
ISDN Analysis and Emulation



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>

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ISDN Analysis and Simulation over T1 E1

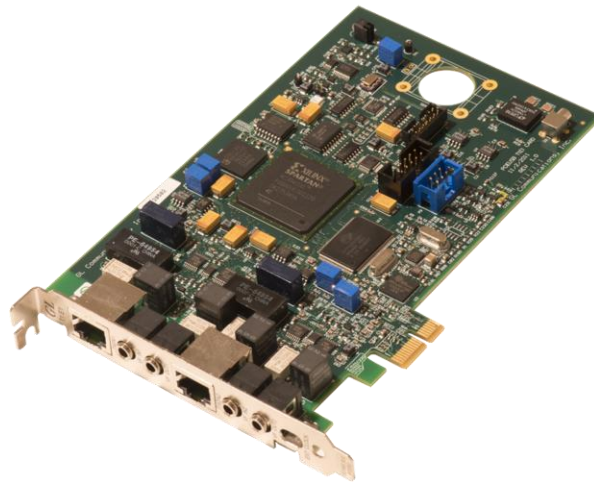
T1 E1 Analyzer Hardware Platforms



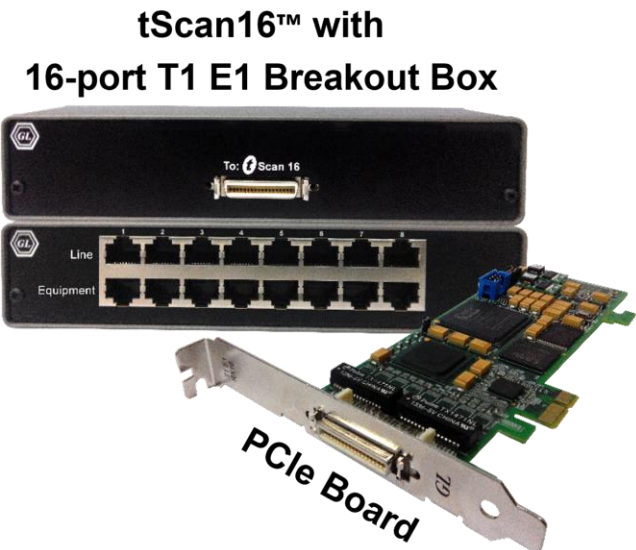
**tProbe™ - Portable USB based T1 E1 VF
FXO FXS and Serial Datacom Analyzer**



Quad / Octal T1 E1 PCIe Card



Dual T1 E1 Express (PCIe) Board



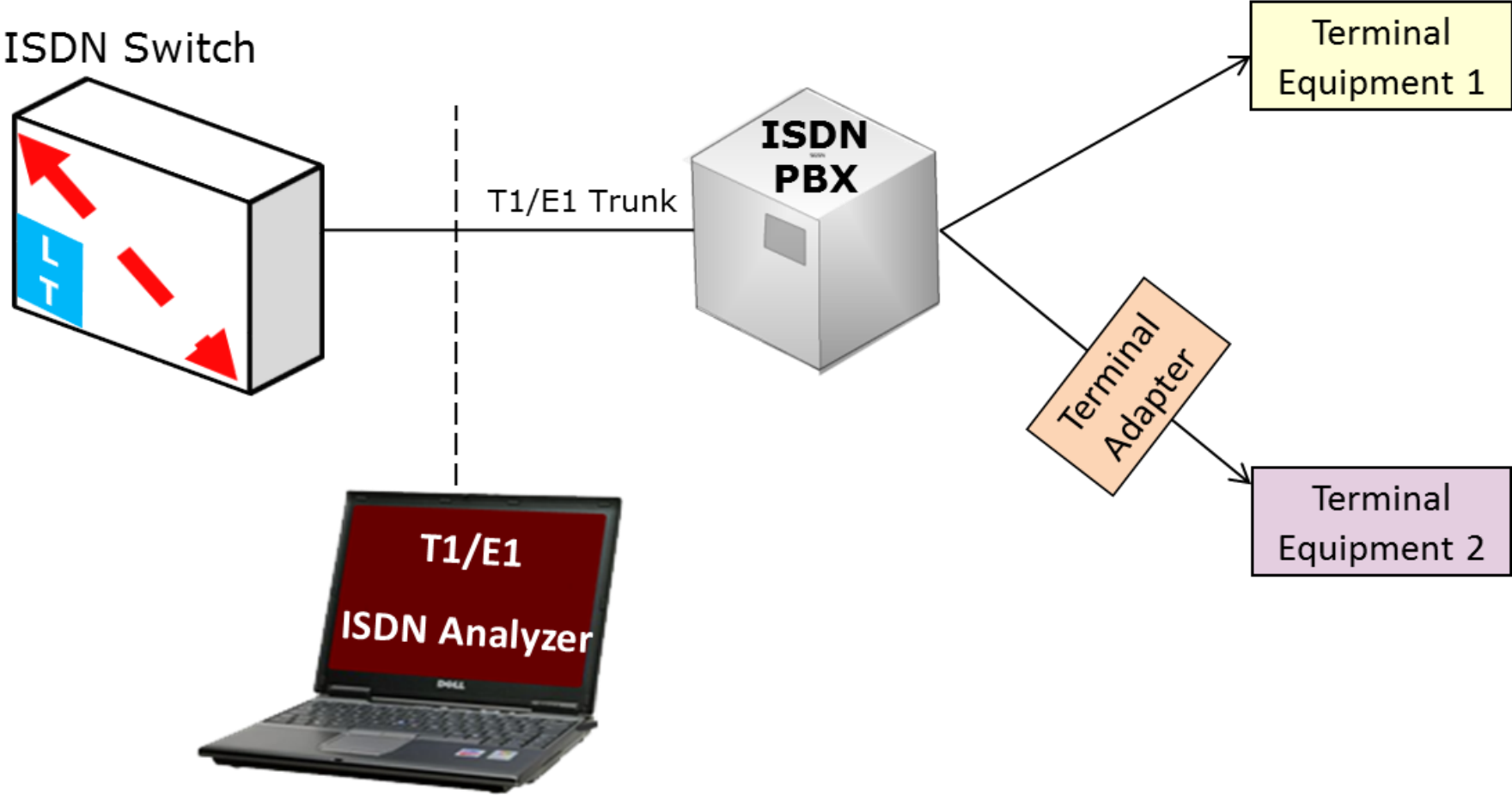
**tScan16™ with
16-port T1 E1 Breakout Box**

PCIe Board

TDM mTOP™ Solutions



ISDN Analyzer



ISDN Analyzer

- ISDN analyzer can capture and analyze stream of frames on an ISDN PRI link
- It decodes LAPD according to Q.921
- Supports the following types of ISDN analyzers:
 - Real-time ISDN Analyzer
 - Remote/Offline ISDN analyzers

Key Features

- Perform real-time / offline / remote analysis
- Consolidated GUI – Summary of all decodes, detail, hex-dump views of each frame, statistics view, and call detail record views
- Supports various protocol standards for proper decode
- Capture options - Channel selection, CRC, bit reversion, bit inversion, scrambler and more
- 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
- Fine tune results with filtering and search capability based on SAPI, TEI, C/R, N(S), N(R), P/F, Supervisory Functions, and ISDN message types
- Trace File Saving Options
- Remote-access capability
- Option to create multiple aggregate column groups and prioritize the groups as per the requirement to display the summary results efficiently
- Allows the user to create search/filter criteria automatically from the current screen selection

Supported Protocols

- LAPD
- Q.931
- 4ESS
- 5ESS
- ETSI (Euro ISDN)
- QSIG ETSI
- BELL NI2 (Bellcore National ISDN-2)
- ANSI
- DASS2
- DPNSS
- ARINC 746
- QSIG ECMA
- DMS 100
- DMS 250

Different Views

ISDN Protocol Analysis Q.93x 64-bit

File View Capture Statistics Database Call Detail Records Configure Help

0 GoTo

Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Error	Message Type Q.93x	Call Reference Value Q.93x	Channel Number Q.93x	Called Number Q.93x
✓ 1	0		4	00:00:00.378362	46		SETUP	1538	6	6704784
✓ 2	0		5	00:00:00.379137	6					
✓ 2	0		6	00:00:00.379775	11		CALL PROCEEDING	1538		
✓ 1	0		7	00:00:00.380175	6					

Card1 TimeSlot=0 Frame=4 at 00:00:00.378362 OK Len=46 *** Right click to SHOW/HIDE layers

HDLCD Frame Data + FCS

```

===== LAPD Layer =====
0000 C/R = .....1. Response(User) Command(Network)
0000 SAPI = 000000.. (0)
0001 TEI = 0000000. (0)
0002 Ctl = .....0 Information
    
```

Hex Dump of the Frame Data

```

+-----+-----+-----+-----+-----+-----+
02 01 50 62 08 02 06 02 05 04 03 80 90 A3 18 03      Pb      €£
A9 83 86 6C 08 80 35 35 35 36 30 30 30 70 08 80      @||| €5556000p €
36 37 30 34 37 38 34 7D 02 91 81 A1 14 4F            6704784} 'i O
    
```

Device #	Frame Count(Device #)
1	13973
total 1	13973
2	13973
total 2	13973

Call ID	Call Status	Calling Num	Called Num	Call Start Date & Time	Call Duration	Release Complete Cause	DevNo	TS	CRV	Interf
1	completed	5551000	5179641	2019-03-11 15:06:49.165250	00:00:00.541387	Normal call clearing	1	0	1794	
2	completed	5552000	1626921	2019-03-11 15:06:49.173825	00:00:00.574650	Normal call clearing	1	0	2050	
3	completed	5553000	8604110	2019-03-11 15:06:49.182400	00:00:00.566350	Normal call clearing	1	0	2306	
4	completed	5554000	9402951	2019-03-11 15:06:49.190887	00:00:00.559737	Normal call clearing	1	0	2562	
5	completed	5555000	8752706	2019-03-11 15:06:49.199575	00:00:00.552900	Normal call clearing	1	0	2818	

C:\Program Files\GL Communications Inc\U 27 946 Frames

Summary view

Detail view

Hex Dump view

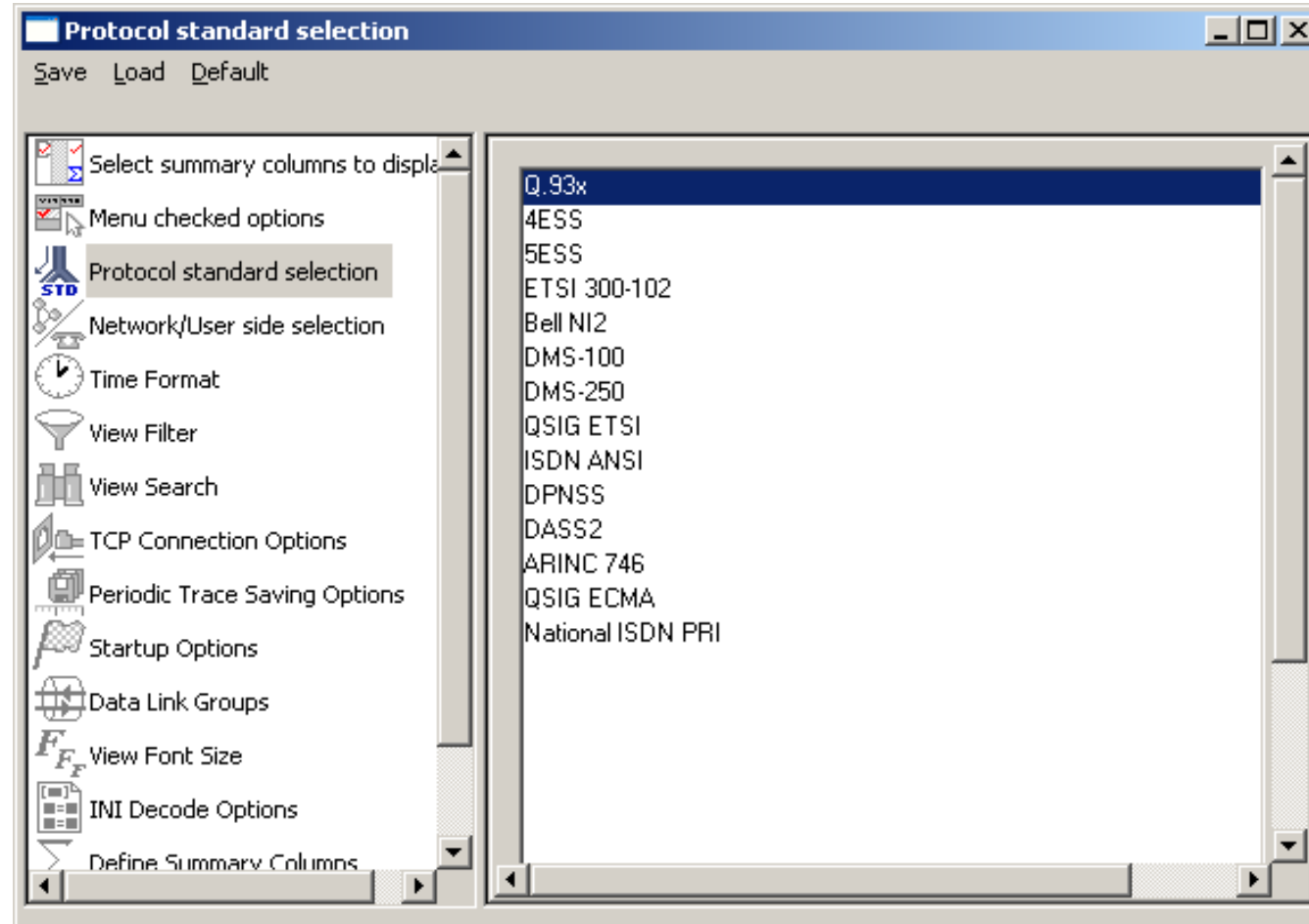
Statistics view

Call trace view

Different Views

- **Summary View:** This pane displays the columns that contain Card Number, Timeslots, Frame Number, Time, Frame Error Status, Command/Response, Length, Error, C/R, SAPI, CTL, P/F, FUNC, and more in a tabular format
- **Detail View:** This pane displays in detail about a frame in order to analyze and decode by selecting it in the summary view
- **Hex Dump View:** This pane displays the frame information in HEX and ASCII format
- **Statistics View:** This pane displays the statistics that are calculated based on the protocol fields
- **Call Trace View (Optional):** This pane displays the call specific information for each individual call from the captured data and display the information in an organized fashion

Protocol Standards



- Please visit <http://www.gl.com/isdn.html> for a complete list of supported protocols and specifications for ISDN

Protocol Standards

- Layer 2: Conveys user information between Layer 3 entities across ISDN using the D-channel. LAPD is parsed according to Q.921
- Layer 3: ISDN information parsing depends on the user's selection of the following ISDN Standards
 - Bell NI2 (Bellcore National ISDN-2): It is used in USA (Bellcore). It includes components to communicate information between ISDN user equipment, and the ISDN switch
 - AT&T/Lucent switch 4ESS and 5ESS (TR41449, TR41459 and 235-900-342): It is an ISDN variant adopted in USA by AT&T
 - ETSI 300-102 (Euro ISDN): This variant is adopted in all European countries
 - QSIG (Q-reference point Signalling System) ETSI: QSIG is inter-private PABX signaling system
 - Q.93x: It is an ITU implementation of ISDN
 - Nortel's switch DMS-100/250(NIS-A2111-1 and NIS-A211-4): It is a Northern Telecom's implementation of National ISDN
 - ISDN ANSI decode - T1.607 (Specification)
- MLPP (Multi-Level Precedence. and Pre-emption) procedures are supported for -
 - ISDN ANSI decode - T1.619 and T1.619a (Specifications)
 - ITU implementation - Q.955.3 (Specification) and
 - Facility Information Element - Q.932 (Specification)

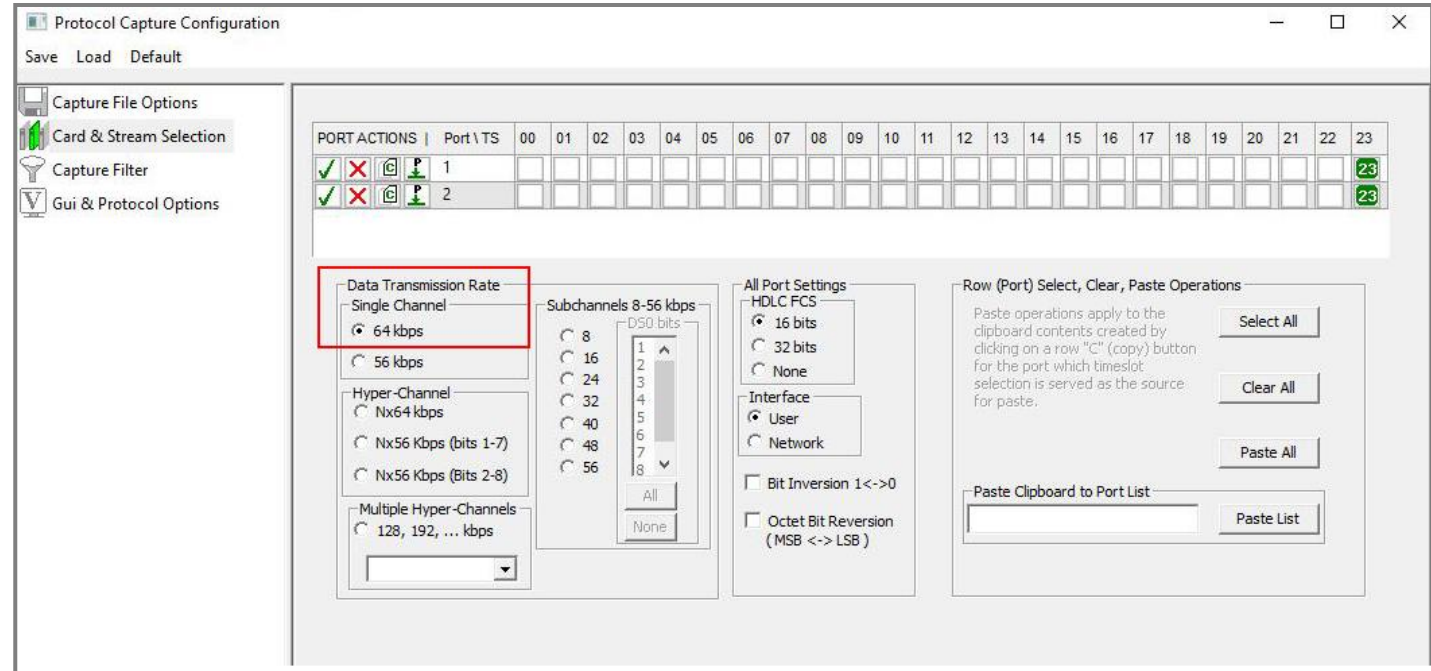
Protocol Standards (Contd.)

