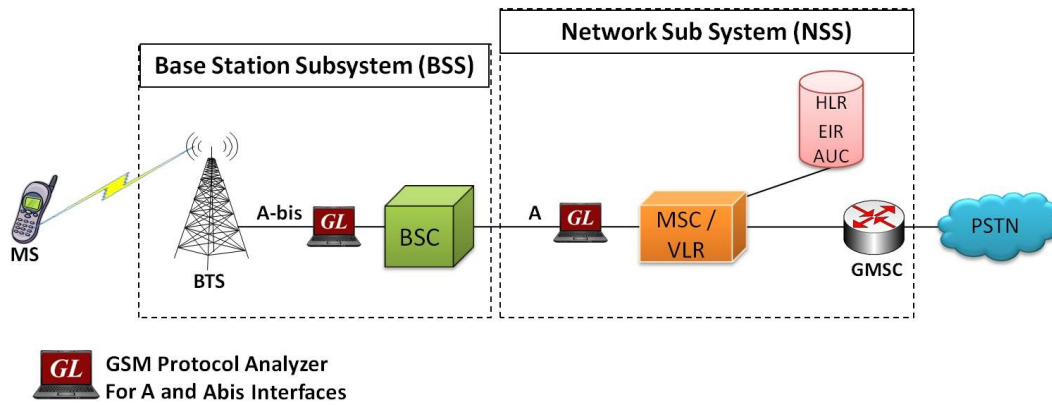


# GSM Protocol Analyzer



## Overview

GL's **GSM Analyzer** is used to analyze GSM protocols, a switching and signaling telecommunication protocol between MSC and BSC, BSC and BTS and so on. GSM Analyzer also supports decoding proprietary 'Mobis' Interface (Motorola equivalent of the GSM A-bis interface - requires additional license XX151) between BSC (Base Site Controller) - BTS (Base Transceiver Station) and BSC (Base Site Controller) - PCU (Packet Controller Unit).

GSM Analyzer also supports complete analysis, decode and monitoring of GSM-Railway (GSM-R) - an international wireless communications standard for railway communication and applications. These probes now supports Packet Data Analyzer with recording capabilities. Packet Data Analysis (PDA) is an outstanding tool for live monitoring of signaling and traffic over TDM. Allowing users to monitor live TDM networks including capture, analysis, and reporting of every call-in detail.

GSM analyzer collects physical and line level status and performance information, voice, data, protocol, statistics, and transmit information to a central / distributed Network Management System (NMS).

GL Communications supports the following types of GSM analyzers:

- Real-time GSM Analyzer (Pre-requisites: GL's field proven T1 E1 internal cards or USB T1 E1 external units, required licenses and Windows® Operating System)
- Offline GSM Analyzers (Pre-requisites: Hardware Dongles and Windows® Operating System)

For more details, refer [GSM Protocol Analysis](#) webpage.

## Main Features

### Display Features

- Displays Summary, Detail, Hex-dump, and Statistics Views
- Detail View:
  - Displays decodes of a user-selected frame from the summary view
  - Provides options to display or hide the required protocol layers
  - Contents of this view can also be copied to clipboard
  - Provides option to toggle detail view vertically or horizontally as feasible for the user
- Summary View displays MTP2, MTP3 information, GSM Message types, information about various channels used during the call, and so on in a tabular format
- Any protocol field can be added to the summary view, filtering, and search features providing users more flexibility to monitor required protocol fields
- Option to create multiple aggregate column groups and prioritize the groups as per the requirement to display the summary results efficiently



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## **Main Features (Contd.)**

### **Supported Protocols**

- A, A-bis, Mobis, Gs, Up, Ls, Lb, and Lp

### **Filtering / Search**

- Advanced filtering and search based on any user selected protocol fields
- Allows the user to automatically create search/filter criteria from the current screen selection

### **Capturing Streams**

- Streams can be captured on the selected time slots (contiguous or non-contiguous), sub-channels or full bandwidth
- Frames can be transmitted/captured in either 64 kbps, 56 kbps, n x 64 kbps, or n x 56 kbps data channels (hyper-channels)
- Multiple streams of GSM traffic on various T1 E1 channels can be simultaneously decoded with different GUI instances

