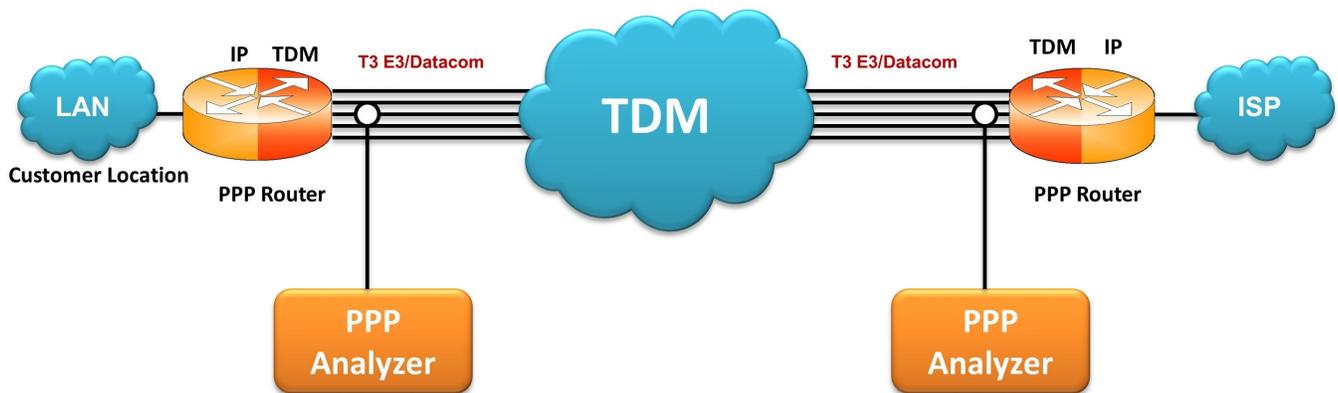


PPP Protocol Analyzer

(Over T3/E3, Datacom Analyzer Units)



Overview

The Point-to-point protocol (PPP) is a link layer protocol, which encapsulates other network layer protocols like IP for transmission on synchronous and asynchronous communications lines. When transmitted over a T3/E3 line, PPP frames are based on the HDLC frame structure. Today the PPP protocol standard finds wide use in synchronous connections between LANs, bridges, routers and other intermediate devices.

Two major features of PPP protocol are:

- Authentication
- Encapsulation of higher layer protocols

GL's PPP Analyzer captures a host of PPP protocols exchanged between the two nodes over T3/E3 links and provides useful analysis, which includes distribution of protocols, protocol fields, frame lengths, and frame status. User can decode and analyze protocols and can perform various statistics measurements.

For more details, refer [T3/E3 PPP Analyzer](#) webpage.

Main Features

Display Features

- Displays Summary, Detail, Hex-dump, and Statistics Views
- Detail View:
 - Displays decodes of a user-selected frame from the summary view
 - Provides options to display or hide the required protocol layers
 - Contents of this view can also be copied to clipboard
 - Provides option to toggle detail view vertically or horizontally as feasible for the user
- Summary View displays Dev #, Time Slot, Layer 3 Protocol, LCP message type and higher protocol specific information like Destination and Source IP address, Destination and Source TCP as well as UDP port details, HTTP/FTP message type, and so on in a tabular format
- Statistics View displays statistics based on frame count, byte count, frames/sec, bytes/sec etc for the entire capture data
- Any protocol field can be added to the summary view, filtering, and search features providing users more flexibility to monitor required protocol fields
- Option to combine data from multiple columns under one column



818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A
(Web) www.gl.com - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) info@gl.com

Main Features (Contd.)

Supported Protocols

- PPP, MLPPP, Multi-class MLPPP, IPCP, BCP, PPP MUX CP, BPDU, PAP, CHAP, SNMP, STUN, DNS, DHCP, SIP, SCTP, SUA, M3UA, IUA, IEC, and more

Filtering / Search

- Advanced filtering and search based on any user selected protocol fields

Capturing Streams

- Streams can be captured on the selected ports
- Supports selection of TSO in E1 analyzer for the analysis of unframed data

Export Options

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

Record/Playback

- User can decode frames from the recorded trace files and can be played back using HDLC playback application

Remote Monitoring

- Remote monitoring capability using GL's Network Surveillance System

Additional Features

- Ability to test and perform numerous measurements across WAN- LAN or LAN-LAN connection
- Ability to test and analyze HDLC based PPP protocol in synchronous environment
- Ability to test and analyze PPP SIGTRAN and PPP over IP protocols
- Also supports Packet Data Analysis module for real-time IP call analysis including SIP, RTP, MEGACO, H.323, MGCP, and T.38 Fax calls
- Ability to configure .INI file to customize sequence fragment format
- Ability to capture and decode both PPP routed protocols, PPP bridged protocols , MLPPP and MC-MLPPP streams of data.
- Trace files for analysis can be loaded through simple command-line arguments
- Multiple trace files can be loaded simultaneously with different GUI instances for offline analysis

PDA Main Features

- Supported protocols - SIP (Session Initiation Protocol RFC 2543 and RFC 3261), MEGACO, MGCP, H323/H225, T.38 Fax, and RTP
- Full RTP Analysis with audio capture/playback supported for all common codecs
- Provides the registration summary of each SIP registration including the user agent, registrar, status, registration request delay (RRD), etc. and graphical view of the active registrations and registration trace of each registration
- Call Quality Of Service (QOS) for all calls with E-Model based (G.107) MOS and R-factor
- Provides Video QoS Statistics such as Missing Packets, Delay, Gap, Video Frame Count, Media Delivery Index (MDI- (Delay Factor : Media Loss Rate)), and Frame Rate, and more
- Supported Audio and Video codecs: Mulaw, Alaw, G.726 (40/32/24/16 kbps), G.726 with VAD, GSM610, G729, G729B, AMR (Wide and Narrow band codec), ILBC (20 , 30 msec), SPEEX, EVRC, EVRCB, H263+, and H264

PPP Analyzer Features

- Summary view provides the information about important fields: Dev #, Layer 3 Protocol, LCP message type, and higher protocol specific information in a tabular format
- Hex Dump View displays raw frame data as hexadecimal and ASCII octet dump of a user-selected frame from the summary view.
- Detail view displays decodes of a user-selected frame from the summary view
- Statistics view displays statistics based on frame count, byte count, frames/sec, bytes/sec, etc., for the entire capture data
- Capability to export summary to the comma separated values (CSV) format for subsequent import into a database or a spreadsheet
- Capability to export detailed decode information to an ASCII file

Summary, Detail, and Hex dump Views

The analyzer displays summary, detail, statistics, and hex dump views in different panes. The summary pane displays Frame Number, Time, Length, Error, PPP Layer3 Protocol, LCP Code, IPCP code, BCP code, PPP Message type, and more. User can select a frame in the summary view to decode all fields in the detail view. The hex dump view displays the frame information in HEX and ASCII formats.

