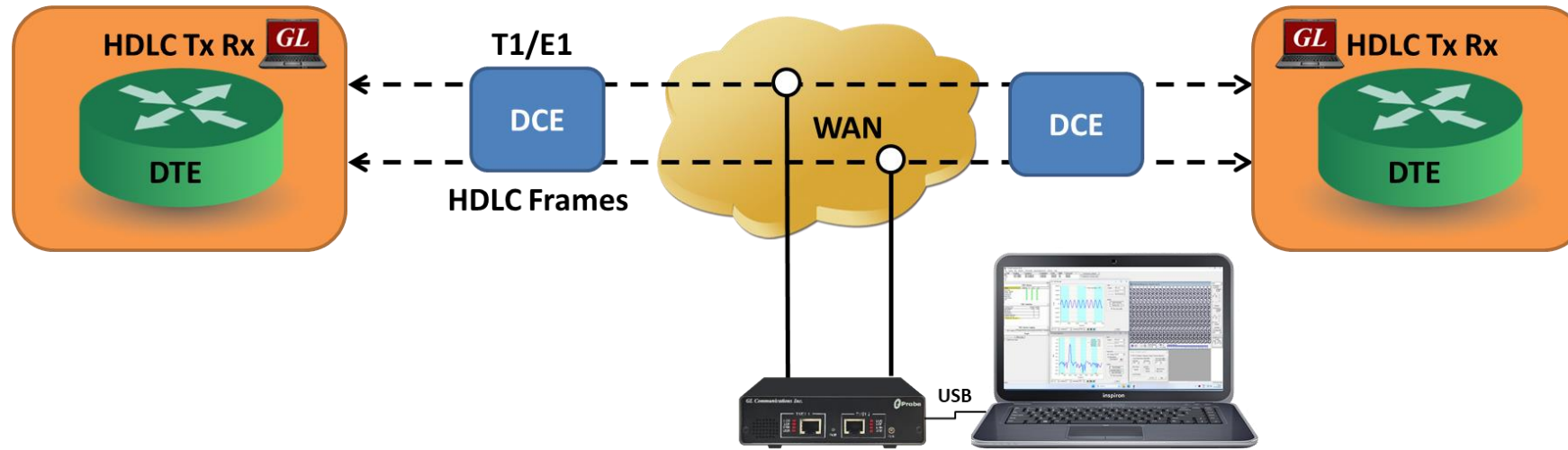

HDLC Analysis and Emulation



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Website: <https://www.gl.com>

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GL's HDLC Analysis and Emulation

- HDLC Analysis
- HDLC Playback
- HDLC Real-time and Offline Analyzer
- HDLC Impairment Utility
- HDLC Tx/Rx Test Application
- HDLC Tx/Rx Using Client Server

HDLC Analysis and Simulation

What is HDLC?

High Level Data Link Control is a protocol, which operates at the data link layer. The HDLC protocol embeds information in a data frame that allows devices to control data flow and correct errors.

Frame Structure:

HDLC data is formatted into frames. A frame of data is encapsulated by flags. The beginning and end of an HDLC frame are marked by flag characters.



Platforms



Front Panel

Back Panel

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

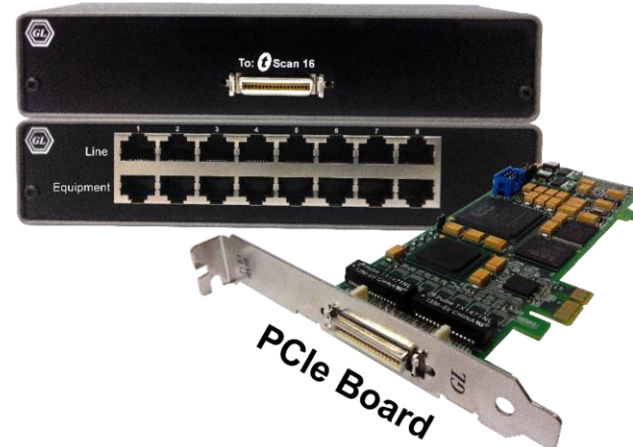


Quad / Octal T1 E1 PCIe Card



Dual T1 E1 Express (PCIe) Board

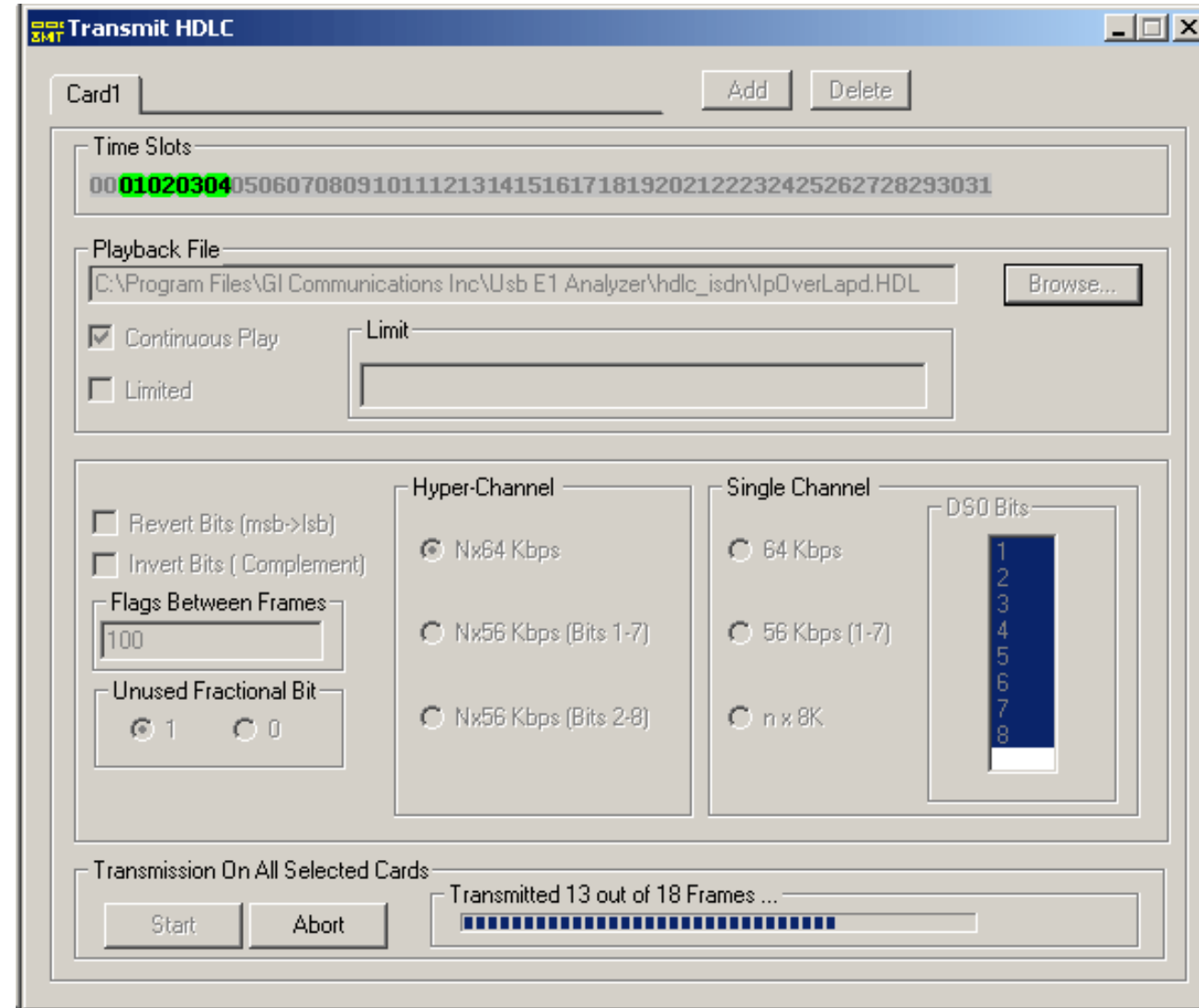
**tScan16™ with
16-port T1 E1 Breakout Box**



PCIe Board

HDLC Playback

- Transmits HDLC frames in the pre-recorded files over T1/E1 channels
- Provides the option to reverse or inverse bits in the selected data during transmission



HDLC Playback (Contd.)

- Frames can be transmitted on selected time slots (contiguous or non-contiguous), sub-channels or full bandwidth

The dialog box is titled "Select Card and Timeslot for Transmission" and contains two main sections: "Card Number" and "Time Slots".

Card Number: A list box showing two options: "1" (selected) and "2".

Time Slots: A list box showing slots from 00 to 18. Slots 00 through 08 are highlighted in blue, indicating they are selected. Slots 09 through 18 are in a greyed-out state. A scroll bar is visible on the right side of the list.

Buttons: "All Time Slots", "No Time Slots", "OK", and "Cancel".

Instructions: "Hold Ctrl or Shift key to make extended time slot selection" and "Select multiple timeslots only for n x 64 Kbps".