### **Export Options**

- Exports Summary View information to a comma delimited file for subsequent import into a database or spreadsheet
- Capability to export detailed decode information to an ASCII file

### **Remote Monitoring**

- Remote monitoring capability using GL's Network Surveillance System

### **Additional Features**

- Decoding of many RR layer non-transparent messages such as "System Information", "Measurement Result", "Immediate Assignment" etc.
- Decodes many SS layer messages such as Register, Facility, Release Complete
- User to User Information IE is added to GSM CC, BCC and GCC protocols to support GSM-R features according to EIRENE specification (H 22 T 0001 2) and ETSI TS 102 610

### **Call Detail Recording**

- Call Detail Recording feature includes data link groups that help in defining the direction of the calls in a given network and form logical groups comprised of unidirectional (either 'Forward' or 'Backward') data links

### **Packet Data Analyzer (PDA)**

- Provides options to capture voice, digits, tones or FAX traffic
- Segregates, captures, and collects statistics on TDM calls
- Provides graphical representation of call analysis, such as ladder diagrams of protocols

## GSM-R Services

- Supports monitoring GSM-R services as per GSM supplementary services (GSM-SS)
  - Enhanced Multi-Level Precedence and Pre-emption (eMLPP)
  - Line identification services like CLIP, CLIR etc
  - Call Forwarding, Call Waiting, and Call Hold
  - MultiParty
  - Closed User Group
  - Advice of Charge
  - Call Barring and Call Deflection
  - User-to-user signaling
  - Follow Me (Based on USSD and CF)
  - Voice Group Call Service (VGCS)
  - Voice Broadcast Service (VBS)
  - Location Services, USSD and more

## Summary, Detail, and Hex dump Views

The analyzer displays Summary, Detail, and Hex Dump Views in different panes. Summary View displays Dev#, Time Slot, Frame#, Time, Length, Error, BSN, BIB, FSN, FIB, Status Field, SLC, DPC, OPC, SCCP Message, and so on. User can select a frame in Summary View to analyze and decode each frame in the Detail View. The Hex dump View displays the frame information in HEX and ASCII format. The contents of detail and hex dump view can also be copied to clipboard.

The screenshot shows the 'GSM Protocol Analysis A-Interface GSM900 64-bit' application. The main window is divided into several panes:

- Summary View:** A table listing captured frames. The selected frame is Frame #4 at Time Slot 23.
- Detail View:** Shows the HDLC Frame Data + FCS and MTP2/MTP3 layers. The MTP2 layer contains BSN, BIB, FSN, FIB, and LI.
- Hex Dump View:** Displays the frame data in hexadecimal and ASCII format.
- Statistics View:** A table showing frame counts for each device.
- Call Log View:** A table showing call details including Call ID, Status, Start Date & Time, Duration, Type, and IDs.

Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Error	OPC MTP3	DPC MTP3	Message Type GSM Phase2+	Message Type RR	Message Type MM
✓ 1	23		4	00:00:02.012875	29		2.2.2	1.1.1	CIPHER MODE COMMA...		
✓ 2	23		5	00:00:02.664125	29		1.1.1	2.2.2	CIPHER MODE COMPLE...		
✓ 1	23		6	00:00:03.323875	23		2.2.2	1.1.1			IDENTITY REQ...
✓ 2	23		7	00:00:03.987125	31		1.1.1	2.2.2			IDENTITY RES...
✓ 1	23		8	00:00:04.652875	33		2.2.2	1.1.1			TMSI REALLOC...

Hex	ASCII
A2 A6 18 83 09 88 04 14 06 00 00 04 00 01 0C 00	c
0A 53 07 02 00 00 0A 01 10 23 00 A4 86	S #

Device #	Frame Count(Device #)
1	55
total 1	55
2	48
total 2	AR

Call ID	Call Status	Call Start Date & Time	Call Duration	Call Type	Mob.ID (Calling#)	Mob.ID (Called#)	DevNo	TS	SM Data	SmsDe
0	Completed	2013-10-22 19:10:30.291875	00:00:07.994875	Location Update	x11111001		2	23		
1	Completed	2013-10-22 19:10:41.400750	00:00:10.751250	Mobile Originating ...	9483429034	91999887354230	2	23	Ability.c...	
2	Completed	2013-10-22 19:11:05.595750	00:00:42.025375	Mobile Originating ...	x11111001	9341141851	2	23		
3	Completed	2013-10-22 19:11:53.920875	00:00:25.705875	Mobile Terminated...	8867640421	9341141851	2	23		
4	Completed	2013-10-22 19:15:21.230625	00:00:09.390500	Mobile Terminated...	918756342341	918756342313	2	23	Ability.c...	

