
Signaling and Traffic Simulation using MAPS



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Message Automation and Protocol Simulation (MAPS™)

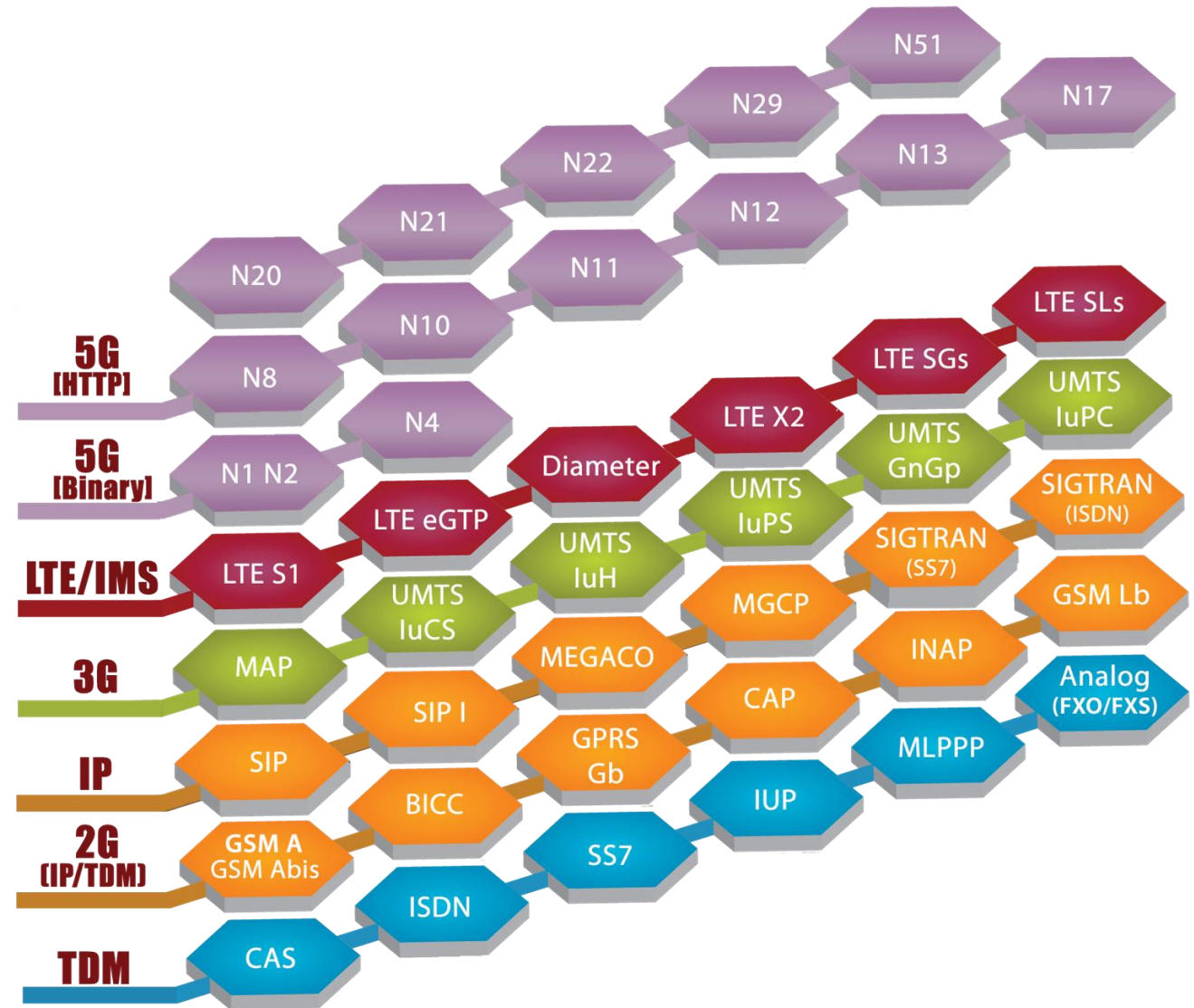
MA - Message Automation

+

PS - Protocol Simulation

About MAPS™

- **MAPS** stands for **M**essage **A**utomation and **P**rotocol **S**imulation
- It is a generic framework for the generation of telecommunications protocol messages and transmission of bearer traffic
- **MAPS™** is built on a proprietary scripting language developed by GL Communications
- All **MAPS™** products come with out-of-the-box scripts that act as fully functional state machines for the relevant protocol



About MAPS™ (Contd.)

- **Scripts:** Scripts act as the state-machine, or engine for a given call. The logic of what messages to send when is all contained in a script
- **Messages:** MAPS has an inventory of generic Message Templates (ex: Invite.txt) which it loads from the hard drive when transmitting an actual message. Messages are completely customizable
- **Profiles:** Scripts and Messages are kept as generic as possible. Specific information (ex: Contact = 12345@sip.carrier.com) about a call is sourced from .xml profiles

Basic Requirements for Emulation

- **Message Templates**

- The message templates are nothing but structure of message stored in particular file format. e.g.: SS7 Protocol suite message template will have “. HDL” format

- **A ‘Script’**

- To send and receive these messages between two nodes and take appropriate actions for a particular message

- **An ‘Import’ mechanism**

- A mechanism for reading the contents of the message template, and replacing the Key Identifier with the value given by the user (or some other means) at the run time. This process of inserting the user values into the message template before sending is called “Import”

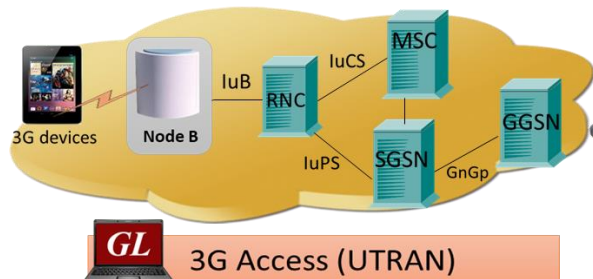
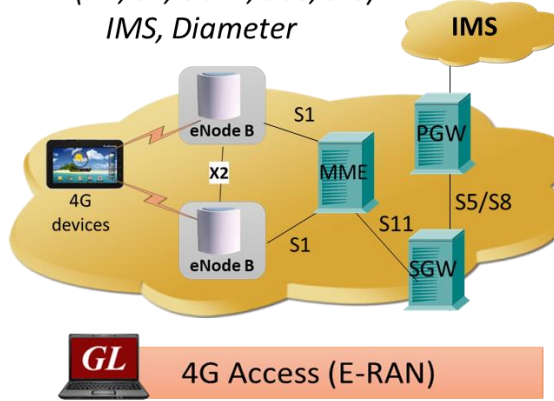
Basic Requirements for Emulation (Contd.)

- **An 'Export' mechanism**
 - A mechanism to extracting Key Identifier values from the received response and store for the future use (in the same call scenario) is called "Export" (This exported value can also be imported to message template in future)
- **A 'Profile' file**
 - Once the Key Identifiers are identified for all the message templates in a call scenario, required values are configured for these Key Identifiers in a file called Profile

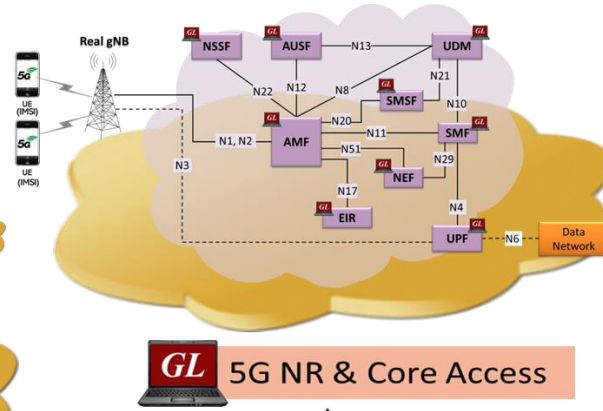
Supported Protocols / Interfaces

5G (N1, N2, N4, N8, N10, N11, N12, N13, N14, N17, N20, N21, N22, 29, 51)

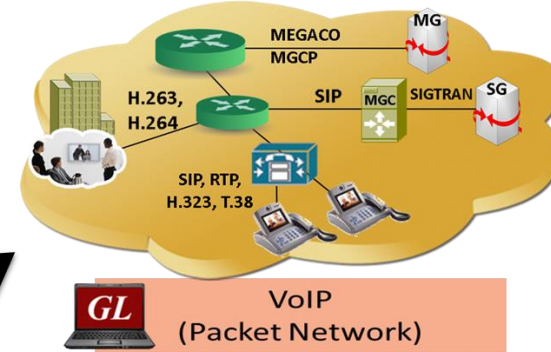
LTE (X2, S1, eGTP, SGs, SLs)
IMS, Diameter



UMTS (IuH, IuCS, IuPS, GnGp) GPRS

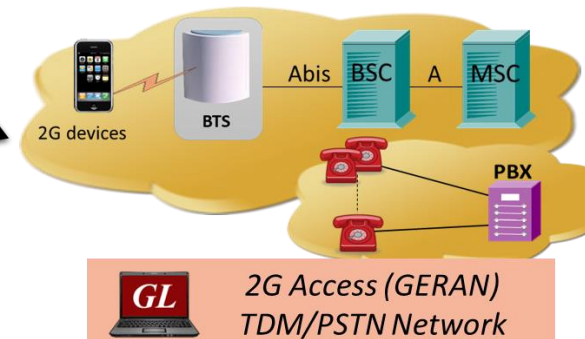


SIP, Megaco, MGCP, SIP-I,
SIGTRAN (ISUP, ISDN)



Signaling, Traffic Generation and Analysis

- GL** MAPS™ 1G – Software-based, or Hardware-based
- GL** MAPS™ HD 40G, 10G, 1G – Rackmount Platforms



CAS, ISDN, MLPPP, SS7, IUP, MAP, CAMEL, INAP, GSM (A, Abis)

Common Protocol Emulation Framework

LTE Emulation

MAPS (Message Automation Protocol Simulation) eNodeB (LTE S1 RELEASE9) - [Call Generation - CallGenDefault]

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Ev. Result	Total Iterations	Completed Iterations
1	LTE51CallControlHb.gls	UEProfile001	(MSI_404110588315863)	Stop	GTPLU Mobile Traffic Stated	Create Context	Pass	1	0
2	LTE51CallControlHb.gls	UEProfile002		Start		None	Unknown	1	0
3	LTE51CallControlHb.gls	UEProfile003		Start		None	Unknown	1	0
4	LTE51CallControlHb.gls	UEProfile004		Start		None	Unknown	1	0
5	LTE51CallControlHb.gls	UEProfile005		Start		None	Unknown	1	0
6	LTE51CallControlHb.gls	UEProfile006		Start		None	Unknown	1	0

Message Sequence Diagram (MAPS):

- Initial Message: Attach Request, PCN Connectivity Request (6:25:04.320000)
- Downlink NASTransport: Authentication Request (6:25:05.149000)
- Uplink NASTransport: Authentication Response (6:25:05.154000)
- Downlink NASTransport: Identity Request (6:25:05.172000)
- Uplink NASTransport: Identity Response (6:25:05.177000)
- Downlink NASTransport: Security Mode Command (6:25:05.194000)
- Uplink NASTransport: Security Mode Complete (6:25:05.197000)
- InitialContextSetupRequest: Attach Accept, Activate Default EPS Bearer (6:25:05.221000)
- InitialContextSetupResponse (6:25:05.229000)
- Uplink NASTransport: Attach Complete, Activate Default EPS Bearer (6:25:05.233000)

SS7 Emulation

MAPS (Message Automation Protocol Simulation) SSP (ISUP ITU) - [Call Generation - CallGenDefault]

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Result	Total Iterations	Completed Iterations
1	Isup_Call.gls	Card1TS01	1.1.1.2.2.2.1	Start	ISUP Call Released	None	Pass	1	0
2	Isup_Call.gls	Card1TS02	1.1.1.2.2.2.2	Stop	File Recorded	Terminate Call	Pass	1	0
3	Isup_Call.gls	Card1TS03	1.1.1.2.2.2.3	Stop	File Recorded	Terminate Call	Pass	1	0
4	Isup_Call.gls	Card1TS04	1.1.1.2.2.2.4	Stop	File Recorded	Terminate Call	Pass	1	0
5	Isup_Call.gls	Card1TS05	1.1.1.2.2.2.5	Stop	File Recorded	Terminate Call	Pass	1	0
6	Isup_Call.gls	Card1TS06	1.1.1.2.2.2.6	Stop	File Recorded	Terminate Call	Pass	1	0
7	Isup_Call.gls	Card1TS07	1.1.1.2.2.2.7	Stop	File Recorded	Terminate Call	Pass	1	0
8	Isup_Call.gls	Card1TS08	1.1.1.2.2.2.8	Stop	File Recorded	Terminate Call	Pass	1	0

Message Sequence Diagram (MAPS):

- Initial Address (18:51:53.797000)
- Address Complete (18:51:54.327000)
- Answer (18:51:54.327000)
- File Transmitted: a-law samples\count10.pcm (18:52:15.117000)
- File Recorded: MAPS\Recv\Files\Isup\Feb6_E0101_1001.pcm (18:52:25.072000)
- Release (18:52:54.910000)
- Release Complete (18:52:55.485000)

SIP Emulation

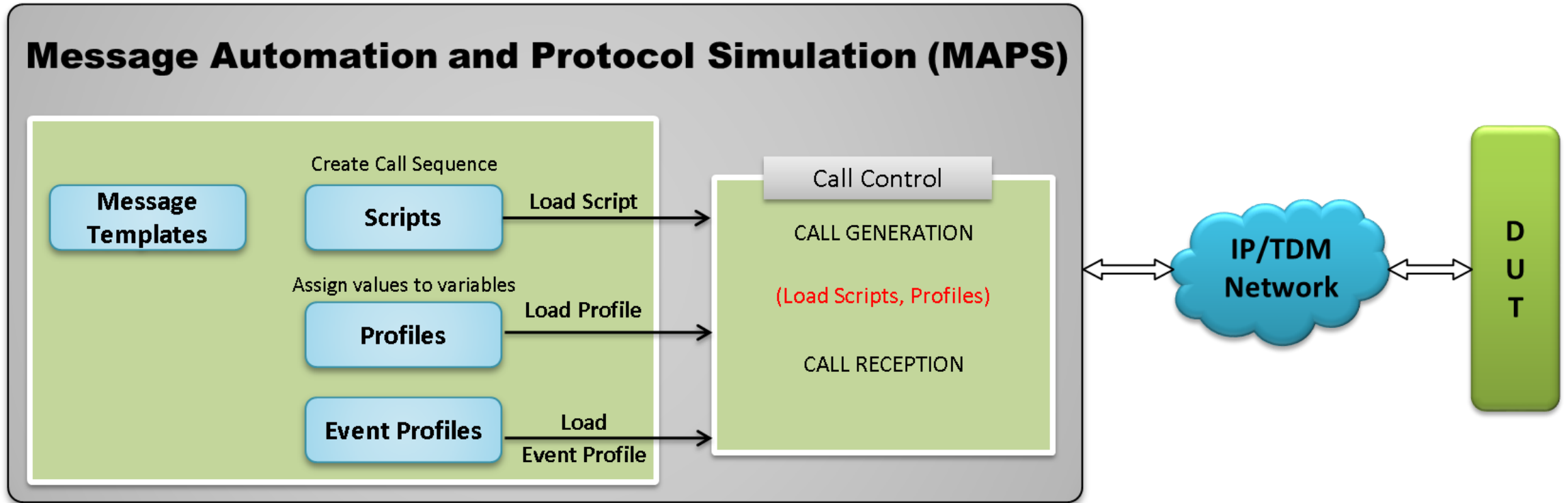
MAPS (Message Automation Protocol Simulation) SIP IETF - [Call Generation - CallGenDefault]

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Result	Total Iterations	Completed Iterations
1	SipRegistrarControl.gls	Profile0001		Start		None	Unknown	1	0
2	SipCallControl.gls	Profile0002	GL-MAPS_27_87968604-10686-7056@192.168.12.78	Stop		SendFileCompleted	Pass	1	0
3	SipCallControl.gls	Profile0002	GL-MAPS_21_87961623-10633-10756@192.168.12.78	Stop		SIP_TerminateCall	Pass	1	0