HDLC Tx / Rx Test

- The HDLC Automated Test System consists of two applications:
 - HDLC Tx Application
 - HDLC Rx Application
- Both applications can function real-time and offline

HDLC Tx Test

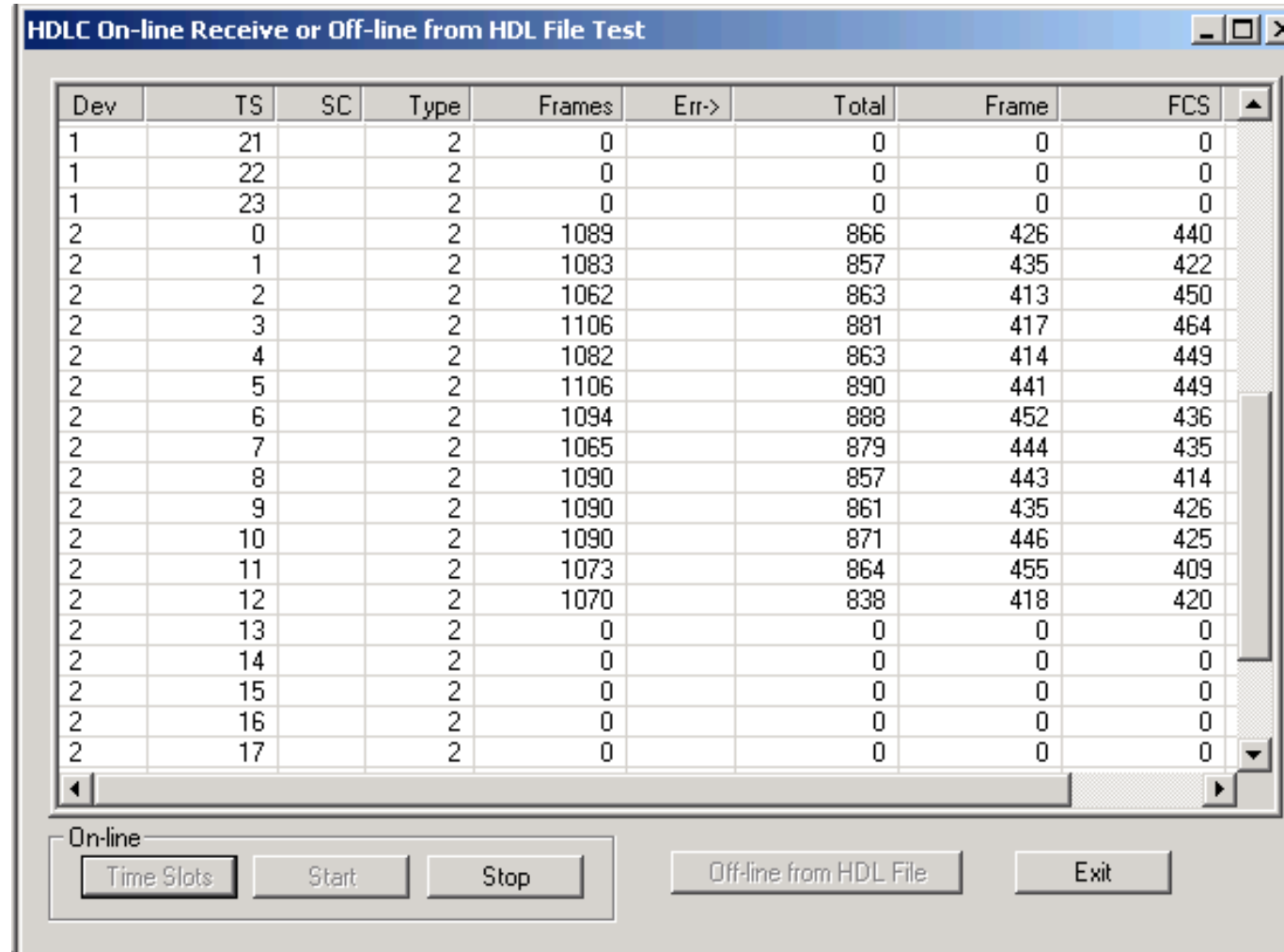
- Generates HDLC test frames, and transmits them over T1/E1 or records them to an HDLC file for subsequent use with other applications

The screenshot shows the 'HDLC On-line Transmit or Off-line to HDL File Test' window. The 'Generated Frame Length' section has three radio buttons: '2 Octets', '6 Octets' (selected), and '7-8000 Octets'. A 'Maximum Length' text box contains the value '256'. Below this is a list of 'Time Slots' containing the sequence '0001020304050607080910111213141516171819202122232425262728293031'. The 'Output HDL File to Save Frames to' section has a text box and a 'Browse...' button. Below this are checkboxes for 'Continuous Play' (unchecked) and 'Limited' (unchecked), with a 'Limit' text box. A 'Create HDL Test File' button is present. The 'Channel bandwidth' section has three radio buttons: '64 Kbps', '56 Kbps', and 'n x 64 Kb' (selected). The 'Subchannels' section has a vertical list with values 1 through 5. The 'Flags Between Frames' text box contains the value '100'. At the bottom, the 'Transmission On All Selected Cards' section has 'Start' and 'Stop' buttons and a progress bar.

The screenshot shows the same 'HDLC On-line Transmit or Off-line to HDL File Test' window, but with the 'Card1' and 'Card2' tabs selected. The 'Time Slots' list now highlights the sequence '000102030405060708091011121314151617' in green. The 'Continuous Play' checkbox is now checked. The 'Channel bandwidth' and 'Subchannels' sections remain the same as in the left screenshot.

HDLC Rx Test

- Receive frames in real-time over T1/E1 or can verify an off-line HDL file for correct frame order and data integrity



HDLC On-line Receive or Off-line from HDL File Test

Dev	TS	SC	Type	Frames	Err->	Total	Frame	FCS
1	21		2	0		0	0	0
1	22		2	0		0	0	0
1	23		2	0		0	0	0
2	0		2	1089		866	426	440
2	1		2	1083		857	435	422
2	2		2	1062		863	413	450
2	3		2	1106		881	417	464
2	4		2	1082		863	414	449
2	5		2	1106		890	441	449
2	6		2	1094		888	452	436
2	7		2	1065		879	444	435
2	8		2	1090		857	443	414
2	9		2	1090		861	435	426
2	10		2	1090		871	446	425
2	11		2	1073		864	455	409
2	12		2	1070		838	418	420
2	13		2	0		0	0	0
2	14		2	0		0	0	0
2	15		2	0		0	0	0
2	16		2	0		0	0	0
2	17		2	0		0	0	0

On-line

Time Slots Start Stop

Off-line from HDL File

Exit

HDLC Link Impairment Utility (HLIU)

- Verifies the proper working of HDLC protocols by simulating various scenarios taking place in a real-time network
- The HLIU application has the following features:
 - Logic Error insertion
 - CRC Error insertion
 - Drop a Frame
 - Change Frame Order
 - Duplicate a Frame
 - Insert a Frame
 - Delay a Frame

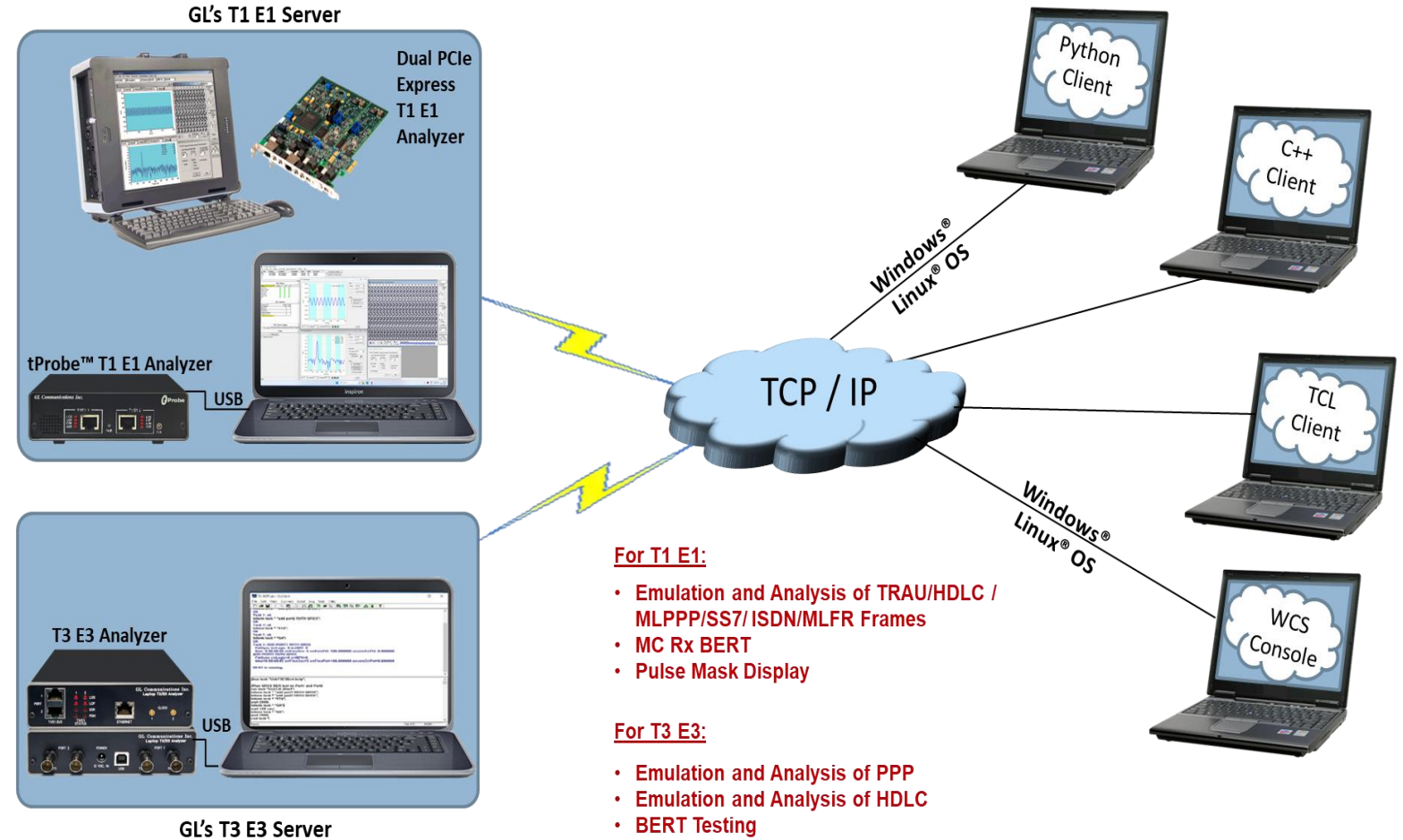
The screenshot shows the HDLC Impairment Utility (HLIU) application window. It is divided into several sections:

- Source Section:** Includes a 'Device Selection' dropdown menu set to 'Card 1' and a 'Hyper Channel Selection' table. The table has 4 rows and 8 columns, with the first column highlighted. To the right are radio buttons for '64 kbps' (selected) and '56 kbps'.
- Frame Manipulation Buttons:** A vertical stack of buttons: 'CRC Error', 'Logic Error', 'Drop Frame', 'Change Order', 'Duplicate', 'Delay Frame', and 'Insert/Abort'.
- Frame Insertion Section:** Includes an 'Insert Frame' button, a 'Tx CRC' checkbox (unchecked), a 'Define Frame' button, and a 'Selected Frame: None' label.
- Delay Setting:** A 'Delay Frame' button followed by a text input field containing '0' and the unit 'mSec'.
- Destination Section:** Similar to the Source section, with a 'Device Selection' dropdown set to 'Card 2' and a 'Hyper Channel Selection' table. It also has radio buttons for '64 kbps' (selected) and '56 kbps'.
- Bottom Section:** Contains 'START' and 'Close' buttons.

