
MAPS™ MC-MLPP(Multi Class Multi Link PPP)

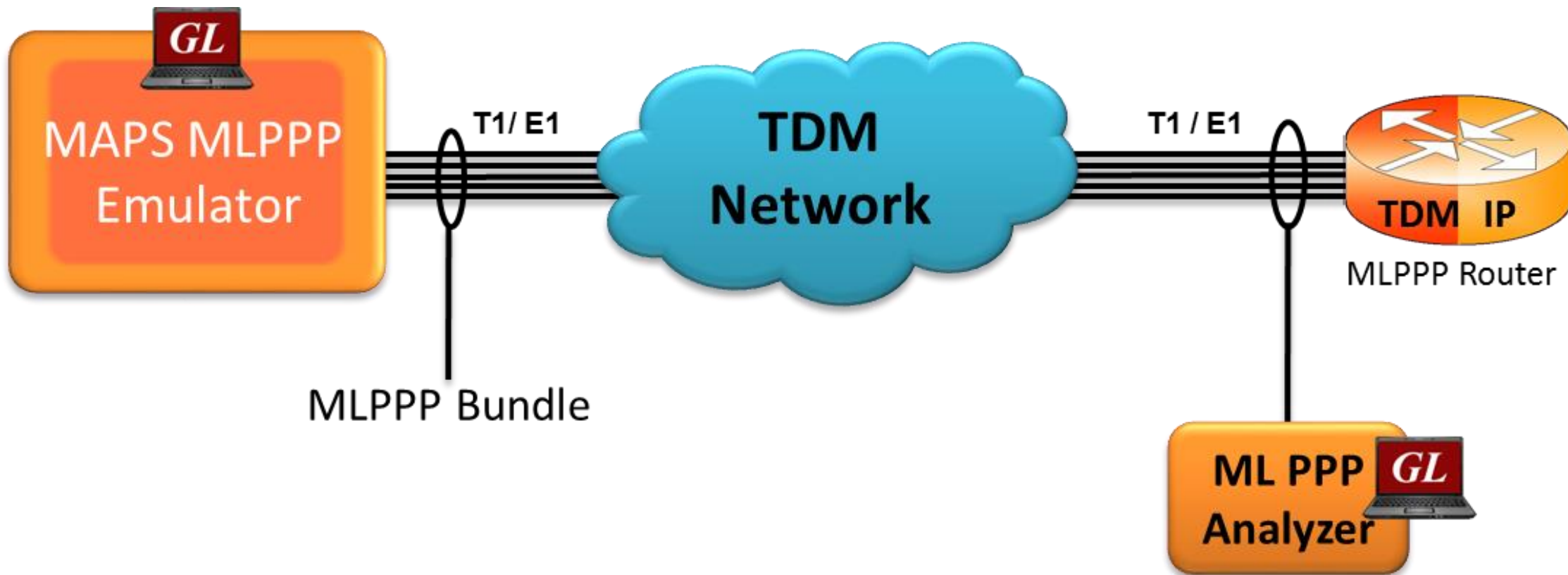
MC-MLPP Conformance Testing



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

MAPS™ MC-MLPP

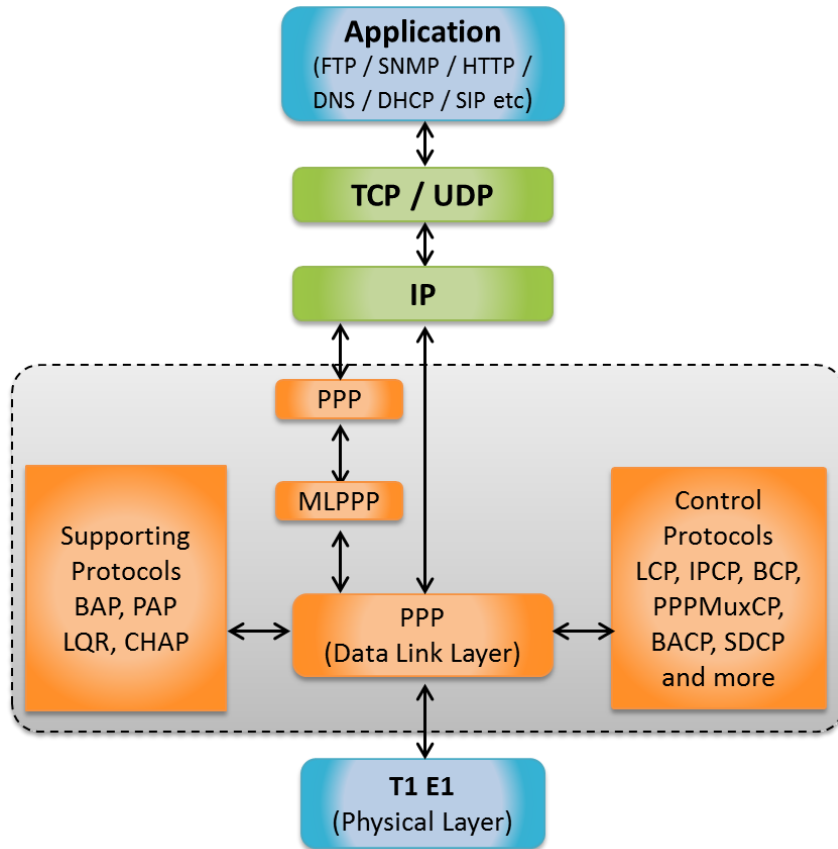
MC-MLPPP Emulation in the TDM Network



Main Features

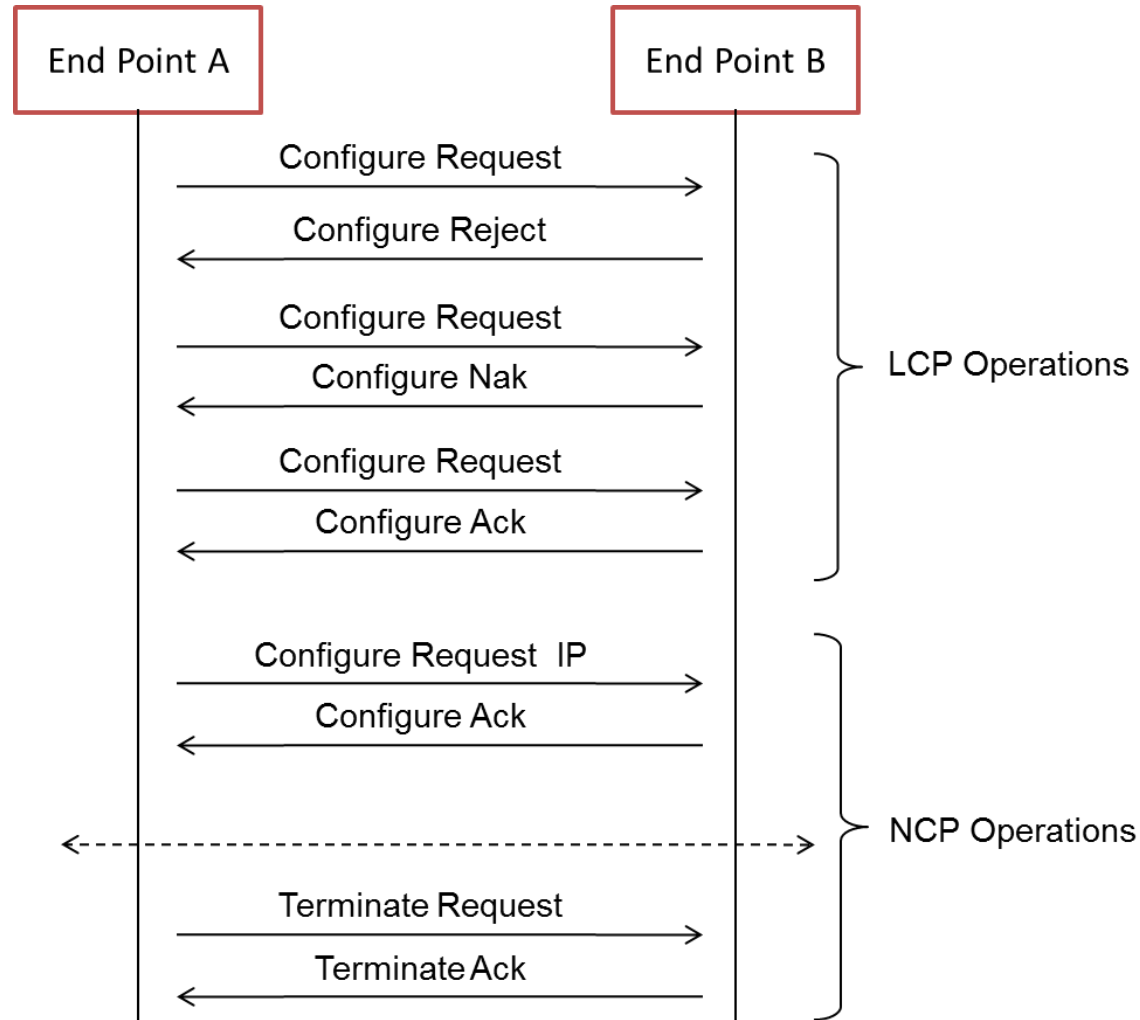
- Performs MC-MLPPP as well as PPP simulation over TDM (T1/E1).
- Supports LCP with the following negotiation options.
 - PPP options: MRU (Maximum Receive Unit), ACFC (Address and Control Field Compression), PFC (Protocol Field Compression), and Magic Number.
 - MLPPP Options: MRRU (Maximum Received Reconstructed Unit), Short Sequence Number Format, Long sequence header format, Endpoint Discrimination, and Multi-class option.
 - Multi-Class Options: Multilink Header Format.
- Supports the following NCPs -
 - IPCP - RFC 1332 (PPP Internet Protocol Control Protocol) and RFC 1877 (PPP Internet Protocol Control Protocol Extensions) standard.
 - PPPMuxCP – RFC 3153 (PPP Network Control Protocol for PPP Multiplexing) standard.
- Supports IP compression negotiation option conforming to RFC 3544.
- Supports full or fractional timeslots for PPP Link.
- Ideal solution for automated testing using command line scripts.
- Supports customization of call flows and message templates using Script editor and Message editor.
- Ready to use Conformance scripts for quick testing.
- Provides protocol trace with full message decoding, and graphical ladder diagrams of call flow with time stamp.
- Provides call statistics with associated captured events and error events during call simulation

