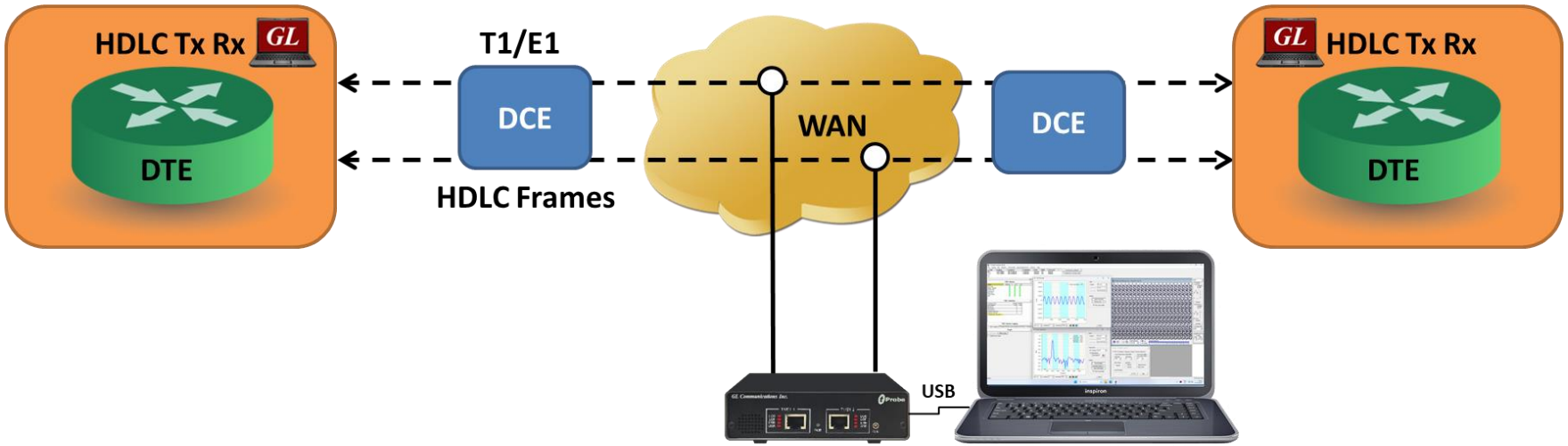
HDLC Analysis and Emulation

GL Communications Inc.
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

Index



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

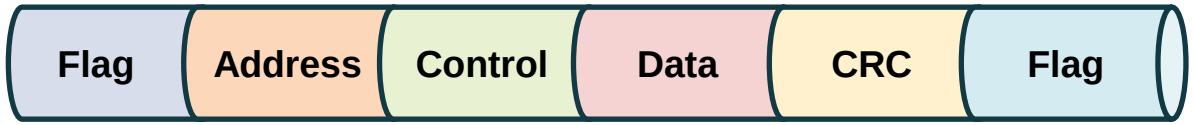
HDLC Analysis and Simulation

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

Back Panel

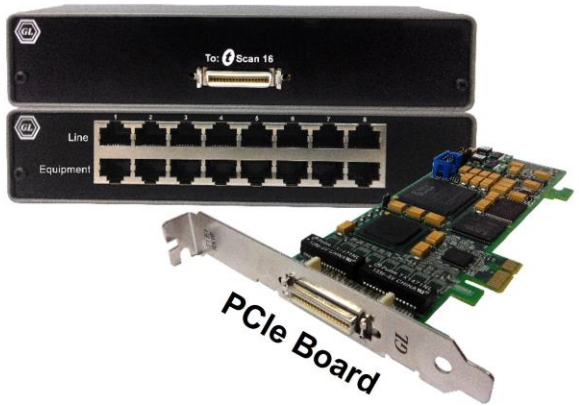
Front Panel

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

Quad / Octal T1 E1 PCIe Card

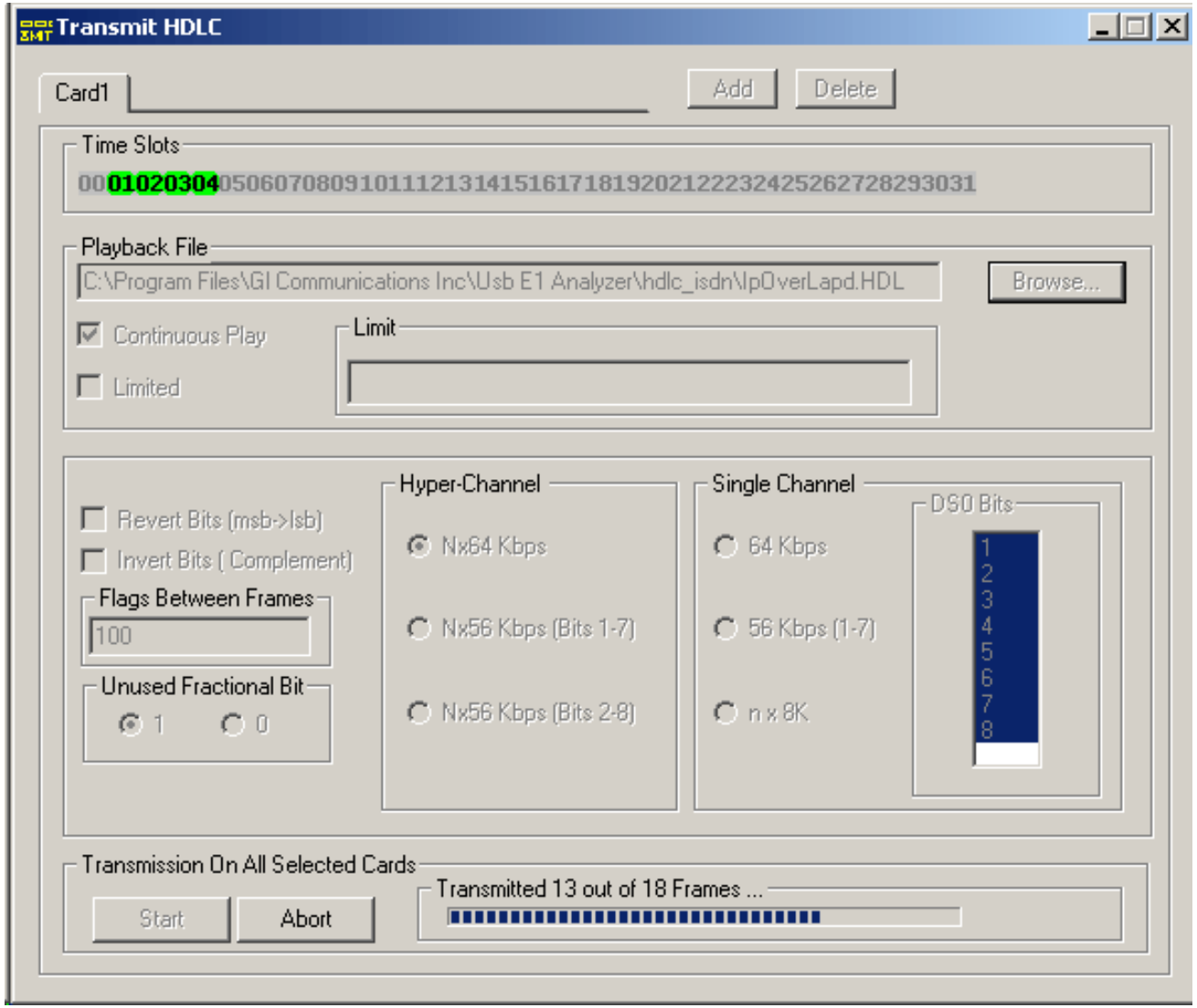
Dual T1 E1 Express (PCIe) Board

tScan16™ with 16-port T1 E1 Breakout Box



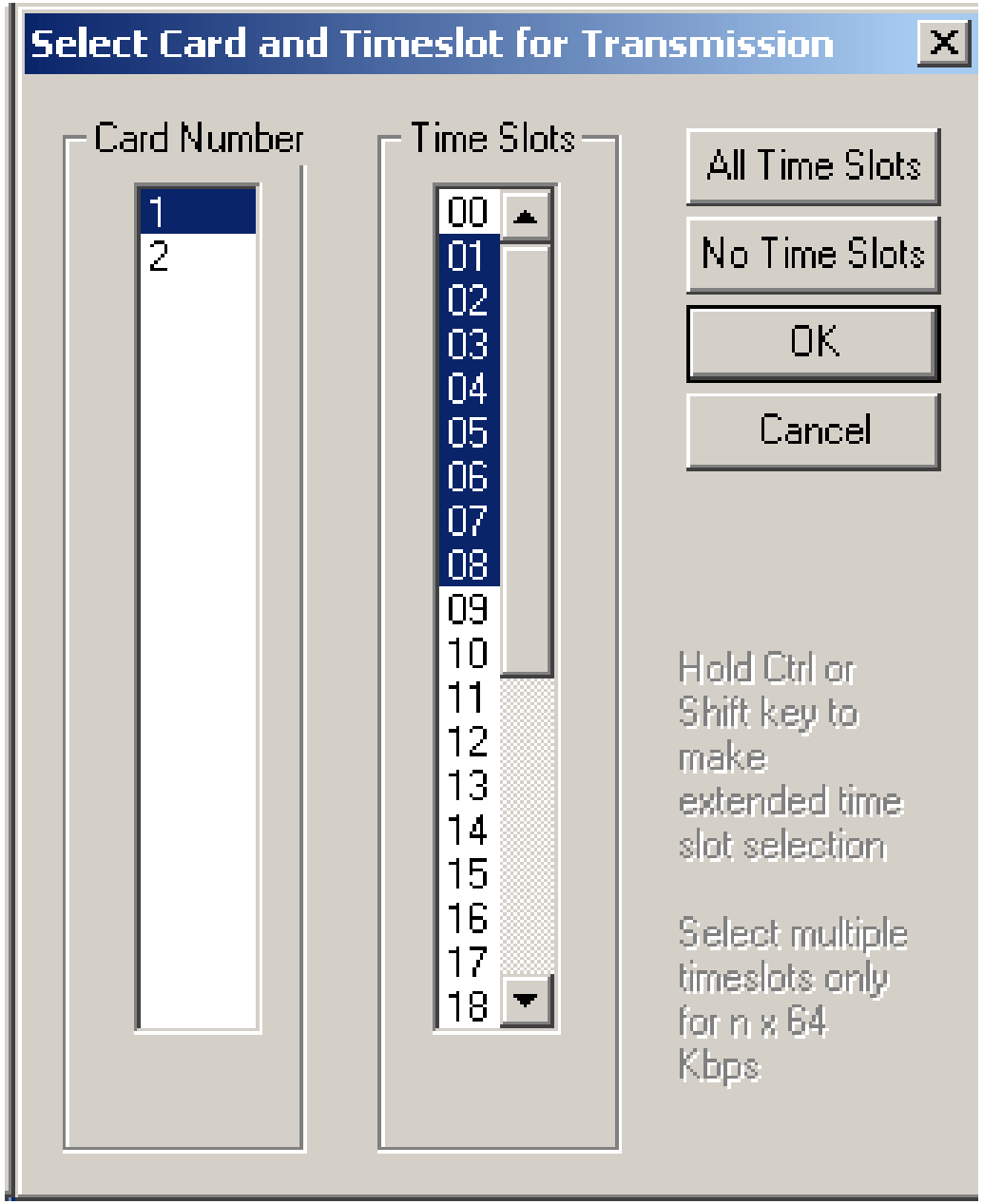
HDLC Playback

- 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



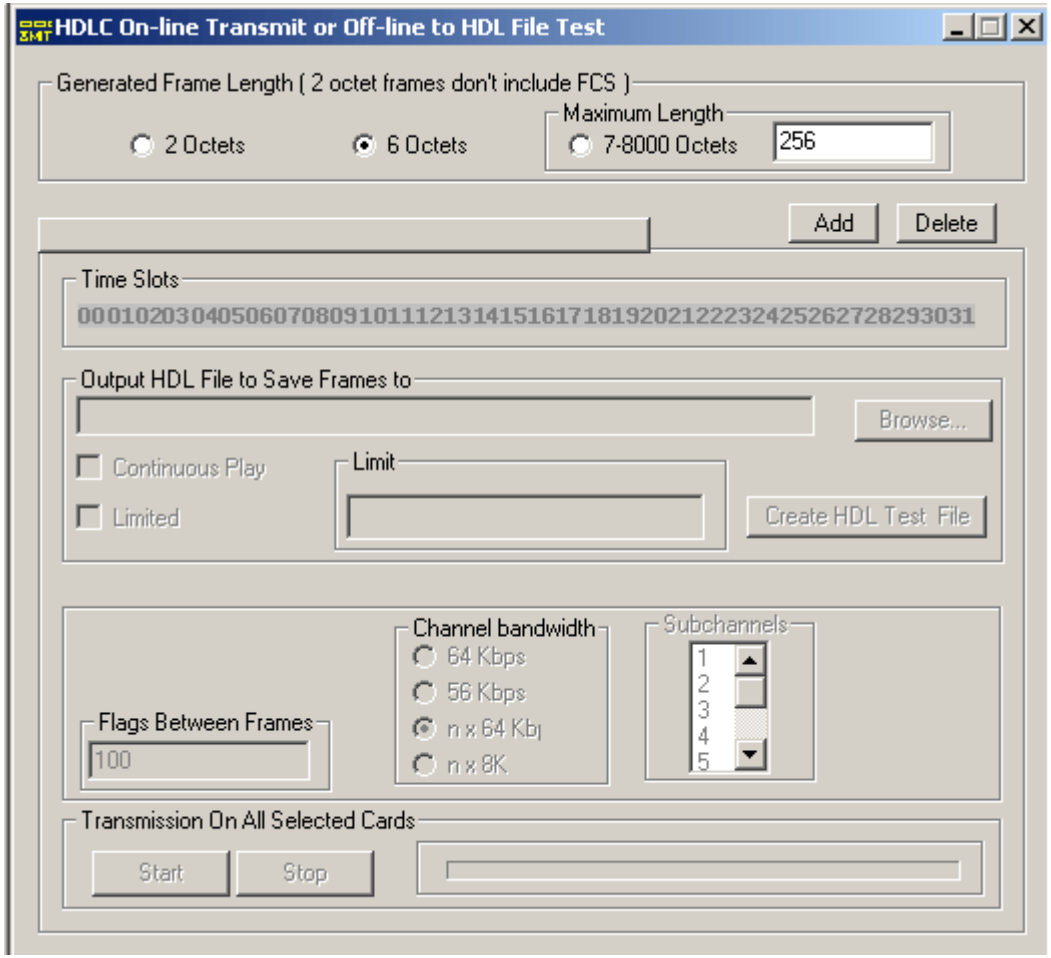
HDLC Tx / Rx Test

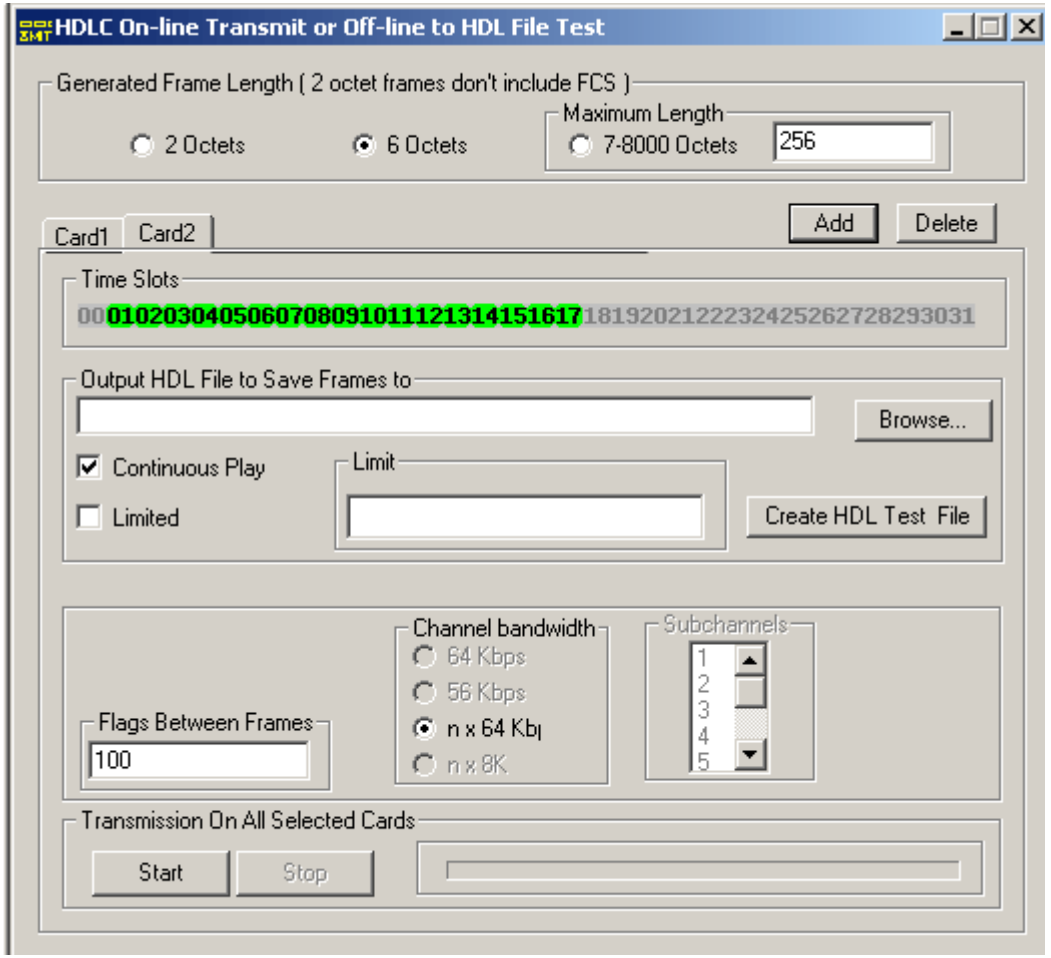