Figure: Summary, Detail, and Hex dump Views

## Real-time and Offline Analysis

Users can capture and analyze GSM frames in real-time and record all or filtered traffic into a trace file. The recorded trace file can be used for offline analysis or exported to a comma-delimited file, or ASCII file. Real-time capturing requires user to specify timeslots, bit inversion, octet bit reversion, user/network side, FCS, and data transmission rate. Recorded trace file can be played back using the HDLC Playback application.

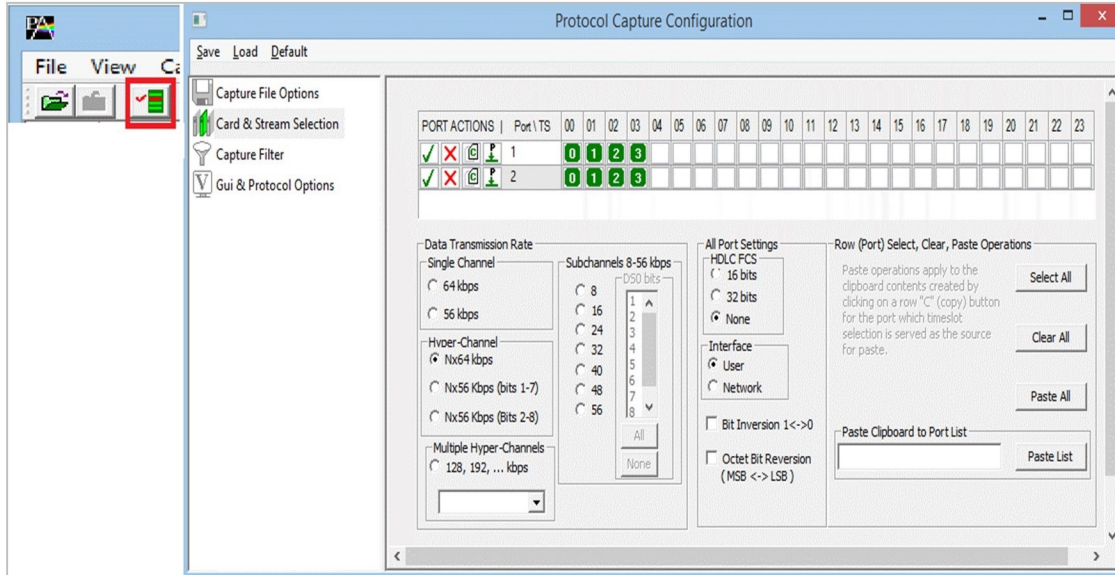


Figure: Stream / Interface Selection

## Filtering and Search

User can record all or filtered traffic into a trace file and also can create search/filter criteria automatically from the current screen selection. The filter and search options add a powerful dimension to the GSM Analyzer that isolates required frames from the captured frames in real-time/remote/offline.. Users can specify custom values for frame length to filter frames during real-time capture. The frames can also be filtered after completion of capture based on Data Link, MTP2, MTP3, SCCP, LAPD, BTSM, RR, MM and more. Similarly, search capability helps user to search for a particular frame based on specific search criteria.

