
MAPS™ ISDN Protocol Emulator



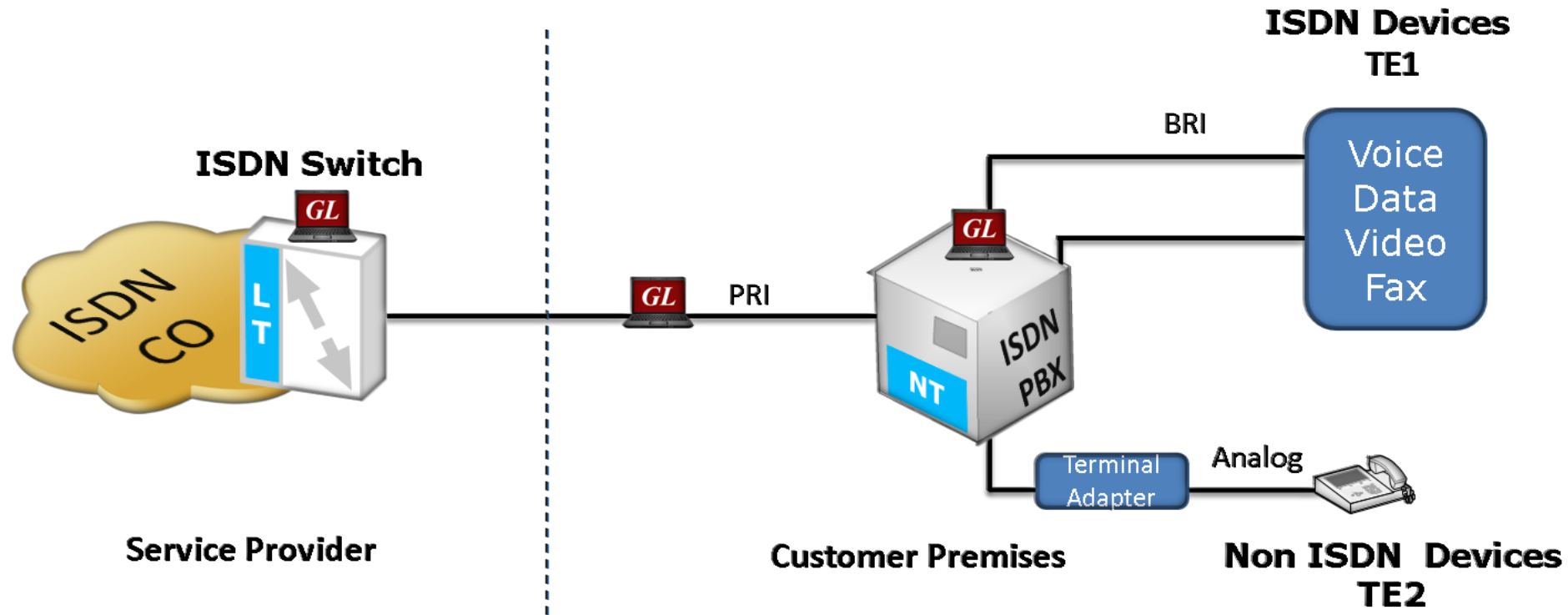
818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878
Phone: (301) 670-4784 Fax: (301) 670-9187 Email: info@gl.com
Website: <https://www.gl.com>

Network Architecture

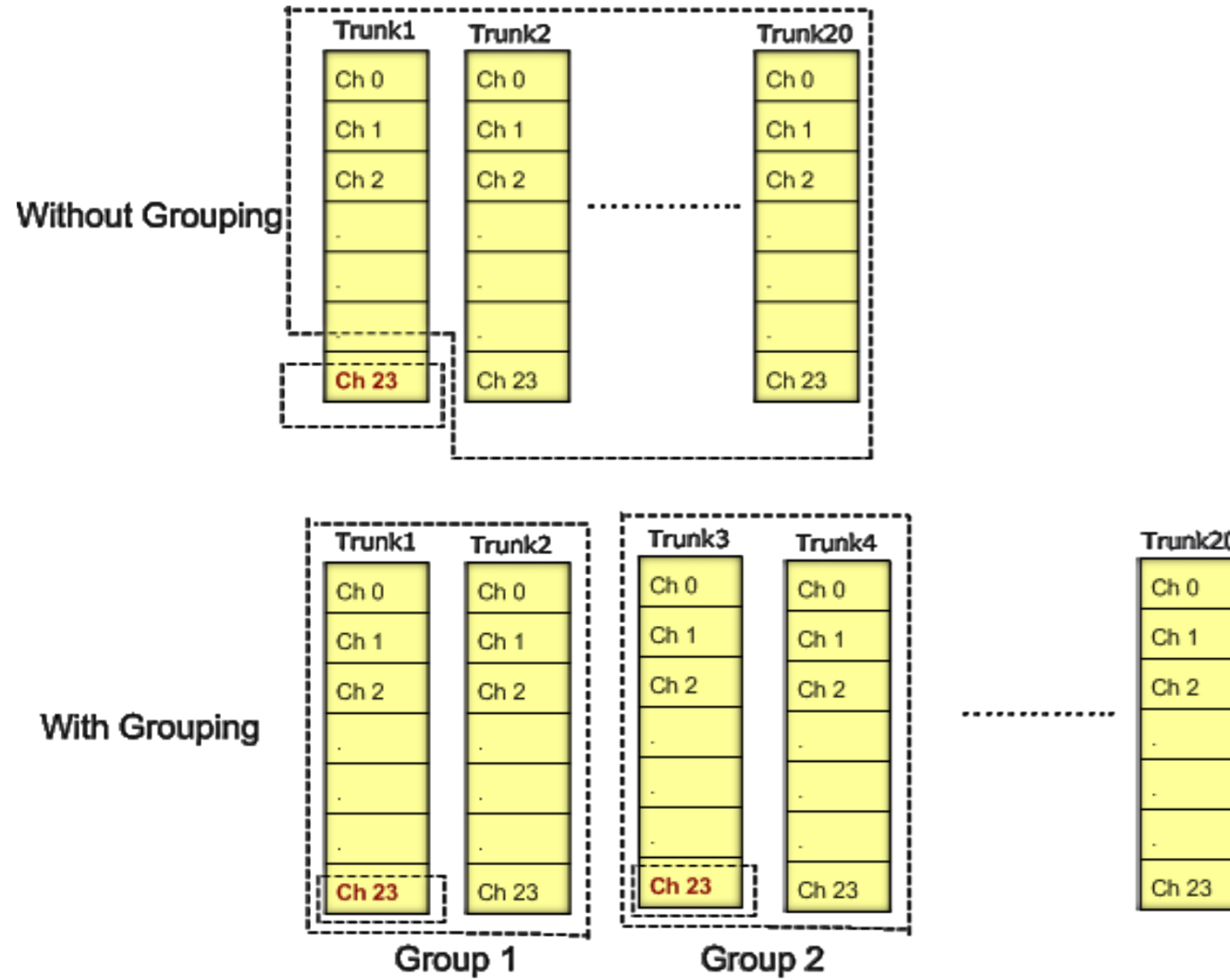


ISDN Analysis and Simulation

Simulate and Monitor Elements in ISDN Network over TDM



NFAS Grouping



Supported Standards and Protocols

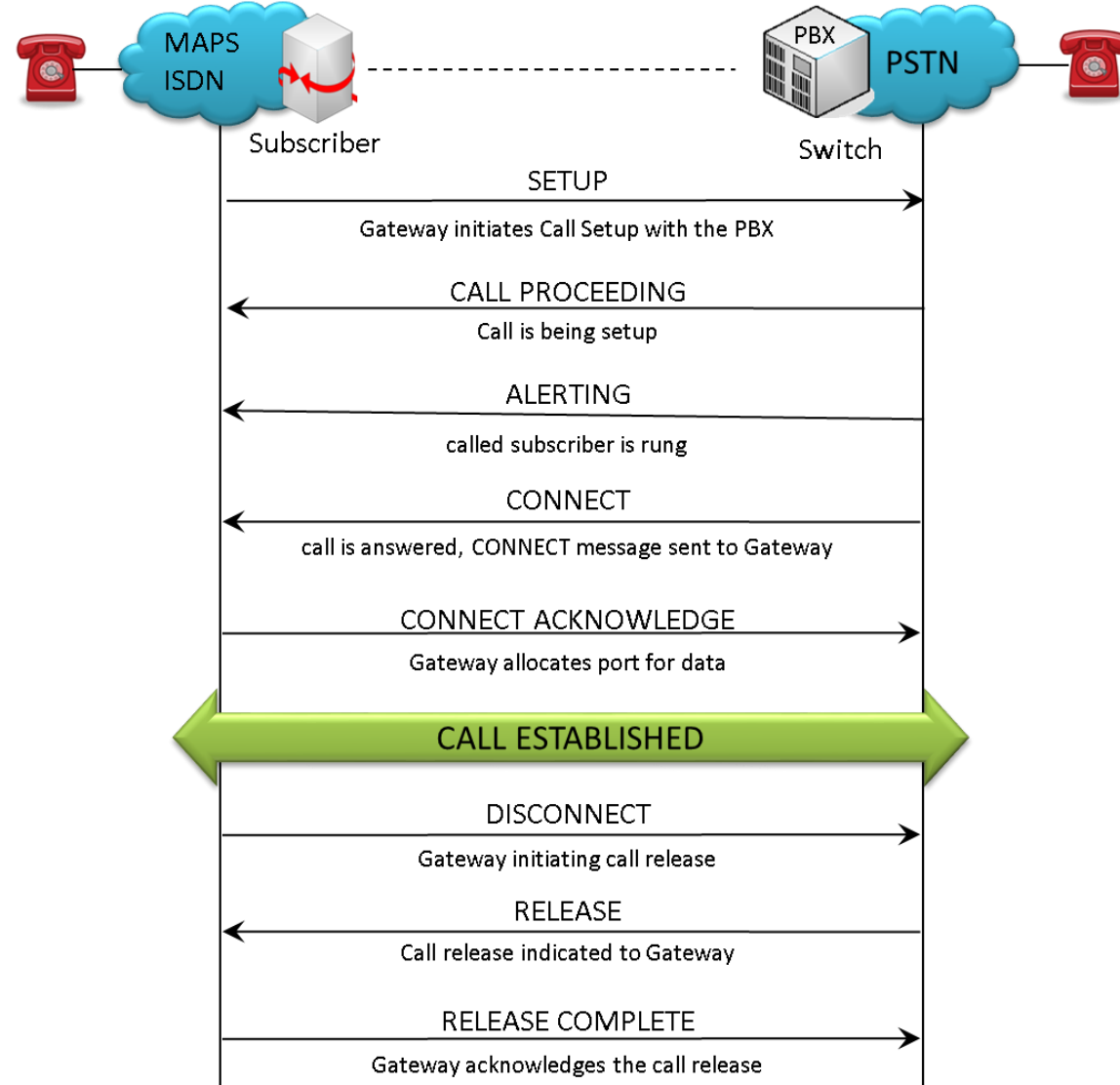
<p>Q.931 ISDN (4ESS, 5ESS, BELL, DMS-100, DMS-250, QSIG ECMA)</p>
<p>Q.921 LAP-D</p>
<p>TI/EI</p>
<p>ISDN TDM</p>