- The HDLC Automated Test System consists of two applications:
  - HDLC Tx Application
  - HDLC Rx Application
- Both applications can function real-time and offline

GL Communications

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

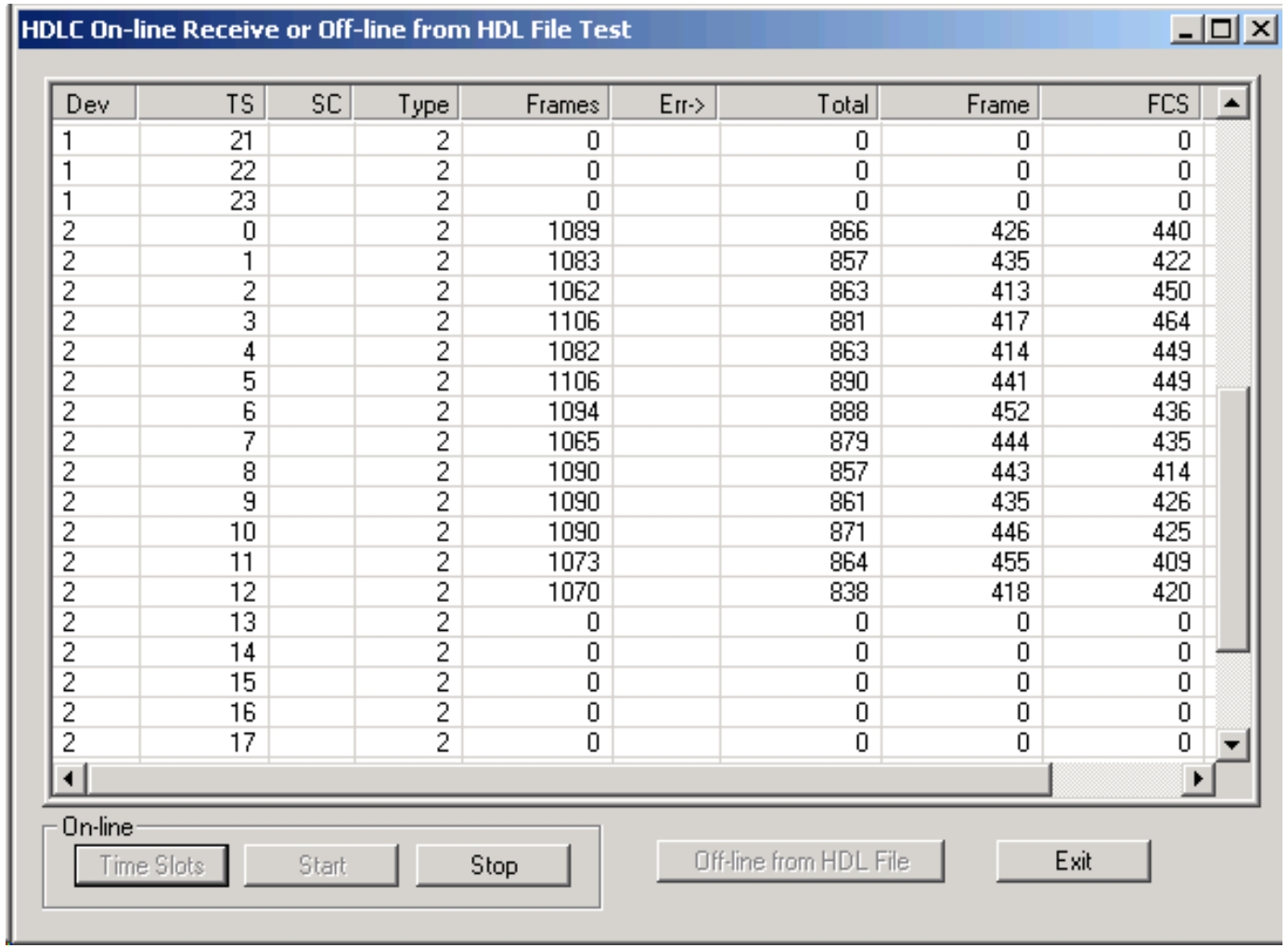




GL Communications

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

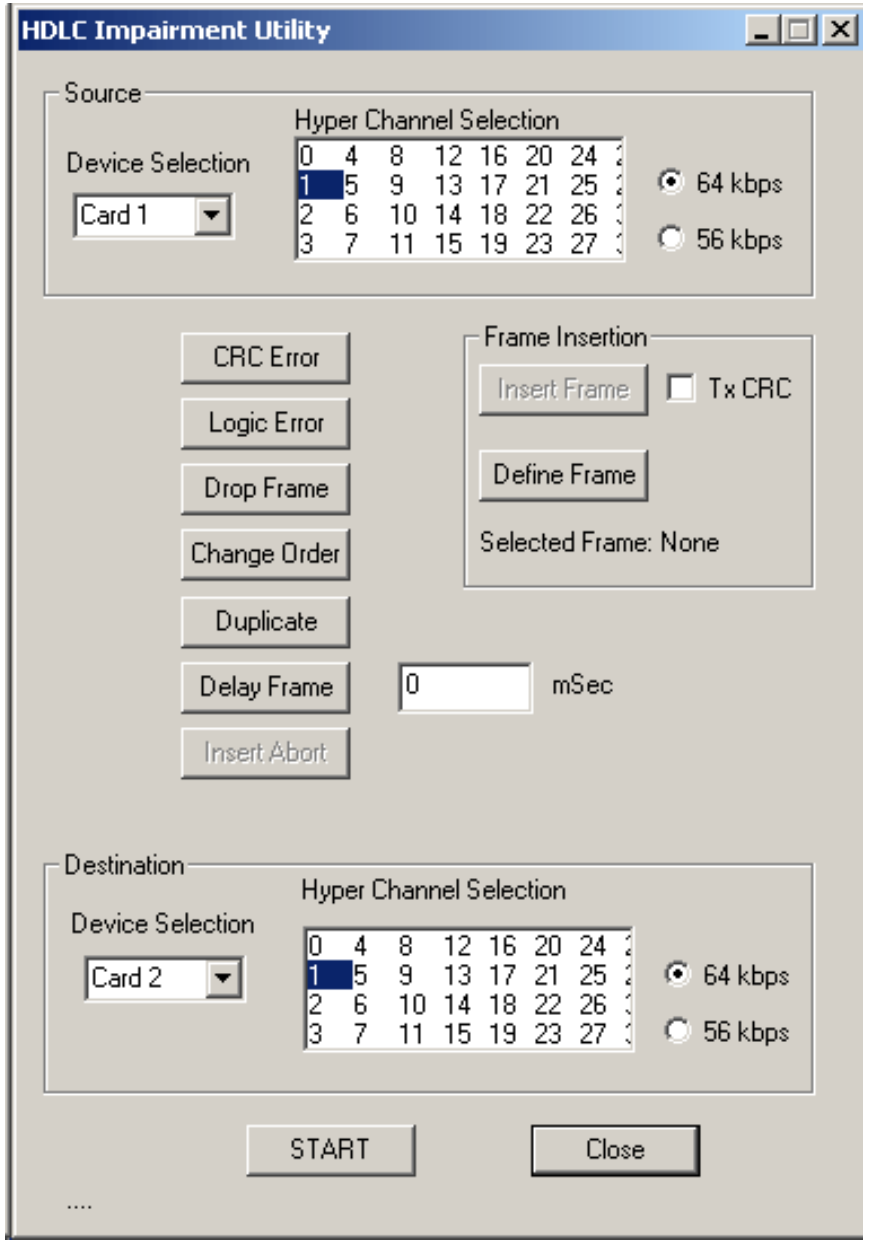


Dev	TS	SC	Type	Frames	Err->	Total	Frame	FCS
1	21		2	0		0	0	0
1	22		2	0		0	0	0
1	23		2	0		0	0	0
2	0		2	1089		866	426	440
2	1		2	1083		857	435	422
2	2		2	1062		863	413	450
2	3		2	1106		881	417	464
2	4		2	1082		863	414	449
2	5		2	1106		890	441	449
2	6		2	1094		888	452	436
2	7		2	1065		879	444	435
2	8		2	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

GL Communications

HDLC Link Impairment Utility (HLIU)

