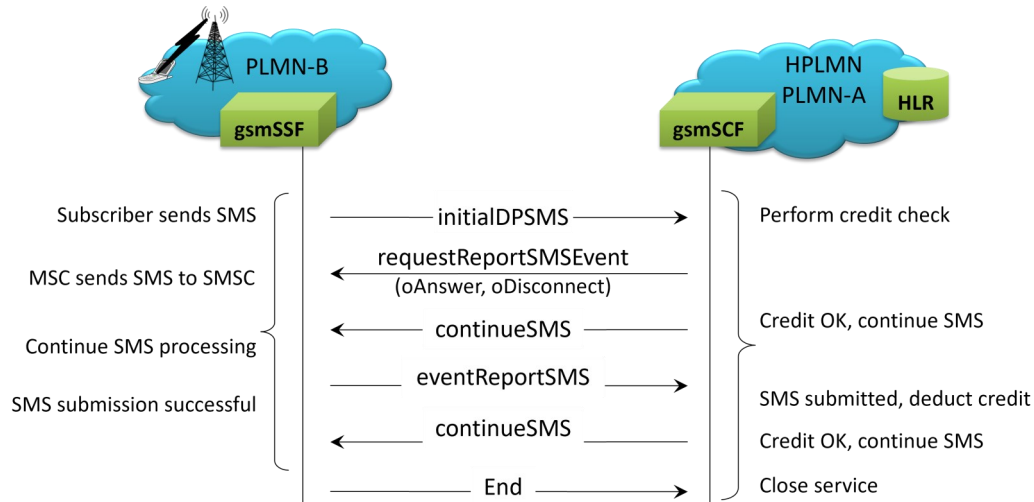
Clear ☐ Capture Events to file

Initialisation Errors Error Events Captured Errors Link S

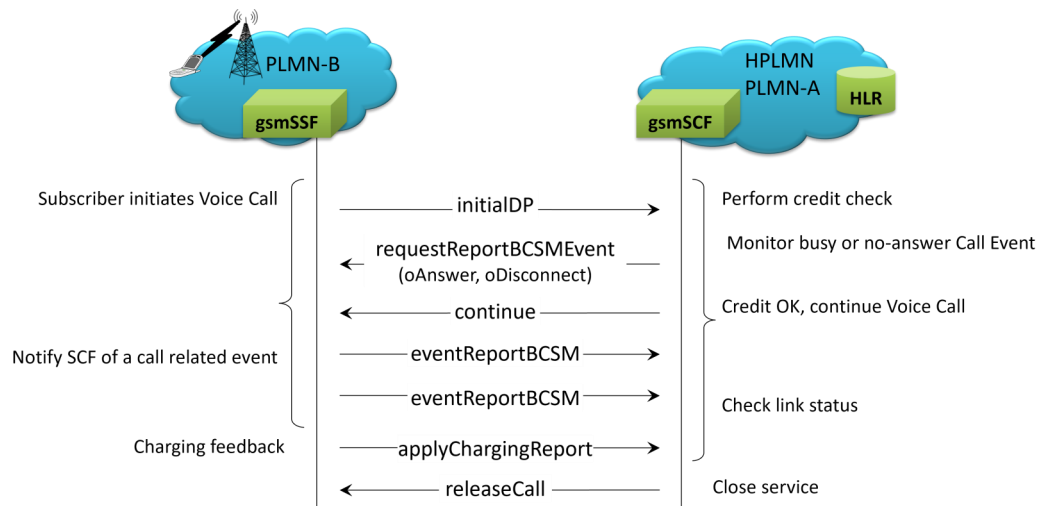
Events Log

CAMEL Procedures (over IP and TDM)