Supported Protocols	Standard / Specification Used
Q.921 (LAPD)	ITU-T Q.921
SR-4994	National ISDN PRI Standard
Q.931	ITU-T Q.931 / Q.932(Facility IE) / Q.955.3 (MLPP Procedures)
4ESS	ISDN PRI (TR-41449)
5ESS	ISDN PRI (Lucent Tech - 5ESS 2000)
BELL	ISDN PRI (Bell Core SR-NWT-002343)
DMS-100	Nortel's Switch DMS 100 NIS-A2111-1
DMS-250	Nortel's Switch DMS 250 NIS-A2111-4
QSIG ECMA	Standard ECMA-143 4th Edition - December 2001

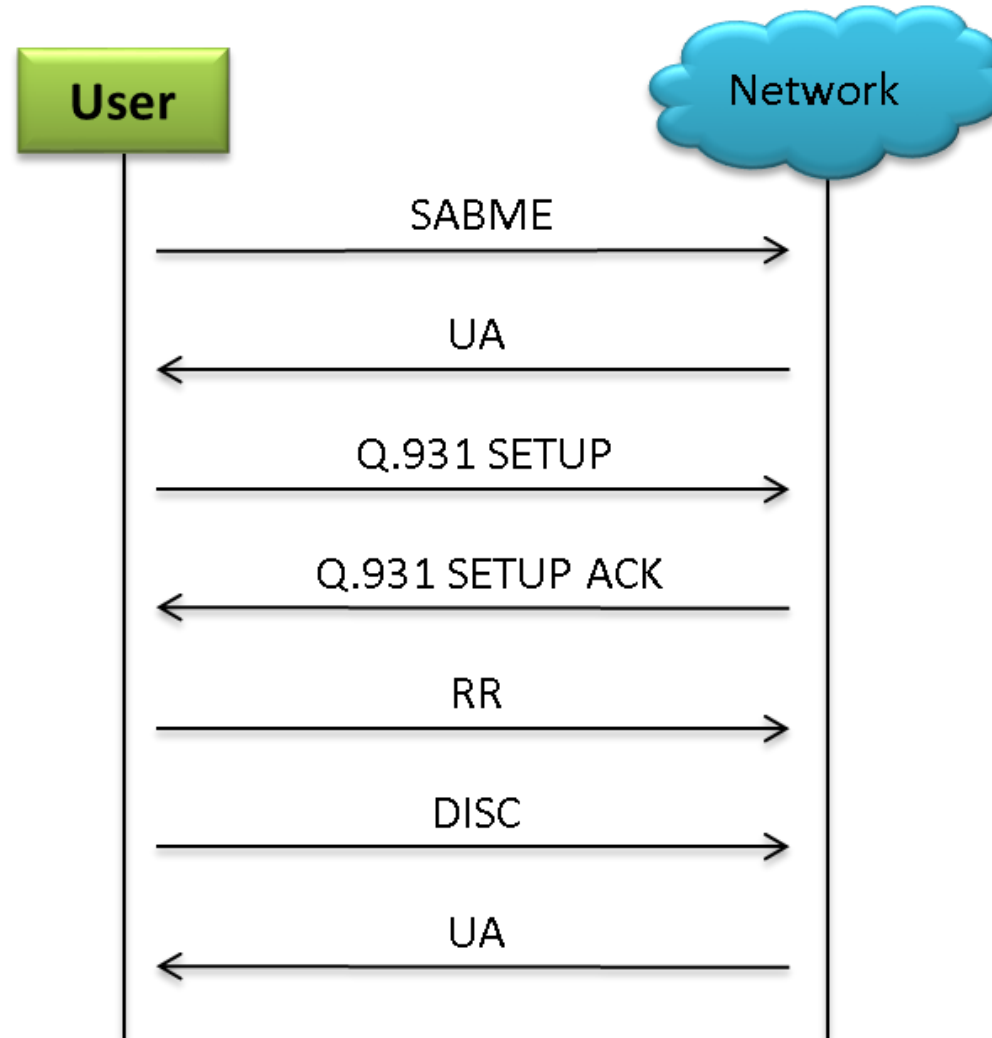
Main Features

- ISDN simulation over TDM (T1/E1)
- Multiple T1/E1 line interfaces supported
- Access to all ISDN Message Parameters such as Call Reference Value, Called Number, Calling Number, Release Cause, and more
- Access to LAPD SABME, UA, RR, DISC signaling messages at layer 2
- Switch and Subscriber Emulation
- Provides various release cause codes such as rejected, no user response, user busy, congested, and so on to troubleshoot the problems in ISDN
- Overlap sending of ISDN messages
- Supports NFAS testing for T1 only

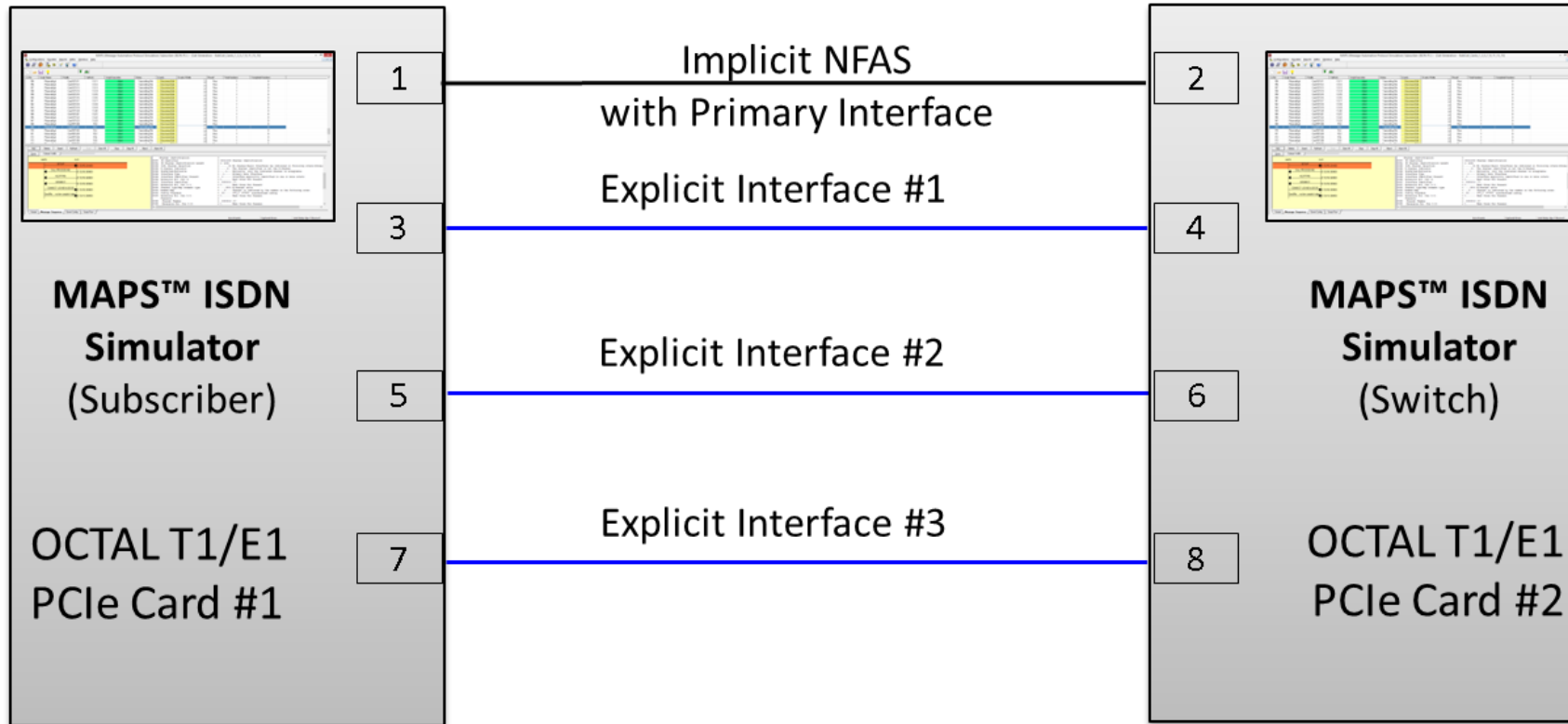
Typical ISDN Call Flow



Typical LAPD Call Flow



ISDN Calls with NFAS Option



ISDN TestBed Setup Configuration

MAPS (Message Automation Protocol Simulation) Switch (ISDN ITU) - [Testbed Setup - NFAS_Implicit_2-4-6-8]

Configurations Emulator Reports Editor Windows Help

Config	Value
NFAS Configuration	
NFAS	True
NFASInterface Type	Implicit
Channel Mapping	Timeslot Based
Channel Selection	Configured In Profile
TEI Type	Similar
NFAS Group	1
NFAS Group 1	
Primary D Channel Configuration	
T1 Signaling Port Number	2
TEI	0
Signaling Timeslot	23
Signaling Subchannel	1..8
Protocol End	SWITCH
NFAS Group Member	3
NFAS Group Member 1	
T1 Card Number	4
NFAS TEI	1
NFAS Interface Identifier	1
NFAS Group Member 2	
T1 Card Number	6
NFAS TEI	1
NFAS Interface Identifier	2
NFAS Group Member 3	
T1 Card Number	8
NFAS TEI	1
NFAS Interface Identifier	3
End User Configuration	Switch_Profiles.xml

_NFASInterfaceType

Select Option

Implicit

Start Edit

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

ISDN Subscriber Profile Configuration

MAPS (Message Automation Protocol Simulation) Subscriber (ISDN ITU) - [Profile Editor - Subscriber_Profiles]

Config

Config	Value
Card1TS01	
Card Number	1
Timeslot	1
Subscriber Identifier	1
Channel Number	1
Called Number	7685612901
Calling Number	8556782101
Transit Network Selection Parameters	
Network Identification Plan	Unknown
Type Of Network Identification	User Specified
Network Identification TNS	1234

CardNumber

Enter Integer

1

Add Insert Delete

Properties

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

Analog and TDM Traffic Simulation

- Transmission, detection of TDM and Analog traffic - digits, voice files, single tones, dual tones, Dynamic VF, FAX, and IVR over established calls
- The volume of calls can vary from one to hundreds of calls depending on the T1 E1 or Analog platform of choice
- All variations of Fax traffic supported over 2 wire analog and T1 E1, such as page size, resolution, min and max data rate, and codec type – including high speed fax such as V.34

ISDN Traffic Profile Configuration

The screenshot displays the MAPS (Message Automation Protocol Simulation) Switch (ISDN ITU) - [Profile Editor - TrafficProfile] interface. The main window is titled "MAPS (Message Automation Protocol Simulation) Switch (ISDN ITU) - [Profile Editor - TrafficProfile]". The interface includes a menu bar (Configurations, Emulator, Reports, Editor, Windows, Help) and a toolbar with various icons. The main area is divided into three panes:

- Left Pane:** A list of profiles labeled "Profiles [Edit-F]". Profiles 34 through 53 are listed, with "Card2TS01" selected.
- Center Pane:** A configuration tree for "Card2TS01". The tree structure is as follows:
 - Card2TS01
 - Enable Traffic: AutoTraffic - File (highlighted with a red box)
 - Traffic Direction For AutoTraffic: TX-Rx
 - Enable File Recording: False
 - IVR Type: Path Verification
 - Digit Parameters
 - TypeOfDigit: DTMF
 - Digits: 1234567890
 - Digit Power 1: -13.00
 - Digit Power 2: -13.00
 - On Time in msec: 80
 - Off Time in msec: 80
 - Tone Parameters
 - Transmit Tone Type: Dial Tone
 - Dial Tone Parameters
 - Dial Tone Frequency 1 in Hz: 440
 - Dial Tone Frequency 2 in Hz: 350
 - Ringback Tone Parameters
 - Ringback Tone Frequency 1 in Hz: 440
 - Ringback Tone Frequency 2 in Hz: 480
 - Busy Tone Parameters
 - Busy Tone Frequency 1 in Hz: 480
 - Busy Tone Frequency 2 in Hz: 620
 - Userdefined Tone Parameters
 - Userdefined Test Tone Frequency 1 in Hz: 1004
 - Userdefined Test Tone Frequency 2 in Hz: 0
 - Tone Power: -10.00
 - Transmit Tone Duration in msec: 10000
- Right Pane:** A settings panel for "EnableTraffic". It contains a "Select Option" dropdown menu with "AutoTraffic - File" selected. Below the dropdown are "Add", "Insert", and "Delete" buttons, and a "Properties" button.

