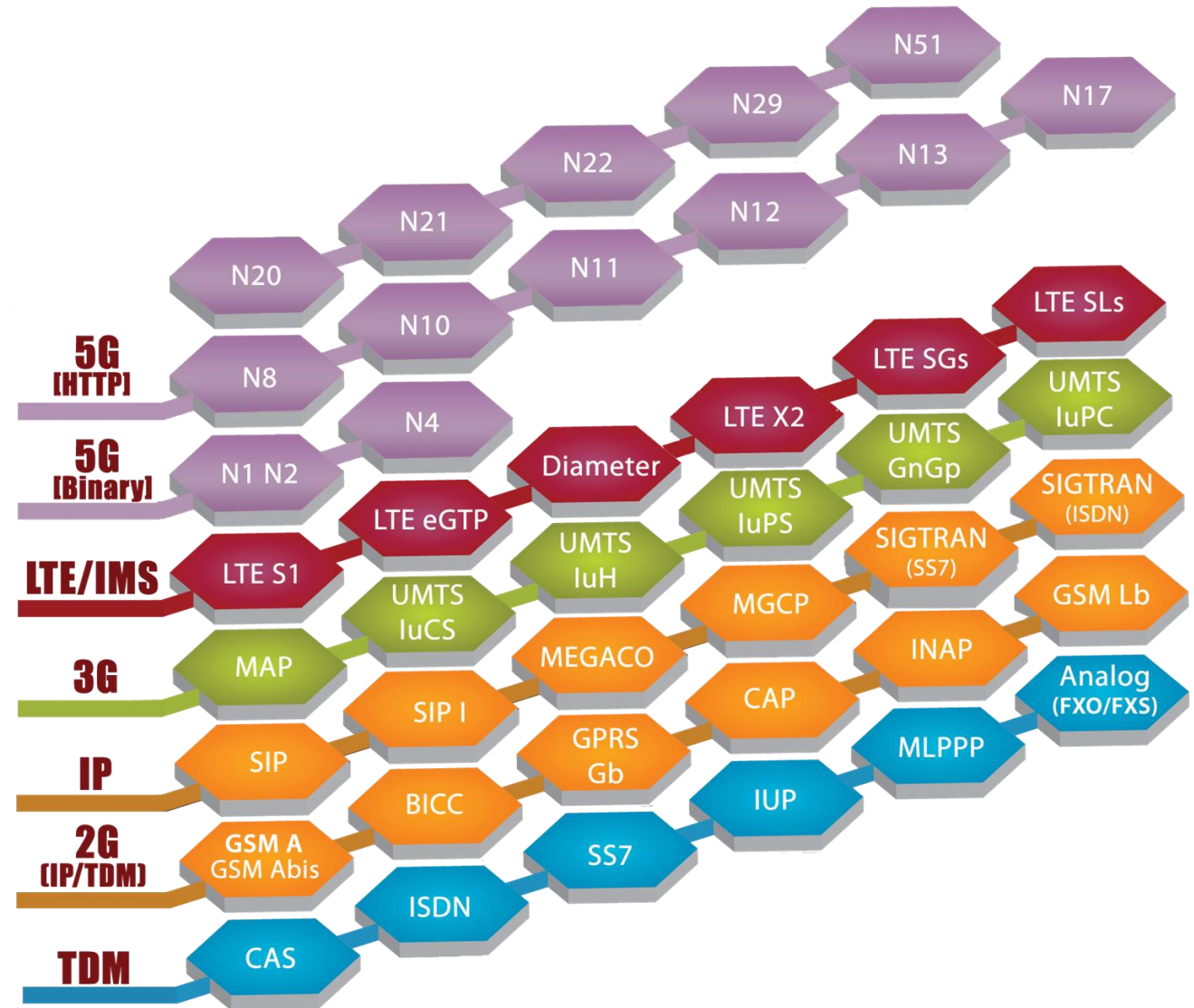

Signaling and Traffic Simulation using MAPS



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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

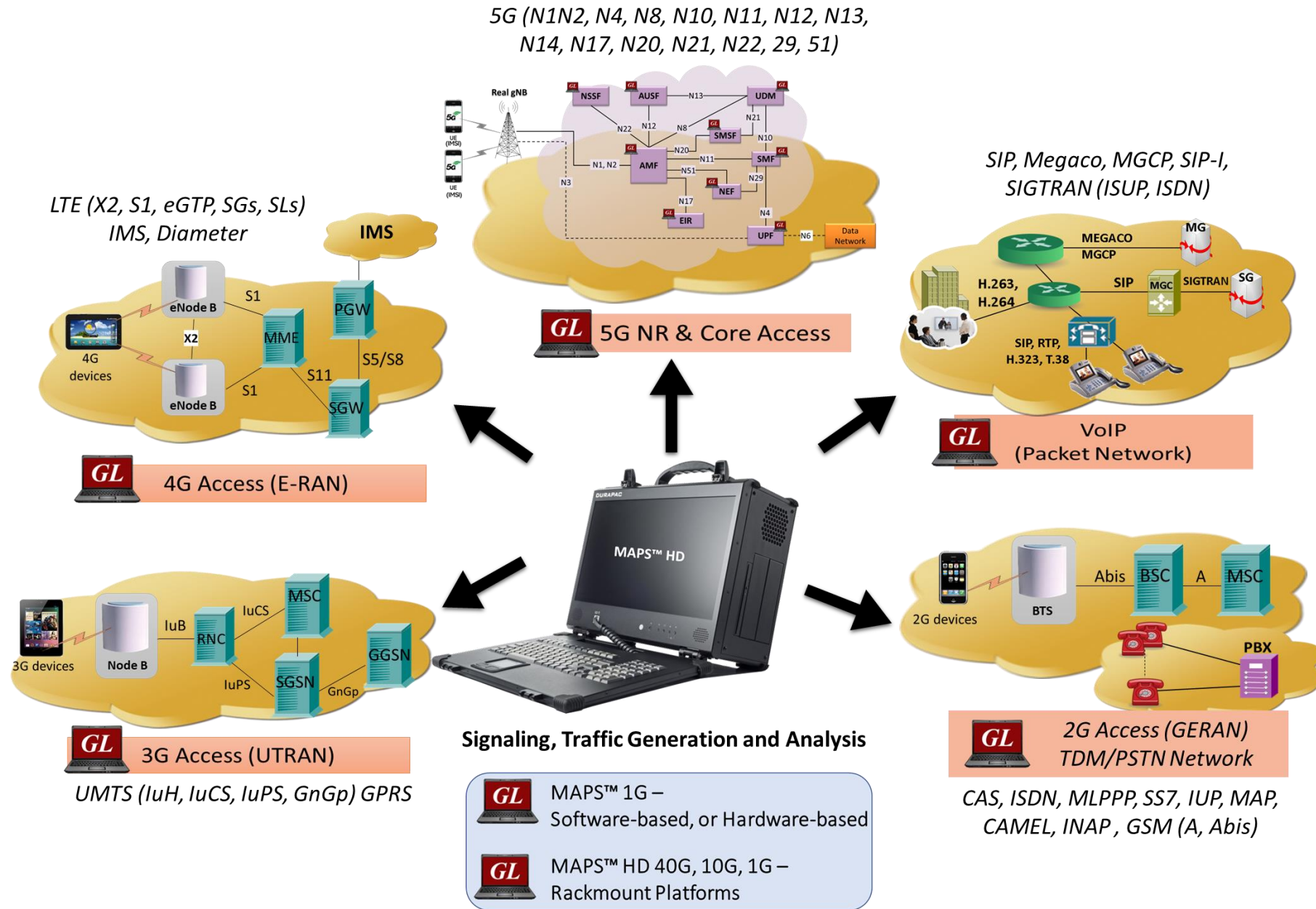
Basic Requirements for Emulation

- **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



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 | Result | Total Iterations | Completed Iterations |
|-------|-----------------------|--------------|----------------------|------------------|--------|----------------------------|---------|------------------|----------------------|
| 1 | LTE51CalControlNB.gls | UEProfile001 | IMSI:404105588015003 | Start | Stop | STPU Mobile Traffic Stated | Pass | 1 | 0 |
| 2 | LTE51CalControlNB.gls | UEProfile002 | | Start | Stop | None | Unknown | 1 | 0 |
| 3 | LTE51CalControlNB.gls | UEProfile003 | | Start | Stop | None | Unknown | 1 | 0 |
| 4 | LTE51CalControlNB.gls | UEProfile004 | | Start | Stop | None | Unknown | 1 | 0 |
| 5 | LTE51CalControlNB.gls | UEProfile005 | | Start | Stop | None | Unknown | 1 | 0 |
| 6 | LTE51CalControlNB.gls | UEProfile006 | | Start | Stop | None | Unknown | 1 | 0 |

Message Sequence Diagram (DUT):

- Initial Address: 18:51:53.797000
- Address Complete: 18:51:54.327000
- Answer: 18:52:15.117000
- File Transmitted: a-law samples/coun10.pcm
- File Recorded: MAPS\Recv Files\lup\Fab8_E0101_1001.pcm
- Release: 18:52:25.072000
- Release Complete: 18:52:55.485000

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_Cal.gls | Card1TS01 | 1.1.1.2.2.2.1 | Start | Stop | ISUP Call Released | Pass | 1 | 0 |
| 2 | Isup_Cal.gls | Card1TS02 | 1.1.1.2.2.2.2 | Start | Stop | File Recorded | Pass | 1 | 0 |
| 3 | Isup_Cal.gls | Card1TS03 | 1.1.1.2.2.2.3 | Start | Stop | File Recorded | Pass | 1 | 0 |
| 4 | Isup_Cal.gls | Card1TS04 | 1.1.1.2.2.2.4 | Start | Stop | File Recorded | Pass | 1 | 0 |
| 5 | Isup_Cal.gls | Card1TS05 | 1.1.1.2.2.2.5 | Start | Stop | File Recorded | Pass | 1 | 0 |
| 6 | Isup_Cal.gls | Card1TS06 | 1.1.1.2.2.2.6 | Start | Stop | File Recorded | Pass | 1 | 0 |
| 7 | Isup_Cal.gls | Card1TS07 | 1.1.1.2.2.2.7 | Start | Stop | File Recorded | Pass | 1 | 0 |
| 8 | Isup_Cal.gls | Card1TS08 | 1.1.1.2.2.2.8 | Start | Stop | File Recorded | Pass | 1 | 0 |

Message Sequence Diagram (DUT):

- Initial Address: 18:51:53.797000
- Address Complete: 18:51:54.327000
- Answer: 18:52:15.117000
- File Transmitted: a-law samples/coun10.pcm
- File Recorded: MAPS\Recv Files\lup\Fab8_E0101_1001.pcm
- Release: 18:52:25.072000
- Release Complete: 18:52:55.485000

SIP Emulation

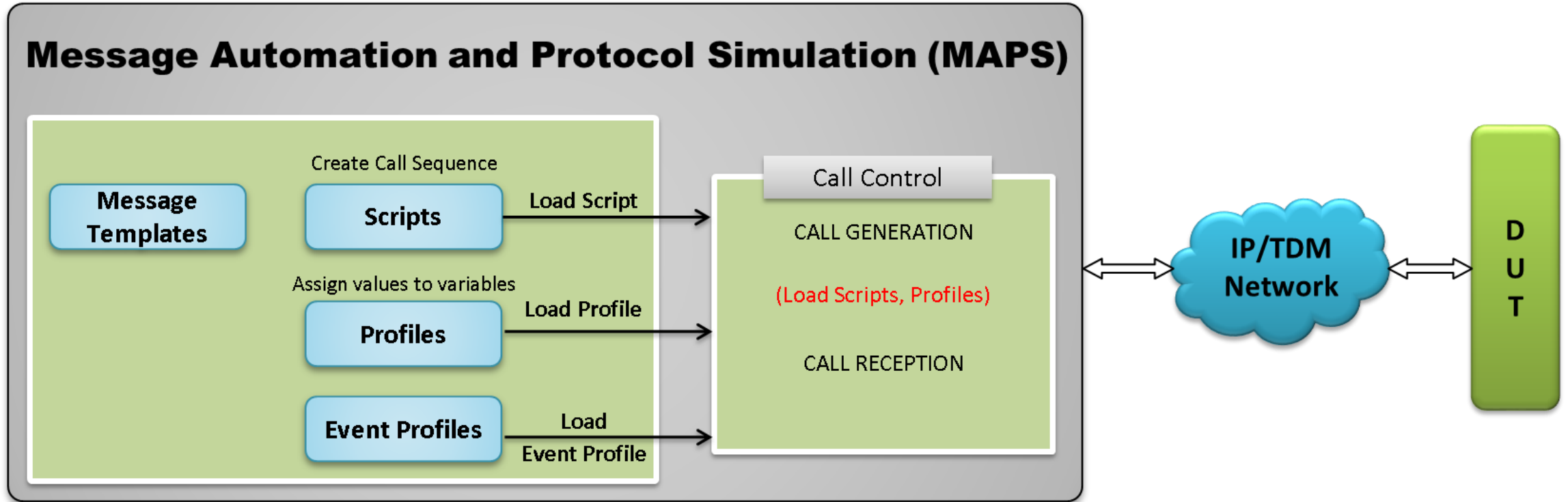
MAPS (Message Automation Protocol Simulation) SIP IETF - [Call Generation - CallGenDefault]

| Sr No | Script Name | Profile | Call Info | Script Execution | Status | Events | Result | Total Iterations | Completed Iterations |
|-------|---------------------------|-------------|---|------------------|--------|-------------------|--------|------------------|----------------------|
| 1 | SipRegistratorControl.gls | Profile0001 | GL-MAPS_27_87968504-10686-7056@192.168.12.78 | Start | Stop | SendFileCompleted | Pass | 1 | 0 |
| 2 | SipCallControl.gls | Profile0002 | GL-MAPS_21_87961623-10633-10756@192.168.12.78 | Start | Stop | SIP_TerminateCall | Pass | 1 | 0 |