- DASS2 - Digital Access Signaling System No 2 - Specification BTNR 190
- DPNSS - Specification ND1301:2001/03
- ARINC 746 - Aeronautical Radio, INC is a signaling protocol based on Q.931
- QSIG ECMA (Q-reference point Signaling System) –Standard ECMA-143 4th Edition - December 2001
- National ISDN PRI CPE (Telcordia – SR-4994)

Real-time Analysis

Card and Stream Selection

- Streams can be captured on the selected time slots (contiguous or non-contiguous), sub-channels (fractional DS0 to DS1) or full bandwidth
- Frames may also be contained in n x 64 kbps, Single Channel – 64 Kbps, 56 Kbps



Real-time Analysis

- Streams can be captured on the selected time slots (contiguous or non-contiguous), sub-channels (fractional DS0 to DS1), Hyper-channels (n x 64 kbps, n x 56 kbps), or full bandwidth
- Frames may also be captured based on their FCS (16 bits, 32 bits, none), bit inversion, octet bit reversion, user/network side options
- Recorded trace file can then be analyzed offline
- Capability to export summary view details to comma separated values (CSV) format for subsequent import into a database or spreadsheet
- Capability to export detail decode information to an ASCII file

The screenshot displays the ISDN Protocol Analysis Q.93x software interface. At the top, there is a menu bar (File, View, Capture, Statistics, Database, Call Detail Records, Configure, Help) and a toolbar with various icons. Below the toolbar is a table of captured frames with columns: Dev, TS..., Su..., Fram..., TIME (Relative), Len, C/R, SAPI, TEI, CTL, P/F, N(S), N(R), FUNC, CRV, and Message Type. The table shows several frames, including SETUP, CALL PROCEEDING, ALERTING, and CONNECT.

Below the table, there is a detailed view of a frame: "Card2 TimeSlot=23 Frame=43 at 00:00:18.960500 OK Len=40". This view shows "HDLC Frame Data + FCS" and a "LAPD Layer" with fields: C/R, SAPI, TEI, and Ctl, each with its corresponding value.

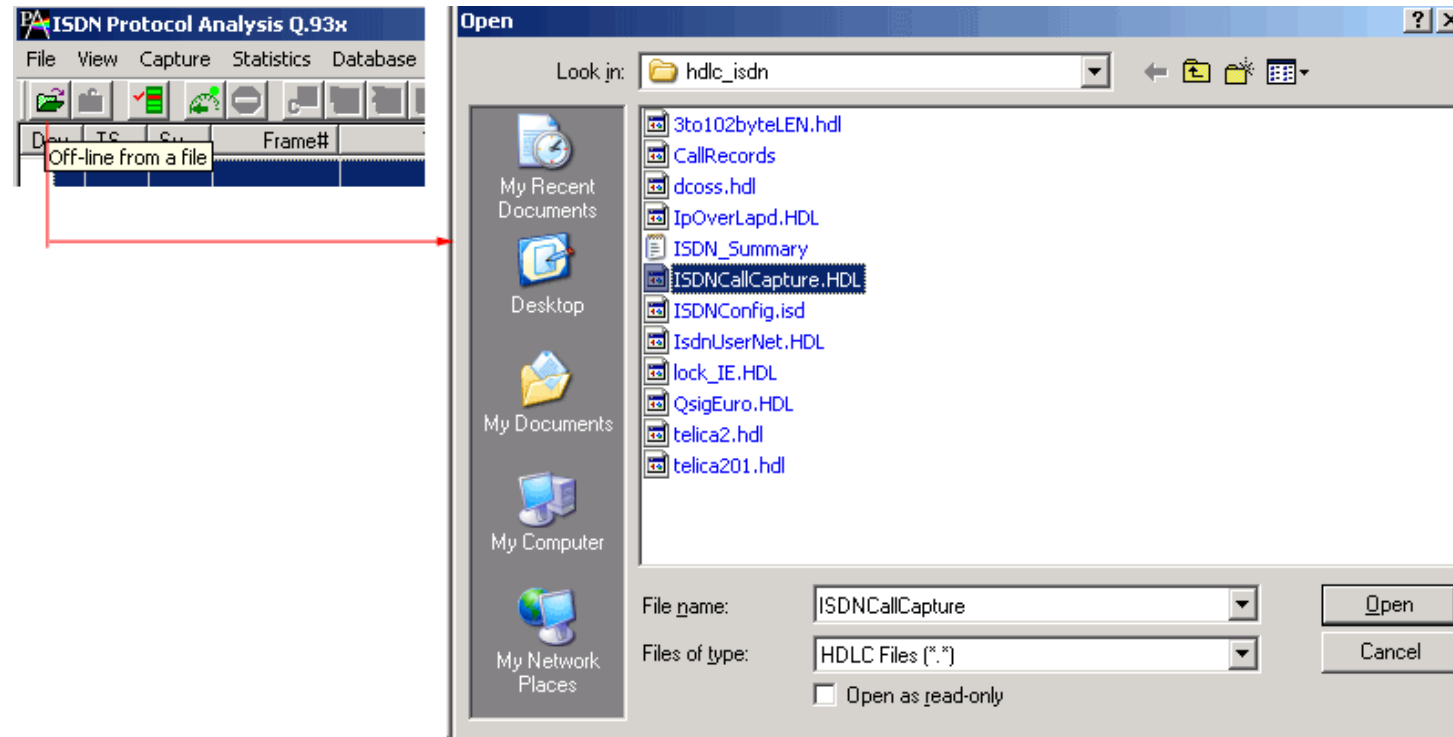
Below the detailed view is a "Hex Dump of the Frame Data" showing a sequence of hexadecimal bytes and their ASCII representation.

At the bottom, there is a summary table with columns: Device # and Frame Count(C/R). It shows data for two devices, with totals for each.

At the very bottom, there is a table with columns: Call ID, Call Status, Calling Num, Called Num, Call Start Date & Time, Call Duration, and Release Complete. It shows details for four calls, including their status (completed or active) and duration.

Offline Analysis

- Off-line analysis is equivalent to capturing a file in pre-defined timeslots
- Captured frames or only the filtered frames can be exported to *.HDL file for the further off-line analysis
- Trace file for offline analysis can be loaded either through analyzer GUI or through simple command-line arguments



Invoke ISDN Offline Analysis

The screenshot shows the 'Off-line ISDN Protocol Analysis Q.93x' application. The main window contains a table with the following columns: Dev, TS..., Su..., Frame#, TIME (Relative), Len, C/R, SAPI, TEI, CTL, P/F, N(S), N(R), FUNC, CRV, and Message Type. The table lists several frames, with Frame 2 at 00:00:00.000362 selected. Below the table, the application displays the details for this frame, including the HDLC Frame Data + FCS and the LAPD Layer parameters. A hex dump of the frame data is also shown.

Dev	TS...	Su...	Frame#	TIME (Relative)	Len	C/R	SAPI	TEI	CTL	P/F	N(S)	N(R)	FUNC	CRV	Message Type
✓ 2	0		0	00:00:00.000000	6	Co...	0	0	Super...	1		40	RR		
✓ 1	0		1	00:00:00.000037	6	Res...	0	0	Super...	1		49	RR		
✓ 2	0		2	00:00:00.000362	6	Res...	0	0	Super...	1		40	RR		
✓ 1	0		3	00:00:00.000375	6	Co...	0	0	Super...	1		49	RR		
✓ 1	0		4	00:00:00.378362	46	Res...	0	0	Inform...	0	40	49		1538	SETUP
✓ 2	0		5	00:00:00.379137	6	Res...	0	0	Super...	0		41	RR		
✓ 2	0		6	00:00:00.379775	11	Co...	0	0	Inform...	0	49	41		1538	CALL PROCEED
✓ 1	0		7	00:00:00.380175	6	Co...	0	0	Super...	0		50	RR		

Card2 TimeSlot=0 Frame=2 at 00:00:00.000362 OK Len=6
HDLC Frame Data + FCS
----- LAPD Layer -----
C/R =1. Response(User), Command(Network)
SAPI = 000000.. (0)
TEI = 000000.. (0)
Ctl
Supervisory Function
P/F
N(R)

Hex Dump of the Frame Data

02 01 01 51 A0 C5

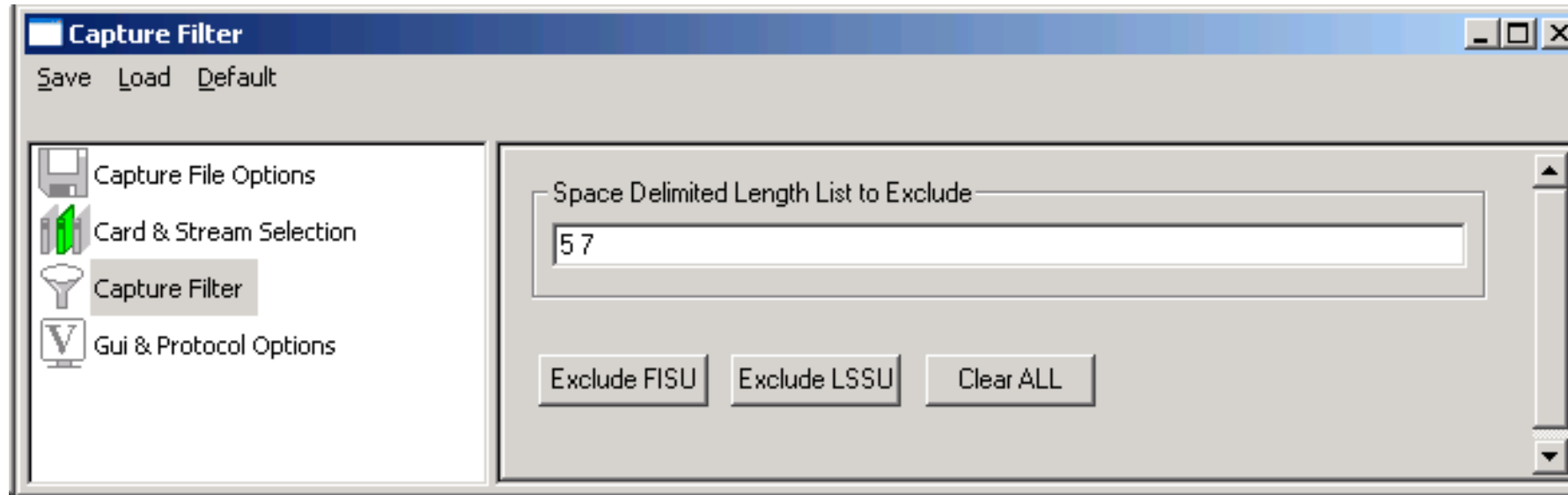
Off-line Viewing isdn\dcoss.hdl

```
C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Deepa>cd C:\Program Files\GL Communications Inc\Isdn Analyzer
C:\Program Files\GL Communications Inc\Isdn Analyzer>isdnprot isdn\dcoss.hdl
C:\Program Files\GL Communications Inc\Isdn Analyzer>_
```

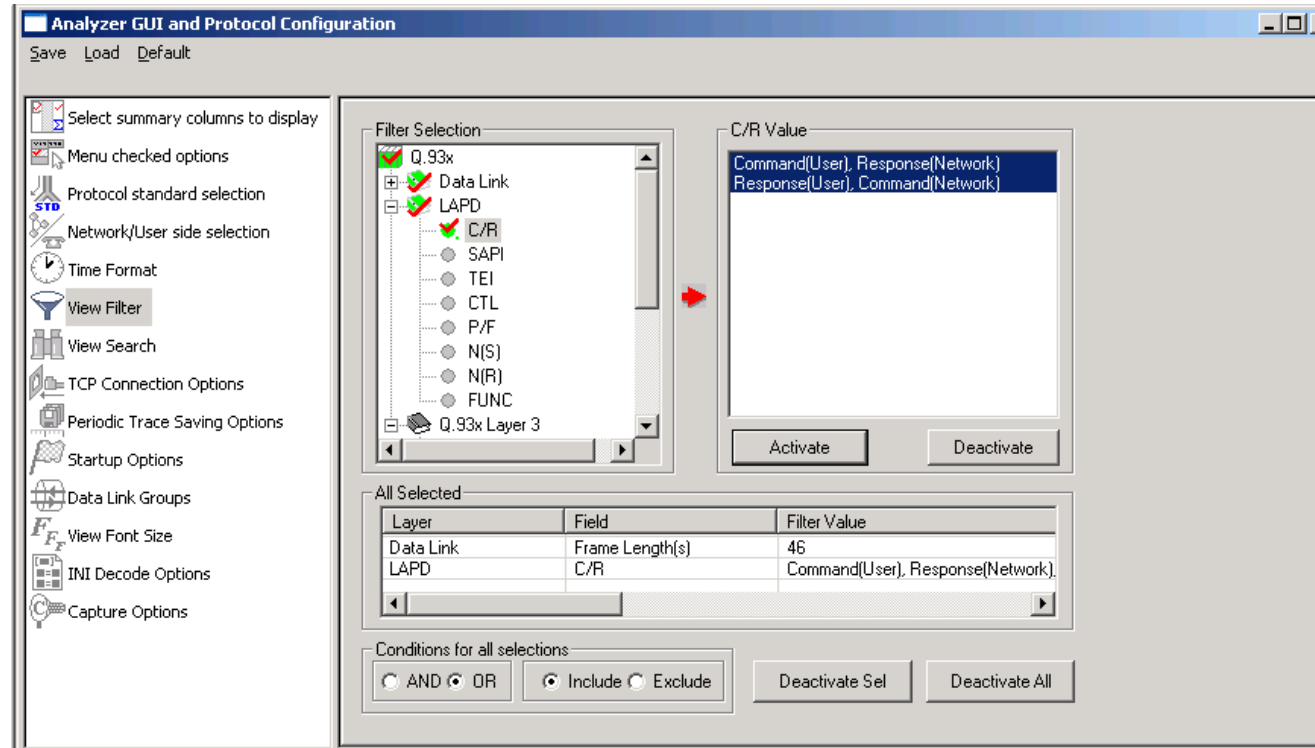
- Trace files for offline analysis can be loaded through simple command-line arguments as below:
 - Command Syntax: isdnprot isdn\Filename.hdl

Filters - Real-time Capture Filter



- Real-time capture filter can be set prior to capturing frames
- Real-time filter parameters - Frame Length, (LSSU (Link Status Signal Unit), FISU (Fill-in Signal Unit), or any other user-defined frame)

Filters – Offline View Filter



- Isolates required frames from all frames in real-time, as well as offline
- Allows filtering according to various layers and protocol fields such as C/R, TEI, SAPI, Called/Calling number, CRV, ISDN message type, cause value, call reference flag, and more

Filtering Criteria From Screen Selection

- Allows the user to create filter criteria automatically from the current screen selection

The image illustrates the process of creating filter criteria from a screen selection in the ISDN Protocol Analysis software. It shows three main components:

- ISDN Protocol Analysis Q.93x 64-bit:** A table displaying protocol data. The selected row (Frame# 4) has a context menu open with the option "Set Filter Criteria as Sel Values" highlighted in red.
- Use Ctrl, Shift for Extended Selection:** A dialog box that appears when the context menu option is selected. It contains a list of selected values: "Q.93x::Call Reference Value" and "Q.93x::Message Type".
- Analyzer GUI and Protocol Configuration:** A configuration window where the selected values are automatically populated into the "All Selected" table. The "All Selected" table is highlighted with a red box.

Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Error	Message Type Q.93x	Call Reference Value Q.93x	Channel N Q.93
✓2	0		0	00:00:00.000000	6				
✓1	0		1	00:00:00.000037	6				
✓2	0		2	00:00:00.000362	6				
✓1	0		3	00:00:00.000375	6				
✓1	0		4	00:00:00.378362	46		SETUP	1538	6
✓2	0		5	00:00:00.379137	6				
✓2	0		6	00:00:00.379775	11		CALL PROCEEDING		
✓1	0		7	00:00:00.380175	6				
✓2	0		8	00:00:00.388812	11		ALERTING		

Layer	Field	Filter Value
Q.93x	Call Reference Value	1538
Q.93x	Message Type	CALL PROCEEDING

Search Criteria From Screen Selection

- Allows the user to create search criteria automatically from the current screen selection

The screenshot shows the 'ISDN Protocol Analysis Q.93x 64-bit' application. The main window displays a table of protocol data. A context menu is open over the selected row (Frame# 4, Message Type SETUP), with the option 'Set Search Criteria as Sel Values' highlighted. A dialog box titled 'Use Ctrl, Shift for Extended Selection' is open, listing the following search criteria:

- Q.93x::Call Reference Value
- Q.93x::Called Number Digits
- Q.93x::Calling Number Digits
- Q.93x::Channel Number
- Q.93x::Message Type

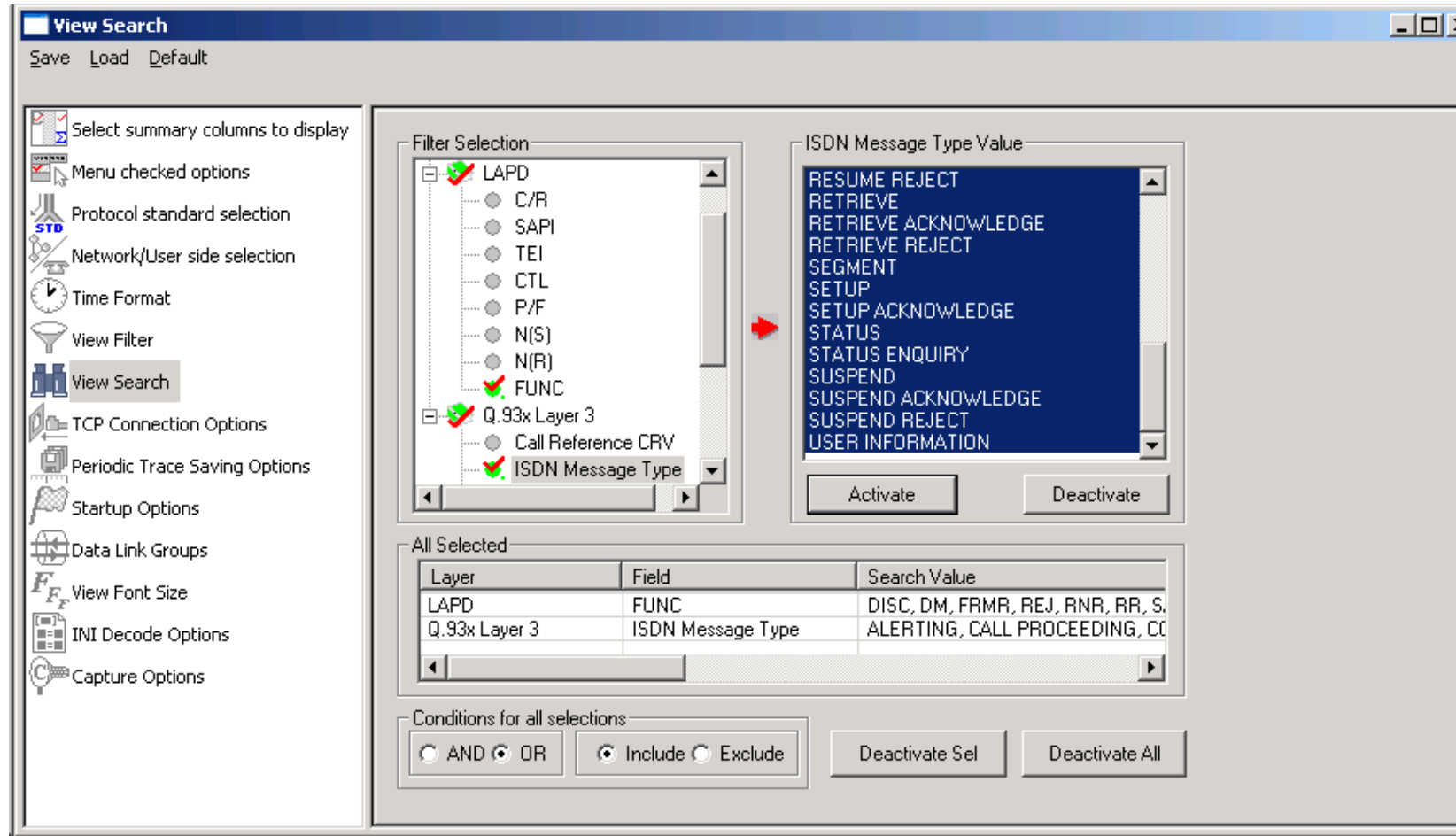
The dialog box has 'OK', 'Select All', and 'Cancel' buttons.

The screenshot shows the 'Analyzer GUI and Protocol Configuration' dialog box. The 'Filter Selection' pane shows 'Q.93x' selected. The 'All Selected' table is highlighted with a red box and contains the following data:

Layer	Field	Search Value
Q.93x	Call Reference Value	1538
Q.93x	Called Number Digits	6704784
Q.93x	Calling Number Digits	ffffnnnn

Below the table, there are options for 'Conditions for all selections' (AND/OR) and 'Include/Exclude', along with 'Deactivate Sel' and 'Deactivate All' buttons.

Search Options



- Search features helps users to search for a particular frame based on specific search criteria

Statistics

- Numerous statistics can be obtained to study the performance of the network based on protocol fields and different parameters
- Statistics can be obtained based on various layers and protocol field values both in real-time as well as offline mode

The screenshot shows the 'Statistics' configuration window. The 'Field Names' section lists the following layers and fields:

- Layers (checked)
- Physical Link (checked)
 - Device # (N)
 - Error Code (N)
 - StartTsOrTSc (N)
 - Time Stamp (S)
- LAPD (checked)
 - C/R (checked)
 - Ctl
 - Modifier Function
 - N(R)
 - N(S)
 - P
 - P/F
 - SAPI
 - Supervisory Function
 - TEI
- Q.93x Layer 3

The 'C/R' section is configured as follows:

- Use Type (single selection): Key
- Statistic Type(s) (calculated, multiple selection): Frame Count
- Value Set: Command(User), Response(Network), Response(User), Command(Network)
- Radio buttons: Cumulative, Separate
- Buttons: Add/Mod, Remove

The 'Selected Statistic Information' section contains the following table:

Layer	Field Name	Use Type	Statistic Type
Physical ...	Device #	Total	
LAPD	C/R	Key	Frame Count

Buttons: Remove Sel, Remove All, Apply

Call Detail Records

Device #	C/R	Frame Count(C/R)
1	Command(User), Response(Network) (0)	79
1	Response(User), Command(Network) (1)	92
total 1	Total	171
2	Command(User), Response(Network) (0)	79
2	Response(User), Command(Network) (1)	92
total 2	Total	171

Call ID	Call Status	Calling Num	Called Num	Call Start Date & Time	Call Duration	Release Complete Cause	DevNo	T
0	active	555016	554016	2010-11-15 11:19:00.025500	00:00:50.978375	x00	2	1
1	active	555017	554017	2010-11-15 11:19:00.362500	00:00:50.641375	x00	2	1
2	active	555018	554018	2010-11-15 11:19:00.825500	00:00:50.178375	x00	2	1
3	completed	555019	554019	2010-11-15 11:19:01.171500	00:00:24.414750	x00	2	1
4	active	555020	554020	2010-11-15 11:19:01.700500	00:00:49.303375	x00	2	1
5	active	555021	554021	2010-11-15 11:19:02.379500	00:00:48.624375	x00	2	1
6	completed	555006	554006	2010-11-15 11:19:02.653500	00:00:01.383000	x00	2	1
7	active	555023	554023	2010-11-15 11:19:02.945500	00:00:48.058375	x00	2	1
8	completed	555009	554009	2010-11-15 11:19:03.258625	00:00:27.952500	x00	2	1
9	active	555012	554012	2010-11-15 11:19:04.092000	00:00:46.911875	x00	2	1
10	completed	555010	554010	2010-11-15 11:19:04.930000	00:00:25.913750	x00	2	1

D:\Program Files\GL Communications I 342 Frames

- Call trace defining important call specific parameters such as call ID, status (active or completed), duration, CRV, release complete cause etc are displayed
- CDR Find option allows to search a particular call detail record from the captured traces

Saving options for the trace files

Captured trace files can be controlled by saving the trace using different conventions such as –

- Trace files with user-defined prefixes
- Trace file with date-time prefixes
- Slider control to indicate the total number of files, file size, frame count, or time limit

Periodic Trace Saving Options
Save Load Default

Select summary columns to display
Menu checked options
Protocol standard selection
Network/User side selection
Time Format
View Filter
View Search
TCP Connection Options
Periodic Trace Saving Options
Startup Options
Data Link Groups
View Font Size
INI Decode Options
Capture Options

Using View Filter
 All Frames (no filtering)
 Filtered Only (use view filter)

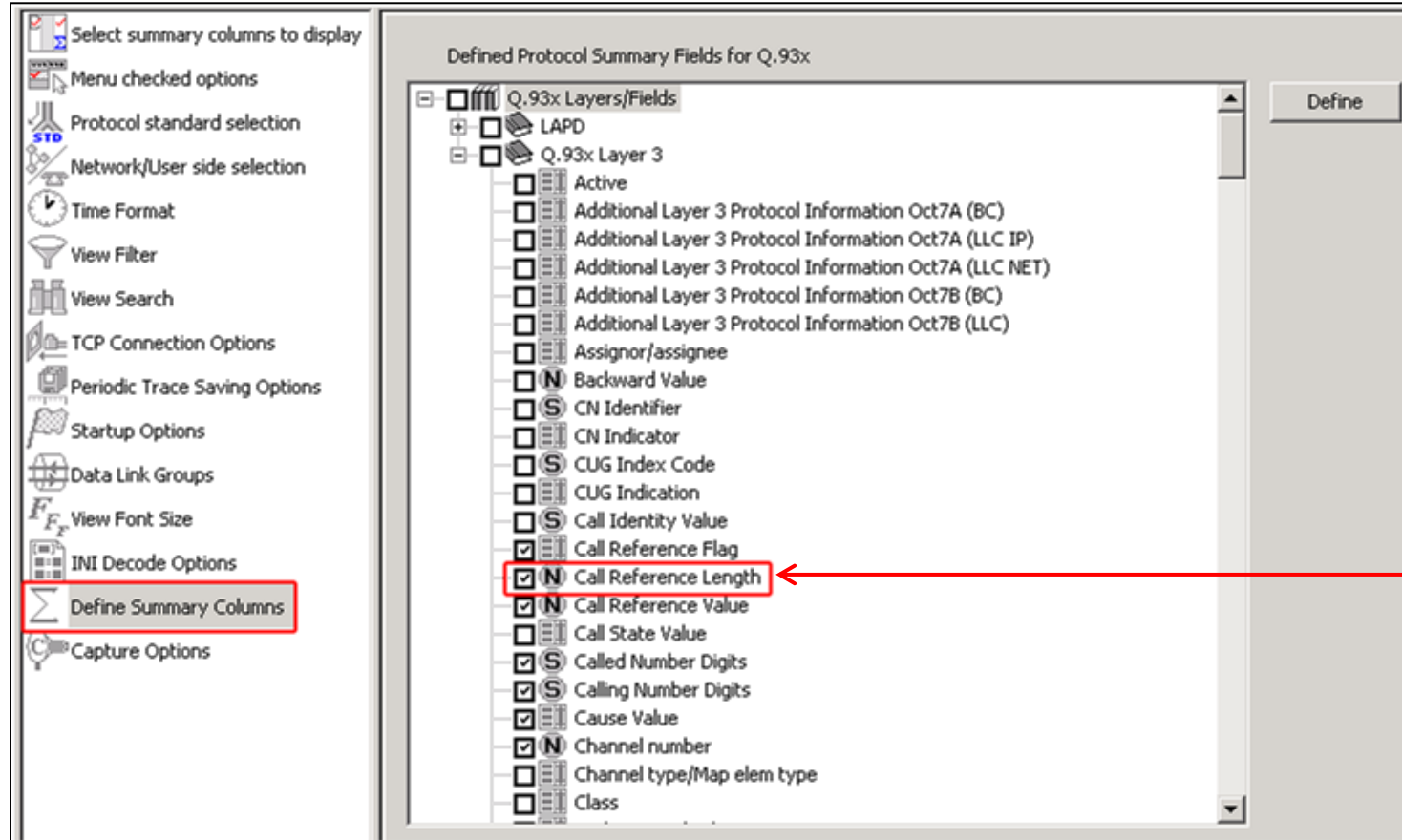
Save Directory
C:\

Save File Names
 Sequential File Names
file name prefix: [] 123 number of digits
file name suffix: .HDL
 Date/Time Formatted Names
file name prefix: %Y%M%D_%H%I
file name suffix: .HDL

Create a New File After the Specified Limit Has Been Reached
 File Size Limit e.g. 1048576 or 1024K or 1M
 Frame Count Limit e.g. 1048576 or 1024K or 1M
 Time Limit e.g. 24:00 (HH:MM)
Limit Value: 1000000

Restrict or Recycle After N Files Options
2147483647
 Keep N Latest Files
 Stop After N Files
 Unrestricted

Define Summary Columns



- Required protocol fields can be added through Define summary column option
- User can remove the protocol field which is not required

Aggregate Group Column

- The user can create multiple aggregate column groups and prioritize the groups as per the requirement to display the summary results efficiently

The screenshot displays the configuration for aggregate summary columns and the resulting output in the main analysis window.

Aggregate Summary Columns Configuration:

Name	Display Format	Summary Columns	Separator
Group~0	Concat	Calling Number Digits_Q.93x Called Number Digits_Q.93x	--->
Group~1	<Col_Alias> Value	Cause Value_Q.93x	
Group~2	Concat	Call Reference Value_Q.93x Message Type_Q.93x	&

ISDN Protocol Analysis Output (Highlighted Row):

Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Group~0	Error	Message Type Q.93x
1	0	0	4	00:00:00.378362	46	5556000 ---> 6704784		SETUP
2	0	0	5	00:00:00.379137	6			
2	0	0	6	00:00:00.379775	11	1538 & CALL PROCEEDING		CALL PROCEEDING
1	0	0	7	00:00:00.380175	6			
2	0	0	8	00:00:00.388812	11	1538 & ALERTING		ALERTING
1	0	0	9	00:00:00.389200	6			
2	0	0	10	00:00:00.628537	11	1538 & CONNECT		CONNECT
1	0	0	11	00:00:00.628887	6			
2	0	0	12	00:00:00.629350	11	1538 & CONNECT ACKNOWLEDGE		CONNECT ACKNOWLEDGE
2	0	0	13	00:00:00.629650	6			
2	0	0	14	00:00:00.779025	15	<Cause Value>Normal call clearing		DISCONNECT
1	0	0	15	00:00:00.779425	6			

Hex Dump (Partial):

```
Card1 TimeSlot=0 Frame=4 at 00:00:00.378362 OK Len=46
HDLC Frame Data + FCS
===== Q.93x Layer =====
0004 Protocol Discriminator = 00001000 Q931/I.451 user-network call control
0005 Call Reference Length = .....0010 (2)
0006 Call Reference Value = 1538 (.0000110 00000010)
0006 Call Reference Flag = 0..... FROM side that originated callref
0008 Message Type = 00000101 SETUP
0009 IEI Bearer Capability = 00000100 Bearer Capability IE Identifier
000A IE Bearer Capability Length = 3 (x03)
000B Information Transfer Capability = ...00000 Speech
```

Data Link Group

- 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

Data Link Group Specification

Card	Timeslot	Subch
01	00	0
02	01	1
03	02	2
04	03	3
05	04	4
06	05	5
07	06	6
08	07	7
09	08	
10	09	
11	10	
12	11	
13	12	
14	13	
15	14	
16	15	
17	16	
18	17	
19	18	
20	19	

Data Link Group Name:

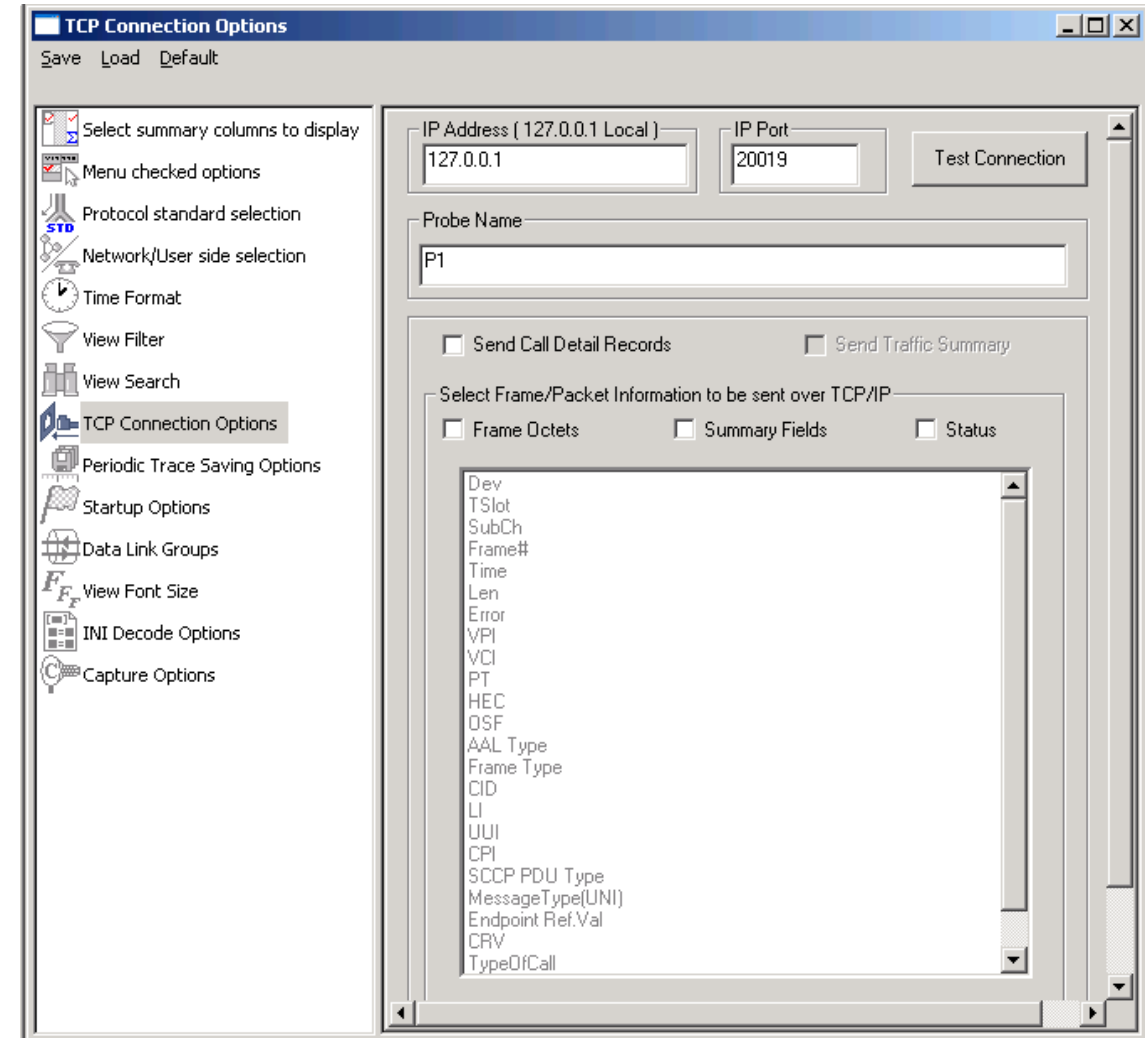
Forward Link Direction

Card	TS	Sc	Dir	Data Link Group Name
1	0	0	-->	West
2	1	1	<--	West
3	2	0	-->	West
4	3	1	<--	West
5	0	0	-->	East
6	1	1	<--	East
7	2	0	<--	East
8	3	1	-->	East

Buttons: Add, Odd Cards, Even Cards, All Cards, None, Delete Sel, Delete All, Default

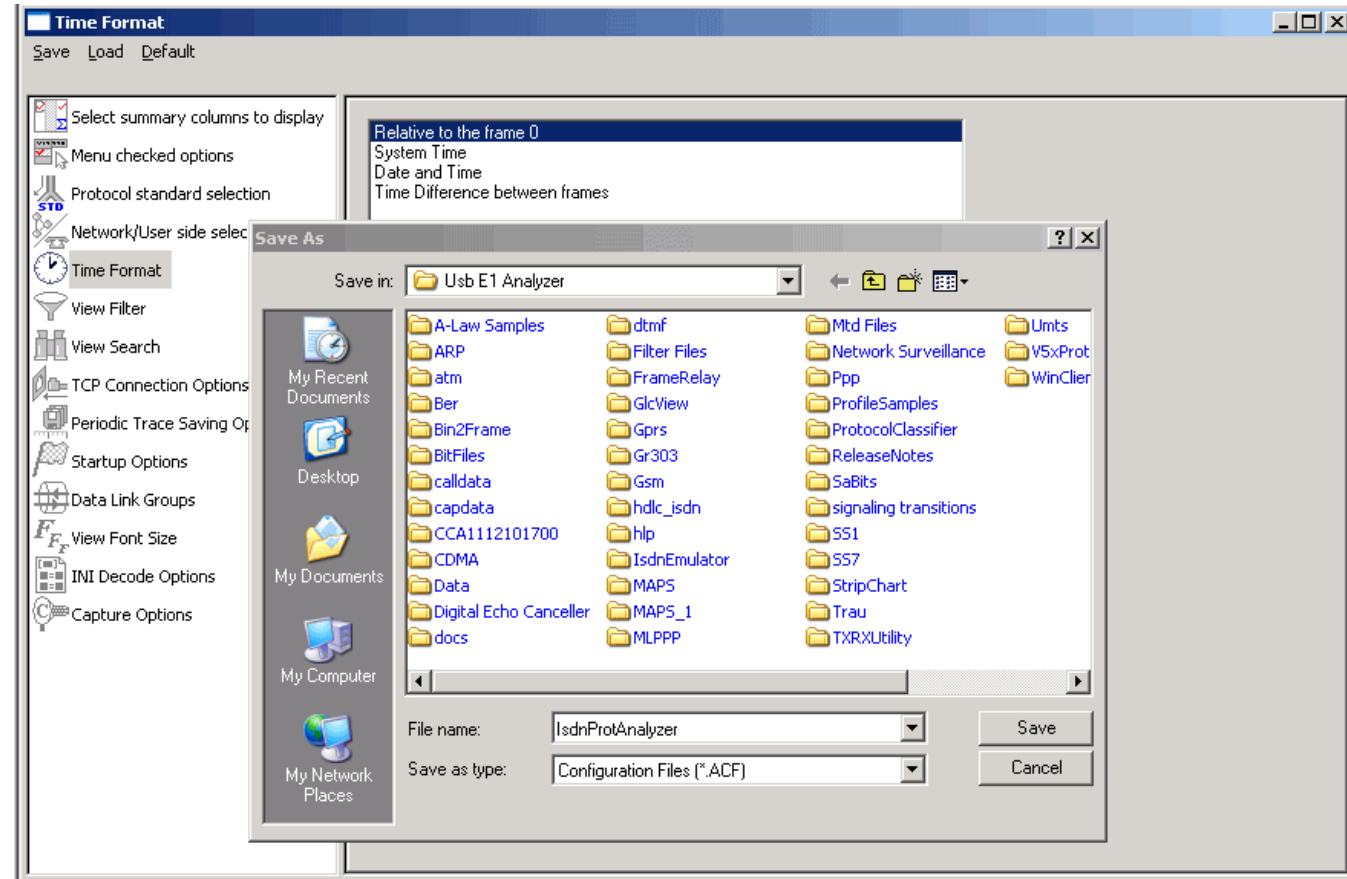
TCP Connection Options

- Used for Network Surveillance and Monitoring
- Designed to send protocol summary information and binary frame data via TCP- IP connection to a **Database Loader** to load data into a database



Save/Load All Configuration Settings

- Provides a consolidated interface for GUI and protocol settings
- Configuration settings can be saved to a file, loaded from a configuration file, or just revert to the default values using the default option



Remote ISDN Analyzer

What are Remote Protocol Analyzers?

“HDLC based protocols can be monitored remotely via a set of hardware and software features available with our T1 or E1 based protocol analyzers

- The RPA functionality permits:
 - Unattended and 24/7 operation
 - Remote accessibility for difficult connection situations
 - Remote non-intrusive operation
 - Remote detailed diagnostic capability
- Supported protocols for remote analysis includes -
 - HDLC
 - ISDN
 - SS7
 - GR303
 - Frame Relay
 - V5.x

Key Features

- Client side consists of a PC with Ethernet connectivity and GUI Remote Protocol Analysis software – no special T1 or E1 hardware is required
- Multiple T1 E1 servers may be simultaneously connected to a single remote client using a single GUI
- Multiple remote clients may access a single T1 E1 server. Also, the T1 E1 server is fully functional while being accessed as a server. Thus, a user may perform T1 E1 operations locally on the server while a remote client is accessing the same server, in real time
- Supports real-time and offline analysis at the remote client location
- Remote analyzers support capturing of encapsulated protocols and long frames
- Common filtering criteria can be set for T1 E1 cards located on multiple servers

Pre-requisites

- At the site of monitoring
 - Dual T1 E1 PCI based cards or USB based T1 E1 units
 - T1 E1 Server software with HDLC capture software
- At the client location
 - Appropriate GUI based “Remote Protocol Analyzer” such as ISDN, SS7, and others – licensed via “Dongle”
 - LAN/WAN TCP/IP Network with sufficient bandwidth to transport HDLC frames.

Remote Analysis

WCS Server Connect

WCS Server

IP Address: 192.168.1.58

IP Port: 17080

Add

Connected Servers

127.0.0.1:17080

192.168.1.58:17080

Delete

OK Cancel

Remote Protocol Analysis

Single User License

GL Communications Inc.

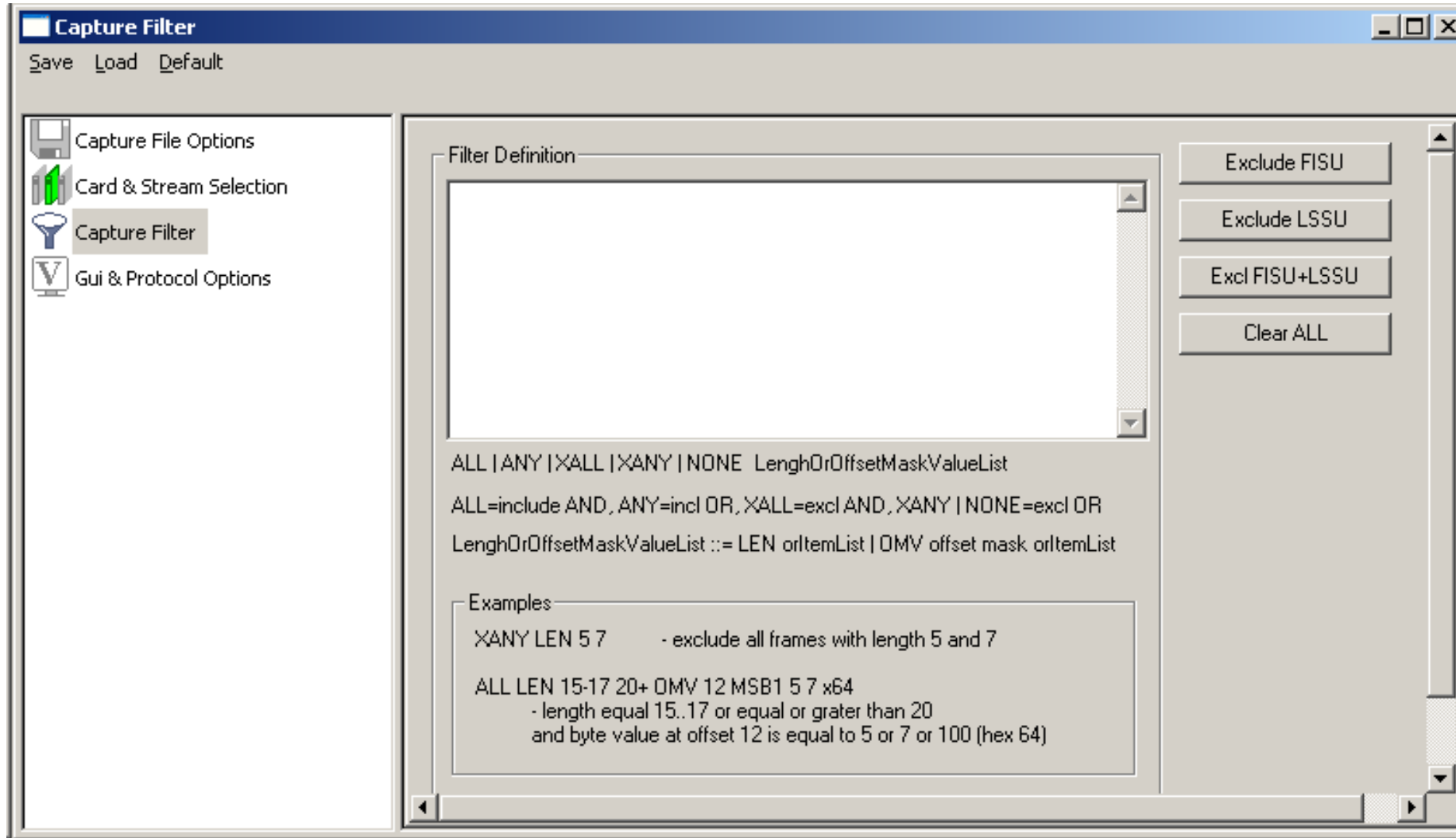
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Remote Analysis Off-line Only

- Users are required to enter IP address of the WCS server and an IP Port
- Multiple Server IP Addresses can be added to connect simultaneously to all T1 E1 cards
- Lists an IP addresses and the IP port numbers
- Option is provided for an user to select the desired IP address of the server

Capture Filter

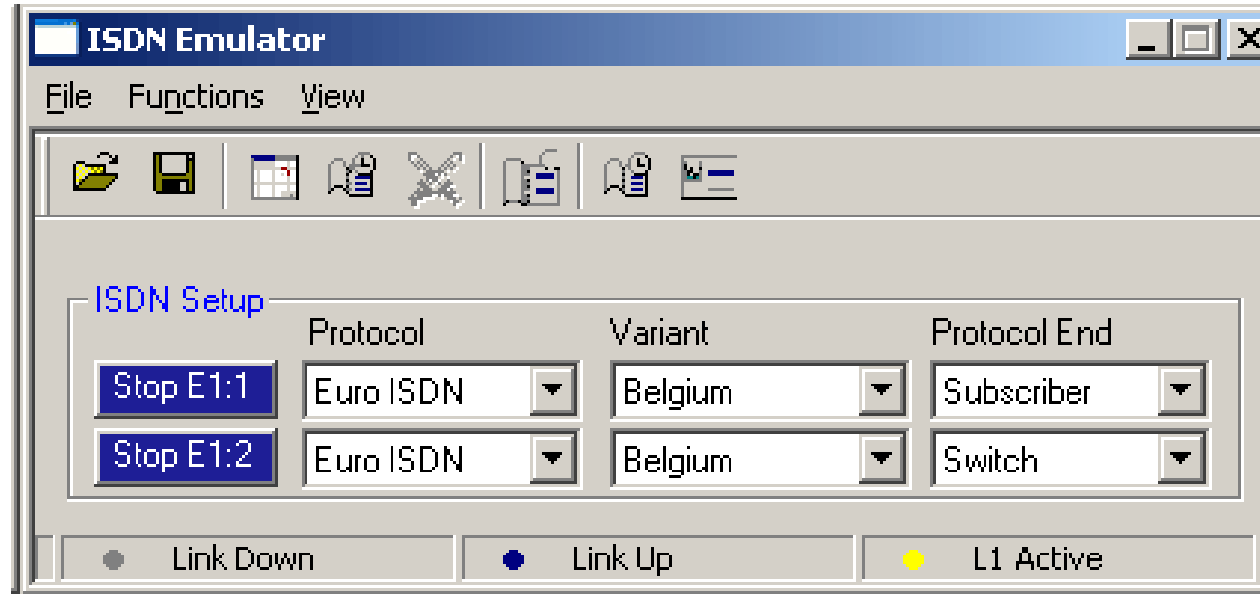


Capture Filter

- Real-time capture filter can be set prior to capturing frames
- Real-time filter parameter – Frame Length
LSSU (Link Status Signal Unit), FISU (Fill-in Signal Unit), or any other user-defined frame

ISDN Emulator (XX029)

ISDN Emulator



- Complete solution for testing, troubleshooting, installation and maintenance of devices and networks implementing PRI ISDN
- ISDN configuration includes selection of various ISDN standards, variants and NFAS, and more
- Send / capture PCM voice files, send / detect DTMF/MF digits, and send / detect frequency tones over an established calls

Key Features

- Nearly all ISDN standards and variants are supported. Variants are AT & T #4ESS, AT & T #5ESS, Bellcore #5ESS, National ISDN 2, Nortel, DMS – 250, and Siemens EWSD
- 1 to 4 Configurable Signaling Links
- Switch and Subscriber Emulation
- User Friendly GUI for Configuring the ISDN Layer parameters
- Provides various release causes such as rejected, no user response, user busy, congested, and so on for disconnection of the particular call on the channel
- Simple NFAS setup for T1
- Single/Dual T1, Single/Dual E1 Interfaces for the ISDN Signaling Links
- Call Records for Complete or Incomplete Calls
- Companion product "ISDN Protocol Analyzer" displays all ISDN Messages in Real Time
- Place call or accept call for each timeslot or for the whole trunk
- Supports Overlap Digit Sending
- Exports call records to a TEXT file
- Displays Lap D (Layer 2) statistics

Call Parameters Configuration

- The user-defined parameters are associated with the ISDN Setup message
- Allows to configure and modify ISDN parameters based on the user requirements
- ISDN call parameters includes –
 - Called/Calling Numbering plan
 - Called/Calling Number Type
 - Calling Number Screening
 - Calling Number Presentation
 - ISDN service type
 - A-Law/u-Law selection
 - Channel Indication
 - User-to-User Information
 - Low Layer compatibility
 - High Layer compatibility
 - Network-specific facilities
- ISDN parameters may be saved within a Timeslot group so as to allow multiple ISDN parameter configurations, simultaneously
- Quick configuration for Called and Calling Number

Call Management

- Allows the user to place calls on a single or on all timeslots manually
- Status field, indicates the link status or ISDN protocol status on that card
- The following types of manual calls may be made:
 - Software originated call to a standard phone
 - Software originated call to a number not corresponding to a standard phone or fax machine (software generated/received calls over timeslots without physical connections)
 - Call originated from a standard phone to ISDN emulator
- Various Release Cause codes such as Unassign Num, Call Forward, User Busy, and many more can be set for disconnecting a particular call