At the bottom of the window, there are status indicators: "Error Events", "Captured Errors", and "Link Status Up=0 Down=0".

ISDN Incoming Call Handler Configuration

Incoming Call Handlers Configuration - default

Message Name	Script Name
SETUP	Recvcall.gls
DISCONNECT	Rx_IdleStateMsgHandler.gls
RELEASE	Rx_IdleStateMsgHandler.gls
RELEASE COMPLETE	Rx_IdleStateMsgHandler.gls
RESTART	Rx_Restart.gls
CONNECT	Rx_IdleStateMsgHandler.gls
STATUS ENQUIRY	Rx_IdleStateMsgHandler.gls
STATUS	Rx_IdleStateMsgHandler.gls

Scripts

- Recvcall.gls

Sequence
 Random

Up
Down

Add Delete Clear Add Delete

ISDN Call Generation

GL MAPS (Message Automation Protocol Simulation) Subscriber (ISDN ITU) - [Call Generation - Untitled]

Configurations Emulator Reports Editor Windows Help

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	E...	Result	Total Iterations	Completed Iterations
1	Placecall.gls	Card1TS01	1.1	Start	Call Released	None	...	Pass	1	1

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

Save Column Width

MAPS DUT

```

SETUP → 12:01:29.847000
CALL PROCEEDING ← 12:01:30.588000
ALERTING ← 12:01:30.588000
CONNECT ← 12:01:30.588000
CONNECT ACKNOWLEDGE → 12:01:30.612000
File Transmitted :: a-law samples\count10.pcm → 12:01:50.686000
DISCONNECT ← 12:02:10.617000
RELEASE → 12:02:10.638000
RELEASE COMPLETE ← 12:02:10.981000
        
```

```

===== Q.93x Layer 3 Layer =====
0000 Protocol Discriminator = 00001000 Q.931/I.451 user-network call control messages
0001 Call Reference Length = ...0010 2 Bytes
0002 Call Reference Value = 2 (.00000000 00000010)
0002 Call Reference Flag = 0..... FROM side that originated callref
0004 Message Type = 00000101 SETUP
      Bearer capability =
0005 IEI Bearer Capability = 00000100 Bearer Capability IE Identifier
0006 IE Bearer Capability Length = 3 (x03)
0007 Information Transfer Capability = ...00000 Speech
0007 Coding Standard = .00..... ITU_T (CCITT) standardized coding
0007 Oct 3 Extension Bit (Oct 3) = 1..... Next Octet Not Present
0008 Information Transfer Rate = ...10000 64 kbit/s
0008 Transfer Mode = .00..... Circuit Mode
0008 Oct 4 Extension Bit (Oct 4) = 1..... Next Octet Not Present
0009 Layer 1 Indent Choice = .01..... Layer 1 Identifier
0009 User Information Layer 1 Protocol (BC) = ...00011 A-law, Rec G.711
0009 Layer 1 Identifier = .01..... Layer 1 Id
0009 Extension Bit (Oct 5) = 1..... Next Octet Not Present
      Channel identification =
000A IE Identifier = 00011000 Channel Identification
000B IE Channel Identification Length = 3 (x03)
000C Info Channel Selection = .....01 B1 channel(Basic Interface)/As indicated in foll
        
```

Scripts Message Sequence Event Config Script Flow

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

ISDN Call Reception

GL
MAPS (Message Automation Protocol Simulation) Switch (ISDN ITU) - [Call Reception]

Configurations Emulator Reports Editor Windows Help

Sr No	Script Name	Call Info	Script Execution	Status	Events	Events Profile	Results
1	Recvcall.gls	2.1	Completed	Call Released	None		Pass

Abort Abort All Show Records Auto Trash Trash

Save Column Width

DUT MAPS

```

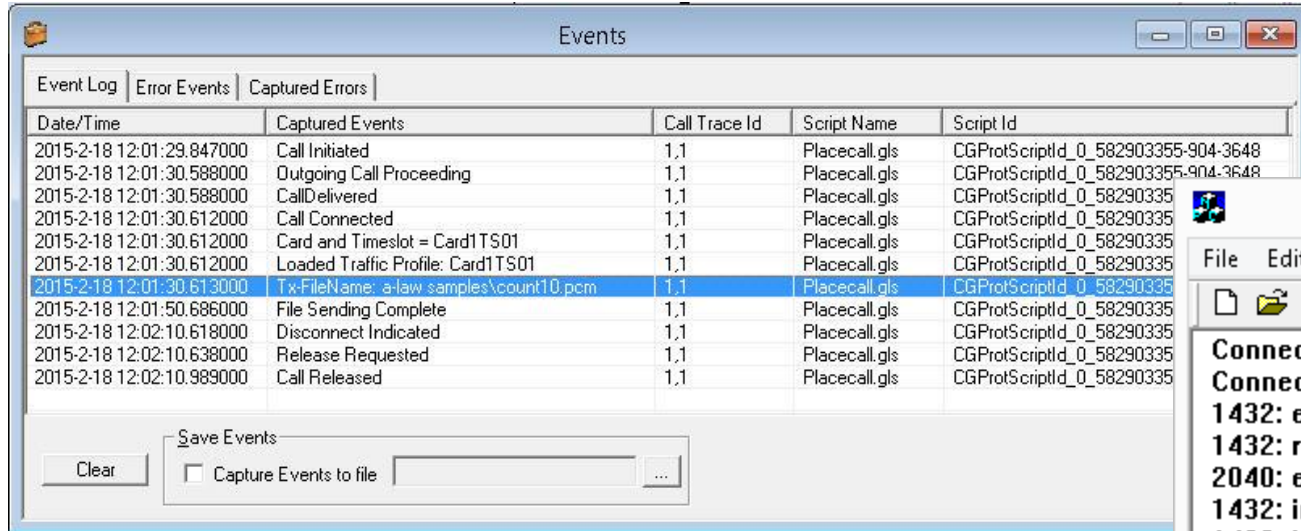
===== Q.93x Layer 3 Layer =====
0000 Protocol Discriminator           = 00001000 Q.931/I.451 user-network call con
0001 Call Reference Length           = ...0010 2 Bytes
0002 Call Reference Value            = 2 (.00000000 00000010)
0002 Call Reference Flag              = 0..... FROM side that originated callref
0004 Message Type                    = 00000101 SETUP
    Bearer capability
0005 IE Bearer Capability              = 00000100 Bearer Capability IE Identifier
0006 IE Bearer Capability Length      = 3 (x03)
0007 Information Transfer Capability  = ...00000 Speech
0007 Coding Standard                  = .00..... ITU_T (CCITT) standardized coding
0007 Oct 3 Extension Bit (Oct 3)     = 1..... Next Octet Not Present
0008 Information Transfer Rate        = ...10000 64 kbit/s
0008 Transfer Mode                    = .00..... Circuit Mode
0008 Oct 4 Extension Bit (Oct 4)     = 1..... Next Octet Not Present
0009 Layer 1 Indent Choice            = .01..... Layer 1 Identifier
0009 User Information Layer 1 Protocol (BC) = ...00011 A-law, Rec G.711
0009 Layer 1 Identifier               = .01..... Layer 1 Id
0009 Extension Bit (Oct 5)           = 1..... Next Octet Not Present
    Channel identification
000A IE Identifier                    = 00011000 Channel Identification
000B IE Channel Identification Length = 3 (x03)
000C Info Channel Selection           = .....01 B1 channel(Basic Interface)/As in
000C D-channel Indicator              = .....0.. The channel identified is not the
000C Preferred/Exclusive              = .....0... Indicated channel is preferred
000C Interface Type                   = 1..... Primary Data Interface
                    
```

Scripts **Message Sequence** Event Config Script Flow

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

ISDN Events and Server Traffic Log

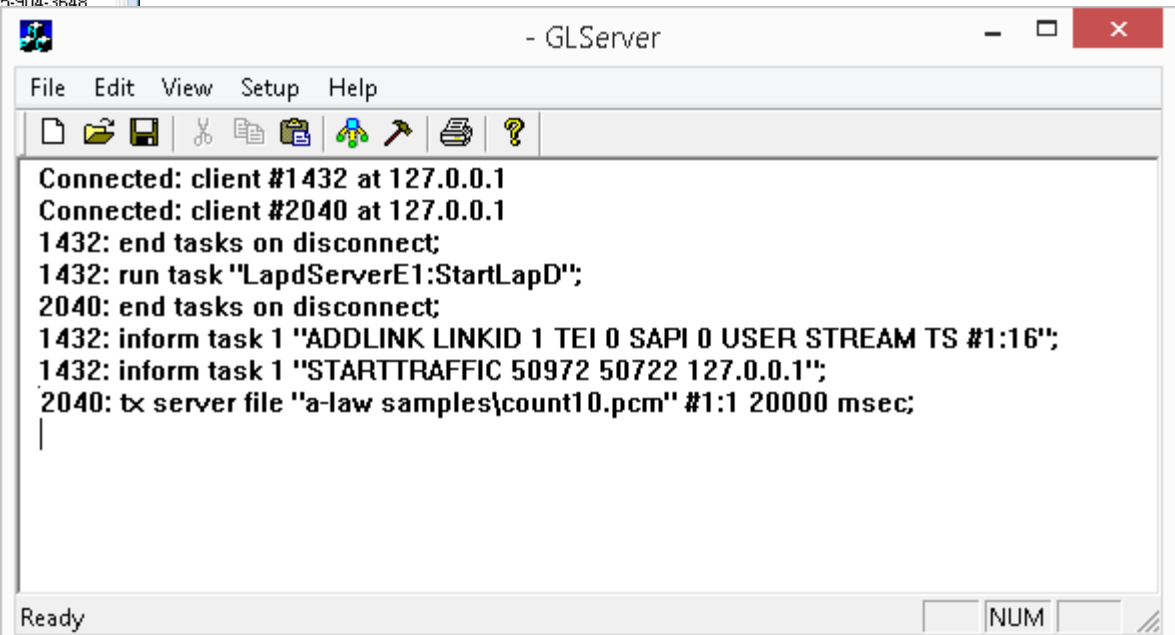
Events Log



The 'Events' window displays a table of call events. The table has five columns: Date/Time, Captured Events, Call Trace Id, Script Name, and Script Id. The events listed include Call Initiated, Outgoing Call Proceeding, Call Delivered, Call Connected, Card and Timeslot = Card1TS01, Loaded Traffic Profile: Card1TS01, Tx-FileName: a-law samples\count10.pcm, File Sending Complete, Disconnect Indicated, Release Requested, and Call Released.