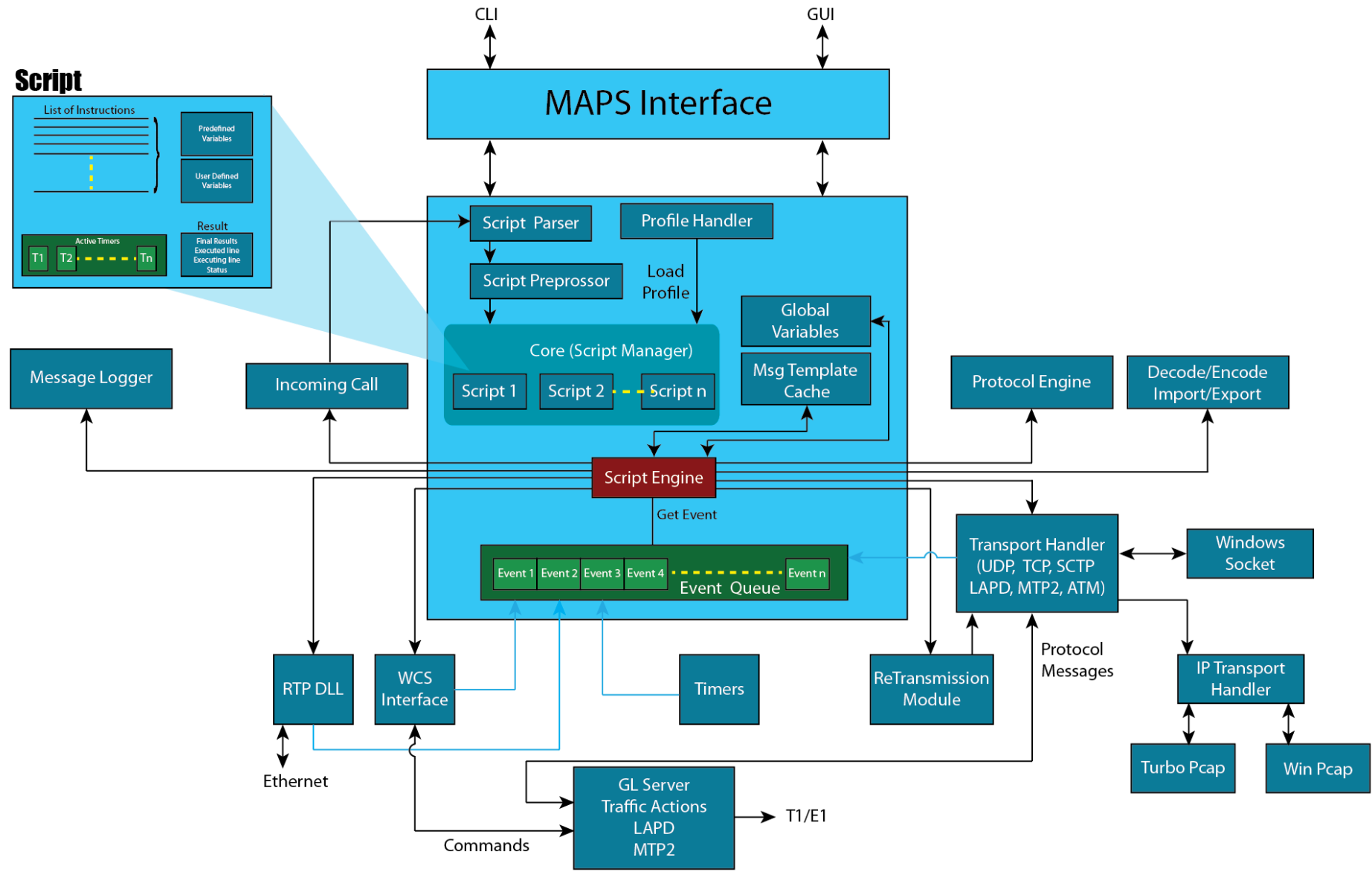
Message Sequence Diagram (DUT):

- INVITE: 4:53:31.059000
- 100 Trying: 4:53:32.454000
- 180 Ringing: 4:53:32.461000
- 200 OK: 4:53:32.605000
- ACK: 4:53:32.609000

Working Principle



MAPS™ Architecture



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 emulate 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

Message Editor - InitialAddress

File View Direction Tools Help

ISUP

- Circuit Identification Code
- Message Type
- Mandatory Fixed Parameters
 - Nature Of Connection Indicators Parameter
 - Satellite indicator
 - Continuity check indicator
 - Echo ctrl dev.ind(Nat.Conn.Ind)
 - Forward Call Indicators Parameter
 - National/international call ind
 - End-to-end method indicator
 - Interworking Indicator

345 Apply

0002 OPC = 1.1.1(01..... 000000100010)

0004 Signalling Link Code = 0011.... (3)

Higher Layer Data = x5901010220010A000208068310551511010A0681115515320400

===== ISUP Layer =====

0005 Circuit Identification Code = 010110010001 (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

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

Ready NUM

Call Generation

Active Calls Call Status Call Events

Loading Scripts
and
Profiles

Message Sequence

Decode Message

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 shows five rows of data, with the first row highlighted in blue.
- Message Sequence Diagram:** A diagram showing the sequence of messages between MME and E-SMLC. The messages are: Location Request (12:55:17.550000), Connection Oriented Information (12:55:19.831000), and Location Response (12:55:22.639000).
- Decoded Message:** A section on the right showing the decoded message structure, including fields like LCSAP-PDU, Extensibility Marker, Choice Index, ProcedureCode, Contents, Criticality, Value, Length, and Preamble.

Red arrows point from the text labels to the corresponding sections in the interface:

- Active Calls: Points to the table of active calls.
- Call Status: Points to the Status column in the table.
- Call Events: Points to the Events column in the table.
- Loading Scripts and Profiles: Points to the top toolbar area.
- Message Sequence: Points to the message sequence diagram.
- Decode Message: Points to the decoded message section.