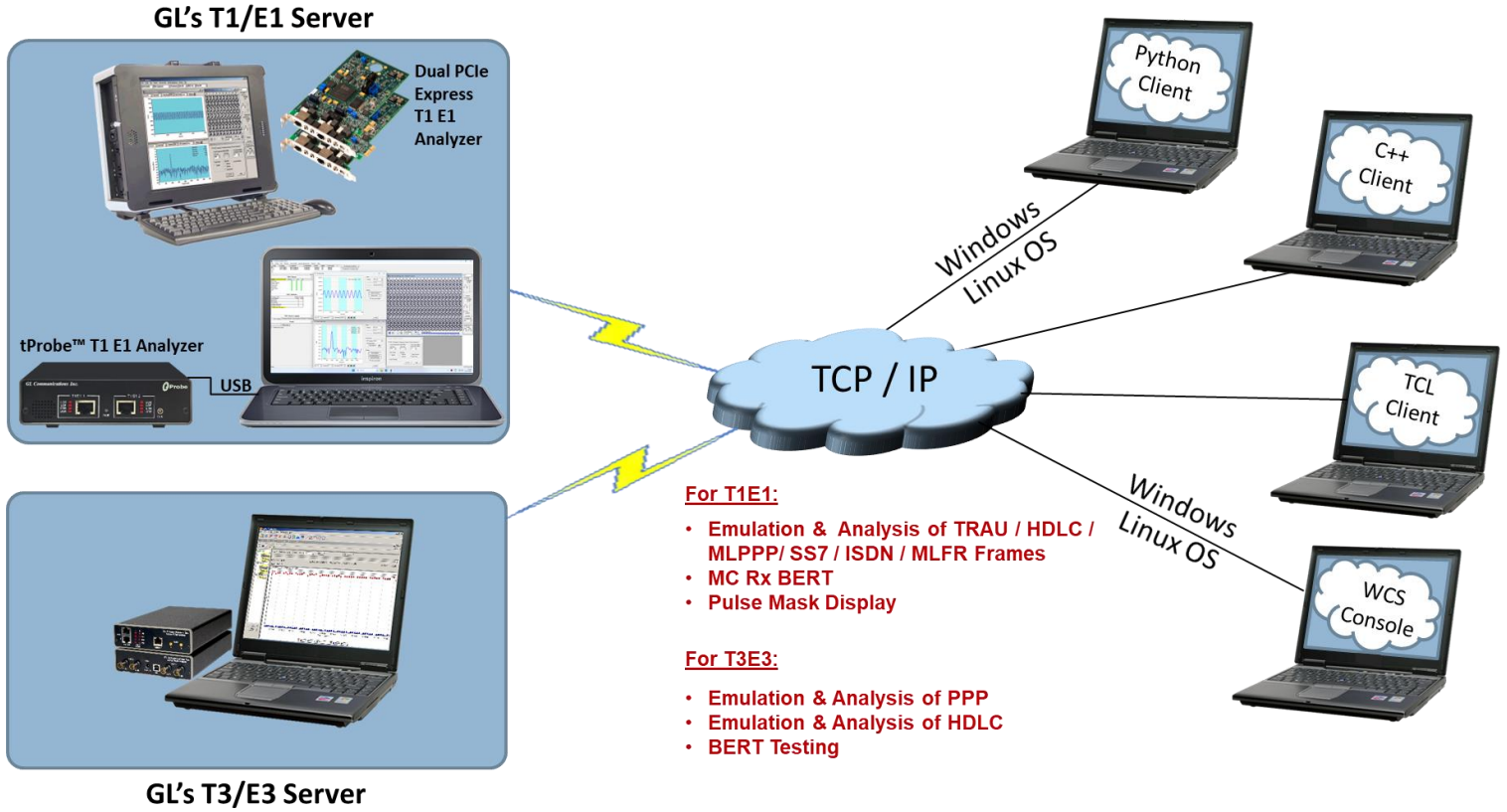
- Verifies the proper working of HDLC protocols by simulating various scenarios taking place in a real-time network
- The HLIU application has the following features:
  - Logic Error insertion
  - CRC Error insertion
  - Drop a Frame
  - Change Frame Order
  - Duplicate a Frame
  - Insert a Frame
  -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



HDLC Emulation using Windows Client Server

Modules

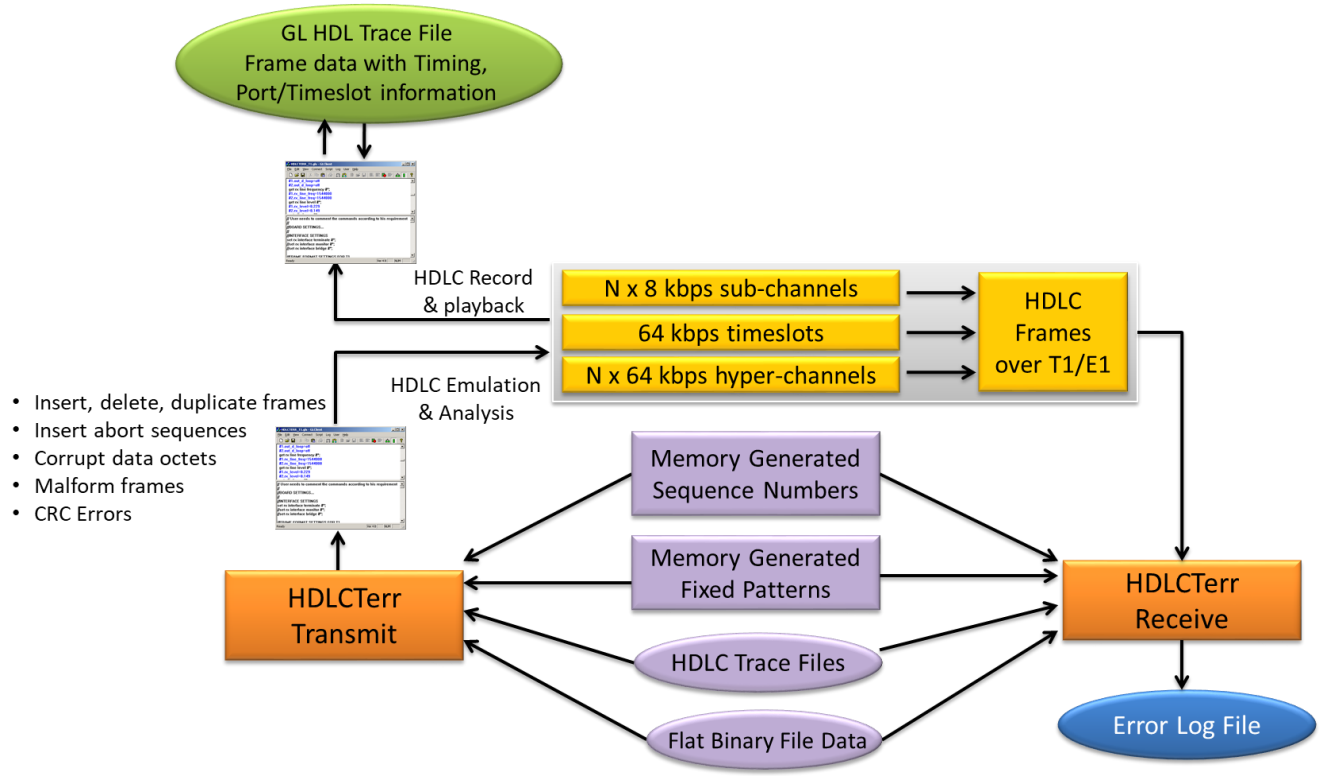
- Tx/Rx of Files and digits
- w/ CAS Simulator and Traffic Classifier
- DSP Operations
- Emulation & Analysis of TRAU / HDLC / MLPPP/ SS7 / ISDN /MLFR Frames
- FDL / SA Bits Encode/Decode
- MC Rx BERT
- Pulse Mask Display



GL Communications

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	✓

GL Communications

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

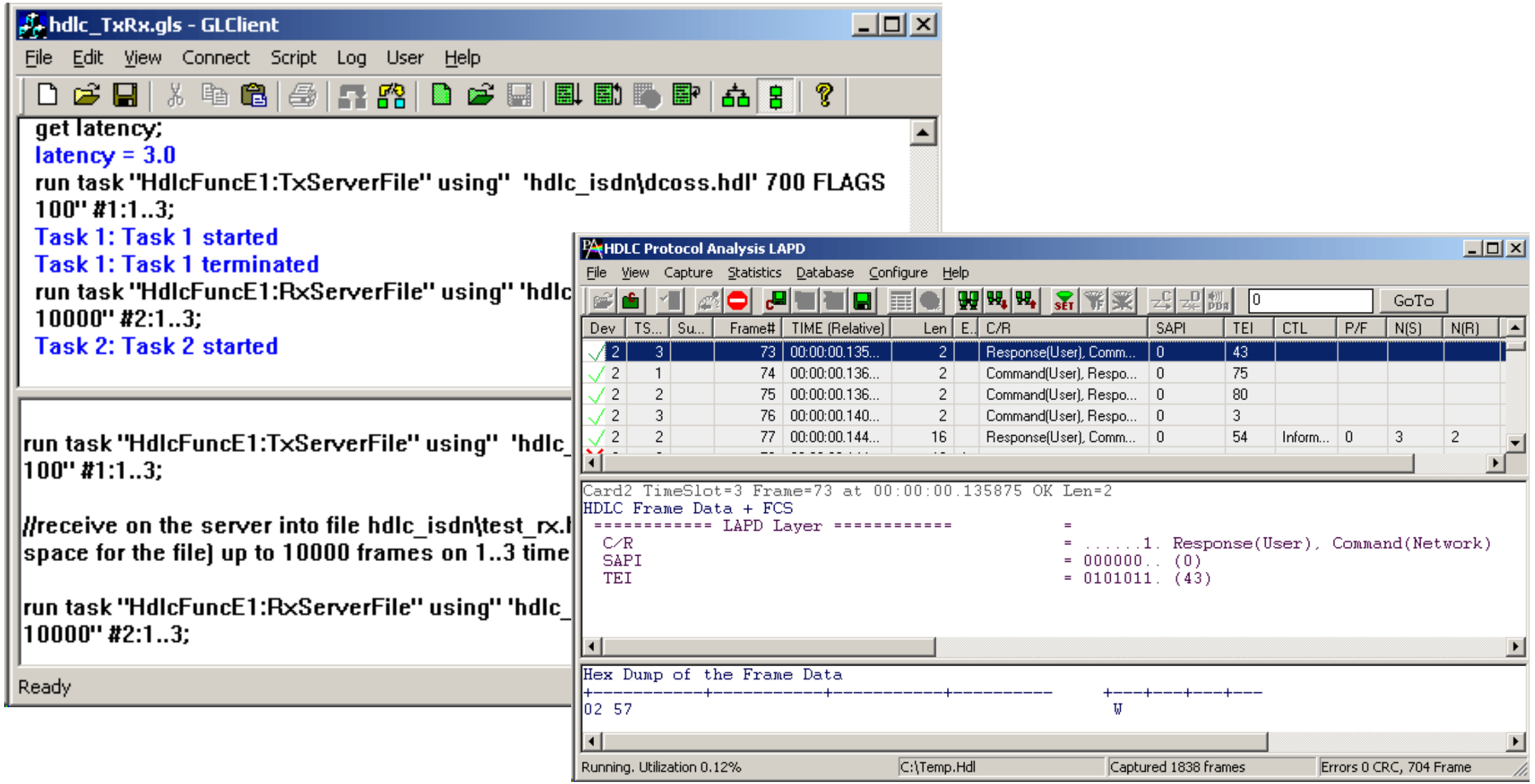
- Various impairments can be introduced before frames are transmitted. Global impairments (effective for all the HDL streams) can be specified as well as impairments can be introduced per stream basis before frame transmission
- One can specify a limited number of impairments, set continuous impairment 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