Date/Time	Captured Events	Call Trace Id	Script Name	Script Id
2015-2-18 12:01:29.847000	Call Initiated	1,1	Placecall.gls	CGProtScriptId_0_582903355-904-3648
2015-2-18 12:01:30.588000	Outgoing Call Proceeding	1,1	Placecall.gls	CGProtScriptId_0_582903355-904-3648
2015-2-18 12:01:30.588000	Call Delivered	1,1	Placecall.gls	CGProtScriptId_0_58290335
2015-2-18 12:01:30.612000	Call Connected	1,1	Placecall.gls	CGProtScriptId_0_58290335
2015-2-18 12:01:30.612000	Card and Timeslot = Card1TS01	1,1	Placecall.gls	CGProtScriptId_0_58290335
2015-2-18 12:01:30.612000	Loaded Traffic Profile: Card1TS01	1,1	Placecall.gls	CGProtScriptId_0_58290335
2015-2-18 12:01:30.613000	Tx-FileName: a-law samples\count10.pcm	1,1	Placecall.gls	CGProtScriptId_0_58290335
2015-2-18 12:01:50.686000	File Sending Complete	1,1	Placecall.gls	CGProtScriptId_0_58290335
2015-2-18 12:02:10.618000	Disconnect Indicated	1,1	Placecall.gls	CGProtScriptId_0_58290335
2015-2-18 12:02:10.638000	Release Requested	1,1	Placecall.gls	CGProtScriptId_0_58290335
2015-2-18 12:02:10.989000	Call Released	1,1	Placecall.gls	CGProtScriptId_0_58290335

WCS Server Traffic Log



The 'GLServer' window displays server traffic logs. The logs show connections from clients #1432 and #2040 at IP address 127.0.0.1. The logs include messages such as 'Connected: client #1432 at 127.0.0.1', '1432: end tasks on disconnect;', '1432: run task "LapdServerE1:StartLapD";', '2040: end tasks on disconnect;', '1432: inform task 1 "ADDLINK LINKID 1 TEI 0 SAPI 0 USER STREAM TS #1:16";', '1432: inform task 1 "STARTTRAFFIC 50972 50722 127.0.0.1";', and '2040: tx server file "a-law samples\count10.pcm" #1:1 20000 msec;'. The window title is '- GLServer' and the status bar shows 'Ready' and 'NUM'.

```
Connected: client #1432 at 127.0.0.1
Connected: client #2040 at 127.0.0.1
1432: end tasks on disconnect;
1432: run task "LapdServerE1:StartLapD";
2040: end tasks on disconnect;
1432: inform task 1 "ADDLINK LINKID 1 TEI 0 SAPI 0 USER STREAM TS #1:16";
1432: inform task 1 "STARTTRAFFIC 50972 50722 127.0.0.1";
2040: tx server file "a-law samples\count10.pcm" #1:1 20000 msec;
```


LAPD Call Simulation

Call Generation

MAPS (Message Automation Protocol Simulation) Subscriber (LAPD ITU) - [Call Generation - Default]

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Ev...	Result	Total Iterations	Completed Iterations
1	LAPD_Subscriber.gls	LAPDLink01	0	Stop	Receive Ready	Deactivate LAPD		Pass	1	0

Message Sequence Diagram (MAPS vs DUT):

- MAPS sends SABME to DUT at 12:32:14.374000
- DUT sends SABME to MAPS at 12:32:15.401000
- MAPS sends UA to DUT at 12:32:15.506000
- DUT sends UA to MAPS at 12:32:15.506000
- MAPS sends SABME to DUT at 12:32:16.412000
- DUT sends SABME to MAPS at 12:32:16.573000
- MAPS sends UA to DUT at 12:32:16.574000
- DUT sends UA to MAPS at 12:32:16.639000
- MAPS sends UA to DUT at 12:32:17.693000
- DUT sends RR to MAPS at 12:32:17.693000
- MAPS sends RR to DUT at 12:32:27.712000

Log Output:

```
===== Lapid Layer =====
0000 EA1 = .....0 Next Octet Present
0000 Command/Response Field (C/R) = .....0 Command(User), Resp
0000 Service Access Point Identifier(SAPI) = 000000.. (0)
0001 EA2 = .....1 Next Octet Not Pres
0001 Terminal Endpoint Identifier(TEI) = 0000000.. (0)
0002 Control Field Bit - 1 = .....1 Supervisory/Unnumber
0002 Ct1 = .....11 Unnumbered
0002 Modifier Function = 011.11.. SABME
0002 P/F = ...1.... (1)
```

Call Reception

MAPS (Message Automation Protocol Simulation) Switch (LAPD ITU) - [Call Reception]

Sr No	Script Name	Call Info	Script Execution	Status	Events	Ev...	Results
1	LAPD_Switch.gls	0	Completed	LAPD Link Down	None		Pass

Message Sequence Diagram (DUT vs MAPS):

- DUT sends SABME to MAPS at 12:32:14.931000
- MAPS sends SABME to DUT at 12:32:14.932000
- DUT sends SABME to MAPS at 12:32:15.962000
- MAPS sends SABME to DUT at 12:32:15.998000
- DUT sends UA to MAPS at 12:32:15.998000
- MAPS sends UA to DUT at 12:32:16.120000
- DUT sends SABME to MAPS at 12:32:17.055000
- MAPS sends UA to DUT at 12:32:17.056000
- DUT sends UA to MAPS at 12:32:17.188000
- MAPS sends RR to DUT at 12:32:27.192000
- DUT sends RR to MAPS at 12:32:28.214000
- MAPS sends RR to DUT at 12:32:28.346000

Log Output:

```
===== Lapid Layer =====
0000 EA1 = .....0 Next Octet Present
0000 Command/Response Field (C/R) = .....0 Command(User), Response(Network
0000 Service Access Point Identifier(SAPI) = 000000.. (0)
0001 EA2 = .....1 Next Octet Not Present
0001 Terminal Endpoint Identifier(TEI) = 0000000.. (0)
0002 Control Field Bit - 1 = .....1 Supervisory/Unnumbered
0002 Ct1 = .....11 Unnumbered
0002 Modifier Function = 011.11.. SABME
0002 P/F = ...1.... (1)
```

ISDN NFAS Call Simulation

Call Generation

MAPS (Message Automation Protocol Simulation) Subscriber (ISDN ITU) - [Call Generation - BulkCall_Cards_1_3_5_7]

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Eve...	Result	Total Iterations	Completed Iterations
46	Placecall.gls	Card3TS21	3,21	Start	Call Released	None		Pass	1	1
47	Placecall.gls	Card3TS22	3,22	Start	Call Released	None		Pass	1	1
48	Placecall.gls	Card3TS23	3,23	Start	Call Released	None		Pass	1	1
49	Placecall.gls	Card5TS23	5,23	Start	Call Released	None		Pass	1	1
50	Placecall.gls	Card7TS23	7,23	Stop	File Sent	DisconnectCall		Pass	1	0
51	Placecall.gls	Card9TS02		Start		None		Unknown	1	0

Buttons: Add, Delete, Insert, Refresh, Start, Start All, Stop, Stop All, Abort, Abort All

Save Column Width

MAPS (DUT) Message Sequence:

- SETUP → 18:25:32.701000
- CALL PROCEEDING ← 18:25:33.021000
- ALERTING ← 18:25:33.021000
- CONNECT ← 18:25:33.022000
- CONNECT ACKNOWLEDGE → 18:25:33.022000
- File Transmitted :: mu-law samples\vivjay.pcm → 18:25:53.051000

```

===== Q.93x Layer 3 Layer =====
0000 Protocol Discriminator = 00001000 Q.931/I.451 user-netw
0001 Call Reference Length = ....0010 2 Bytes
0002 Call Reference Value = 9 (.00000000 00001001)
0003 Call Reference Flag = 0..... FROM side that origin
0004 Message Type = 00000101 SETUP
0005 Bearer capability = 00000100 Bearer Capability IE
0006 IE Bearer Capability = 3 (x03)
0007 Information Transfer Capability = ...00000 Speech
0008 Coding Standard = .00..... ITU T (CCITT) standar
0009 Oct 3 Extension Bit (Oct 3) = 1..... Next Octet Not Presen
0008 Information Transfer Rate = ...10000 64 kbit/s
0008 Transfer Mode = .00..... Circuit Mode
0008 Oct 4 Extension Bit (Oct 4) = 1..... Next Octet Not Presen
0009 Layer 1 Indent Choice = .01..... Layer 1 Identifier
0009 User Information Layer 1 Protocol (BC) = ...00010 Mu-law, Rec G.711
0009 Layer 1 Identifier = .01..... Layer 1 Id
0009 Extension Bit (Oct 5) = 1..... Next Octet Not Presen
000A Channel identification = 00011000 Channel Identificatio
000B IE Channel Identification Length = 4 (x04)
000C Info Channel Selection = .....01 B1 channel(Basic Inte
    
```

Scripts | Message Sequence | Event Config | Script Flow

● Error Events ● Captured Errors ● Link Status Up=1

Call Reception

MAPS (Message Automation Protocol Simulation) Switch (ISDN ITU) - [Call Reception]

Sr No	Script Name	Call Info	Script Execution	Status	Events	Events Profile	Results
1	Recvcall.gls	4,23	Completed	Call Released	None		Pass
2	Recvcall.gls	4,22	Completed	Call Released	None		Pass
3	Recvcall.gls	4,21	Completed	Call Released	None		Pass
4	Recvcall.gls	4,20	Completed	Call Released	None		Pass
5	Recvcall.gls	4,19	Completed	Call Released	None		Pass
6	Recvcall.gls	6,23	Completed	Call Released	None		Pass
7	Recvcall.gls	8,23	Completed	Call Released	None		Pass

Buttons: Abort, Abort All

Show Records Auto Trash Trash

Save Column Width

DUT (MAPS) Message Sequence:

- SETUP → 18:25:32.863000
- CALL PROCEEDING ← 18:25:32.865000
- ALERTING ← 18:25:32.866000
- CONNECT ← 18:25:32.866000
- CONNECT ACKNOWLEDGE → 18:25:33.182000
- File Transmitted :: mu-law samples\vivjay.pcm → 18:25:52.895000
- DISCONNECT ← 18:26:33.192000
- RELEASE ← 18:26:33.193000
- RELEASE COMPLETE → 18:26:33.512000

```

===== Q.93x Layer 3 Layer =====
0000 Protocol Discriminator = 00001000 Q.931/I.451 user-network call control messag
0001 Call Reference Length = ....0010 2 Bytes
0002 Call Reference Value = 9 (.00000000 00001001)
0003 Call Reference Flag = 0..... FROM side that originated callref
0004 Message Type = 00000101 SETUP
0005 Bearer capability = 00000100 Bearer Capability IE Identifier
0006 IE Bearer Capability = 3 (x03)
0007 Information Transfer Capability = ...00000 Speech
0007 Coding Standard = .00..... ITU T (CCITT) standardized coding
0007 Oct 3 Extension Bit (Oct 3) = 1..... Next Octet Not Present
0008 Information Transfer Rate = ...10000 64 kbit/s
0008 Transfer Mode = .00..... Circuit Mode
0008 Oct 4 Extension Bit (Oct 4) = 1..... Next Octet Not Present
0009 Layer 1 Indent Choice = .01..... Layer 1 Identifier
0009 User Information Layer 1 Protocol (BC) = ...00010 Mu-law, Rec G.711
0009 Layer 1 Identifier = .01..... Layer 1 Id
0009 Extension Bit (Oct 5) = 1..... Next Octet Not Present
000A Channel identification = 00011000 Channel Identification
000B IE Channel Identification Length = 4 (x04)
000C Info Channel Selection = .....01 B1 channel(Basic Interface)/As indicated in
000C D-channel Indicator = .....0... The channel identified is not the D-channel
    
```

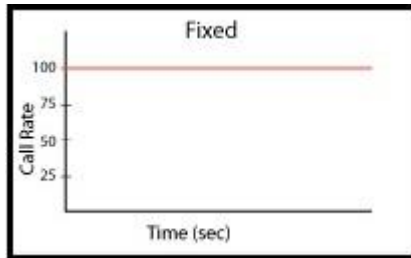
Scripts | Message Sequence | Event Config | Script Flow

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

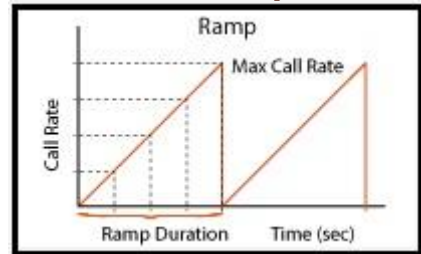
Load Generation

- 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.