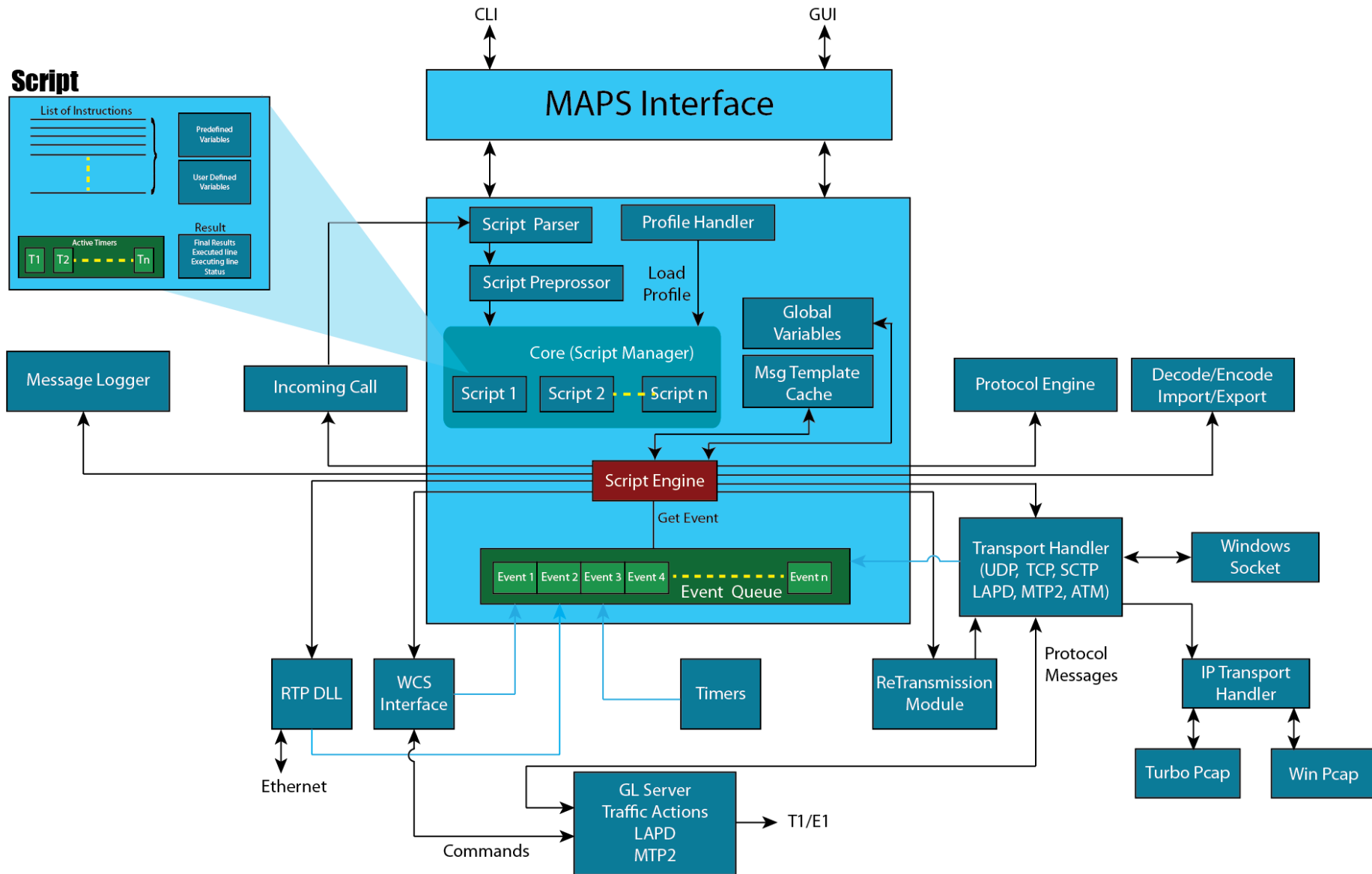
Message Sequence Diagram (MAPS):

- INVITE (4:53:31.059000)
- 100 Trying (4:53:32.454000)
- 180 Ringing (4:53:32.461000)
- 200 OK (4:53:32.609000)
- ACK (4:53:32.609000)

Working Principle



MAPS™ Architecture



Script

List of Instructions

Predefined Variables

User Defined Variables

Active Timers: T1, T2, ..., Tn

Result: Final Results, Executed line, Executing line, Status

Customize Test Scenarios using Scripts

- Unlimited access in creating test scenarios
- Build valid or invalid and conformance test cases
- A simple, easy to learn but very powerful scripting language
- Can be an Extremely simple scripts to test a particular scenario. But Flexible enough to simulate a complete protocol state machine
- A GUI based 'Script Editor' helps to build scripts even before syntax and semantics of the scripting language is familiar

Sample Script

```
Send "Initial Address" "InitialAddressImport";
```

```
Recv "Address Complete" "AddressCompleteExport";
```

```
Recv "Answer" "AnswerImport";
```

```
TxRx:tx _TDM file: filename = "Vijay.pcm";
```

```
Send "Release" "ReleaseImport";
```

```
Recv "Release Complete" "ReleaseCompleteExport";
```

Customize Protocol Messages

Message Editor

The screenshot shows the 'Message Editor - InitialAddress' window. The interface includes a menu bar (File, View, Direction, Tools, Help), a toolbar with icons for file operations and help, and a tree view on the left showing the protocol structure under 'ISUP'. The tree view includes 'Circuit Identification Code', 'Message Type', 'Mandatory Fixed Parameters', 'Nature Of Connection Indicators Parameter', and 'Forward Call Indicators Parameter'. A text box with '345' and an 'Apply' button is visible next to the 'Circuit Identification Code' parameter.

The main area displays a list of protocol parameters and their values:

```
0002 OPC = 1.1.1(01..... 00000010 ....0010)
0004 Signalling Link Code = 0011.... (3)
Higher Layer Data = x5901010220010A000208068310551511010A0681115515320400
===== ISUP Layer =====
0005 Circuit Identification Code = 01011001 ....0001 (345)
0007 Message Type = 00000001 Initial address
Mandatory Fixed Parameters =
Nature Of Connection Indicators Parameter =
0008 Satellite indicator = .....10 two satellite circuits in the connection
0008 Continuity check indicator = ....00.. continuity check not required
0008 Echo ctrl dev.ind(Nat.Conn.Ind) = ...0... outgoing echo control device not included
Forward Call Indicators Parameter =
0009 National/international call ind = .....0 treated as a national call
0009 End-to-end method indicator = .....00. No end-to-end method available
0009 Interworking Indicator = ....0... no interworking encountered (No. 7 signalling all the way)
0009 End-to-end inFor.ind(ForwardCall.Ind) = ...0.... not available
0009 ISDN User Part Indicator = ..1..... used all the way
0009 ISDN User Part Preferences Indicators = 00..... preferred all the way (default)
000A ISDN Access Ind(ForwardCall Ind) = .....1 Originating Access ISDN
```

At the bottom, a hexadecimal dump shows the message bytes: 05 12 50 02 32 59 01 01 02 20 01 0A 00 02 08 06 83 10 55 15 11 01 0A 06 81 11 55 15 32 04 00.

Call Generation

Active Calls Call Status Call Events

Loading Scripts and Profiles

The screenshot displays the MAPS (Message Automation Protocol Simulation) MME (LTE SLs 3GPP) - [Call Generation - CallGenDefault] interface. The interface is divided into several sections:

- Table of Active Calls:** A table with columns: Sr No, Script Name, Profile, Call Info, Script Execution, Status, Events, E..., Result, Total..., and Compl... The table contains 5 rows of data.
- Message Sequence Diagram:** A diagram showing the interaction between MME and E-SMLC. It includes messages: Location Request (12:55:17.550000), Connection Oriented Information (12:55:19.831000), and Location Response (12:55:22.639000).
- Decoded Message:** A detailed view of the decoded message, showing the LCSAP Layer structure and its contents.

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	E...	Result	Total ...	Compl...
1	Location_Request_MME.gls	UEProfile0001	0x0311480012041631	Start	Successful Location Response Received	None		Pass	1	1
2	Location_Request_MME.gls	UEProfile0002	0x0311480012041632	Stop	SLs Location Request Initiated	Send_SLs_ConnectionOriented_M...		Unknown	1	0
3	Location_Request_MME.gls	UEProfile0003		Start		None		Unknown	1	0
4	Location_Request_MME.gls	UEProfile0004		Start		None		Unknown	1	0
5	Location_Request_MME.gls	UEProfile0005		Start		None		Unknown	1	0

```

===== LCSAP Layer =====
LCSAP-PDU = CHOICE
Extensibility Marker = 0
Choice Index = 0
ProcedureCode = INTEGER
Contents = 0 id-Location-Service-Reques
Criticality = ENUMERATOR
Contents = 0 reject(0)
Value = Open Type
Length = 67
Extensibility Marker = 0
Preamble = 0
ProtocolIE-Container = SEQUENCE OF
Iteration Count = 9
ProtocolIE-Container = Instance 0
ProtocolIE-ID = INTEGER
Contents = 2 id-Correlation-ID
Criticality = ENUMERATOR
Contents = 0 reject(0)
Value = Open Type
Length = 4
    
```

Message Sequence

Decode Message

Fine Control over Call Behavior

MAPS (Message Automation Protocol Simulation) [Call Generation - CallGenDefault]

Configurations Emulator Reports Editor Windows Help

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Events ...	Result	Total Iterations	Completed Iterations
1	Isup_Call.gls	Card1TS01	1.1.1.2.2.2.1	Abort	File Sent	Retrieve		Pass	1	0
2	Call.gls	Card1TS02		Start		None				0
3	Call.gls	Card1TS03		Start		None				0
4	Call.gls	Card1TS04		Start		None				0
5	Call.gls	Card1TS05		Start		None				0
6	Call.gls	Card1TS06		Start		None				0
7	Call.gls	Card1TS07		Start		None				0
8	Call.gls	Card1TS08		Start		None		Unknown	1	0

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

View Executing Line

Script Contents

```
"Hold":
  CallHoldInitiated = 1;
  (ISUPScriptId) goto "Hold";
  resume;

"Retrieve":
  CallHoldInitiated = 0;
  (ISUPScriptId) goto "Retrieve";
  resume;

"Suspend":
  SuspendInitiated = 1;
  (ISUPScriptId) goto "Suspend Call";
  resume;
```

Control moves to "Retrieve" section, after selecting the "Retrieve" User Event

Scripts Message Sequence Event Config Script Flow

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

User Events

MAPS (Message Automation Protocol Simulation) SSP (ISUP ITU) - [Call Generation - CallGenDefault]

Configurations Emulator Reports Editor Windows Help

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Events ...	Result	Total Iterations	Completed Iterations
1	Isup_Call.gls	Card1TS01	1.1.1.2.2.2.1	Abort	File Sent	Retrieve	...	Pass	1	0
2	Isup_Call.gls	Card1TS02		Start		None	...	Unknown	1	0
3	Isup_Call.gls	Card1TS03		Start		None	...	Unknown	1	0
4	Isup_Call.gls	Card1TS04		Start		None	...	Unknown	1	0
5	Isup_Call.gls	Card1TS05		Start		None	...	Unknown	1	0
6	Isup_Call.gls	Card1TS06		Start		None	...	Unknown	1	0
7	Isup_Call.gls	Card1TS07		Start		None	...	Unknown	1	0
8	Isup_Call.gls	Card1TS08		Start		None	...	Unknown	1	0

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

View Executing Line

Script Contents

```
"OnISUPCallHold":  
"Hold":  
  CallHoldInitiated = 1;  
  (ISUPScriptId) goto "Hold";  
  resume;  
"Retrieve":  
  CallHoldInitiated = 0;  
  (ISUPScriptId) goto "Retrieve";  
  resume;  
"Suspend":  
  SuspendInitiated = 1;  
  (ISUPScriptId) goto "Suspend Call";  
  resume;
```

Control moves to "Retrieve" section, after selecting the "Retrieve" User Event

Scripts | message sequence | Event Logging | Script Flow

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

Script Content View

```
Script Contents
"PlaceCall"(opc,dpc,cic):
    StartChildScript (ISUPScriptId,"ISUP","ISUP.gls",LoadedProfileName);
    ActiveUserEvent:Add:"Terminate Call","Initiate Reset","Clear Call";
    Status = "ISUP Call Initiated";
    ISUPState = "ISUP CALL INITIATED";
    (ISUPScriptId)goto"ISUPMakeCall":cic,opc,dpc,SLS,NetInd,ConnectionId,StreamID,
    return;

"OnISUPCallInitiated"(opc,dpc,cic):
    ReportEvent (InitialAddress = "Initial Address");
    resume;

"OnISUPCallProgressReceived":
    ReportEvent (AddressComplete = "Address Complete");
    resume;

"OnISUPCallConnected":
    Result="Pass";
    ReportEvent (Answer = "Answer");
    Status = "ISUP Call Connected";
    ISUPState = "ISUP CALL CONNECTED";
    if (StopAll==1)
        goto "Terminate Call":Cause;
    endif
    ActiveUserEvent:Add:"Hold","Suspend";
    ActiveUserEvent:Remove:"Accept Call","Reject Call";
    if (CallDuration != 0)
        starttimer CallDurationTimer CallDuration msec;
    else
        goto "Terminate Call":Cause;
```

<

Scripts Message Sequence Event Config Script Flow

Script Flow

Script ID	Script Name	Subscript Name	Line No	Script Flow
*	Isup_Call.gls		68	goto "PlaceCall":opc,dpc,cic;
*	Isup_Call.gls		94	"PlaceCall"(opc,dpc,cic):
*	Isup_Call.gls		95	StartChildScript (ISUPScriptId,"ISUP","ISUP.gls",LoadedProfileName);
ISUP	ISUP.gls		6	"Init":
ISUP	ISUP.gls		7	ISUPState = "IDLE";
ISUP	ISUP.gls		8	ISUPResult = "Unknown";
ISUP	ISUP.gls		9	SetScriptVariable(ParentScriptId,ISUPResult = ISUPResult);
ISUP	ISUP.gls		10	ParentScriptId = "";
ISUP	ISUP.gls		11	Cause = 16;
ISUP	ISUP.gls		12	COTExpected = 0;
ISUP	ISUP.gls		13	AddressCompleteSent=0;
ISUP	ISUP.gls		14	KeyIdentifier: opc , dpc, cic ;
ISUP	ISUP.gls		15	ReleaseInitiated = 0;
ISUP	ISUP.gls		16	ReleaseReceived = 0;
ISUP	ISUP.gls		17	CallActive = 0;
ISUP	ISUP.gls		18	MsgHandler : "ISUPMsgHandler";
ISUP	ISUP.gls		19	ReleaseGuardTimerStarted=0;
ISUP	ISUP.gls		21	wait;
*	Isup_Call.gls		96	ActiveUserEvent:Add:"Terminate Call","Initiate Reset","Clear Call";
*	Isup_Call.gls		97	Status = "ISUP Call Initiated";
*	Isup_Call.gls		98	ISUPState = "ISUP CALL INITIATED";
*	Isup_Call.gls		99	(ISUPScriptId)goto"ISUPMakeCall":cic,opc,dpc,SLS,NetInd,ConnectionId,StreamID, ...
ISUP	ISUP.gls		32	"ISUPMakeCall"(cic,opc,dpc,SLS,NetInd,ConnectionId,StreamID, CallingNumber,CalledNu...
ISUP	ISUP.gls		33	send "InitialAddress" "InitialAddressImport" "StreamId" = StreamID "ConnectionI...
ISUP	ISUP.gls		34	if (ContinuityCheckIndicator!=0)
ISUP	ISUP.gls		36	endif
ISUP	ISUP.gls		37	ISUPState="CALL INITIATED" ;
ISUP	ISUP.gls		38	Status = "Call Initiated";
ISUP	ISUP.gls		39	EventLog ("Call Initiated");
ISUP	ISUP.gls		40	starttimer T7 _T7TimeOut;
ISUP	ISUP.gls		41	(ParentScriptId) goto "OnISUPCallInitiated":opc,dpc,cic;

Incoming Call Handler

The screenshot shows the 'Incoming Call Handlers Configuration - default' window. It contains a table with the following data:

Message Name	Script Name
Signalling Link Test Message	SLTM.gls
Initial Address	Isup_Call.gls...
Release	Rx_CIC_Management.gls
Reset Circuit	Rx_CIC_Management.gls
Continuity Check Request	Rx_CIC_Management.gls
Blocking	Rx_CIC_Management.gls
Unblocking	Rx_CIC_Management.gls
Circuit Group Reset	Rx_CIC_Management.gls
Circuit Group Blocking	Rx_CIC_Management.gls
Circuit Group Unblocking	Rx_CIC_Management.gls
Release Complete	Rx_CIC_Management.gls

On the right side, there is a 'Scripts' list with the following items:

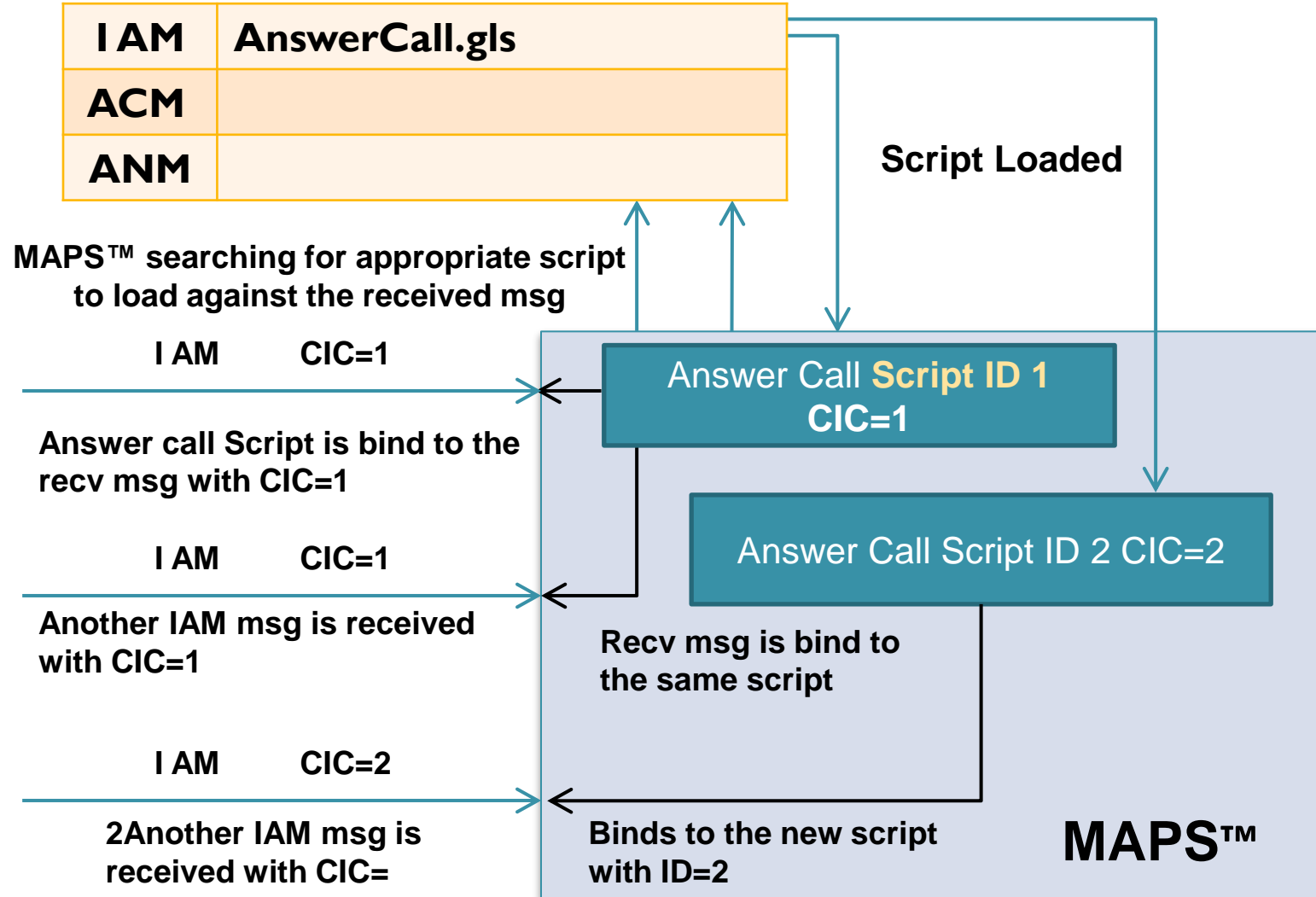
- Isup_Call.gls
- Isup_Call - Reject.gls
- Isup_Call-Forward.gls
- Isup_Call - Conferance.gls

Below the 'Scripts' list, there are two radio buttons: 'Sequence' (selected) and 'Random'. The 'Sequence' radio button is circled in green. Below these are 'Up' and 'Down' buttons. At the bottom of the window, there are 'Add', 'Delete', and 'Clear' buttons.

Incoming Call Handler (Contd.)

Incoming Call Handler

I AM	AnswerCall.gls
ACM	
ANM	



Call Reception

Active Calls

Completed Calls

Sr No	Script Name	Call Info	Script Execution	Status	Events	E...	Results
1	Check_SCTP_Status.gls		Stop	Monitoring SCTP Status	None		Unknown
2	M3UA.gls	1001	Stop	ASP Active	None		Pass
3	SCMG.gls	1001	Stop	Subsystem-Allowed	None		Pass
4	IuCS_Call.gls	IMSI:.001010123456219,TMSI:.0x00000002	Completed	SCCP Connection Released	None		Pass
5	IuCS_Call.gls	IMSI:.001010123456219,CalledNumber:.90658	Completed	SCCP Connection Released	None		Pass

Time	Direction	Message
15:58:59.225000	RNC to MSC	InitialUE-Message, CM SERVICE REQUEST
15:58:59.226000	MSC to RNC	CC connection confirm
15:58:59.228000	RNC to MSC	DirectTransfer, AUTHENTICATION REQUEST
15:58:59.359000	MSC to RNC	DirectTransfer, AUTHENTICATION RESPONSE
15:58:59.359000	RNC to MSC	SecurityModeCommand,
15:58:59.379000	MSC to RNC	SecurityModeComplete,
15:58:59.380000	RNC to MSC	DirectTransfer, CM SERVICE ACCEPT
15:58:59.400000	RNC to MSC	DirectTransfer, SETUP
15:58:59.401000	MSC to RNC	DirectTransfer, CALL PROCEEDING
15:58:59.403000	RNC to MSC	RAB-AssignmentRequest,
15:58:59.425000	MSC to RNC	RAB-AssignmentResponse,


```

===== 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         = 72 (x00000048)
      Protocol Data
0008 Tag                    = x0210 Transfer Protocol Data
000A Length                 = 63 (x003F)
      Originating Point Code
000E Point Code             = 3.3.3(..011000 00011011)
      Destination Point Code
0012 Point Code             = 2.2.2(..010000 00010010)
0014 Service Indicator       = ....0011 SCCP
0015 Network Indicator      = .....00 International network
0016 Message Priority        = .....00 Priority Code 0
0017 Signalling Link Selection = 1 (x01)

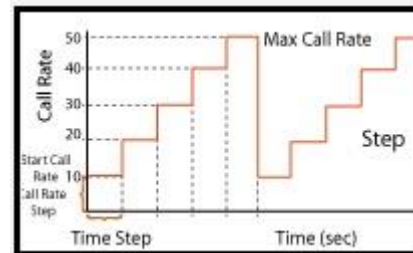
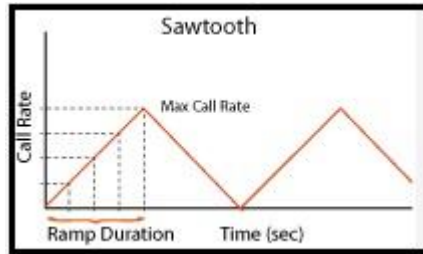
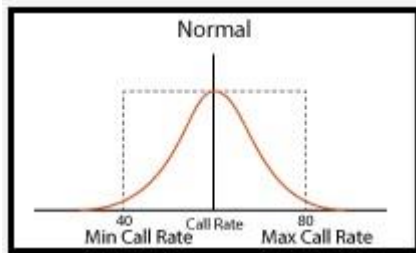
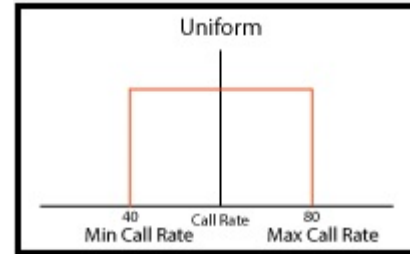
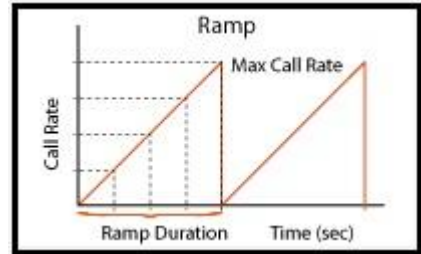
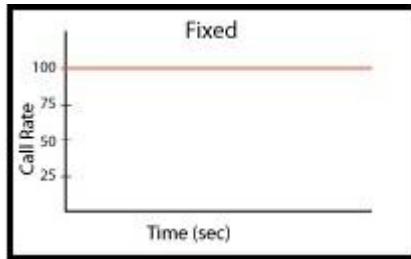
      Parameter Padding
      ===== SCCP Layer =====
0018 Message Type           = 00000110 DT1 data form 1
      Mandatory Fixed Parameters
      Destination Local Reference Parameter
0019 Destination Local Reference = 8 (x0000008)
      Segmenting Reassembling Parameter
001C More Data Indicator    = .....0 No more data
001D Delay to Mandatory Parameter = .....001 (x01)
    
```

Message Sequence

Decoded Message Details

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.



Load Generation - LoadGendefault

Total Calls To Generate * (* indicates no limit)

Max Active Calls 30 Unique Distributions Per Script

Multi Distributions

Distributions	Description	Add
Uniform	MinCR=40 , MaxCR=80 , Duration=10	Remove
Fixed	Call Rate=200 , Duration=10	Remove All
Normal	MinCR=40 , MaxCR=80 , Duration=10	Edit

Scripts

Profile Exclusive Profiles

Scripts	Profile
Placecall	Card1TS01
	Card1TS02
	Card1TS03
	Card1TS04
	Card1TS05
	Card1TS06
	Card1TS07
	Card1TS08
	Card1TS09
	Card1TS10
	Card1TS11
	Card1TS12
	Card1TS13

Add Delete Add Delete

Stop Time

Days 0 Hours 0 Minutes 0

Start Time - 00:00:00.000

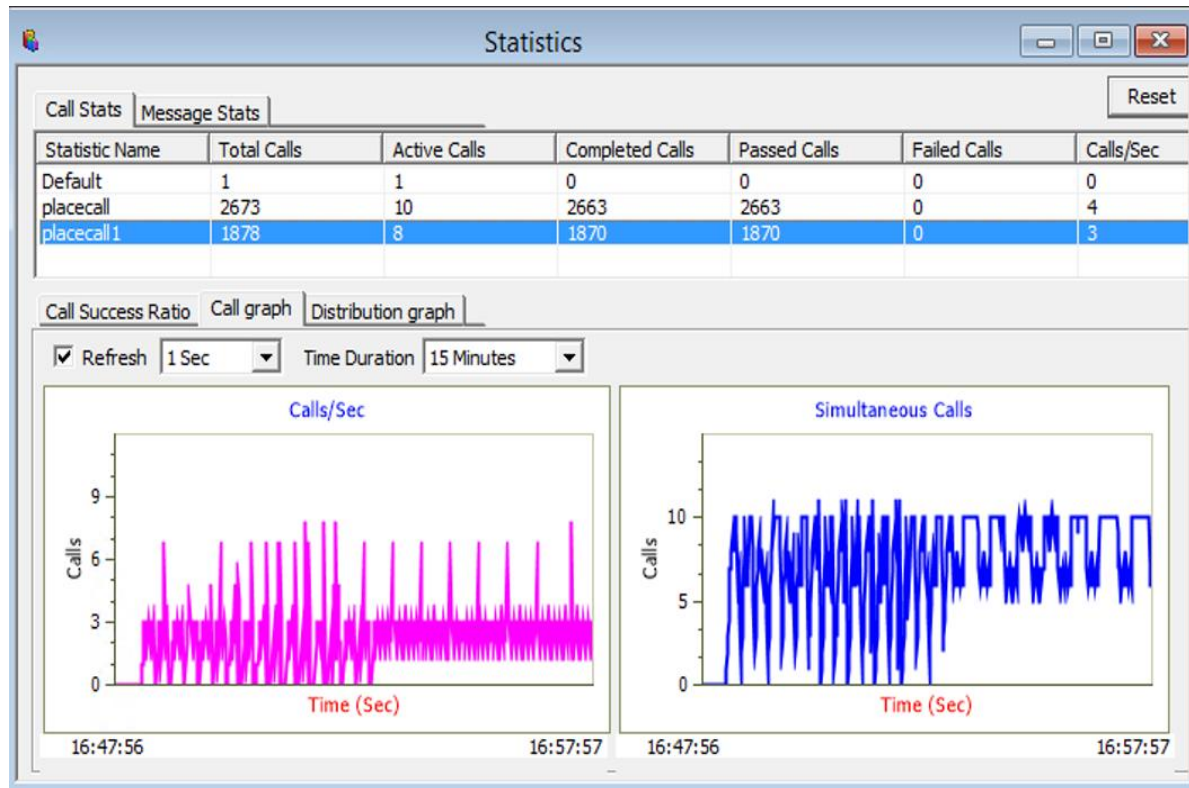
End Time - 00:00:00.000

Pause Start

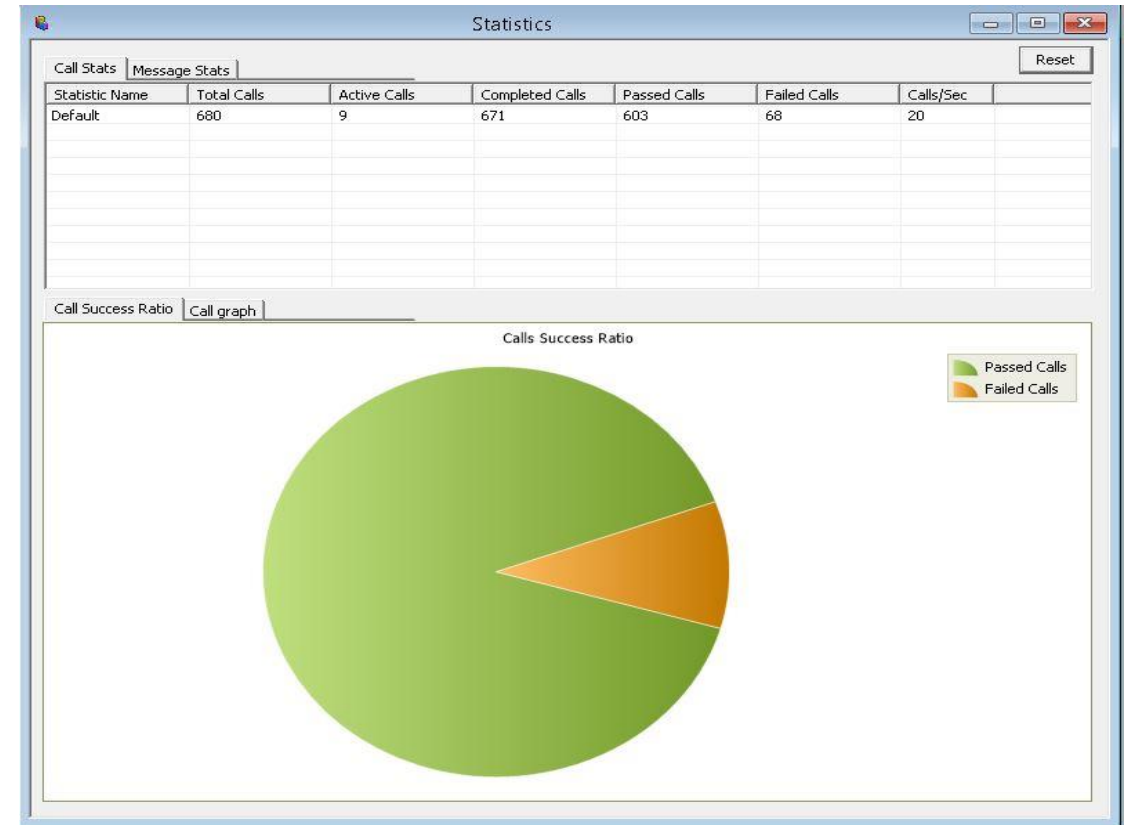
Success Call Ratio Statistics

MAPS™ Features

Call Graph

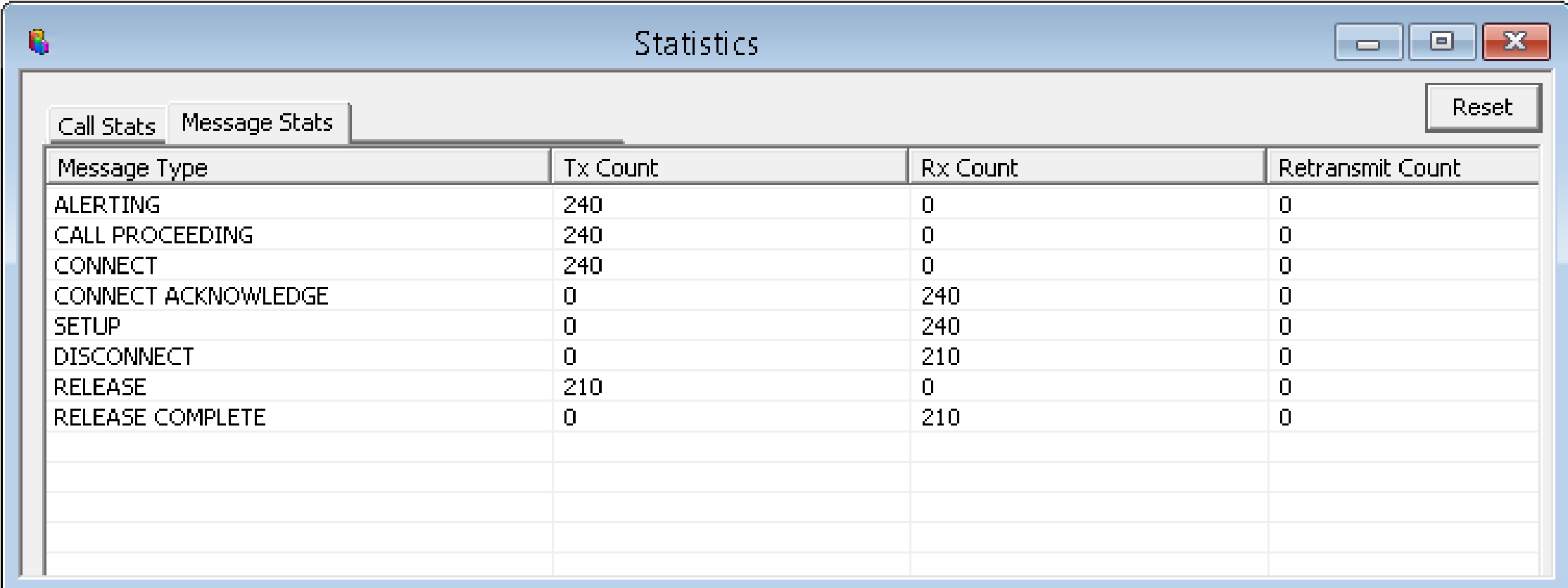


Call Stats



Message Statistics

- Message Stats provides a running tabular log of all messages transmitted, retransmitted and received during the session
- Provides an easy way to monitor the reception of error responses during load generation