HDLC Emulation using Windows Client Server

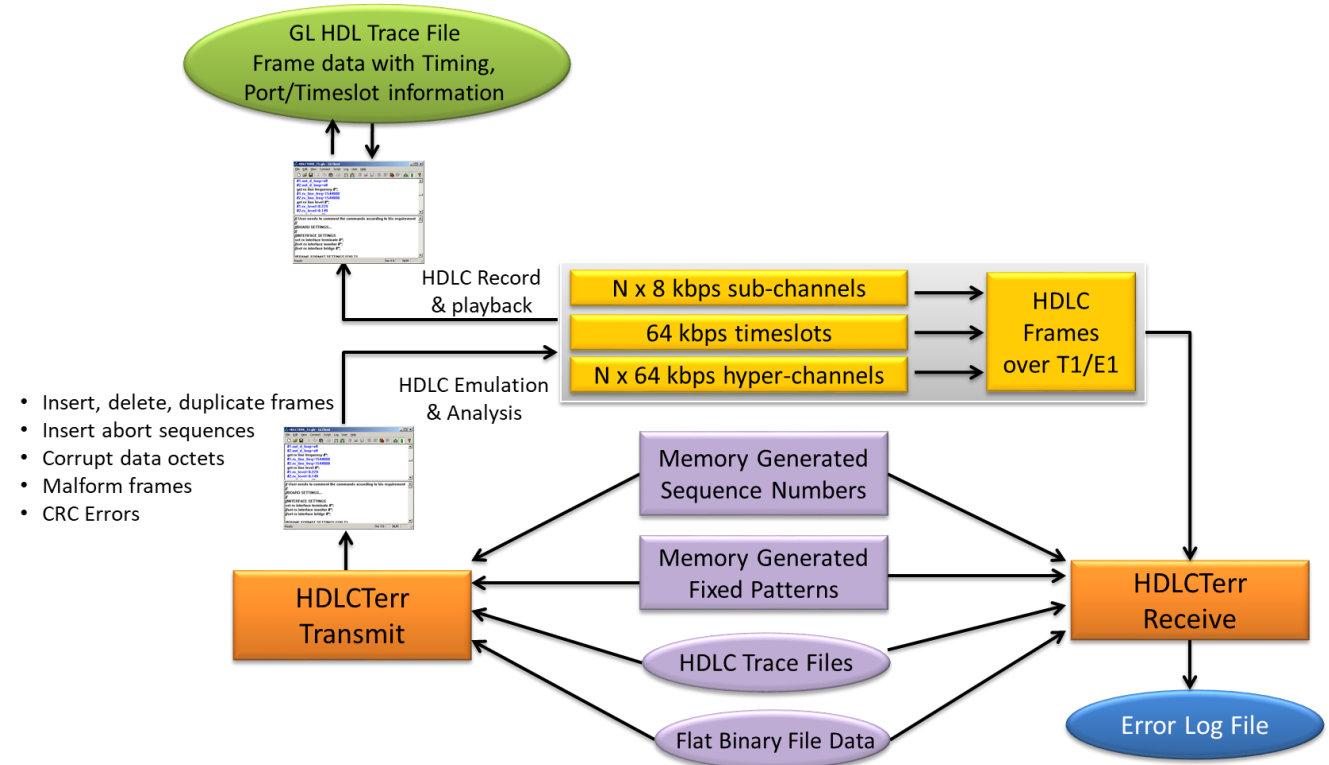
Modules

- Tx/Rx of Files and digits
- w/ CAS Simulator and Traffic Classifier
- DSP Operations
- Emulation & Analysis of TRAU / HDLC / MLPPP/ SS7 / ISDN /MLFR Frames
- FDL / SA Bits Encode/Decode
- MC Rx BERT
- Pulse Mask Display



HDLC Emulation using Windows Client Server (Contd.)

- WCS module XX634 - Multi-Channel HDLC Emulation and Analysis & File based High Throughput HDLC Record/Playback
 - Offers high throughput file-based HDLC record and playback (support for various bandwidth over multiple links and option to speed up /slow down the transmission)
 - Performs multi-channel HDLC emulation and analysis
- WCS module XX640, XX641 - File based HDLC Record/Playback & Remote Record/Playback
 - Allows transmission/reception of *.HDL frames files located on the server and on client



Remote operation	✓
Automation	✓
Multi-site connectivity	✓
Simultaneous testing of high capacity T1/E1 systems through a single Client	✓
Integration of T1/E1 testing into more complex testing systems	✓
Intrusive / Non-Intrusive T1/E1 Testing	✓

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

Impairments

- Various impairments can be introduced before frames are transmitted. Global impairments (effective for all the HDL streams) can be specified as well as impairments can be introduced per stream basis before frame transmission
- One can specify a limited number of impairments, set continuous impairment in each frame, or apply impairment to each Nth frame leaving some frames intact
- The following types of Impairments can affect an entire HDL frame:
 - Frame deletion
 - Frame insertion
 - Frame duplication

Impairments (Contd.)

- Impairments can also modify some octets in a frame at a certain offset and these include:
 - Inserting octets
 - Deleting octets
 - Bitwise ANDing octets
 - Bitwise Oring octets
 - Bitwise XORing octets
 - In addition, the following frame structure impairments can be introduced:
 - CRC (FCS) errors
 - Frame errors (non-integral number of octets between flags)
 - Abort sequences

Sample Script performing HDLC Record / Playback

```
hdlc_TxRx.gls - GLClient
File Edit View Connect Script Log User Help

get latency;
latency = 3.0
run task "HdlcFuncE1:TxServerFile" using " 'hdlc_isdn\dccoss.hdl' 700 FLAGS
100" #1:1..3;
Task 1: Task 1 started
Task 1: Task 1 terminated
run task "HdlcFuncE1:RxServerFile" using " 'hdlc_
10000" #2:1..3;
Task 2: Task 2 started

run task "HdlcFuncE1:TxServerFile" using " 'hdlc_
100" #1:1..3;

//receive on the server into file hdlc_isdn\test_rx.1
space for the file) up to 10000 frames on 1..3 time

run task "HdlcFuncE1:RxServerFile" using " 'hdlc_
10000" #2:1..3;

Ready
```

HDLC Protocol Analysis LAPD													
File View Capture Statistics Database Configure Help													
Dev	TS...	Su...	Frame#	TIME (Relative)	Len	E..	C/R	SAPI	TEI	CTL	P/F	N(S)	N(R)
✓ 2	3		73	00:00:00.135...	2		Response(User), Comm...	0	43				
✓ 2	1		74	00:00:00.136...	2		Command(User), Respo...	0	75				
✓ 2	2		75	00:00:00.136...	2		Command(User), Respo...	0	80				
✓ 2	3		76	00:00:00.140...	2		Command(User), Respo...	0	3				
✓ 2	2		77	00:00:00.144...	16		Response(User), Comm...	0	54	Inform...	0	3	2

Card2 TimeSlot=3 Frame=73 at 00:00:00.135875 OK Len=2
HDLC Frame Data + FCS
===== LAPD Layer =====
C/R =1. Response(User), Command(Network)
SAPI = 000000.. (0)
TEI = 0101011. (43)

Hex Dump of the Frame Data
+-----+-----+-----+-----+-----+-----+-----+-----+
02 57 W

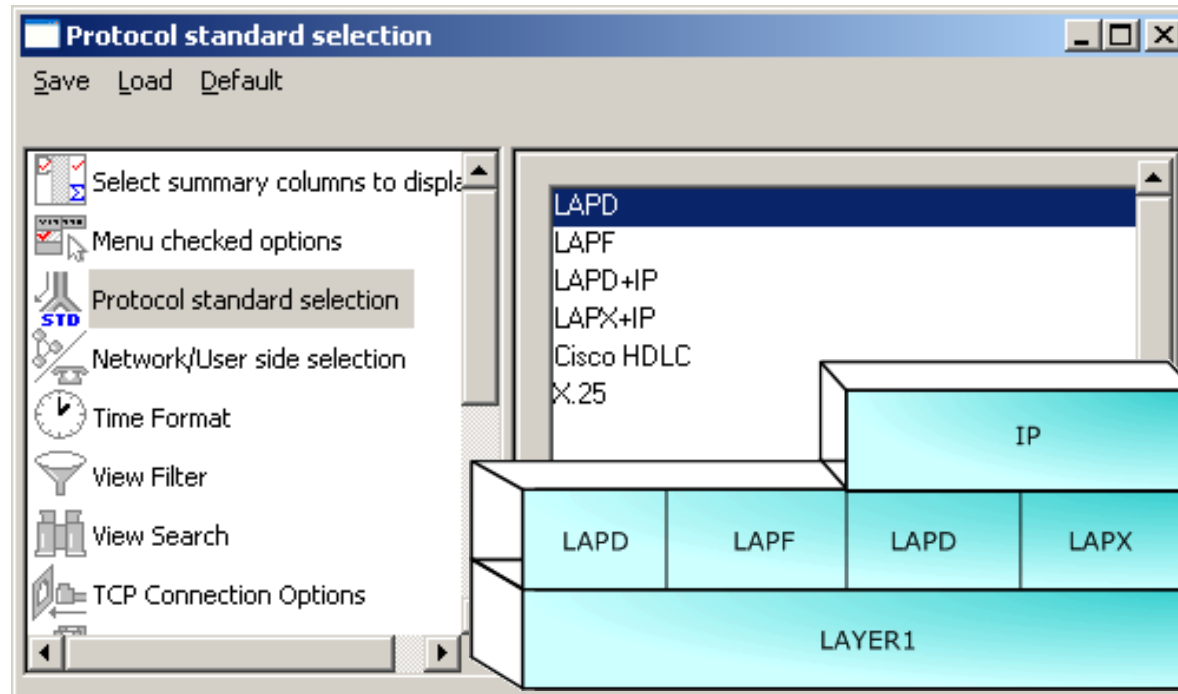
Running. Utilization 0.12% C:\Temp.Hdl Captured 1838 frames Errors 0 CRC, 704 Frame