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 | 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;
```

Scripts Message Sequence Event Config Script Flow

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

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

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 | Hold | | | 1 | 0 |
| 2 | Isup_Call.gls | Card1TS02 | | Start | | None | | | 1 | 0 |
| 3 | Isup_Call.gls | Card1TS03 | | Start | | None | | | 1 | 0 |
| 4 | Isup_Call.gls | Card1TS04 | | Start | | None | | | 1 | 0 |
| 5 | Isup_Call.gls | Card1TS05 | | Start | | None | | | 1 | 0 |
| 6 | Isup_Call.gls | Card1TS06 | | Start | | None | | | 1 | 0 |
| 7 | Isup_Call.gls | Card1TS07 | | Start | | None | | | 1 | 0 |
| 8 | Isup_Call.gls | Card1TS08 | | Start | | None | | | 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;
ActiveUserEvent: Add: "Retrieve";

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

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

Scripts Message Sequence Event Config Script Flow

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

"Retrieve" User Event is added

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



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

| <input checked="" type="checkbox"/> Show Script ID <input checked="" type="checkbox"/> Show Script Name <input checked="" type="checkbox"/> Show Subscript Name <input checked="" type="checkbox"/> Line No <input type="text" value="Search"/> <input type="button" value="Save"/> | | | | |
|---|---------------|----------------|---------|--|