The screenshot shows a window titled "Statistics" with a "Message Stats" tab selected. The window contains a table with the following data:

Message Type	Tx Count	Rx Count	Retransmit Count
ALERTING	240	0	0
CALL PROCEEDING	240	0	0
CONNECT	240	0	0
CONNECT ACKNOWLEDGE	0	240	0
SETUP	0	240	0
DISCONNECT	0	210	0
RELEASE	210	0	0
RELEASE COMPLETE	0	210	0

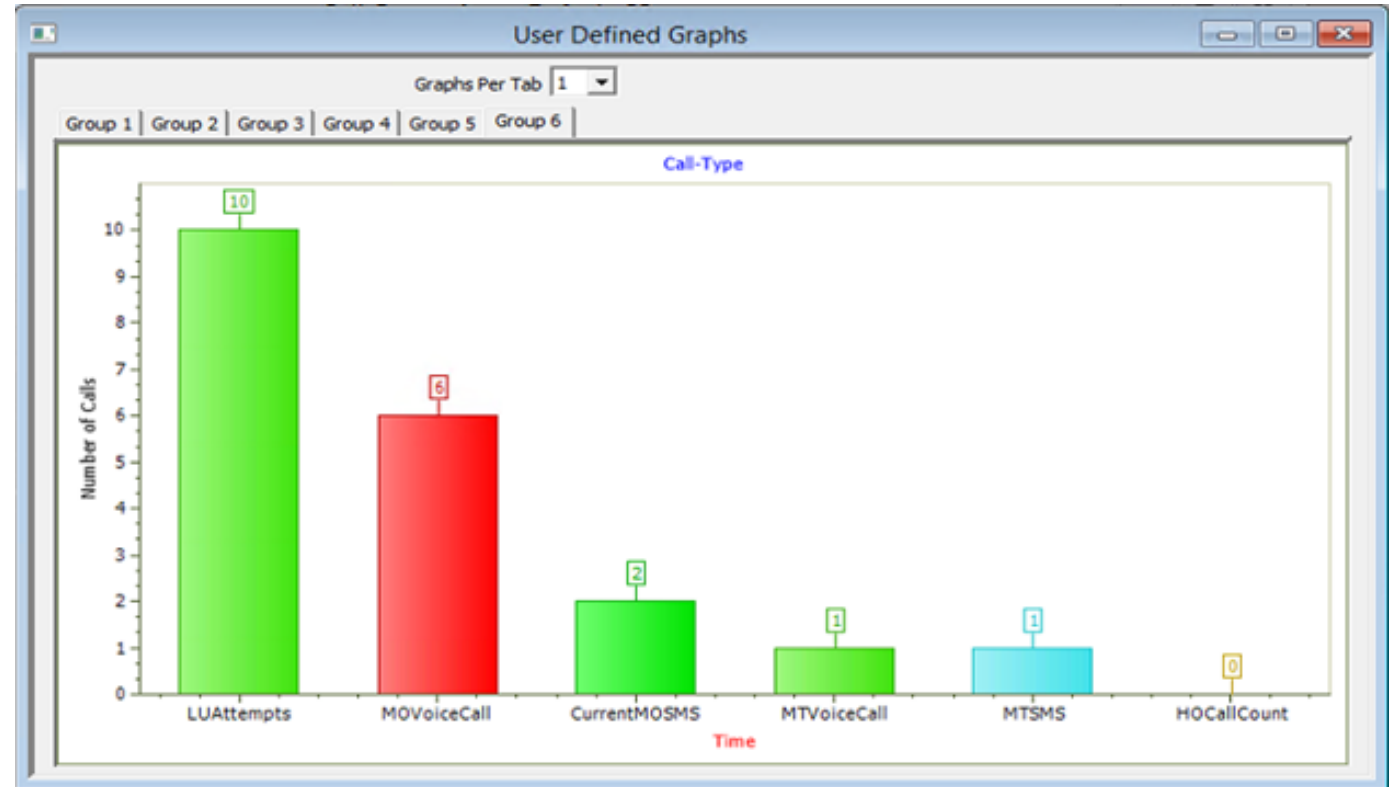
User Defined Graphs and Statistics

User Defined Statistics - VoiceQualityStats

Packet Stats

Name	Values
Active RTP Sessions	1987
Completed RTP Sessions	1548093
Sessions With Zero Receive Traffic	0
MOS Score Stats	0
Sessions with Mos (5.0 - 4.0)	612618 [39%]
Sessions with Mos (4.0 - 3.0)	852971 [55%]
Sessions with Mos (3.0 - 2.0)	73446 [4%]
Sessions with Mos (< 2.0)	9058 [0%]
Total RTP Packet Sent	4485008797
Total RTP Packet Received	4481760883
Packet-Loss Stats	0
Total PacketLoss	4072 [0%]
Sessions with Zero Packet-Loss	1534967 [99%]
Sessions with Packet-Loss(<1%)	13126 [0%]
Sessions with Packet-Loss(1% - 5%)	0 [0%]
Sessions with Packet-Loss(5% - 10%)	0 [0%]
Sessions with Packet-Loss(>10%)	0 [0%]
Packet-Discarded Stats	0
Total PacketDiscarded	3738934 [0%]
Sessions with Zero Packet-Discard	1464299 [94%]
Sessions with Packet-Discard(<1%)	41479 [2%]
Sessions with Packet-Discard(1% - 5%)	37232 [2%]
Sessions with Packet-Discard(5% - 10%)	4843 [0%]
Sessions with Packet-Discard(>10%)	240 [0%]
Packet-Duplicate Stats	0
Total Duplicate Packet	0 [0%]
Sessions with Zero Duplicate Packets	1539942 [99%]
Sessions with Duplicate Packets(<1%)	0 [0%]
Sessions with Duplicate Packets(1% - 5%)	0 [0%]
Sessions with Duplicate Packets(5% - 10%)	0 [0%]
Sessions with Duplicate Packets(>10%)	0 [0%]
Packet-Out Of Sequence Stats	0 [0%]
Total Out Of Sequence Packet	0 [0%]
Sessions with Zero OOS Packets	1539942 [99%]
Sessions with OOS Packets(<1%)	0 [0%]
Sessions with OOS Packets(1% - 5%)	0 [0%]
Sessions with OOS Packets(5% - 10%)	0 [0%]
Sessions with OOS Packets(>10%)	0 [0%]
Jitter Stats	0
Sessions with Jitter(< 1 msec)	1450779 [93%]
Sessions with Jitter(< 5 msec)	93031 [6%]
Sessions With Jitter(< 10 msec)	4841 [0%]
Sessions With Jitter(>= 10 msec)	350 [0%]

Insert Add Delete Edit

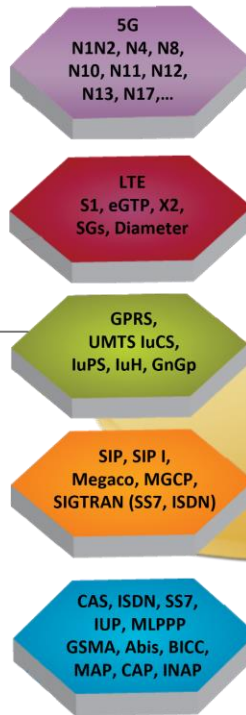


Traffic Simulation

Simulate User Equipment



All Protocols

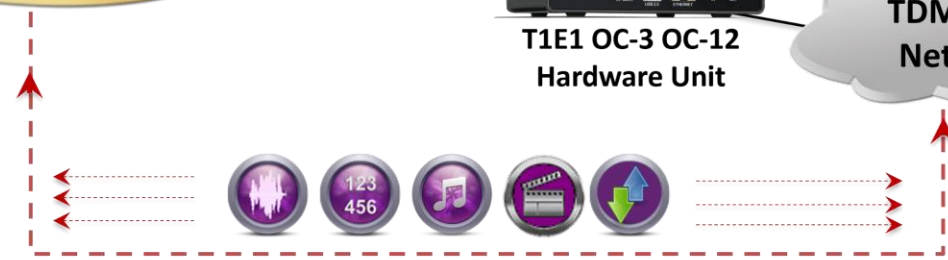
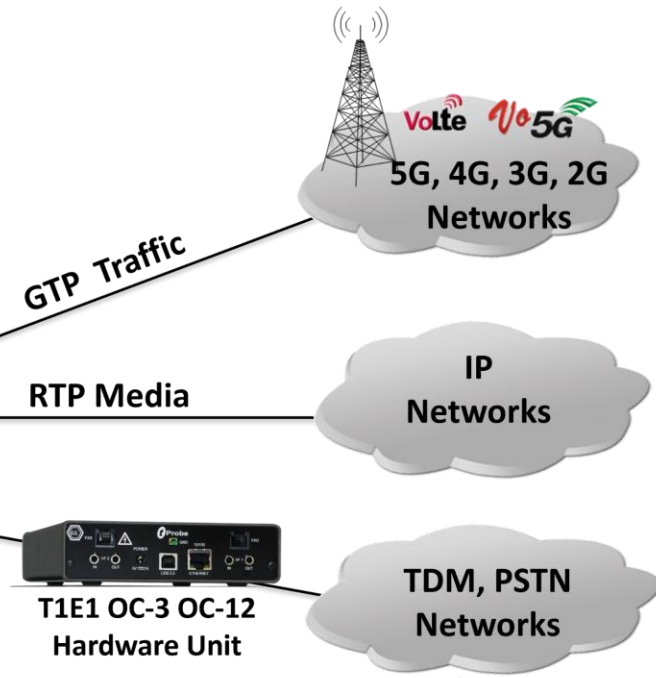


Hundreds of thousands of simultaneous calls



MAPS™ High Density (HD)
Call Generator

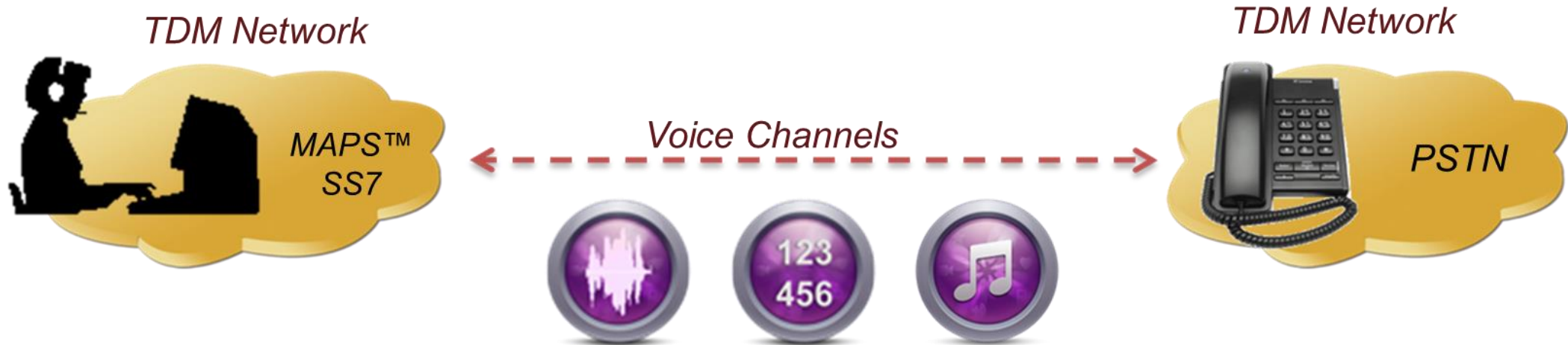
Load, Stress,
Performance



Supported RTP Codecs

- **PCMU/PCMA:** 64kbps, 8000Hz, VAD
- **G.722/G.722.1:** 24/32/64kbps, 16000Hz, No VAD
- **G.729/G.729B:** 8kbps, 8000Hz, VAD
- **GSM 6.10 FR:** 13.2kbps, 8000Hz, No VAD
- **GSM EFR:** 12.2kbps, 8000Hz Yes VAD
- **GSM:** 5.6kbps, 8000Hz, Yes VAD
- **G.726:** 16/24/32/40kbps, 8000Hz, Yes VAD
- **AMR:** 4.75/5.15/5.9/6.7/7.4/7.95/10.2/12.2kbps, 8000Hz, Yes VAD (*OPTIONAL LICENSE*)
- **AMR WB:** 4.75/5.15/5.9/6.7/7.4/7.95/10.2/12.2kbps, 16000Hz, Yes VAD (*OPTIONAL LICENSE*)
- **EVRC:** 1/8, 1/2, 1 rate, 8000Hz, No VAD (*OPTIONAL LICENSE*)
- **EVRC_B:** 1/8, 1/2, 1 rate, 8000Hz, Yes VAD (*OPTIONAL LICENSE*)
- **EVRC_C:** 1/8, 1/2, 1 rate, 16000Hz, Yes VAD (*OPTIONAL LICENSE*)
- **SMV:** Modes 0,1,2 and 3, 8000Hz, No VAD (*OPTIONAL LICENSE*)
- **ILBC:** 15.2/13.33kbps, 8000Hz, No VAD
- **SPEEX:** 8kbps, 8000Hz, Yes VAD
- **SPEEX WB:** 11.2kbps, 16000Hz, Yes VAD

TDM Traffic Simulation



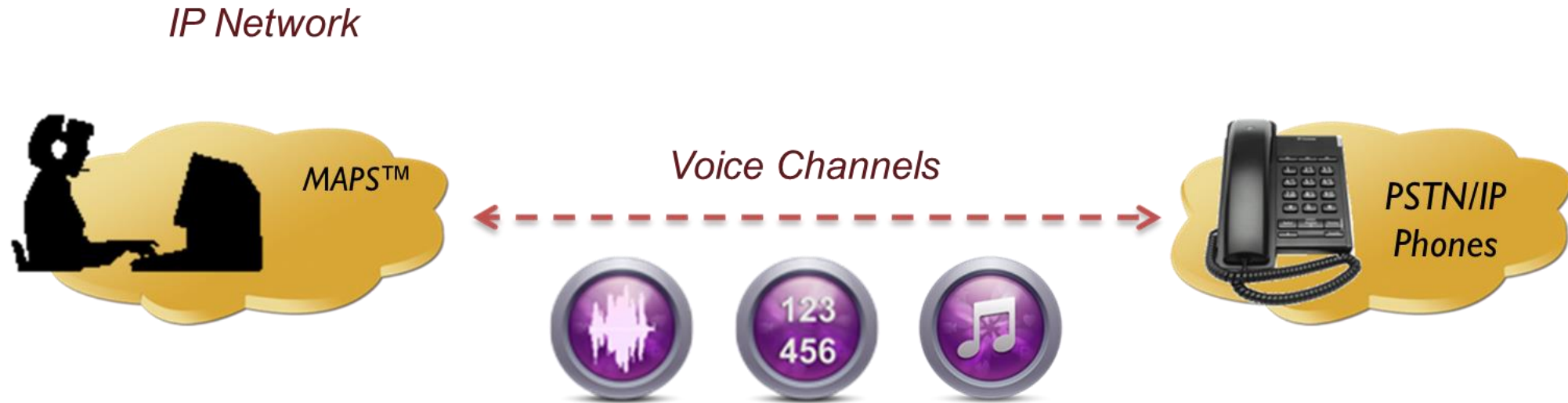
Tx

- *Pre recorded PCM files*
- *DTMF, MF, MFR2B and MFR2F Digits*
- *User Defined Tones*
- *FAX*
- *AAL2*

Rx

- *PCM files*
- *DTMF, MF, MFR2B and MFR2F Digits*
- *User Defined Tones*
- *FAX*
- *AAL2*