HDLC Analysis

- Perform real-time / offline / remote analysis
- Consolidated GUI – Summary of all decodes, detail & hex-dump views of each frame, statistics view, & call detail record views
- Multiple streams of HDLC traffic on various T1/E1 channels can be simultaneously decoded with different GUI instances
- Captured frames can later be used for traffic simulation using HDLC Transmit / Receive / Playback application
- Remote monitoring capability using GL's Network Surveillance System
- Fine tune results with filtering and search capability
- Trace File Saving Options
- Extensive statistics measurement ability
- Remote-access capability

Supported Protocols

- The HDLC analyzer supports the following type of protocols:
 - LAPD - ITU Q.921
 - LAPF - ITU Q.922
 - LAPD+IP - ITU Q.921 & Layer 3 as Internet Protocol (IP)
 - LAPX+IP
 - Cisco HDLC (cHDLC)
 - X.25, LAPB - ITU-T Recommendation X.25



HDLC Analysis

The screenshot displays the HDLC Protocol Analysis LAPD 64-bit software interface. The top menu bar includes File, View, Capture, Statistics, Database, Configure, and Help. Below the menu is a toolbar with various icons for file operations, capture, and analysis. The main window is divided into four sections, each with a red arrow pointing to a label on the right:

- Summary View:** A table showing captured frames. The columns are Dev, TSlot, SubCh, Frame#, TIME (Relative), Len, Error, Modifier Function LAPD, Supervisory Function LAPD, SAPI LAPD, and TEI LAPD. The first four frames are highlighted in blue.
- Detail View:** A text-based representation of the HDLC frame data. It shows the LAPD Layer structure with fields like C/R, SAPI, TEI, Ctl, and Supervisory Function, each with its corresponding value and a description.
- Hex Dump View:** A hex dump of the frame data, showing the raw bytes (00 01 01 51 D6 FC) and their ASCII representation (Q0u).
- Statistics View:** A table showing the frame count for each device. The columns are Device # and Frame Count(Device #). The data shows that device 1 and device 2 each have 13973 frames.

The status bar at the bottom indicates the file path: C:\Program Files\GL Communications Inc\U:\ 27 946 Frames.

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

Real-time Analysis

- Streams can be captured on the selected time slots (contiguous or non-contiguous), sub-channels (fractional DS0 to DS1), Hyper-channels($n \times 64$ kbps, or $n \times 56$ kbps), or Full bandwidth (56kbps, or 64kbps)
- 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
- 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

The screenshot shows a 'Port and Time Slot Selection' dialog box. It features a table with two columns, '1' and '2', listing time slots from 00 to 14. Slots 01, 02, and 03 are highlighted in blue. Below the table are three sections: 'User (unchecked) / Network (checked)' with a checked checkbox; 'Bit Inversion (1 <-> 0)' with a checked checkbox; and 'Octet Bit Reversion (MSB <-> LSB)' with a checked checkbox. The 'Data Transmission Rate' section has 'Single Channel' selected with radio buttons for 64 kbps and 56 kbps. The 'Hyper-Channel' section has radio buttons for Nx64 kbps, Nx56 Kbps (bits 1-7), and Nx56 Kbps (Bits 2-8). The 'Subchannels 8-56 kbps' section has radio buttons for 8, 16, 24, 32, 40, 48, and 56, with a 'DS0 bits' list showing 1 through 8. The 'HDLC FCS' section has radio buttons for 16 bits, 32 bits, and None, with 'None' selected. At the bottom are buttons for 'All TS', 'Clear TS', 'All as Port1', and 'All as Ports1,2'.

HDLC Protocol Analyzer

HDLC Protocol Analysis LAPD 64-bit

File View Capture Statistics Database Configure Help

0 GoTo

Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Error	Modifier Function LAPD	Supervisory Function LAPD	SAPI LAPD	TEI LAPD	N(R) LAPD	N(S) LAPD
✓ 2	0		0	00:00:00.000000	6			RR	0	0	40	
✓ 1	0		1	00:00:00.000037	6			RR	0	0	49	
✓ 2	0		2	00:00:00.000362	6			RR	0	0	40	
✓ 1	0		3	00:00:00.000375	6			RR	0	0	49	
✓ 1	0		4	00:00:00.378362	46				0	0	49	40

Card2 TimeSlot=0 Frame=0 at 00:00:00.000000 OK Len=6 *** Right click to SHOW/HIDE layers

HDLC Frame Data + FCS

```

===== LAPD Layer =====
0000 C/R          = .....0. Command(User) Response(Network)
0000 SAPI         = 000000.. (0)
0001 TEI         = 0000000.. (0)
0002 Ctl         = .....01 Supervisory
0002 Supervisory Function = ....00.. RR

```

Hex Dump of the Frame Data

```

+-----+-----+-----+-----+-----+-----+
00 01 01 51 D6 FC                               QQu

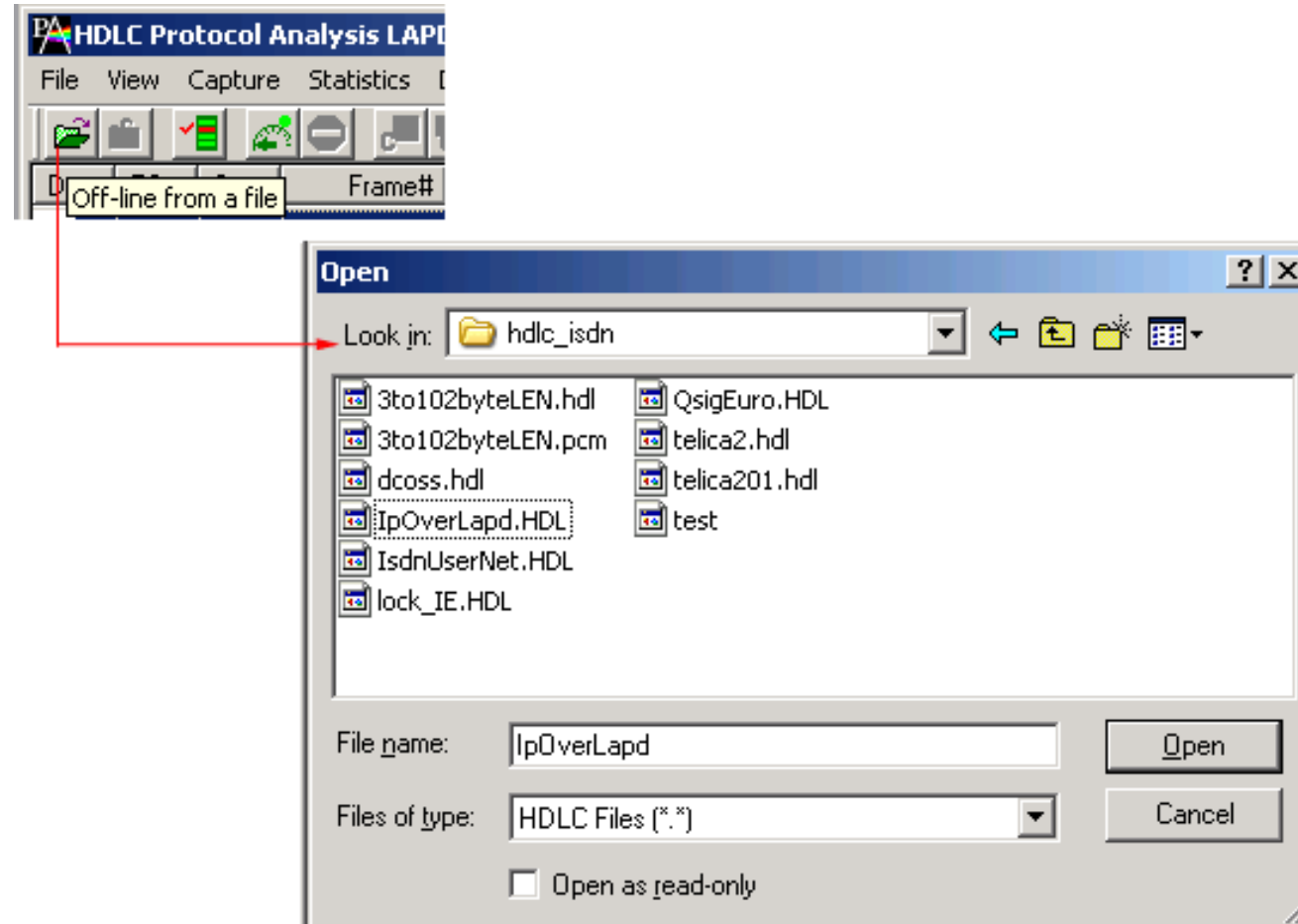
```

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

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

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



Offline Analysis (Contd.)

- Trace files for offline analysis can be loaded through simple command-line arguments as below:
- Command Syntax:** `hdlcprot hdlc\Filename.hdl`

Command Line Interface

The screenshot displays the HDLC Protocol Analysis LAPD application window. The main window shows a table of captured frames with columns: Dev, TS..., Su..., Frame#, TIME (R..., Len, Error, C/R, SAPI, and CTL. Below the table, there is a command window titled 'D:\WINDOWS\system32\cmd.exe' showing the command prompt. The command `hdlcprot hdlc\IsdnUserNet.H` is entered and highlighted with a red box. The status bar at the bottom indicates 'Off-line Viewing' and '137 Frames'.