GL Communications

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



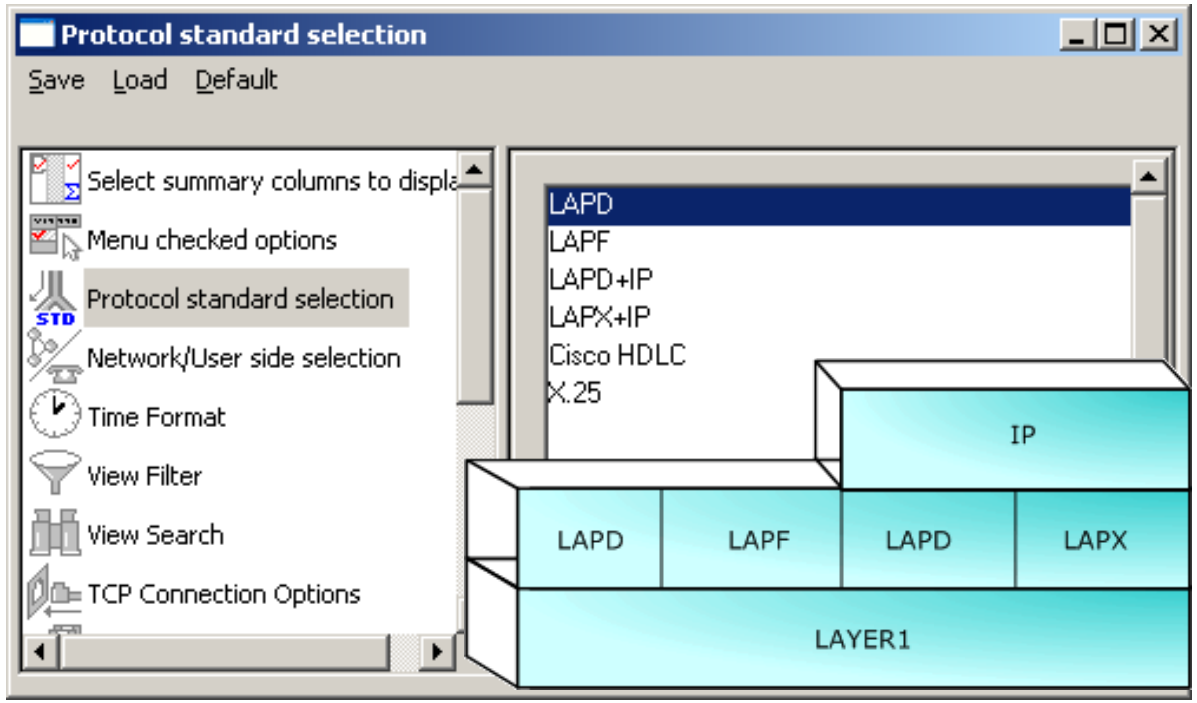
GL Communications

HDLC Analysis

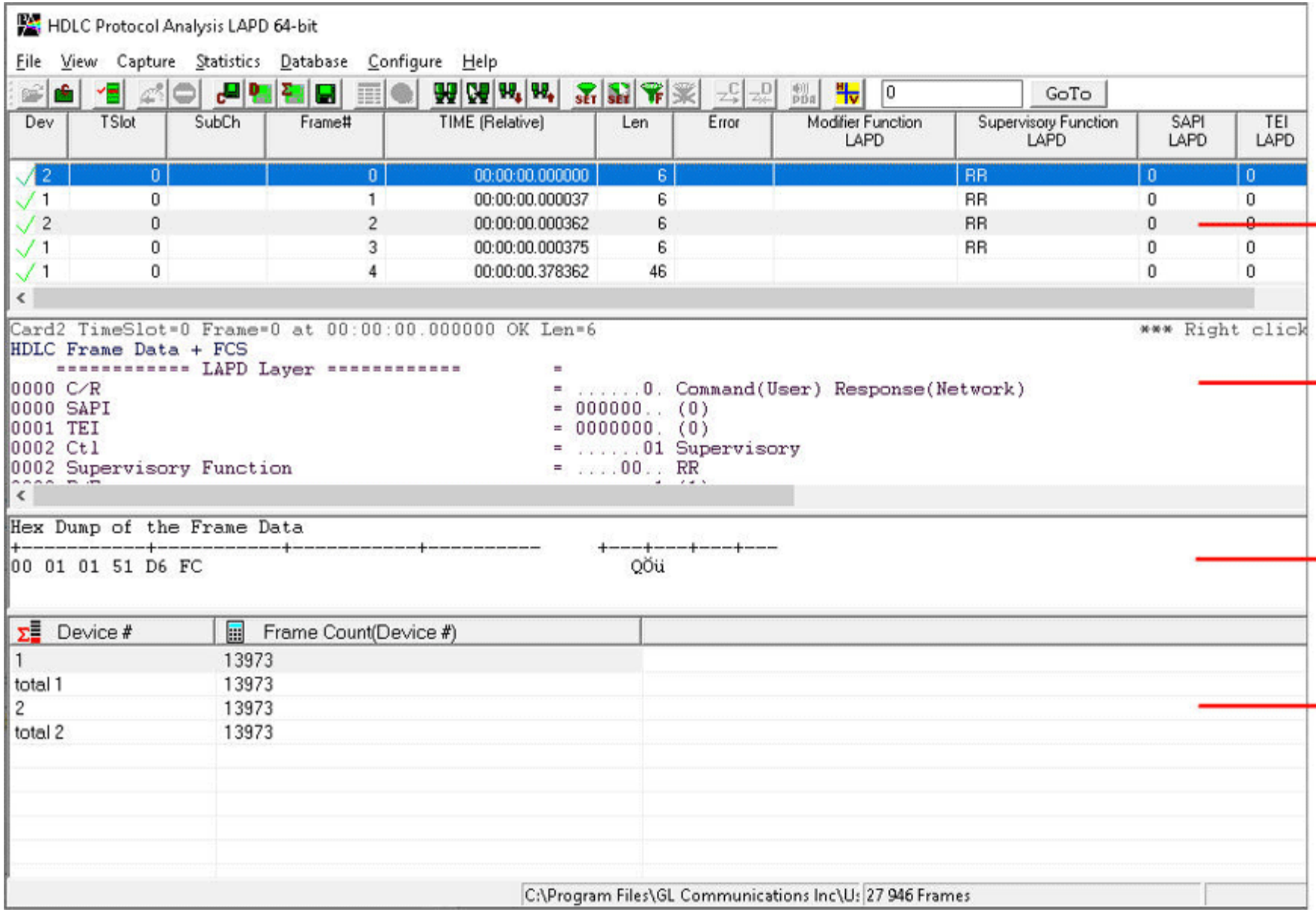
- Perform real-time / offline / remote analysis
- Consolidated GUI – Summary of all decodes, detail & hex-dump views of each frame, statistics view, & call detail record views
- Multiple streams of HDLC traffic on various T1/E1 channels can be simultaneously decoded with different GUI instances
- Captured 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



Summary View

Detail View

Hex Dump View

Statistics View

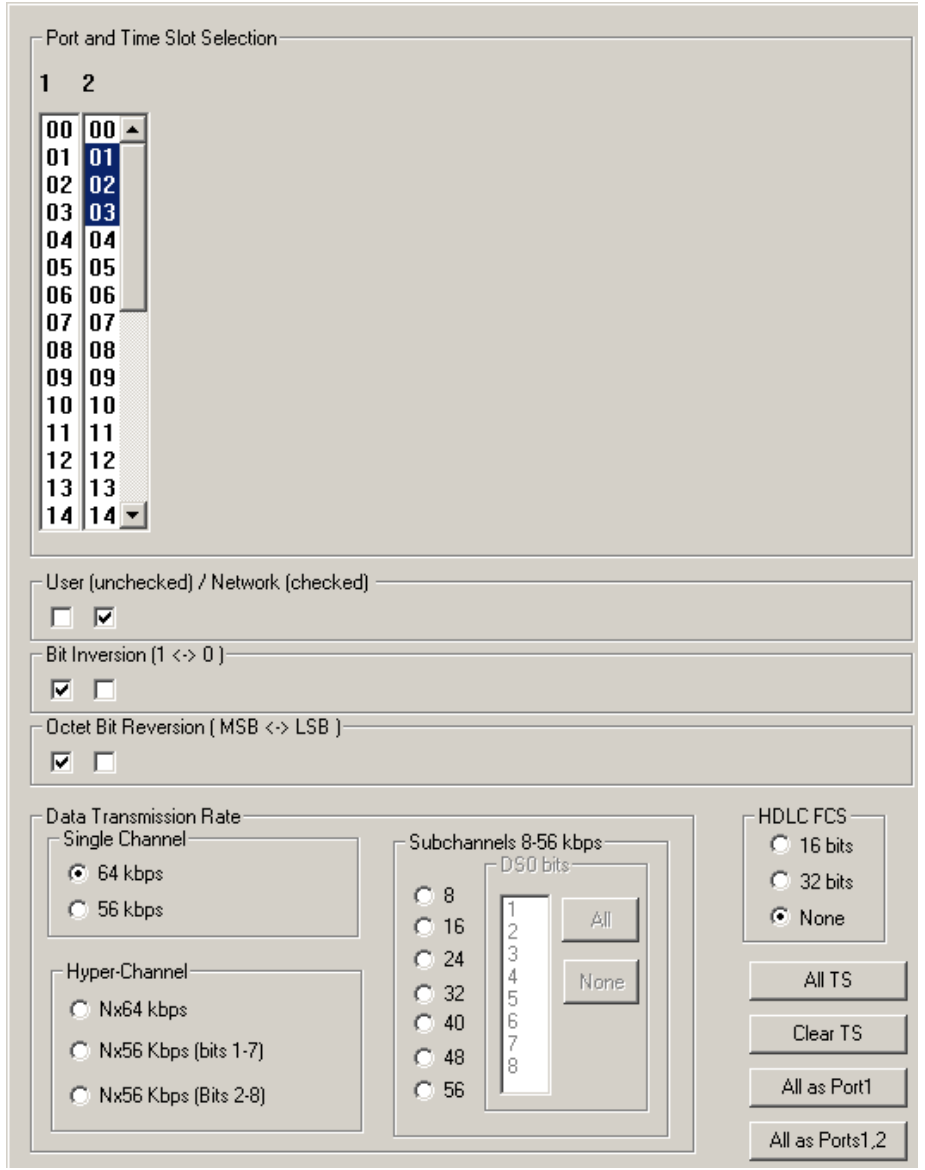
GL Communications

Different Views

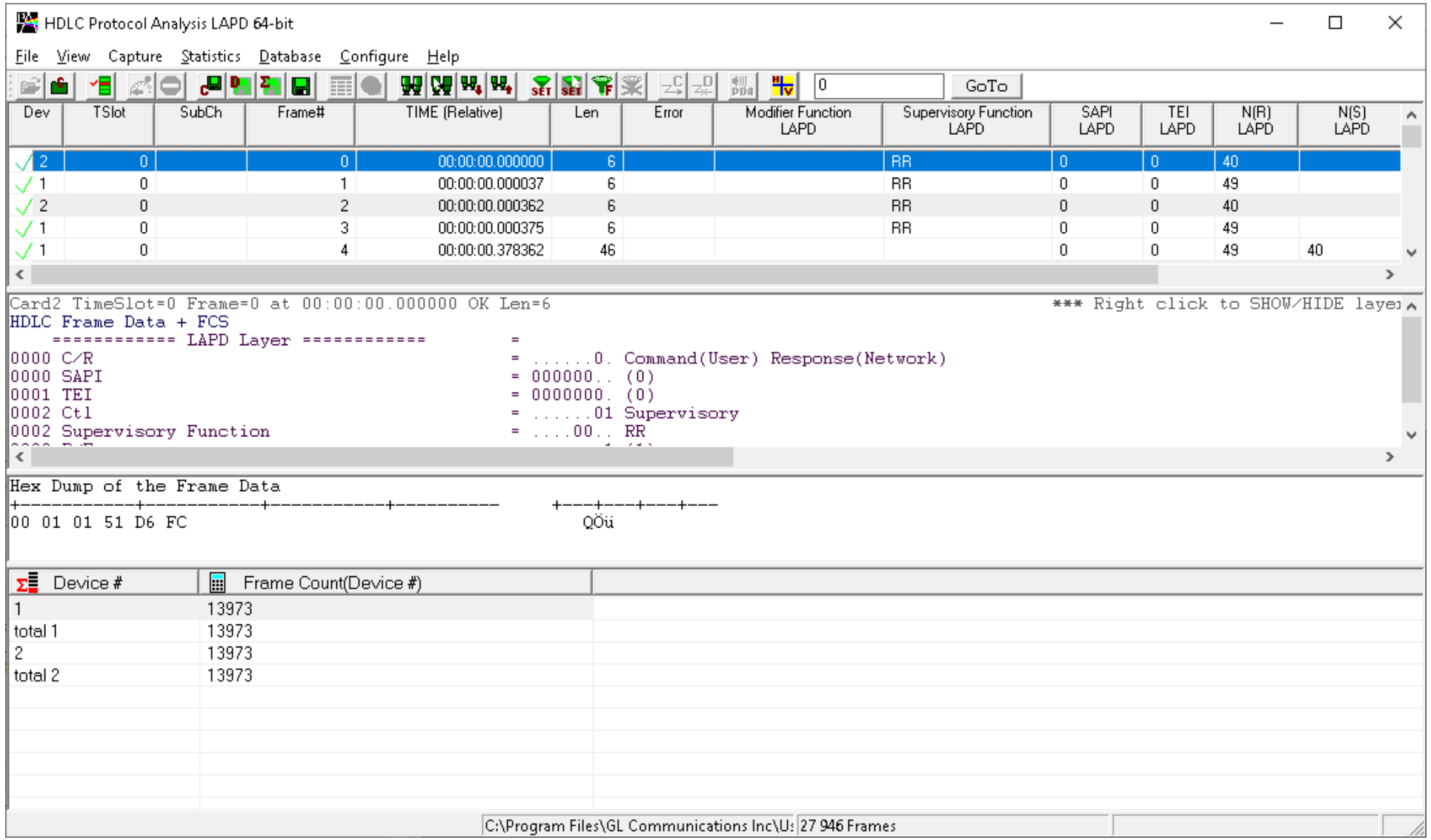
- **Summary View**: This pane displays the columns that contain Card Number, Timeslots, Frame Number, Time, Frame Error Status, Command/Response, Length, Error, C/R, SAPI, CTL, P/F, FUNC, and more in a tabular format
- **Detail View**: This pane displays in detail about a frame in order to analyze and 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 x 64 kbps, or n x 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