RTP Traffic Simulation



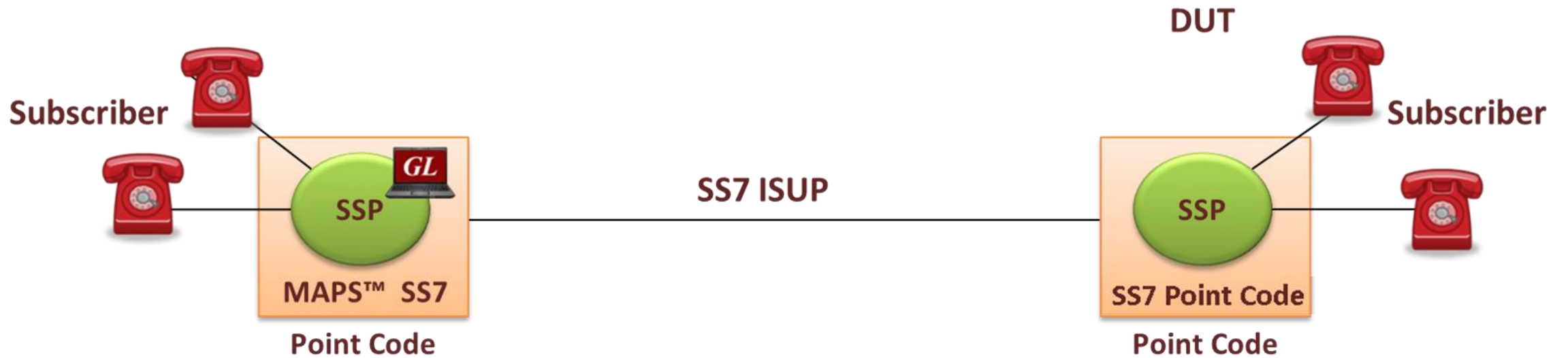
Tx

- *Pre recorded GLW files*
- *DTMF, MF Digits*
- *User Defined Tones*
- *Insert Voice*
- *FAX T.30*

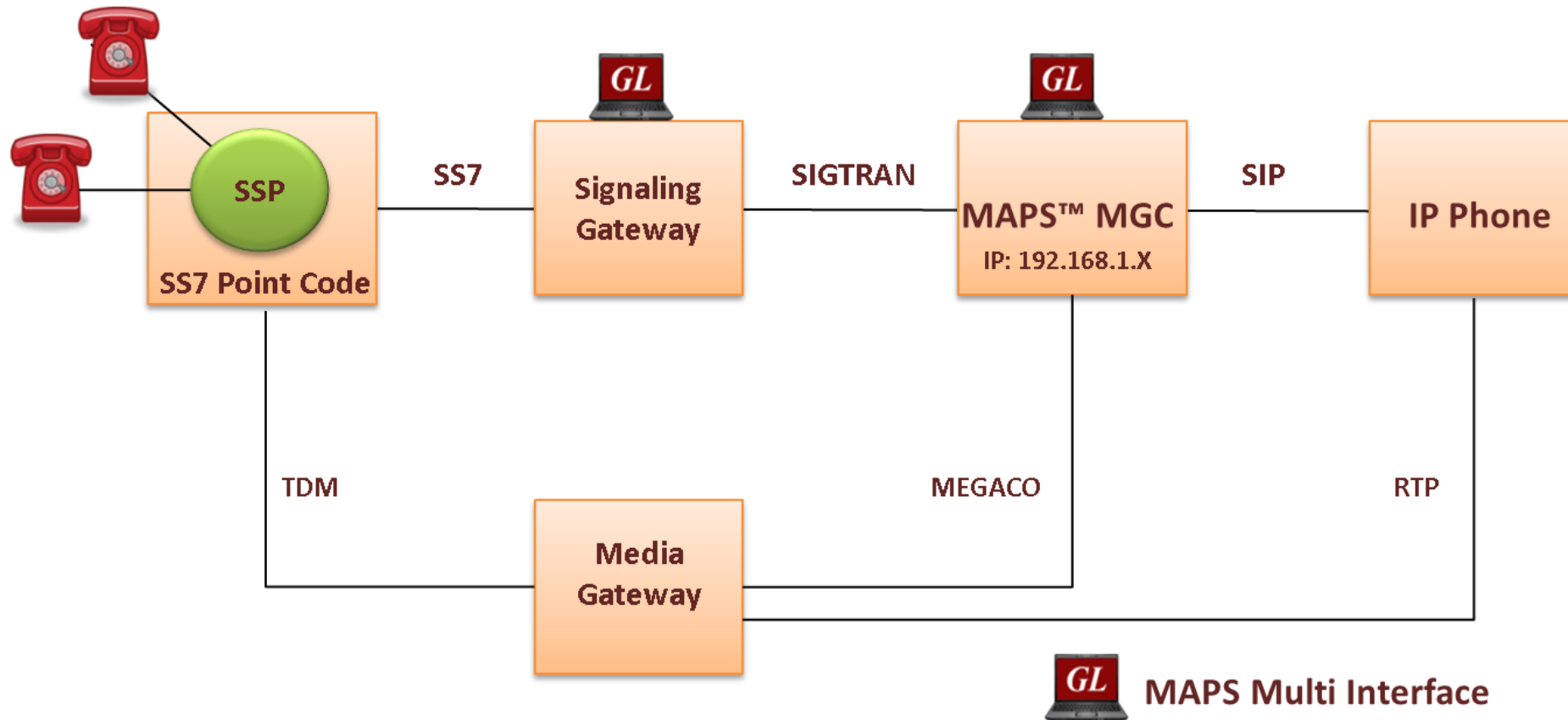
Rx

- *GLW files*
- *DTMF, MF Digits*
- *User Defined Tones*
- *FAX T.30*

Single Interface Simulation



Multi Interface Simulation



Multiple Transport Support



Dual T1 E1 Express (PCIe) Board



Quad / Octal T1 E1 PCIe Card



Rackmount Quad T1 E1 Analyzer

16-Port T1 E1 Breakout-Box



PCIe Board



tProbe™ - Portable USB based T1 E1 VF FXO FXS and Serial Datacom Analyzer

IP Hardware

- IP variants of MAPS™ can be run on any modern Windows server
- A typical i7 platform will be able to handle ~2000 concurrent RTP sessions through a conventional server-grade NIC
- We also offer an HD (High Density) appliance which can deliver up to 20,000 concurrent RTP sessions per Unit of rack space



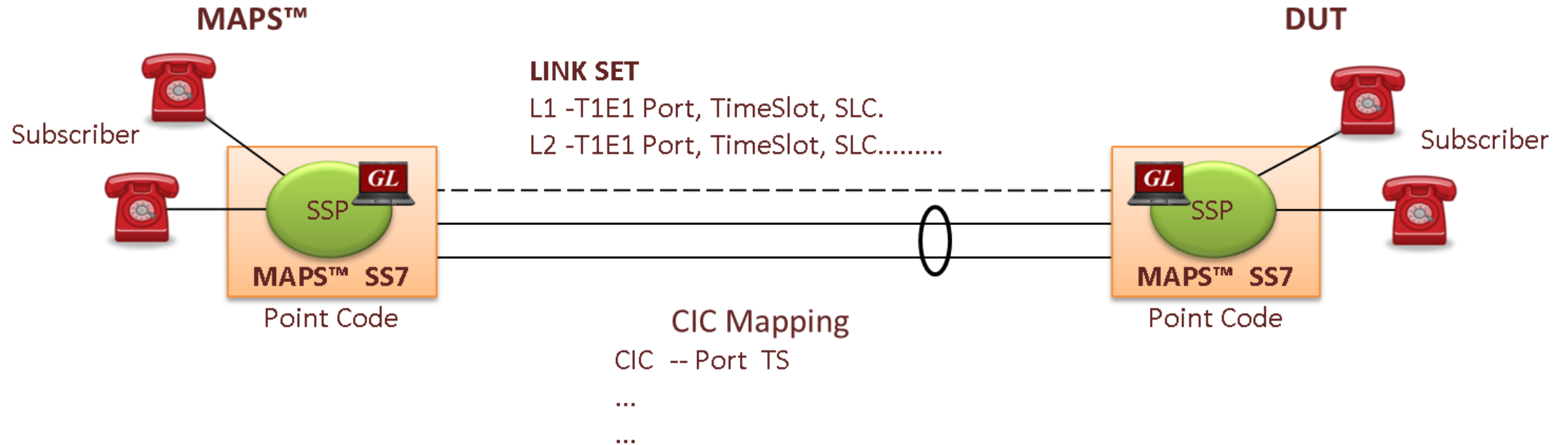
High Density (HD) RTP Traffic Simulation

- Rackmount network appliance with 4x1GigE NIC
- Transport over UDP and TCP, IPv4 and IPv6, and TLS for secure transport
- Easily achieve up to 20,000 endpoints per appliance (5000 per port)
- Up to 350 calls per second (with RTP traffic)
- Scales to around 100,000 to 200,000 endpoints with use of Master Controller for single point of control
- Manage 10+ MAPS™ systems with single point of control from master controller

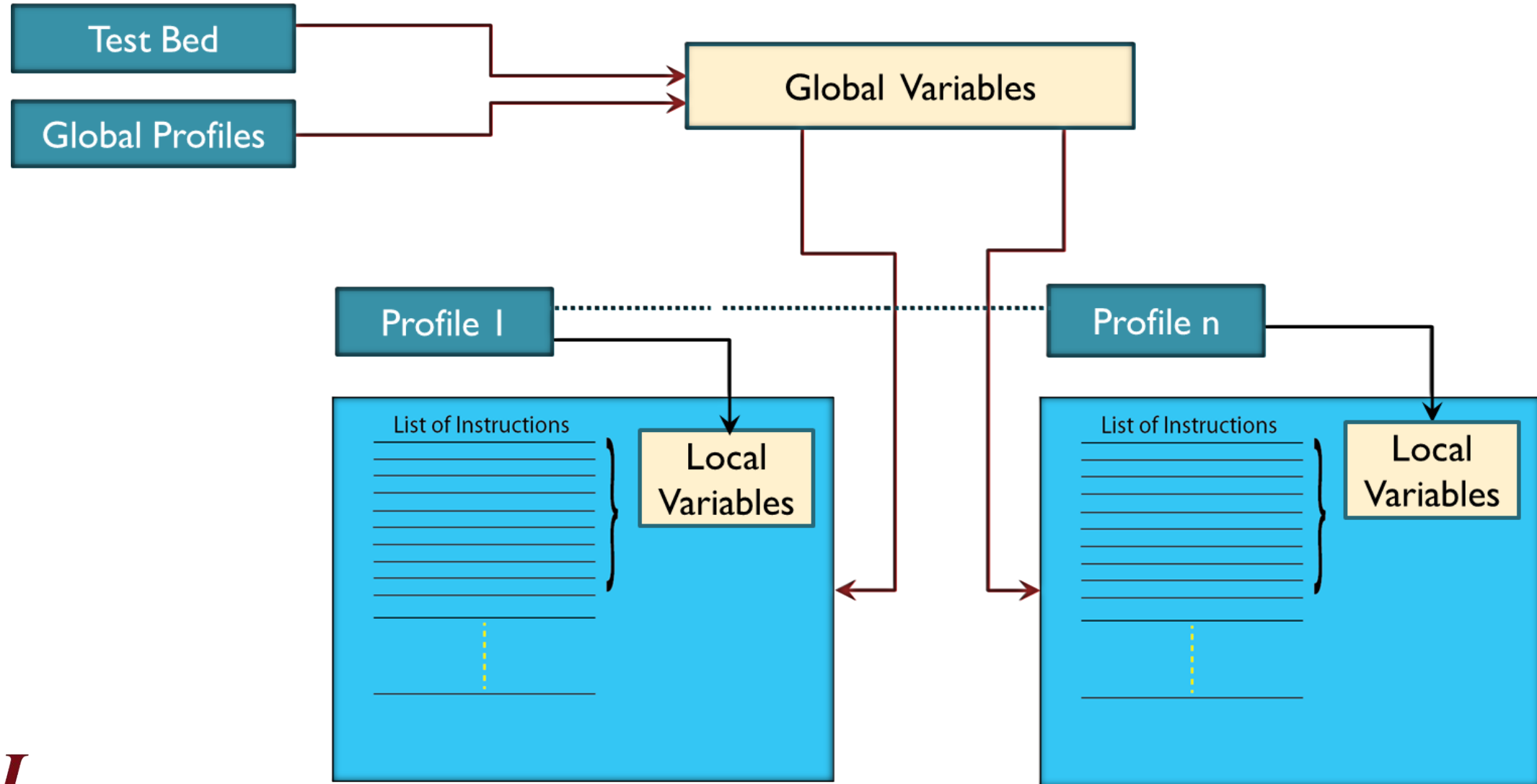


Introduction to MAPS™ Configurations

- Testbed Setup
- Global Configuration
- Profiles



Local and Global Variables



Testbed Configuration

Config

Config	Value
MSC Configurations	
Adapter Index	0
M3UA Termination Type	SGP
Enable or Disable RTP	Enable
MSC	1
MSC 1	
MSC IP Address	192.168.1.21
MGW IP Address	192.168.1.21
MSC Port	2906
PLMN Identifiers	
Mobile Country Code	001
Mobile Network Code	01
MTP Parameters	
MSC Point Code	2.2.2
Signaling Link Selection	1
Network Indicator	International
MSC Address Indicator	National
RNC Parameters	
Supported RNCs	1
RNC 1	
RNC IP Address	192.168.1.21
RNC Port	2905
RNC Point Code	3.3.3
RNC Address Indicator	National
Location Area Identifier	
Location Area Code	0001
Service Area Code	0001
RNC ID	1
End User Configurations	MS Profiles.xml

LAC

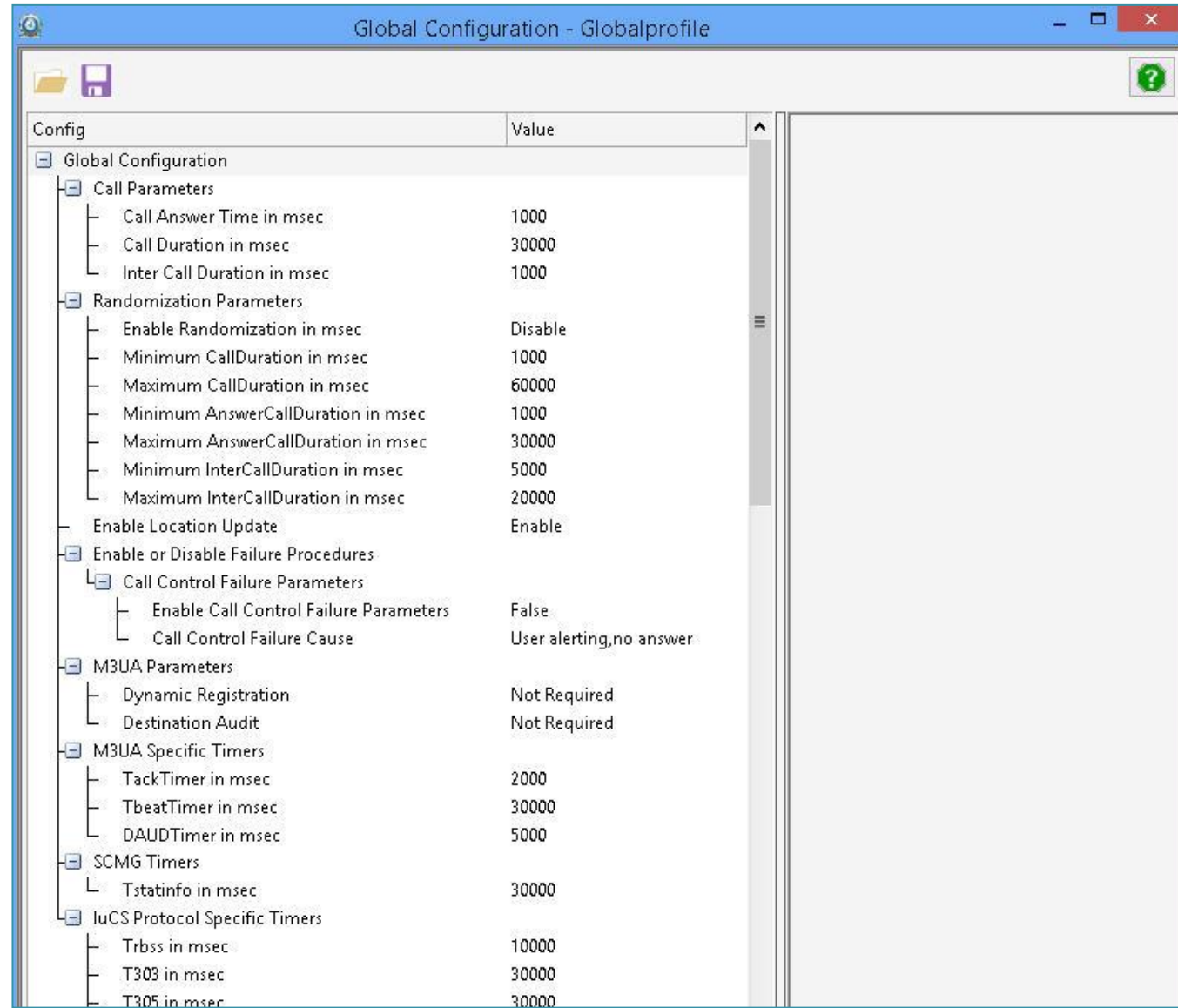
Enter Hex

0001

Start Edit

Error Events Captured Errors Link Status Up=0 Down=

Global Configuration



The screenshot shows a software window titled "Global Configuration - Globalprofile". The window contains a tree view of configuration parameters on the left and a corresponding value column on the right. The parameters are organized into several categories, each with a minus sign icon to indicate it is expanded. The values are displayed in a plain text format.