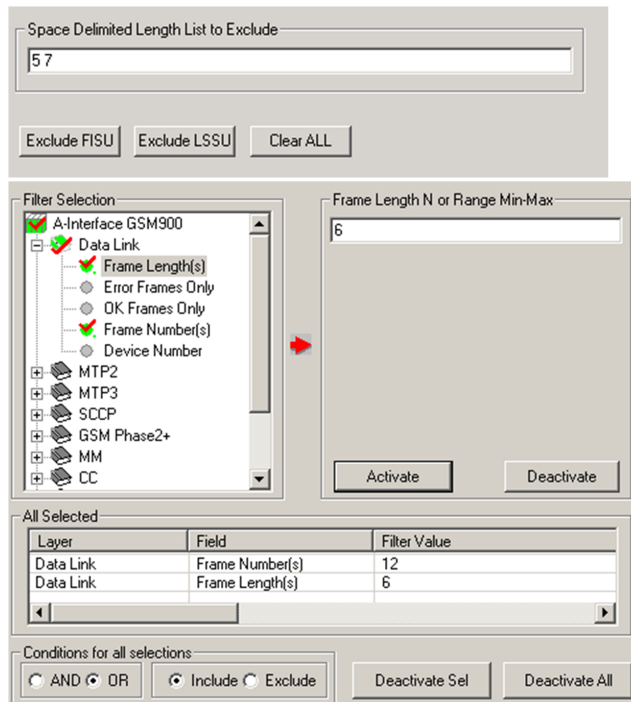


Figure: Real-time and Offline Filter

## Aggregate Column Group

The enhanced feature of the protocol analyzer is aggregate column groups. The user can also create multiple aggregate column groups and prioritize the groups as per the requirement to display the summary results in an efficient way.

If the user has five different aggregate columns and wants to prioritize some columns, the user can create a group of aggregate columns with the highest priority and will display only the columns of chosen priority. If the values are null, then the next group values are displayed. The aggregate columns comprising a group will have the same prefix and suffix index as ~0, ~1 ... ~N. The **group~0** is the root aggregate group that has the highest priority

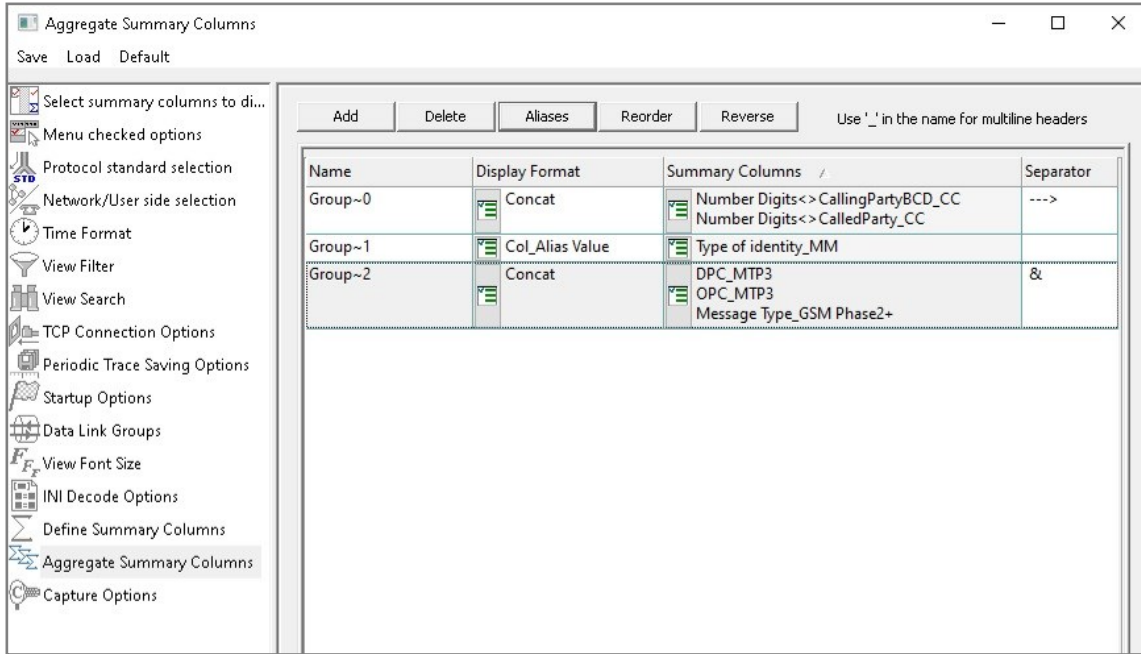


Figure: Aggregate Column Group

The updated results are as shown in the figure below. Here the root aggregate group~0 summary columns are displayed first and then Group~1 and Group~2 as per the assigned priority if the higher group values are null.