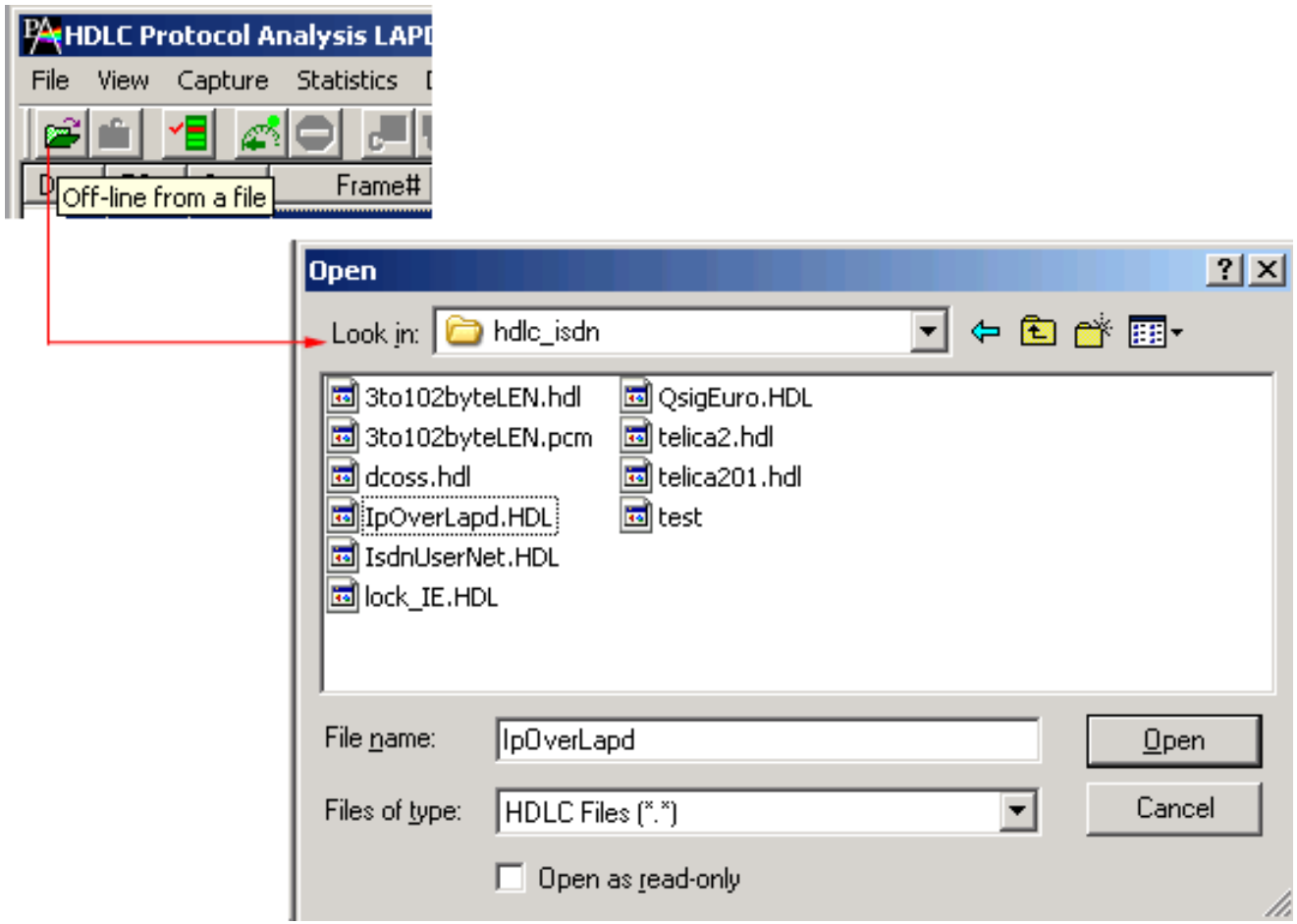


HDLC Protocol Analyzer



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

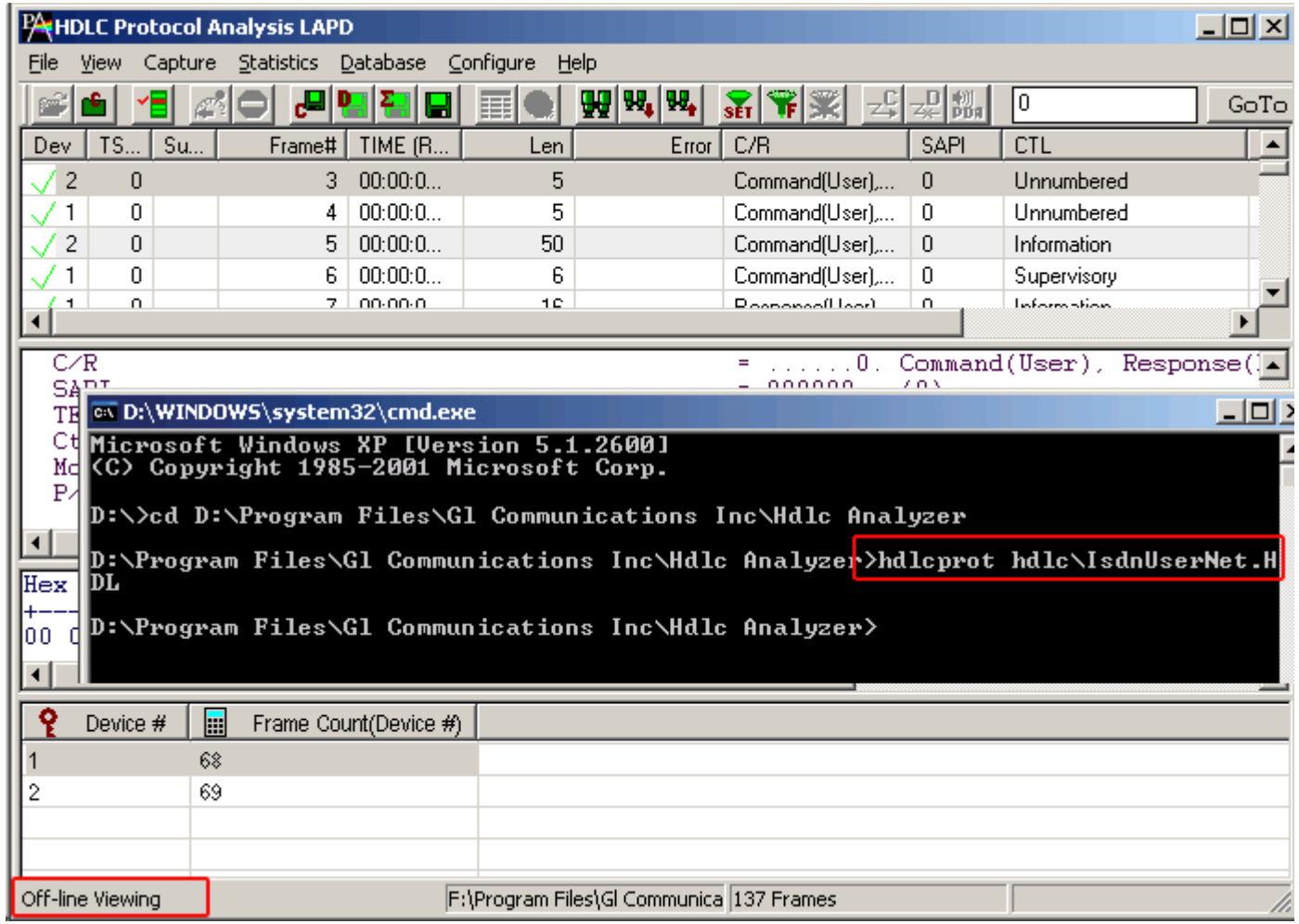


GL Communications

Offline Analysis (Contd.)

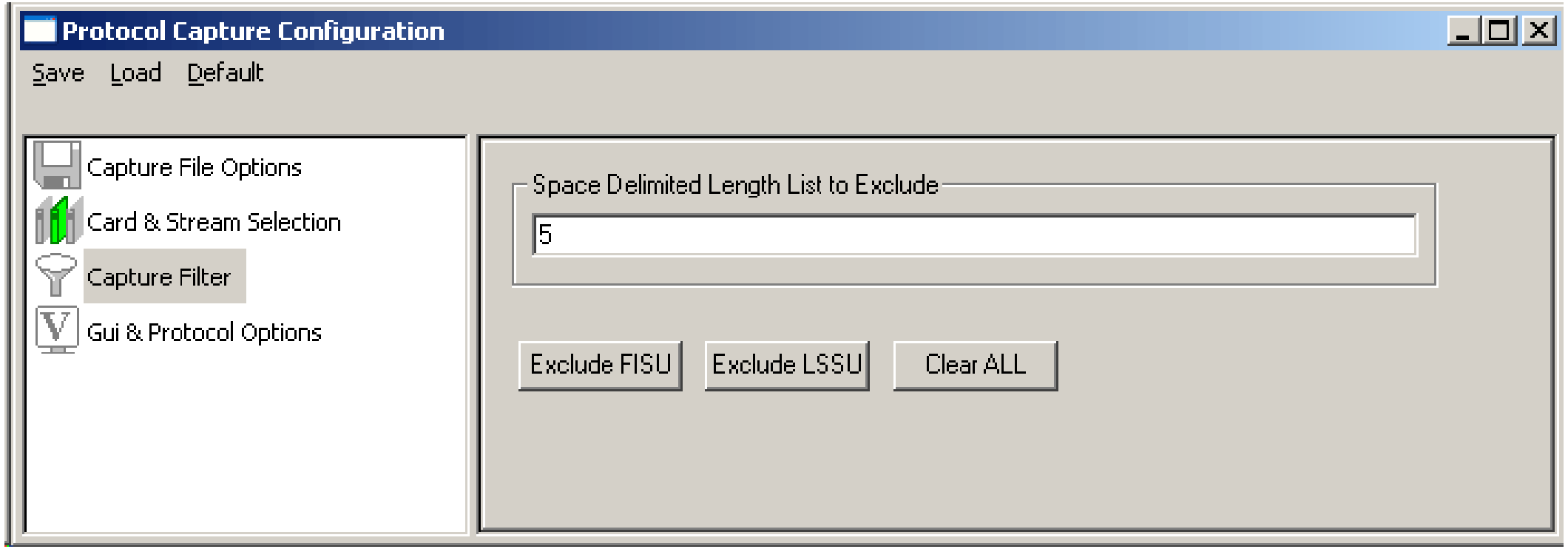
- Trace files for offline analysis can be loaded through simple command-line arguments as below:
- **Command Syntax: hdlcprot hdlc\Filename.hdl**

