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# HDLC Analysis and Emulation

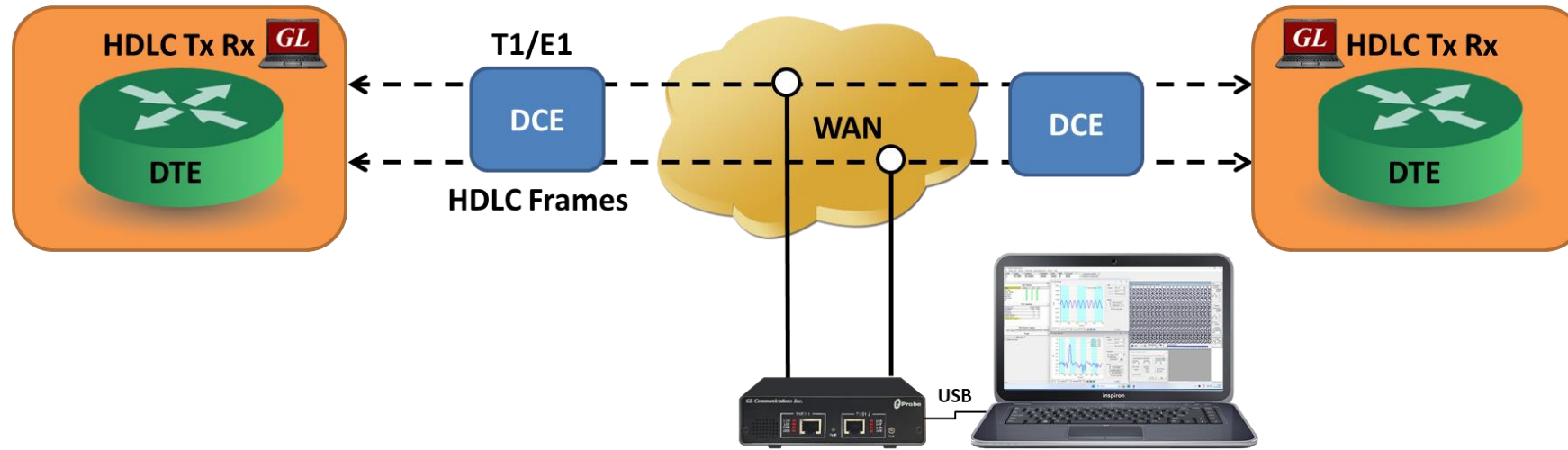
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GL's HDLC Analysis and Emulation

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# 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



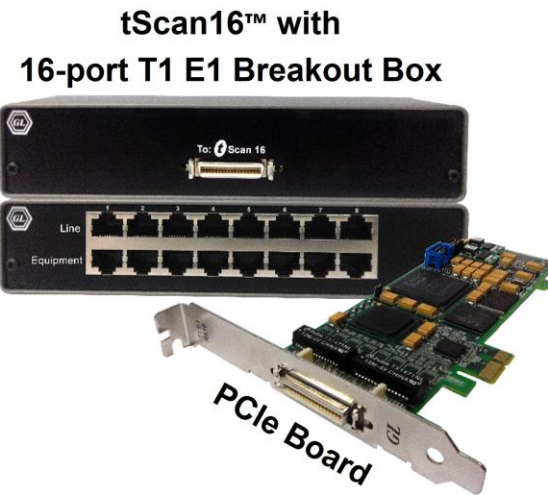
**tProbe™ - Portable USB based T1 E1 VF  
FXO FXS and Serial Datacom Analyzer**



**Quad / Octal T1 E1 PCIe Card**



**Dual T1 E1 Express (PCIe) Board**

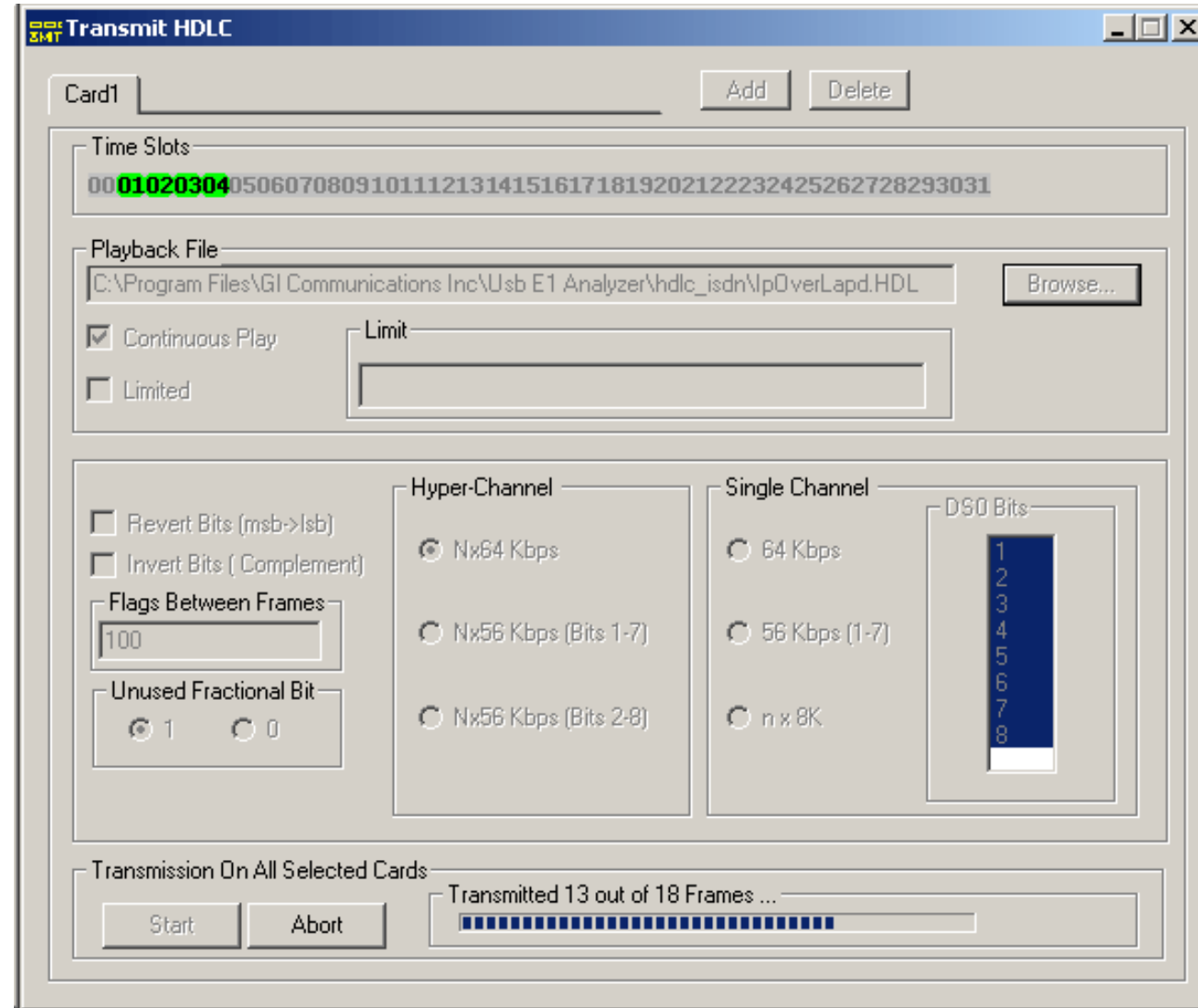


**tScan16™ with  
16-port T1 E1 Breakout Box**

**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

Select Card and Timeslot for Transmission

Card Number

- 1
- 2

Time Slots

- 00
- 01
- 02
- 03
- 04
- 05
- 06
- 07
- 08
- 09
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17
- 18

All Time Slots

No Time Slots

OK

Cancel

Hold Ctrl or Shift key to make extended time slot selection

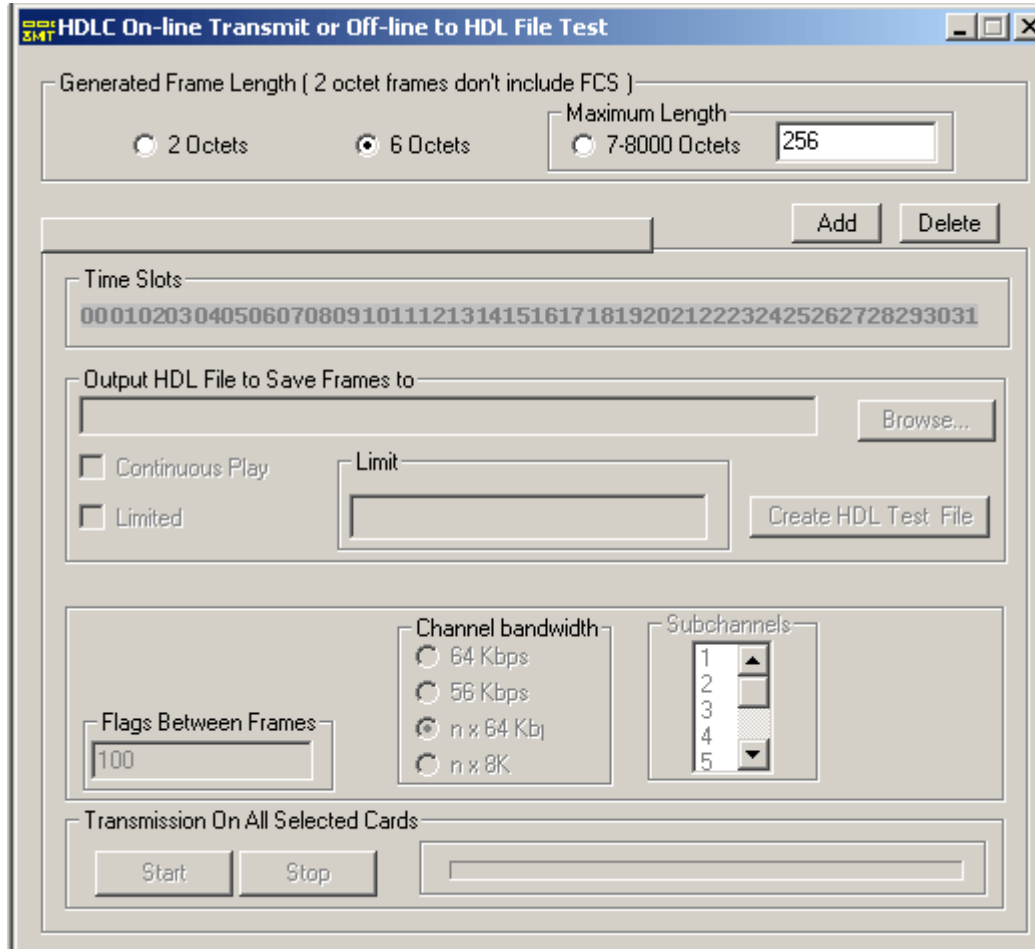
Select multiple timeslots only for n x 64 Kbps