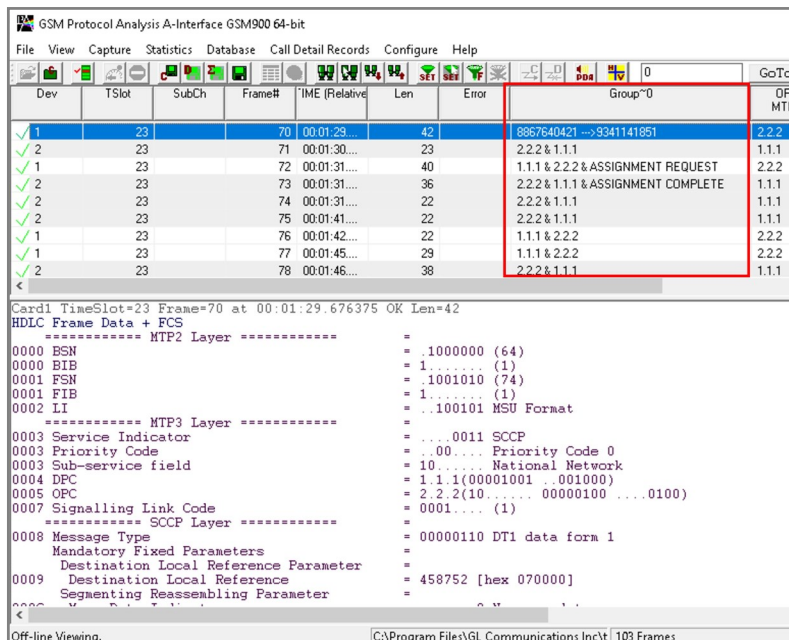


Figure: Aggregate Column Group Display



## Call Detail Record & Statistics View

Important call specific parameters like Call ID, Call disposition, Call duration, OPC/DPC, Call type (point-to-point/point-to-multipoint etc) are calculated based on signaling messages, and displayed in Call Detail View. Additionally, users are provided with the option to search a particular call detail record from the captured traces.

Various statistics can be obtained in statistics view to study the performance and trend in the GSM network based on protocol fields and parameters.

The screenshot displays the 'Statistics' dialog box and the main application window. The 'Statistics' dialog shows a list of field names on the left, including 'Called Addr(Q,708 V Digits)', 'Called Address', 'Calling Addr(CC(1-3 digits),NS)', etc. The 'Message Type' section is set to 'Use Type (single selection)' with 'Key' selected. The 'Statistic Type(s)' section has 'Frame Count' selected. The 'Value Set' section has 'LUDT Long unitdata', 'LUDT Long unitdata service', and 'RLC release complete' selected. The 'Selected Statistic Information' table is as follows:

Layer	Field Name	Use Type	Statistic Type
Physical...	Device #	Total	
SCCP	Message Type	Key	Frame Count

The main application window shows a list of captured frames with columns: ev, TS, Su..., Frame#, TIME (Relative), Len, BSN, BIB, FSN, FIB, Statu..., SLC, DPC, and a status column. Below this is a summary table for device statistics:

Device #	Message Ty...	Frame Count(Message Ty...
1	CC connection con...	5
1	RLSD released (4)	2
1	DT1 data form 1 (6)	51
total 1	Total	58
2	CR connection req...	5
2	RLC release comp...	2
2	DT1 data form 1 (6)	47
total 2	Total	54

At the bottom, there is a 'Call Detail Record' table with columns: Call ID, Call Status, Call Start Date & Time, Call Duration, DevNo, TS, OPC, DPC, and Call Type.

Call ID	Call Status	Call Start Date & Time	Call Duration	DevNo	TS	OPC	DPC	Call Type
A0	active	2010-08-10 15:09:19.008500	00:02:13.195625	2	31	2.2.2	1.1.1	CM Service
A1	active	2010-08-10 15:09:54.209250	00:01:37.994875	2	31	2.2.2	1.1.1	CM Service
A2	active	2010-08-10 15:10:05.982250	00:01:26.221875	2	31	2.2.2	1.1.1	CM Service
A3	active	2010-08-10 15:10:14.686500	00:01:17.517625	2	31	2.2.2	1.1.1	CM Service
A4	active	2010-08-10 15:10:20.782625	00:01:11.421500	2	31	2.2.2	1.1.1	CM Service

The status bar at the bottom indicates the file path: D:\Program Files\GL Communi 345420 Frames.