TimeSlot	Called Nr	Calling Nr	Last Cause	Release Cause
01. PlaceCall	554000	555000	No answer	No Answer
02. Connected	554001	555001		Normal clear
03. Connected	554002	555002		Normal clear
04. Connected	554003	555003		Normal clear
05. Connected	554004	555004		Normal clear
06. Connected	554005	555005		Normal clear
07. Connected	554006	555006		Normal clear
08. PlaceCall	554007	555007	Normal	Normal clear
09. Alerting	554008	555008		Normal clear
10. Alerting	554009	555009		Normal clear
11. Connected	554010	555010		Normal clear
12. Connected	554011	555011		Normal clear
13. Connected	554012	555012		Normal clear
14. Connected	554013	555013		Normal clear
15. Connected	554014	555014		Normal clear
16. UnAvail	554015	555015		Normal clear
17. PlaceCall	554016	555016	Normal	Normal clear
18. AnswerCall	554017	555017		Normal clear
19. Connected	554018	555018		Normal clear
20. AnswerCall	554019	555019		Normal clear
21. PlaceCall	554020	555020	No user resp	No Response
22. Connected	554021	555021		Normal clear
23. AnswerCall	554022	555022		Normal clear
24. Connected	554023	555023		Normal clear
25. Connected	554024	555024		Normal clear
26. AnswerCall	554025	555025	Normal	Normal clear
27. AnswerCall	554026	555026		Normal clear
28. Connected	554027	555027		Normal clear
29. AnswerCall	554028	555028		Normal clear
30. AnswerCall	554029	555029		Normal clear
31. AnswerCall	554030	555030		Normal clear

Call Records

No	P	TS	TimeStamp	CalledNr	CallingNr	Typ	Result	Duration...	Setup...	Cause	
1	1	1	11/22/10 13:46:47	554000	555000	Out	Comp	00:16.375	00.453	Normal	
2	2	1	11/22/10 13:46:47	554000	555000	In	Comp	00:16.313	00.000	Normal	
3	1	2	11/22/10 13:46:47	554001	555001	Out	Comp	00:20.610	00.453	Normal	
4	2	2	11/22/10 13:46:47	554001	555001	In	Comp	00:20.500	00.000	Normal	
5	1	4	11/22/10 13:46:47	554003	555003	Out	Comp	00:20.891	00.891	Normal	
6	2	4	11/22/10 13:46:47	554003	555003	In	Comp	00:20.704	00.000	Normal	
7	1	5	11/22/10 13:46:47	554004	555004	Out	Comp	00:21.188	01.203	Normal	
8	2	5	11/22/10 13:46:47	554004	555004	In	Comp	00:20.953	00.000	Normal	
9	1	7	11/22/10 13:46:47	554006	555006	Out	Comp	00:21.453	01.250	Normal	
10	2	7	11/22/10 13:46:47	554006	555006	In	Comp	00:21.125	00.000	Normal	
11	1	15	11/22/10 13:46:47	554014	555014	Out	Comp	00:22.188	02.235	Normal	
12	2	15	11/22/10 13:46:48	554014	555014	In	Comp	00:21.469	00.000	Normal	
13	1	19	11/22/10 13:46:47	554018	555018	Out	Comp	00:29.625	02.578	Normal	
14	2	19	11/22/10 13:46:48	554018	555018	In	Comp	00:28.719	00.000	Normal	
15	1	20	11/22/10 13:46:47	554019	555019	Out	Comp	00:32.000	02.657	Normal	
16	2	20	11/22/10 13:46:48	554019	555019	In	Comp	00:31.047	00.000	Normal	
17	1	21	11/22/10 13:46:47	554020	555020	Out	Comp	00:32.297	02.782	Normal	
18	2	21	11/22/10 13:46:48	554020	555020	In	Comp	00:31.313	00.000	Normal	

Total Calls : 18 Complete Calls : 18 InComplete Calls : 0

- Displays completed as well as incomplete call chronologically

Card Statistics

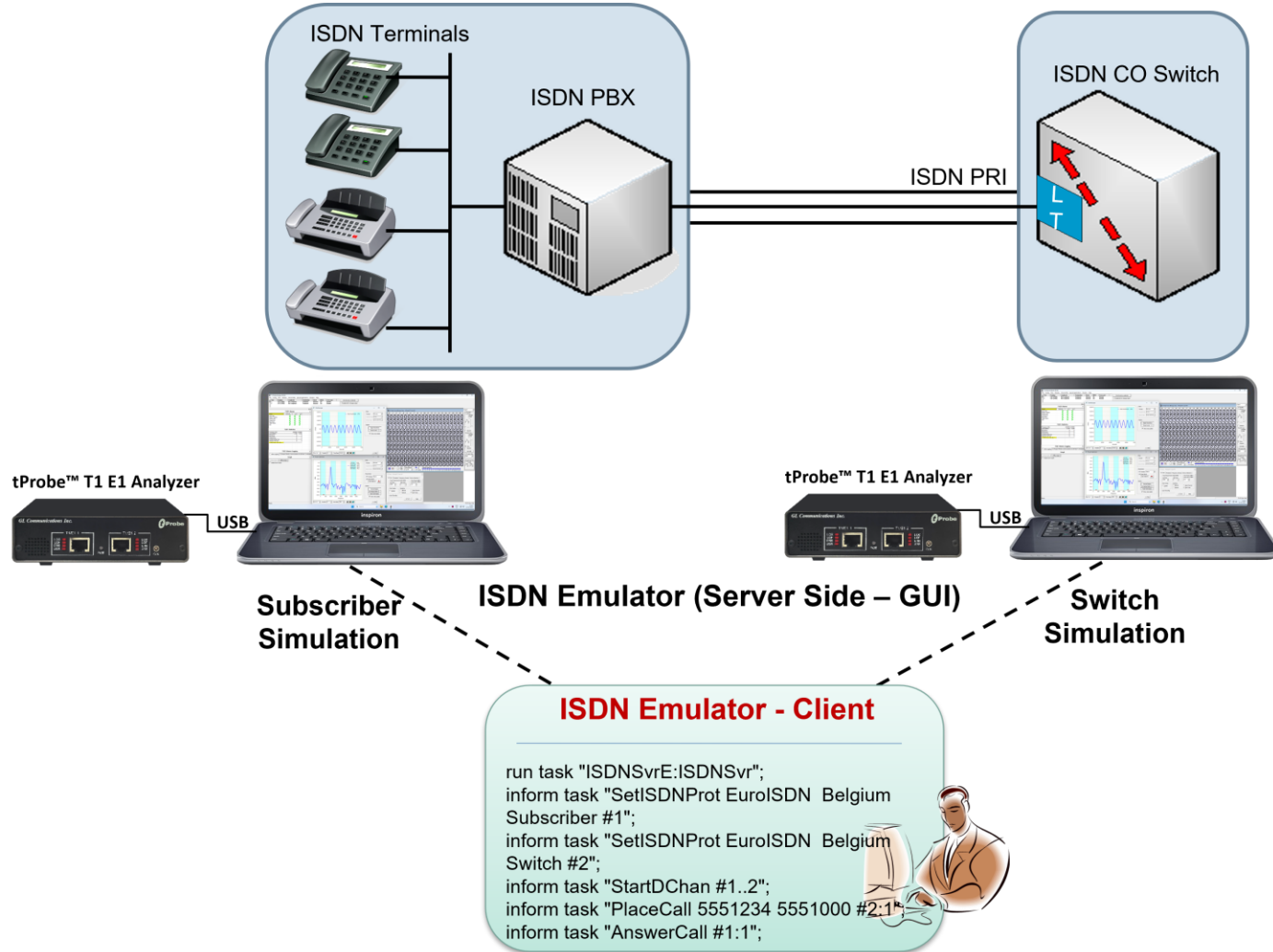
- Displays the complete statistics for Layer 1, LAPD and Layer 3
- Layer1 statistics includes number of packet sent/received, CRC errors, Internal errors, number of Restarts, Receive Under runs and Transmission Overruns and etc.
- LAPD details includes if LAPD is active and its state
- Layer 3 details include number of active calls

The screenshot shows a window titled "Statistics Port 1" with a "Device Selection" dropdown menu set to "Card #1". The window is divided into three sections: Layer 1, Layer 2, and Layer 3. Layer 1 statistics include Xmtd Pkts (192), Rcvd Pkts (191), CRC Errs (0), Rcv Urns (0), Malformed (0), Xmt Druns (0), Xmt Dis B (0), Rcv Dis B (0), Xmt Dis F (0), Rcv Dis F (0), Internal Err (0), and Restarts (0). Layer 2 statistics show Active (checked) and State (MF Est). Layer 3 statistics show Active Calls (21). There are "Reset" and "OK" buttons at the bottom.

Layer	Statistic	Value
Layer 1	Xmtd Pkts	192
	Rcvd Pkts	191
	CRC Errs	0
	Rcv Urns	0
	Malformed	0
	Xmt Druns	0
	Xmt Dis B	0
	Rcv Dis B	0
	Xmt Dis F	0
	Rcv Dis F	0
	Internal Err	0
Restarts	0	
Layer 2	Active	<input checked="" type="checkbox"/>
	State	MF Est
Layer 3	Active Calls	21

ISDN Emulation using Client Server

ISDN Emulation (Module license # - XX629)



MAPS™ - ISDN (XX648)

The screenshot displays two windows from the GLClient application. The left window, titled 'Untitled - GLClient', shows a list of tasks and their states, along with a command prompt for task execution. The right window, titled 'ISDN Protocol Analysis Q.93x', shows a table of captured frames and a detailed view of a specific frame's data.

Task List:

- Task 1: TS#2:28, CallState=PROCEEDING
- Task 1: TS#2:28, CallState=ALERTING
- Task 1: TS#2:29, CallState=PROCEEDING
- Task 1: TS#2:29, CallState=ALERTING
- Task 1: TS#2:30, CallState=PROCEEDING
- Task 1: TS#2:30, CallState=ALERTING
- Task 1: TS#2:31, CallState=PROCEEDING
- Task 1: TS#2:31, CallState=ALERTING
- inform task "AnswerCall #1:1..31";
- Task 1 informed
- Task 1: TS#1:1, CallState=CONNECTED
- Task 1: TS#1:2, CallState=CONNECTED
- Task 1: TS#1:3, CallState=CONNECTED
- Task 1: TS#1:4, CallState=CONNECTED
- Task 1: TS#1:5, CallState=CONNECTED
- Task 1: TS#1:6, CallState=CONNECTED

Command Prompt:

```
run task "ISDNSvrE:ISDNSvr";  
inform task "SetISDNProt EuroISDN Belgium Switch #1";  
inform task "SetISDNProt EuroISDN Belgium Subscriber #2";  
inform task "StartDChan #1..2";  
inform task "PlaceCall 5551234 5551000 #2:1..31";  
inform task "AnswerCall #1:1..31";  
inform task "DisconnectCall CAUSE_NORMAL_CLEAR #1:1..31";  
inform task "StopDChan #1..2";
```

ISDN Protocol Analysis Q.93x Frame Table:

Frame#	TIME (Relative)	Len	E...	C/R	SAPI	TEI	CTL	P/F	N(S)	N(R)	F...	CRV	Message Type	
177	00:00:47.382125	6		Response(User), Comma...	0	0	Supervisory	0		49	30		25	ALERTING
178	00:00:47.482250	15		Response(User), Comma...	0	0	Information	0	49	30			25	ALERTING
179	00:00:47.484250	16		Response(User), Comma...	0	0	Information	0	50	30			26	CALL PROCEEDING
180	00:00:47.504375	15		Response(User), Comma...	0	0	Information	0	51	30			26	ALERTING
181	00:00:47.506375	16		Response(User), Comma...	0	0	Information	0	52	30			27	CALL PROCEEDING
182	00:00:47.508500	15		Response(User), Comma...	0	0	Information	0	53	30			27	ALERTING
183	00:00:47.510500	16		Response(User), Comma...	0	0	Information	0	54	30			28	CALL PROCEEDING
184	00:00:47.512500	15		Response(User), Comma...	0	0	Information	0	55	30			28	ALERTING

Card 1 TimeSlot=16 Frame=177 at 00:00:47.382125 OK Len=6

HDLC Frame Data + FCS

```
===== LAPD Layer =====  
C/R = .....1. Response(User), Command(Network)  
SAPI = 000000.. (0)  
TEI = 0000000.. (0)  
Ctl = .....01 Supervisory  
Supervisory Function = ....00.. RR  
P/F = .....0 (0)  
N(R) = 0110001.. (49)
```

Hex Dump of the Frame Data

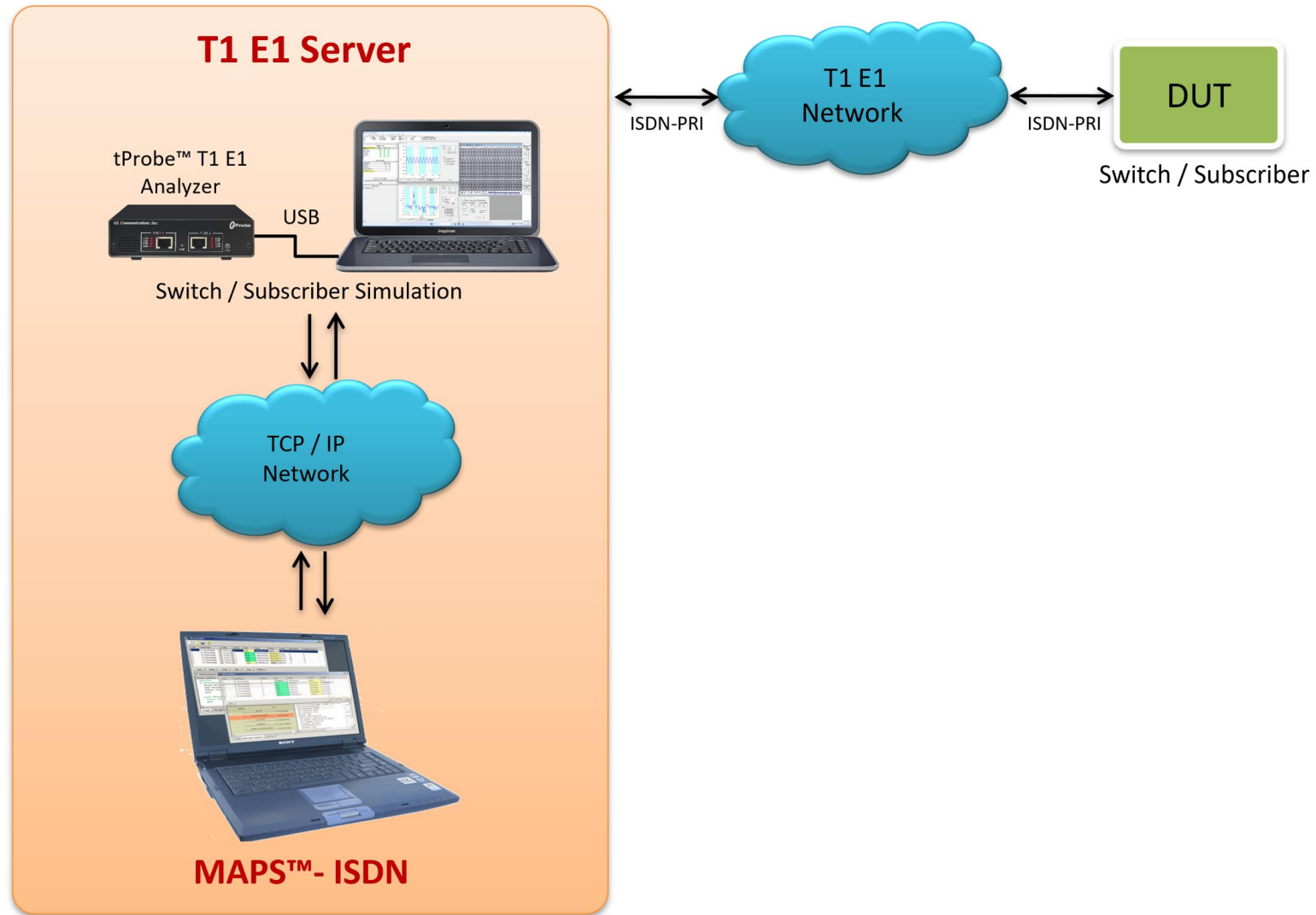
```
02 01 01 62 B8 C6 b,Æ
```

Stopped C:\Temp.Hdl Idle, 508 frames

- Place and Answer ISDN Calls
- Monitor all link state and call state

High-Capacity ISDN Emulation using MAPS™

MAPS™ - ISDN (XX648)



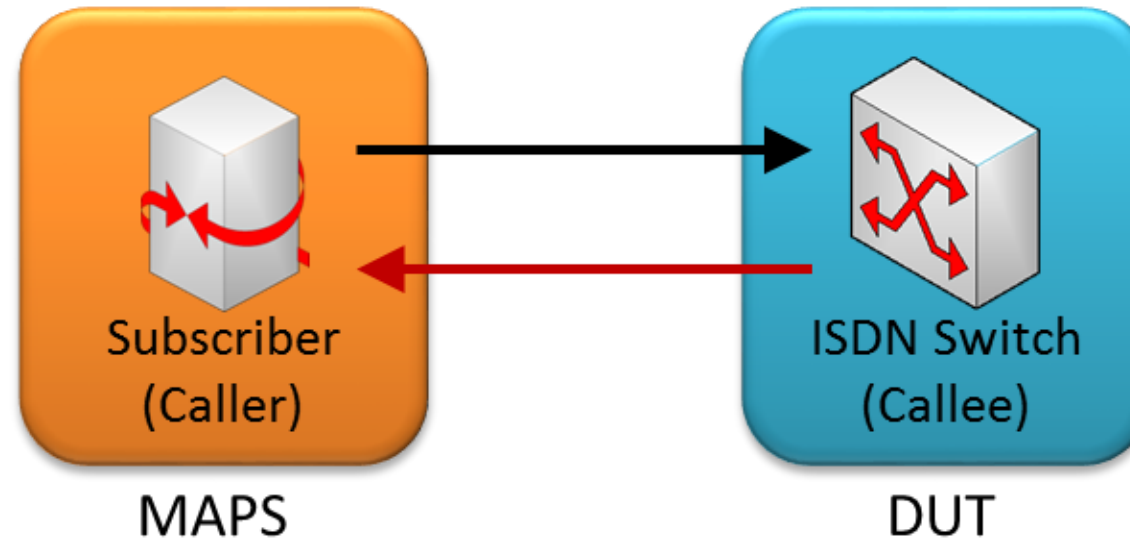
MAPS™ - ISDN Key Features

- 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, Port Number, and more
- 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
- Supported on Windows® 8 (or higher) operating systems