| 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; |

Scripts \ Message Sequence \ Event Config \ **Script Flow**

The screenshot shows the "Incoming Call Handlers Configuration - default" window. It contains a table with two columns: "Message Name" and "Script Name". The table lists various messages and their corresponding scripts. To the right of the table is a "Scripts" list box containing several script names. Below the list box are "Up" and "Down" buttons. At the bottom of the window are "Add", "Delete", and "Clear" buttons. On the far right, there are radio button options for "Sequence" (selected) and "Random".

| 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 |

Scripts:

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

Configuration Options:

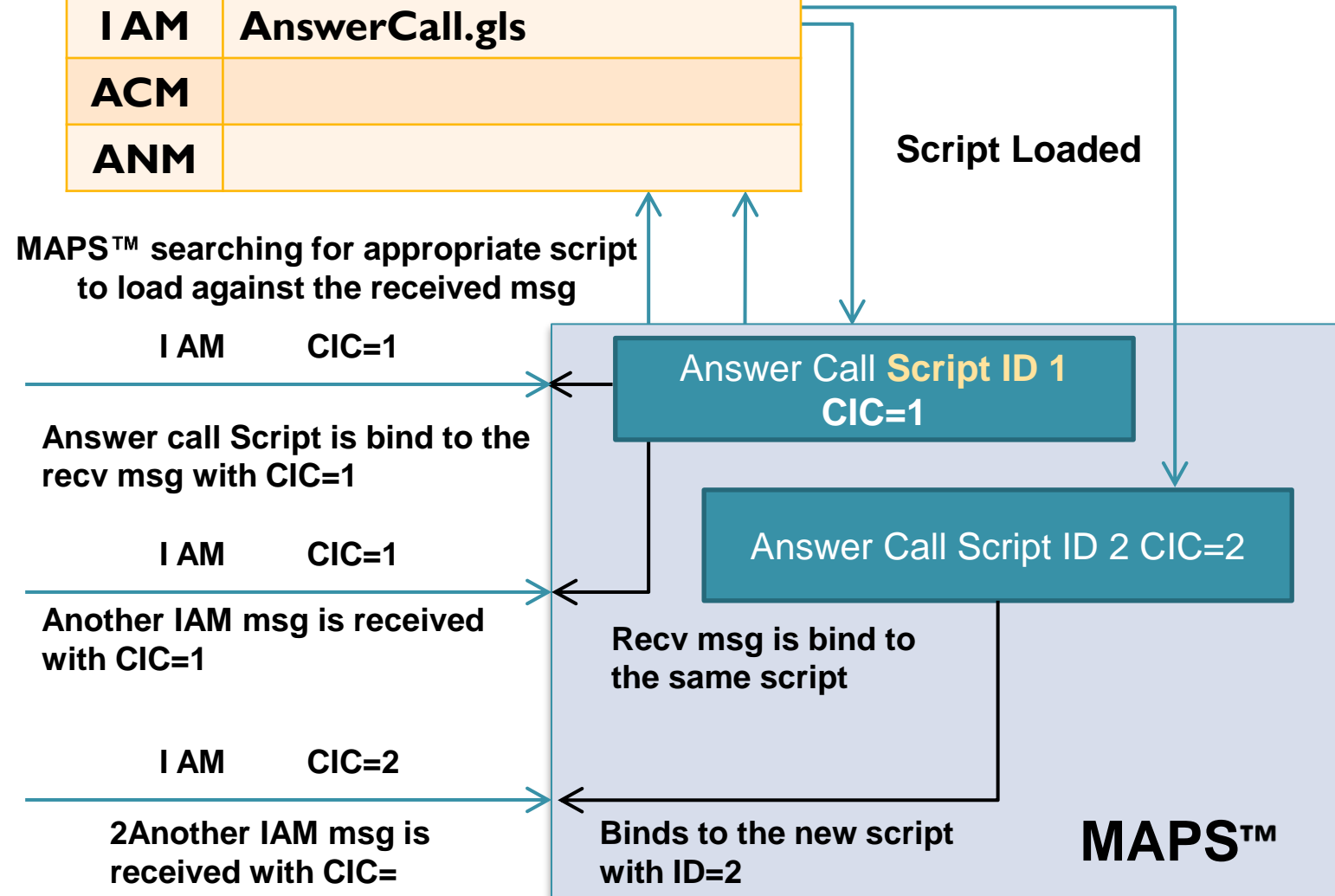
- ☒ Sequence
- ☐ Random

Buttons: Up, Down, Add, Delete, Clear.

Incoming Call Handler (Contd.)

Incoming Call Handler

| | |
|-------------|-----------------------|
| I AM | AnswerCall.gls |
| ACM | |
| ANM | |



Call Reception

Active Calls

Completed Calls

MAPS (Message Automation Protocol Simulation) MSC (UMTS IUCS 3GPP SCTP) - [Call Reception]

Configurations Emulator Reports Editor Windows Help

| 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 |

Abort Abort All ☒ Show Records ☐ Auto Trash Trash

Save Column Width

Message Sequence

RNC MSC

InitialUE-Message, CM SERVICE REQUEST → 15:58:59.225000

← CC connection confirm 15:58:59.226000

← DirectTransfer, AUTHENTICATION REQUEST 15:58:59.228000

DirectTransfer, AUTHENTICATION RESPONSE → 15:58:59.359000