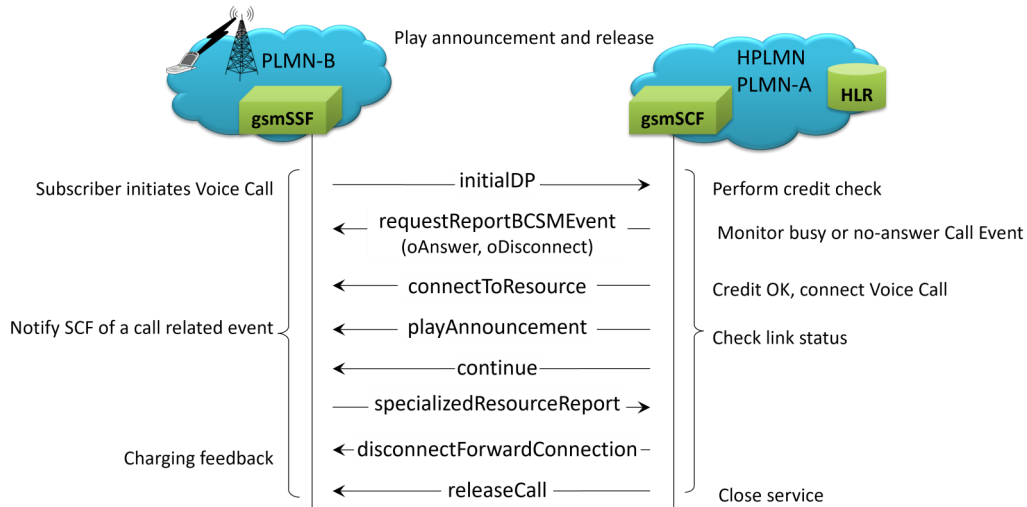
MAPS™ CAP emulator can be configured to emulate procedures over IP and TDM. Supported services includes Prepaid Voice Call, Apply Charging GPRS, Low balance Voice Call, Toll-free Call, Initiate Call Attempt (ICA), and Camel SMS.