Supported Protocol Standards



Supported Protocols	Standard / Specification Used
Point-to-Point Protocol	RFC1661
Multi-Link PPP	RFC1990
Multi-Class Extension to Multi-Link PPP	RFC2686
IPCP	RFC1332
IPCP Extensions	RFC1877
PPPMuxCP	RFC3153

MC-MLPP Call Flow Scenario



Testbed Configuration

MAPS (Message Automation Protocol Simulation) (MLPPP IETF) - [Testbed Setup - Card1]

Configurations Emulator Reports Editor Windows Help

Config	Value
MLPPP Config	
MLPPP Task Configuration	1
MLPPP Task Configuration 1	
SimulationType	MLPPP
MLPPPTaskConfiguration1	1 TS #1:1
Default Profile	MLPPP_Profiles.xml

LinkConfig

Enter Char

1 TS #1:1

Help

Start Load Save Edit

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

Profile Configuration

The screenshot displays the 'Profile Editor - MLPPP_Profiles' window. On the left, a list of profiles is shown, with 'MLPPPProfile01' selected. The main area shows a tree view of configuration parameters for 'MLPPPProfile01'. A red box highlights the 'MRU' parameter, which is set to 1500. Other parameters include Magic Number (110), Identifier (27), Stream ID (1), MAXFAILURE of Peer (5), IP Address for Peer (22.22.22.22), Peer Primary DNS (44.44.44.44), Peer Primary NBNS (66.66.66.66), Peer Secondary DNS (88.88.88.88), Peer Secondary NBNS (212.121.212.121), Local IPHC Parameters (TCP Space: 11, Non TCP Space: 11, Max Period: 11, Max Time: 5, Max Header: 11), Local Other Parameters (IP Address: 1.0.0.0, Primary DNS address: 2.0.0.0, Primary NBNS Address: 3.0.0.0, Secondary DNS Address: 4.0.0.0, Secondary NBNS Address: 5.0.0.0), Local VJ Parameters (Max Slot ID: 5, Comp Slot ID: 1, Max Configure of Peer: 5), MLPPP Options (Max Rcv Reconstructed Unit: 1500, End Point Discriminator: Class Address: 556897, Sequence Number: 0), MultiLink Header Format (Code: Long Sequence Number F..., Suspendable Classes: 15), and PPP Mux CP Options (PID: IP).

Config	Value
MLPPPProfile01	
MRU	1500
Magic Number	110
Identifier	27
Stream ID	1
MAXFAILURE of Peer	5
IP Address for Peer	22.22.22.22
Peer Primary DNS	44.44.44.44
Peer Primary NBNS	66.66.66.66
Peer Secondary DNS	88.88.88.88
Peer Secondary NBNS	212.121.212.121
Local IPHC Parameters	
TCP Space	11
Non TCP Space	11
Max Period	11
Max Time	5
Max Header	11
Local Other Parameters	
IP Address	1.0.0.0
Primary DNS address	2.0.0.0
Primary NBNS Address	3.0.0.0
Secondary DNS Address	4.0.0.0
Secondary NBNS Address	5.0.0.0
Local VJ Parameters	
Max Slot ID	5
Comp Slot ID	1
Max Configure of Peer	5
MLPPP Options	
Max Rcv Reconstructed Unit	1500
End Point Discriminator	
Class	
Address	556897
Sequence Number	0
MultiLink Header Format	
Code	Long Sequence Number F...
Suspendable Classes	15
PPP Mux CP Options	
PID	IP

The right pane shows the 'MRU' configuration with the value 1500 entered in the 'Enter Integer' field. A 'Help' button is visible at the bottom right of the right pane. Below the right pane are buttons for 'Quick Config', 'Add', 'Insert', 'Delete', 'Properties', 'Load', and 'Save'.

Incoming Call Handler Configuration

Incoming Call Handlers Configuration - default

Message Name	Script Name
Configure-Request	TestLoopBackUsingPeerMagicNumber.gls
Configure-Ack	
Configure-Nak	
Configure-Reject	
Terminate-Request	
Terminate-Ack	
Code-Reject	
Protocol-Reject	
Echo-Request	
Echo-Reply	
Discard-Request	

Scripts

- TestLoopBackUsingPeerMagicN...

Sequence
 Random

Up
Down

Add Delete Clear Add Delete

MC-MLPP Call Generation

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

Configurations Emulator Reports Editor Windows Help

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Events Profile	Result	Total Iterations	Completed Iterations
1	OpenStateTest.gls	MLPPPProfile01		Start	Opened	None	EventProfile.xml ...	Pass	1	1

Save Column Width

MAPS DUT

```

sequenceDiagram
    participant MAPS
    participant DUT
    MAPS->>DUT: Configure-Request 16:30:34.289000
    DUT-->>MAPS: Configure-Ack 16:30:36.721000
    MAPS->>DUT: Configure-Request 16:30:39.855000
    DUT-->>MAPS: Configure-Ack 16:30:39.856000
    
```

```

===== PPP Link Layer =====
0000 Address Compression Choice = 1111... No Address Compression
0000 Address = 11111111 Broadcast Address
0001 Ctl = 00000011 UnSequenced Frame
0002 ProtocolField Selection = .....0 ProtocolField Two Octets
0002 Protocol = 11000000 00100001 Link Control
===== Link Control Layer =====
Code Type =
0004 Code = 00000001 Configure-Request
0005 Identifier = 27 (x1B)
0006 Length = 18 (x0012)
Magic-Number =
0008 IE id = 00000101 Magic-Number
0009 Length of Options = 6 (x06)
000A Magic-Number = 110 (x0000006E)
Maximum-Receive-Unit =
000E IE id = 00000001 Maximum-Receive-Unit
000F Length of Options = 4 (x04)
0010 Maximum-Receive-Unit = 1500 (x05DC)
PFC =
0012 IE- Id = 00000111 Protocol -Field-Compression
0013 Length of Options = 2 (x02)
ACFC =
0014 IE- Id = 00001000 Address-and-Control-Field-Compression
0015 Length of Options = 2 (x02)
    
```