Command Line Interface



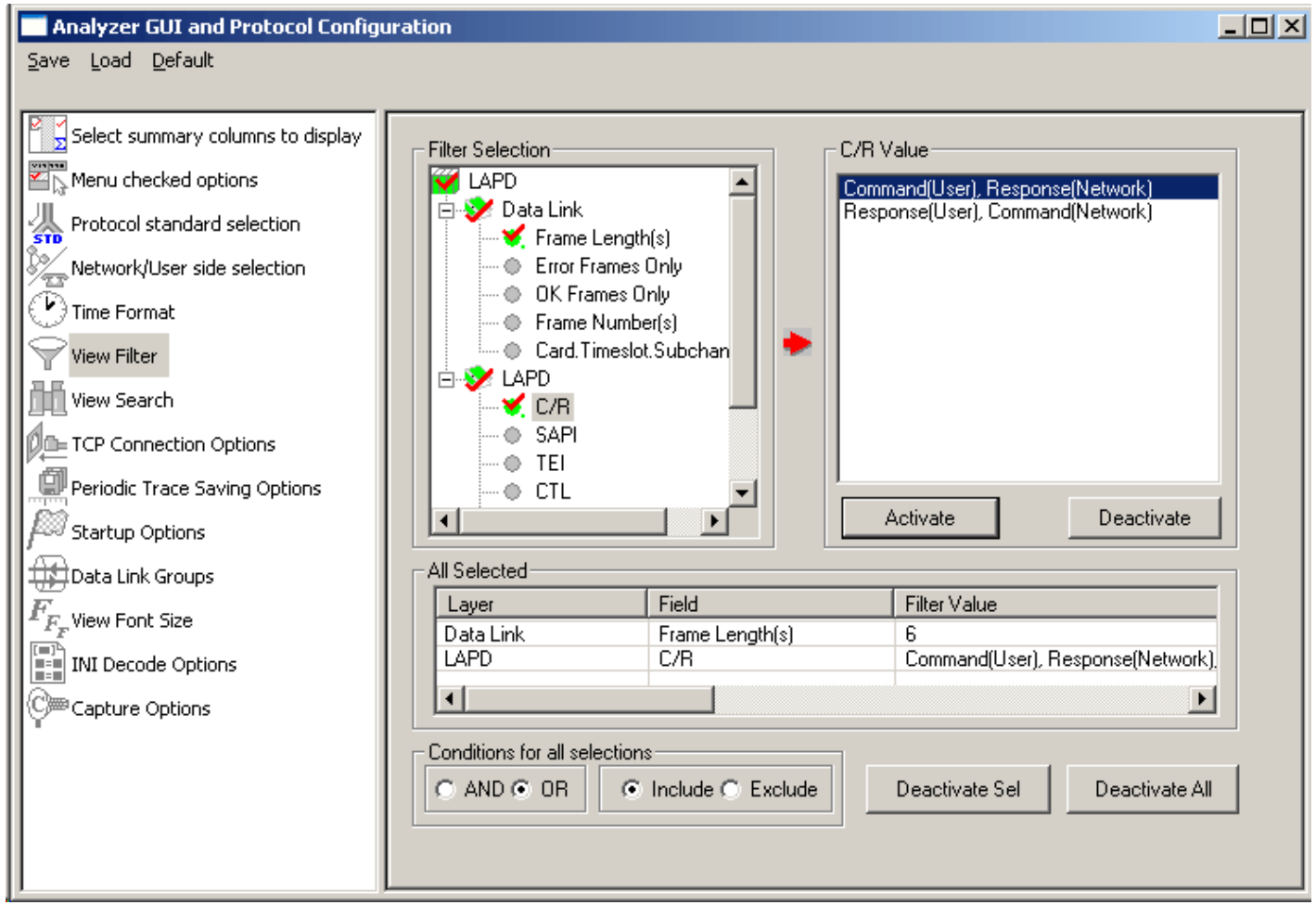
Filters - Real-time Capture Filter

- 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



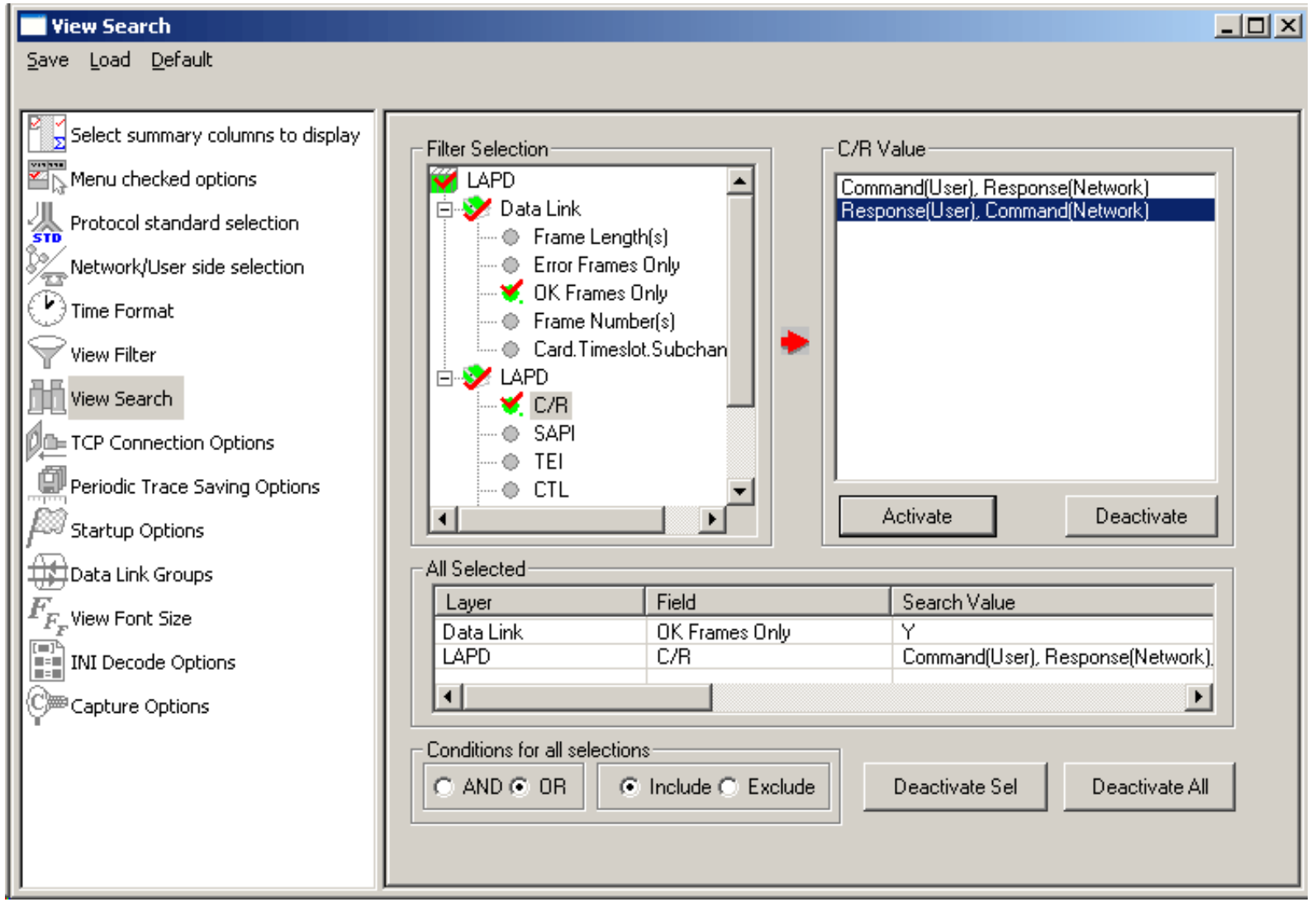
Filters - Offline View Filter

- 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



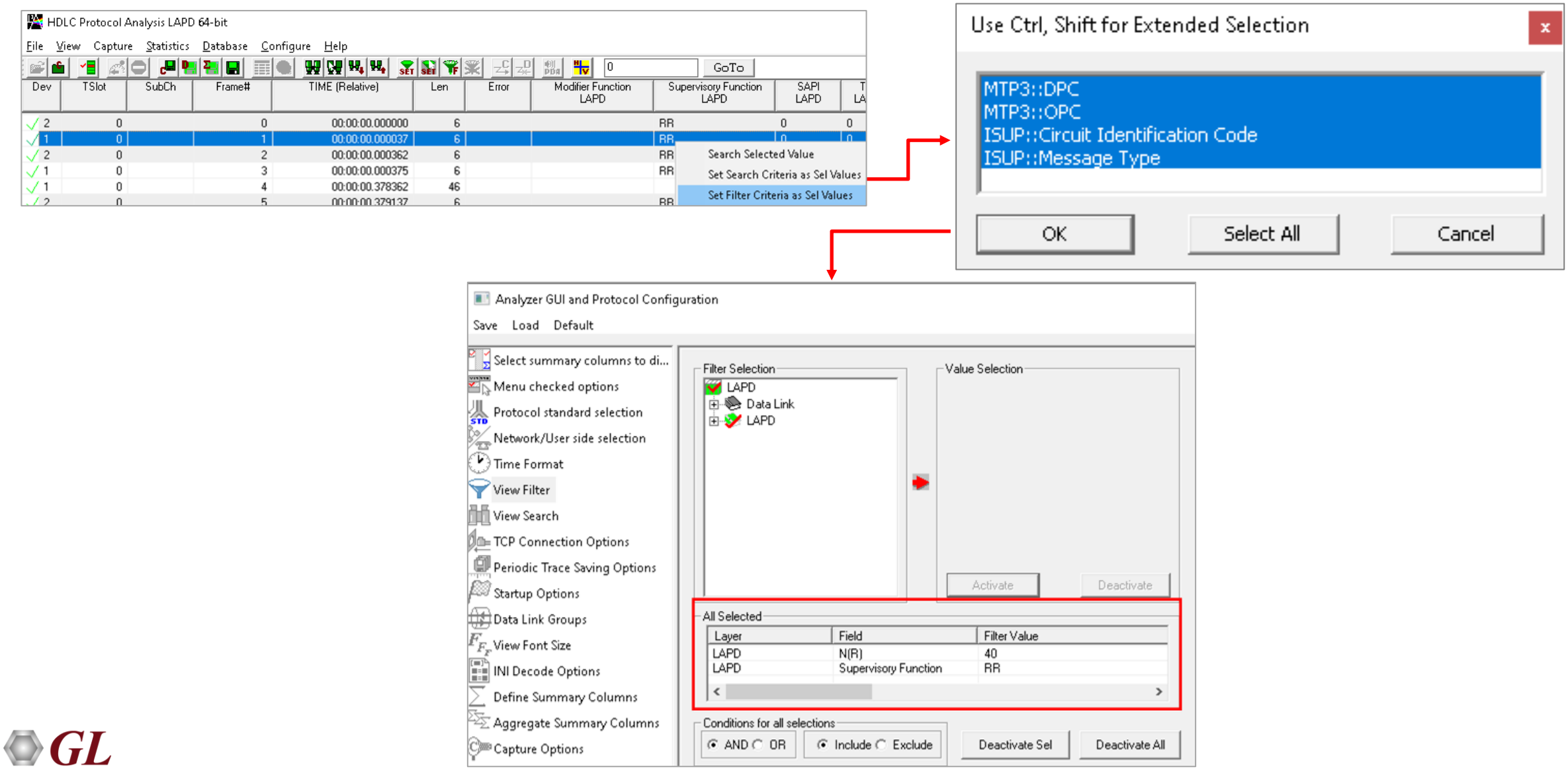
Search Options

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



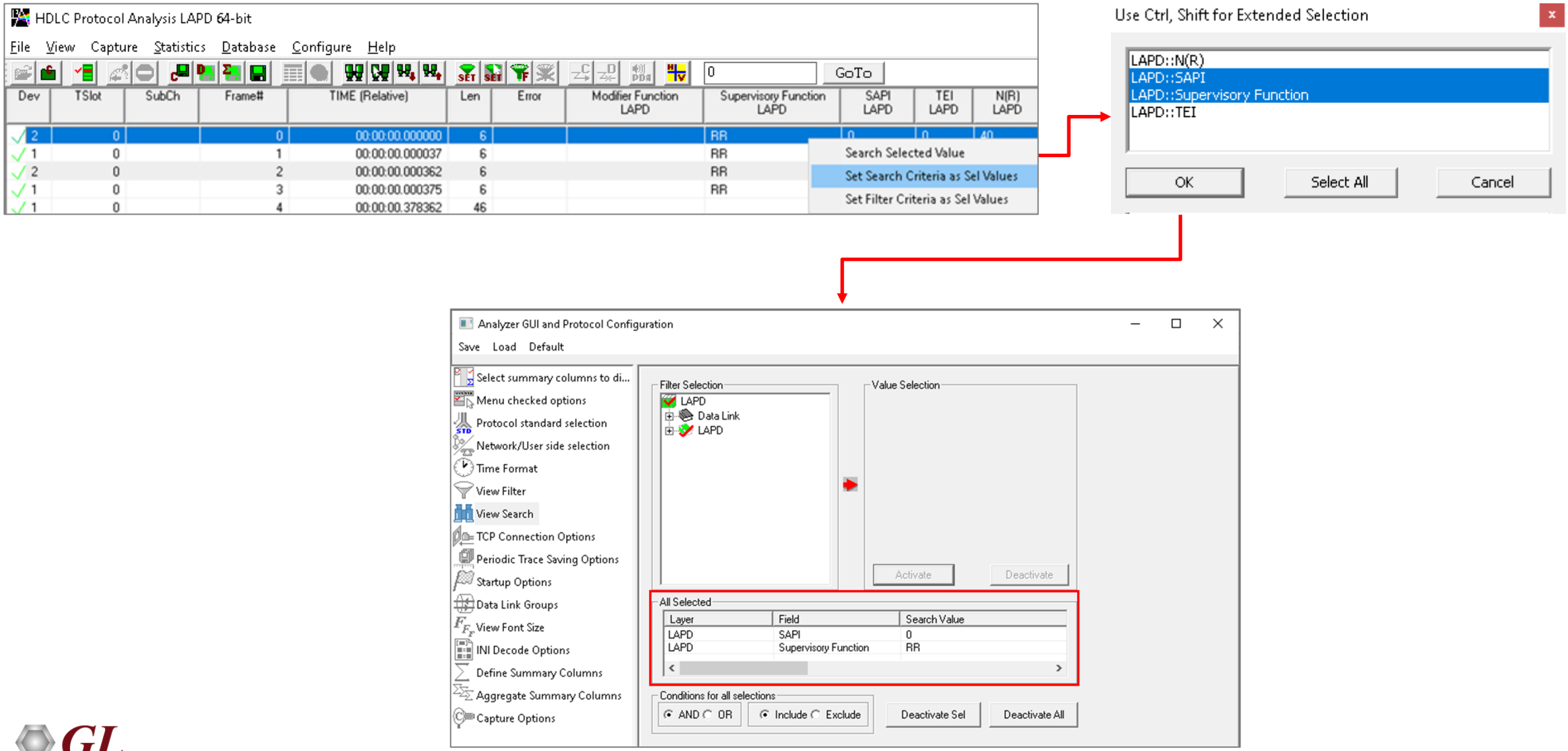
Filtering Criteria From Screen Selection