The screenshot displays the PPP Protocol Analysis software interface with four main panes, each indicated by a red arrow and label:

- Summary View:** A table showing captured frames. The table has columns: Dev, Frame#, TIME (Relative), Len, Error, PPP Layer3Prot..., Mlppp Seq No, and Mlppp Cte. The data rows are:

Dev	Frame#	TIME (Relative)	Len	Error	PPP Layer3Prot...	Mlppp Seq No	Mlppp Cte
2	0	00:00:00.000000	6		Padding		
2	1	00:00:09.980000	6		Padding		
2	2	00:00:19.960000	6		Padding		
2	3	00:00:27.031875	38		Padding		
2	4	00:00:27.037125	38		Padding		
- Detail View:** Shows the decoded structure of the selected frame (Frame #0). It displays:


```

      Card2 Frame=0 at 00:00:00.000000 OK Len=6
      HDLC Frame Data + FCS
      ===== PPP Link Layer =====
      Protocol = 00000000 00000001 Padding
      ===== Unsupported Layer =====
      Data = "  " (x018D)
      
```
- Hex Dump View:** Shows the raw frame data in hexadecimal and ASCII. The hex dump is:


```

      Hex Dump of the Frame Data
      +-----+-----+-----+-----+
      00 01 01 8D 37 E0
      
```
- Statistics View:** A summary table of captured data:

Device #	Protocol	Frame Count(Protocol)	Frame Count(Device #)
2	Padding (1)	103	103
Total	total Padding (1)	103	103
2	802.1d Hello Packets (513)	92	92
Total	total 802.1d Hello Packets (513)	92	92

The status bar at the bottom indicates "Off-line Viewing" and "C:\Program Files\GL Communica 195 Frames".

Figure: Summary, Detail, and Hex dump Views

Real-time and Offline Analysis

Multiple ports can be selected in a single instance of the analyzer to capture the frames simultaneously. The recorded trace file can then be analyzed offline and exported to an ASCII file, or printed. The real-time capturing requires users to specify ports and frame check sequence (FCS) type.

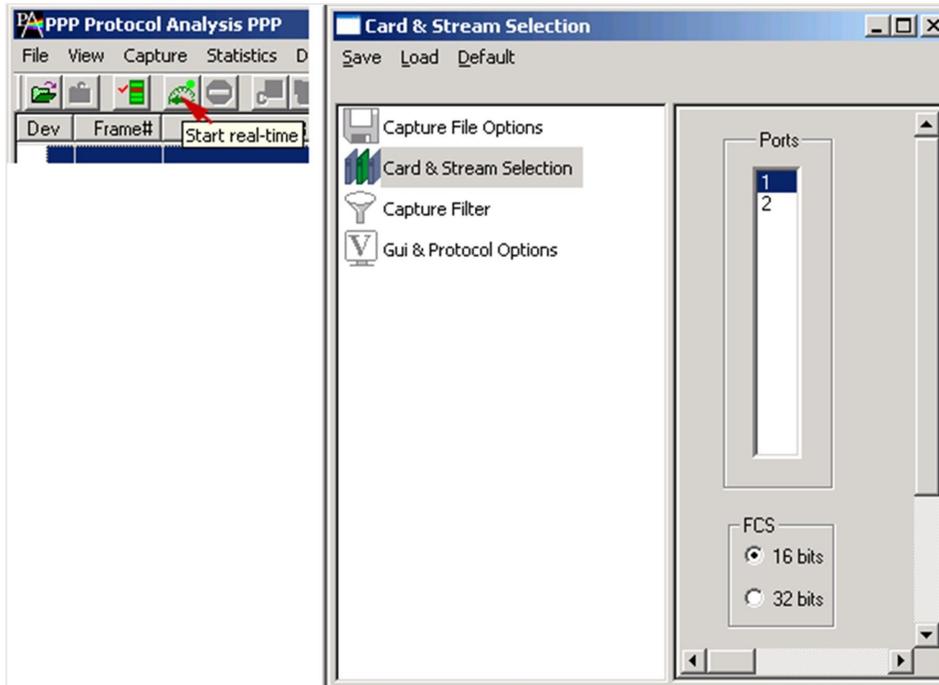


Figure: Stream / Interface Selection

Filtering and Search

There are two types of filters: real-time capture filter and offline filter. The real-time capture filter is used to limit frames captured to a trace file. The offline filter applies to the trace file before it is displayed.

Filtering and search capability adds a powerful dimension to the PPP Analyzer. This feature isolates frames of interest from all frames in real-time, as well as offline. In real-time capturing, filter allows capturing of frames having specified length, offset, mask, and value. The view filter applies to the captured frames and is based on the data link and decoded protocol field values: Time, Length, Error, Layer3 Protocol, LCP, IPCP, PPP Message type, etc. Similarly, search capability helps user to search for a particular frame based on a specific search criteria.