Scripts Message Sequence Event Config Script Flow

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

MC-MLPP Call Reception

The screenshot displays the MAPS (Message Automation Protocol Simulation) (MLPPP IETF) - [Call Reception] application window. The interface includes a menu bar (Configurations, Emulator, Reports, Editor, Windows, Help) and a toolbar with various icons. Below the menu is a table summarizing the test execution:

Sr No	Script Name	Call Info	Script Execution	Status	Events	Events...	Results
1	TestLoopBackUsingPeerMagicNumber.gls		Completed		None		Pass

Below the table are buttons for 'Abort', 'Abort All', 'Show Records' (checked), 'Auto Trash', and 'Trash'. A 'Save' button and a 'Column Width' slider are also present. The main area is divided into two panes:

- Message Sequence Diagram:** Shows a sequence of messages between DUT and MAPS. The messages are: Configure-Request (DUT to MAPS at 18:32:49.251000), Configure-Ack (MAPS to DUT at 18:32:49.252000), Configure-Request (DUT to MAPS at 18:32:49.252000), and Configure-Nak (DUT to MAPS at 18:32:51.629000). The 'Configure-Nak' message is highlighted in orange.
- Hex Dump:** Displays the raw data for the selected 'Configure-Nak' message. It is divided into two sections: 'PPP Link Layer' and 'Link Control Layer'.

```
===== PPP Link Layer =====  
0000 Address Compression Choice = 1111.... No Address Compression  
0000 Address = 11111111 Broadcast Address  
0001 Ctl = 00000011 UnSequenced Frame  
0002 ProtoCol Field Selection = .....0 ProtocolField Two Octets  
0002 Protocol = 11000000 00100001 Link Control  
===== Link Control Layer =====  
Code Type =  
0004 Code = 00000011 Configure-Nak  
0005 Identifier = 14 (x0E)  
0006 Length = 14 (x000E)  
Magic-Number =  
0008 IE id = 00000101 Magic-Number  
0009 Length of Options = 6 (x06)  
000A Magic-Number = 31698 (x00007BD2)  
Max-Recv-Recnstrctd-Unit =  
000E IE-Id = 00010001 Maximum-Receive-Reconstructed-Unit  
000F Length of Options = 4 (x04)  
0010 Maximum-Receive-Reconstructed-Unit = 1500 (x05DC)
```

At the bottom, there are tabs for 'Scripts', 'Message Sequence' (selected), 'Event Config', and 'Script Flow'. The status bar shows 'Error Events', 'Captured Errors' (indicated by a red dot), and 'Link Status Up=0 Down=0'.

MC-MLPP Call Event Log

Date/Time	Captured Events	Call...	Script Name	Script Id
2014-10-21 16:29:44.761000	Source Port = 44419		Mapslnit.gls	
2014-10-21 16:29:44.761000	Source Port = 44887		Mapslnit.gls	
2014-10-21 16:30:06.312000	ConfigReq Sent		OpenStateTest.gls	CGProtScriptId_77146006-1152-376
2014-10-21 16:30:10.017000	ConfigReq received		OpenStateTest.gls	CGProtScriptId_77146006-1152-376
2014-10-21 16:30:10.018000	ConfigAck Sent		OpenStateTest.gls	CGProtScriptId_77146006-1152-376
2014-10-21 16:30:18.704000	Ack Received		OpenStateTest.gls	CGProtScriptId_77146006-1152-376
2014-10-21 16:30:18.704000	Open state Entered		OpenStateTest.gls	CGProtScriptId_77146006-1152-376
2014-10-21 16:30:34.289000	ConfigReq Sent		OpenStateTest.gls	CGProtScriptId_77173990-1153-376
2014-10-21 16:30:36.721000	Ack Received		OpenStateTest.gls	CGProtScriptId_77173990-1153-376
2014-10-21 16:30:39.855000	ConfigReq received		OpenStateTest.gls	CGProtScriptId_77173990-1153-376
2014-10-21 16:30:39.856000	ConfigAck Sent		OpenStateTest.gls	CGProtScriptId_77173990-1153-376
2014-10-21 16:30:39.856000	Open state Entered		OpenStateTest.gls	CGProtScriptId_77173990-1153-376

Clear Save Events Capture Events to file ...

Global Configuration

The screenshot shows a software window titled "Global Configuration - Globalprofile". The window is divided into two main sections. On the left, there is a tree view of configuration options. On the right, there is a detailed view of the selected configuration option.