ISDN Supported Protocol Standards

Supported Protocols	Standard / Specification Used
Q.931	ITU-T Q.931 / Q.932(Facility IE) / Q.955.3 (MLPPP Procedures)
4ESS	ISDN PRI (TR-41449)
5ESS	ISDN PRI (Lucent Tech - 5ESS 2000)
BELL	ISDN PRI (Bell Core SR-NWT-002343)

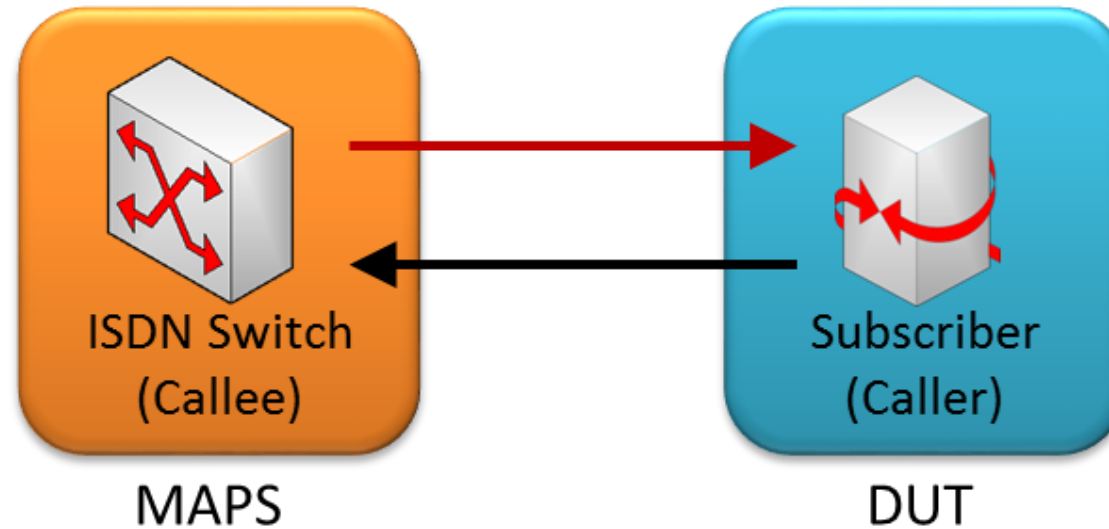
MAPS™ - ISDN as Subscriber



Scenario: MAPS™ testing ISDN Switch

- MAPS™ - ISDN can be configured to act as Subscriber to generate ISDN messages
- Capable to test ISDN Switch by sending ISDN messages

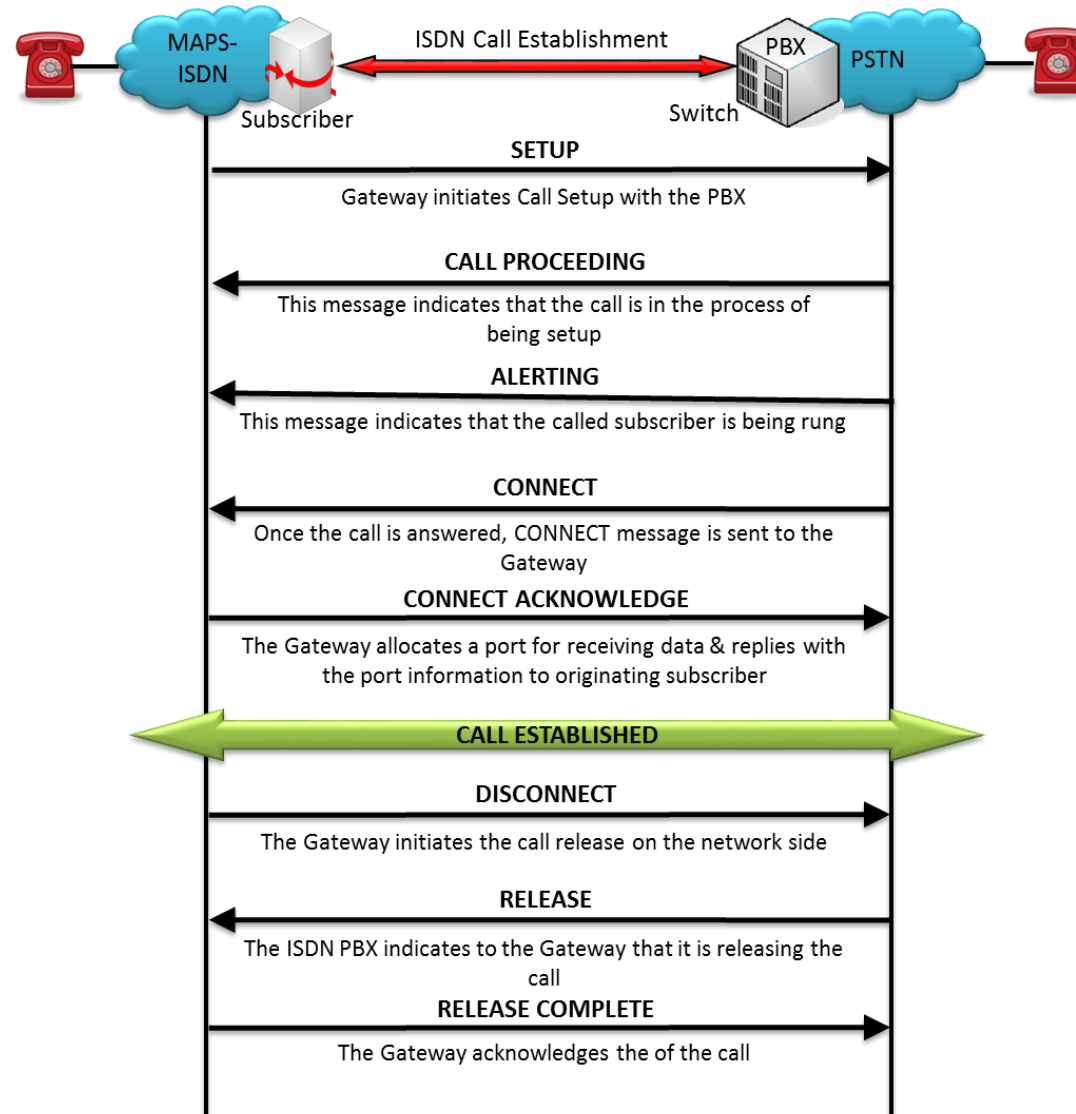
MAPS™ - ISDN as ISDN Switch



Scenario: MAPS™- ISDN acting as Switch

- MAPS™ - ISDN can be configured to act as Subscriber to generate ISDN messages
- Capable to test ISDN Switch by sending ISDN messages

Typical ISDN Call Flow



MAPS™ - ISDN Call Generation

Active Calls Completed Calls

Load Scripts →

Load Profiles →

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Events Profile	Result	Total Iterations	Completed Iterations
1	PlaceCall.gls	TS10.xml	10	Abort	Call Connected	Disconn...		Pass	1	0
2	PlaceCall.gls	TS1.xml	1	Abort	Call Connected	Disconn...		Pass	1	0
3	PlaceCall.gls	TS2.xml	2	Abort	Call Connected	Disconn...		Pass	1	0
4	PlaceCall.gls	TS3.xml	3	Abort	Call Connected	Disconn...		Pass	1	0
5	PlaceCall.gls	TS4.xml	4	Start	Call Released	None		Pass	1	1
6	PlaceCall.gls	TS5.xml	5	Abort	Call Connected	Disconn...		Pass	1	0
7	PlaceCall.gls	TS6.xml	6	Abort	Call Connected	Disconn...		Pass	1	0
8	PlaceCall.gls	TS7.xml	7	Abort	Call Connected	Disconn...		Pass	1	0
9	PlaceCall.gls	TS8.xml	8	Abort	Call Connected	Disconn...		Pass	1	0
10	PlaceCall.gls	TS9.xml	9	Start	Call Released	None		Pass	1	1

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

Message Sequence of a selected call

Selected ISDN Message Decodes

```

===== Q.93x Layer 3 Layer =====
Protocol Discriminator           = 000C
Call Reference Length           = ....
Call Reference Value            = 5 (.
Call Reference Flag             = 0...
Message Type                    = 000C
Bearer capability               =
IEI Bearer Capability           = 000C
IE Bearer Capability Length     = 3 (x
Information Transfer Capability = ...C
Coding Standard                 = .00.
Oct 3 Extension Bit (Oct 3)    = 1...
Information Transfer Rate      = ...1
Transfer Mode                   = .00.
Oct 4 Extension Bit (Oct 4)    = 1...
User Information Layer 1 Protocol Ident = .01.
    
```

MAPS™ - ISDN Call Reception

Active Calls Completed Calls

Call Reception

Sr No	Script Name	Call Info	Script Execution	Status	Events	Events Profile	Results
1	RecvCall.gls	10	Abort	Call Active	Disconnect...		Pass
2	RecvCall.gls	9	Abort	Call Active	Disconnect...		Pass
3	RecvCall.gls	8	Completed	Call Released	None		Pass
4	RecvCall.gls	7	Abort	Call Active	Disconnect...		Pass
5	RecvCall.gls	6	Abort	Call Active	Disconnect...		Pass
6	RecvCall.gls	5	Abort	Call Active	Disconnect...		Pass
7	RecvCall.gls	4	Abort	Call Active	Disconnect...		Pass
8	RecvCall.gls	3	Abort	Call Active	Disconnect...		Pass
9	RecvCall.gls	2	Completed	Call Released	None		Pass
10	RecvCall.gls	1	Abort	Call Active	Disconnect...		Pass

Abort Auto Trash Trash

MAPS DUT

```

      SETUP      ← 14:21:43.087000
      CALL PROCEEDING      → 14:21:43.087000
      ALERTING      → 14:21:43.087000
      CONNECT      → 14:21:53.103000
      CONNECT ACKNOWLEDGE      ← 14:21:53.447000
          
```

Scripts **Message Sequence** Event Config

===== Q.93x Layer 3 Layer =====

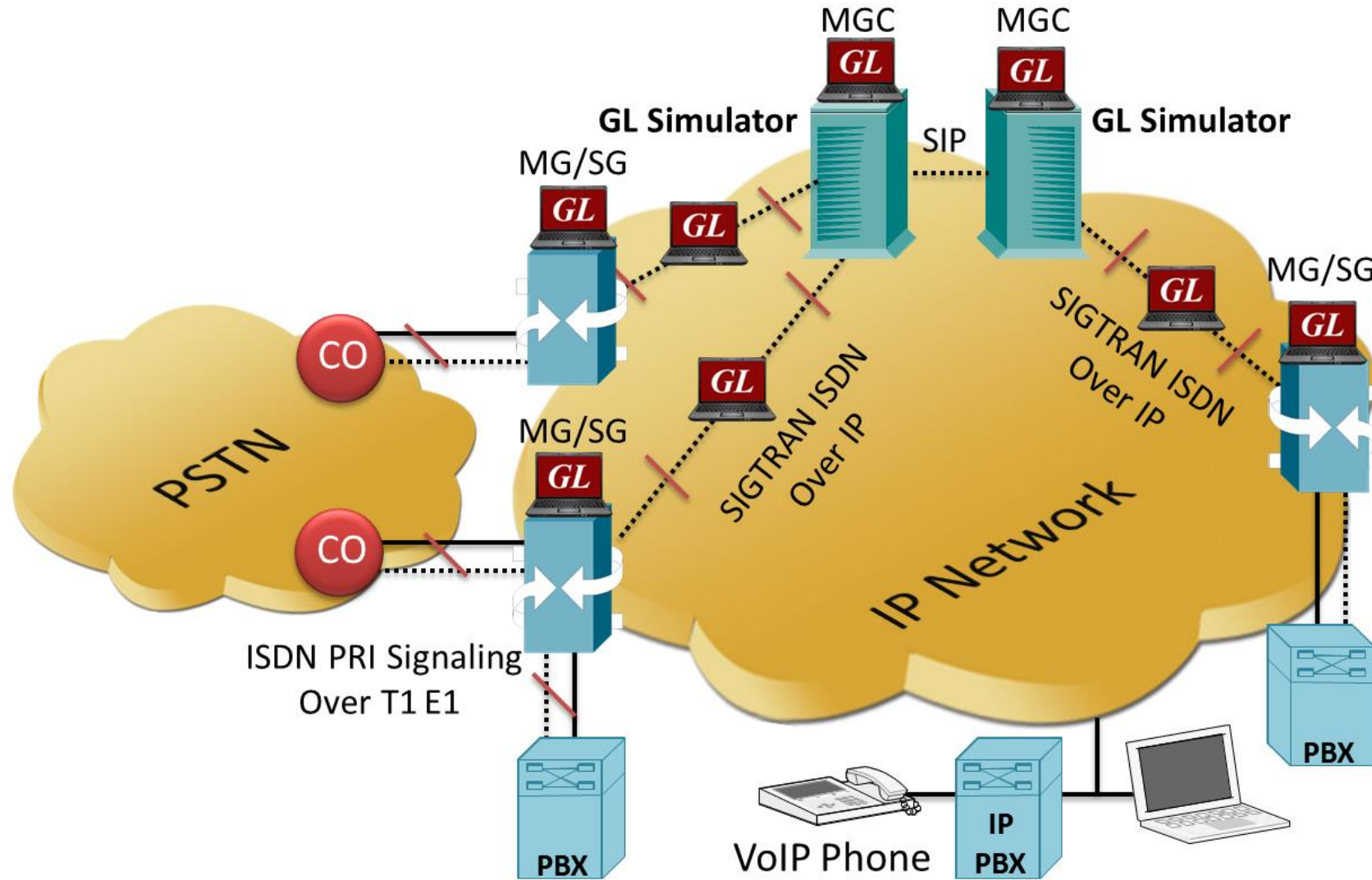
```

Protocol Discriminator
Call Reference Length
Call Reference Value
Call Reference Flag
Message Type
Bearer capability
IEI Bearer Capability
IE Bearer Capability Length
Information Transfer Capability
Coding Standard
Oct 3 Extension Bit (Oct 3)
Information Transfer Rate
Transfer Mode
          
```

Message Decodes of the selected ISDN message

High-Capacity ISDN SIGTRAN Emulation using MAPS™

MAPS™ ISDN - SIGTRAN (PKS135)



 **MAPS™ ISDN-SIGTRAN**
Simulate Elements in ISDN Network over IP

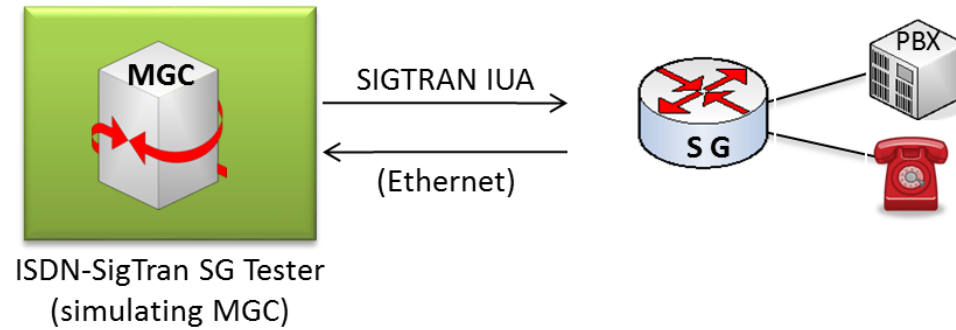
Key Features

- Simulates ISDN signalling over IP (ISDN-SIGTRAN)
- Generates and process all ISDN messages such as Setup, Connect, Release messages, and more
- Switch and Subscriber Emulation
- User controlled access to optional ISDN parameters such as timers
- Provides various release cause codes such as rejected, no user response, user busy, congested, and so on to troubleshoot the problems in ISDN
- Impairments can be applied to messages to simulate error conditions
- Supports scripted call generation and automated call reception

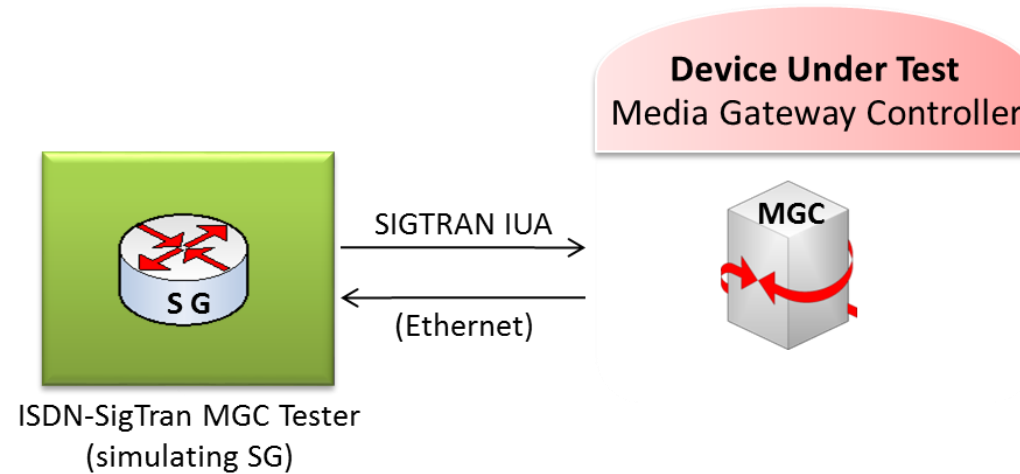
Supported Protocol Standards

Supported Protocols	Standard / Specification Used
ISDN SIGTRAN	
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)
IUA	RFC 4233 Integrated Services Digital Network (ISDN) Q.921-User Adaptation Layer