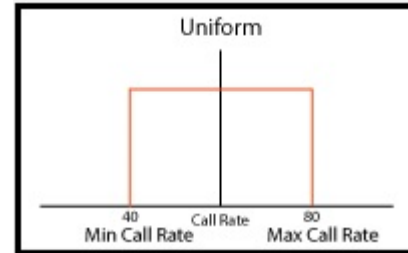
Fixed



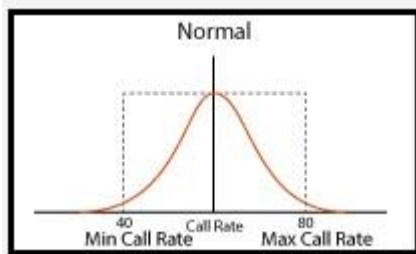
Ramp



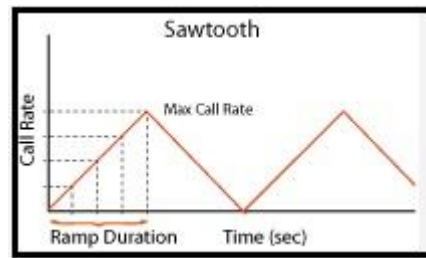
Uniform



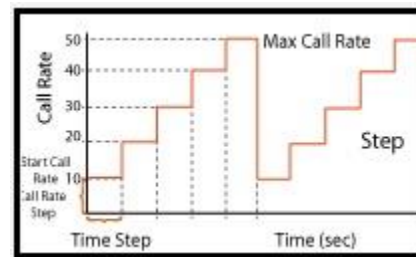
Normal



Saw-tooth



Step



The screenshot shows the 'Load Generation - LoadGendefault' software interface. It includes a title bar, a toolbar, and several configuration sections. The 'Total Calls To Generate' is set to '*' and 'Max Active Calls' is set to 30. There is a checkbox for 'Unique Distributions Per Script'. The 'Multi Distributions' section contains a table with columns 'Distributions' and 'Description'. The 'Scripts' section has a 'Profile' dropdown and a 'Scripts' list. The 'Stop Time' section has a checkbox and a time selection area. The 'Start Time' and 'End Time' sections have time selection areas and 'Pause' and 'Start' buttons.

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

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

Bulk Call Generation

MAPS (Message Automation Protocol Simulation) Subscriber (ISDN ITU) - [Call Generation - Untitled]

Configurations Emulator Reports Editor Windows Help

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Ev...	Result	Total Iterations	Completed Iteratic
1	Placecall.gls	Card1TS01		Start		None	...	Unknown	10	0
2	Placecall.gls	Card1TS02		Start		None	...	Unknown	10	0
3	Placecall.gls	Card1TS03		Start		None	...	Unknown	10	0
4	Placecall.gls	Card1TS04		Start		None	...	Unknown	10	0
5	Placecall.gls	Card1TS05		Start		None	...	Unknown	10	0
6	Placecall.gls	Card1TS06		Start		None	...	Unknown	10	0
7	Placecall.gls	Card1TS07		Start		None	...	Unknown	10	0
8	Placecall.gls	Card1TS08		Start		None	...	Unknown	10	0
9	Placecall.gls	Card1TS09		Start		None	...	Unknown	10	0
10	Placecall.gls	Card1TS10		Start		None	...	Unknown	10	0

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

View Executing Line

Script Contents

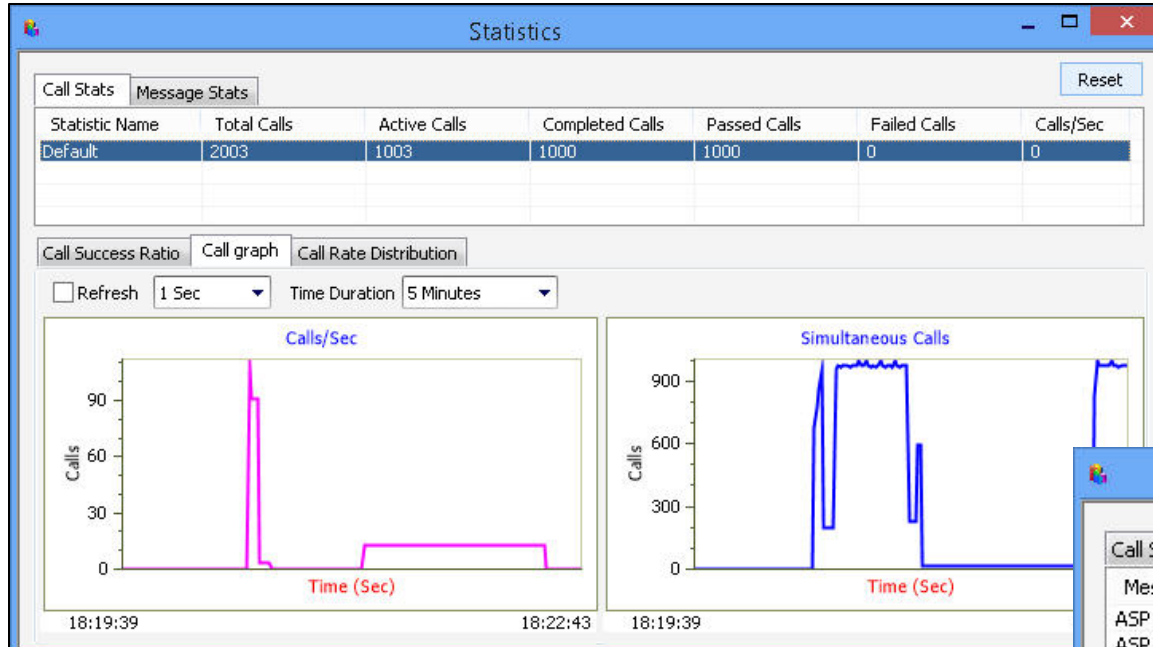
```
//////////////// Place Call Subscriber Side //////////////////  
  
////////// START PlaceCall //////////  
  
/// Initialization Section ///  
  
ReportEvent (ISDNScript = "Started");  
State = "IDLE";  
IsGeneration=1;  
Direction="E";  
AllocUniqueId "Subscriber" crv;  
Restart="False";  
Reserved="False";  
RestartIndicatorClass=0;
```

Scripts Message Sequence Event Config Script Flow

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

Bulk Call Statistics and Graph

Call Stats and Graph



Message Stats

The screenshot shows a software window titled "Statistics" with a "Message Stats" tab selected. A table displays message statistics for various message types.

Message Type	Tx Count	Rx Count	Retransmit Count
ASP Active	1	0	0
ASP Active Acknowledgement	0	1	0
ASP Up	1	0	0
ASP Up Acknowledgement	0	1	0
Apply Charging	0	4000	0
Event Report BCSM	1000	0	0
Initial DP	1000	0	0
Notify	0	2	0
Request Report BCSM Event	0	2000	0
SSA subsystem-allowed	1	1	0
SST subsystem-status-test	1	1	0
continue	0	1000	0
Apply Charging Report	3000	0	0

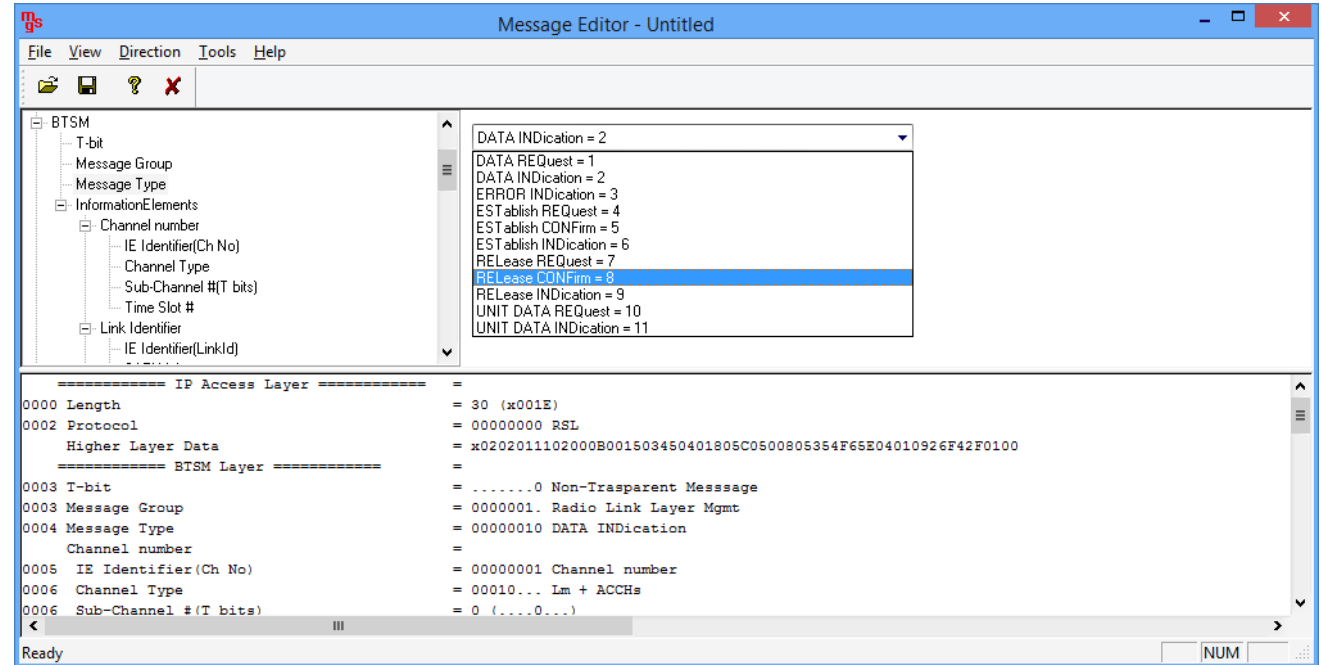
Customizations - Call Flow (Scripts)