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



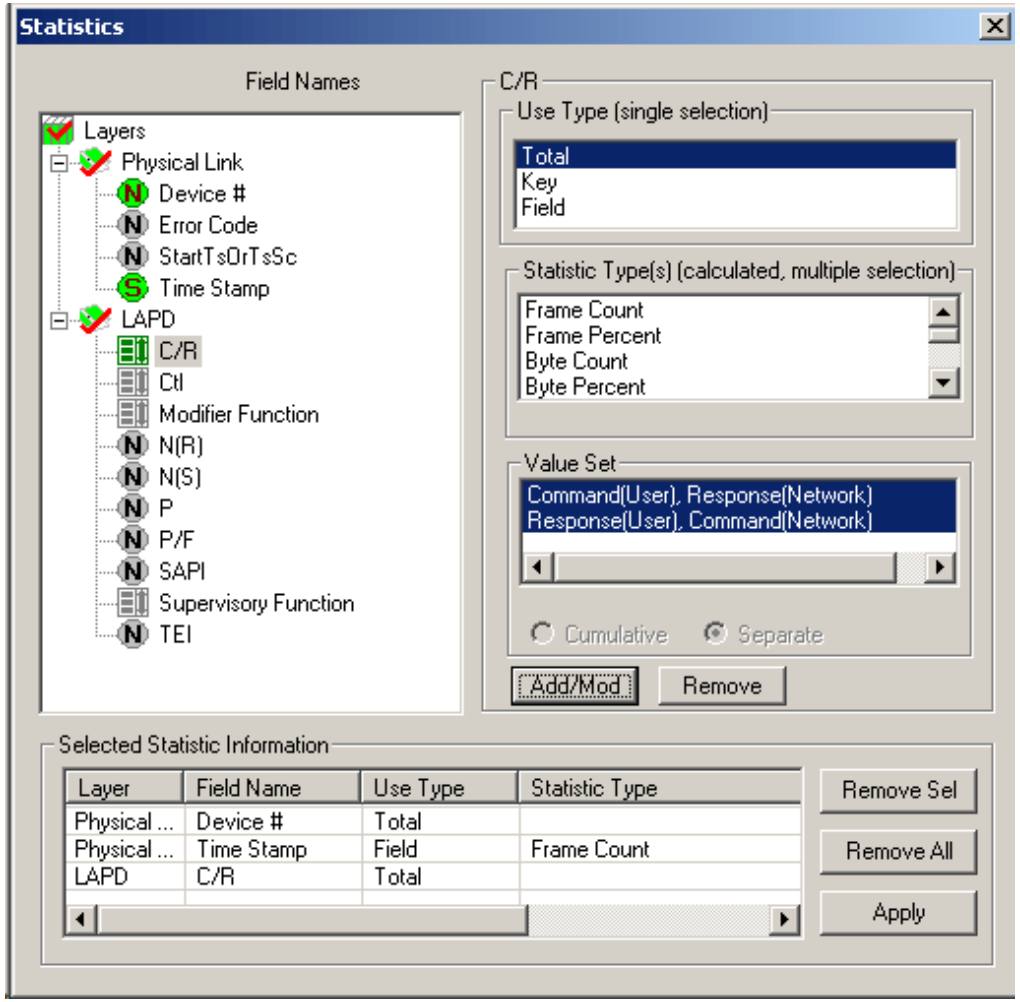
Search Criteria From Screen Selection

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



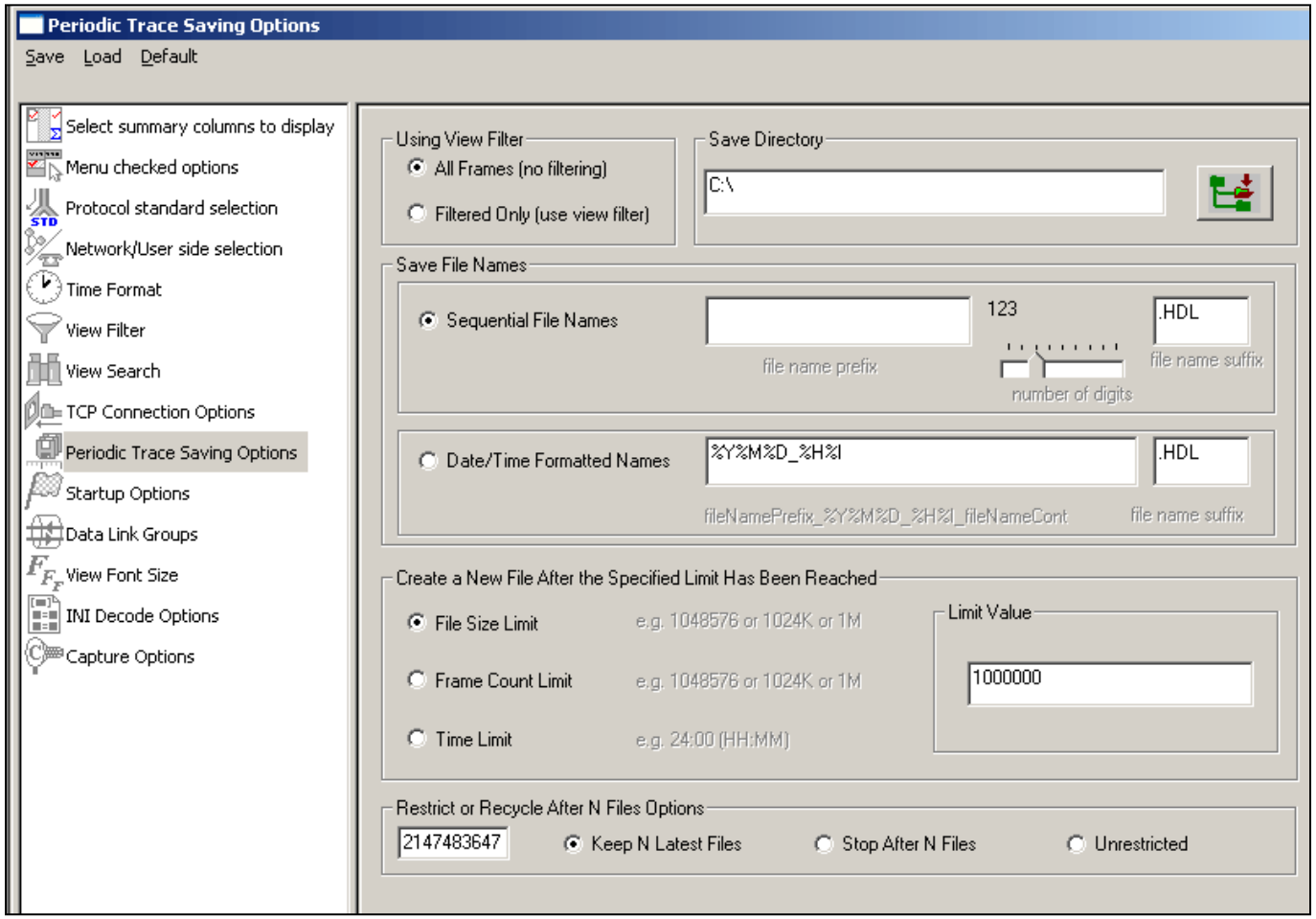
Statistics

- 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



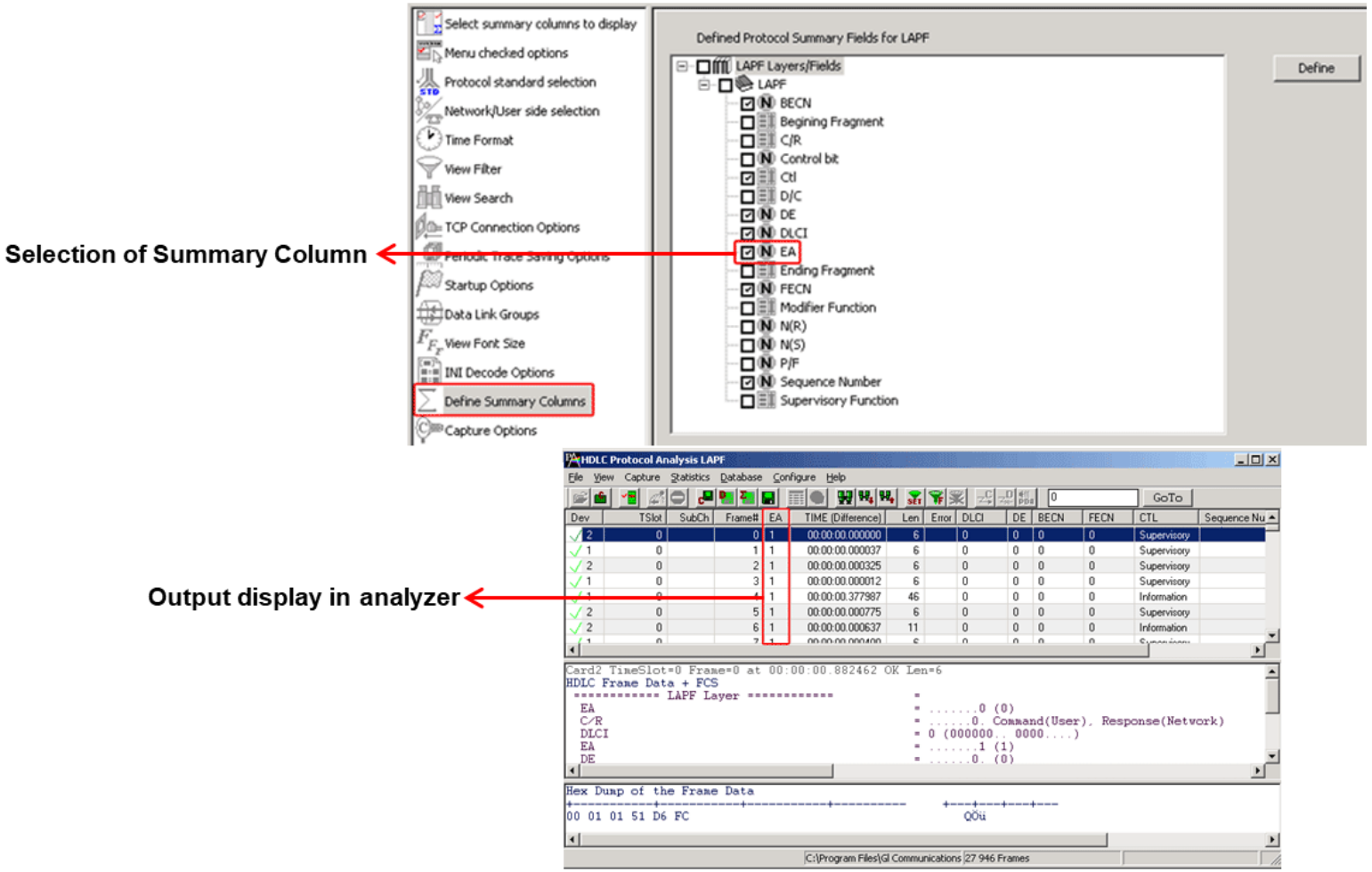
Saving a File

- 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



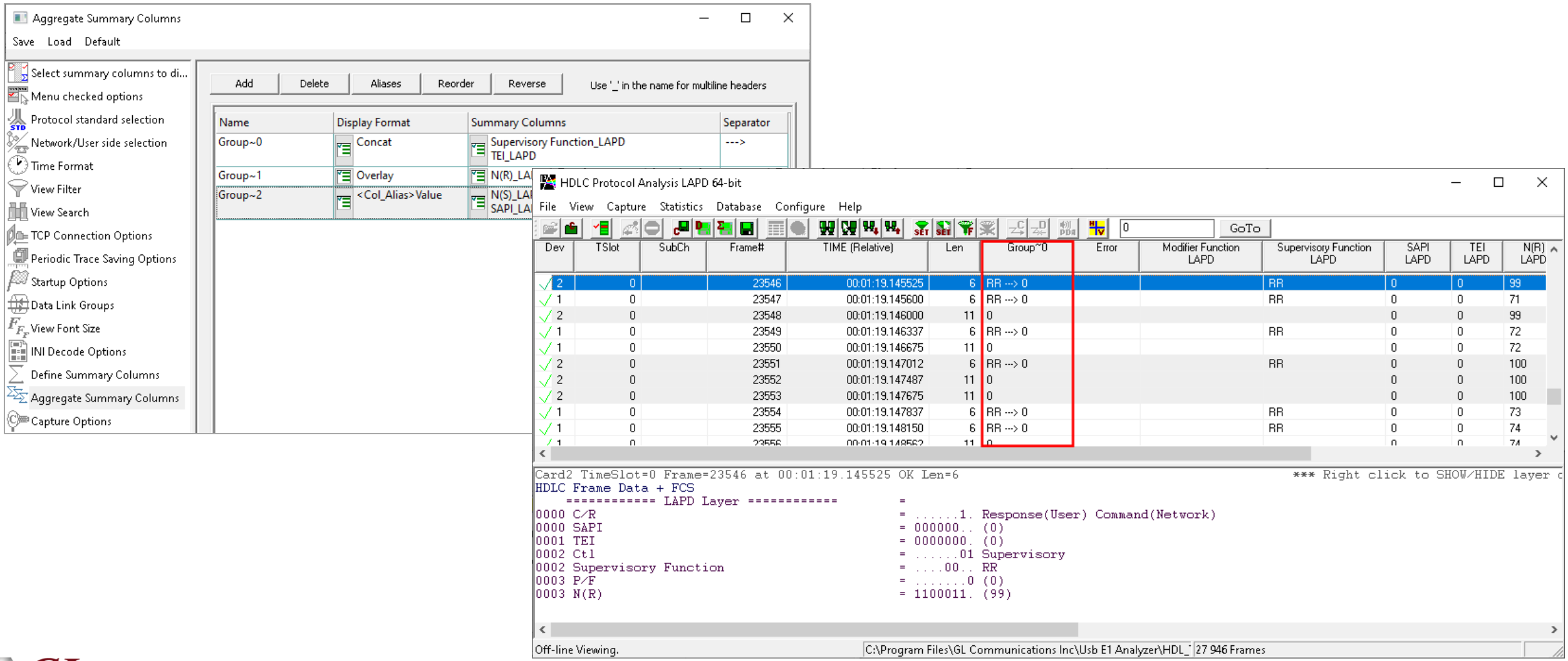
Define Summary Columns

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



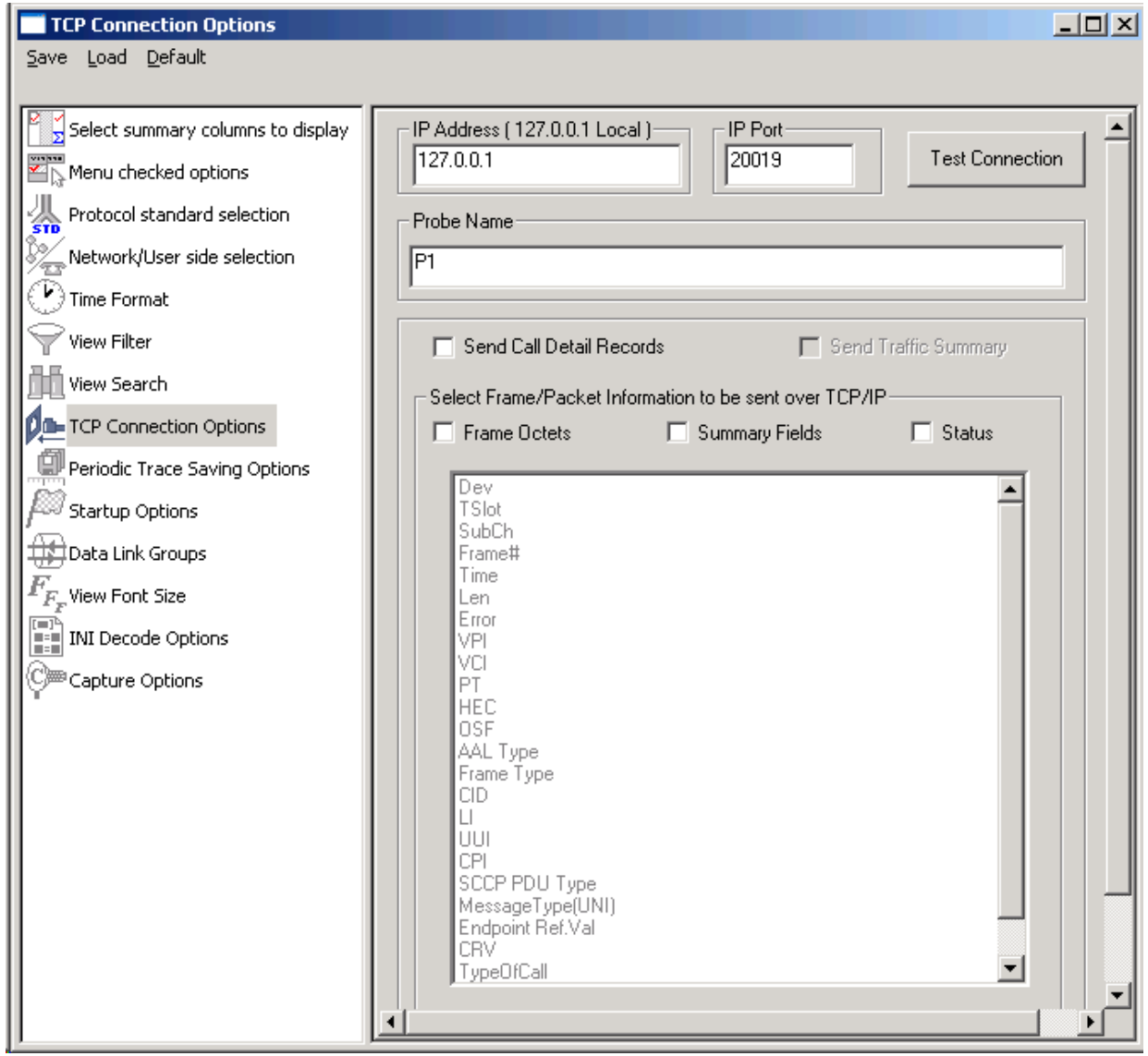
Aggregate Group Column

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



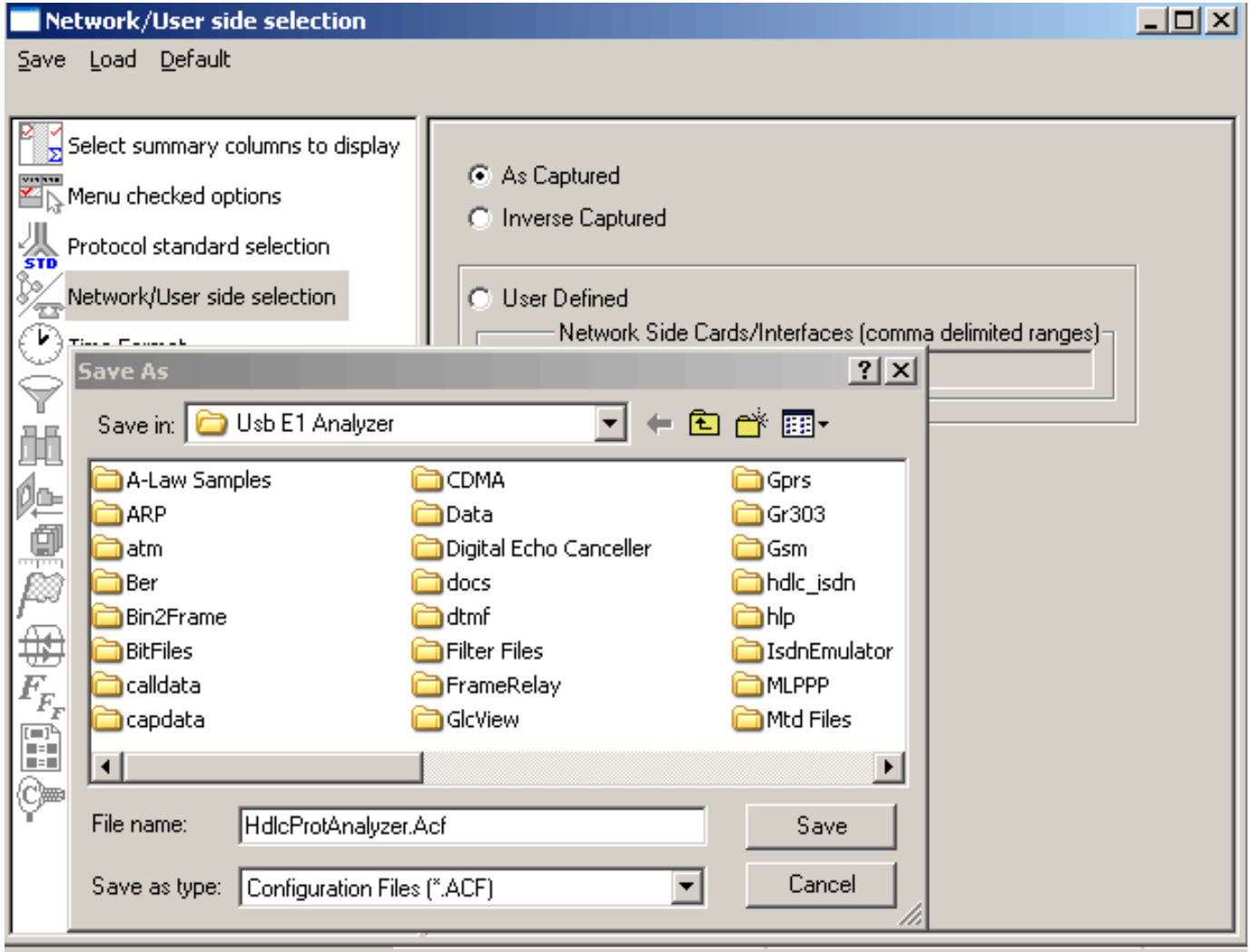
TCP Connection Options

- 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

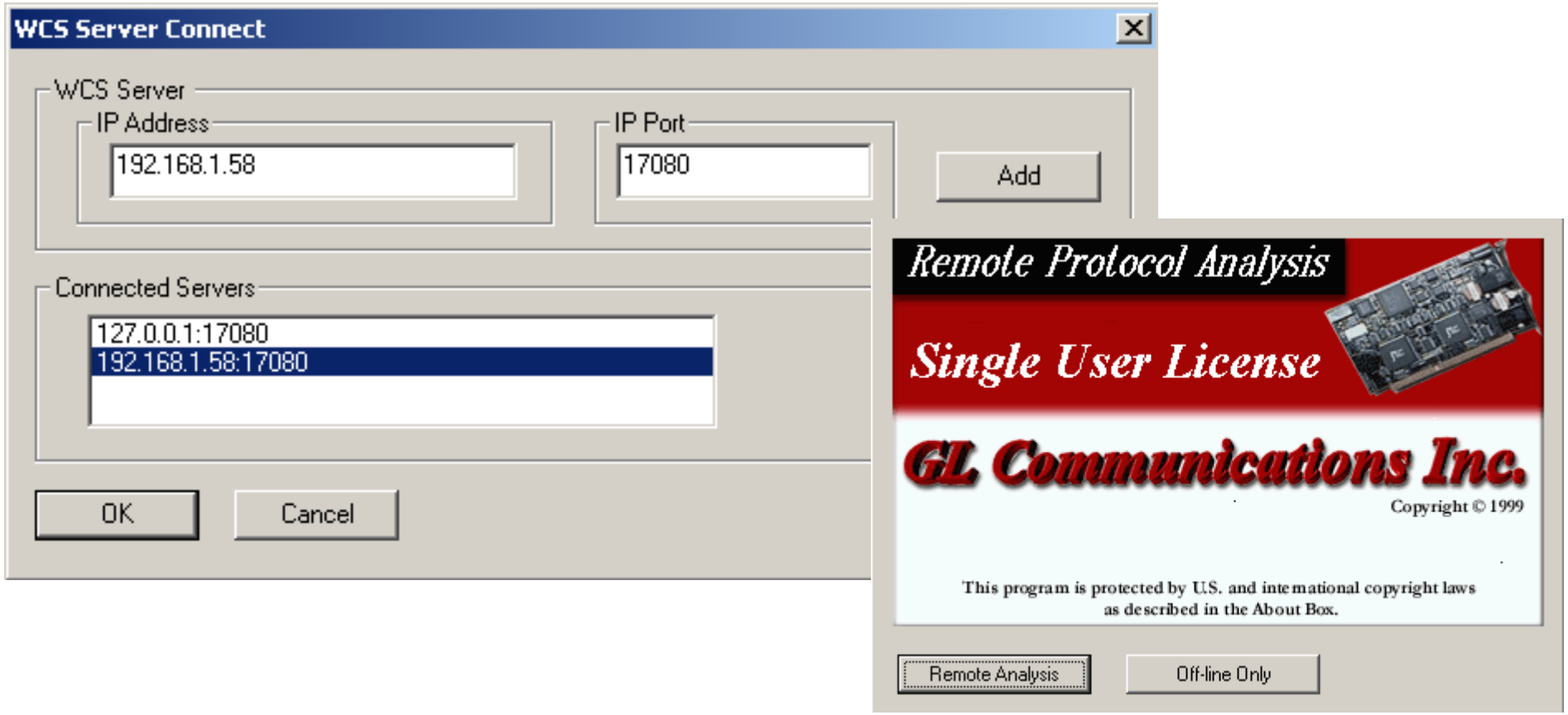
- Client side consists of a PC with Ethernet connectivity and GUI Remote Protocol Analysis software – no special T1 or E1 hardware is required