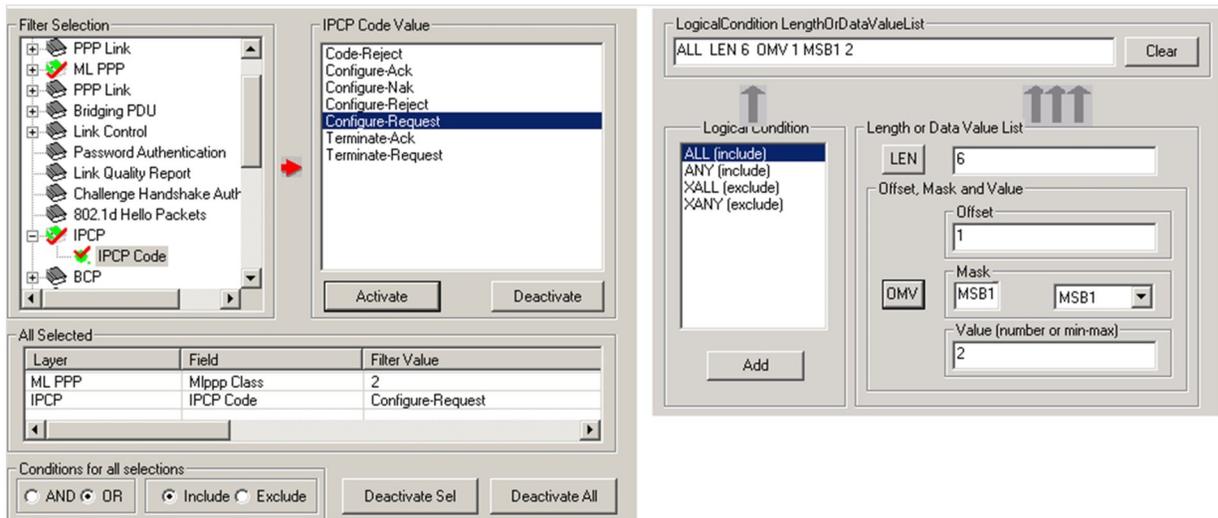


Figure: Real-time and Offline Filter

Statistics View

Statistics is an important feature available in the PPP Analyzer and can be obtained for all frames both in real-time as well as in the offline mode. Numerous statistics based on protocol fields can be obtained to study the performance and trend in a PPP network.

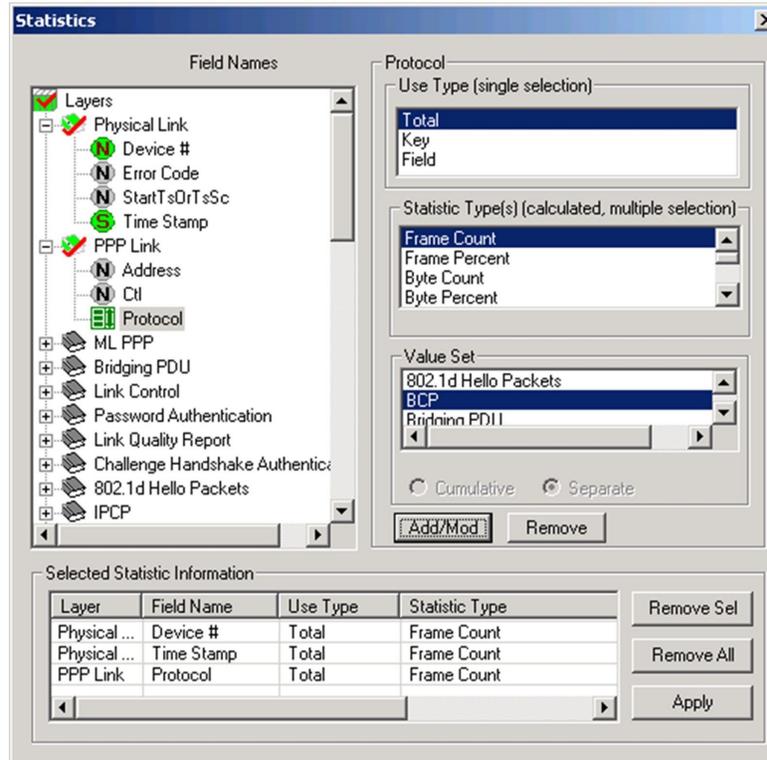


Figure: Statistics Definition Dialog

Packet Data Analysis (PDA) – Summary View

Main Features

- Call Quality Of Service (QOS) for all calls with E-Model based (G.107) Mean Opinion Score (MOS) and R-factor with individual and summary statistics presented in graphical and tabular formats
- Calculates minimum, maximum, and average Round Trip Delay (RTD) values for SIP calls
- Graphs are provided for key values to give a pictorial representation of the statistics; some of the graphs available are – active calls, average jitter, E-Model MOS/R-Factor/Packets Discarded, RTP packets summary, ladder diagram for T.38 traffic, and call signaling
- Displays summary of signaling, audio, and video (for all video calls) parameters of each call in call summary
- Generates alert summary when particular vital parameters go beyond a specified value

Packet Data Analysis (PDA) – Summary View (Contd.)

PDA - Summary View

- TA Summary view displays summary of data transmission in each direction including calling number, called number, duration, max/min RTD, average RTD and so on
- It includes separate statistical counts on total packets, calls, failed calls for SIP, H323, MEGACO, and RTP based calls. The user can get the statistics of active calls, purged calls, and so on

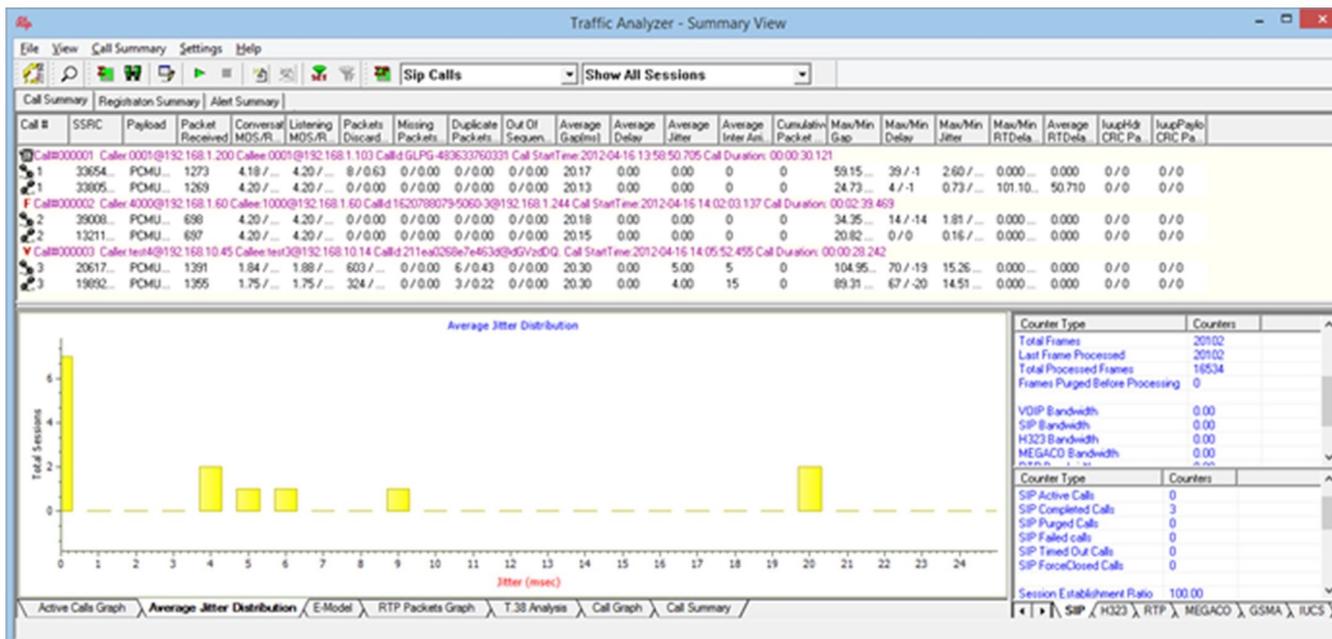


Figure: Traffic Analyzer Summary View

Call Summary – Signaling, Audio, and Video Parameters

The Call Summary displays the signaling, audio, and video parameters of each call for SIP, RTP, MEGACO, and H323 in a tabular format. Video QoS parameters such as Codec Info, Frame Rate, Missing Packets, Delay, Gap, Video Frame Count, Out Of Sequence count, Duplicate Packets count, Media Delivery Index (MDI), etc are displayed for all video calls with H.263 and H.264 codecs.