- Scripts are written in our proprietary *.gls scripting language. They represent generic state machines intended provide protocol/signaling logic for a call and establish bearer traffic
- Each instance of a script corresponds to a single transaction/call, i.e., if you place 500 calls in parallel you will actually have 500 script instances running at once. If you place 500 calls in series the same script will execute and terminate 500 times
- It is possible to create your own scripts, but almost never necessary! We attempt to provide all necessary scripts out of the box

```
Line#  Script
1      //Initialize Variables
2      ReportEvent (Script = "Started");
3      CallDurationTimeOut=$_CallDuration;
4      InterCallDurationTimeOut=$_InterCallDuration;
5      AnswerCallTimeOut=$_CallAnswerTime;
6      ScriptIdCounter = 0;
7      RtpSessionState = "Null";
8      ProtocolStandard="GSMAbis";
9      GSMAbisMMState = "IDLE";
10     GSMAbisRRState = "IDLE";
11     ContextCreated=0;
12     IMSIStr="IMSI";
13     TMSIStr="TMSI";
14     CallIdString="CalledNumber.";
15     KeyIdentifier: IMSIStr,IMSI,TMSIStr,TMSI,CallIdString,CalledNumber;
16     MTCallType="None";
17     RA= 300;
18     StopAll=0;
19     Cause = 16;
20     GSMAbisStatus = "Null";
21     Status = $GSMAbisStatus;
22
23     if [_EnableRandomization == 1]
24         InitializeRandomId(RandomDuration,_RandomCDMin,_RandomCDMax,"uniform");
25         GenerateRandomId(RandomDuration,CallDurationTimeOut);
26         EventLog ("Call Duration = ", CallDurationTimeOut);
27
28         InitializeRandomId(RandomCDuration,_RandomCDMin,_RandomCDMax,"uniform");
29         GenerateRandomId(RandomCDuration,InterCallDurationTimeOut);
30         EventLog ("Inter Call Duration = ", InterCallDurationTimeOut);
31
32         InitializeRandomId(RandomAnswerCallTime,_RandomACDMin,_RandomACDMax,"uniform");
33         GenerateRandomId(RandomAnswerCallTime,AnswerCallTimeOut);
34         EventLog ("Answer Call Duration = ", AnswerCallTimeOut);
35     endif
36
37     //Setting CallWaitTime should be set to make greater than CallDurationTime
```