Dev	TS...	Su...	Frame#	TIME (R...	Len	Error	C/R	SAPI	CTL
✓ 2	0		3	00:00:0...	5		Command(User)...	0	Unnumbered
✓ 1	0		4	00:00:0...	5		Command(User)...	0	Unnumbered
✓ 2	0		5	00:00:0...	50		Command(User)...	0	Information
✓ 1	0		6	00:00:0...	6		Command(User)...	0	Supervisory
✓ 1	0		7	00:00:0...	16		Response(User)...	0	Information

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

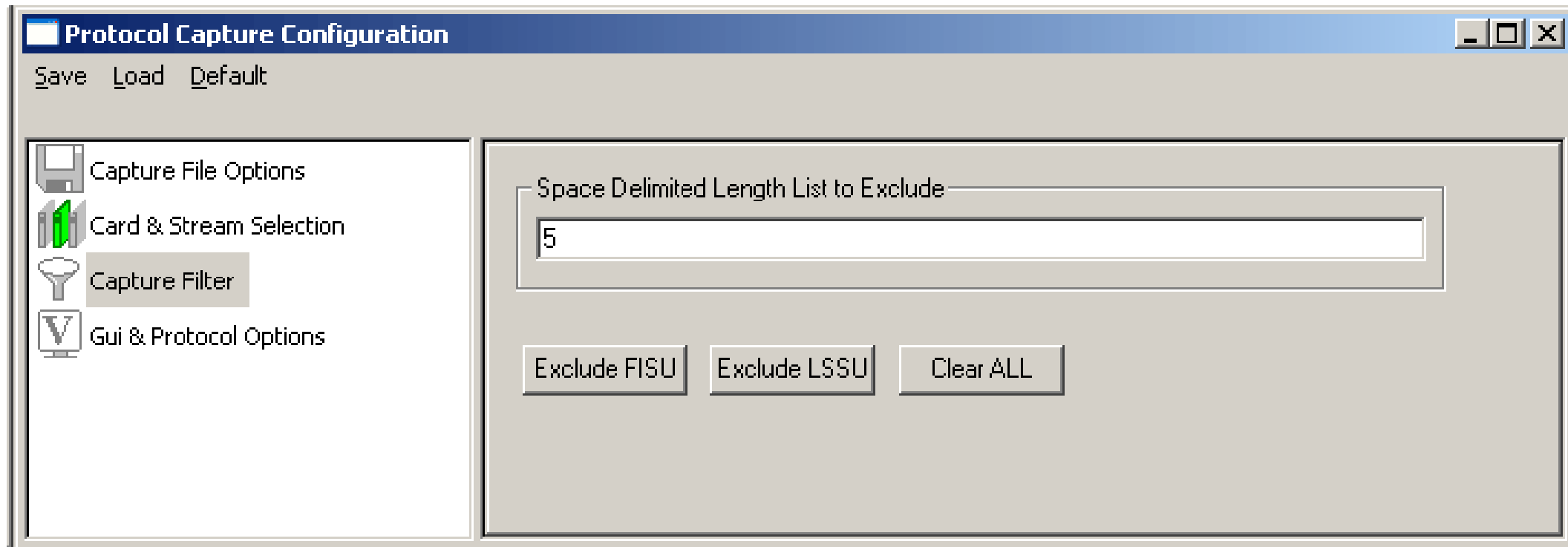
D:\>cd D:\Program Files\GL Communications Inc\Hdlc Analyzer
D:\Program Files\GL Communications Inc\Hdlc Analyzer>hdlcprot hdlc\IsdnUserNet.H
D:\Program Files\GL Communications Inc\Hdlc Analyzer>
```

Device #	Frame Count(Device #)
1	68
2	69

Off-line Viewing F:\Program Files\GL Communica 137 Frames

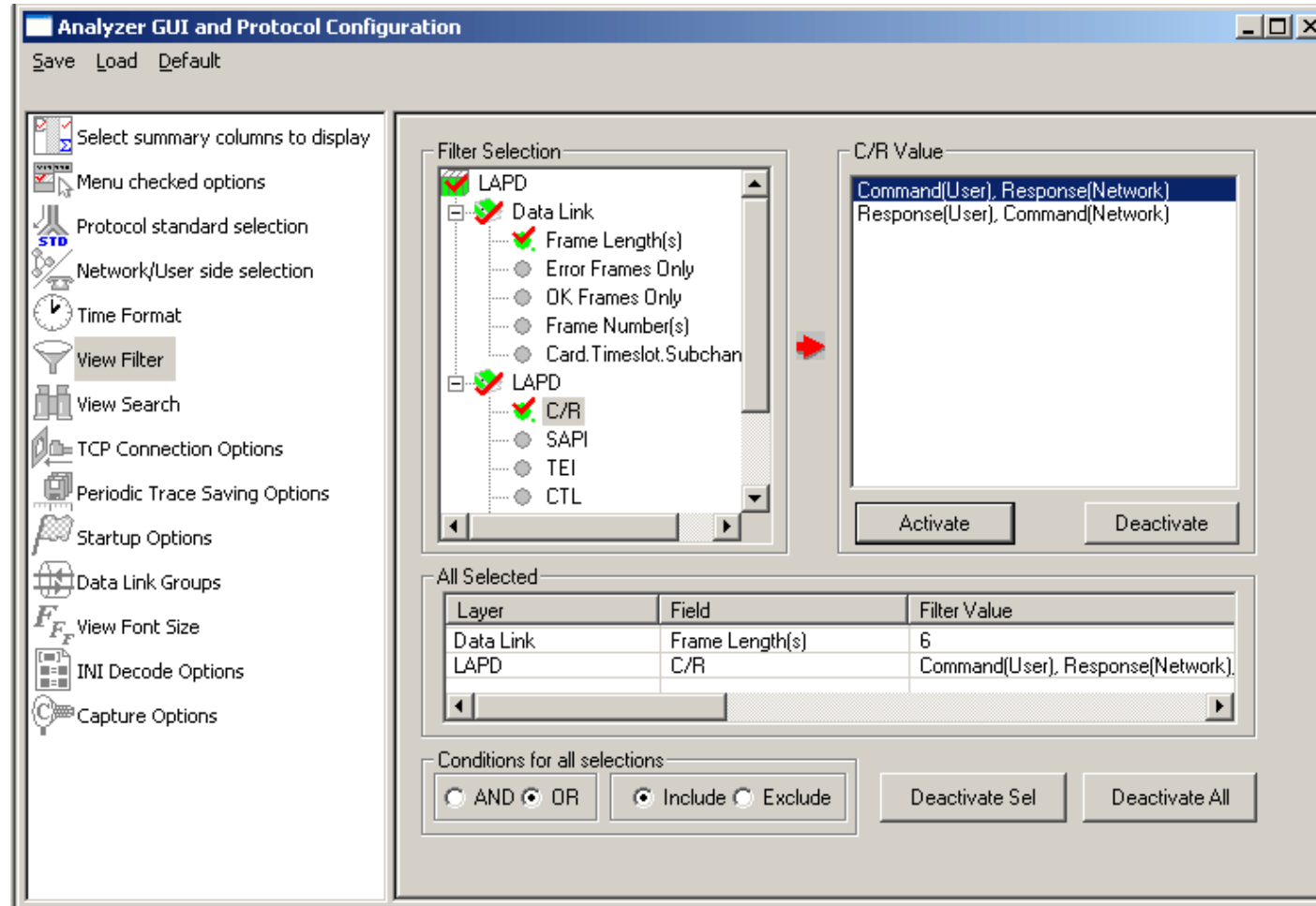
Filters - Real-time Capture Filter

- Real-time capture filter can be set prior to capturing frames
- Real-time filter for HDLC based protocols is done by excluding LSSU (Link Status Signal Unit), FISU (Fill-in Signal Unit), or any other user-defined frame



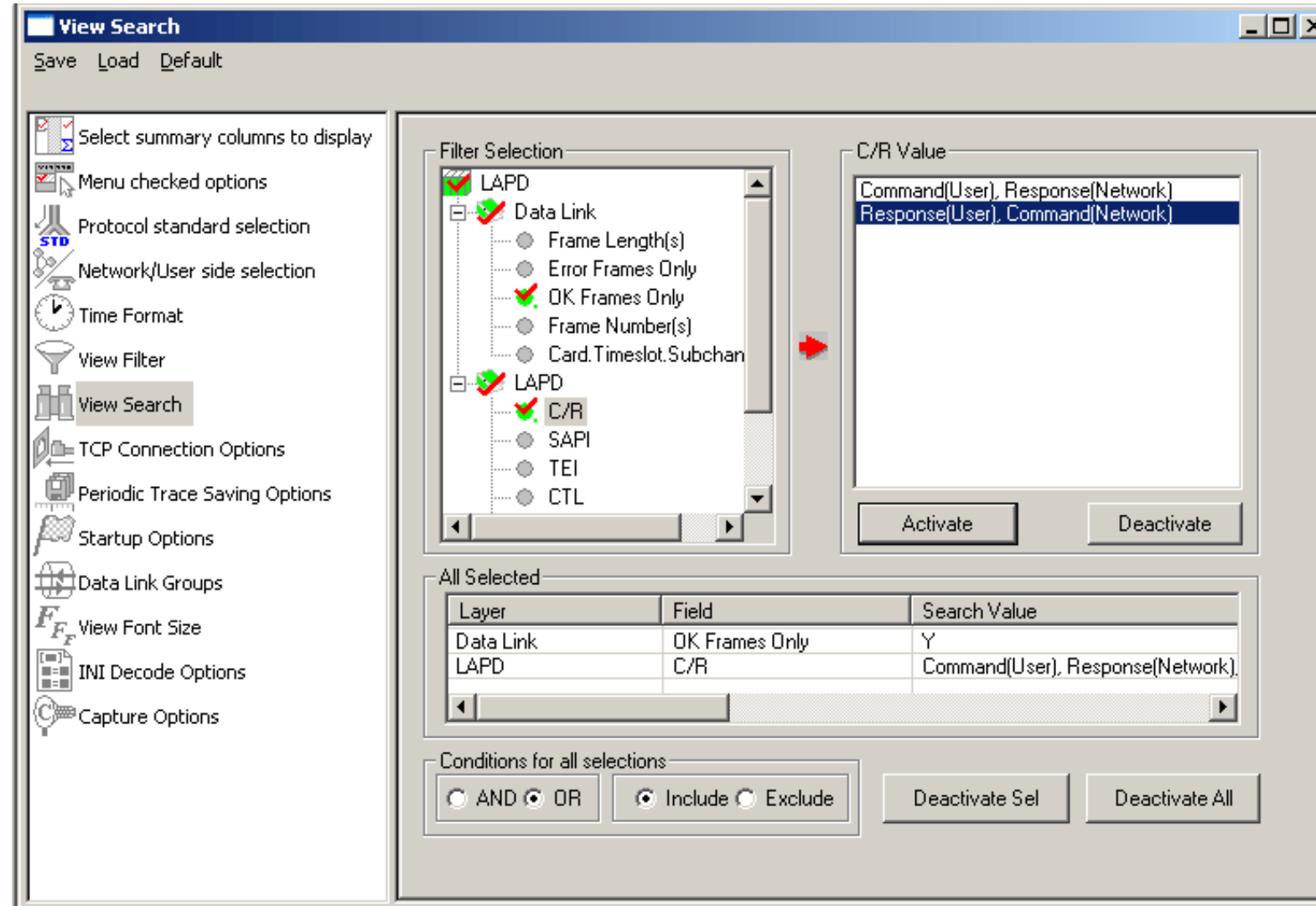
Filters - Offline View Filter

- Isolates required frames from all frames in real-time / remote / offline
- Filter applies to the captured frames and is based on the data link and other decoded protocol field values: CTL, C/R, Modifier Function, N(R), N(S), P, P/ F, SAPI, supervisory function and TEI



Search Options

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



Filtering Criteria From Screen Selection

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

HDLC Protocol Analysis LAPD 64-bit

File View Capture Statistics Database Configure Help

Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Error	Modifier Function LAPD	Supervisory Function LAPD	SAPI LAPD	T LA
✓ 2	0		0	00:00:00.000000	6			RR	0	0
✓ 1	0		1	00:00:00.000037	6			RR	0	0
✓ 2	0		2	00:00:00.000362	6			RR		
✓ 1	0		3	00:00:00.000375	6			RR		
✓ 1	0		4	00:00:00.378362	46					
✓ 2	0		5	00:00:00.379137	6			RR		

Search Selected Value
Set Search Criteria as Sel Values
Set Filter Criteria as Sel Values

Use Ctrl, Shift for Extended Selection

MTP3::DPC
MTP3::OPC
ISUP::Circuit Identification Code
ISUP::Message Type

OK Select All Cancel

Analyzer GUI and Protocol Configuration

Save Load Default

Select summary columns to di...
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
Define Summary Columns
Aggregate Summary Columns
Capture Options

Filter Selection

Value Selection

Activate Deactivate

All Selected

Layer	Field	Filter Value
LAPD	N(R)	40