MAPS™ - ISDN SIGTRAN Configuration

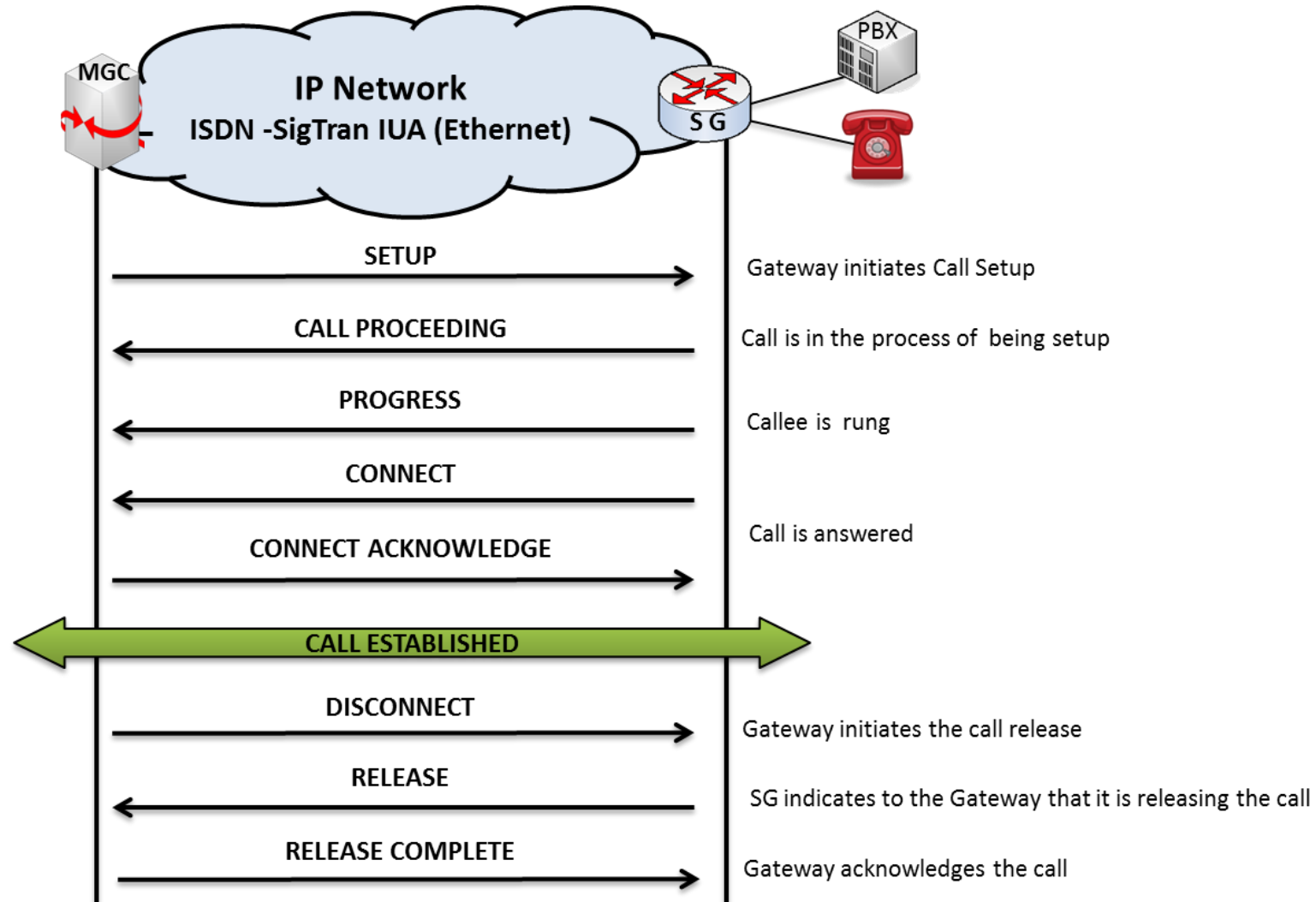


Scenario: MAPS™ acting as MGC



Scenario: MAPS™ acting as Signaling GW

Typical Call Scenario



Call Generation and Reception

The image displays two windows from a software application used for call generation and reception. The top window, titled "Call Generation - Untitled", shows a table of active calls and a script editor. The bottom window, titled "Call Reception", shows a table of completed calls, a message sequence diagram, and a detailed ISDN message decode.

Call Generation - Untitled

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Events Profile	Result	Total Iterations	Completed Iterations
1	PlaceCall.gs	SigPro1	1	Abort	Call Connected	Disconn.		Pass	Infinite	93

Script Contents:

```

KeyIdentifier:CN:
send "SETUP" "SETUP!aport" retxmit T303 (2,T303 msec);
State="Call Initiated" ;
EventLog ("Call Initiated");
Recvwaittime=8000 ;

"mainloop":
recv msg wait Recvwa
    
```

Call Reception

Sr No	Script Name	Call Info	Script Execution	Status	Events	Events Profile	Results
1	RecvCall.gs	1	Completed	Call Released	None		Pass
2	RecvCall.gs	1	Abort	Call Active	Disconnec.		Pass

Message Sequence of a selected call:

Direction	Message	Time
MAPS → DUT	SETUP	14.49.26.500000
DUT → MAPS	CALL PROCEEDING	14.49.26.515000
DUT → MAPS	ALERTING	14.49.26.515000
DUT → MAPS	CONNECT	14.49.34.078000
MAPS → DUT	CONNECT ACKNOWLEDGE	14.49.34.078000

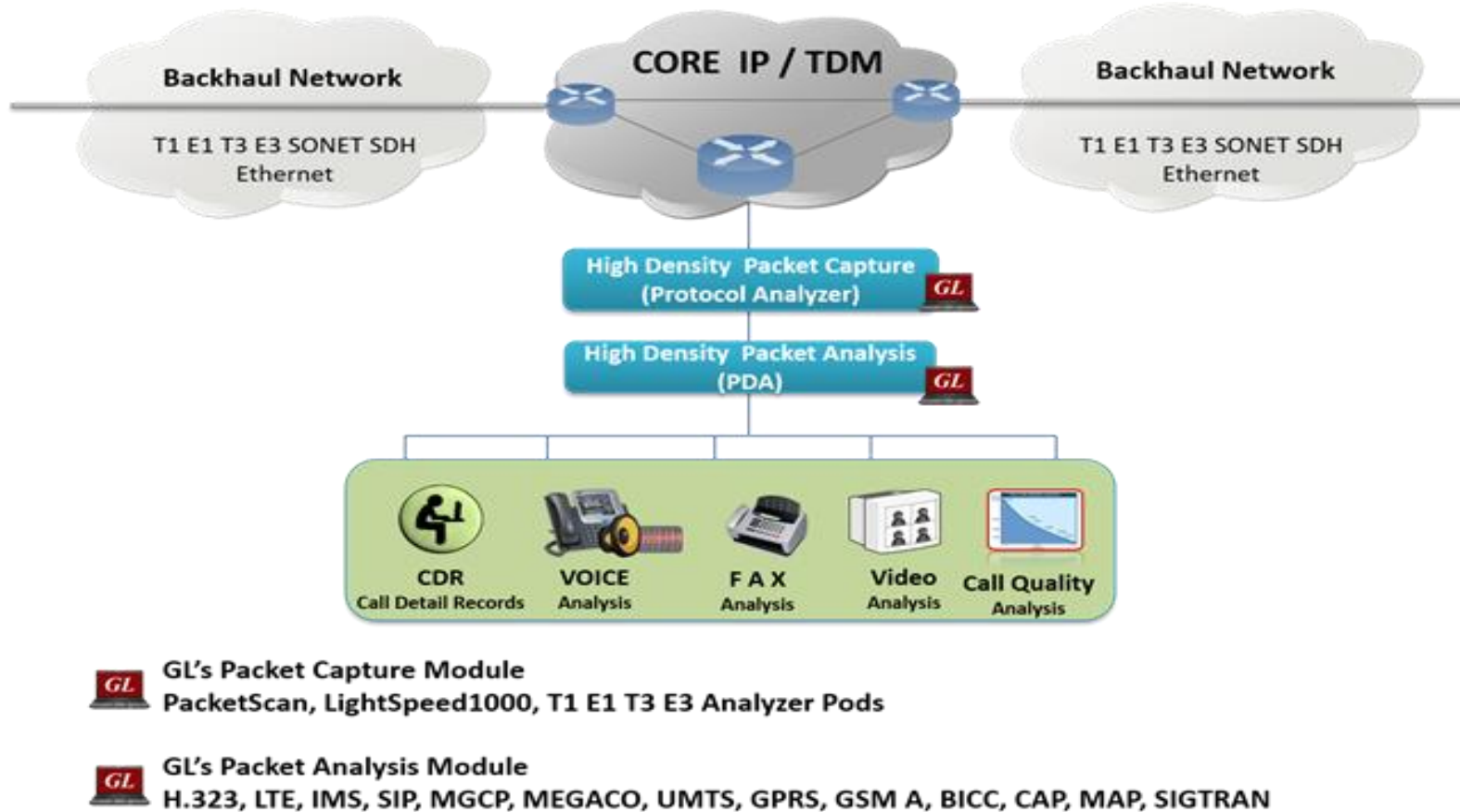
Message Decodes of the selected ISDN message:

```

***** ISDN Q.921-User Adaptation Layer Layer *****
Version                = 00000001 R
Message Class          = 00000101 Q
PTM Message Type      = 00000010 D
Message Length         = 68 (x00000)
Interface-Identifier Tag
Length                = 8 (x0008)
Interface Identifier (integer)
Length                = 0 (x000000)
DLCI Tag              = x0005 DLCI
Length                = 8 (x0008)
SAPI(Service Access Point Identifier)
TEI(Terminal Endpoint Identifier)
Protocol Data
    
```

ISDN Packet Data Analysis (PDA)

Packet Data Analyzer over TDM



- Monitors live TDM networks including capture, analysis, and reporting of every call-in detail. Supported protocols include CAS, ISDN, ISUP, CAMEL, MAP, INAP, and GSM

Main Features

<p>CDR, Call Flow, Statistics, and Report Generation</p>	<ul style="list-style-type: none"> • Isolates call specific information for each individual call from the captured data and displays the information in an organized fashion • A host of call and message counters gives the user an instantaneous snapshot of the traffic on the network • Pictorial representation of the statistics including ladder diagrams for the calls of various protocols • Ability to export and analyze call detail records of completed calls in CSV file format. • These reports can be further fed to DB and accessed using GL's NetSurveyorWeb™ Lite for analysis • Isolates calls, a graphical call flow diagram can be created from a call trace. • Filters on CDR information feature is used to search required calls by using "key" as CDR parameters • Event counters on CDR information provides over all count of completed events such as total calls, active calls, completed calls, purged calls, failed calls, calls per second, remaining calls and more • Flexible options are provided to interchange/hide the columns as required
<p>Traffic Recording</p>	<ul style="list-style-type: none"> • Supports capturing of voice, digits, tones and FAX etc to *.PCM file format
<p>Triggers and Actions</p>	<ul style="list-style-type: none"> • Filter captures based on protocol parameters such as OPC, DPC or CIC in case of ISUP followed by a set of actions such as save call, send mail, trigger alarm notification etc for the completed calls
<p>Exporting Calls</p>	<ul style="list-style-type: none"> • Supports saving the selected calls from traffic analyzer into *.HDL, *.PCAP, or *.PCAPNG formats

ISDN Data Link Group

ISDN Data Link Group

File

Device Selection

East 1 West 2

NFAS

Interface ID 1 Pri-D East 1 Pri-D West 2

East	West	NFAS	Interface ID	Pri-D East	Pri-D West
1	2	Enabled	0	1	2
3	4	Enabled	1	1	2
5	6	Enabled	0	5	6
7	8	Enabled	1	5	6

Add

Delete

Delete All

Close

Traffic Recording Configurations

Traffic Recording Configuration ✕

File

Traffic Recording

Recording (Non Segmented)

Directory

Record Duration sec {0 to Record Entire Call Duration}

Include Absolute Path in CDR

Segmented Recording

Directory

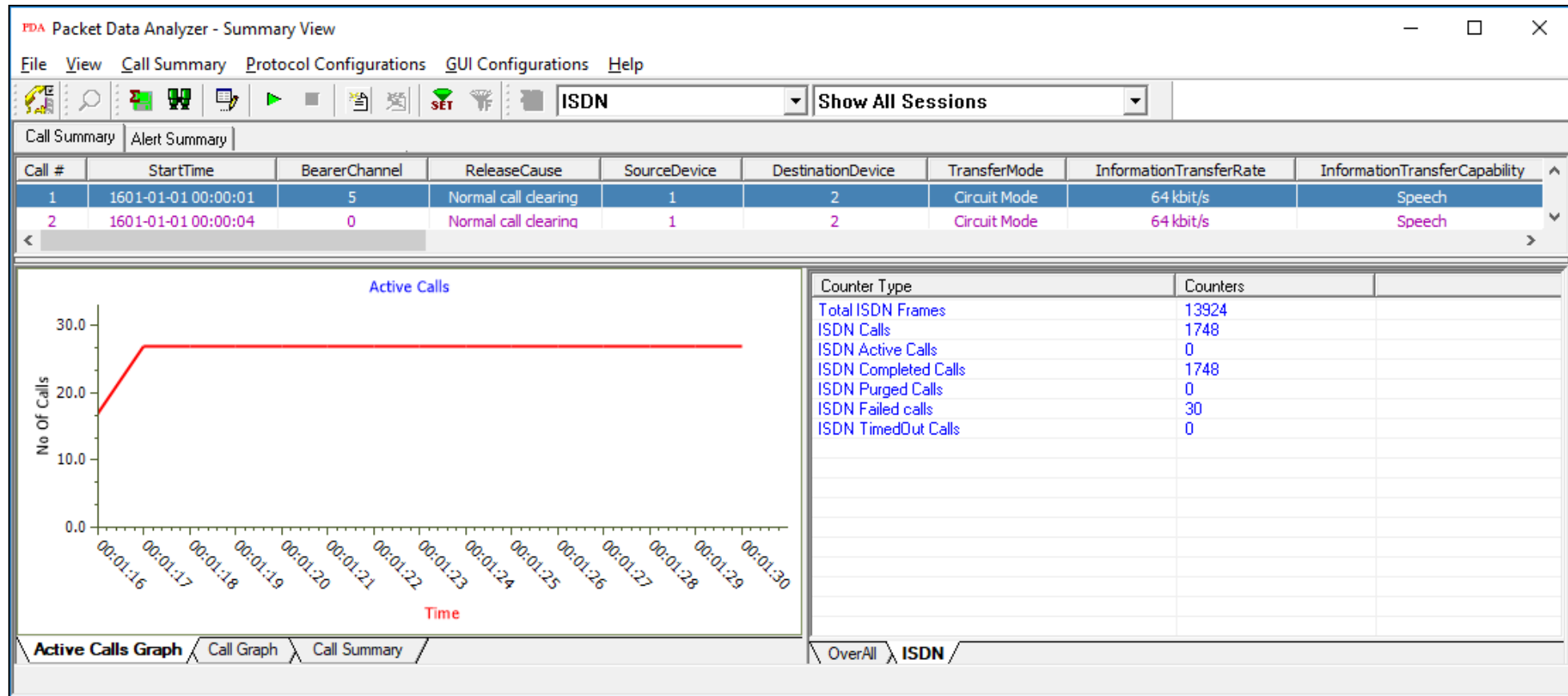
No. of Segments Segment Length sec

Max Simultaneous Recordings

Create Subfolder Every min

ISDN Call Summary

Active Call Graph



Summary View

Packet Data Analyzer - Summary View

File View Call Summary GUI Configurations Help

ISDN Show All Calls

Call #	StartTime	Caller	Callee	CallReference	SourcePort	DestinationPort	TimeSlot	BearerChannel	InterfaceType	InterfaceId	Result	ReleaseCause	Duration	BillingTime(mSec)
1	2019-03-04 16:36:24.426	8556782101	7685612901	2	1	2	16	1	Primary Rate Interface	0	Pass	Normal call clearing	00:01:01.489	60178
2	2019-03-04 16:36:24.436	8556782102	7685612902	3	1	2	16	2	Primary Rate Interface	0	Pass	Normal call clearing	00:01:01.481	60175
3	2019-03-04 16:36:24.443	8556782103	7685612903	4	1	2	16	3	Primary Rate Interface	0	Pass	Normal call clearing	00:01:01.476	60172
4	2019-03-04 16:36:24.450	8556782104	7685612904	5	1	2	16	4	Primary Rate Interface	0	Pass	Normal call clearing	00:01:01.487	60185
5	2019-03-04 16:36:24.458	8556782105	7685612905	6	1	2	16	5	Primary Rate Interface	0	Pass	Normal call clearing	00:01:01.489	60179
6	2019-03-04 16:36:24.465	8556782106	7685612906	7	1	2	16	6	Primary Rate Interface	0	Pass	Normal call clearing	00:01:01.484	60176