Figure: Statistics & Call Detail Record View

## Detail Packet Analysis (PDA)

Packet Data Analysis (PDA) is an outstanding tool for live monitoring of signaling and traffic over TDM. Packet Data Analysis (PDA) is distributed with GL's CAS, ISDN, SS7, and GSM protocol analyzer. Allowing users to monitor live TDM networks including capture, analysis, and reporting of every call-in detail.

GL's Packet Analyzers can capture TDM traffic over different transmission lines, including T1, E1, T3, E3, and OC-3 STM-1 / OC-12 STM-4. PDA then processes the captured frames, identifies, and segregates calls based on signaling parameters to generate reports.

Performance metrics for each call includes Caller and Callee id information, call duration, status, call-initiated time, call established time, call stop time, call terminator, call failure reason, and total signaling frames. Graphs are provided for key values to give a pictorial representation of the statistics.

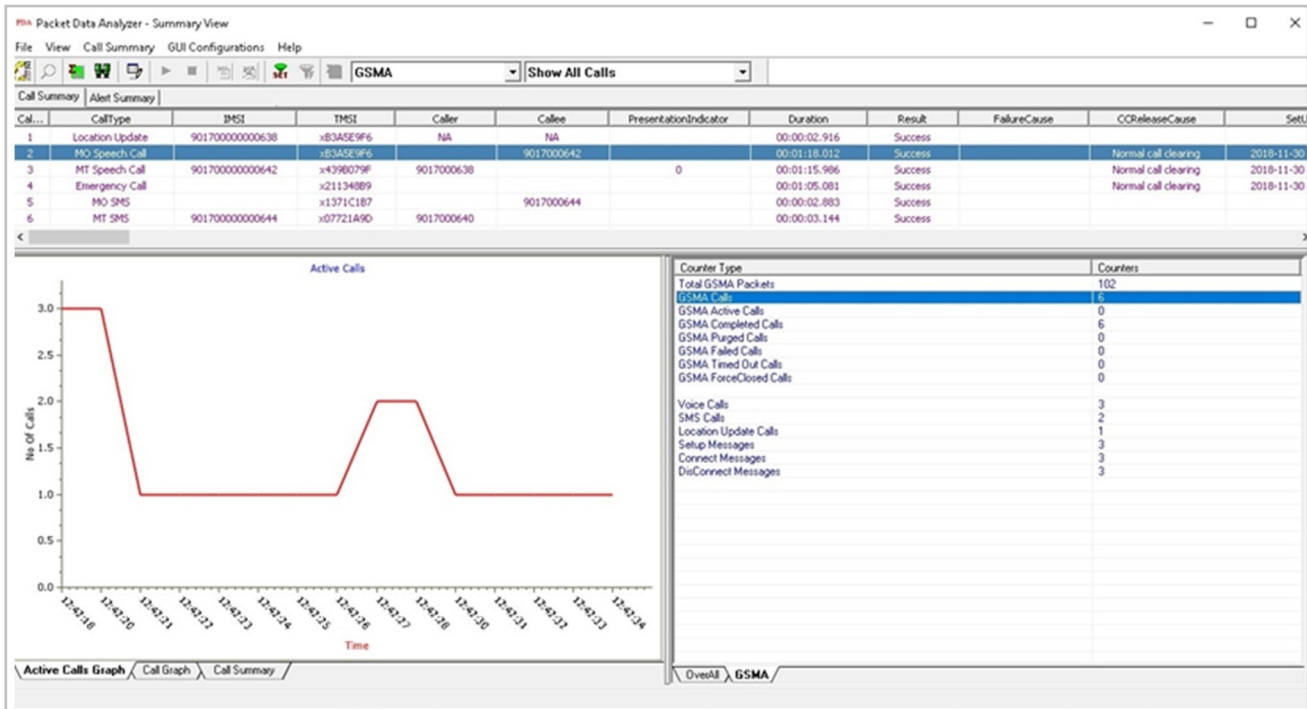


Figure: Call Capture Option with PDA

## Scripted GSM Emulation over A and Abis interfaces using MAPS™

GL's GSM A Interface Emulator is an advanced protocol simulator/tester for GSM simulation over A Interface that can simulate BSSMAP and DTAP messages and signaling specification as defined by 3GPP standards.