LAPD	Supervisory Function	RR

Conditions for all selections

AND OR Include Exclude

Deactivate Sel Deactivate All

Search Criteria From Screen Selection

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

HDLC Protocol Analysis LAPD 64-bit

File View Capture Statistics Database Configure Help

Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Error	Modifier Function LAPD	Supervisory Function LAPD	SAPI LAPD	TEI LAPD	N(R) LAPD
✓ 2	0		0	00:00:00.000000	6			RR	0	0	40
✓ 1	0		1	00:00:00.000037	6			RR			
✓ 2	0		2	00:00:00.000362	6			RR			
✓ 1	0		3	00:00:00.000375	6			RR			
✓ 1	0		4	00:00:00.378362	46						

Search Selected Value
Set Search Criteria as Sel Values
Set Filter Criteria as Sel Values

Use Ctrl, Shift for Extended Selection

LAPD::N(R)
LAPD::SAPI
LAPD::Supervisory Function
LAPD::TEI

OK Select All Cancel

Analyzer GUI and Protocol Configuration

Save Load Default

Select summary columns to di...
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
Define Summary Columns
Aggregate Summary Columns
Capture Options

Filter Selection

Value Selection

Activate Deactivate

All Selected

Layer	Field	Search Value
LAPD	SAPI	0
LAPD	Supervisory Function	RR

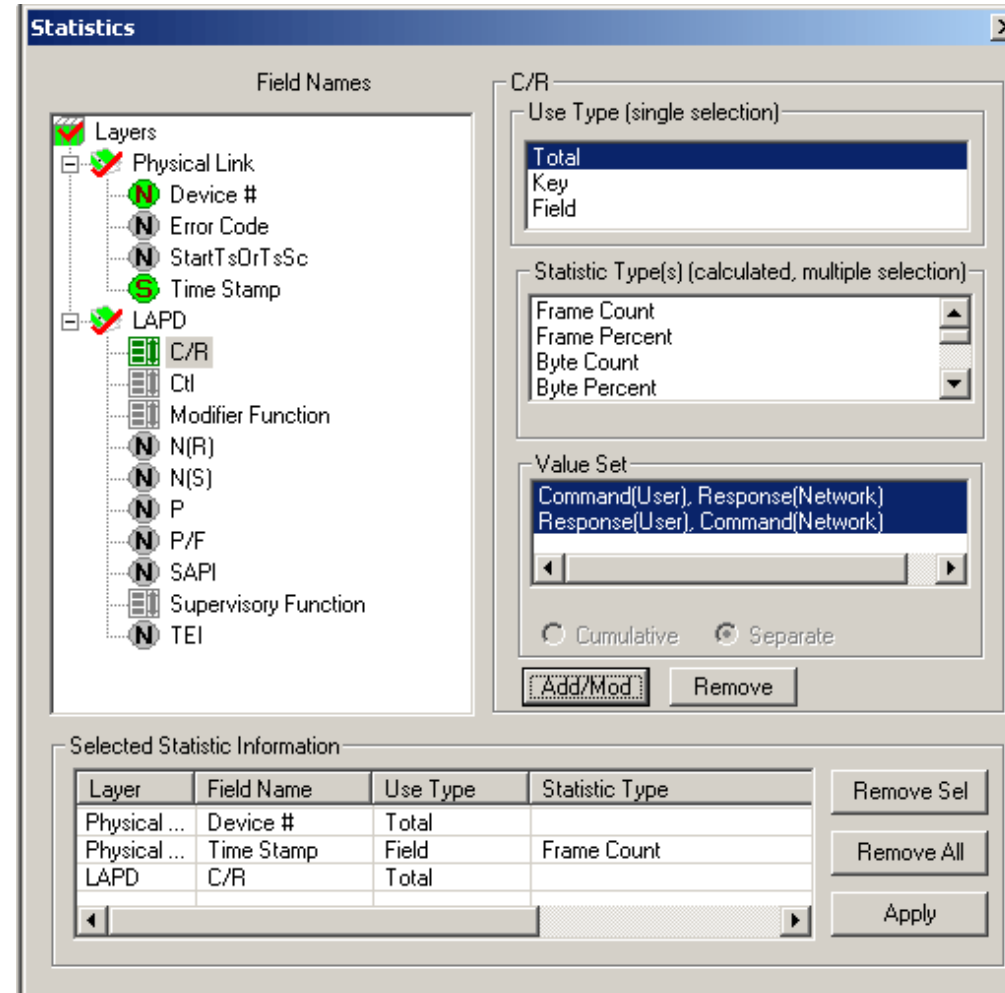
Conditions for all selections

AND OR Include Exclude

Deactivate Sel Deactivate All

Statistics

- Statistics is an important feature available in HDLC analyzer and can be obtained for all frames both in real-time as well as offline mode
- Numerous statistics can be obtained to study the performance and trend in the HDLC network s based on various protocol fields and parameters



Saving a File

- 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 [] .HDL
number of digits
☐ Date/Time Formatted Names
fileNamePrefix_%Y%M%D_%H%i_fileNameCont [] .HDL
file name suffix

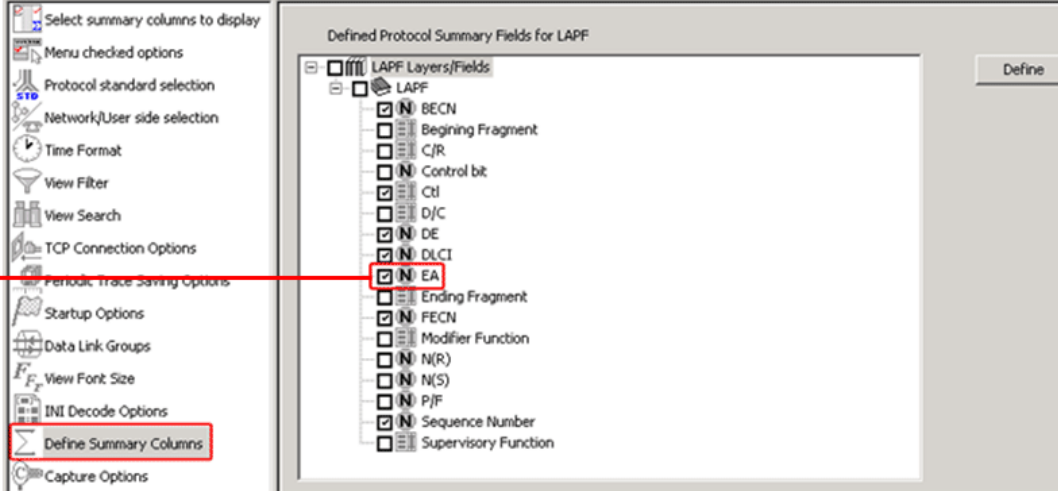
Create a New File After the Specified Limit Has Been Reached
☒ File Size Limit e.g. 1048576 or 1024K or 1M
☐ Frame Count Limit e.g. 1048576 or 1024K or 1M
☐ Time Limit e.g. 24:00 (HH:MM)
Limit Value: 1000000

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

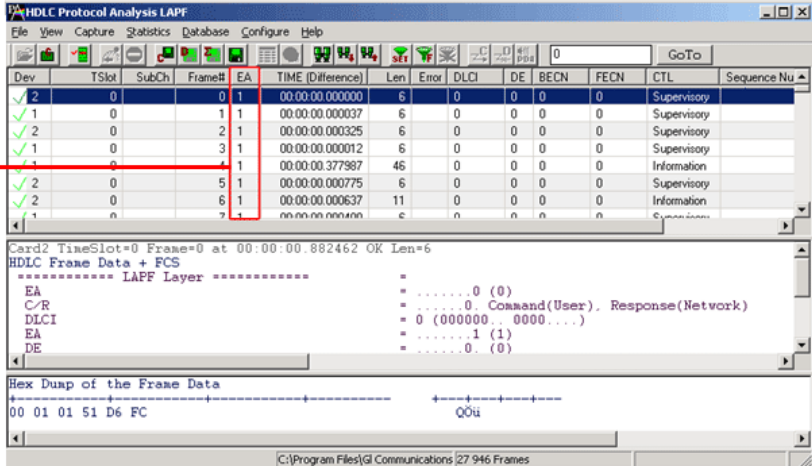
Define Summary Columns

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

Selection of Summary Column →



Output display in analyzer →



Dev	TSlot	SubCh	Frame#	EA	TIME (Difference)	Len	Error	DLCI	DE	BECN	FECN	CTL	Sequence Nu
✓ 2	0		0	1	00:00:00.000000	6	0	0	0	0	0	Supervisory	
✓ 1	0		1	1	00:00:00.000037	6	0	0	0	0	0	Supervisory	
✓ 2	0		2	1	00:00:00.000325	6	0	0	0	0	0	Supervisory	