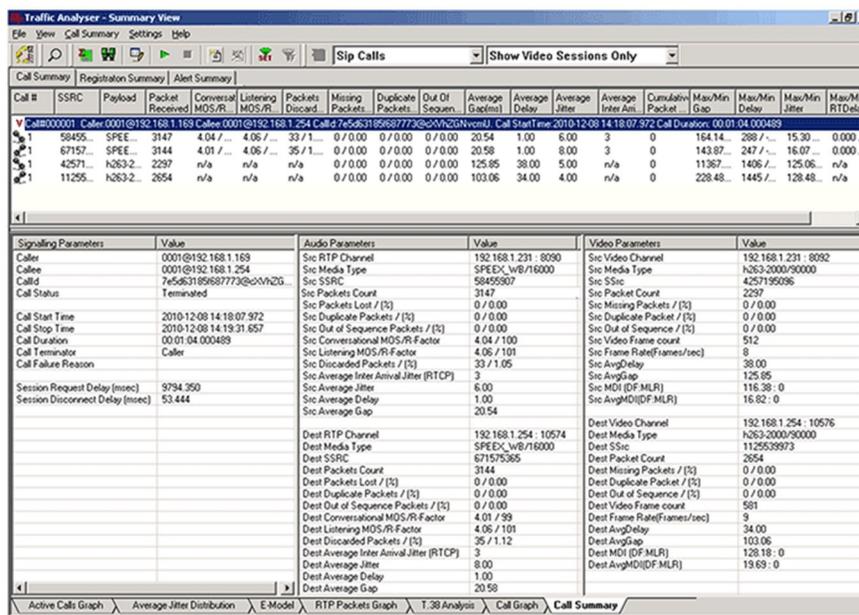


Figure: Signaling, Audio, and Video Parameters

Graphs in PDA – Summary View

Active Calls – A line graph, depicting the Number Of Calls Vs Time.

Average Jitter Distribution – Distribution of the Average Jitter values across the Total Sessions

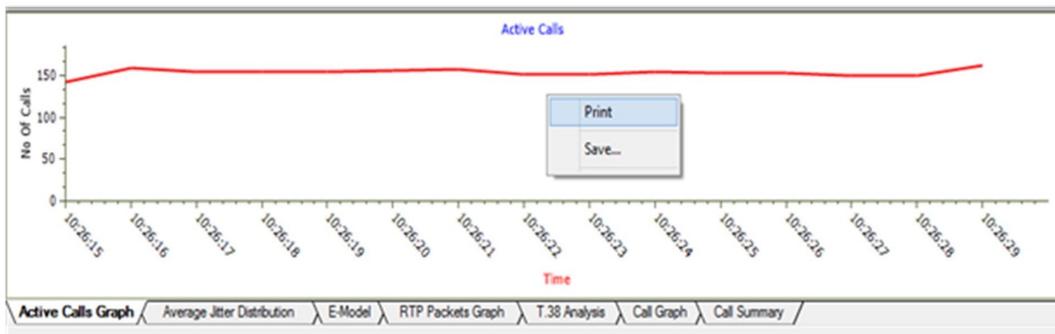


Figure: Active Call Graph

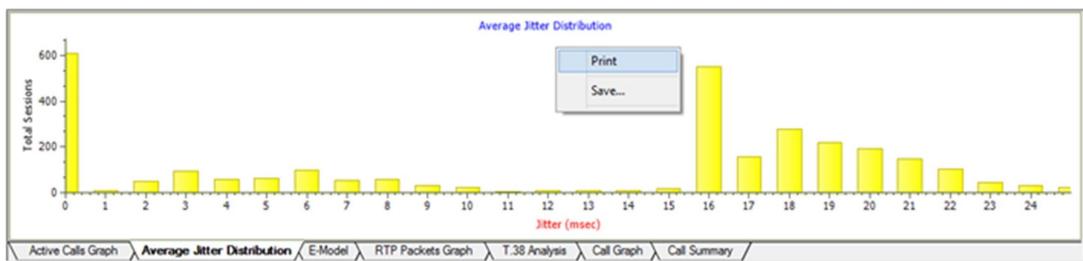


Figure: Average Distribution Graph

E-model - This graph provides R-factor, MOS and packets discarded against number of sessions- all these three graphs show statistics of terminated calls.

- **R-Factor** – A bar Graph that plots R-Factor across No of Sessions
- **MOS** – A bar Graph that plots Mean Opinion Score values across No. of Sessions
- **Packets Discarded** – A bar Graph that plots Packets Discarded across No. of Sessions
- **RTP Packets Graph** - Plots and compares out of ordered packets, missing packets and duplicate packets against Total Audio Packets