← SecurityModeCommand, 15:58:59.359000

SecurityModeComplete, → 15:58:59.379000

← DirectTransfer, CM SERVICE ACCEPT 15:58:59.380000

DirectTransfer, SETUP → 15:58:59.400000

← DirectTransfer, CALL PROCEEDING 15:58:59.401000

← RAB-AssignmentRequest, 15:58:59.403000

RAB-AssignmentResponse, → 15:58:59.425000

Decoded Message Details

===== 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 = x00

===== SCCP Layer =====

0018 Message Type = 00000110 DT1 data form 1

Mandatory Fixed Parameters

Destination Local Reference Parameter =

0019 Destination Local Reference = 8 (x000008)

Segmenting Reassembling Parameter =

001C More Data Indicator =0 No more data

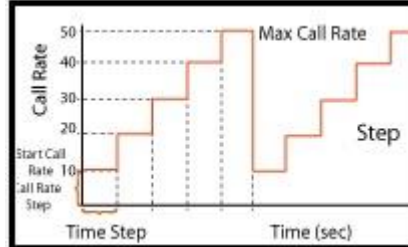
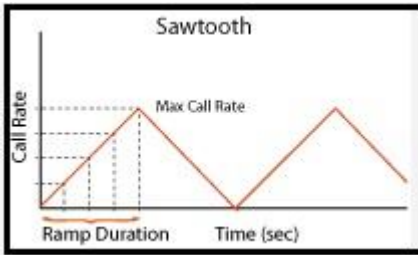
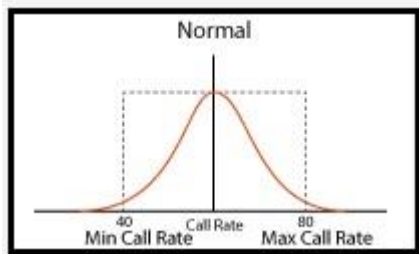
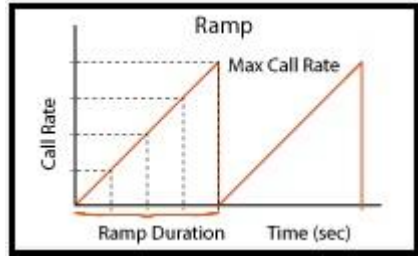
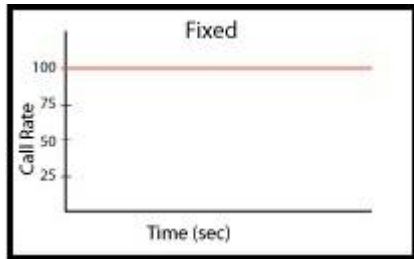
001D Pointer to Mandatory Parameter = Parameter offset x01 (1)

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

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

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

Scripts ☒ 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

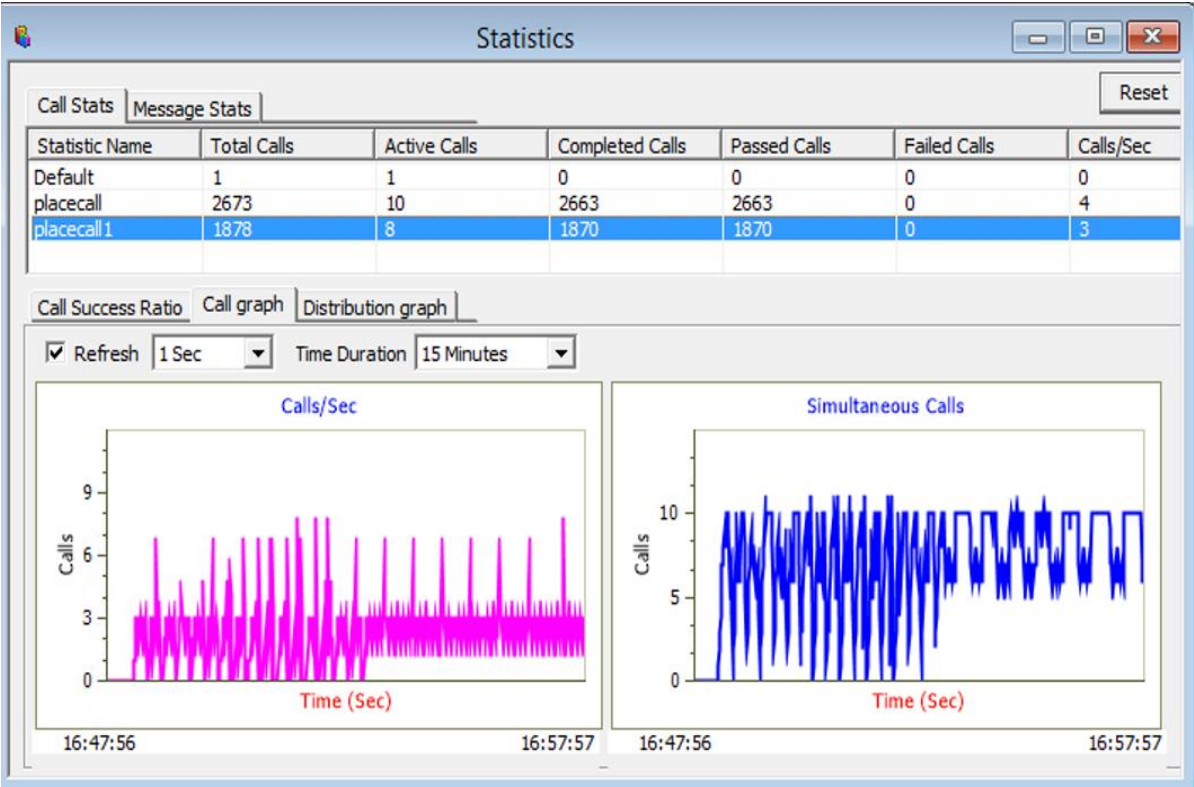
Start Time - 00:00:00.000 End Time - 00:00:00.000

Pause Start

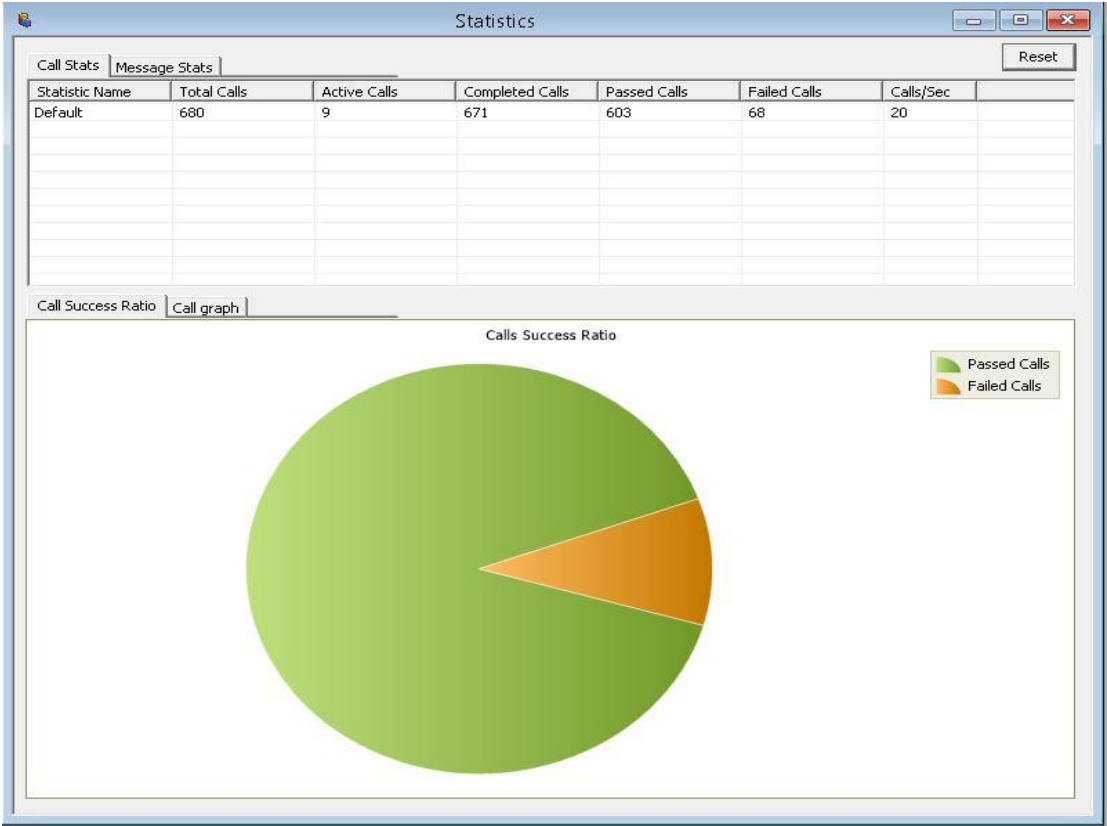
Success Call Ratio Statistics

MAPS™ Features

Call Graph

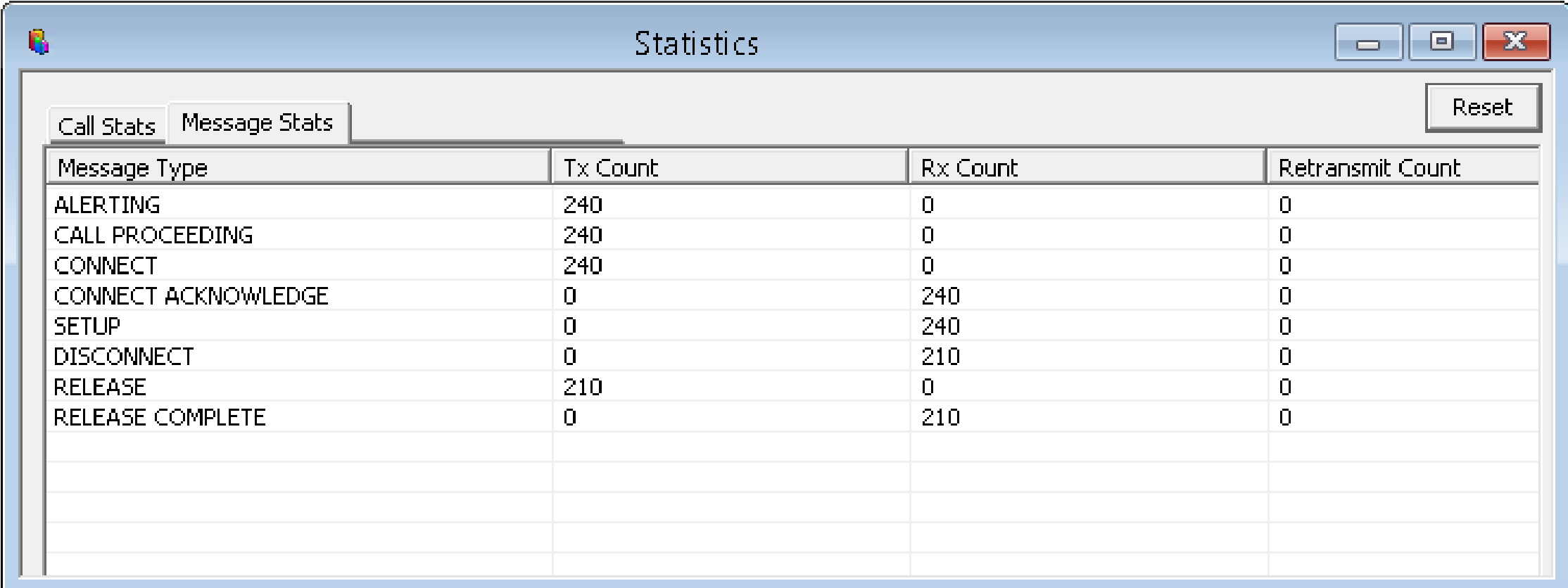


Call Stats



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



| 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 |
| | | | |
| | | | |
| | | | |
| | | | |