Config	Value
Global Configuration	
Call Parameters	
Call Answer Time in msec	1000
Call Duration in msec	30000
Inter Call Duration in msec	1000
Randomization Parameters	
Enable Randomization in msec	Disable
Minimum CallDuration in msec	1000
Maximum CallDuration in msec	60000
Minimum AnswerCallDuration in msec	1000
Maximum AnswerCallDuration in msec	30000
Minimum InterCallDuration in msec	5000
Maximum InterCallDuration in msec	20000
Enable Location Update	Enable
Enable or Disable Failure Procedures	
Call Control Failure Parameters	
Enable Call Control Failure Parameters	False
Call Control Failure Cause	User alerting,no answer
M3UA Parameters	
Dynamic Registration	Not Required
Destination Audit	Not Required
M3UA Specific Timers	
TackTimer in msec	2000
TbeatTimer in msec	30000
DAUDTimer in msec	5000
SCMG Timers	
Tstatinfo in msec	30000
IuCS Protocol Specific Timers	
Trbss in msec	10000
T303 in msec	30000
T305 in msec	30000

Sample Profile

MAPS (Message Automation Protocol Simulation) MSC (UMTS IU-CS 3GPP S-CTP) - [Profile Editor - MS_Profiles]

Configurations Emulator Reports Editor Debug Tools Windows Help

#	Profiles (EdR-F2)	Config	Value
1	MSProfile0001	MSProfile0001	
2	MSProfile0002	Type Of Call	Terminate MO Call
3	MSProfile0003	Service Type For MT Call	Speech Call
4	MSProfile0004	Enable Paging On TMSI	Disable
5	MSProfile0005	SSType	USSD Notify
6	MSProfile0006	Mobile ID	
7	MSProfile0007	IMEI	353887067326268
8	MSProfile0008	TMSI	01110001
9	MSProfile0009	IMSI	001013014041741
10	MSProfile0010	MSISDN	
11	MSProfile0011	Calling Number Parameters	
12	MSProfile0012	Numbering plan ident...	ISDN/Telphony nu...
13	MSProfile0013	Type of number	Unknown
14	MSProfile0014	Calling Number	3014041741
15	MSProfile0015	Called Number Parameters	
16	MSProfile0016	Numbering Plan Ident...	ISDN/Telphony nu...
17	MSProfile0017	Type of Number	Unknown
18	MSProfile0018	Called Number	3014041791
19	MSProfile0019	Presentation Indicator	Disable
20	MSProfile0020	Location Area Identifiers for Paging	
21	MSProfile0021	LAC	0001
22	MSProfile0022	SAC	0001
23	MSProfile0023	RAC	01
24	MSProfile0024	RNCID	2
25	MSProfile0025	RAB Parameters	
26	MSProfile0026	Authentication Procedures	Disable
27	MSProfile0027	Ciphering Procedures	Disable
28	MSProfile0028	Authentication Parameters	
29	MSProfile0029	USSD Configuration	
30	MSProfile0030	SMS Call Parameters	
31	MSProfile0031	Codec Options and Traffic Config...	
		Codec Options	AMR-OA-Mode7
		Packetization Time in msec	20
		Traffic Config	
		Traffic Type	Auto Traffic File
		Traffic Direction	TxOnly
		Impairment Type	None
		Traffic Profile Name	Profile0001
		Enable Real Media Gateway	False
		Real Media Gateway Destinati...	192.168.12.204

EnableAutoMT
Select Option
Terminate MO Call

Add Insert Delete
Properties

Initialization Errors Error Events Captured Errors Link Status Up=0 Dow

MAPS™ Scripting

Script Variants

- MAPS™ Scripts can be written in different ways as we have flexible commands such as **Go to, IF Else IF, Timers, Actions, User Events** etc.
- **Two Types of Scripting**
 - Simple, Non-Event driven
 - Event Driven
- **Non-Event driven:** Defines flow sequentially without monitoring any events. These can be small and simple scripts using send and receive actions
- **Event Driven:** Defines flow on basis of user selected events. Using Event Driven scripting one can achieve Protocol State Machines as per protocol specifications

Structure of Non Event Driven Script

```
//Script Description .....
```

```
//Initalization Section
```

```
-----  
-----
```

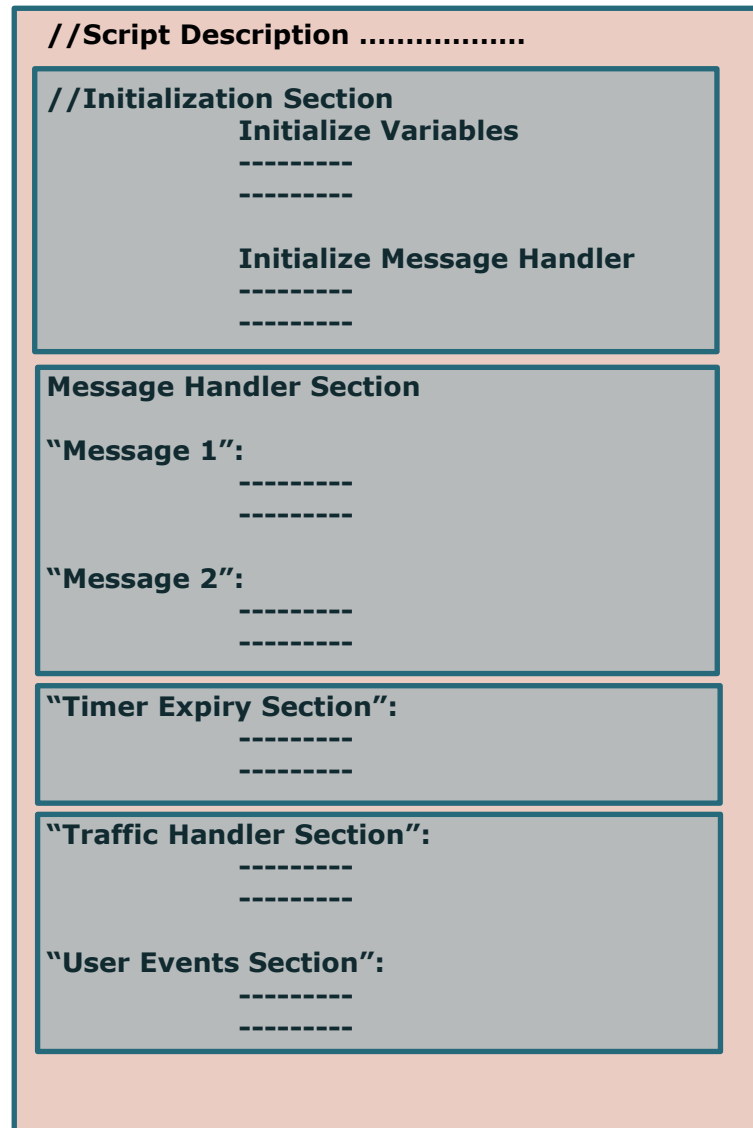
```
//Action section
```

```
Send "MessageName" "ImportFile Name";  
Recv "Message" "ExportFile Name";  
Result = "Pass";  
State = ".....";  
Status = ".....";  
Exit;
```

Script Events

- **Message Handler:** On Receipt of any Message Event control move to defined section in script
- **Traffic Event:** On detection of any traffic actions, Control move to detected Traffic Event Section like “Digits Detected”, Tone Detected”, etc.
- **Timer:** On Expiry of Timer, control moves to respective Timer Expiry section
- **User Events:**
 - Within scripts: Goto “Label”
 - User Intervention: User Event
 - Intervention from another Script: Apply Event to another script

Structure of Event Driven Script



Scripts

Below call flow scenario using MAPS Script

Send "Initial Address" "InitialAddressImport";

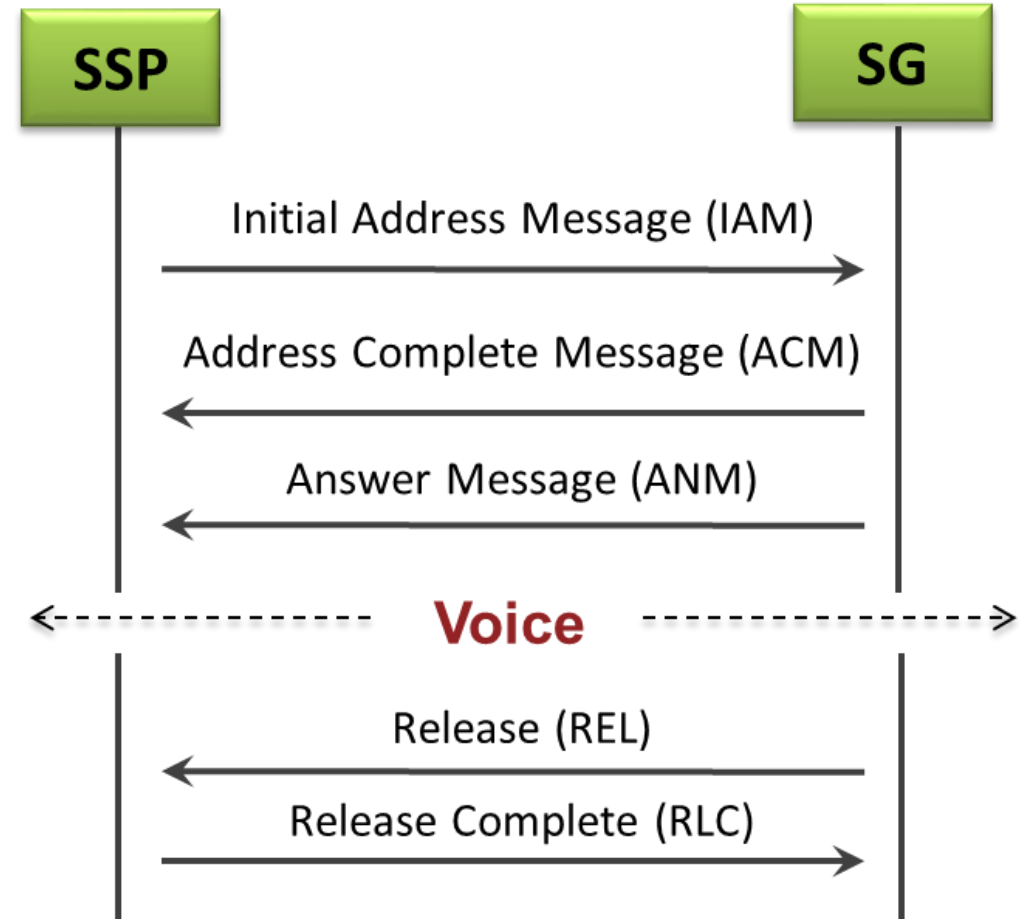
Recv "Address Complete" "AddressCompleteExport";

Recv "Answer" "AnswerImport";

TxRx:tx _TDM file: filename = "Vijay.pcm";

Send "Release" "ReleaseImport";

Recv "Release Complete" "ReleaseCompleteExport";