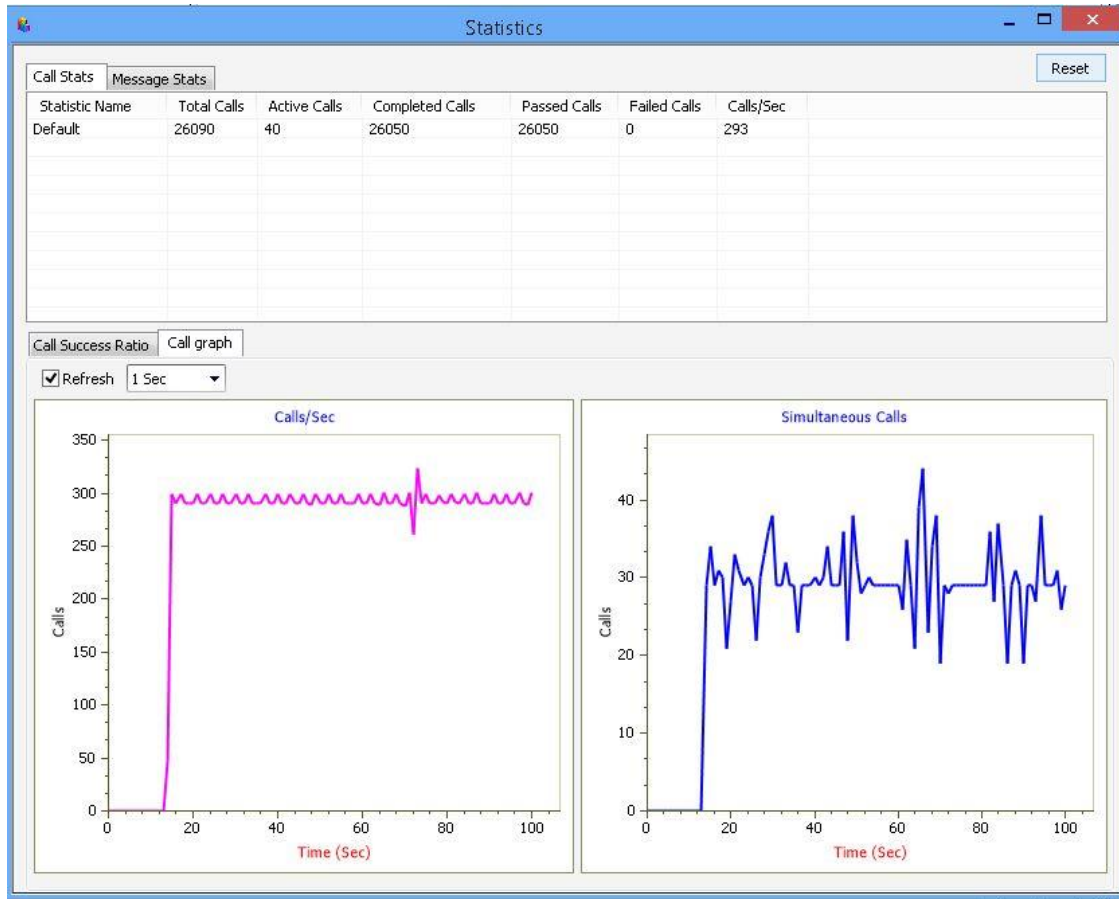
Config	Value
Global Configuration	
Protocol Specific Timers	
TimeSpan in msec	10
RecvTime in msec	100
MLPPPConfigurations	
MAXFAILURE	5
LinkStatus	DOWN
LinkstreamID	1

The right-hand side of the window shows the configuration for the selected "LinkStatus" option. It includes a label "globalLinkStatus", a "Select Option" dropdown menu, and a "Help" button. The dropdown menu is currently set to "DOWN".

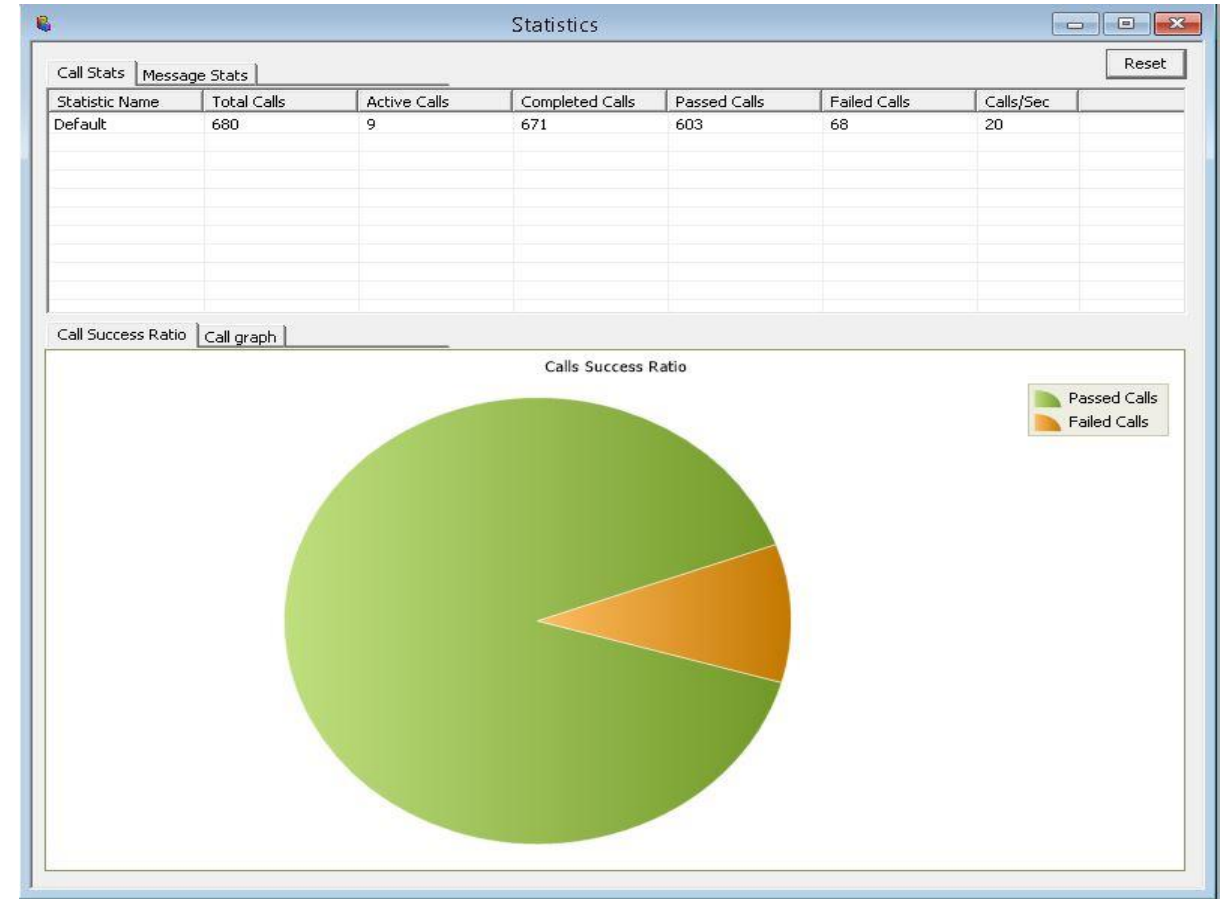
At the bottom of the window, there are four buttons: "Apply", "Load", "Save", and "Edit".