✓ 1	0		3	1	00:00:00.000012	6	0	0	0	0	0	Supervisory	
✓ 1	0		4	1	00:00:00.377987	46	0	0	0	0	0	Information	
✓ 2	0		5	1	00:00:00.000775	6	0	0	0	0	0	Supervisory	
✓ 2	0		6	1	00:00:00.000637	11	0	0	0	0	0	Information	
✓ 1	0		7	1	00:00:00.000000	6	0	0	0	0	0	Supervisory	

Card2 TimeSlot=0 Frame=0 at 00:00:00.882462 OK Len=6
HDLC Frame Data + FCS
===== LAPF Layer =====
EA 0 (0)
C/R 0. Command(User), Response(Network)
DLCI 0 (000000..0000....)
EA 1 (1)
DE 0. (0)

Hex Dump of the Frame Data
00 01 01 51 D6 FC QQu

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 'Aggregate Summary Columns' dialog box in the HDLC Protocol Analysis LAPD 64-bit software. The dialog has a left sidebar with various configuration options, including 'Aggregate Summary Columns' which is currently selected. The main area of the dialog contains a table with columns: Name, Display Format, Summary Columns, and Separator. The table lists three groups: Group~0, Group~1, and Group~2. Group~0 is highlighted, showing 'Supervisory Function_LAPD' and 'TEI_LAPD' as summary columns with a separator of '--->'. Group~1 shows 'N(R)_LA' and 'SAPI_LA' as summary columns. Group~2 shows '<Col_Alias>Value' as a summary column.

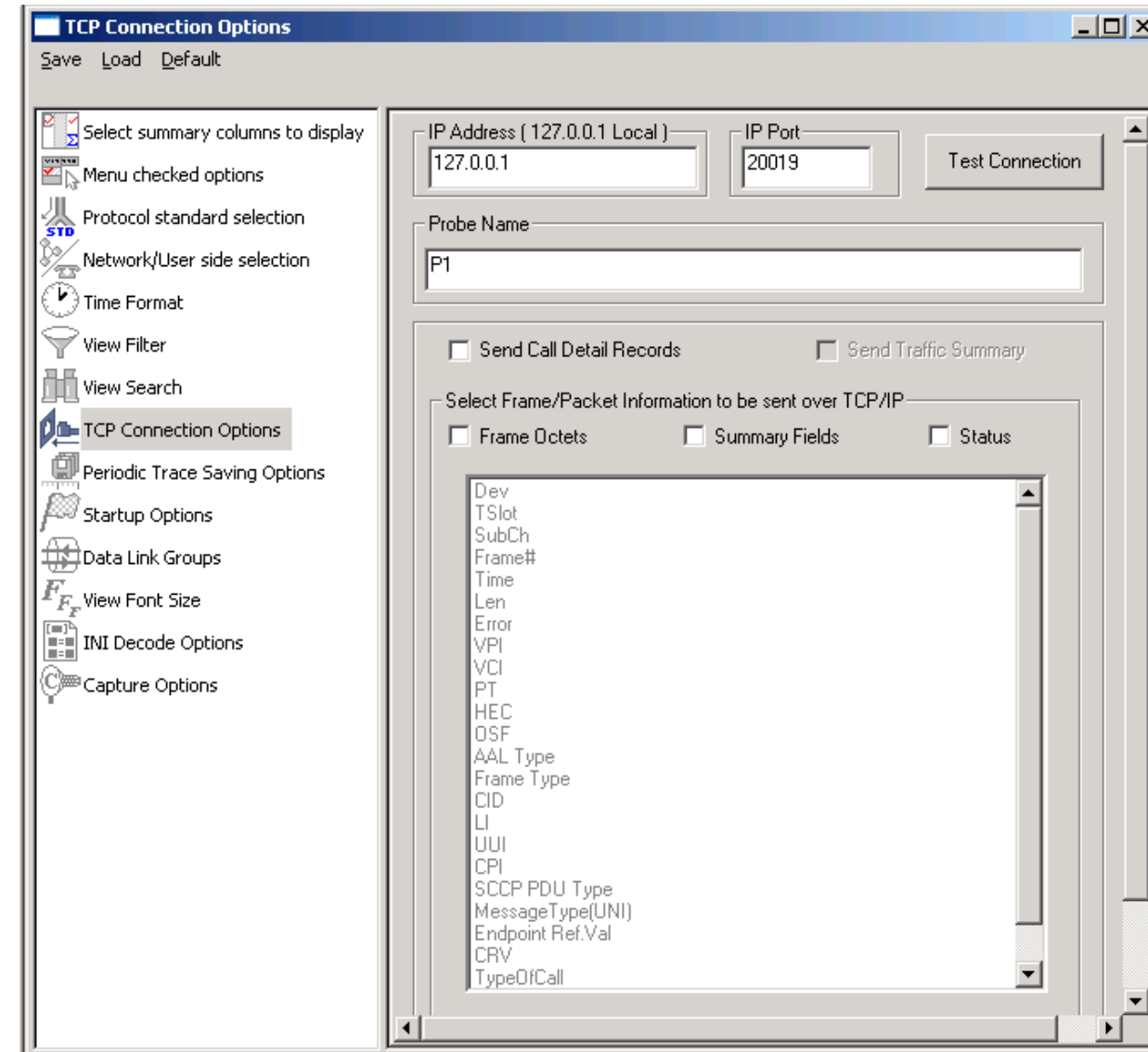
The main window shows the HDLC Protocol Analysis LAPD 64-bit interface. The 'Group~0' column in the data table is highlighted with a red box. The data table has columns: Dev, TSlot, SubCh, Frame#, TIME (Relative), Len, Group~0, Error, Modifier Function LAPD, Supervisory Function LAPD, SAPI LAPD, TEI LAPD, and N(R) LAPD. The data rows show various frames with their respective details.

Card2 TimeSlot=0 Frame=23546 at 00:01:19.145525 OK Len=6
HDLC Frame Data + FCS
***** LAPD Layer *****
0000 C/R =1. Response(User) Command(Network)
0000 SAPI = 000000.. (0)
0001 TEI = 0000000.. (0)
0002 Ctl =01 Supervisory
0002 Supervisory Function =00.. RR
0003 P/F =0 (0)
0003 N(R) = 1100011. (99)

Off-line Viewing. C:\Program Files\GL Communications Inc\Usb E1 Analyzer\HDL_ 27 946 Frames

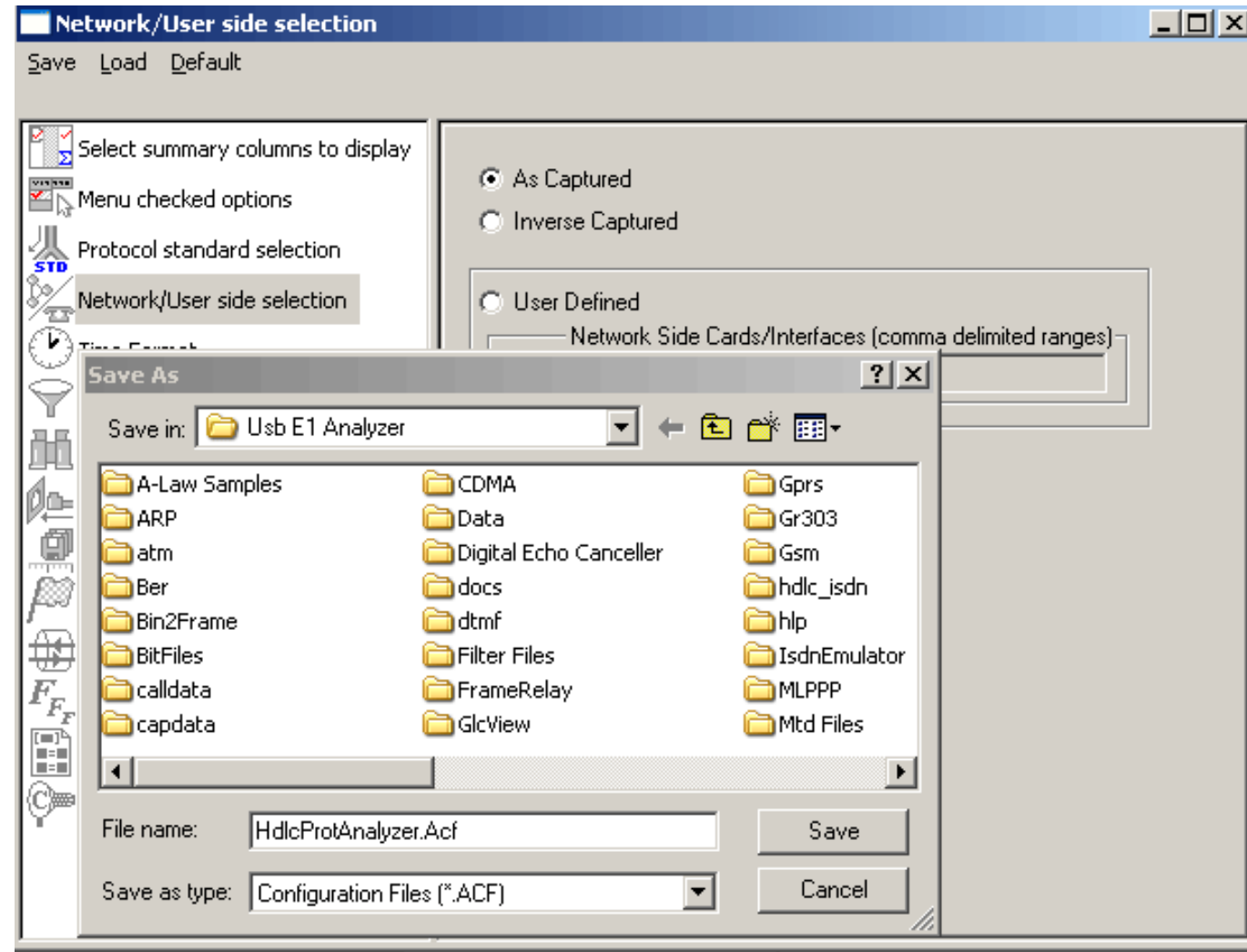
TCP Connection Options

- 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

- Protocol configuration window provides a consolidated interface for all the settings required in the analyzer such as protocol selection, stream/interface selection, and so on
- Configuration settings can be saved to a file, loaded from a configuration file, or user may just revert to the default values using the default option



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