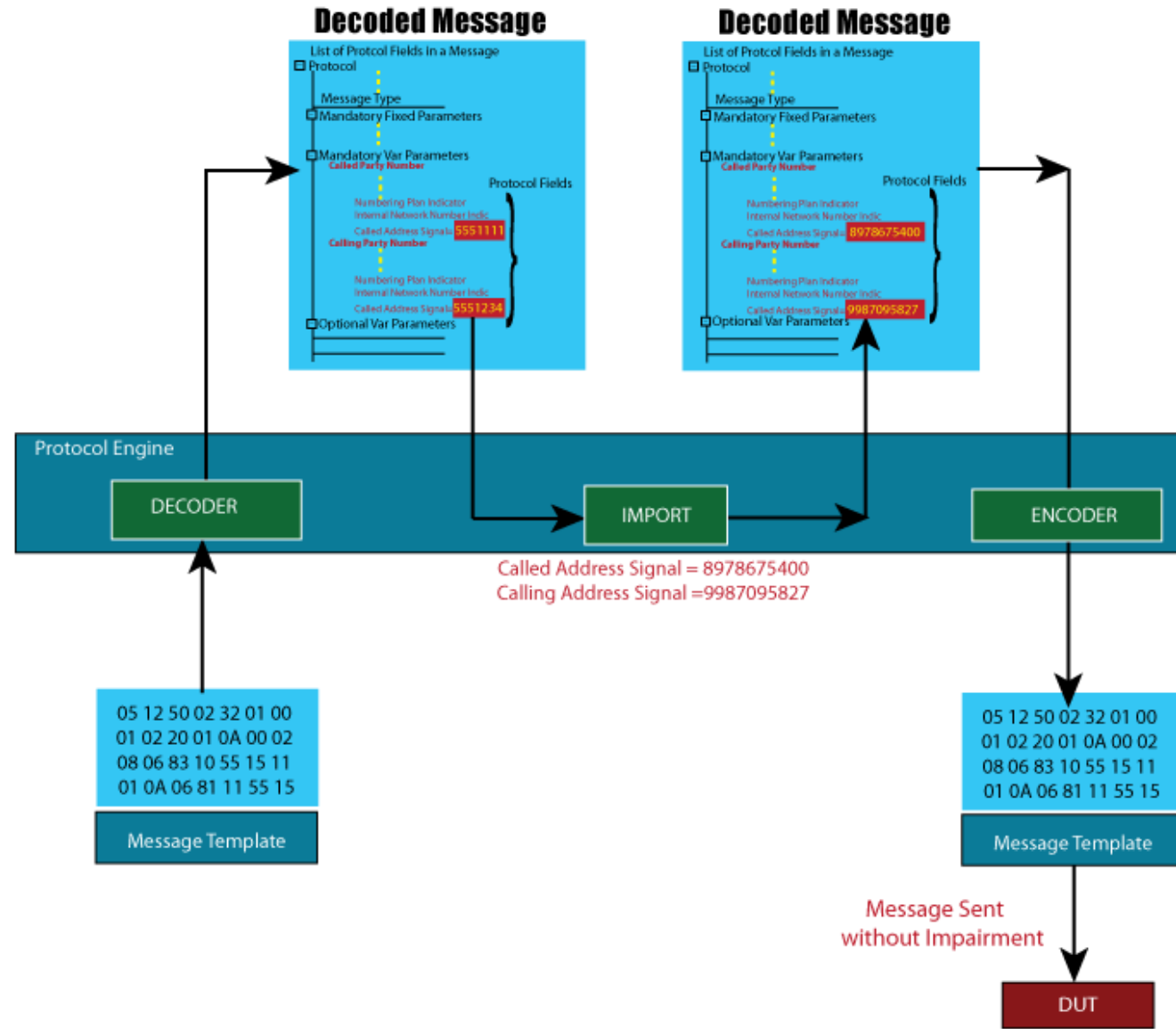


Sample Script

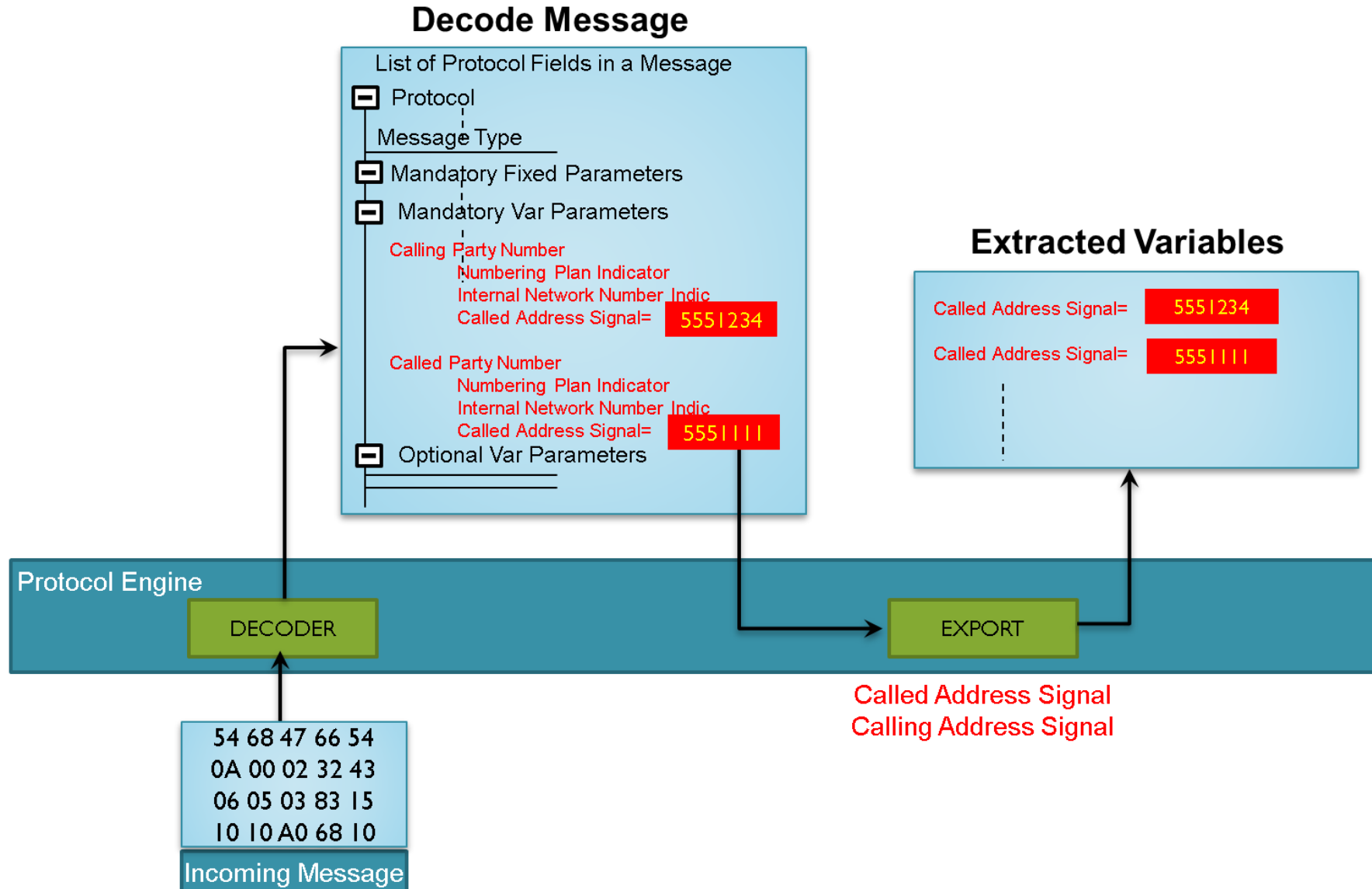
```
ScriptEditor - [C:\Program Files\GL Communications Inc\MAPS5G-N1N2\MAPS\N1N2\RELEASE15\gNB\Scripts\5GMMHandler.gls]
File View Edit Shortcuts Tools Help
Command Window
Action
- Send
- Recv
- Decode
- Bind
- Unbind
- Load Profile
- Start Timer
- Stop Timer
- Stop Retransmit Timer
Conditional & Flow Control
- If Statements
- Wait Statements
- Loop Statements
- Add Label...
- GoTo...
- Message Handler
- User Event
- Active User Event
Variable
Maps CLI
Logs / Comment
Init
Child Script
DataBase
- Send Report
- Resume
- Return
- Include
- Exit
Utility Functions
- Arithmetic Operations
- Conversions
- String Operation
- Random Numbers
- General
- Bit Operation
- Append Operation
Time
25 CI_Converted=CellIdentity;
26 endif
27 ConvertToString (CI_Converted,CIStr);
28 Split (CIStr,1,Pri,CIStr);
29 AccessNetworkInfo="";
30 AppendInAscii (AccessNetworkInfo, MCCstr,MNCstr,TACstr,CIStr);
31 RegRequestedTypeOfIdentity=TypeOfIdentity;
32 goto "GetUESecurityCapabilityDump";
33 //incr PTI 1;
34 AllocUniqueId "gNBDataTEID" gNBDataTEIDInt; // FOR FIRST PDU SESSION
35 IntToHex (gNBDataTEIDInt, gNBDataTEID);
36 SetScriptVariable (ParentScriptId, gNBDataTEID=gNBDataTEID, gNBDataTEIDInt=gNBDataTEIDInt, MCC=MCC, MNC=MNC, T
37 Split (IMSI, 3, MCC_imsi, IMSIRemain);
38 Split (IMSIremain, 2, MNC_imsi, MSIN);
39 ConvertToString (MSIN, MSIN);
40 ConvertStringToSpecifiedType (MSIN, MSIN, "BinaryString" );
41
42 if (IdentifygNB == "True")
43     if (_SMPiggyBack=="Enable")
44         incr PDUSessionId 1;
45         if (TypeOfIdentity==0)
46             MobileId=0;
47             send "RegistrationRequest_NoIdentity" "RegistrationRequest_NoIdentityImport" "StreamId" = _
48         elseif (TypeOfIdentity==1)
49             MobileId=$MSIN;
50             KidDispStr="MSIN:";
51             send "RegistrationRequest_SUCI_Piggyback" "RegistrationRequest_SUCI_PiggybackImport" "Strea
52         elseif (TypeOfIdentity==3)
53             MobileId=$IMEI;
54             KidDispStr="IMEI:";
55             send "RegistrationRequest_IMEI" "RegistrationRequest_IMEIImport" "StreamId" = _UESignalingS
56         elseif (TypeOfIdentity==4)
57             MobileId=$TMSI;
58             KidDispStr="TMSI:";
59             send "RegistrationRequest_TMSI" "RegistrationRequest_TMSIImport" "StreamId" = _UESignalingS
60         elseif (TypeOfIdentity==5)
61             MobileId=$IMEISV;
62             KidDispStr="IMEISV:";
63             send "RegistrationRequest_IMEISV" "RegistrationRequest_IMEISVImport" "StreamId" = _UESignalingS
64         else
65             MobileId="";
66             KidDispStr="";
67             send "RegistrationRequest_Unknown" "RegistrationRequest_UnknownImport" "StreamId" = _UESignalingS
68         endif
69     endif
70 endif
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
Line Count - 738 | Line: 1 Col: 1
```