MC-MLPP Call Ratio Statistics

Call Graph

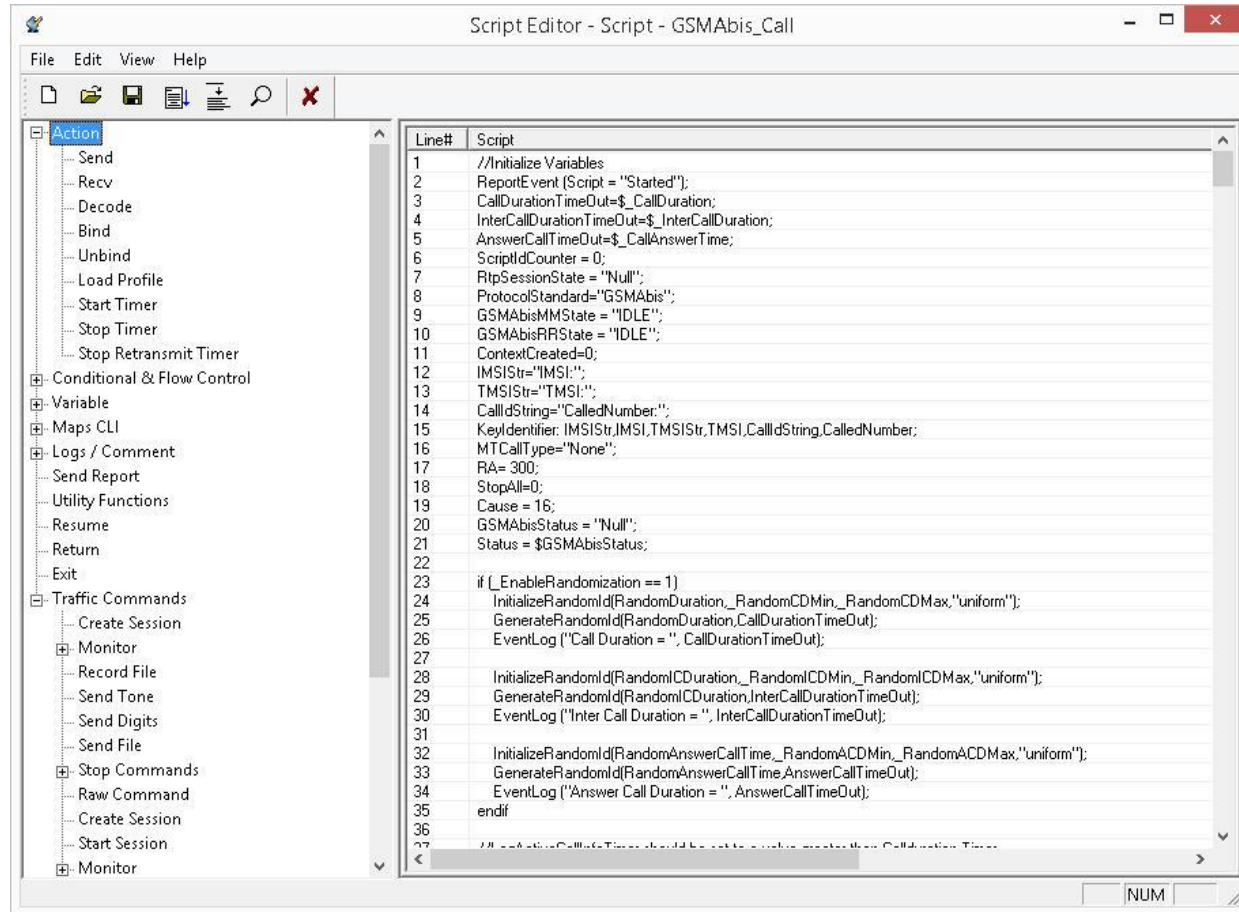


Call Stats



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.