CAMEL SMS Procedure

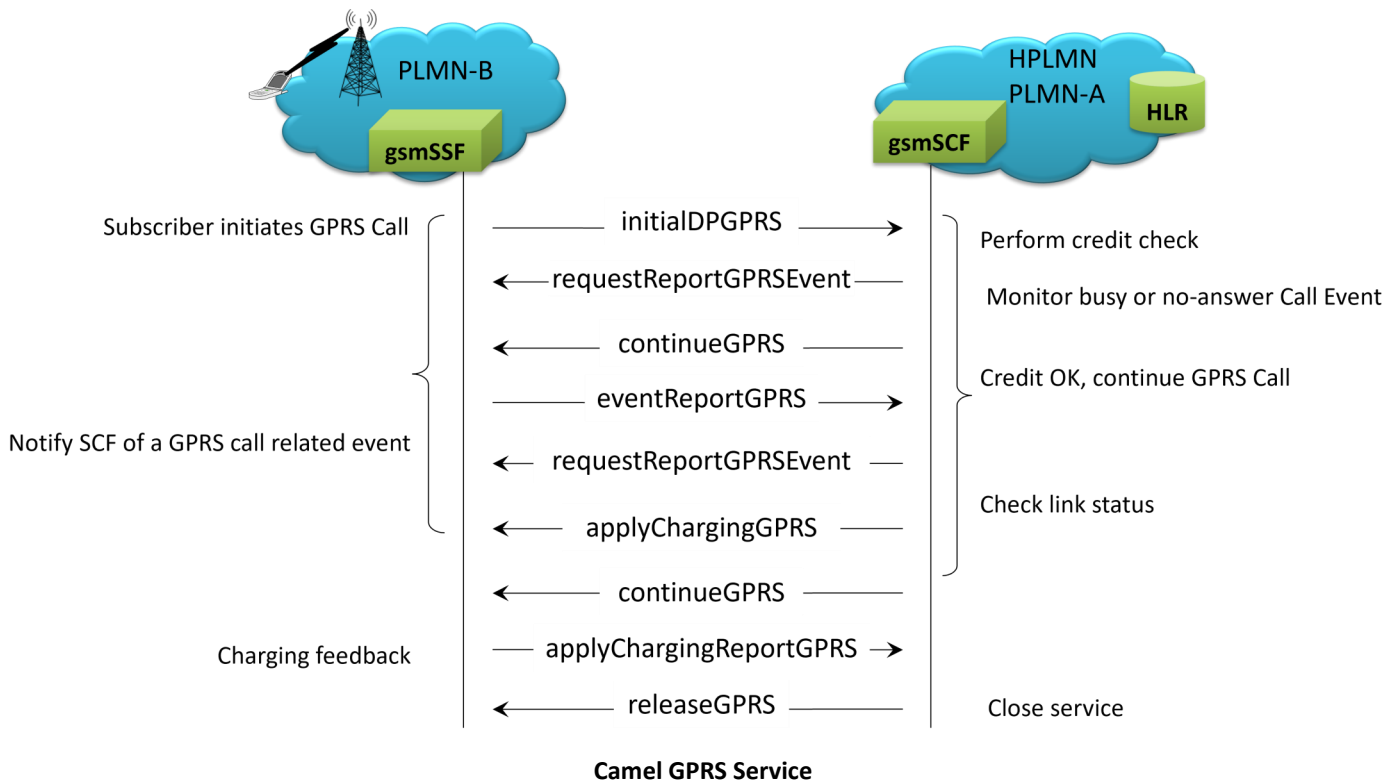
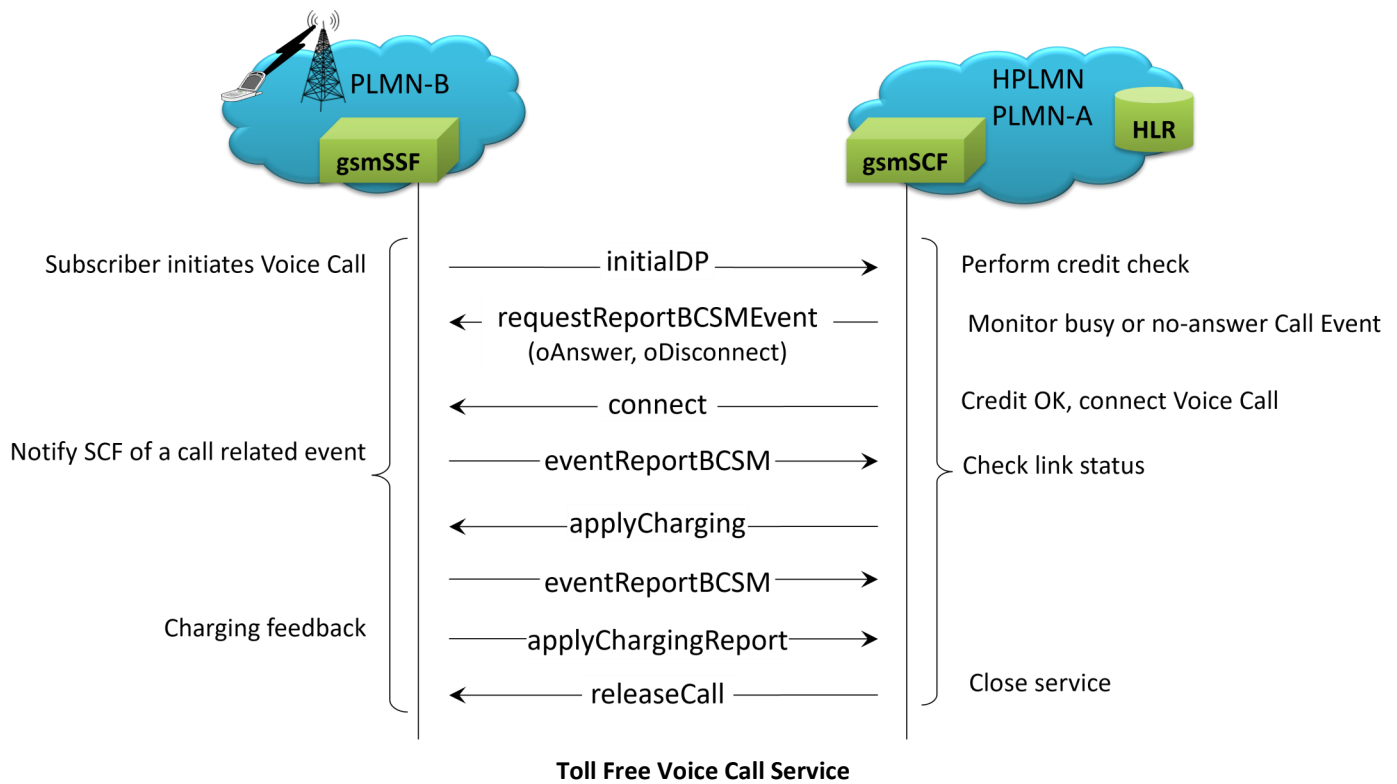