# 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



HDLC On-line Transmit or Off-line to HDL File Test

Generated Frame Length ( 2 octet frames don't include FCS )

2 Octets  6 Octets  7-8000 Octets

Maximum Length

Time Slots

0001020304050607080910111213141516171819202122232425262728293031

Output HDL File to Save Frames to

Continuous Play

Limited

Flags Between Frames

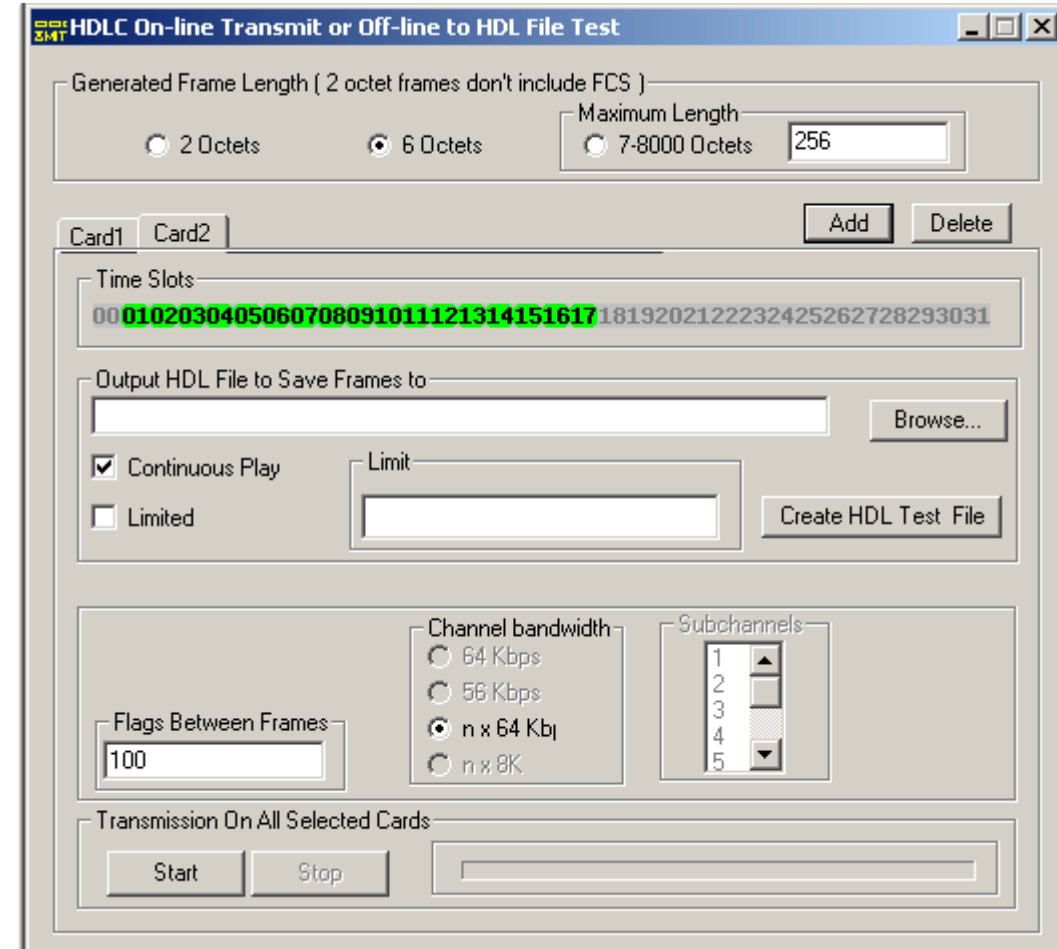
Channel bandwidth

64 Kbps  56 Kbps  n x 64 Kbj  n x 8K

Subchannels

1 2 3 4 5

Transmission On All Selected Cards



HDLC On-line Transmit or Off-line to HDL File Test

Generated Frame Length ( 2 octet frames don't include FCS )