The screenshot shows a software window titled "Script Editor - Script - GSMAbis_Call". On the left side, there is a tree view of actions under the "Action" category, including Send, Recv, Decode, Bind, Unbind, Load Profile, Start Timer, Stop Timer, Stop Retransmit Timer, Conditional & Flow Control, Variable, Maps CLI, Logs / Comment, Send Report, Utility Functions, Resume, Return, Exit, Traffic Commands, Create Session, Monitor, Record File, Send Tone, Send Digits, Send File, Stop Commands, Raw Command, Create Session, Start Session, and Monitor. The right side of the window displays a script code editor with a table of line numbers and script commands.

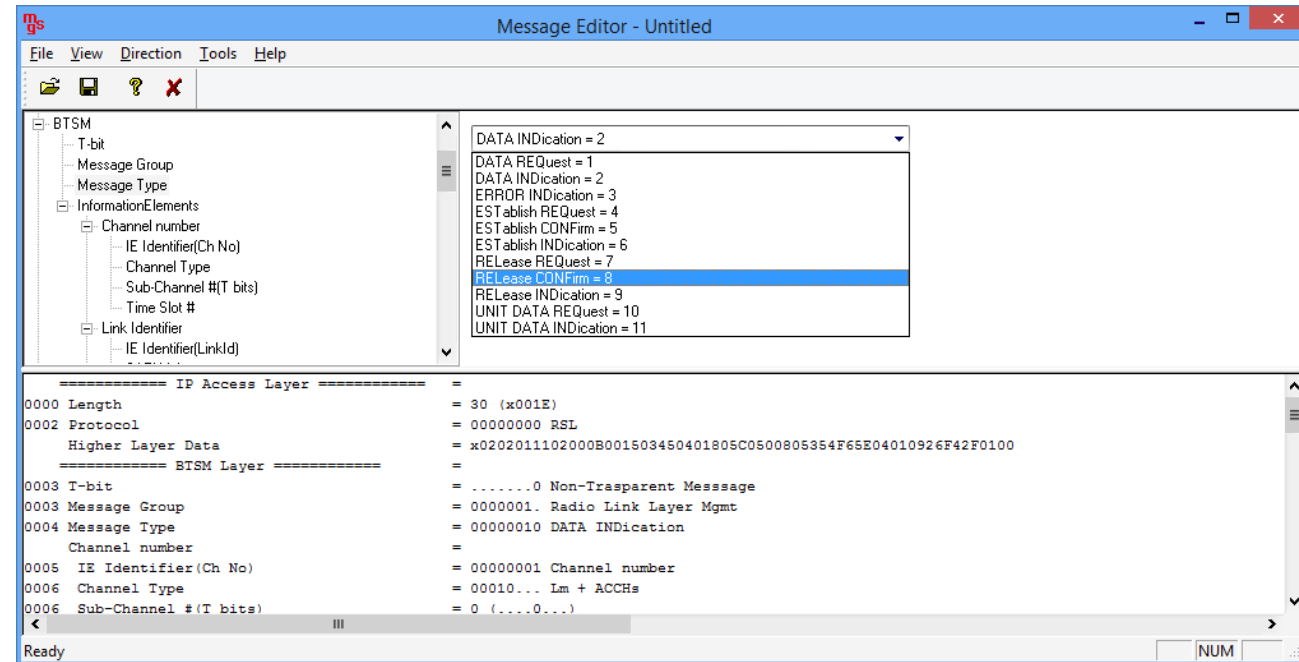
Line#	Script
1	//Initialize Variables
2	ReportEvent (Script = "Started");
3	CallDurationTimeOut=\$_CallDuration;
4	InterCallDurationTimeOut=\$_InterCallDuration;
5	AnswerCallTimeOut=\$_CallAnswerTime;
6	ScriptIdCounter = 0;
7	RtpSessionState = "Null";
8	ProtocolStandard="GSMAbis";
9	GSMAbisMMState = "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	//--ActiveCallTime should be set to a value greater than CallDuration Time--

Customizations - Protocol Messages

When the script actually sends a message it does so by loading a hdl file template from disk