Prepaid Voice Call Service



Low Balance Voice Call Service

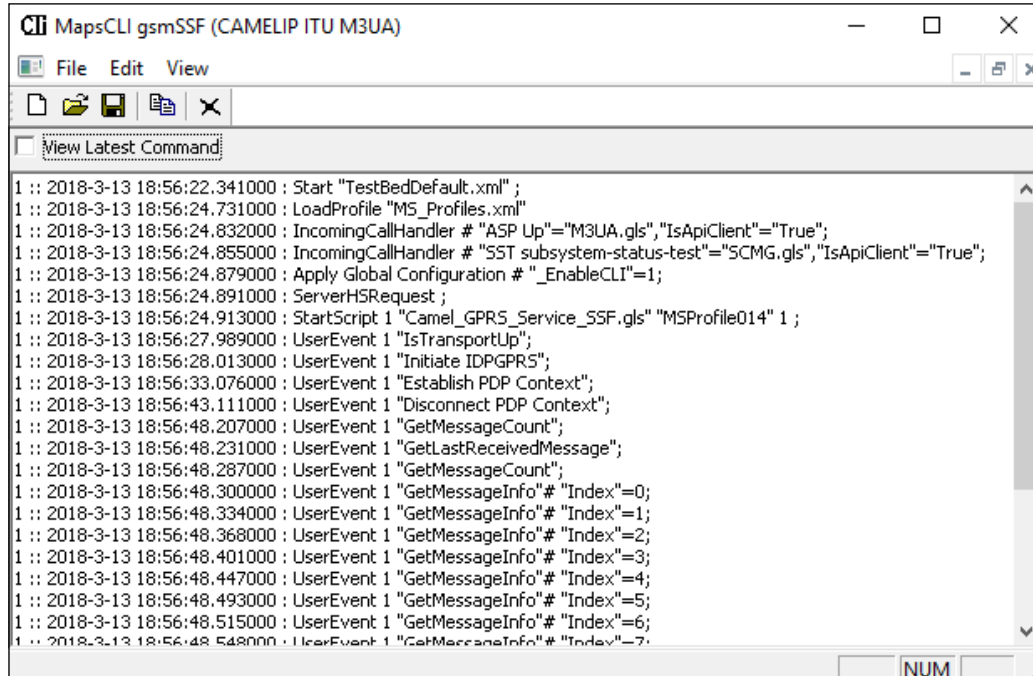
CAMEL Procedures (over IP and TDM Contd.)



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 includes Python and Java.

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

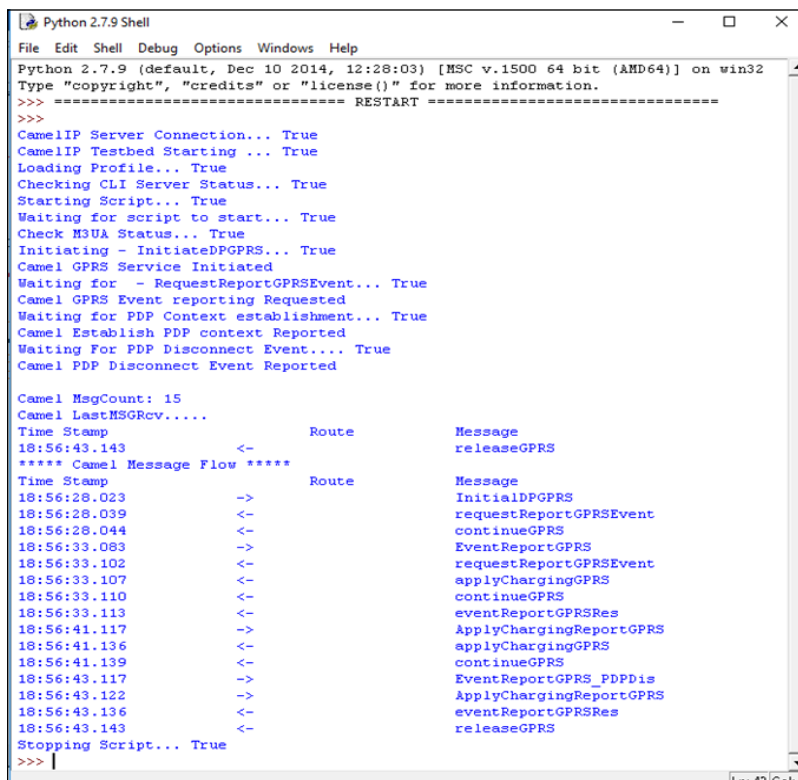


```

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

```

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 =====
>>>
CamelIP Server Connection... True
CamelIP 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 LastMSGRev.....
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
>>>

```

Sample Python Client

Supported Protocols and Specifications

CAP
TCAP
SCCP
MTP3
TDM

CAP
TCAP
SCCP
MTP3b
SSCOP
AAL5
ATM
Physical Layer
CAP over ATM

CAP	
TCAP	
SCCP	
MTP3	M3UA
M2PA	
SCTP	
IP	

Supported Protocols	Standard / Specification Used
TDM	
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
ATM	
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
XX696	MAPS™ CAP Emulation (CAMEL Application Part)
PKS151	MAPS™ CAP IP Emulation (CAMEL Application Part)

Item No	Related Software
XX694	MAPS™ MAP Emulation (B, C, D, E, F, G, and H interfaces)
PKS132	MAPS™ MAP IP Emulator

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

Note: PCs which include GL hardware/software require Intel or AMD processors for compliance.

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



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