Customizations - Protocol Messages

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



Customizations - User Events

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;
```

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

Customizations - Statistics and Reports

MOS, R-Factor

Packet Loss

Packets Discarded

Duplicate Packets

Out-Of-Sequence

Packets

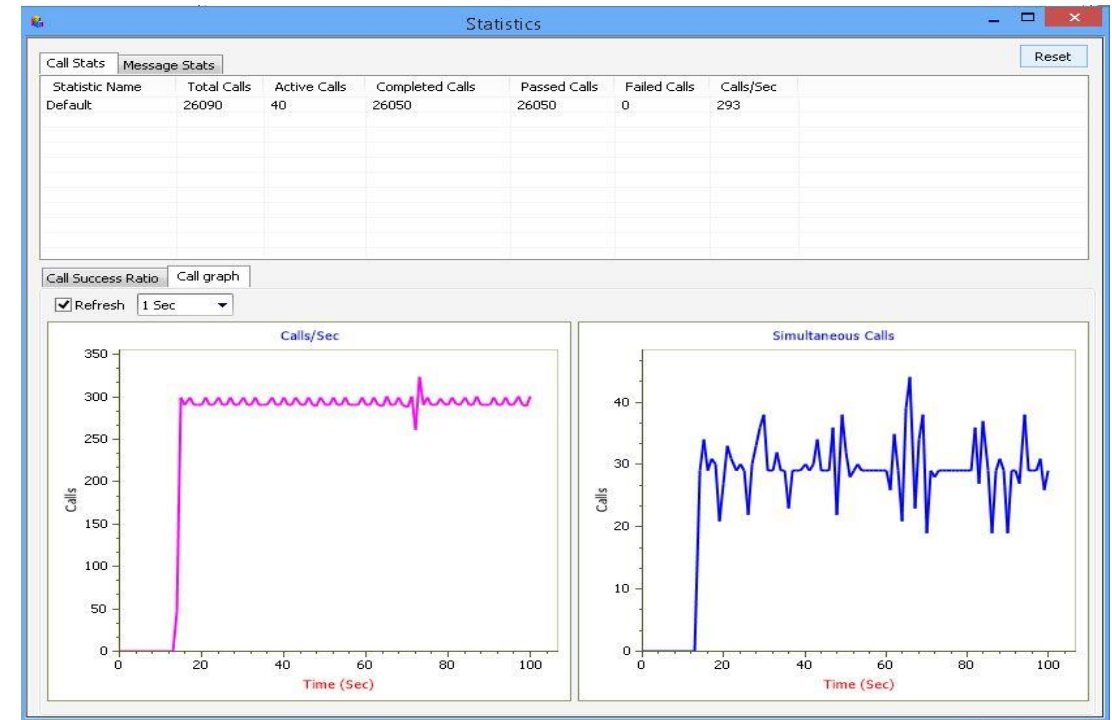
Jitter Statistics

User Defined Statistics - VoiceQualityStats

Packet Stats

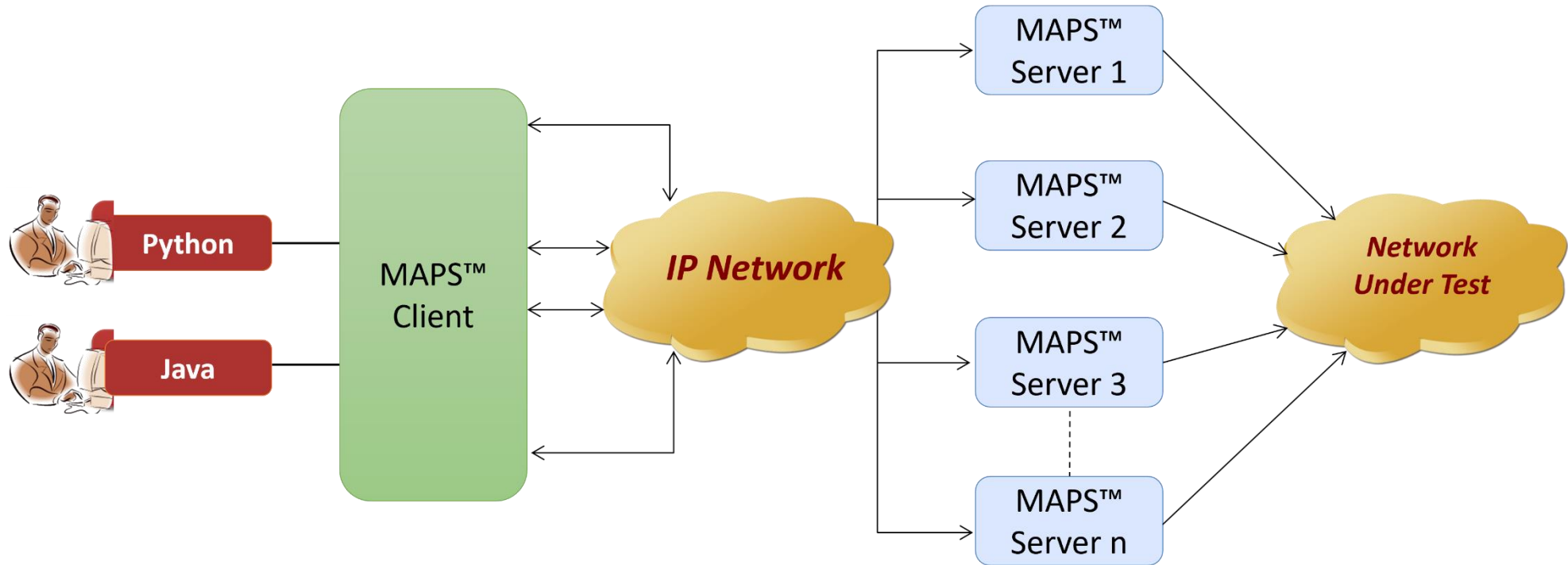
Name	Values
Active RTP Sessions	1987
Completed RTP Sessions	1548093
Sessions With Zero Receive Traffic	0
MOS Score Stats	0
Sessions with Mos (5.0 - 4.0)	612618 [39%]
Sessions with Mos (4.0 - 3.0)	852971 [55%]
Sessions with Mos (3.0 - 2.0)	73446 [4%]
Sessions with Mos (< 2.0)	9058 [0%]
Total RTP Packet 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
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



Call Stats provide a running tabular log of system level stats, tracked stats include: Total Calls, Active Calls, Completed Calls, Passed Calls, Failed Calls, Instantaneous Calls/Sec

MAPS™ API Architecture

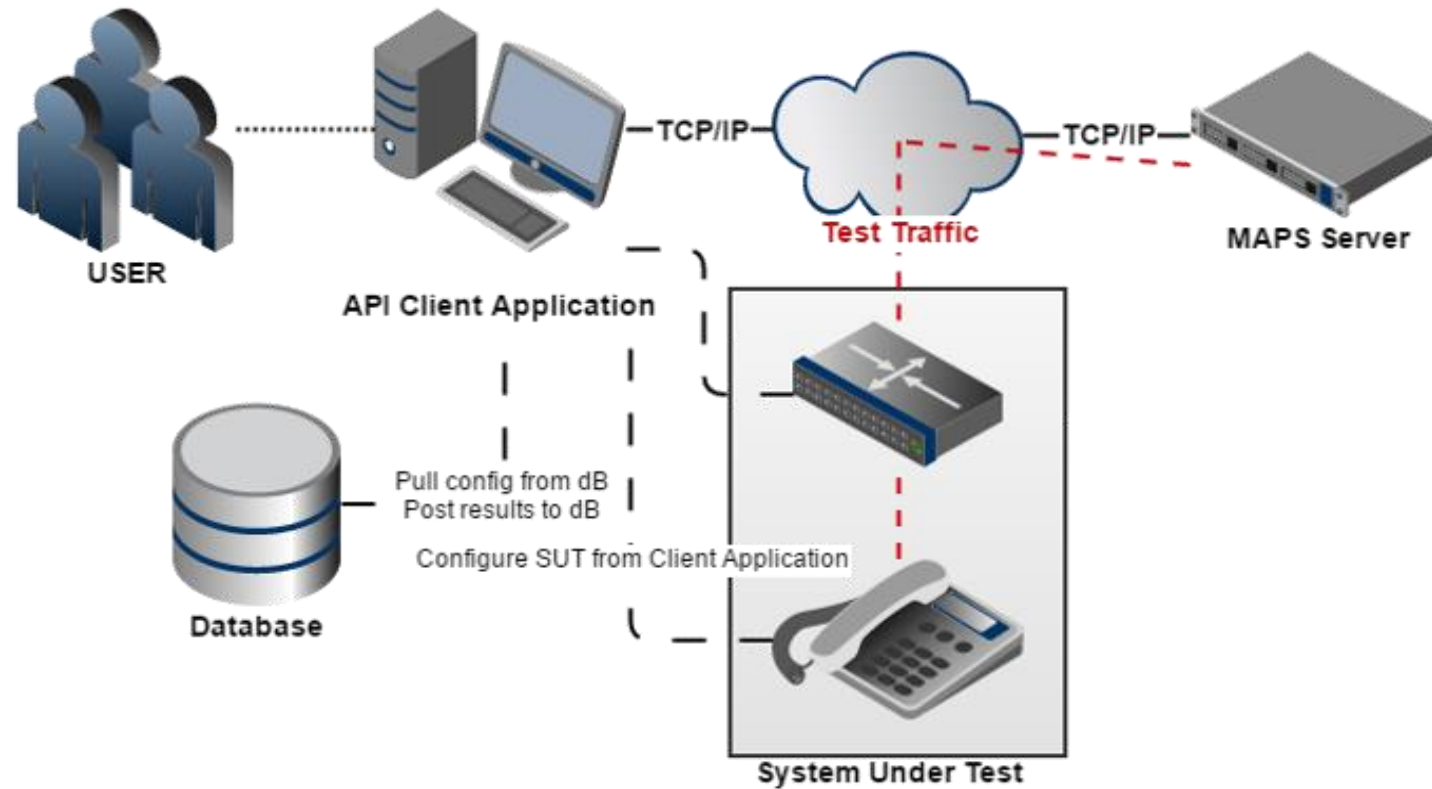


- API wraps our proprietary scripting language in standard languages familiar to the user:
 - Python
 - Java
- Clients and Servers support a “Many-to-Many” relationship, making it very easy for users to develop complex test cases involving multiple signaling protocols

API Architecture

System Integration

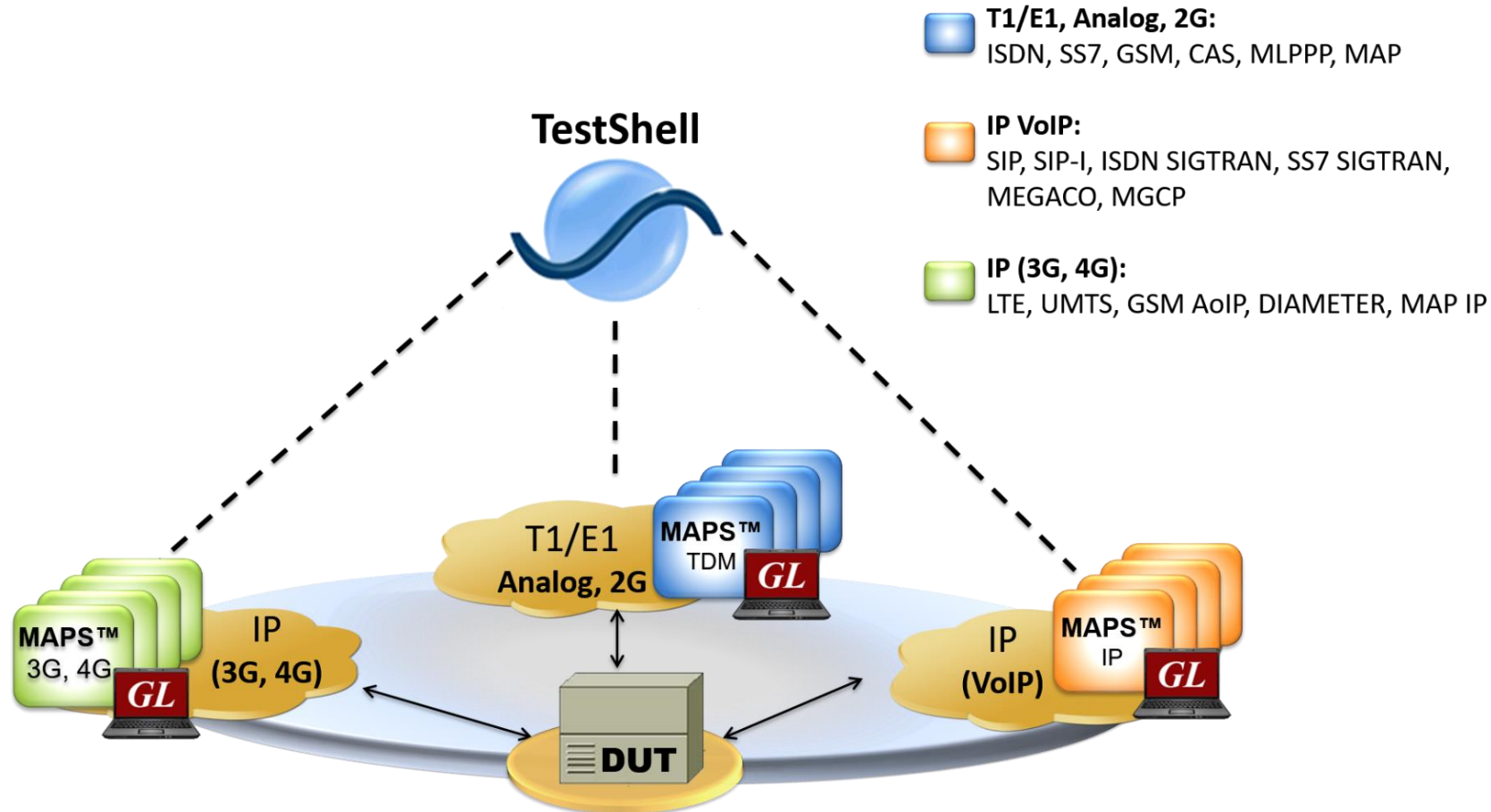
- The same Client Application used to control MAPS™ can be, and very often is, used to control other elements of the System Under Test



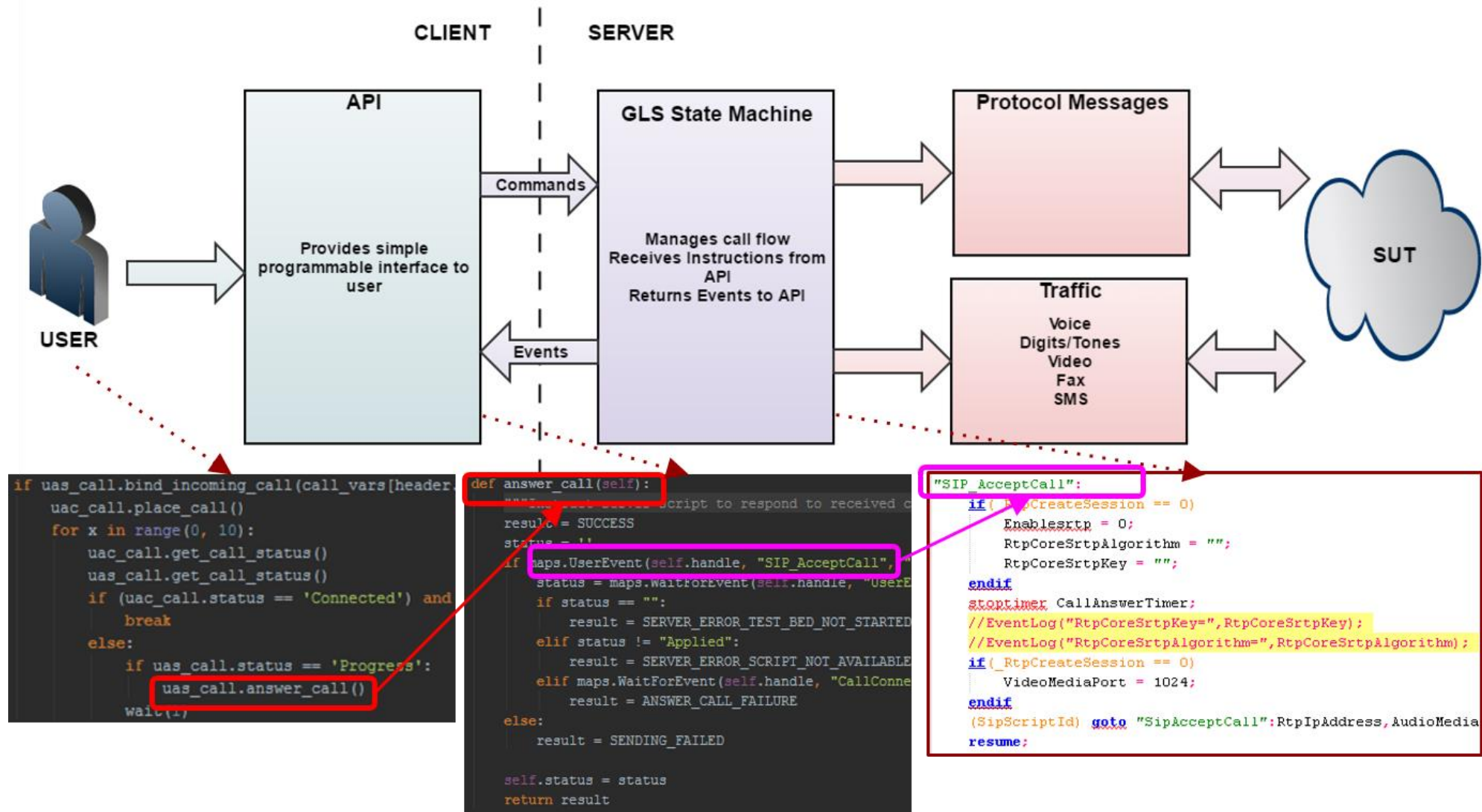
API Architecture

System Integration

- Client Application can be as simple as executing a script from an IDE or it can be integrated into a full-fledged automation test suite like QualiSystems TestShell or HP UFT



API Architecture



APIs High Level vs Low Level

- The API is broken into High and Low level function calls / scripts
- For High Level scripts, all the fine-grained protocol control happen in the script running on the MAPS server, hidden from the API user
- Low Level scripts put the API user in complete control of the protocol stack. This makes Low Level scripts more flexible and powerful, but also correspondingly more complex

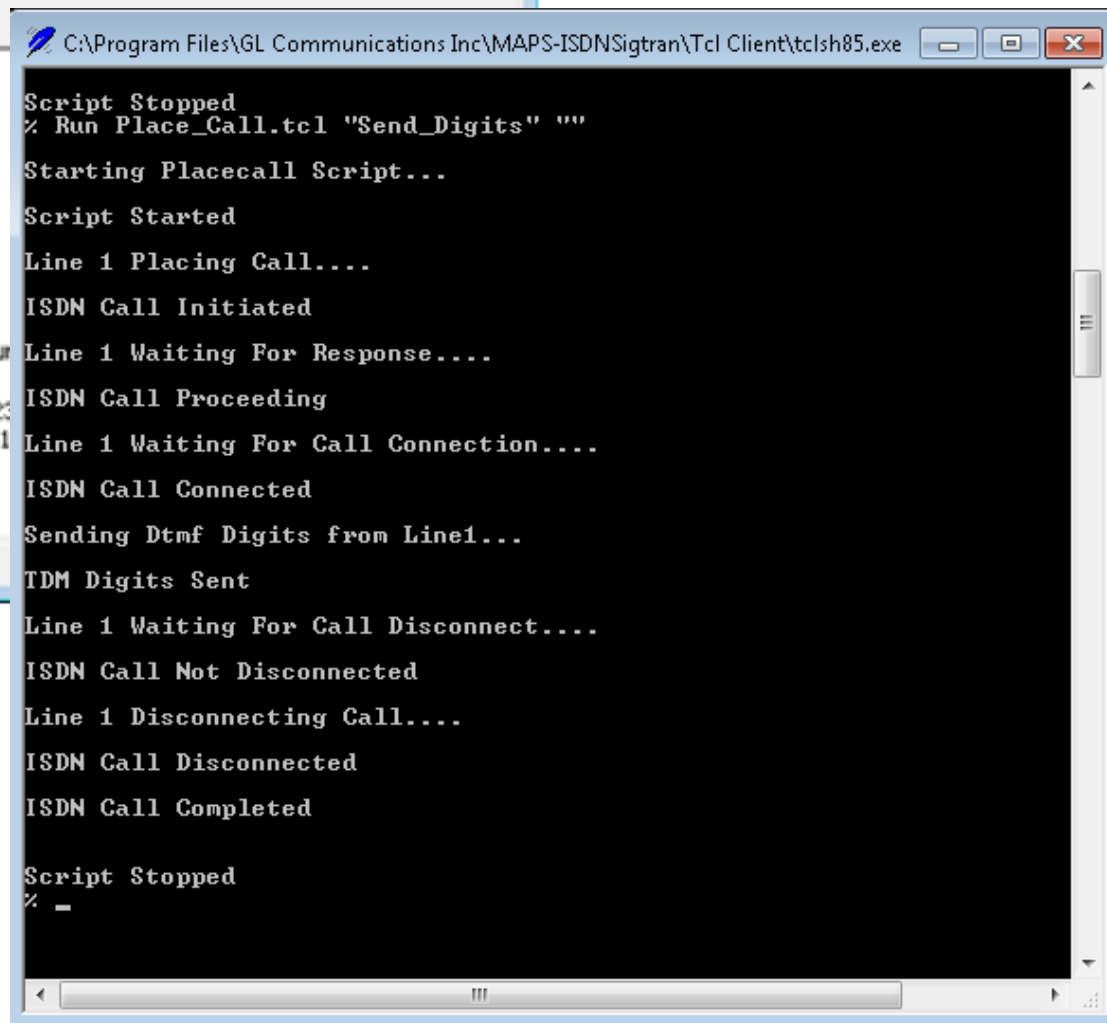
```
my_call = local_server.start_call_script("HIGH", "PLACE_CALL")
if my_call.handle != 0:
    my_call.set_local_variable("Contact", "(s)", local_contact)
    my_call.set_local_variable("AddressOfRecord", "(s)", local_aor)
    my_call.set_local_variable("To", "(s)", remote_uri)
    my_call.place_call()
```