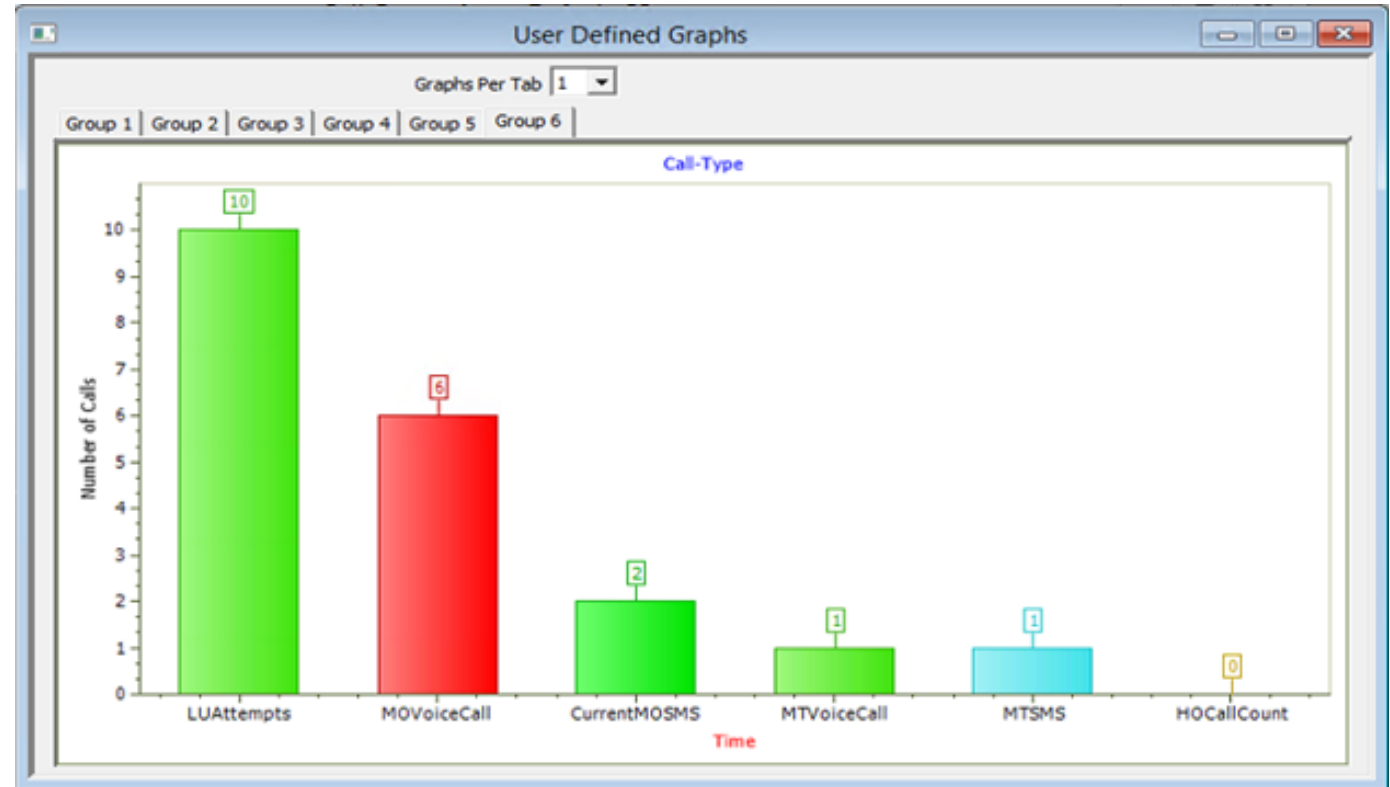
User Defined Graphs and Statistics

User Defined Statistics - VoiceQualityStats

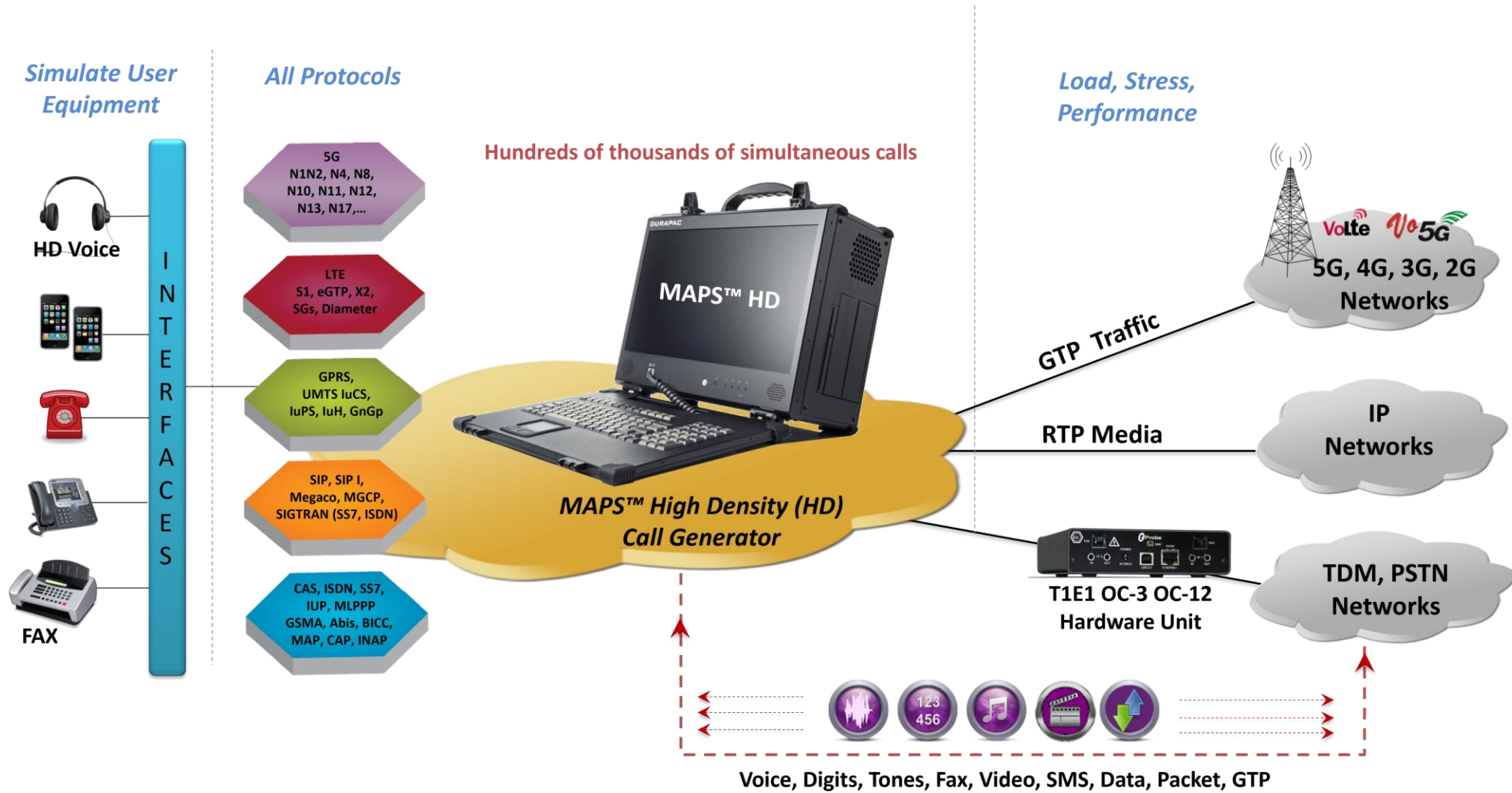
Packet Stats

| 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



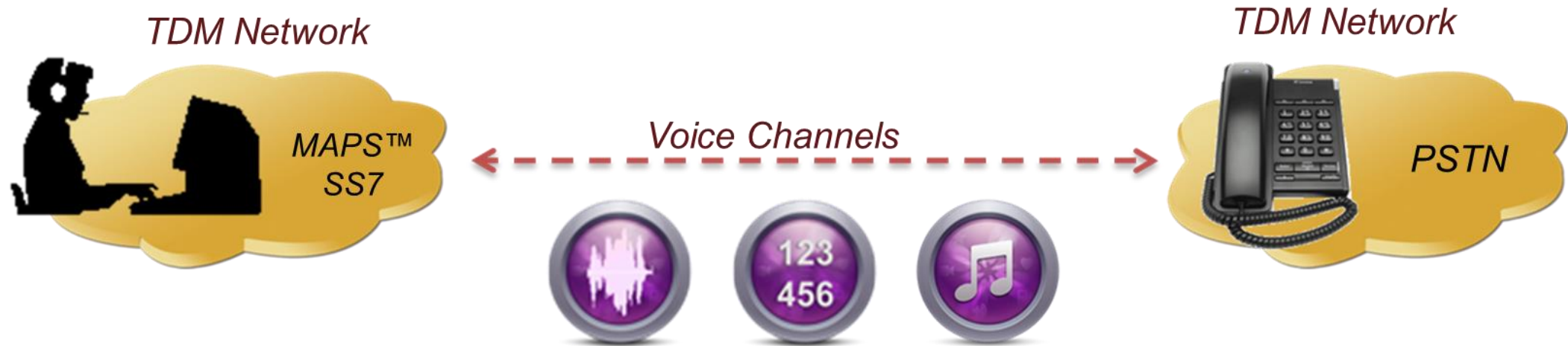
Traffic Simulation



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



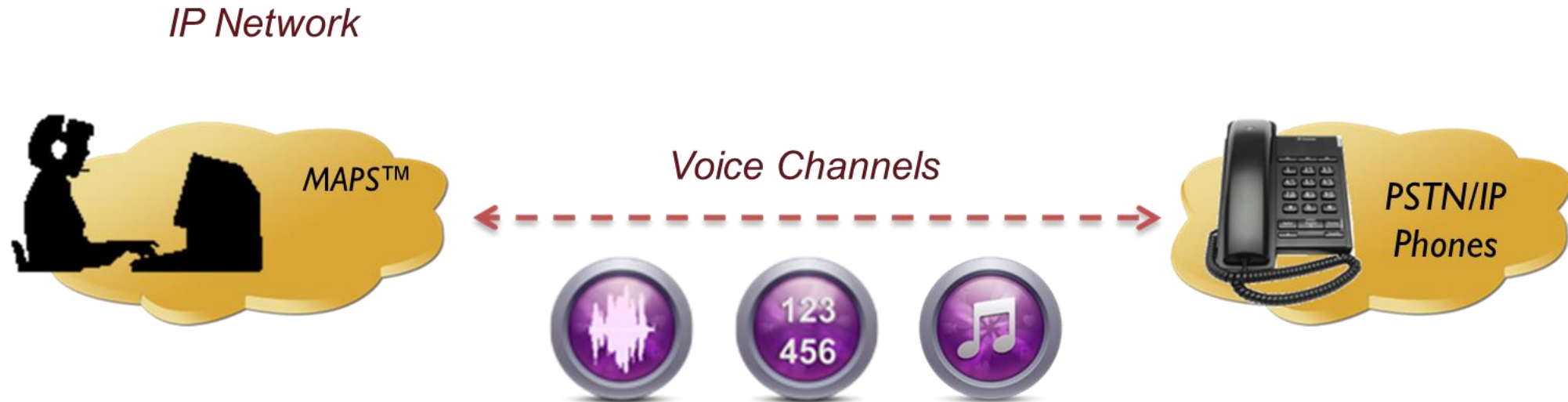
Tx

- *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



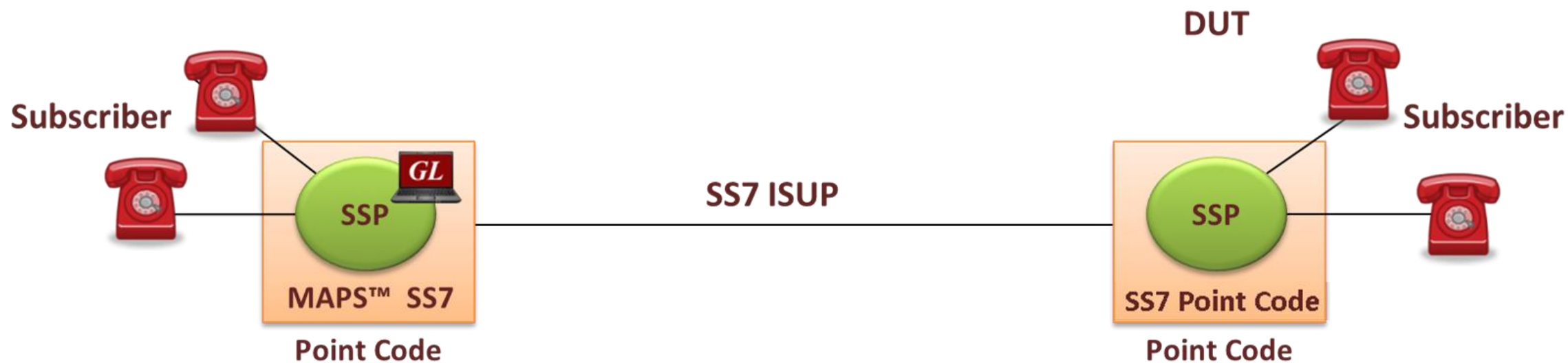
Tx

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

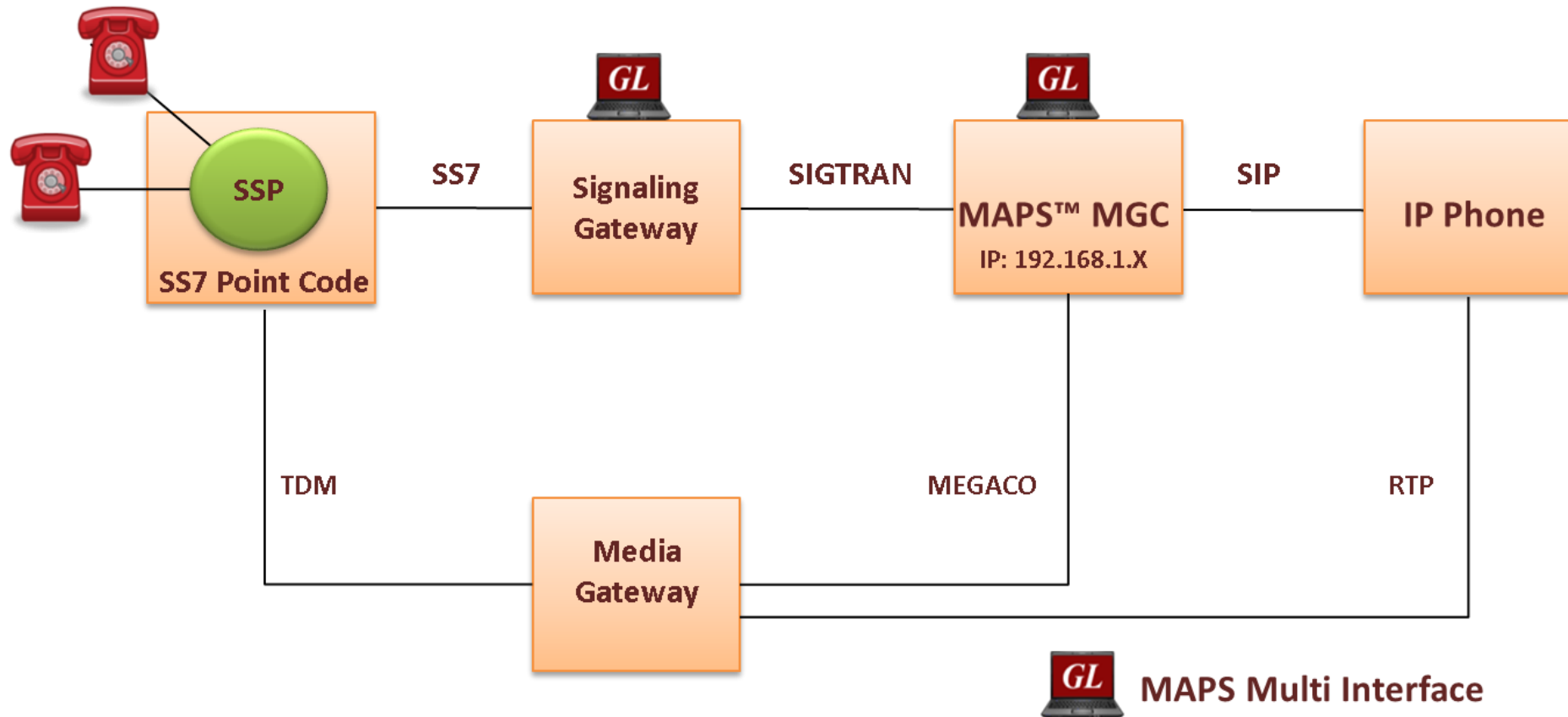
Rx

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

Single Interface Simulation



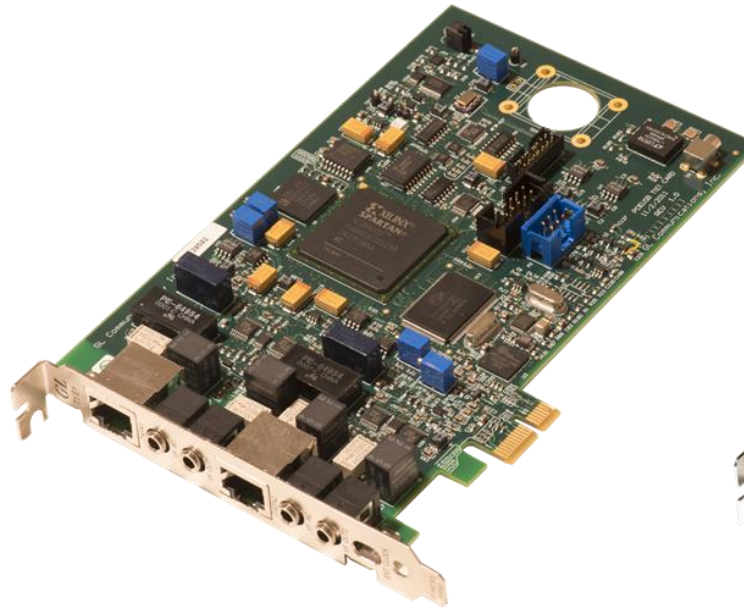
Multi Interface Simulation



Multiple Transport Support



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



Dual T1 E1 Express (PCIe) Board



Quad / Octal T1 E1 PCIe Card

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

MAPS™ HD Lunchbox Appliance

- Rackmount/lunchbox network appliance with 4x1GigE or 8x1GigE NIC
- Signaling calls can be transmitted over UDP and TCP, IPv4 and IPv6, and TLS for secure transport
- Emulates around 50,000 to 100,000 user endpoints.
- Up to 250 calls per second (with RTP traffic)
- For UDP transport, scales up to 64,000 simultaneous calls for each appliance (i.e. 8,000 RTP media sessions per port) with duplex RTP traffic
- Manage 10+ MAPS™ systems with single point of control from master controller



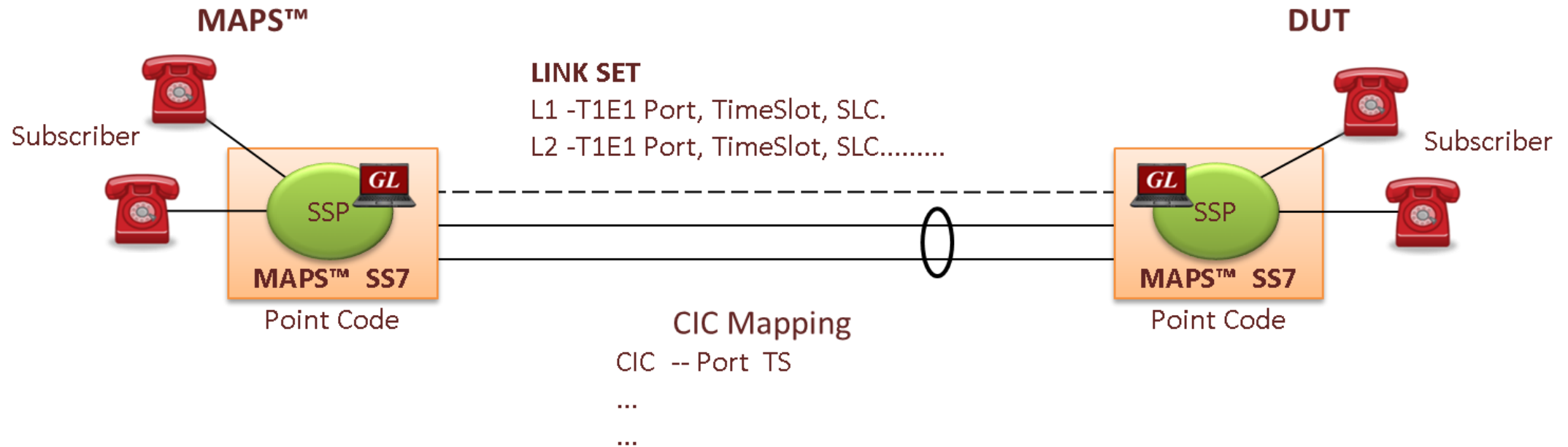
MAPS™ HD Rackmount Appliance



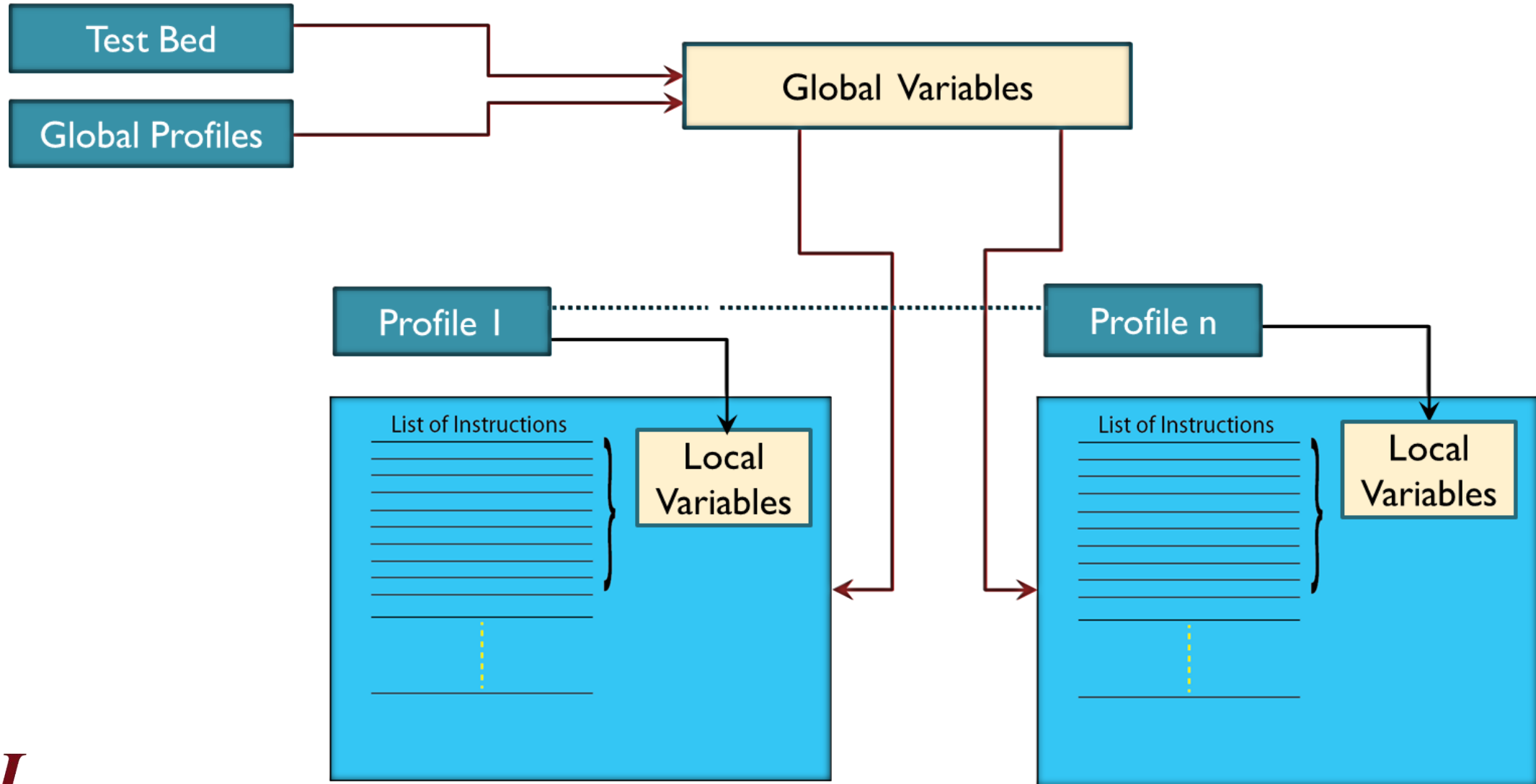
8x1GigE