2 Octets  6 Octets  7-8000 Octets

Maximum Length

Card1 Card2

Time Slots

0001020304050607080910111213141516171819202122232425262728293031

Output HDL File to Save Frames to

Continuous Play

Limited

Flags Between Frames

Channel bandwidth

64 Kbps  56 Kbps  n x 64 Kbj  n x 8K

Subchannels

1 2 3 4 5

Transmission On All Selected Cards



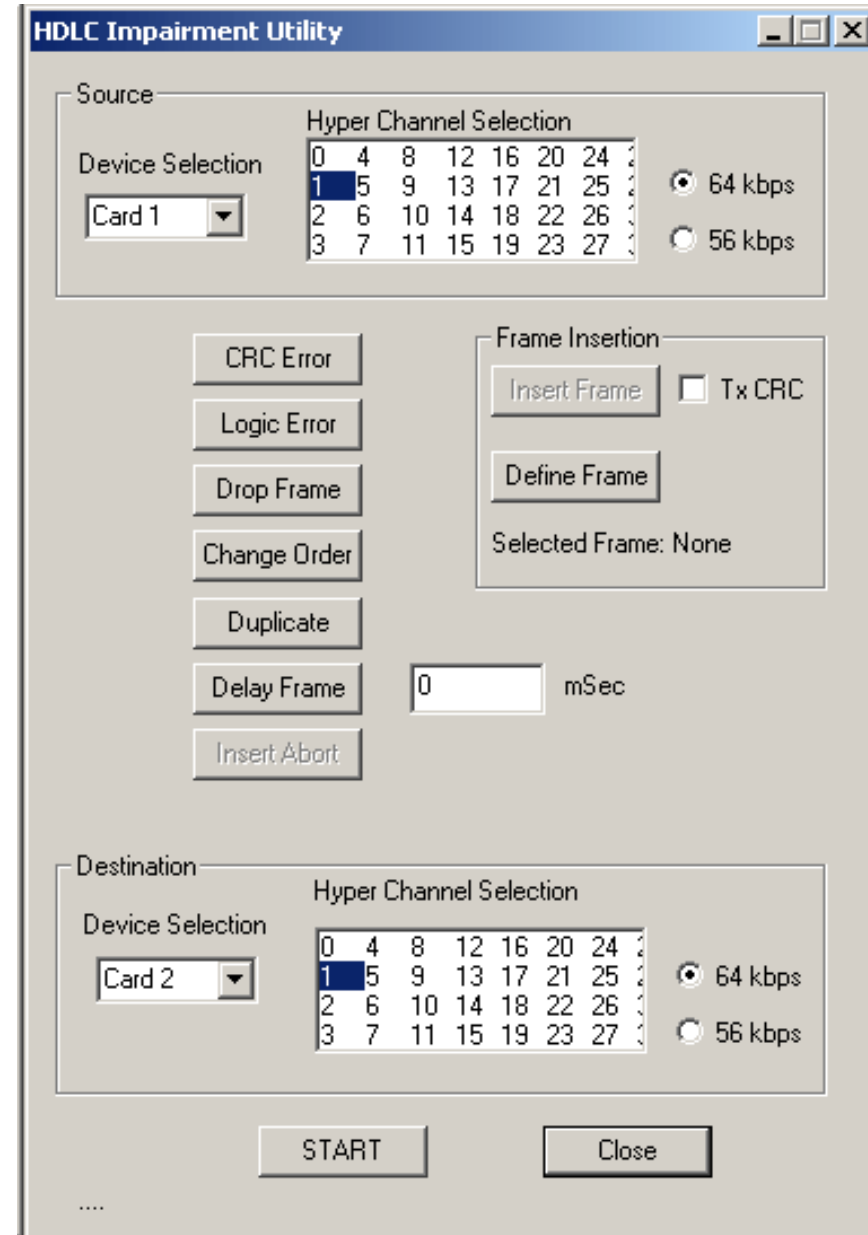
# HDLC Rx Test

- 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

# HDLC Link Impairment Utility (HLIU)

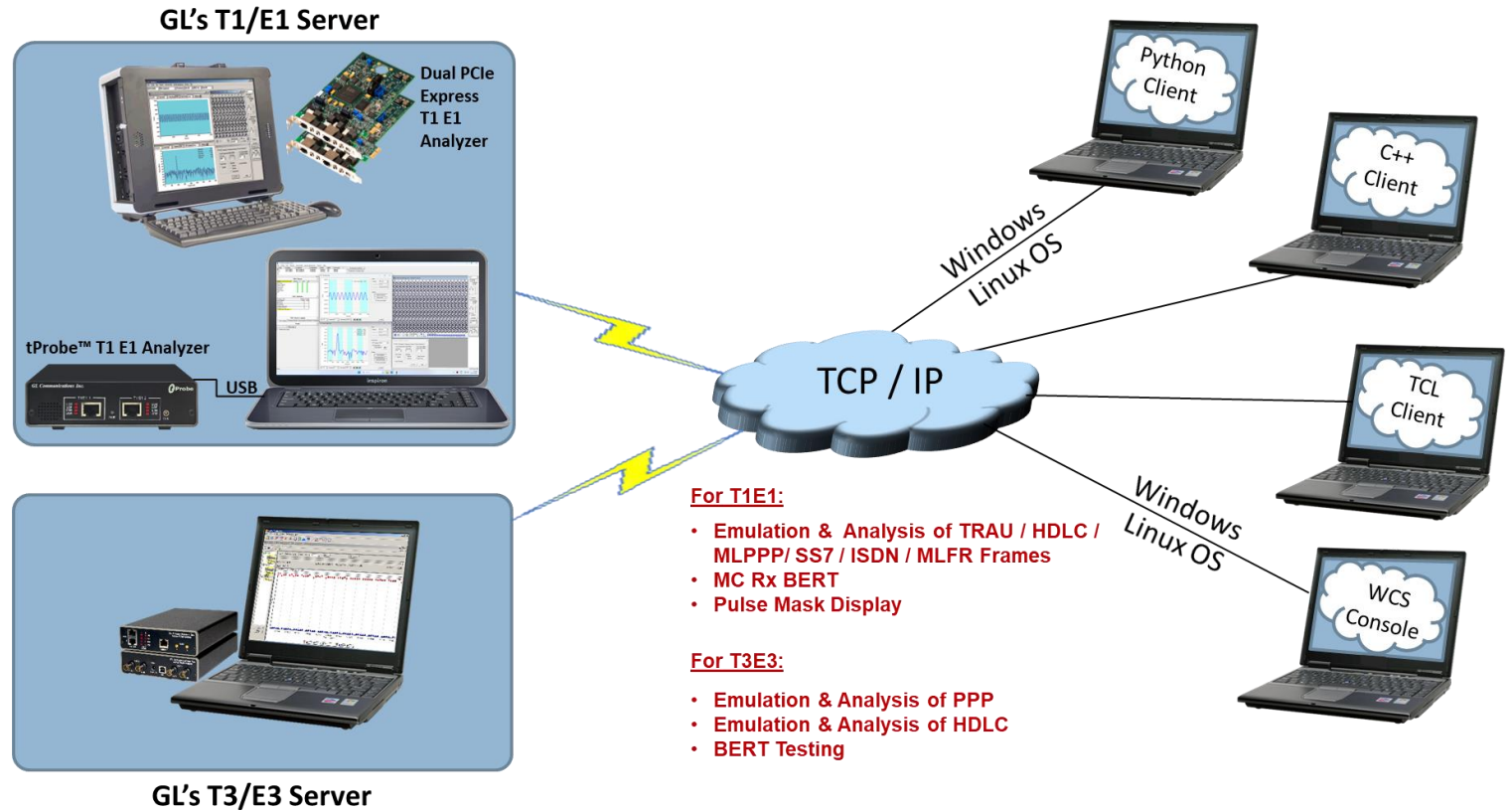
- Verifies the proper working of HDLC protocols by simulating various scenarios taking place in a real-time network
- The HLIU application has the following features:
  - Logic Error insertion
  - CRC Error insertion
  - Drop a Frame
  - Change Frame Order
  - Duplicate a Frame
  - Insert a Frame
  -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



# HDLC Emulation using Windows Client Server

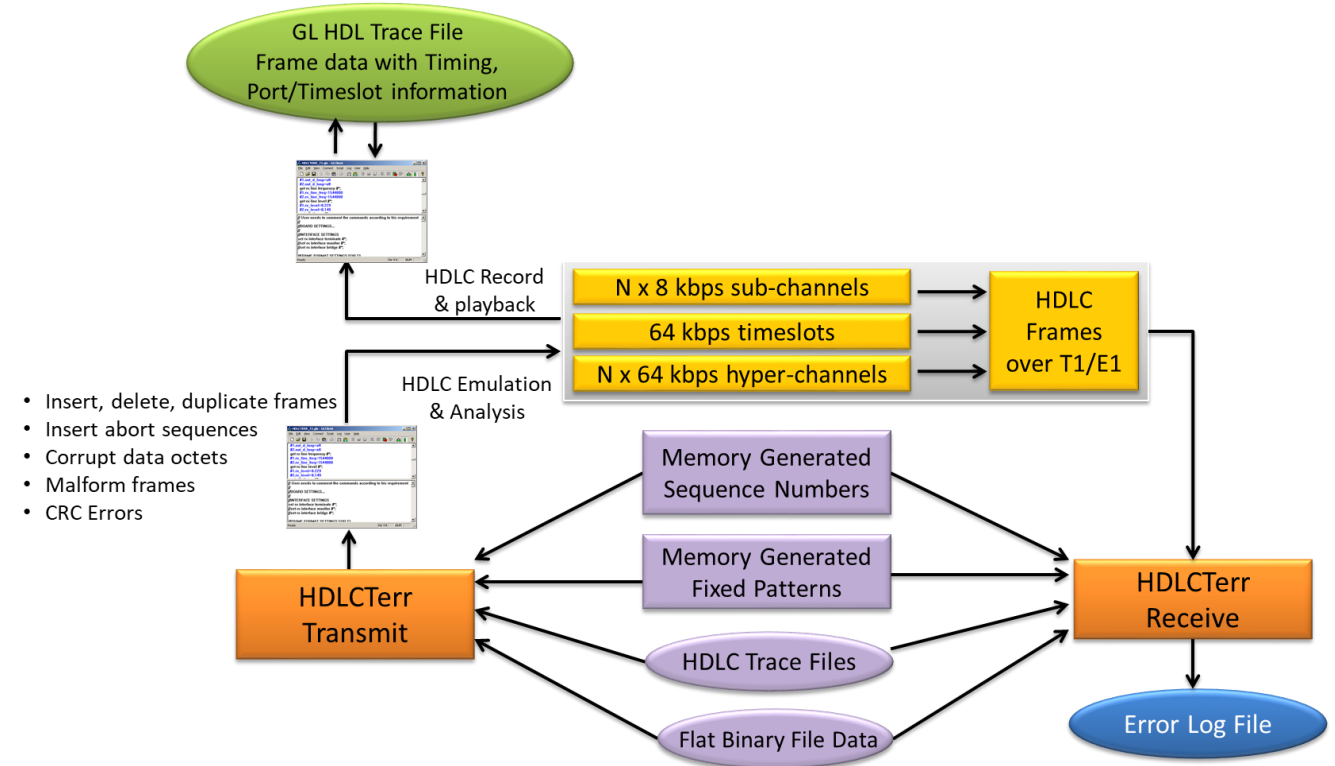
## Modules

- 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



# 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
[Icons]
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.l
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

0 GoTo

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

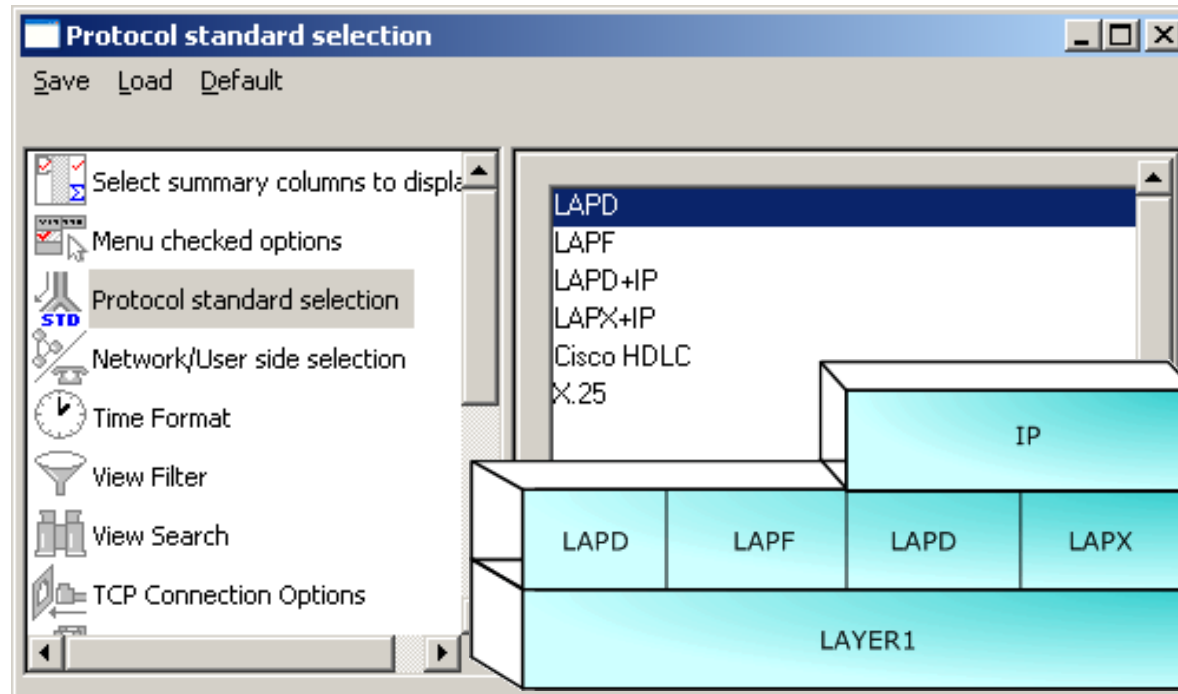


# HDLC Analysis

- 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

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
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	0	0
1	0		3	00:00:00.000375	6			RR	0	0
1	0		4	00:00:00.378362	46				0	0