Column Width

TimeStamp	Frame Number	1	2
00.00.000	8	1:16	2:16
00.00.986	19	1:16	2:16
00.00.989	20	1:16	2:16
00.00.990	21	1:16	2:16
00.01.153	40	1:16	2:16
01.01.168	66	1:16	2:16
01.01.325	73	1:16	2:16
01.01.489	81	1:16	2:16

Find

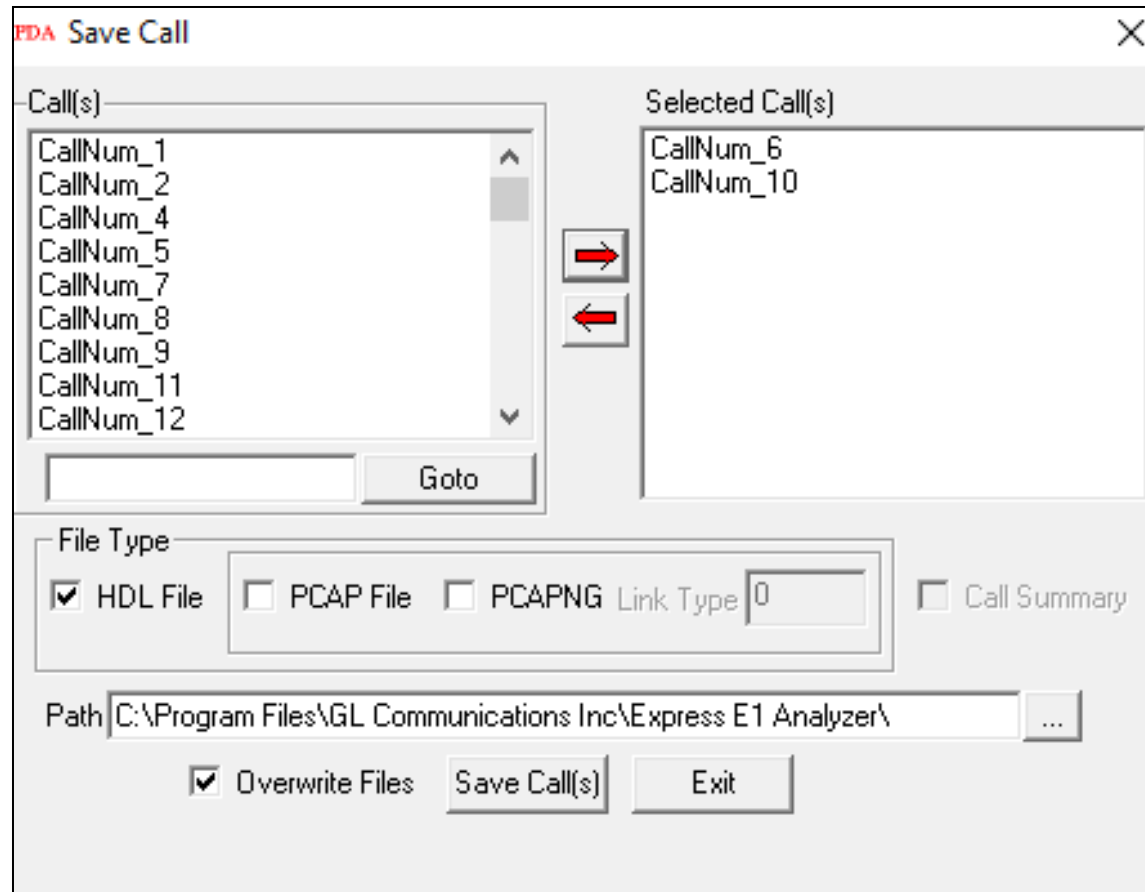
```

===== LAPD Layer =====
C/R = .....0.. Command(User) Response(Network)
SAPI = 000000.. (0)
TEI = 00000000.. (0)
CtI = .....0 Information
N(S) = 00000000.. (0)
P = .....0 (0)
N(R) = 00000000.. (0)
===== Q.93x Layer =====
Protocol Discriminator = 00001000 Q931/I.461 user-network call cont
Call Reference Length = ....0010 (2)
Call Reference Value = 2 (.00000000 00000010)
Call Reference Flag = 0..... FROM side that originated callre:
Message Type = 00000101 SETUP
IEI Bearer Capability = 00000100 Bearer Capability IE Identifier
IE Bearer Capability Length = 3 (x03)
Information Transfer Capability = ...00000 Speech
Coding Standard = .00..... ITU_T (CCITT) standardized codin:
Information Transfer Rate = ...10000 64 kbit/s
Transfer Mode = .00..... Circuit Mode
User Information Layer 1 Protocol (LLC) = ...00011 A-law Rec G.711
User Information Layer 1 Protocol Ident = .01..... (1)
IEI Channel Identification = 00011000 Channel Identification IE Ident:
IE Channel Identification Length = 3 (x03)
    
```

Active Calls Graph Call Graph Call Summary

Triggers and Action Settings

Save Call to File



- Allows the users to save the filtered files either in *.HDL, *.PCAP, or *.PCAPNG format

Audio Recording

Action

- Save Call
- Audio Recording
- User Defined
- Send e-mail
- Alert Summary
- Call Detail Record
- Extract Fax Image

Audio Recording Options

Audio File Name Mask

Audio Files Destination Directory
 ...

Audio Mixing Options

Mix Stereo To Separate Wave File

Create File Options -- If File Exists

Overwrite Skip Operation Append Sequence Number

- Allows to save the filtered files as the voice files in *.wav format

Send e-mail

The screenshot shows a configuration window for the 'Send e-mail' feature. On the left, under the 'Action' header, there is a list of options with checkboxes: 'Save Call', 'Audio Recording', 'User Defined', 'Send e-mail', 'Alert Summary', 'Call Detail Record', and 'Extract Fax Image'. The 'Send e-mail' option is checked. The main area of the window is divided into three sections:

- Audio Recording Options:** Includes a text field for 'Audio File Name Mask' containing the pattern `%I_%Y_%M_%D_%h-%m-%s.wav` and a text field for 'Audio Files Destination Directory' containing `\GL Communications Inc\` with a browse button (...).
- Audio Mixing Options:** Contains three radio buttons: 'Mix' (selected), 'Stereo', and 'To Separate Wave File'.
- Create File Options -- If File Exists:** Contains three radio buttons: 'Overwrite' (selected), 'Skip Operation', and 'Append Sequence Number'.

- With this option, the Packet Data Analyzer sends an e-mail containing useful information about each filtered call

Alert Summary

Action

<input checked="" type="checkbox"/> Save Call	Alarm Type	Warning
<input type="checkbox"/> Audio Recording		
<input type="checkbox"/> User Defined	Alarm Message	Triggers at the specified value
<input type="checkbox"/> Send e-mail		
<input checked="" type="checkbox"/> Alert Summary		
<input type="checkbox"/> Call Detail Record		
<input type="checkbox"/> Extract Fax Image		

- With this option, the user can set the alarm type and alarm message for the selected triggering type

Call Detail Record (CDR)

Action

- Save Call
- Audio Recording
- User Defined
- Send e-mail
- Alert Summary
- Call Detail Record
- Extract Fax Image

Call Side Record Probe Name

Call Master Record

Call Events Record

CSV Files Destination Directory

...

Use Sub Folders

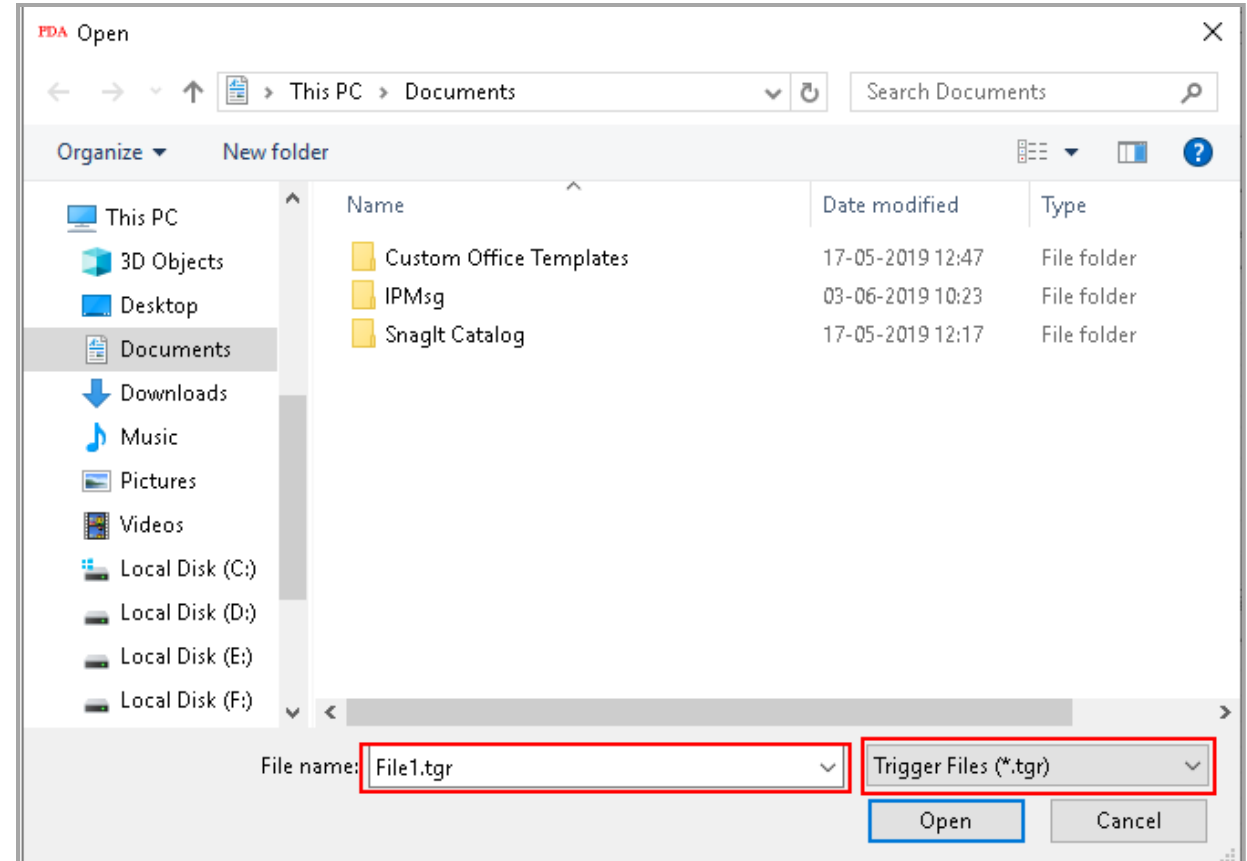
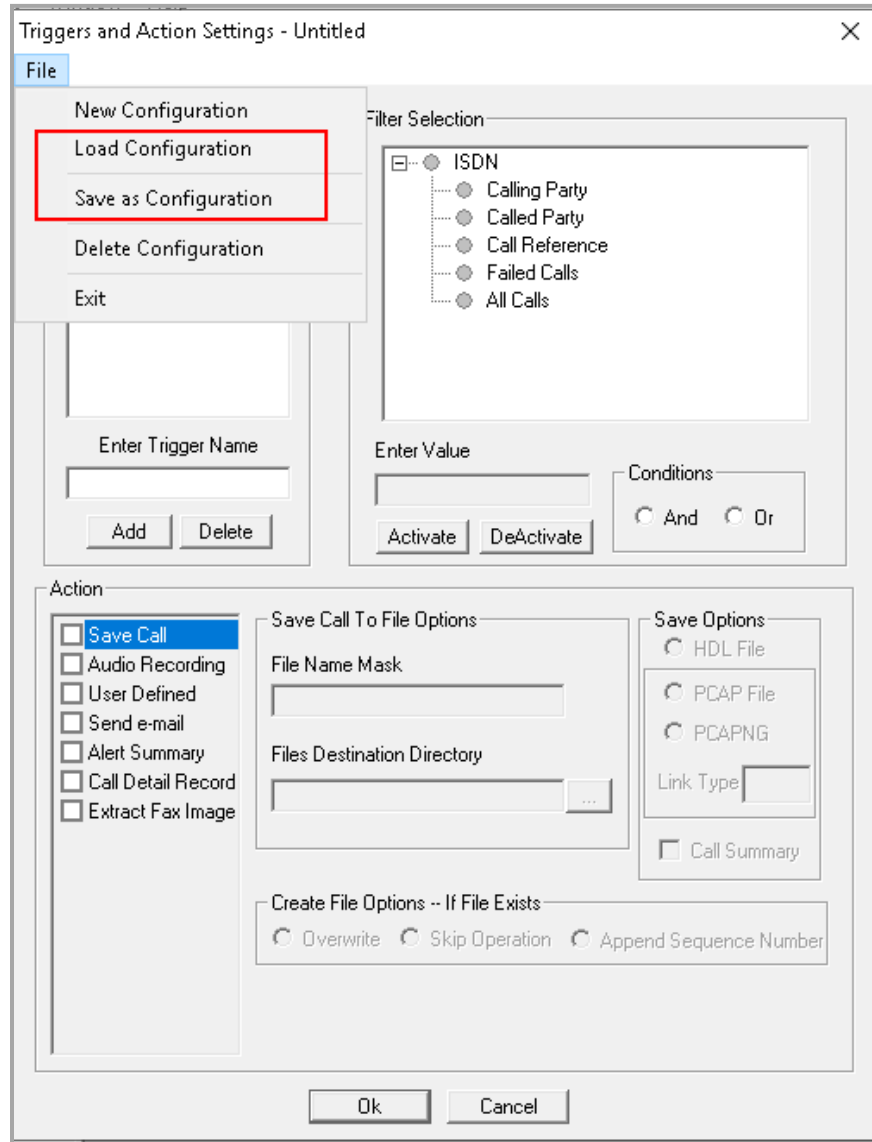
Folder Prefix Create Subfolder Every hr

Create File Options -- If File Exists

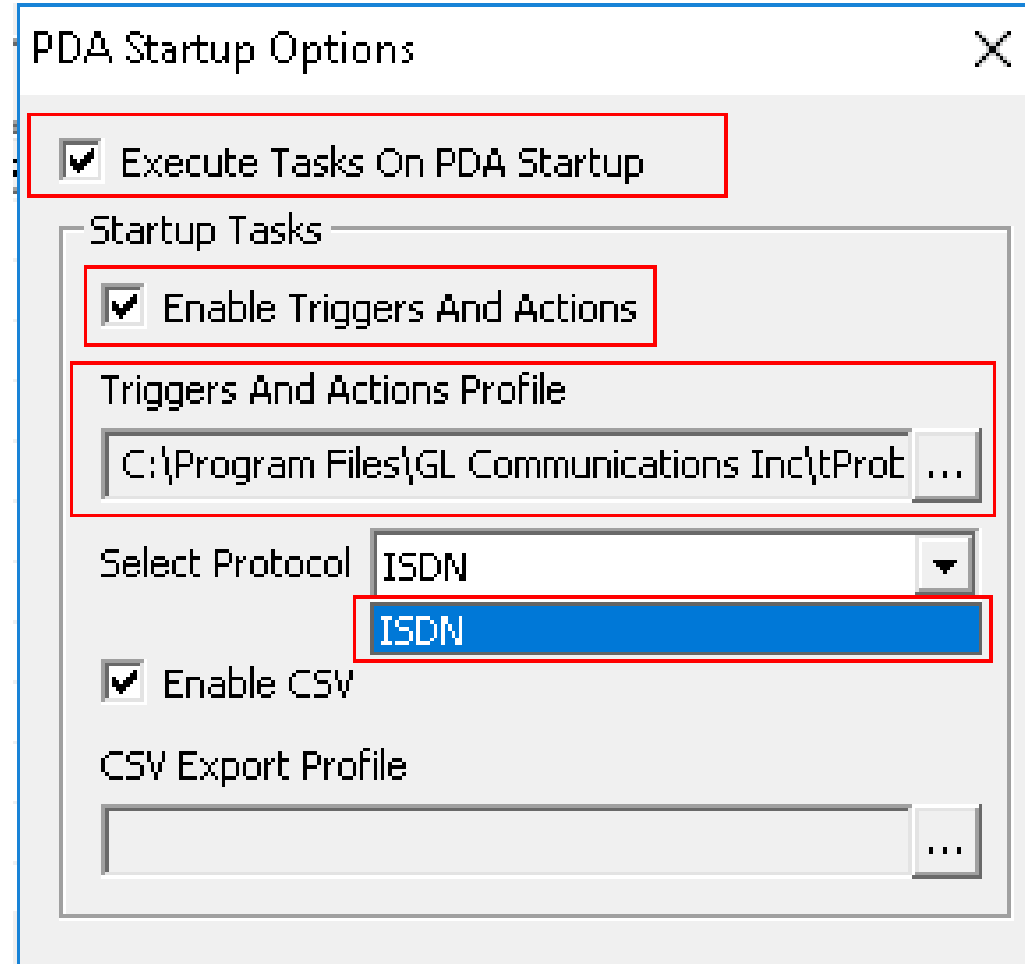
Overwrite Skip Operation Append Sequence Number

- With this option, the Packet Data Analyzer can output call detail records (CDR) in the form of three Comma Separated Value (CSV) files such as Call Side Record, Call Master Record, and Call Events

Load or Save Configurations



PDA Start-up Options



- Allows user to configure start-up tasks which will be started automatically whenever PDA is launched
- Loads the selected Triggers and Actions profile while invoking PDA

Thank you