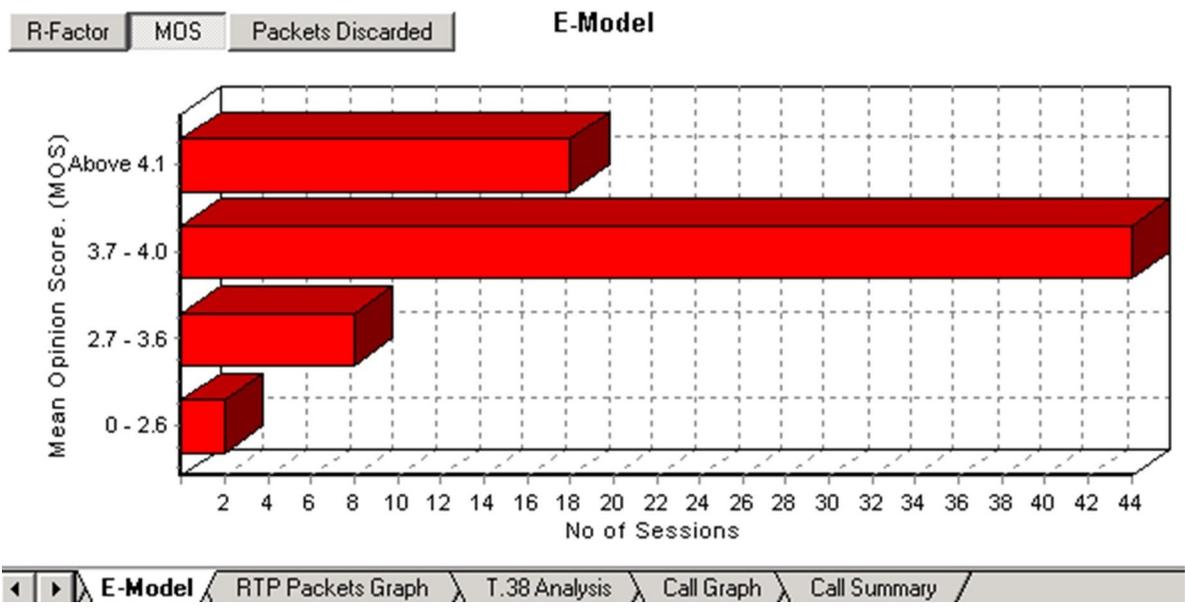


Figure: E-Model Graph

T.38 Analysis - Supports decoding, and monitoring of Fax (T.38 data) over VoIP. Identified T.30 messages is displayed in T.38 ladder diagram.

Call Graph - Displays the message sequence of captured VoIP (SIP or MEGACO) calls.

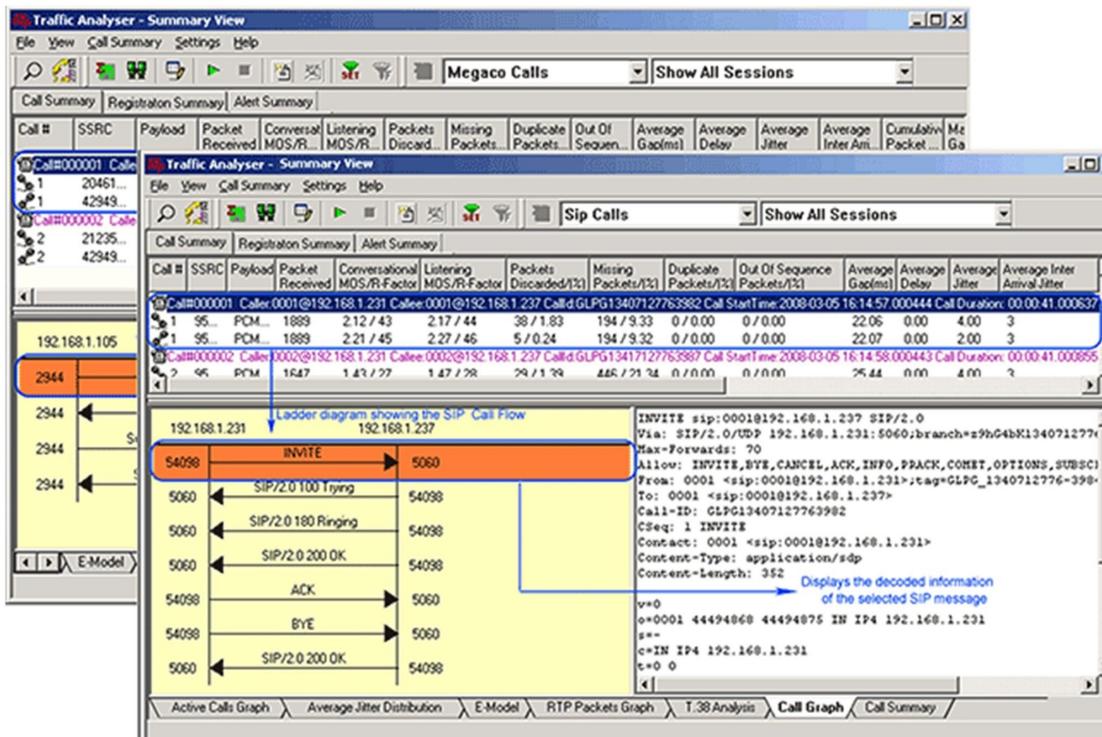


Figure: T.38 analysis and Call Flow Ladder Diagram

Packet Data Analysis (PDA) – Detail View

Main Features

- Provides further detail statistics on the two (or one) RTP sessions that are part of a single call
- RTP sessions include the graphical representation of R-Factor statistics which includes Quality Metrics with R-Factor and MOS Factors graphs, Jitter Buffer Statistics, Degradation Factor, Burst Metrics, and Delay Metrics
- Codecs: Mulaw, Alaw, G.726 (40/32/24/16 kbps), G.726 with VAD, GSM610, G729, G729B, AMR (Wide & Narrow band), ILBC (20 , 30 msec), SPEEX, EVRC, EVRCB, H263+, and H264

Packet Data Analysis (PDA) – Detail View (Contd.)

PDA – Detail View

This display assists in any comparisons that are to be made between the two RTP sessions of a call. Each frame of the selected session is dissected and its contents are displayed in a tabular form for easier viewing and comparisons. Vital aspects from the RTP frame needed for close analysis are included in the table.

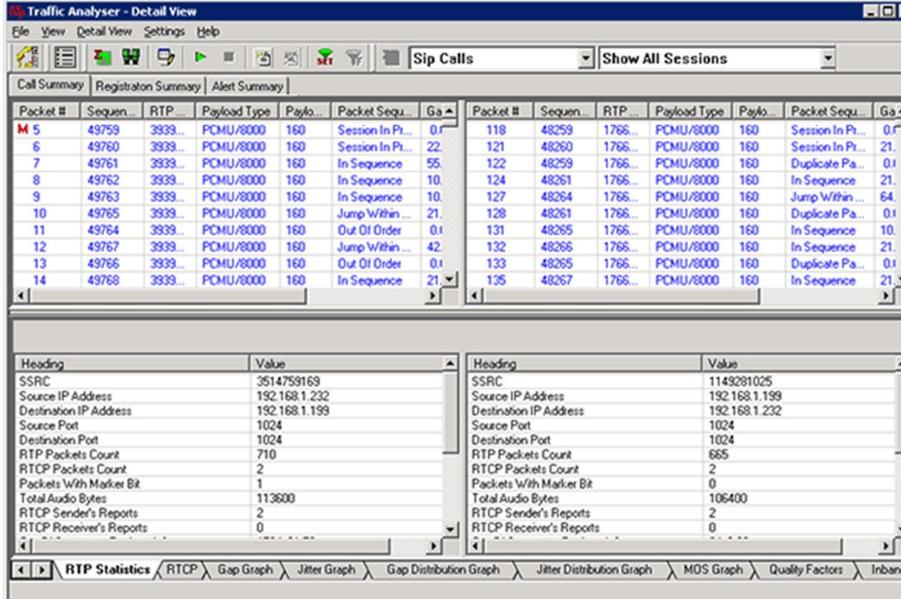


Figure: Traffic Analyzer Detail View

Graphs in PDA – Detail View

Gap/Jitter graphs – Plots the Gap (in milliseconds)/Jitter versus the packet number