High Performance Smart NIC

Introduction to MAPS™ Configurations

- Testbed Setup
- Global Configuration
- Profiles



Local and Global Variables



Testbed Configuration

GL MAPS (Message Automation Protocol Simulation) MSC (UMTS IUCS 3GPP SCTP) - [Testbed Setup - TestBed...

Configurations Emulator Reports Editor Windows Help

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

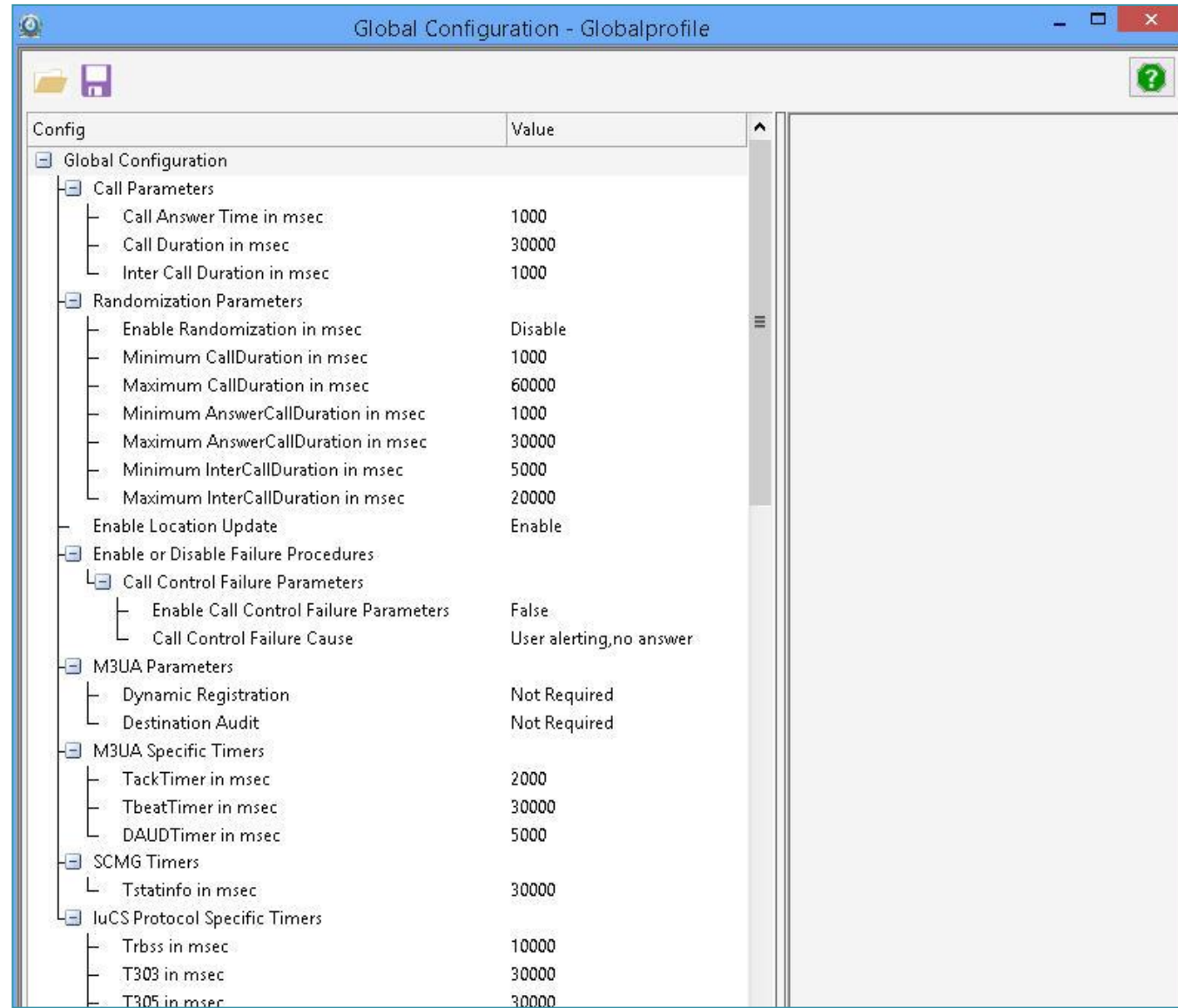
Enter Hex

0001

Start Edit

Error Events Captured Errors Link Status Up=0 Down=

Global Configuration



The screenshot shows a software window titled "Global Configuration - Globalprofile". It contains a tree view on the left and a corresponding table of values on the right. The tree view is expanded to show the following structure:

- 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

| 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 IUCS 3GPP SCTP) - [Profile Editor - MS_Profiles]

Configurations Emulator Reports Editor Debug Tools Windows Help

Profiles (Edt-F2)

| # | Profiles (Edt-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

Initialisation 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

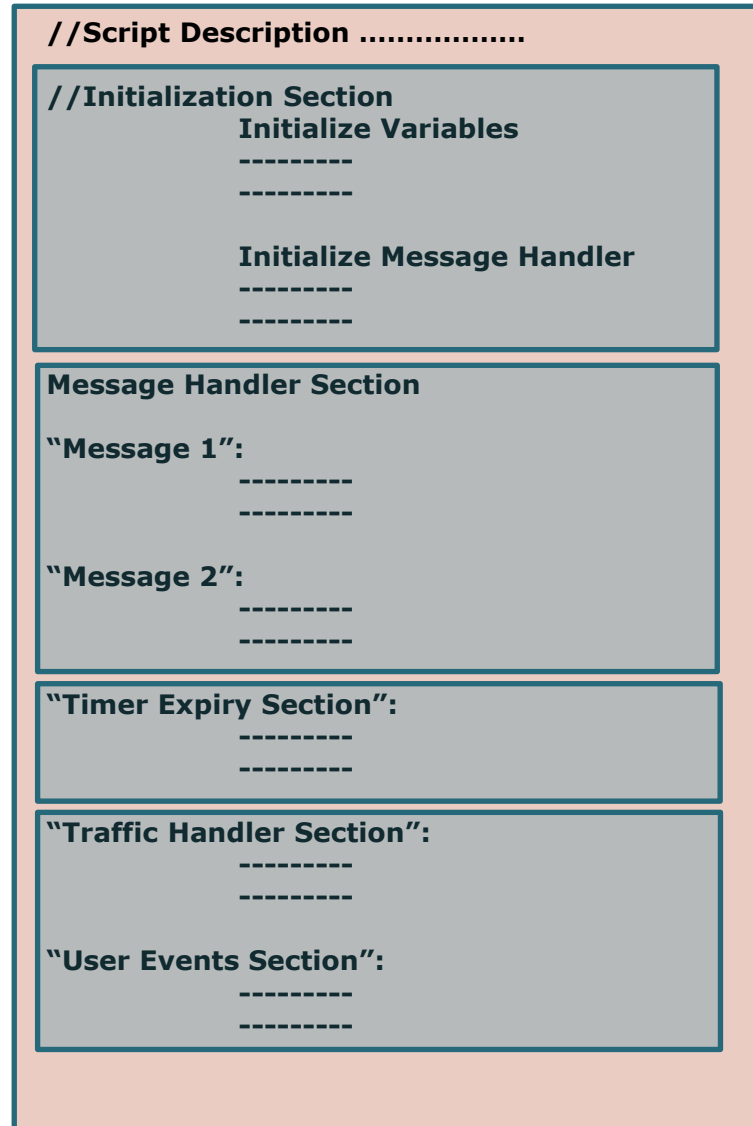
//Action section

**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";

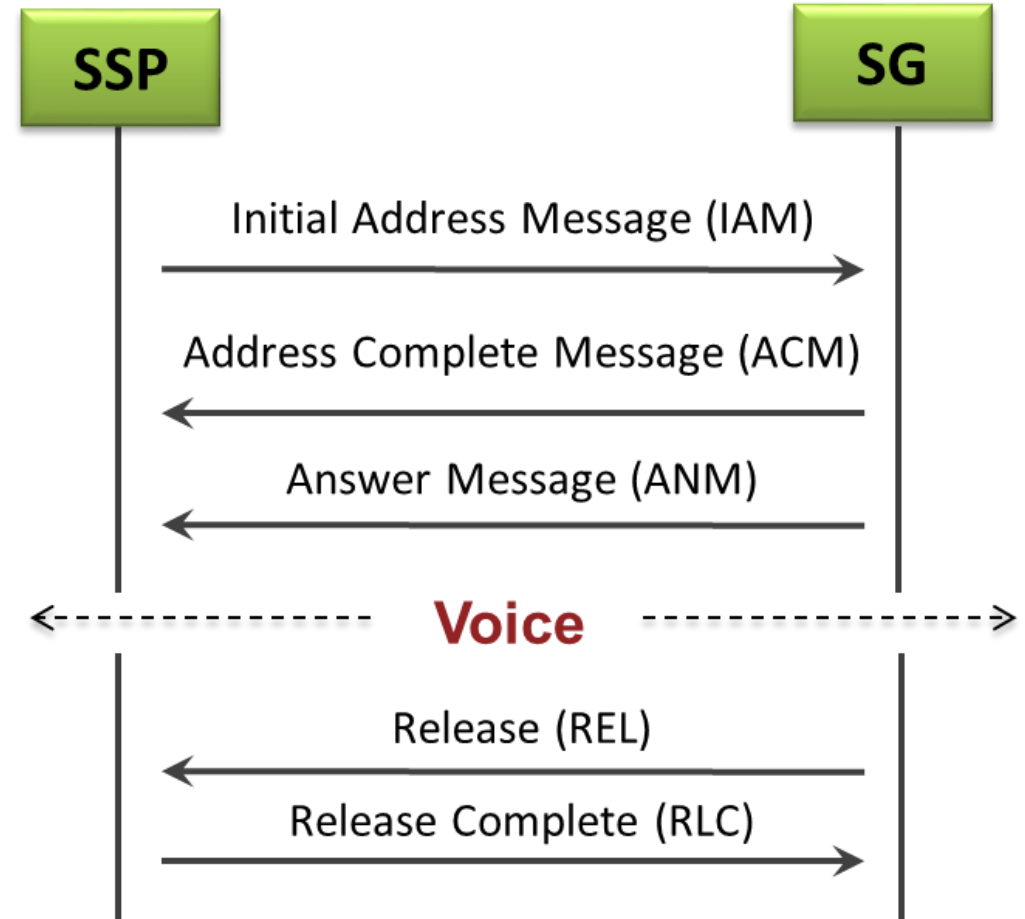
Recv "Address Complete" "AddressCompleteExport";

Recv "Answer" "AnswerImport";

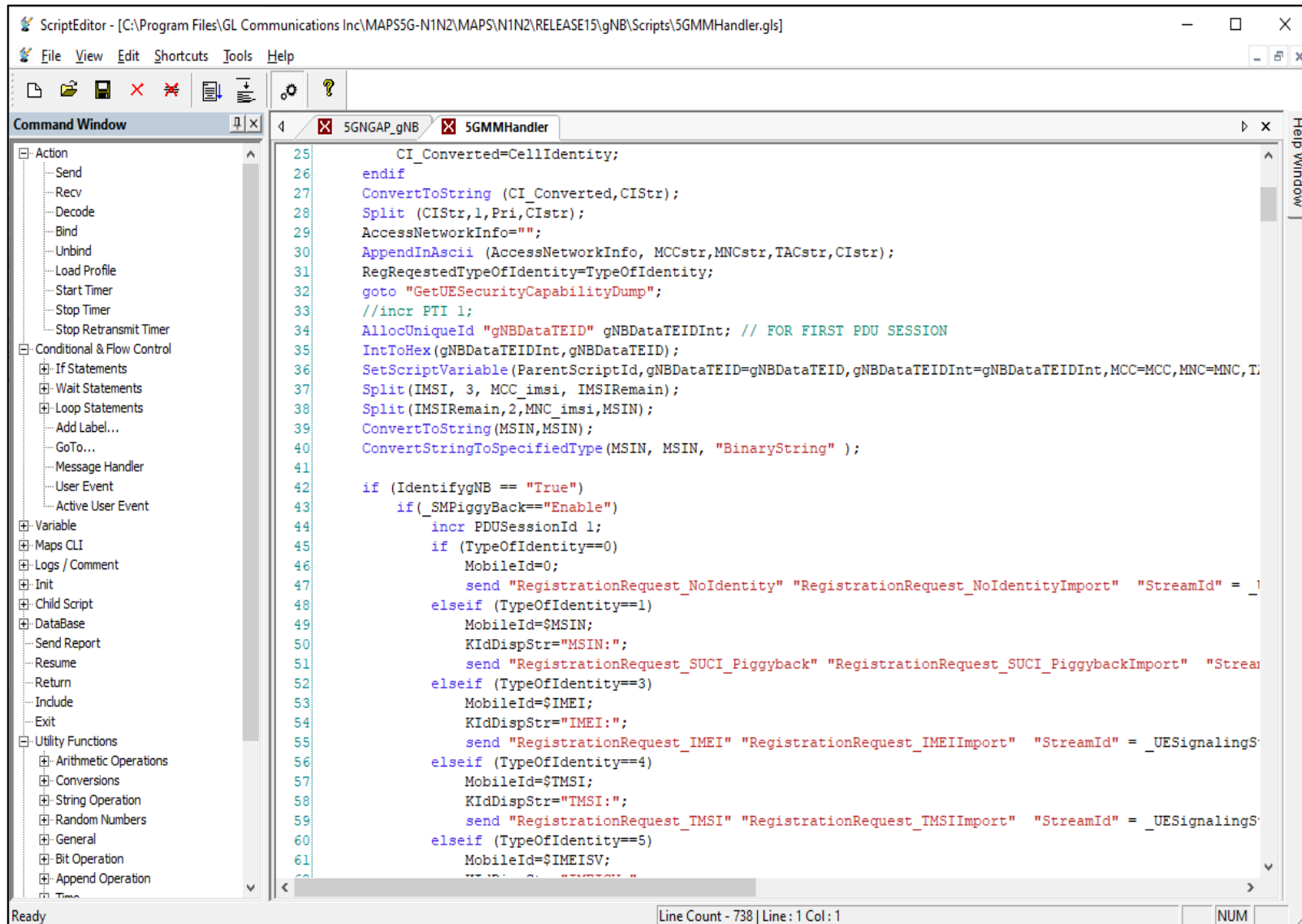
TxRx:tx _TDM file: filename = "Vijay.pcm";

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

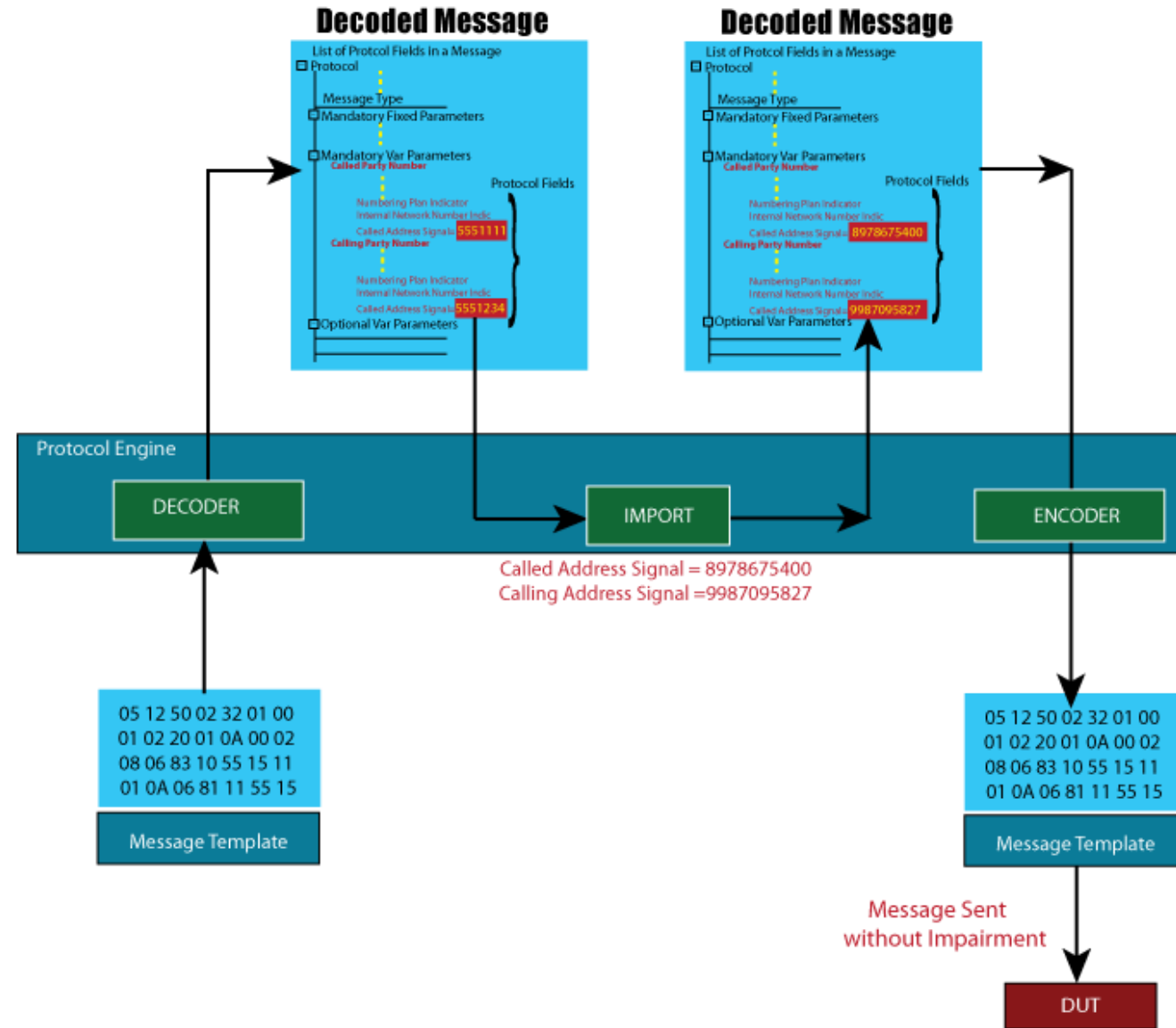
5GNGAP_gNB 5GMMHandler