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

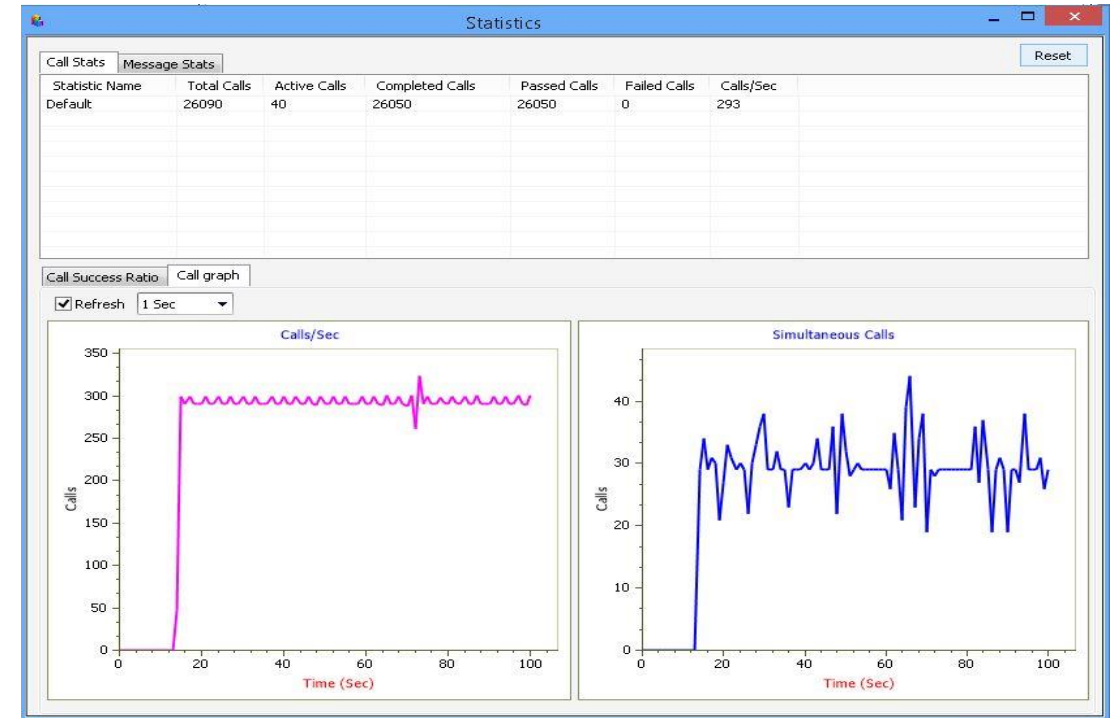
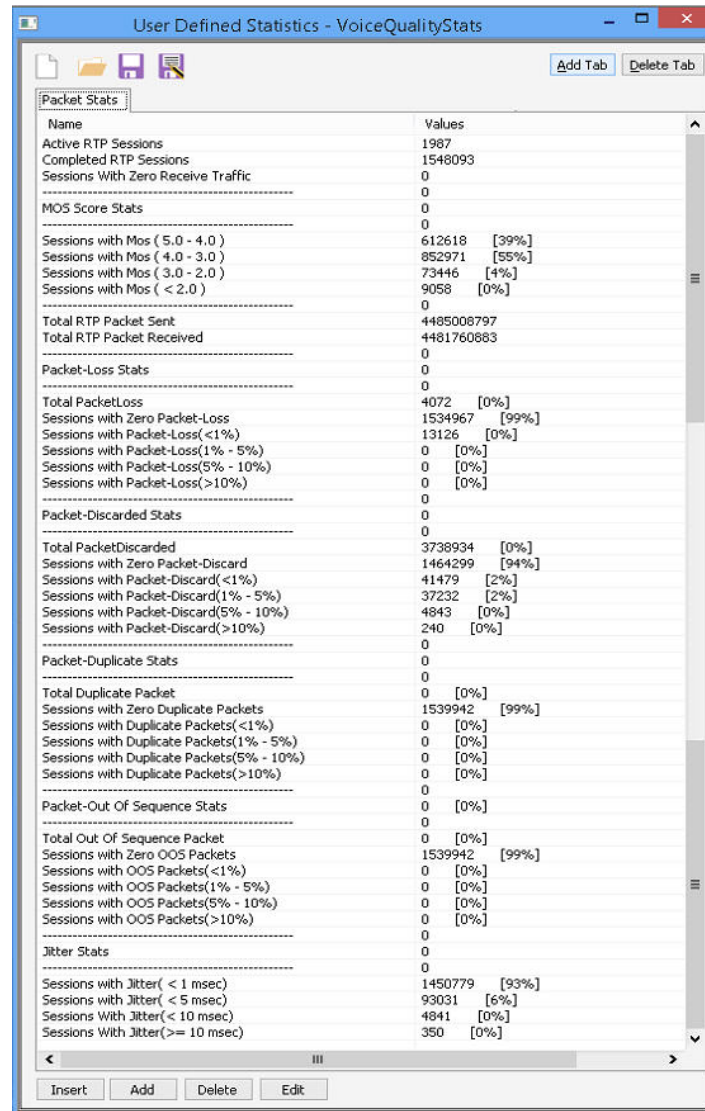
Packets Discarded

Duplicate Packets

Out-Of-Sequence

Packets

Jitter Statistics



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 MLPPP Conformance Suite

MAPS™ MLPPP conformance scripts are suitable for conformance tests and functional tests, where test objects can be accurately, reliably and comfortably validated for compliance with IETF standard.

Supported Conformance Tests are:

- PPP Conformance Test Scripts

- Link Establishment Phase

- Link Maintenance Phase

- Link Terminating Phase

- Generalized Test

- NCP Negotiation Phase

- MLPPP Conformance Test Scripts

- Link Establishment Phase

- Link Maintenance Phase

- Link Terminating Phase

- MLPPP Generalized Test

- MLPPP Bundle Test Scripts

- PPP Links for MLPPP Bundle

- MLPPP Short Sequence Test

- MLPPP Initialize Sequence Number Test

- MLPPP Control Field Test

- NCP over MLPPP/PPP

- Bundle Echo Test

- Multi-Class MLPPP Test Scripts

- PPP MUX CP Test Scripts

THANK YOU