Card2 TimeSlot=0 Frame=0 at 00:00:00.000000 OK Len=6 \*\*\* Right click

HDLC Frame Data + FCS

----- LAPD Layer -----

```
0000 C/R          = .....0.. Command(User) Response(Network)
0000 SAPI        = 000000.. (0)
0001 TEI         = 00000000.. (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

Summary View

Detail View

Hex Dump View

Statistics 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

# 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 configuration window titled "Port and Time Slot Selection". It features a table for selecting time slots (00-14) and various checkboxes for "User", "Network", "Bit Inversion", and "Octet Bit Reversion". There are also sections for "Data Transmission Rate" (Single Channel and Hyper-Channel), "Subchannels 8-56 kbps" (DS0 bits), and "HDLC FCS" (16 bits, 32 bits, None). Buttons for "All TS", "Clear TS", "All as Port1", and "All as Ports1,2" are visible at the bottom right.

1	2
00	00
01	01
02	02
03	03
04	04
05	05
06	06
07	07
08	08
09	09
10	10
11	11
12	12
13	13
14	14

User (unchecked) / Network (checked)

Bit Inversion (1 <-> 0)

Octet Bit Reversion (MSB <-> LSB)

Data Transmission Rate

Single Channel  
 64 kbps  
 56 kbps

Hyper-Channel  
 Nx64 kbps  
 Nx56 Kbps (bits 1-7)  
 Nx56 Kbps (Bits 2-8)

Subchannels 8-56 kbps  
DS0 bits  
 8  
 16  
 24  
 32  
 40  
 48  
 56

HDLC FCS  
 16 bits  
 32 bits  
 None

All TS  
Clear TS  
All as Port1  
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                               QOu

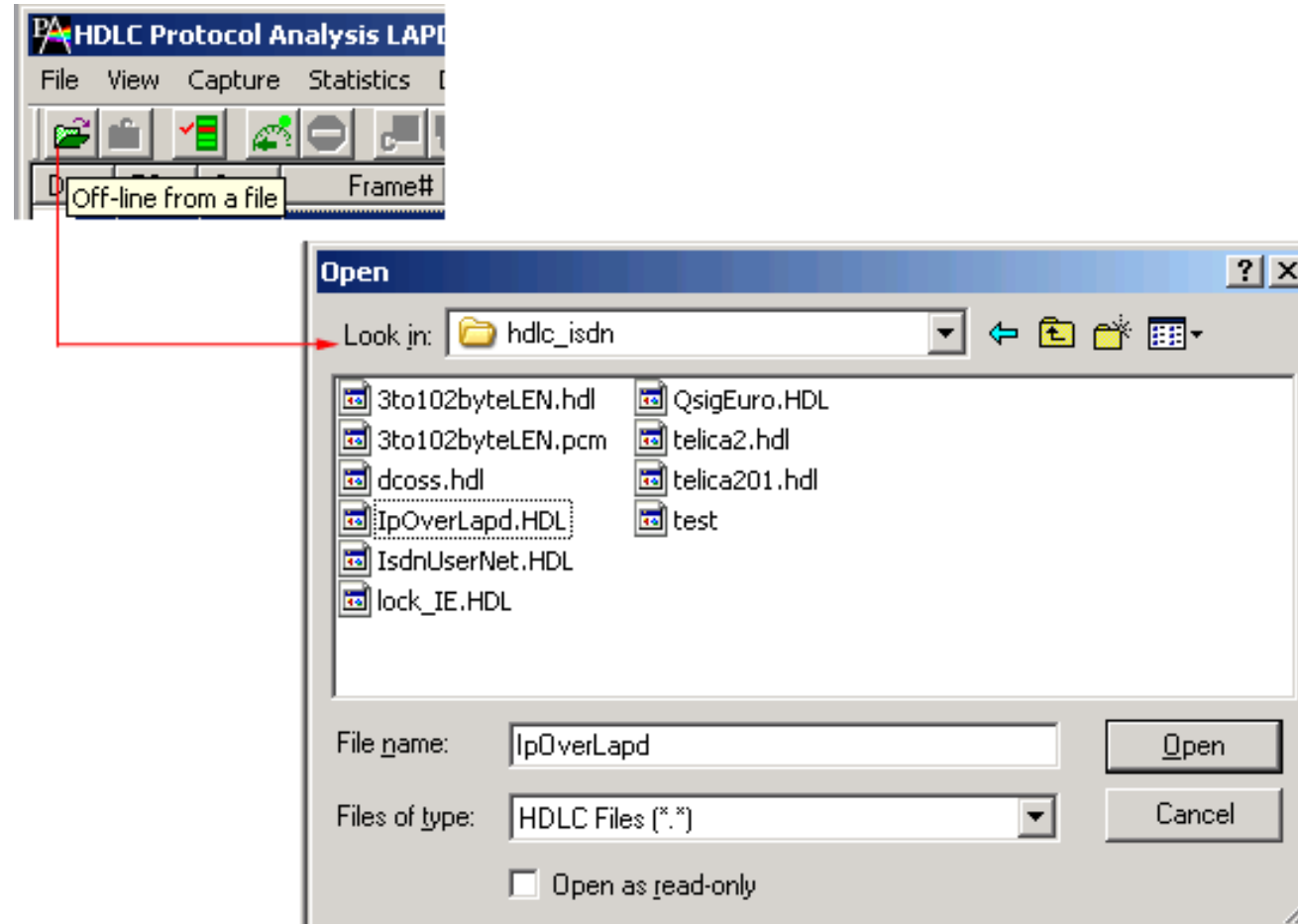
```

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 software interface. The main window shows a table of captured frames with the following data:

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

Below the table, a command prompt window is open, showing the following commands and output:

```
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

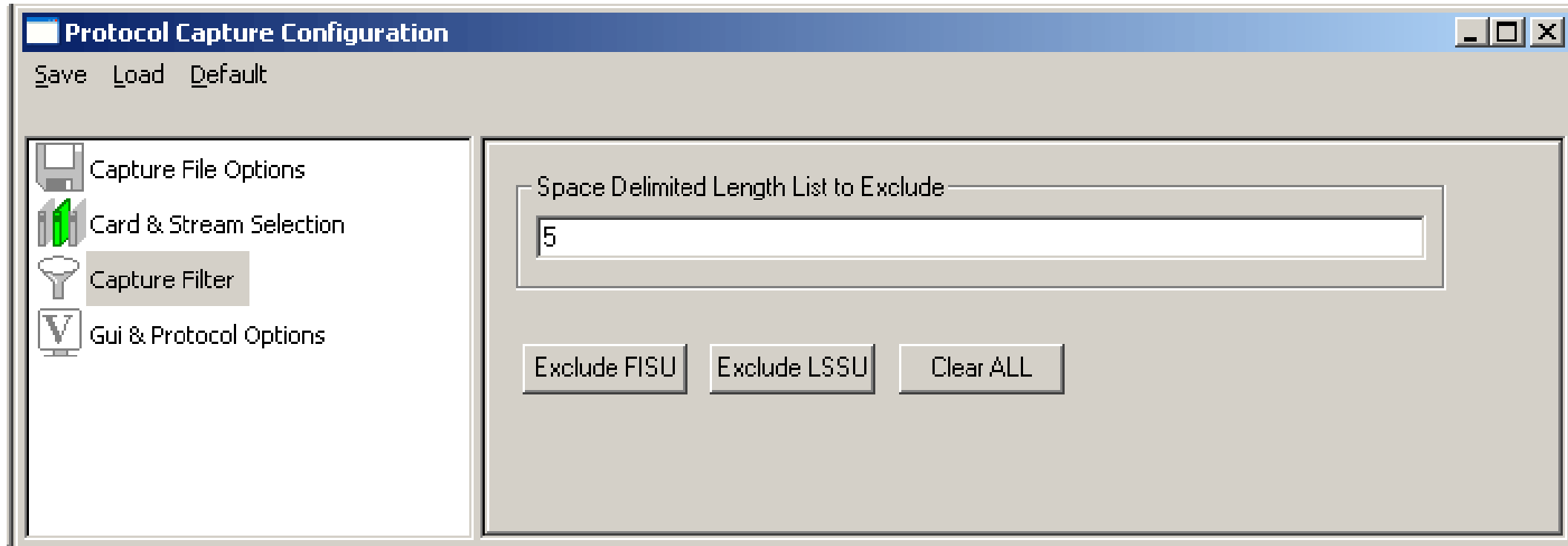
D:\>cd D:\Program Files\GL Communications Inc\Hdlc Analyzer
D:\Program Files\GL Communications Inc\Hdlc Analyzer>hdlcprot hdlc\IsdnUserNet.H
D:\Program Files\GL Communications Inc\Hdlc Analyzer>
```

The status bar at the bottom of the software window indicates "Off-line Viewing" and "F:\Program Files\GL Communica 137 Frames".