```
25 CI_Converted=CellIdentity;
26
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=$MSIN;
50             KidDispStr="MSIN:";
51             send "RegistrationRequest_SUCI_Piggyback" "RegistrationRequest_SUCI_PiggybackImport" "Stream
52         elseif (TypeOfIdentity==3)
53             MobileId=$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;
```

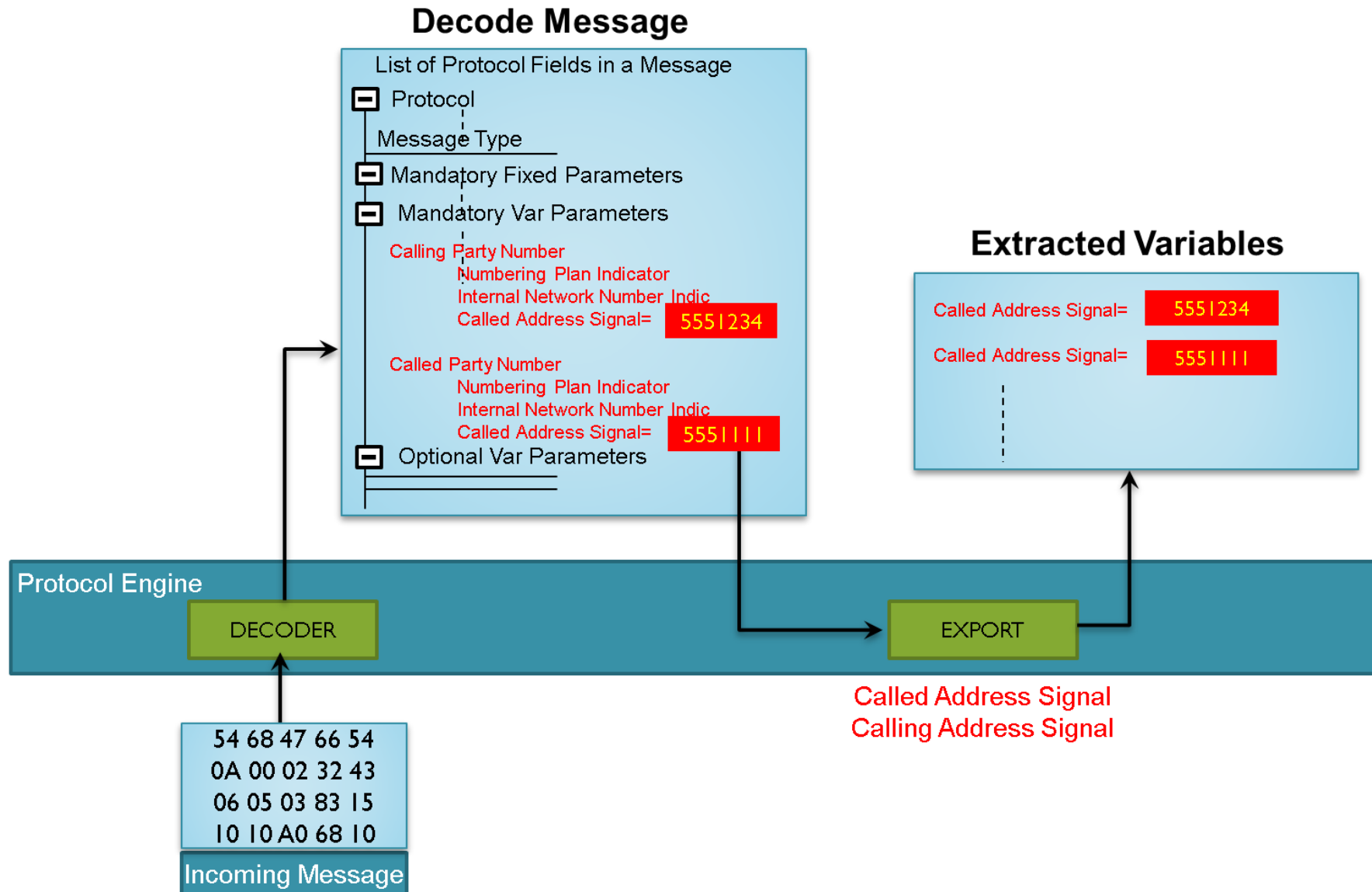
Ready Line Count - 738 | Line: 1 Col: 1 NUM

Understanding Send and Receive Messages

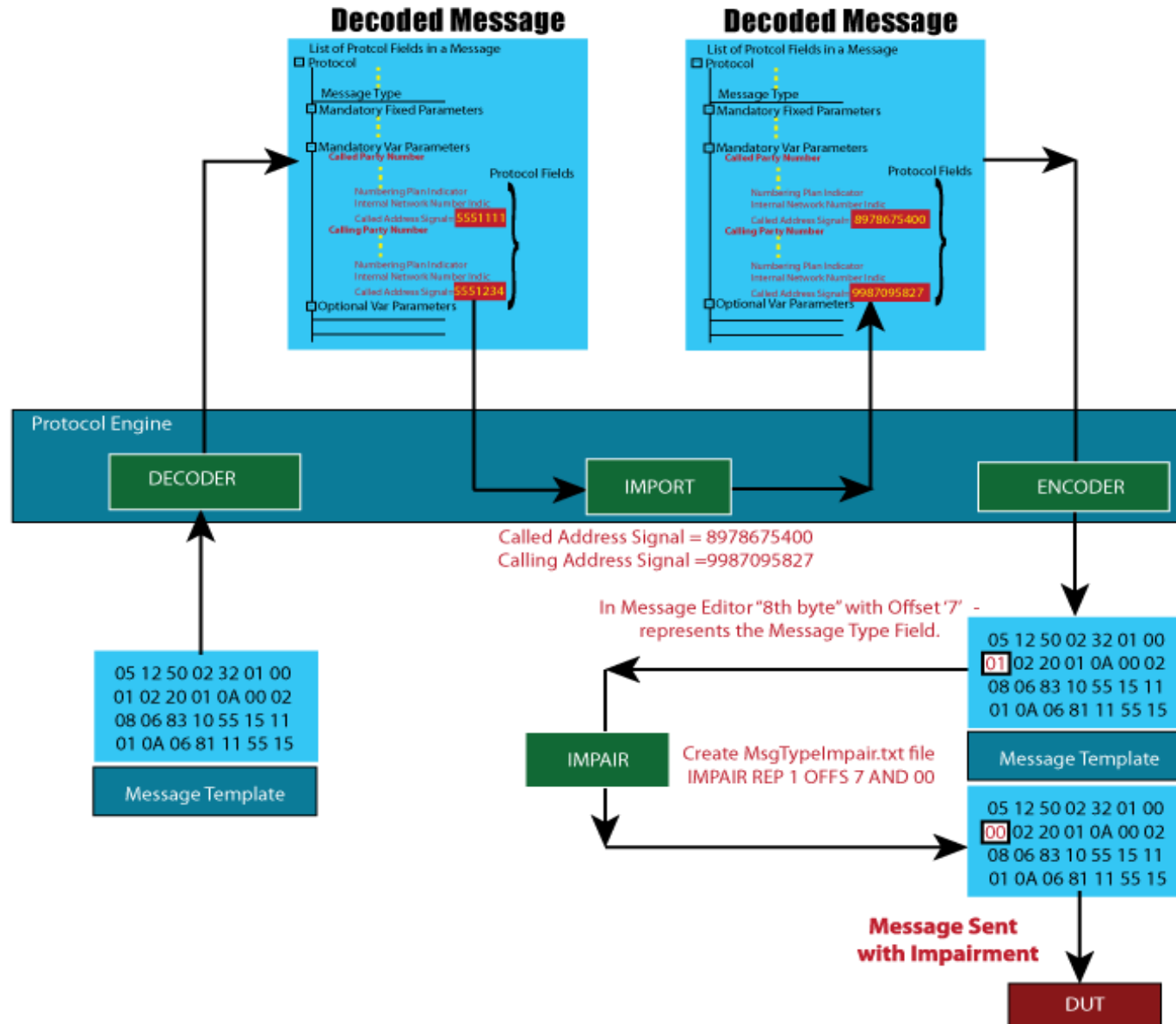
Basic Send Command



Basic Receive/Decode Command

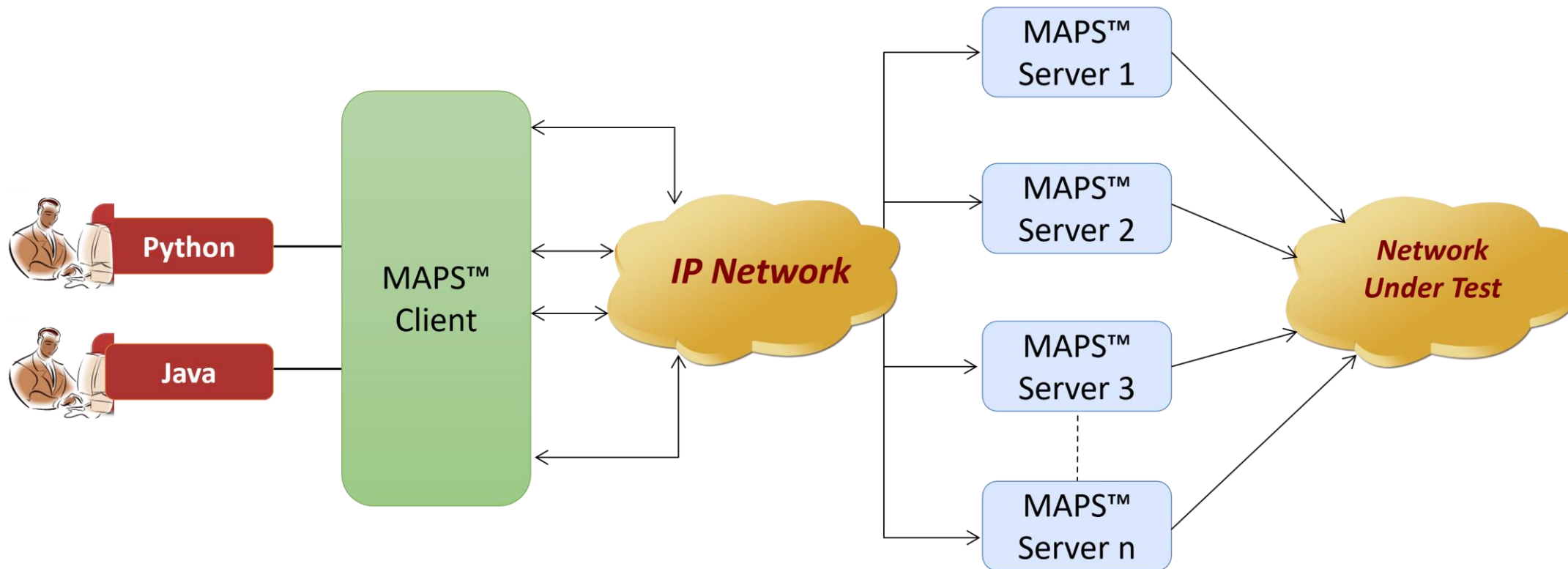


Send Command With Impairment

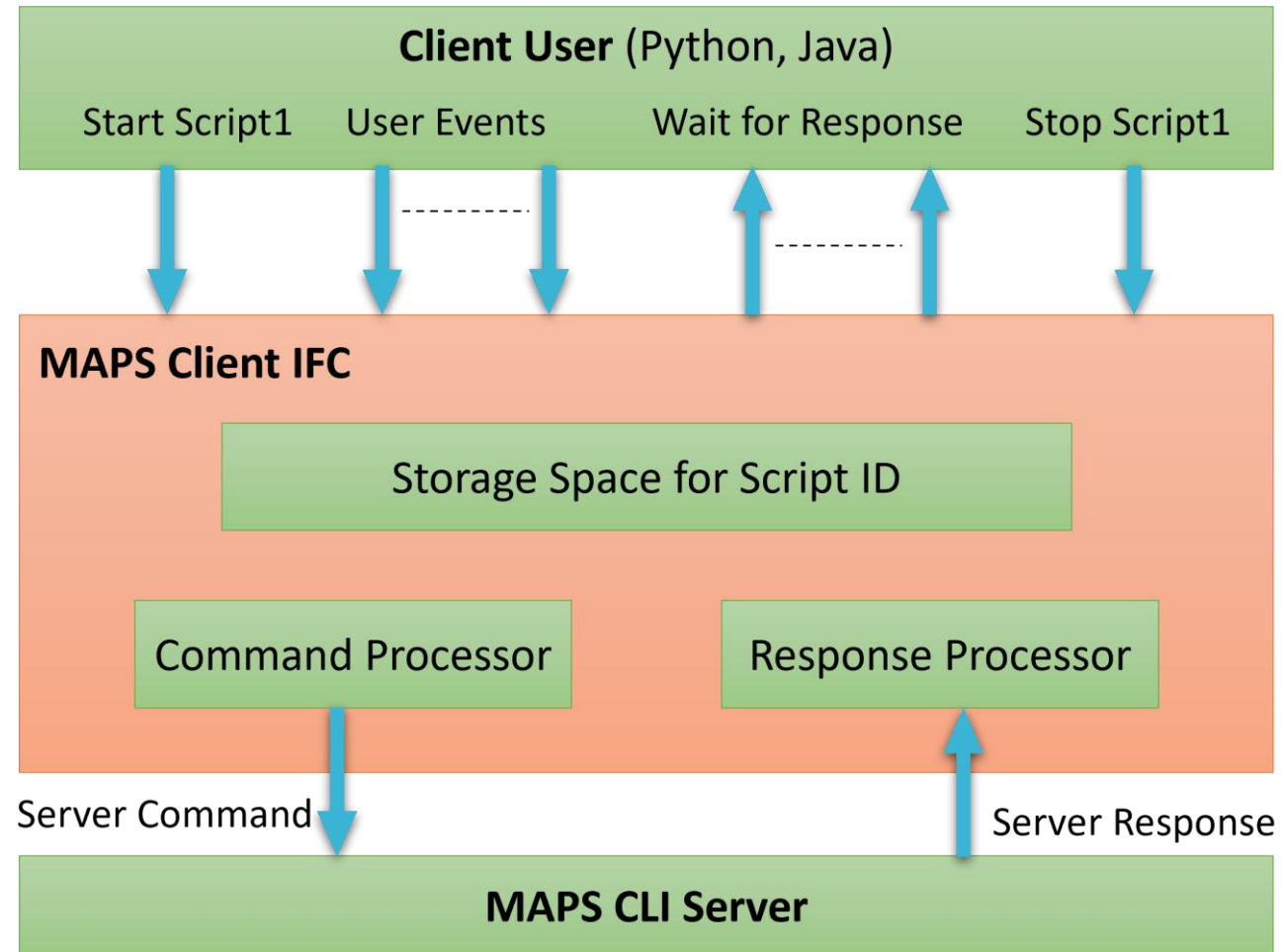


CLI/APIs for Remote Control and Test Automation

CLI for Remote Call Control and 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
```

```
CLI 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 source files like 'IsdnPlaceCall.java'. The main editor shows the 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', 'Script Initiated', 'LAPD Link is UP', 'Placing ISDN Call', and various ISDN message logs. A separate window titled 'MapsCLI Subscriber (ISDN ITU)' displays a detailed log of the call process, including timestamps and specific events like 'Start', 'LoadProfile', 'Apply Global Configuration', 'StartScript', and 'UserEvent'.

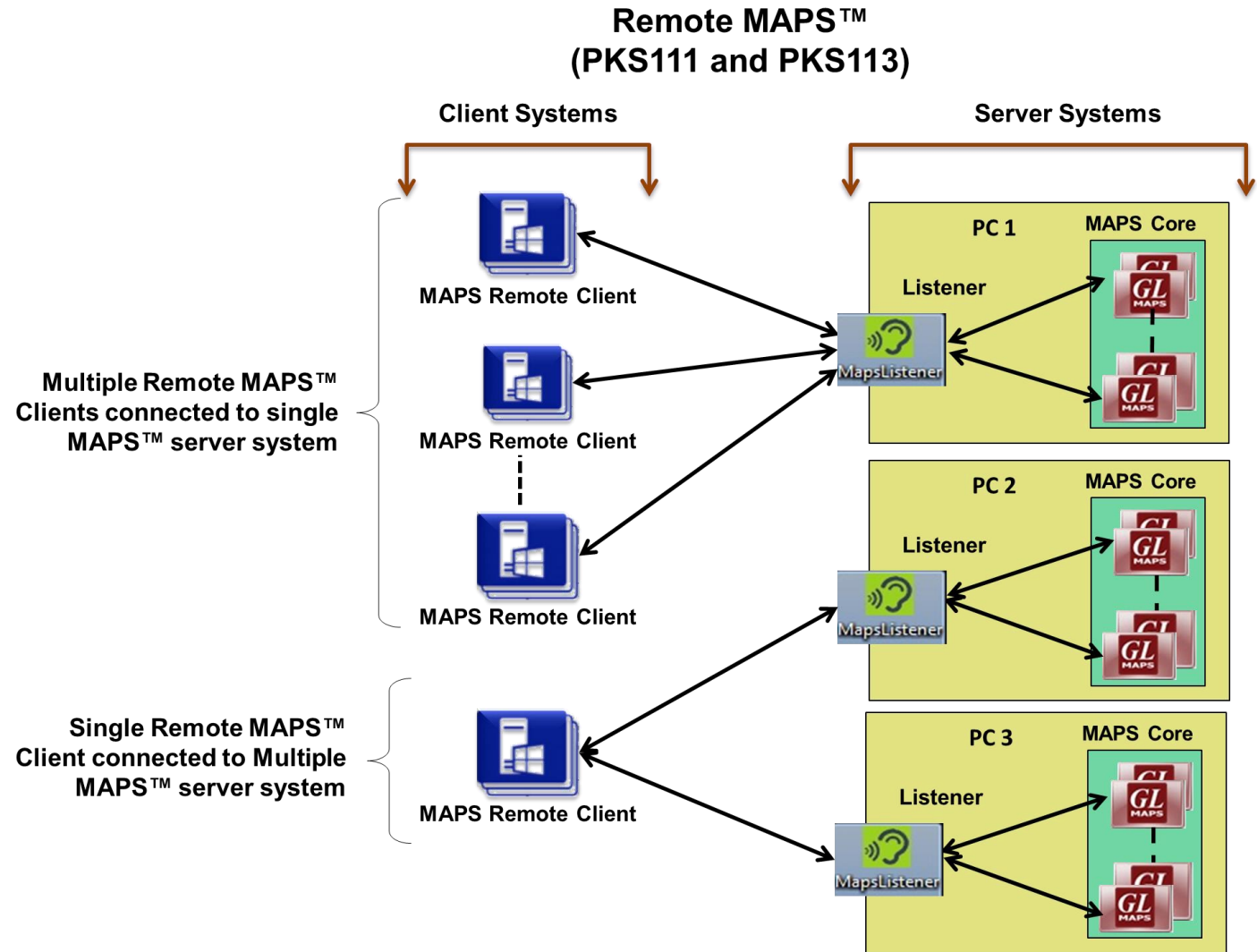
```
public class IsdnPlaceCall {  
    public static void main(String[] args) throws InterruptedException {  
        // create isdn client  
        IsdnClient isdnClient = new IsdnClient("192.168.12.217", 10024);  
        isdnClient.setTestbedProfile("1 Subscriber_Card1.xml");  
        // connect client to server  
        if (isdClient.connect()) {  
            System.out.println("ISDN Client Connected");  
            Thread.sleep(2000);  
            // initialize isdn client testbed  
        }  
    }  
}
```

ISDN Client Connected
Script Initiated
LAPD Link is UP
Placing ISDN Call
ISDNCallStatus: 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

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. The top navigation bar includes a 'Refresh' button, a 'Protocol' dropdown set to 'VOIP (SIP & H323)', and a 'Type' dropdown set to 'CDR'. The user 'gl' is logged in. The left sidebar contains a menu with options like 'Quick CDR', 'All Calls', 'Failed Calls', 'Passed Calls', 'Poor LMOS', 'Good LMOS', 'Longer Duration Calls', 'Voice Calls', 'Custom CDR', 'CDR', 'Test', 'Test KPI', 'Default KPIs', 'Basic KPIs', 'Protocol Specific', 'Config', and 'MailBox'. The main content area shows a 'Quick CDR \ All Calls' section with date and time filters. Below this is a 'Query Execution Time : 0.19715 Seconds' message. A 'Quick Search' bar is set to 'Trafficsumid'. The main table displays call records with columns: 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 duration of 00:00:18.118.

| 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