Gap Distribution Graph – Number of packets with a particular value of gap is plotted against the (gap) value

Jitter Distribution Graph – Number of packets with a particular value of jitter is plotted against the jitter value

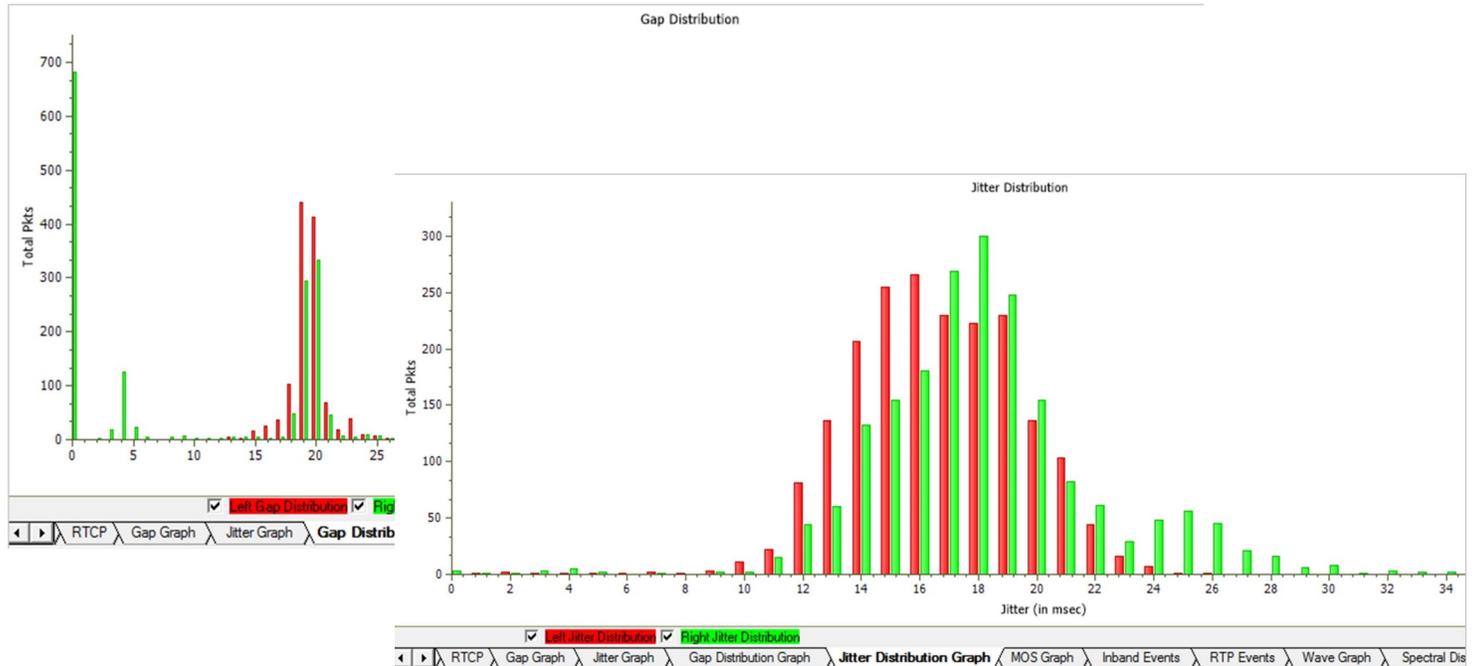


Figure: Gap/Jitter Distribution Graph

Graphs in PDA – Detail View

MOS Graph – Plots Mean Opinion Score values throughout the duration of the call.

Quality Factor – Plots and compares Good Quality packets, Packets Discarded, and Echo level against total Packets for each individual session.

Wave graph – Displays the amplitude of the incoming signal in a selected call as a function of time.

Spectral Display – Displays the power of incoming signal while the capturing is going on as a function of frequency.