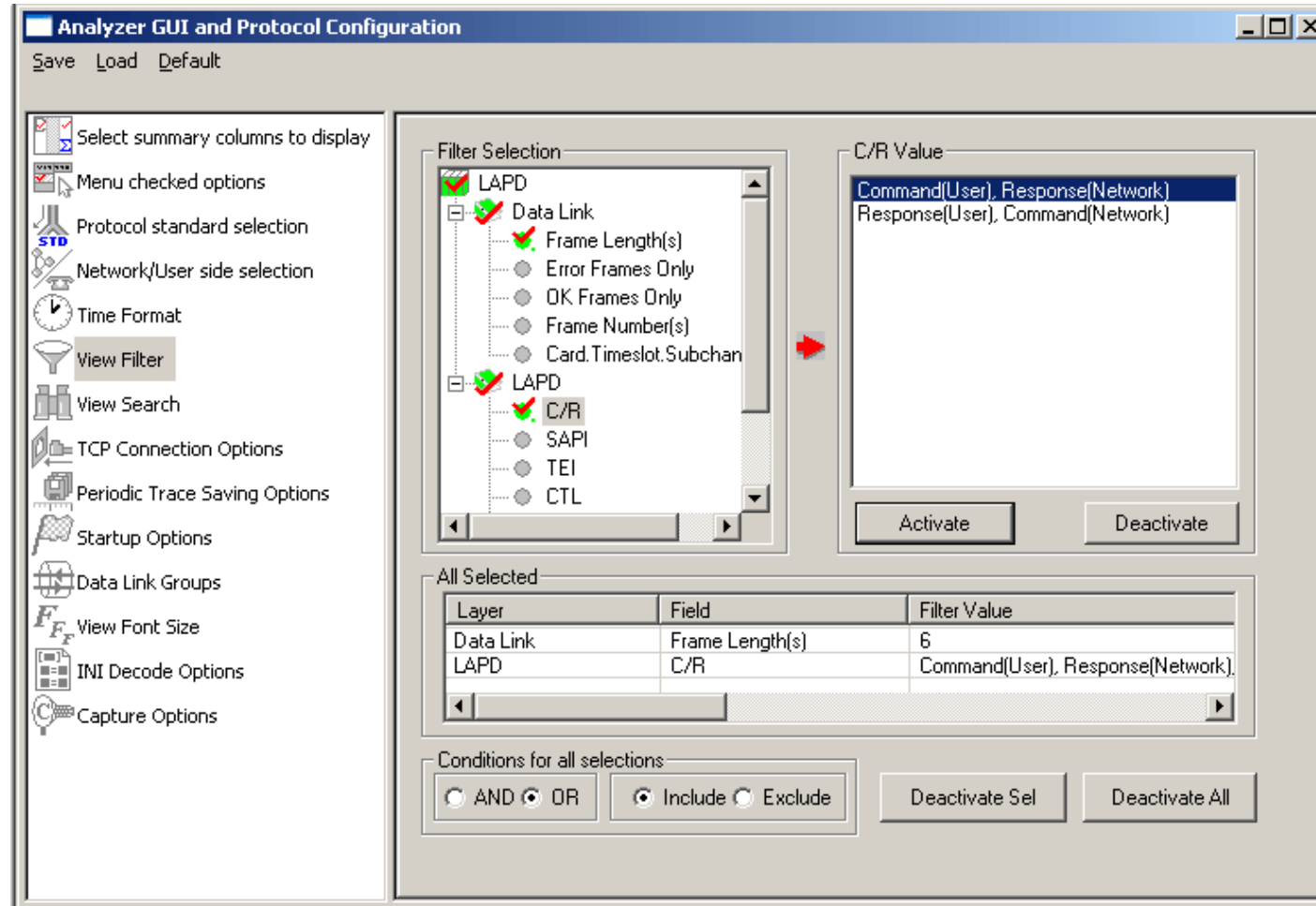
# Filters - Real-time Capture Filter

- 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



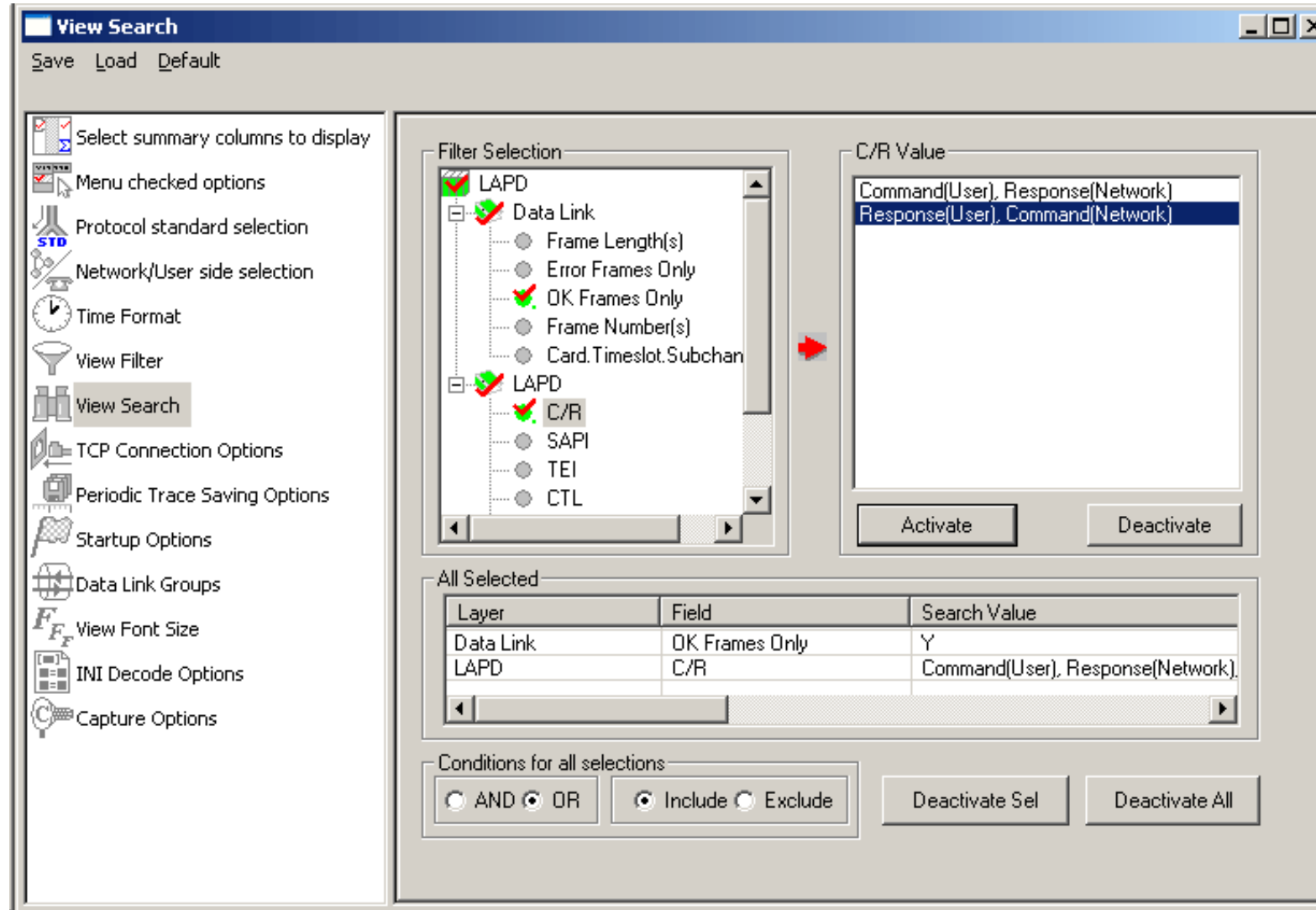
# Filters - Offline View Filter

- 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

The image illustrates the process of creating filter criteria from a screen selection in the HDLC Protocol Analysis tool. It consists of three main parts:

**1. Data Table:** A table showing protocol analysis results. The first row is selected (highlighted in blue).

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			

**2. Dialog Box:** A dialog box titled "Use Ctrl, Shift for Extended Selection" is open, showing the selected values from the table: "MTP3::DPC", "MTP3::OPC", "ISUP::Circuit Identification Code", and "ISUP::Message Type". The "Set Filter Criteria as Sel Values" option is selected in the table, and a red arrow points from this option to the dialog box. The dialog box has "OK", "Select All", and "Cancel" buttons.

**3. Configuration Window:** The "Analyzer GUI and Protocol Configuration" window is shown. The "View Filter" option is selected in the left sidebar. The "Filter Selection" pane shows "LAPD" selected. The "Value Selection" pane is empty. Below these panes, a table titled "All Selected" is highlighted with a red box, showing the filter criteria:

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

At the bottom of the configuration window, there are radio buttons for "AND" and "OR" conditions, and "Include" and "Exclude" options. There are also "Deactivate Sel" and "Deactivate All" buttons.

# Search Criteria From Screen Selection

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

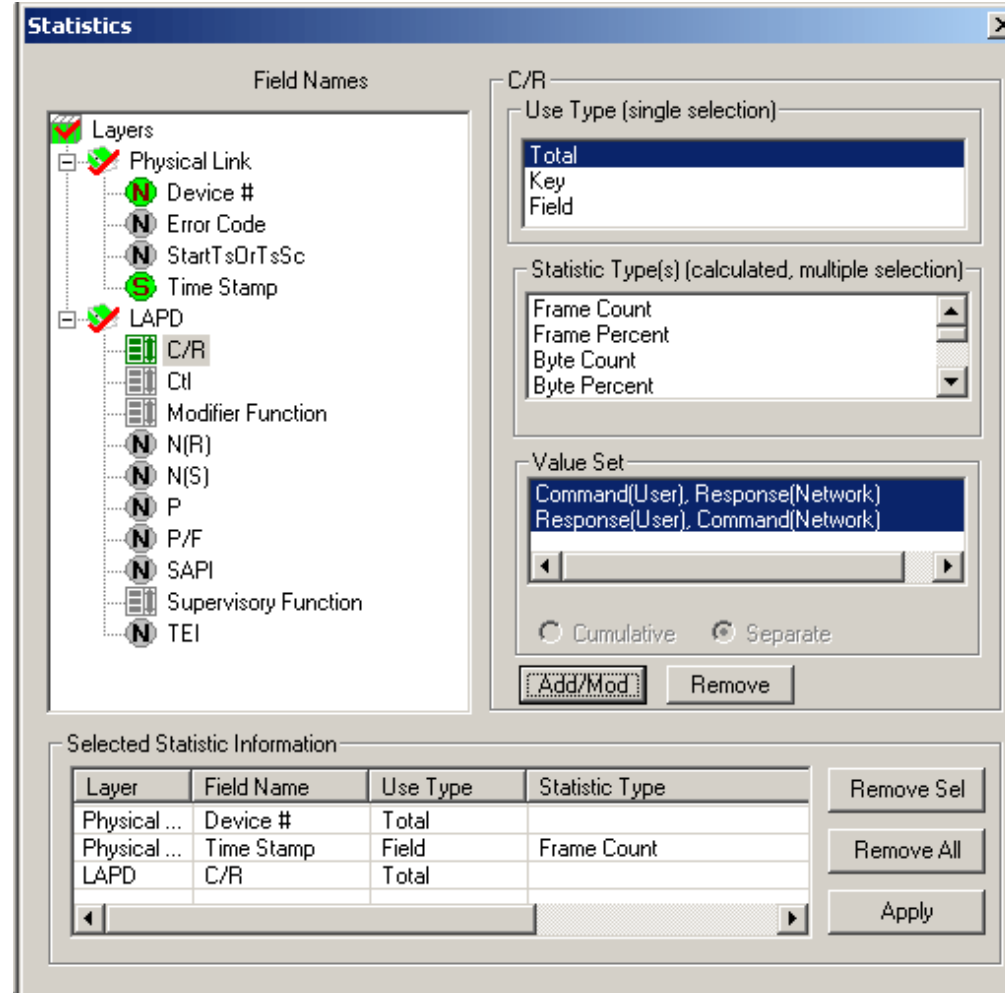
The image illustrates the process of creating search criteria from a screen selection in the HDLC Protocol Analysis tool. It consists of three main components:

- HDLC Protocol Analysis LAPD 64-bit:** A table showing protocol analysis data. The selected row (Frame# 0) has the following values: Dev: 2, TSlot: 0, SubCh: 0, Frame#: 0, TIME (Relative): 00:00:00.000000, Len: 6, Error: (empty), Modifier Function LAPD: RR, Supervisory Function LAPD: RR, SAPI LAPD: 0, TEI LAPD: 0, N(R) LAPD: 40. A context menu is open over this row with the option "Set Search Criteria as Sel Values" highlighted.
- Use Ctrl, Shift for Extended Selection:** A dialog box showing a list of selected values: LAPD::N(R), LAPD::SAPI, LAPD::Supervisory Function, and LAPD::TEI. The "Set Search Criteria as Sel Values" option from the context menu is linked to this dialog.
- Analyzer GUI and Protocol Configuration:** A configuration window with a "Filter Selection" pane containing "LAPD" and "Data Link". Below it, an "All Selected" table is highlighted with a red box, showing the search criteria derived from the selection:

Layer	Field	Search Value
LAPD	SAPI	0
LAPD	Supervisory Function	RR

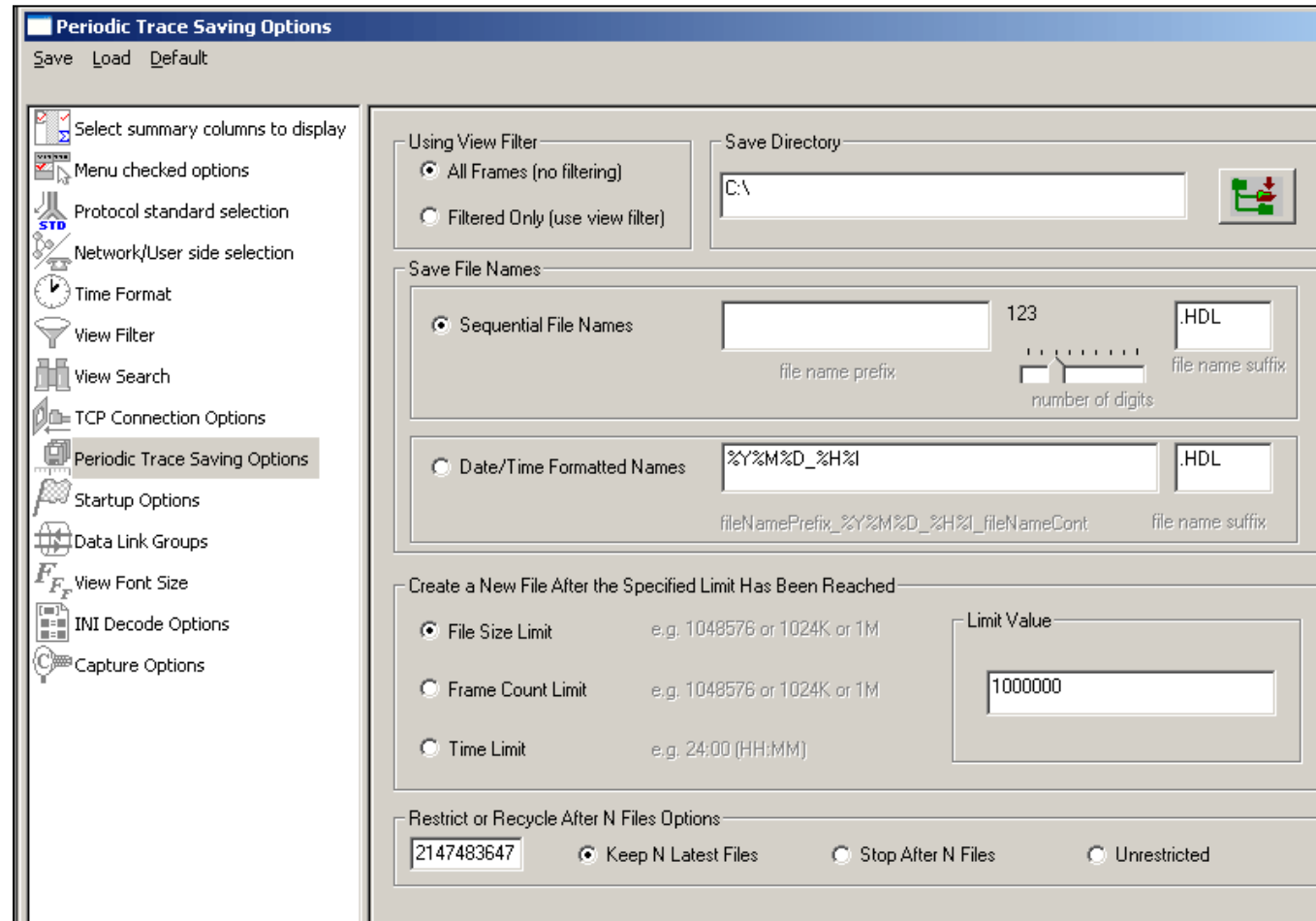
# Statistics

- 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



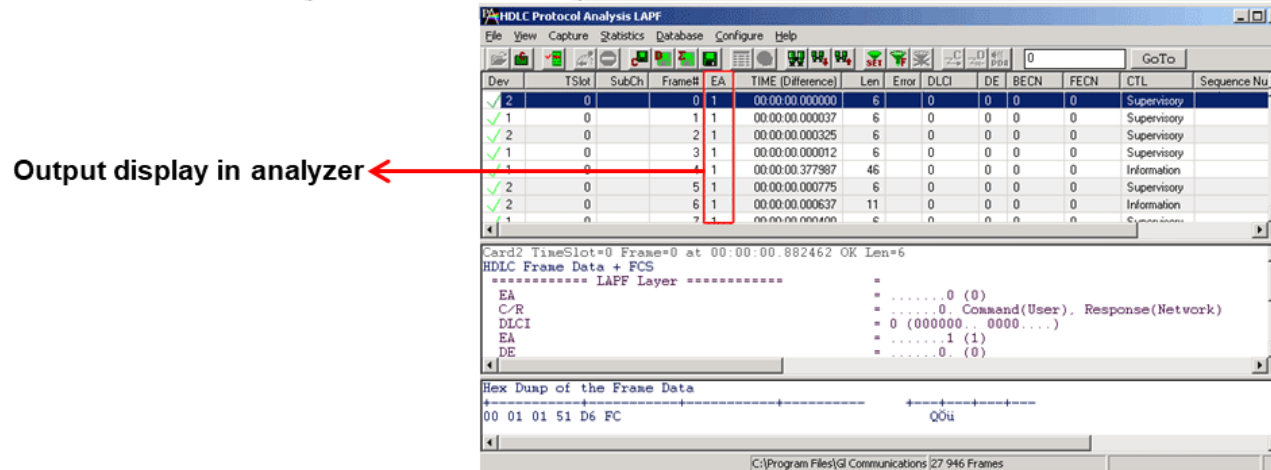
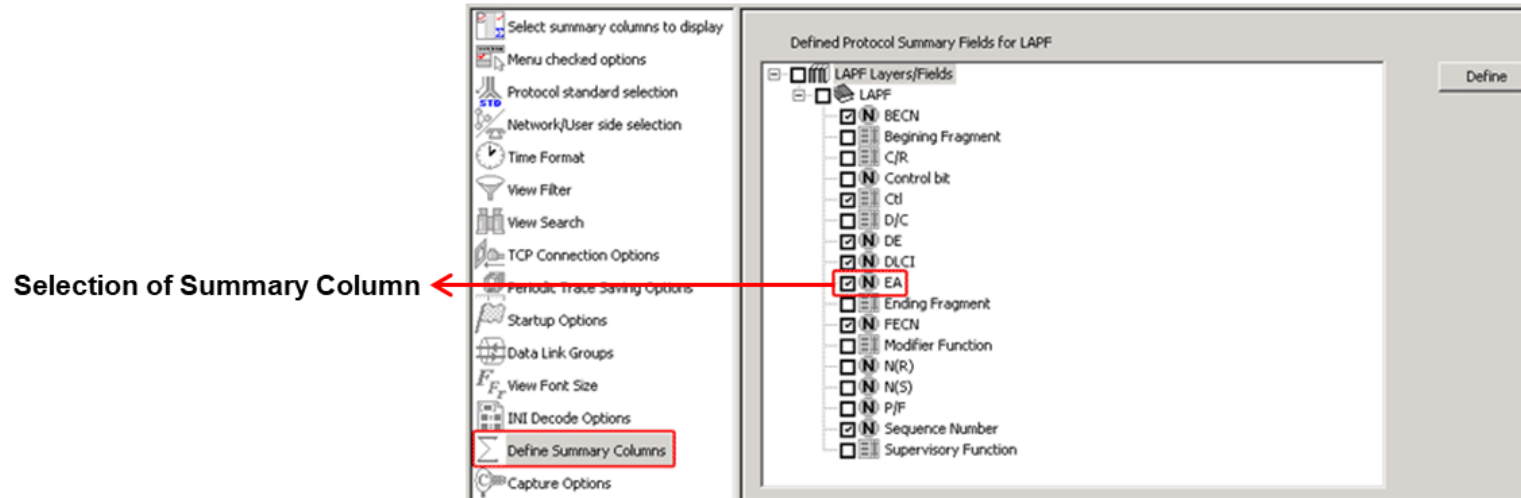
# Saving a File

- 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

The screenshot displays the 'Aggregate Summary Columns' configuration window and the main HDLC Protocol Analysis window. The configuration window shows three groups defined:

Name	Display Format	Summary Columns	Separator
Group~0	Concat	Supervisory Function_LAPD TEI_LAPD	--->
Group~1	Overlay	N(R)_LA	
Group~2	<Col_Alias>Value	N(S)_LA SAPI_LA	

The main analysis window shows a table of captured frames with the 'Group~0' column highlighted in red:

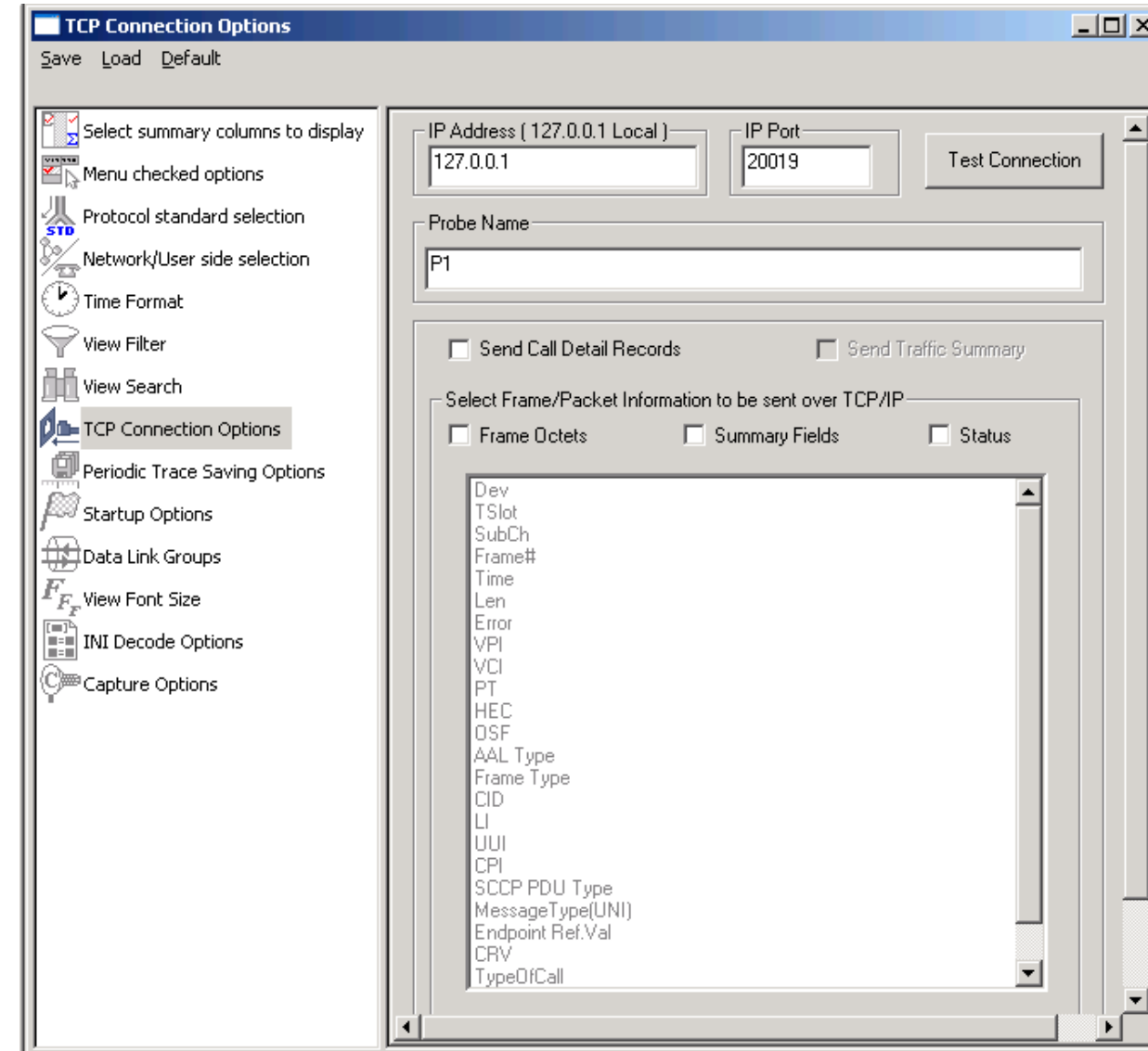
Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Group~0	Error	Modifier Function LAPD	Supervisory Function LAPD	SAPI LAPD	TEI LAPD	N(R) LAPD
✓ 2	0		23546	00:01:19.145525	6	RR --> 0			RR	0	0	99
✓ 1	0		23547	00:01:19.145600	6	RR --> 0			RR	0	0	71
✓ 2	0		23548	00:01:19.146000	11	0				0	0	99
✓ 1	0		23549	00:01:19.146337	6	RR --> 0			RR	0	0	72
✓ 1	0		23550	00:01:19.146675	11	0				0	0	72
✓ 2	0		23551	00:01:19.147012	6	RR --> 0			RR	0	0	100
✓ 2	0		23552	00:01:19.147487	11	0				0	0	100
✓ 2	0		23553	00:01:19.147675	11	0				0	0	100
✓ 1	0		23554	00:01:19.147837	6	RR --> 0			RR	0	0	73
✓ 1	0		23555	00:01:19.148150	6	RR --> 0			RR	0	0	74
✓ 1	0		23556	00:01:19.148562	11	0				0	0	74

The detailed frame view for Frame 23546 shows the following data:

```
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)
```

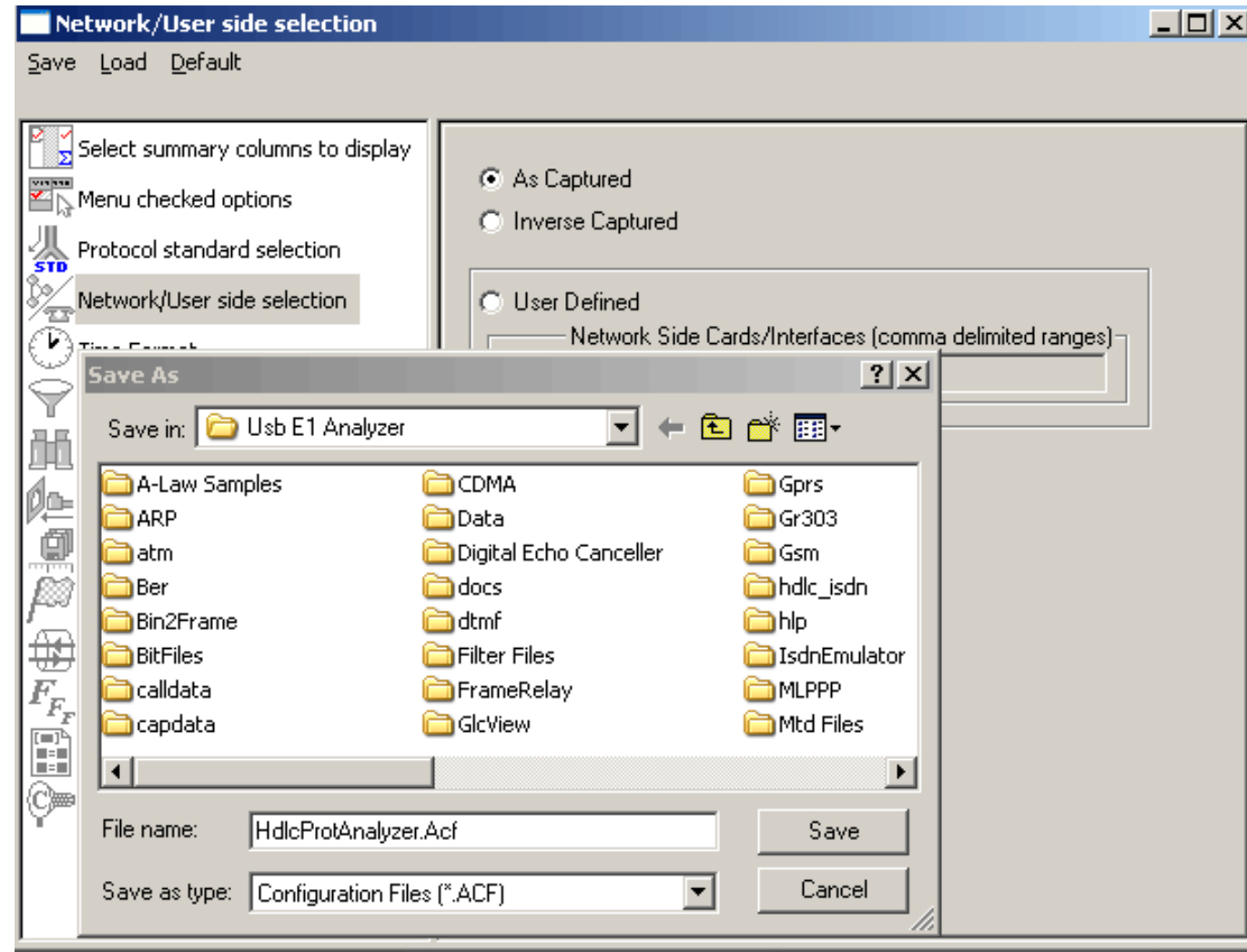
# TCP Connection Options

- 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

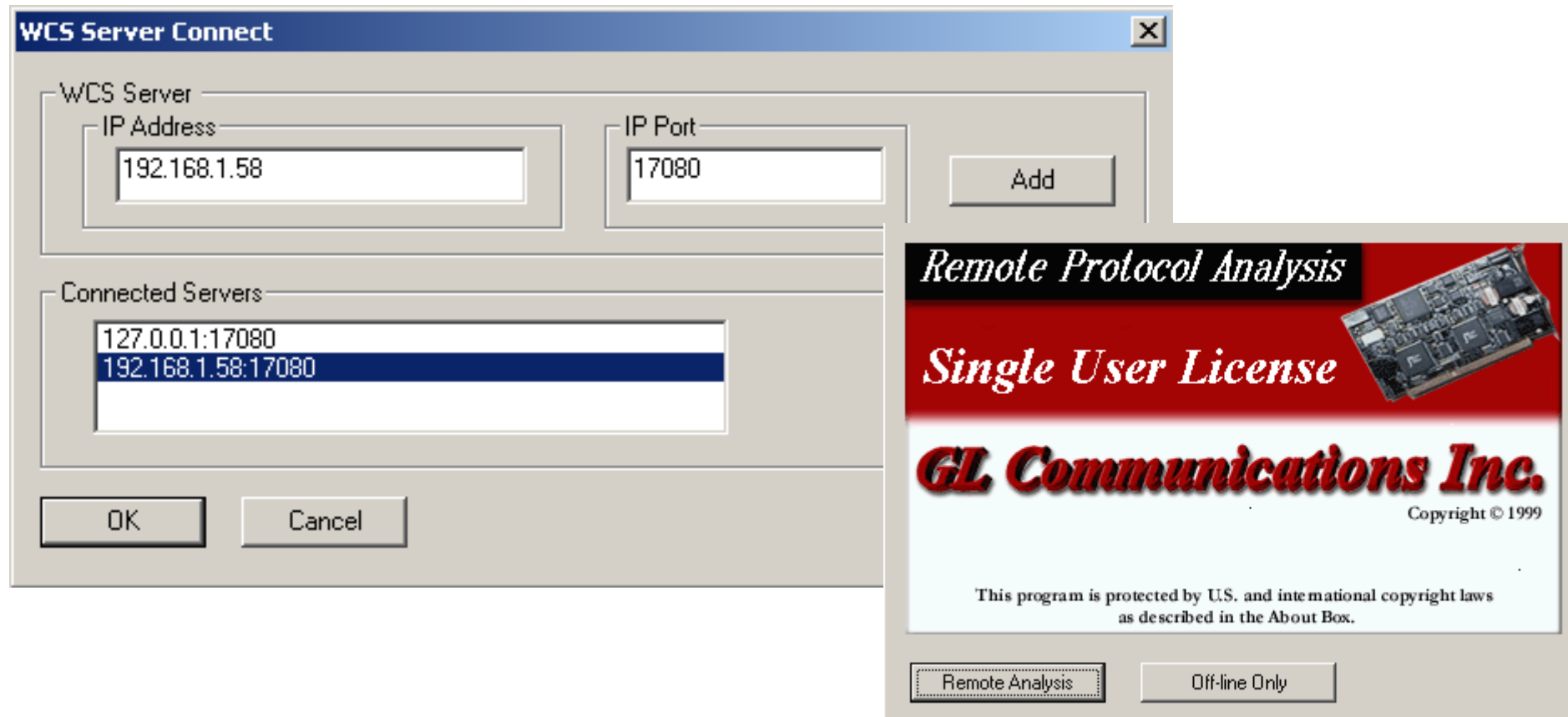
- Client side consists of a PC with Ethernet connectivity and GUI Remote Protocol Analysis software – no special T1 or E1 hardware is required
- Multiple T1/E1 servers may be simultaneously connected to a single remote client using a single GUI
- Multiple remote clients may access a single T1/E1 server.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