- Multiple T1/E1 servers may be simultaneously connected to a single remote client using a single GUI
- Multiple remote clients may access a single T1/E1 server.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

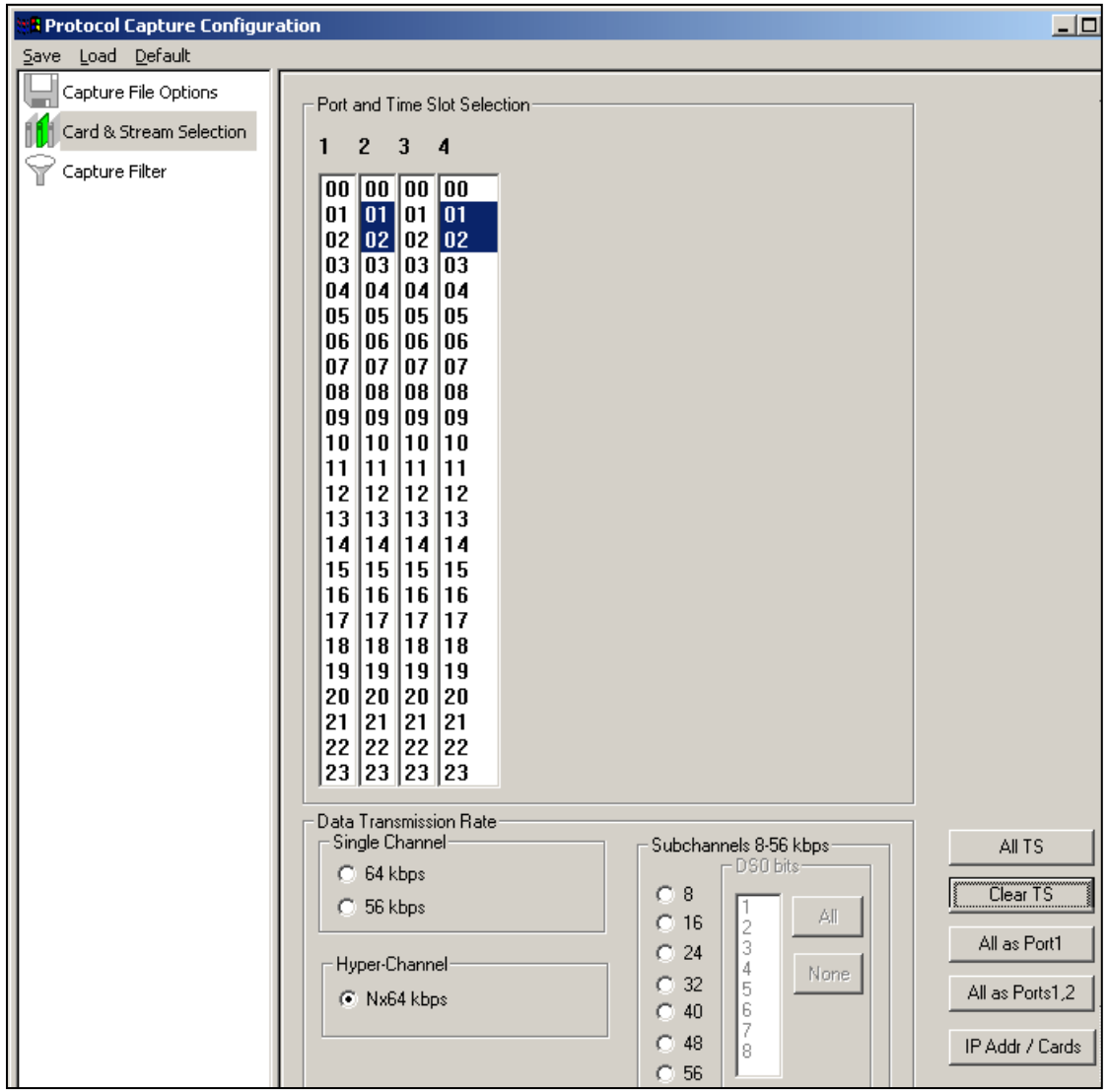
- Users are required to enter IP address of the WCS server and an IP Port
- Multiple Server IP Addresses can be added to connect simultaneously to all T1E1 cards.
- Lists an IP addresses and the IP port numbers
- Option is provided for the user to select the desired IP address of the server



Stream Selection

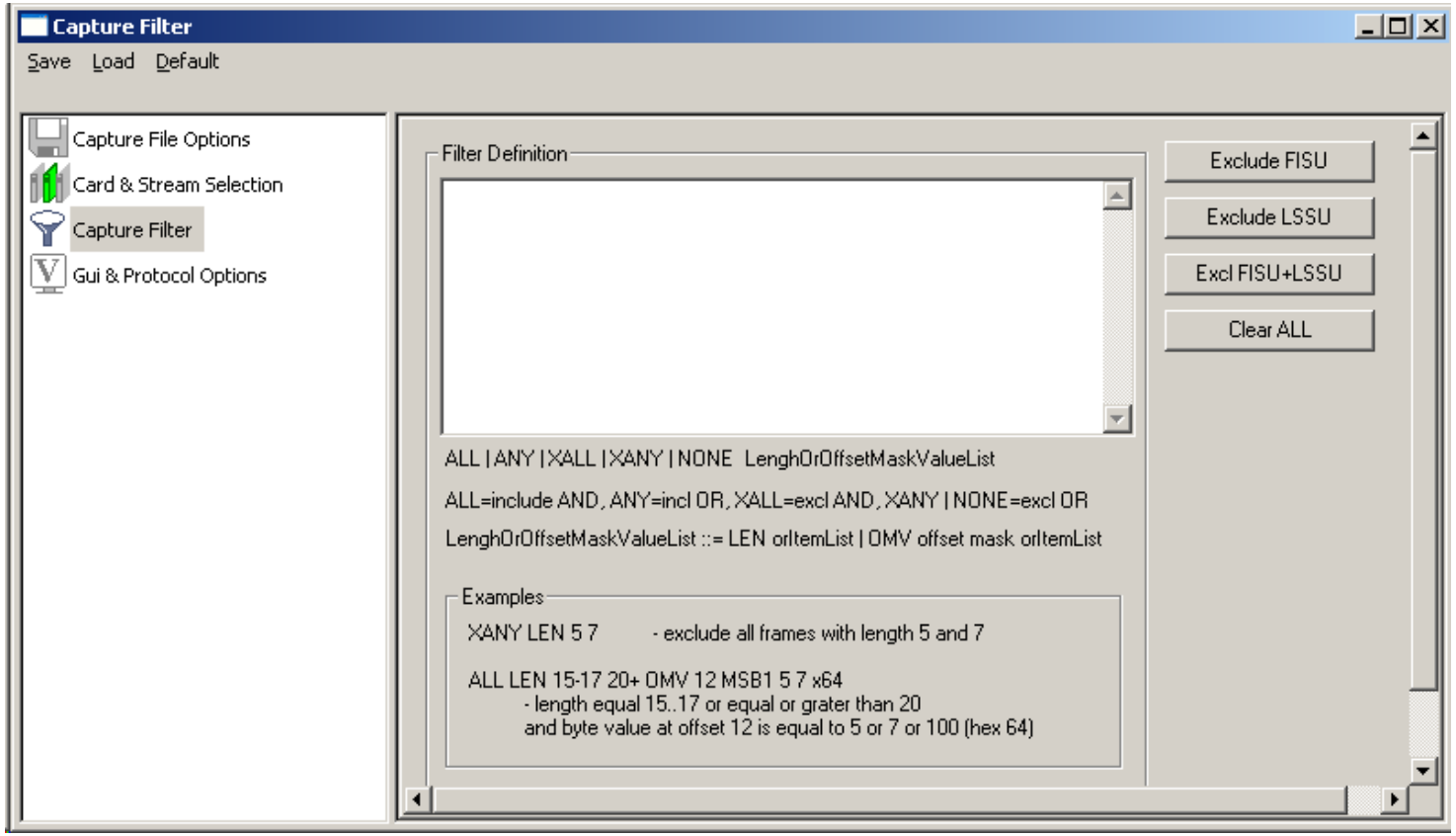
Remote Protocol Analyzers

- 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 x 64 kbps
- Recorded trace file can then be analyzed offline, exported to ASCII file, or printed



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