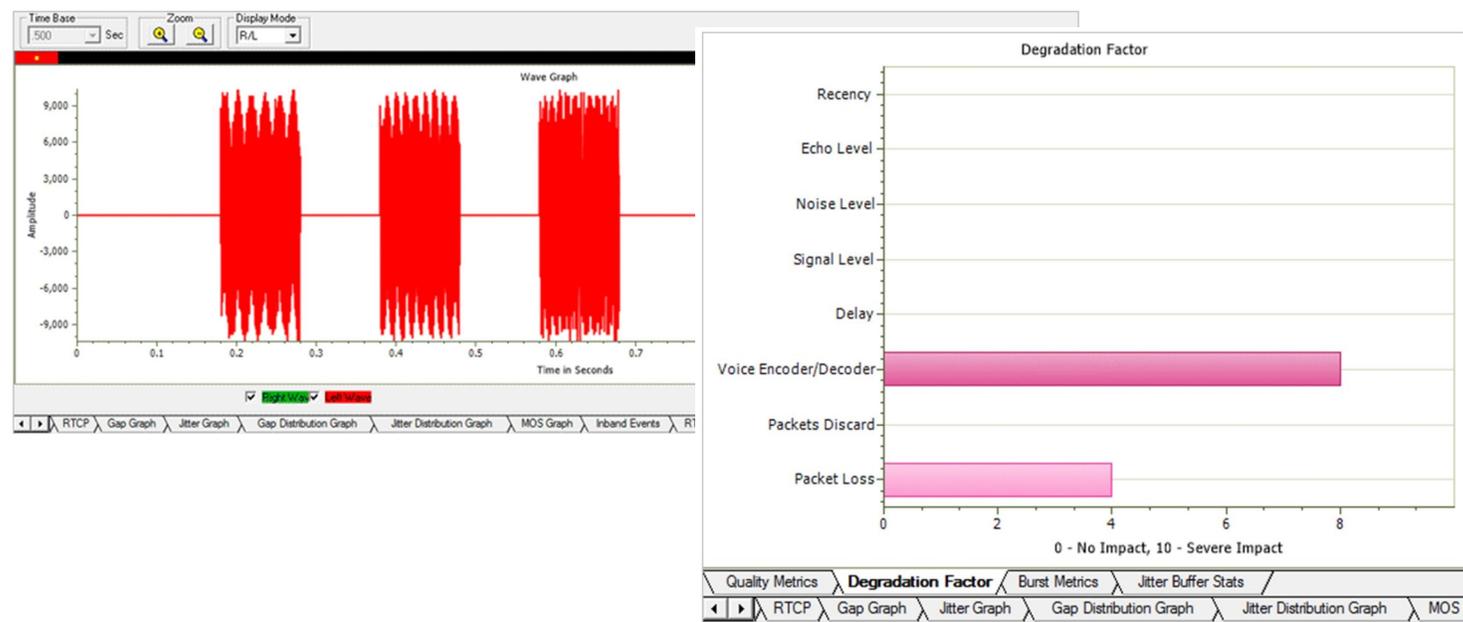


Figure: Wave Graph and Quality Factors

Quality Metrics based on E-model includes R-Factor and MOS Factor. R-Factor bar graph will display statistics such as R Listening, R Conversational, R-G107, and R-Nominal values.

MOS Factor bar graph will display statistics such as MOS CQ, MOS PQ, and MOS Nominal values during a call.

Degradation Factor – A pie chart plots and compares different statistics such as Good Quality, Packets discarded, Echo level, Packet loss, and Regency against total Packets for each individual sessions.

Jitter Buffer Statistics – A pie chart plots and compares packets received, packets discarded and packets lost against total Packets for each individual sessions. Also provides a tabular data on average.

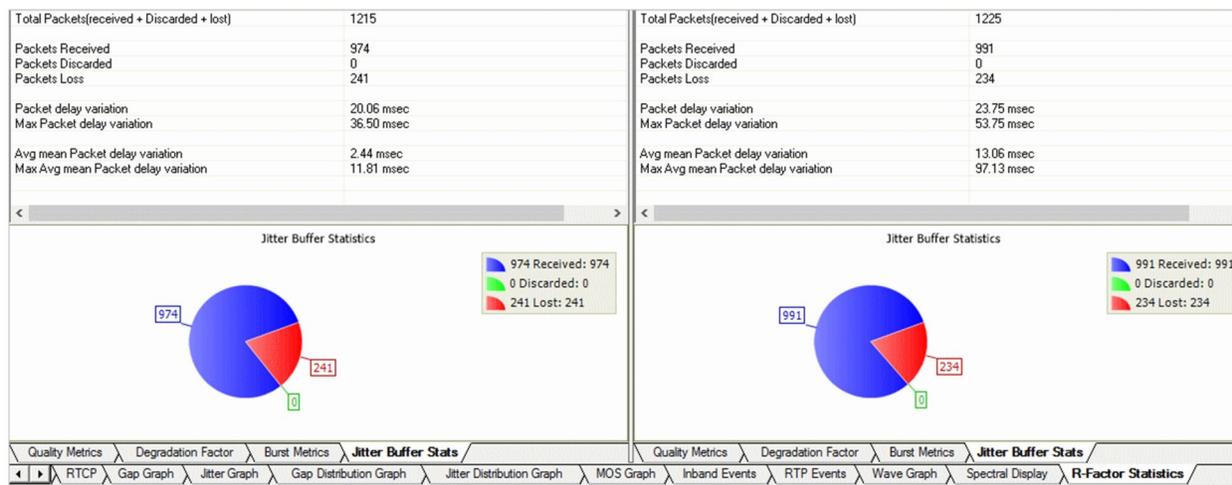


Figure: Jitter Buffer Statistics

Other Features in PDA

Play Audio, Write to File, and Record Video

The Play Audio plays the selected call to the PC speaker. Write to File is similar to the Play Audio option. The basic difference being that the output is written to a file instead of playing to the speaker.

PDA can monitor video calls and display both audio and video RTP streams in summary view. Users can record video calls to a file in QuickTime format, which can be viewed by VLC player.

Record Video option is available for both auto detected RTP calls and SIP calls. Supported video codecs are: H263++ (CIF 190/350 kbps, 512 kbps, QCIF 64 /80/128 kbps) and H264 is an industry standard for video compression, the codec offers better compression performance over previous standards.

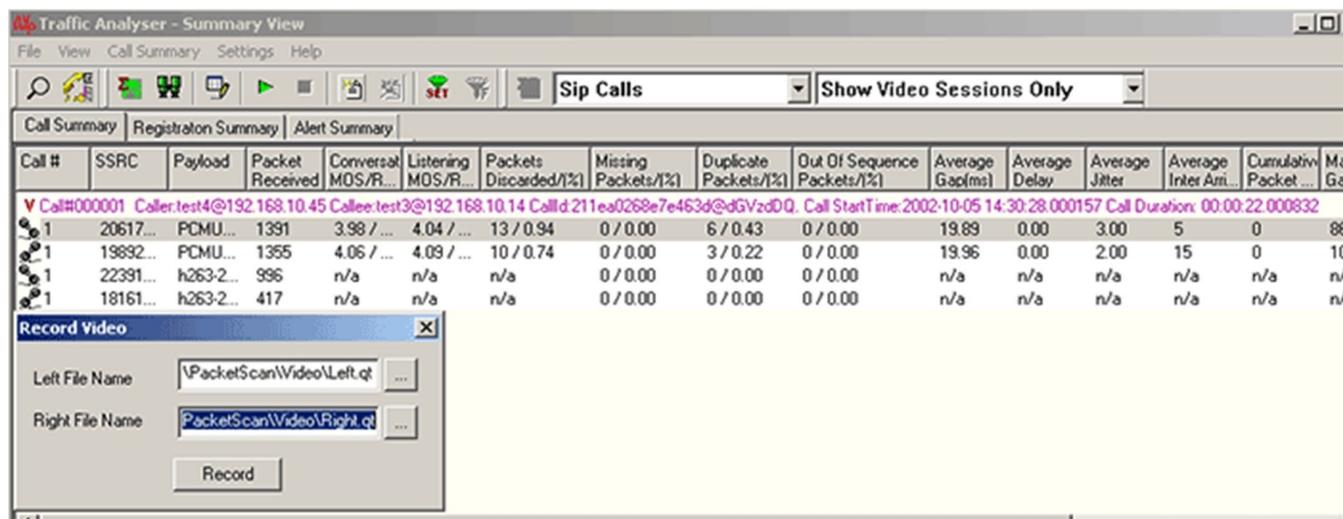


Figure: Record Video

Save call

The Save Call feature enables the user to save a particular call either in GL's proprietary *.HDL file format or in Ethereal *.PCAP file format. Call Summary details could also be saved for a particular call and this will be saved as a *.rtf file. This is especially useful to get data from real-time traffic locations to the lab for detail analysis of a flawed call.