Understanding Send and Receive Messages

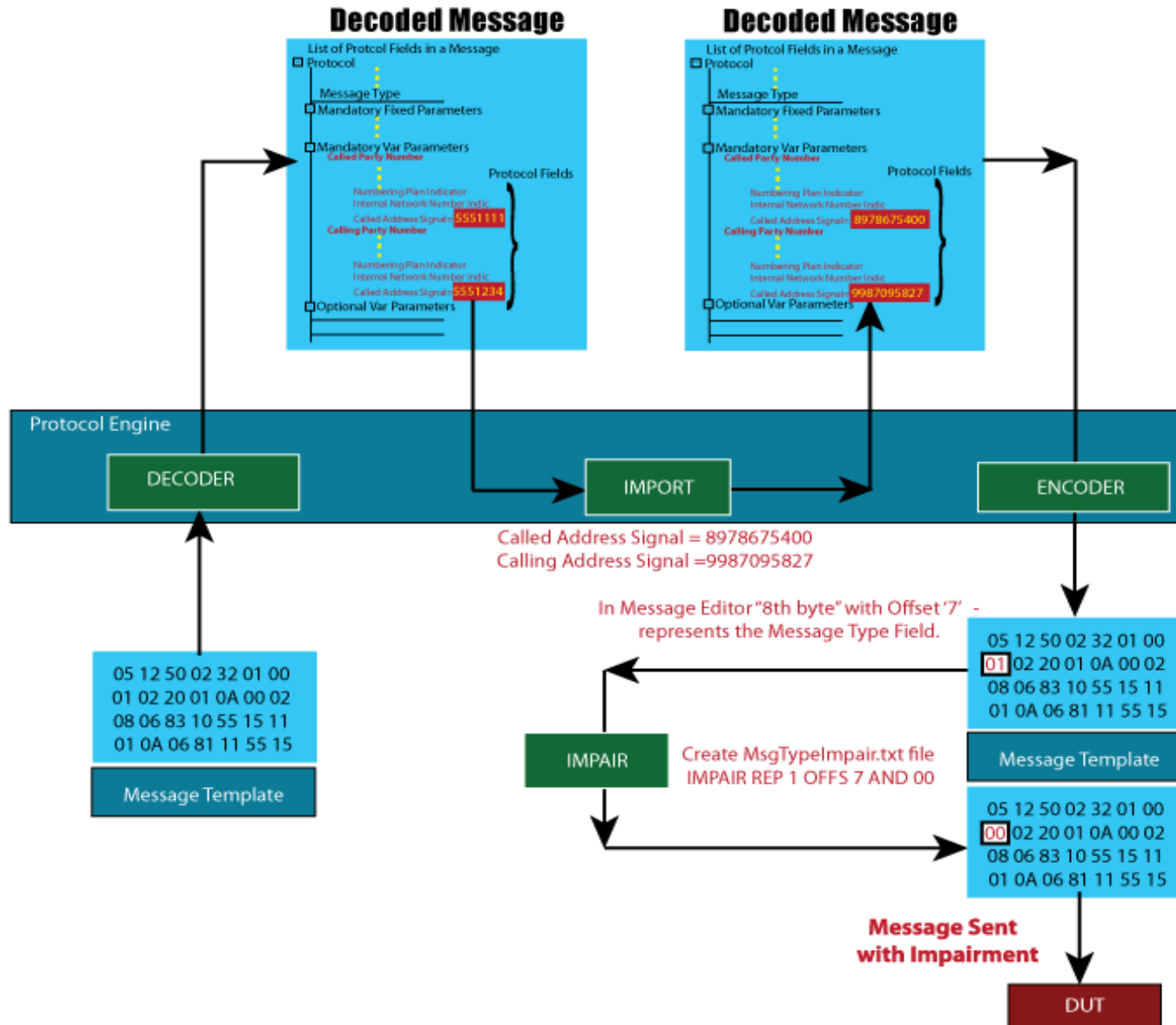
Basic Send Command



Basic Receive/Decode Command

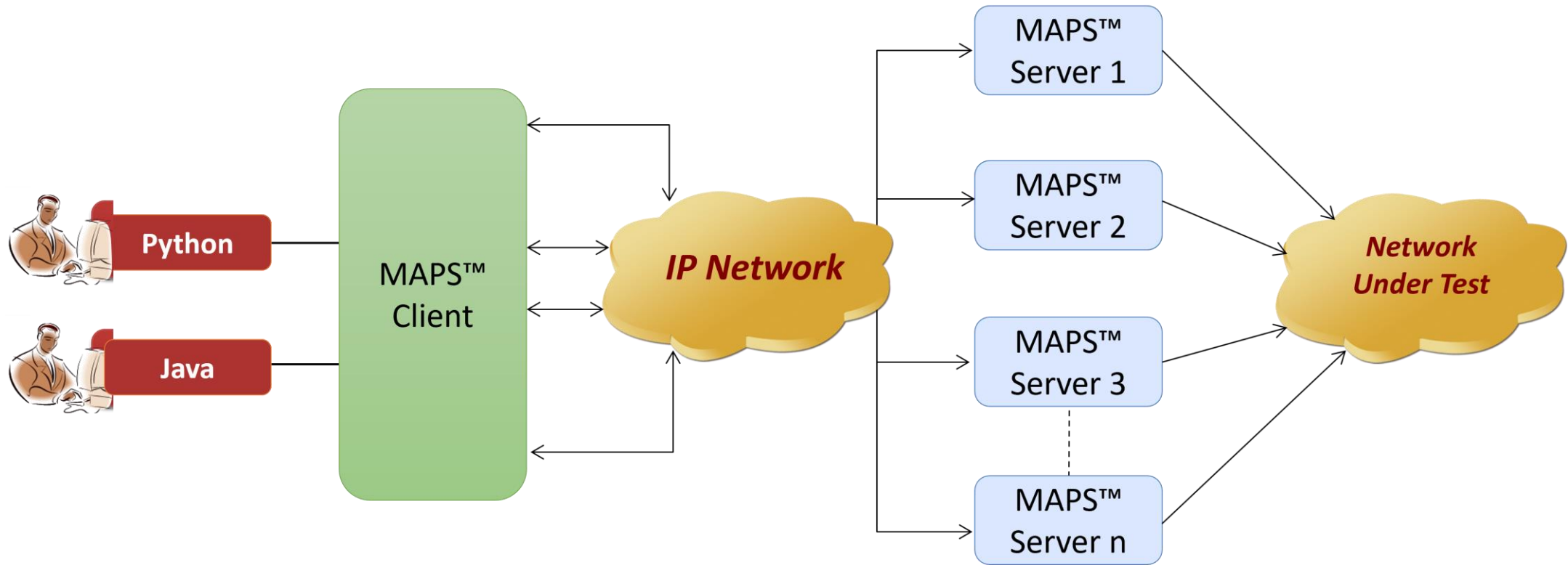


Send Command With Impairment

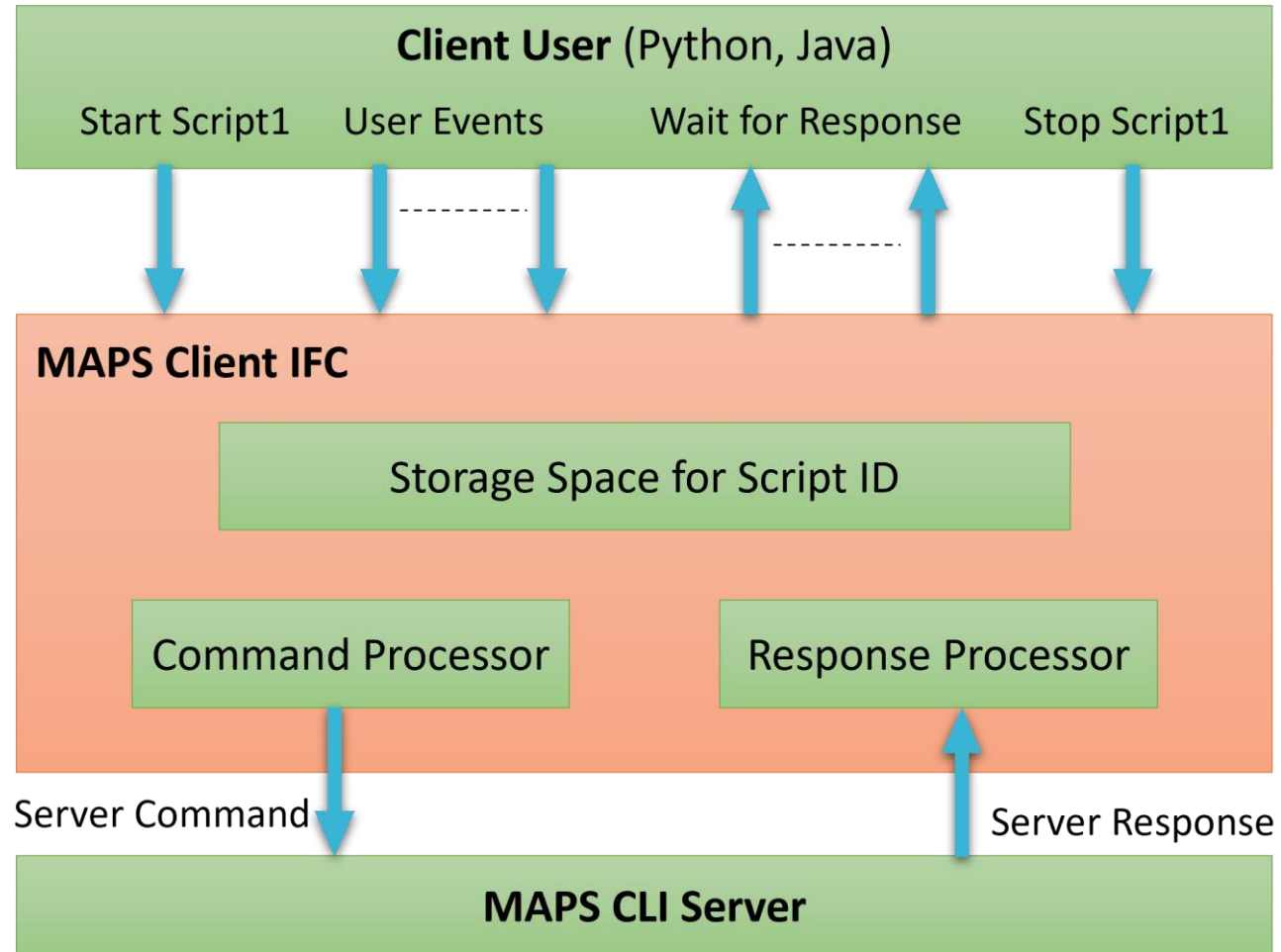


CLI/APIs for Remote Control and Test Automation

CLI for Remote Call Control & 3rd Party Integration



Command Line Interface Working Principle



Python Client

```
Python 3.7.5 Shell
File Edit Shell Debug Options Windows Help
Python 3.7.5 (tags/v3.7.5:5c02a39a0b, Oct 15 2019, 00:11:34): bit (AMD64) on win32
Type "copyright", "credits" or "license()" for more information.
>>> ===== RESTART =====
>>>
SERVER INITIALIZED
CONNECTED
Negotiated Codec = PCMU
0
CMOS =
LMOS =
CR_FACTOR =
LR_FACTOR =
TX_PACKETS =
RX_PACKETS =
LOST_PACKETS =
DISCARDED_PACKETS =
OUT_OF_SEQ_PACKETS =
DUPLICATE_PACKETS =
AVG_JITTER =

17:30:44.246 -> INVITE
INVITE sip:0001@192.168.1.26 SIP/2.0
Via: SIP/2.0/UDP 192.168.1.36:5060;branch=z9hG4bK_5_178932828-5280-12832
Max-Forwards: 70
Allow: INVITE,BYE,CANCEL,ACK,INFO,OPTIONS,SUBSCRIBE,NOTIFY,REFER,REGISTER
From: 0001 <sip:0001@192.168.1.36>;tag=FromTag_2_178932828-5277-12832
To: 0001 <sip:0001@192.168.1.26>
Call-ID: GL-MAPS_4_178932828-5279-12832@192.168.1.36
CSeq:1 INVITE
Contact: 0001 <sip:0001@192.168.1.36>
Supported: 100rel
Content-Type: application/sdp
Content-Length: 266

v=0
o=0001 33852938 33852938 IN IP4 192.168.1.36
s=SIP Call
c=IN IP4 192.168.1.36
t=0 0
m=audio 1024 RTP/AVP 18 0 101
```

```
MapsCLI (SIP IETF)
File Edit View
View Latest Command
1 :: 2018-6-6 17:30:35.649000 : Start "TestBedDefault.xml" ;
1 :: 2018-6-6 17:30:41.367000 : LoadProfile "UserAgent_Profiles.xml"
1 :: 2018-6-6 17:30:41.829000 : Apply Global Configuration # "_EnableCLI"=1;
1 :: 2018-6-6 17:30:41.841000 : StartScript 1 "SipCallControl.gls" "Profile0001" 1 ;
1 :: 2018-6-6 17:30:41.853000 : UserEvent 1 "SetVariable"# "Contact"="0001@192.168.1.36";
1 :: 2018-6-6 17:30:41.864000 : UserEvent 1 "SetVariable"# "AddressOfRecord"="0001@192.168.1.36";
1 :: 2018-6-6 17:30:41.875000 : UserEvent 1 "SetVariable"# "RtpIpAddress"="192.168.1.36";
1 :: 2018-6-6 17:30:41.886000 : UserEvent 1 "SetVariable"# "To"="0001@192.168.1.26";
1 :: 2018-6-6 17:30:41.897000 : UserEvent 1 "SetVariable"# "Packetizationtime"="20";
1 :: 2018-6-6 17:30:41.908000 : UserEvent 1 "SetVariable"# "OvrCodecListSize"=3;
1 :: 2018-6-6 17:30:41.919000 : UserEvent 1 "SetVariable"# "OvrCodecList[0]"="G729";
1 :: 2018-6-6 17:30:41.931000 : UserEvent 1 "SetVariable"# "OvrPayloadList[0]"=18;
1 :: 2018-6-6 17:30:41.942000 : UserEvent 1 "SetVariable"# "OvrCodecList[1]"="PCMU";
1 :: 2018-6-6 17:30:41.954000 : UserEvent 1 "SetVariable"# "OvrPayloadList[1]"=0;
1 :: 2018-6-6 17:30:41.966000 : UserEvent 1 "SetVariable"# "OvrCodecList[2]"="telephone-event";
1 :: 2018-6-6 17:30:41.978000 : UserEvent 1 "SetVariable"# "OvrPayloadList[2]"=101;
1 :: 2018-6-6 17:30:41.989000 : UserEvent 1 "RTP_CreateSession";
1 :: 2018-6-6 17:30:44.758000 : UserEvent 1 "GetCallStatus";
1 :: 2018-6-6 17:30:44.771000 : UserEvent 1 "GetCallStatus";
1 :: 2018-6-6 17:30:44.837000 : UserEvent 1 "GetNegotiatedCodec";
1 :: 2018-6-6 17:30:44.860000 : UserEvent 1 "SendFile"# "TxFileName"="voicefiles\Send\G711\ULAW\Vijay.glw", "TxFileDuration"=10;
1 :: 2018-6-6 17:30:54.887000 : UserEvent 1 "GetVoiceQualityStats";
```

Java Client

The screenshot displays the Eclipse IDE environment. The Package Explorer on the left shows the project structure for 'T1_TDM_Rel_Jar1.4', including sub-packages like 'mapscli_examples.ISDN' and files such as 'IsdnPlaceCall.java'. The main editor window shows the source code for 'IsdnPlaceCall.java', which includes a 'main' method that creates an 'IsdnClient', connects to a server, and initiates an ISDN call. The Console window at the bottom shows the execution output, including 'ISDN Client Connected' and a series of ISDN messages. The MapsCLI Subscriber (ISDN ITU) window shows the CLI command history, including 'Start Script 1 "Placecall.gls"', 'Apply Global Configuration', and 'StopScript 1;'.

```
public class IsdnPlaceCall {
    public static void main(String[] args) throws InterruptedException {
        // create isdn client
        IsdnClient isdnClient = new IsdnClient("192.168.12.217", 10024);
        isdnClient.setTestbedProfile("1 Subscriber_Card1.xml");

        // connect client to server
        if (isdnClient.connect()) {
            System.out.println("ISDN Client Connected");
            Thread.sleep(2000);
        }
        // initialize isdn client testbed
    }
}
```

Console Output:

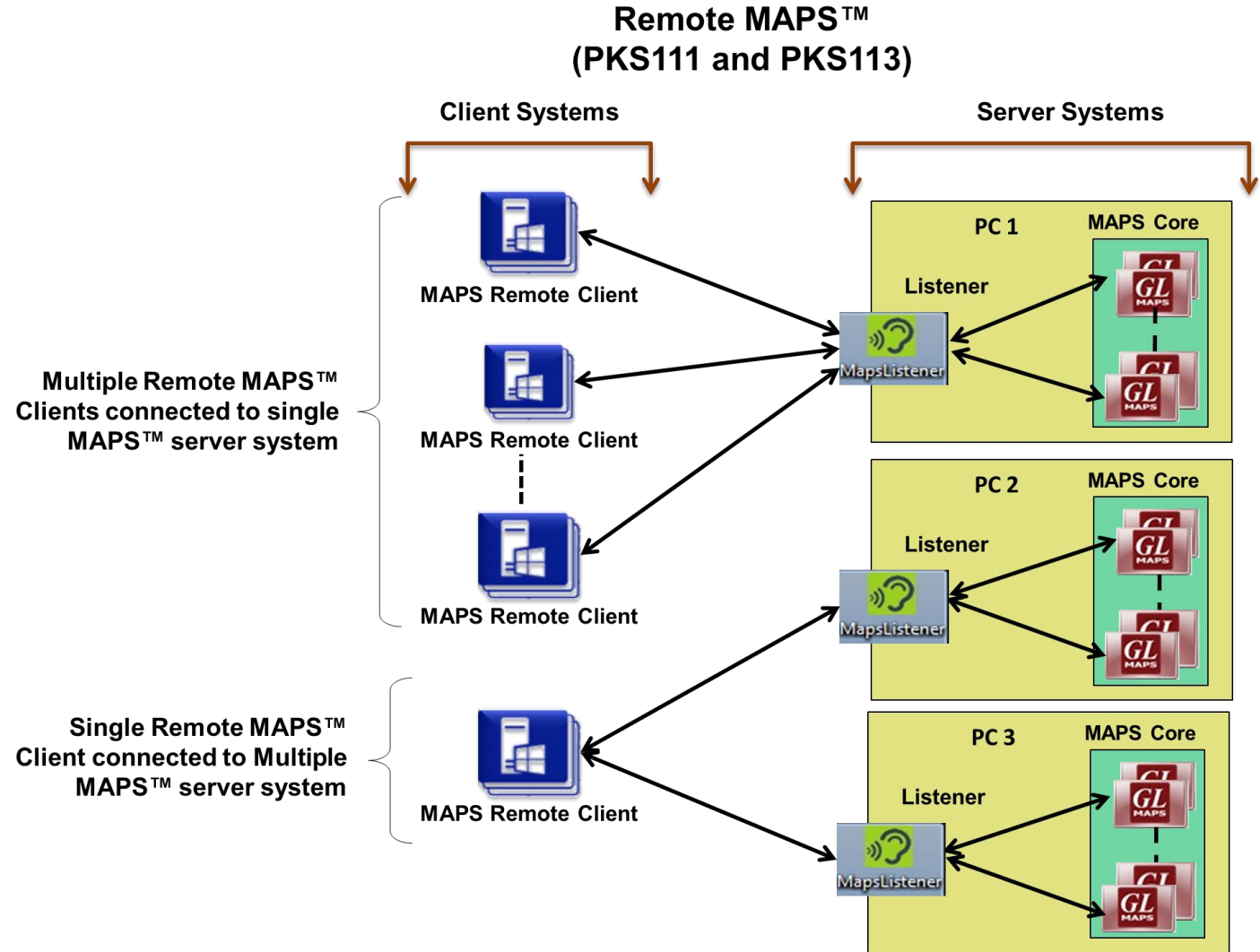
```
<terminated> IsdnPlaceCall [Java Application] C:\Program Files\Java\jre1.8.0_92\bin\javaw.exe (Mar
ISDN Client Connected
Script Initiated
LAPD Link is UP
Placing ISDN Call
ISDNCallSatus: CALL ACTIVE
TxFile: 0
TxFileComplete: 0
ISDNMsgCount: 8
ISDNMSGInfo: 11:03:20.587 -> SETUP
ISDNMSGInfo: 11:03:20.911 <- CALL PROCEEDING
ISDNMSGInfo: 11:03:20.912 <- ALERTING
ISDNMSGInfo: 11:03:20.912 <- CONNECT
ISDNMSGInfo: 11:03:20.913 -> CONNECT ACKNOWLEDGE
ISDNMSGInfo: 11:03:35.897 -> DISCONNECT
ISDNMSGInfo: 11:03:36.206 <- RELEASE
ISDNMSGInfo: 11:03:36.207 -> RELEASE COMPLETE
ISDNLastMSGRCV: 11:03:36.206 <- RELEASE
```

MapsCLI Subscriber (ISDN ITU) Command History:

```
2017-3-7 11:03:20.035000 : Start "1 Subscriber_Card1.xml";
2017-3-7 11:03:20.148000 : LoadProfile "Subscriber_Profiles.xml"
2017-3-7 11:03:20.383000 : Apply Global Configuration # "_EnableCLI"=1;
2017-3-7 11:03:20.385000 : Apply Global Configuration # "_ChannelMode"="Number";
2017-3-7 11:03:20.385000 : StartScript 1 "Placecall.gls" "Card1TS01" 1;
2017-3-7 11:03:20.474000 : UserEvent 1 "IsTransportUp";
2017-3-7 11:03:20.585000 : UserEvent 1 "Place Call";
2017-3-7 11:03:22.660000 : UserEvent 1 "GetCallStatus";
2017-3-7 11:03:24.742000 : UserEvent 1 "TxFile" # "TxFileName"="mu-law samples\vijay.pcm", "TxFileDuration"=6000;
2017-3-7 11:03:35.895000 : UserEvent 1 "DisconnectCall";
2017-3-7 11:03:36.989000 : UserEvent 1 "GetMessageCount";
2017-3-7 11:03:37.099000 : UserEvent 1 "GetMessageInfo" # "Index"=0;
2017-3-7 11:03:37.210000 : UserEvent 1 "GetMessageInfo" # "Index"=1;
2017-3-7 11:03:37.316000 : UserEvent 1 "GetMessageInfo" # "Index"=2;
2017-3-7 11:03:37.426000 : UserEvent 1 "GetMessageInfo" # "Index"=3;
2017-3-7 11:03:37.535000 : UserEvent 1 "GetMessageInfo" # "Index"=4;
2017-3-7 11:03:37.647000 : UserEvent 1 "GetMessageInfo" # "Index"=5;
2017-3-7 11:03:37.753000 : UserEvent 1 "GetMessageInfo" # "Index"=6;
2017-3-7 11:03:37.867000 : UserEvent 1 "GetMessageInfo" # "Index"=7;
2017-3-7 11:03:37.972000 : UserEvent 1 "GetLastReceivedMessage";
2017-3-7 11:03:39.066000 : StopScript 1;
```

Remote MAPS™ Server

- Multi-node and multi-interface simulation from a single GUI
- Suitable for testing any core network, access network, and inter-operability functions
- Single Licensing Server controlling server and client licenses (no. of users)
- Unlimited number of remote client user can be defined at the server
- Admin privileges to control Testbed and access to configuration files for each remote client user
- Remote Client users has privileges to perform all other functions - call emulation, edit scripts/profiles, and view statistics
- Option to license multiple clients either at Remote client systems (MAPS™ Remote Client to control one or more MAPS™ Server - PKS111) or at the MAPS™ Server systems (MAPS™ Server with Multi-user capability - PKS113)
- Simultaneous traffic generation/reception at 100% on all servers



Send Reports to Database

- MAPS™ generated reports can be sent to Database using built in commands
- This helps to monitor and analyze test Remotely

The screenshot displays the GL NetSurveyorWeb interface. At the top, there's a navigation bar with 'Data', 'Reports', 'Alarms', and 'Users' tabs. The system status is shown as '2018-02-12 12:05:12'. The main content area is titled 'Quick CDR \ All Calls' and includes a date range filter from '2018-01-01' to '2018-02-12' and a time filter from '00:00:00' to '23:59:59'. Below this, there's a search bar with 'Trafficsumid' and a 'GO' button. The table below shows a list of call records with columns for SIno, Calling Number, Called Number, Starttime, Duration, Call Success, and Failure Cause. The table contains 15 rows of data, all showing successful calls with a failure cause of 0.

SIno	Calling Number	Called Number	Starttime	Duration	Call Success	Failure Cause
1	001013012041639@ims.mnc001.mcc001.3gppnetwork.org	3012041689@ims.mnc001.mcc001.3gppnetwork.org	2018-02-06 14:35:15.667	00:00:18.118	1	0
2	001013012041638@ims.mnc001.mcc001.3gppnetwork.org	3012041688@ims.mnc001.mcc001.3gppnetwork.org	2018-02-06 14:35:15.666	00:00:18.118	1	0
3	001013012041637@ims.mnc001.mcc001.3gppnetwork.org	3012041687@ims.mnc001.mcc001.3gppnetwork.org	2018-02-06 14:35:15.665	00:00:18.117	1	0
4	001013012041636@ims.mnc001.mcc001.3gppnetwork.org	3012041686@ims.mnc001.mcc001.3gppnetwork.org	2018-02-06 14:35:15.663	00:00:18.117	1	0
5	001013012041635@ims.mnc001.mcc001.3gppnetwork.org	3012041685@ims.mnc001.mcc001.3gppnetwork.org	2018-02-06 14:35:15.662	00:00:18.116	1	0
6	001013012041634@ims.mnc001.mcc001.3gppnetwork.org	3012041684@ims.mnc001.mcc001.3gppnetwork.org	2018-02-06 14:35:15.661	00:00:18.115	1	0
7	001013012041633@ims.mnc001.mcc001.3gppnetwork.org	3012041683@ims.mnc001.mcc001.3gppnetwork.org	2018-02-06 14:35:15.660	00:00:18.114	1	0
8	001013012041632@ims.mnc001.mcc001.3gppnetwork.org	3012041682@ims.mnc001.mcc001.3gppnetwork.org	2018-02-06 14:35:15.659	00:00:18.011	1	0
9	001013012041631@ims.mnc001.mcc001.3gppnetwork.org	3012041681@ims.mnc001.mcc001.3gppnetwork.org	2018-02-06 14:35:15.658	00:00:17.990	1	0
10	001013012041640@ims.mnc001.mcc001.3gppnetwork.org	3012041690@ims.mnc001.mcc001.3gppnetwork.org	2018-02-02 16:48:10.865	00:00:09.629	1	0
11	001013012041639@ims.mnc001.mcc001.3gppnetwork.org	3012041689@ims.mnc001.mcc001.3gppnetwork.org	2018-02-02 16:48:10.864	00:00:09.629	1	0
12	001013012041638@ims.mnc001.mcc001.3gppnetwork.org	3012041688@ims.mnc001.mcc001.3gppnetwork.org	2018-02-02 16:48:10.863	00:00:09.629	1	0
13	001013012041637@ims.mnc001.mcc001.3gppnetwork.org	3012041687@ims.mnc001.mcc001.3gppnetwork.org	2018-02-02 16:48:10.863	00:00:09.628	1	0
14	001013012041636@ims.mnc001.mcc001.3gppnetwork.org	3012041686@ims.mnc001.mcc001.3gppnetwork.org	2018-02-02 16:48:10.862	00:00:09.628	1	0
15	001013012041635@ims.mnc001.mcc001.3gppnetwork.org	3012041685@ims.mnc001.mcc001.3gppnetwork.org	2018-02-02 16:48:10.862	00:00:09.628	1	0

Thank you