```
if local_server.status == "STARTED":
    my_call = local_server.start_call_script("LOW", "PLACE_CALL")
    if my_call.handle != 0:
        my_call.set_local_variable("Contact", "(s)", local_contact)
        my_call.set_local_variable("AddressOfRecord", "(s)", local_aor)
        my_call.set_local_variable("To", "(s)", remote_uri)
        if my_call.rtp_action.create_session(rtp_address, rtp_port) == SUCCESS:
            my_call.send_message("Invite", "InviteImport")
            recvd_msg = my_call.receive_message(timeout)
            if recvd_msg == "100 TRYING" or recvd_msg == "180 RINGING":
```

CLI Support



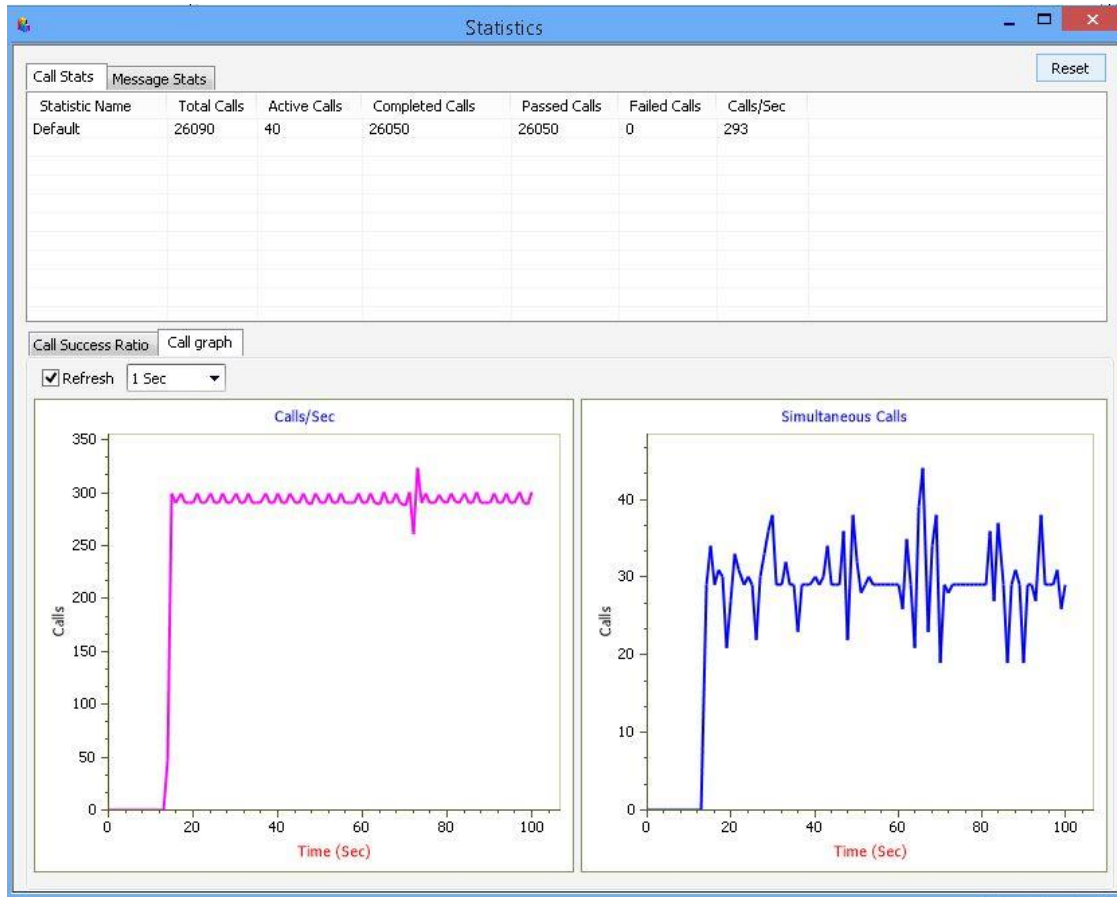
```
CLI MapsCLI Subscriber (ISDN-SigTran ITU)
File Edit View
View Latest Command
2015-6-25 12:28:37.191000 : IncomingCallHandler # "RELEASE"="Rx_IdleStateMsgHandler.gls";
2015-6-25 12:28:37.192000 : IncomingCallHandler # "RELEASE COMPLETE"="Rx_IdleStateMsgHandler.gls";
2015-6-25 12:28:37.192000 : IncomingCallHandler # "STATUS ENQUIRY"="Rx_IdleStateMsgHandler.gls";
2015-6-25 12:28:37.192000 : IncomingCallHandler # "STATUS"="Rx_IdleStateMsgHandler.gls";
2015-6-25 12:28:37.192000 : IncomingCallHandler # "DISCONNECT"="Rx_IdleStateMsgHandler.gls";
2015-6-25 12:28:37.192000 : IncomingCallHandler # "ASP Up"="IUA.gls";
2015-6-25 12:28:37.192000 : IncomingCallHandler # "ASP Down"="IUA.gls";
2015-6-25 12:28:37.192000 : IncomingCallHandler # "ASP Active"="IUA.gls";
2015-6-25 12:28:37.193000 : IncomingCallHandler # "ASP Inactive"="IUA.gls";
2015-6-25 12:28:37.193000 : IncomingCallHandler # "Establish Request"="IUAInterfaceMGMT.gls";
2015-6-25 12:28:54.157000 : Apply Global Configuration # "_CallDuration"=70000,"_EnableCLI"=1,"_InterCallDur
2015-6-25 12:34:11.823000 : StartScript 1 "PlaceCall.gls" "Card1TS01" 1 ;
2015-6-25 12:34:11.931000 : UserEvent 1 "Place Call" # "CalledNumber"="3331234543","CallingNumber"="222123
2015-6-25 12:34:14.007000 : UserEvent 1 "TxDigits" # "DigitOffTime"="80","DigitOnTime"="80","DigitPower1"="-1
2015-6-25 12:34:46.767000 : UserEvent 1 "DisconnectCall";
2015-6-25 12:34:46.876000 : StopScript 1;
```



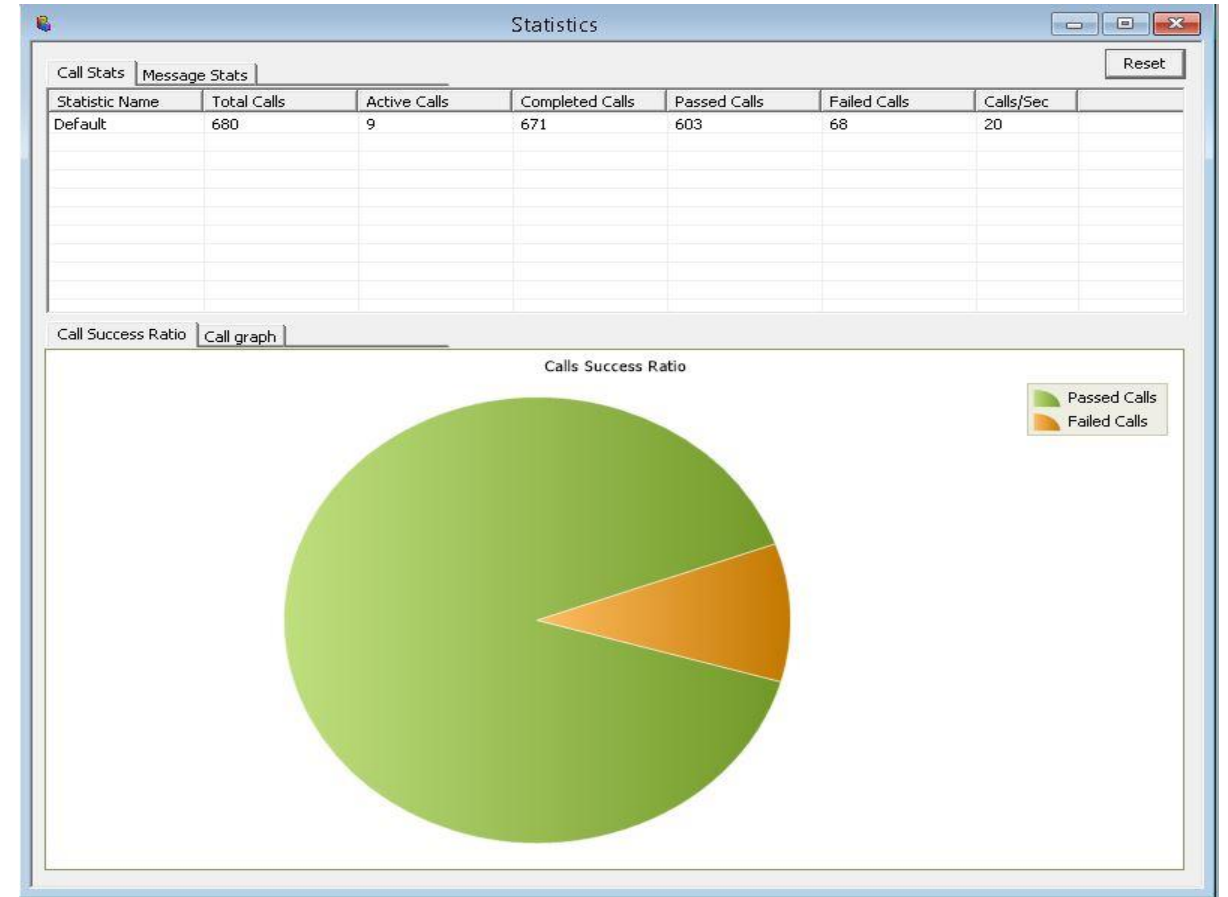
```
C:\Program Files\GL Communications Inc\MAPS-ISDN\Sigtran\Tcl Client\tclsh85.exe
Script Stopped
% Run Place_Call.tcl "Send_Digits" ""
Starting Placecall Script...
Script Started
Line 1 Placing Call....
ISDN Call Initiated
Line 1 Waiting For Response....
ISDN Call Proceeding
Line 1 Waiting For Call Connection....
ISDN Call Connected
Sending Dtmf Digits from Line1...
TDM Digits Sent
Line 1 Waiting For Call Disconnect....
ISDN Call Not Disconnected
Line 1 Disconnecting Call....
ISDN Call Disconnected
ISDN Call Completed
Script Stopped
% _
```

Success Call Ratio Statistics

Call Graph



Call Stats



Thank You