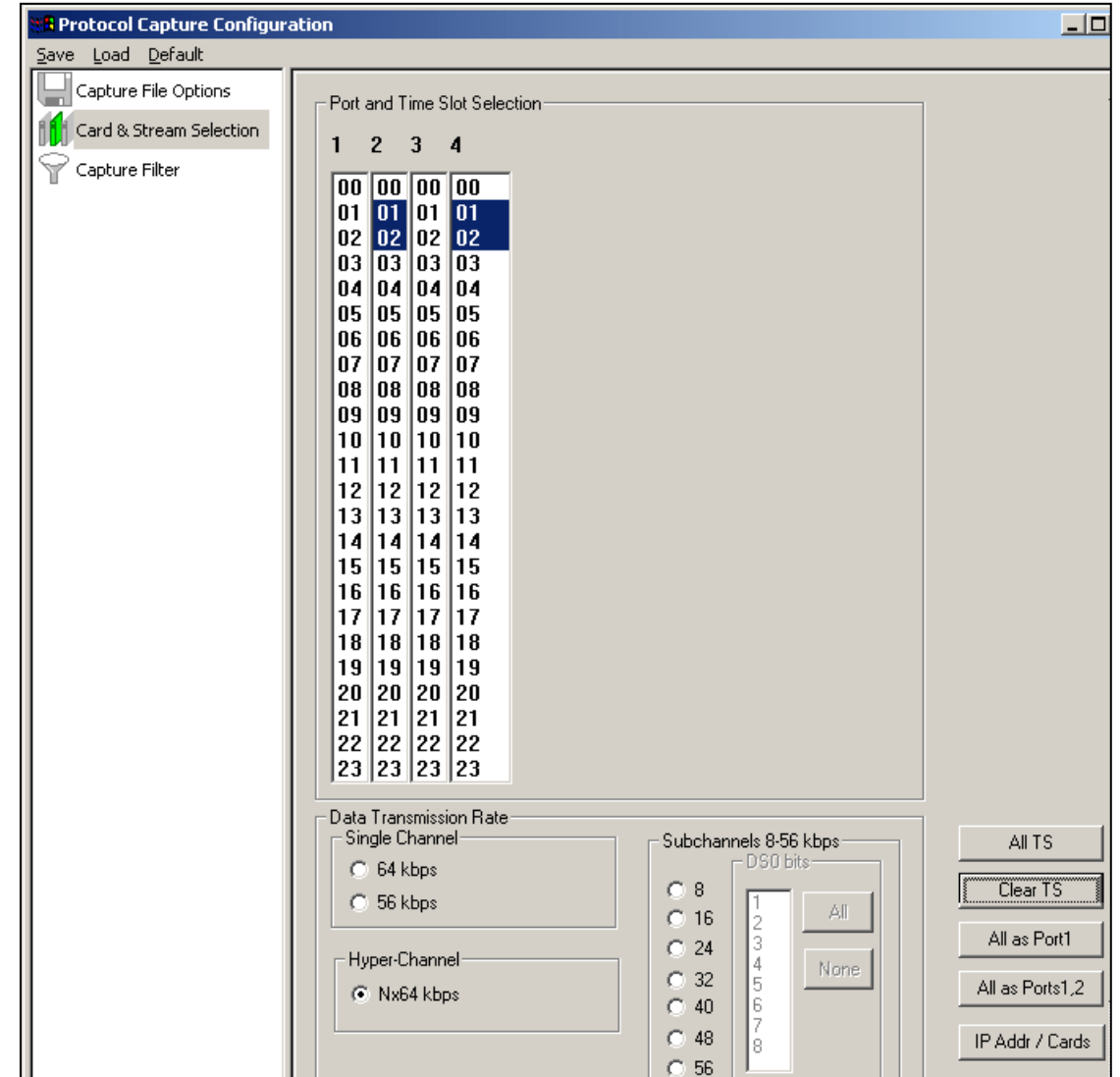
- Users are required to enter IP address of the WCS server and an IP Port
- Multiple Server IP Addresses can be added to connect simultaneously to all T1E1 cards.
- Lists an IP addresses and the IP port numbers
- Option is provided for the user to select the desired IP address of the server



# Stream Selection

## Remote Protocol Analyzers

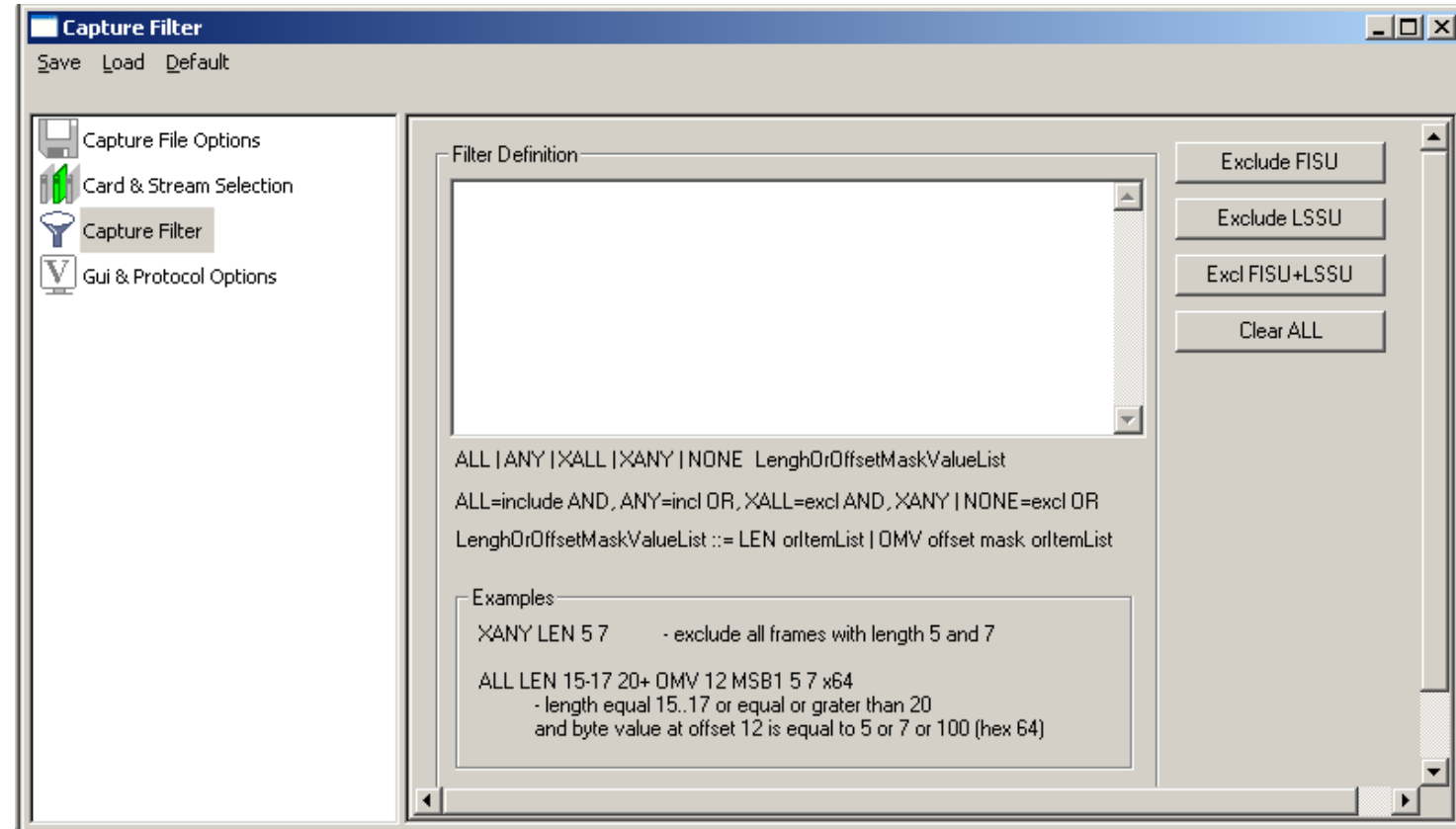
- Streams can be captured on the selected time slots (contiguous or non-contiguous), sub-channels (fractional DS0 to DS1) or full bandwidth
- Frames may also be contained in  $n \times 64$  kbps
- Recorded trace file can then be analyzed offline, exported to ASCII file, or printed





# 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