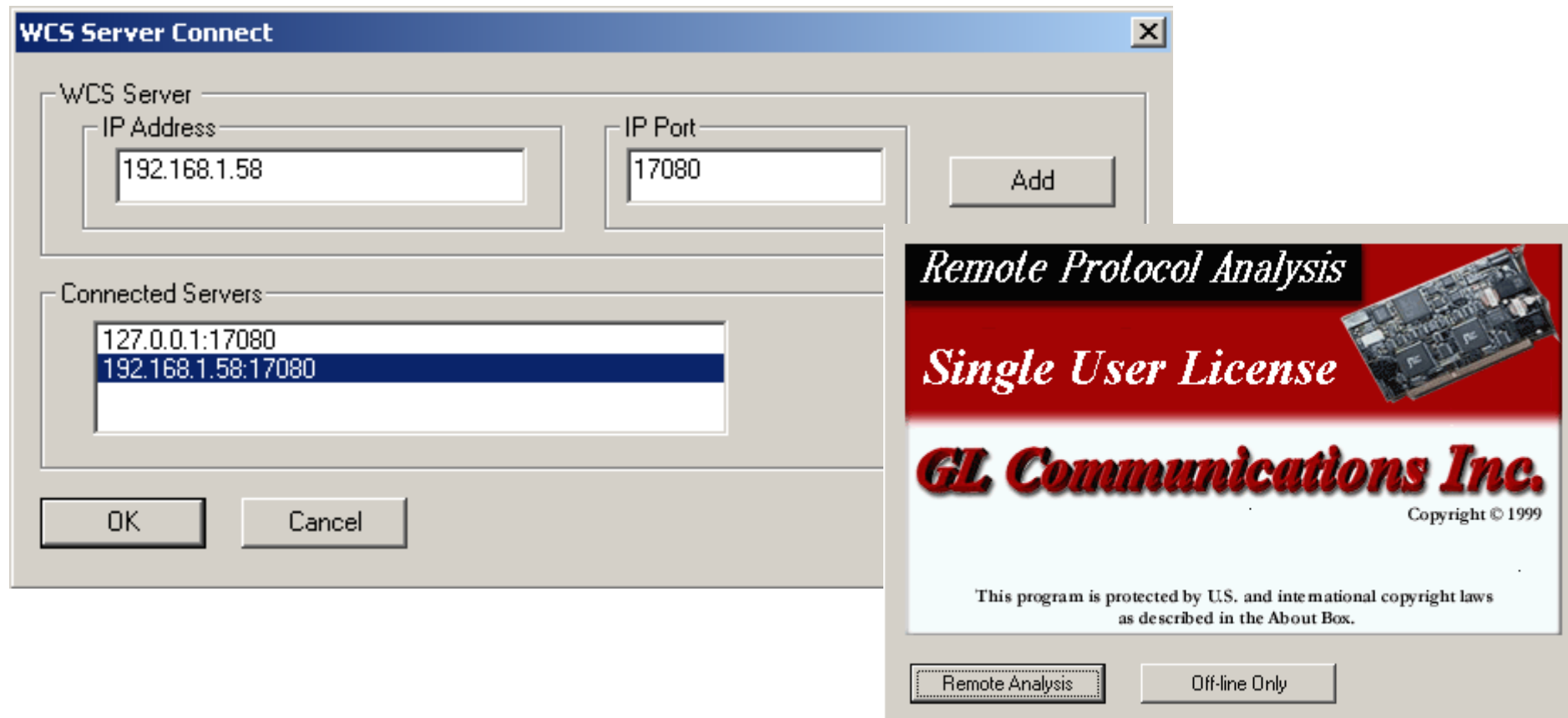
- Client side consists of a PC with Ethernet connectivity and GUI Remote Protocol Analysis software – no special T1 or E1 hardware is required
- Multiple T1/E1 servers may be simultaneously connected to a single remote client using a single GUI
- Multiple remote clients may access a single T1/E1 server. 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

- 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 T1E1 cards.
- Lists an IP addresses and the IP port numbers
- Option is provided for the user to select the desired IP address of the server



Stream Selection

Remote Protocol Analyzers

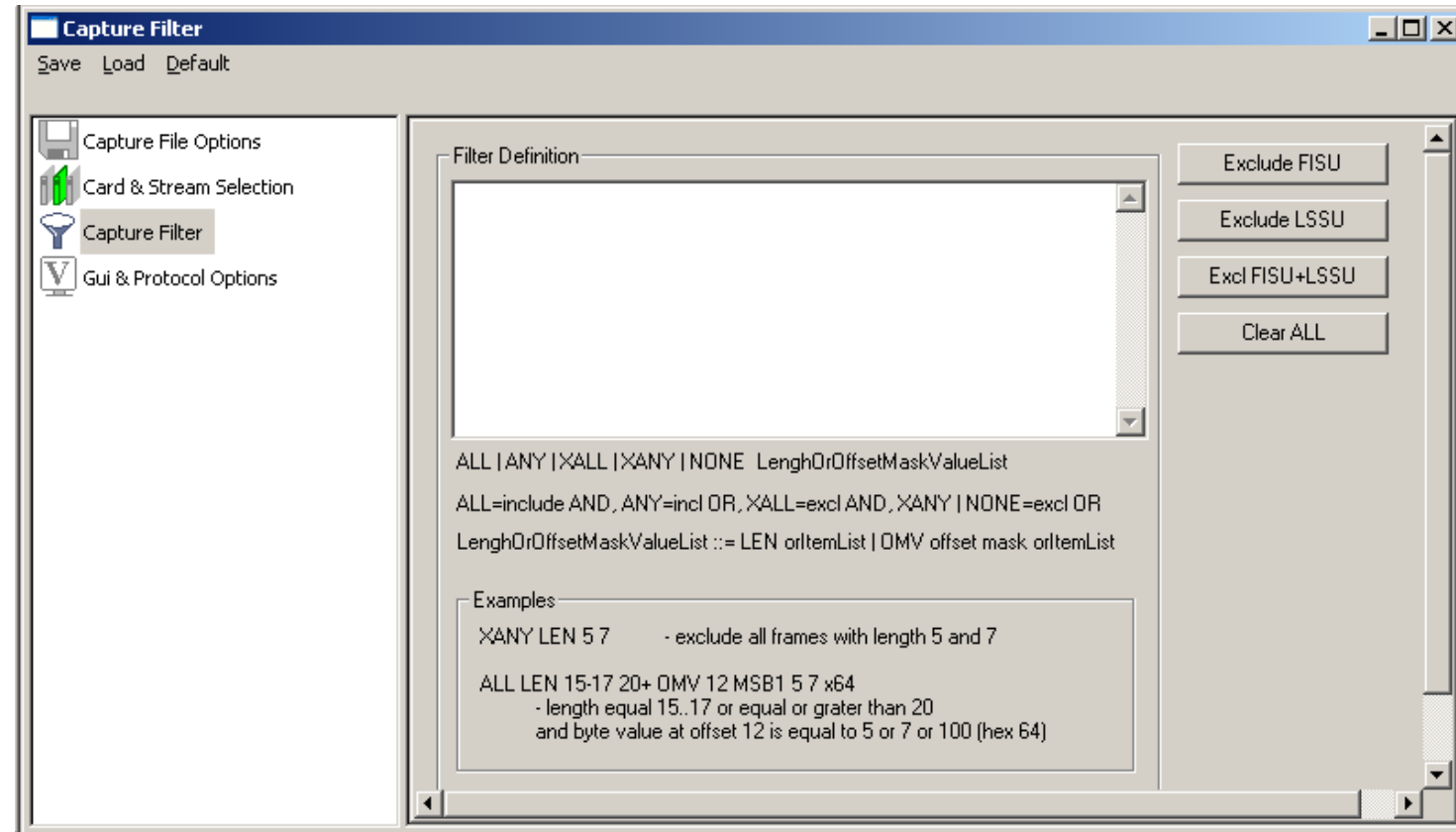
- Streams can be captured on the selected time slots (contiguous or non-contiguous), sub-channels (fractional DS0 to DS1) or full bandwidth
- Frames may also be contained in $n \times 64$ kbps
- Recorded trace file can then be analyzed offline, exported to ASCII file, or printed

The image shows a software window titled "Protocol Capture Configuration". It has a menu bar with "Save", "Load", and "Default". On the left is a sidebar with three icons and labels: "Capture File Options", "Card & Stream Selection" (highlighted), and "Capture Filter". The main area is titled "Port and Time Slot Selection" and contains a table with 24 rows and 4 columns. The columns are labeled 1, 2, 3, and 4. The rows are labeled 00 to 23. The cell at row 01, column 2 is selected. Below the table are three sections: "Data Transmission Rate" with radio buttons for "Single Channel" (64 kbps, 56 kbps) and "Hyper-Channel" (selected, Nx64 kbps); "Subchannels 8-56 kbps" with radio buttons for 8, 16, 24, 32, 40, 48, and 56; and a "DS0 bits" section with a list box showing 1 through 8, "All", and "None". On the right side of the window are buttons for "All TS", "Clear TS", "All as Port1", "All as Ports1,2", and "IP Addr / Cards".

	1	2	3	4
00	00	00	00	00
01	01	01	01	01
02	02	02	02	02
03	03	03	03	03
04	04	04	04	04
05	05	05	05	05
06	06	06	06	06
07	07	07	07	07
08	08	08	08	08
09	09	09	09	09
10	10	10	10	10
11	11	11	11	11
12	12	12	12	12
13	13	13	13	13
14	14	14	14	14
15	15	15	15	15
16	16	16	16	16
17	17	17	17	17
18	18	18	18	18
19	19	19	19	19
20	20	20	20	20
21	21	21	21	21
22	22	22	22	22
23	23	23	23	23

Capture Filter

- Real-time capture filter can be set prior to capturing frames
- Real-time filter for HDLC based protocols is done by excluding LSSU (Link Status Signal Unit), FISU (Fill-in Signal Unit), or any other user-defined frame



Thank you