For more details, visit [MAPS™ GSM A Interface Emulator](#) webpage.

GL's GSM Abis Interface Emulator is an advanced protocol simulator/tester for GSM simulation over Abis Interface that can simulate BTSMP messages and signaling specification as defined by 3GPP standards.

For more details, visit [MAPS™ GSM Abis Interface Emulator](#) webpage.

## Supported Protocol Standards

Supported Protocols	Specification Used
TCP, UDP, IP, MAC	RFC 793, RFC 768, RFC 791, IEEE 802.3
MTP2	Q.703, ITU-T Blue Book / ANSI T1.111-1996
MTP3	Q.704, ITU-T Blue Book / ANSI T1.111-1996
SCCP	Q.713, CCITT (ITU-T) Blue Book / ANSI T1.112-1996
GSM Phase2 + BSSMAP / DTAP (BSSAP/DTAP)	3GPP TS 48.008 10.0.0)
SMS	3GPP TS 03.40 V7.5.0 & 3GPP TS 04.11 V7.1.0 GSM 03.38 version 7.2.0 Release 1998
Test & Network Management Messages (ITU / ANSI)	ITU-T Q.703, Q.704 / ANSI T1.111.4, ANSI T1.111.7
MM / CC	3GPP TS 04.08 V7.17
RR	3GPP TS 04.18 V8.13.0
GSM-SS	3GPP TS 24.080 Release 5. <ul style="list-style-type: none"> <li>– EIRENE FRS (Functional Requirements Specification) 7.1</li> <li>– EIRENE SRS (System Requirements Specification) 15.1</li> </ul>
LAPD	Q.921, CCITT (ITU-T)
BTSM	3GPP TS 08.58 V8.6.0
BSSAP +	3GPP TS 29.018 V6.0.0
RRLP / LLP	3GPP TS 44.031 V 7.5.0 / 3GPP TS 44.071 V 6.0.0
SMLCPP / BSSLAP	3GPP TS 48.031 V 6.6.0 / 3GPP TS 48.071 V 7.2.0
BSSAP-LE (BSSMAP-LE/DTAP-LE)	3GPP TS 49.031 V7.3.0
Mobis Layer 3	BSC-BTS: Motorola GSM Base Station System BSC to BTS Interface Design Specification. Document ID: GSD-GSM_NRS-MULTI_FA-IDS-001. BSC-PCU: Motorola GSL External Interface Specification - GSR9. Document ID: GSD-GSR9-GSL-EIS-001.
UMA Protocols (Stage 3) R1.0.4	TS 24.008, Mobile radio interface layer 3 specification, Core Network Protocols - Stage 3  TS 25.331, RRC Protocol Specification  TS 44.018, Mobile radio interface layer 3 specification  TS 48.018, Serving GPRS Support Node (SGSN)  TS 48.008, BSS GPRS Protocol (BSSGP)  TS 45.008, Radio subsystem link control
GCC / BCC	3GPP TS 44.068 V9.0.0 / 3GPP TS 44.069 V9.0.0
MAC	IEEE 802.3
IP	RFC 791
TCP	RFC 793
UDP	RFC 768



## Buyer's Guide

Item No	Product Description
<a href="#">XX150</a>	Real-time GSM Protocol Analyzer (T1 or E1)
<a href="#">OLV150</a>	Offline GSM Analyzer
<a href="#">XX151</a>	GSM Motorola Mobis option (Optional license)

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

Item No	Related Software
<a href="#">XX090</a>	HDLC Capture and Playback Software (T1 or E1)
<a href="#">XX600</a>	Basic Client/Server Scripted Control Software (Included with Basic Software)
<a href="#">XX693</a>	GSM A-bis Interface Emulator
<a href="#">XX692</a>	GSM A Interface Emulator
<a href="#">PKV170</a>	NetsurveyorWeb™ (Perpetual License, Unlimited Users/Nodes) – Includes Oracle 11g Standard Edition One and Standard Server-Grade Computing Platform

\*Specifications and features subject to change without notice.

For more details, refer [GSM Protocol Analysis](#) webpage.



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