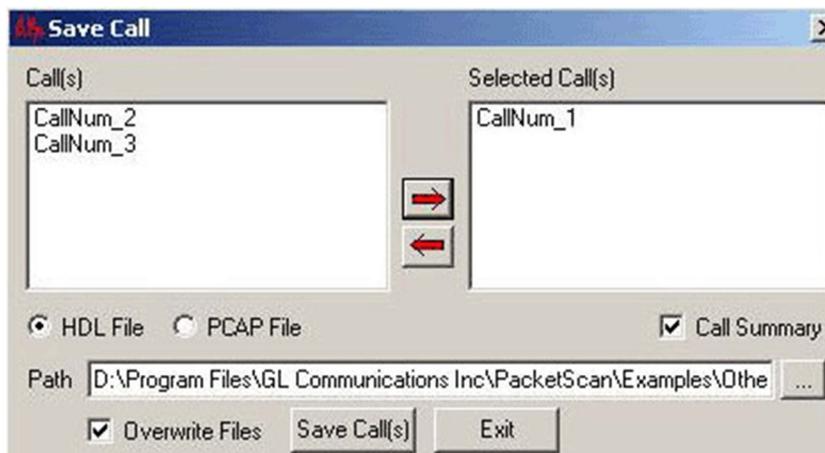


Figure: Save Call

Other Features in PDA (Contd.)

RTP/RTCP Statistics and Inband Events

The user can get the complete details of a single selected call such as Total Packets count, SSRC, RTP packet count, RTCP packet count, Total Audio bytes. Inband Events display inband DTMF and MF digits as they are received with details such as Timestamp, Type, Event, On-Time, Power, Freq1 / Power1, Freq2 / Power2.

Triggers and Action Settings

Triggers and Action Settings allow the user to filter calls based on certain SIP, RTP, MEGACO, and H323 parameters followed by a set of actions for the completed calls. The filtered file can be saved in either GL's proprietary HDL file format or Ethereal PCAP file format. Additionally, a summary of call signaling and audio parameters can be saved as *.rtf file. The actions include saving call to a file, recording audio to a file, sending an email, posting alert summary, viewing custom calls in summary view, creating Call Detail Records in CSV file format, and extracting Fax from calls in TIFF format.

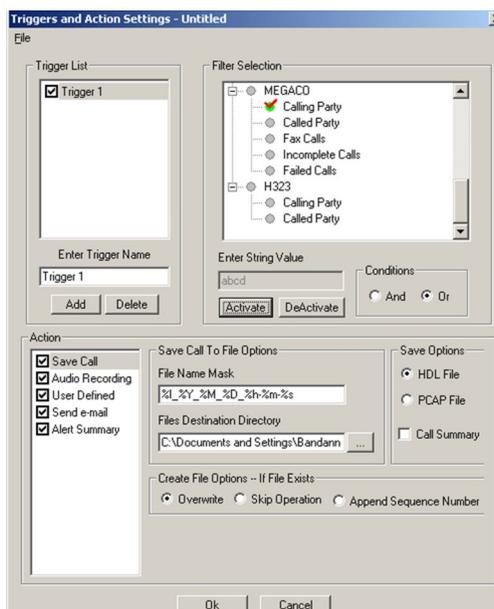


Figure: Trigger and Action Settings

Alert Summary

PDA generates alerts when particular vital parameters go beyond a specified value and display in Alert Summary table. The user can specify the criteria based on which the alerts are to be generated. The tab provides an active list of the alerts that have occurred during the test session in tabular columns.

Call#	Protocol	Message	Type	Threshold	Value	Caller	Callee	Callid
1	SIP	mos value between 3 to 4	Warning	2.00-4.00	3.57	0005@192.168.1.236	0005@192.168.1.234	GLPG143457205760
2	SIP	mos value between 3 to 4	Warning	2.00-4.00	3.39	0006@192.168.1.236	0006@192.168.1.234	GLPG143617205763
3	SIP	mos value between 3 to 4	Warning	2.00-4.00	2.77	0008@192.168.1.236	0008@192.168.1.234	GLPG143617205769
3	SIP	mos value between 1 to 2.5	Critical	1.00-2.50	2.36	0008@192.168.1.236	0008@192.168.1.234	GLPG143617205769
4	SIP	mos value between 3 to 4	Warning	2.00-4.00	3.48	0009@192.168.1.236	0009@192.168.1.234	GLPG143617205772
5	SIP	mos value between 3 to 4	Warning	2.00-4.00	3.30	0011@192.168.1.236	0011@192.168.1.234	GLPG14377205778
6	SIP	mos value between 3 to 4	Warning	2.00-4.00	2.77	0012@192.168.1.236	0012@192.168.1.234	GLPG143927205781
6	SIP	mos value between 1 to 2.5	Critical	1.00-2.50	2.31	0012@192.168.1.236	0012@192.168.1.234	GLPG143927205781
7	SIP	mos value between 3 to 4	Warning	2.00-4.00	2.27	0001@192.168.1.231	0001@192.168.1.237	GLPG13407127763982
7	SIP	mos value between 1 to 2.5	Critical	1.00-2.50	2.27	0001@192.168.1.231	0001@192.168.1.237	GLPG13407127763982
8	SIP	mos value between 1 to 2.5	Critical	1.00-2.50	1.47	0002@192.168.1.231	0002@192.168.1.237	GLPG13417127763987
9	SIP	mos value between 1 to 2.5	Critical	1.00-2.50	1.04	0003@192.168.1.231	0003@192.168.1.237	GLPG13425567763992

Figure: Alert Summary View

Packet Data Analysis (PDA) – Registration Summary

- Provides the registration summary of each SIP registration including the user agent, registrar, status, registered time, expiry time, time to live, remaining time, and registration request delay (RRD), and Re-registration Attempts.
- Provides graphical view of the active registrations and registration trace of each registration

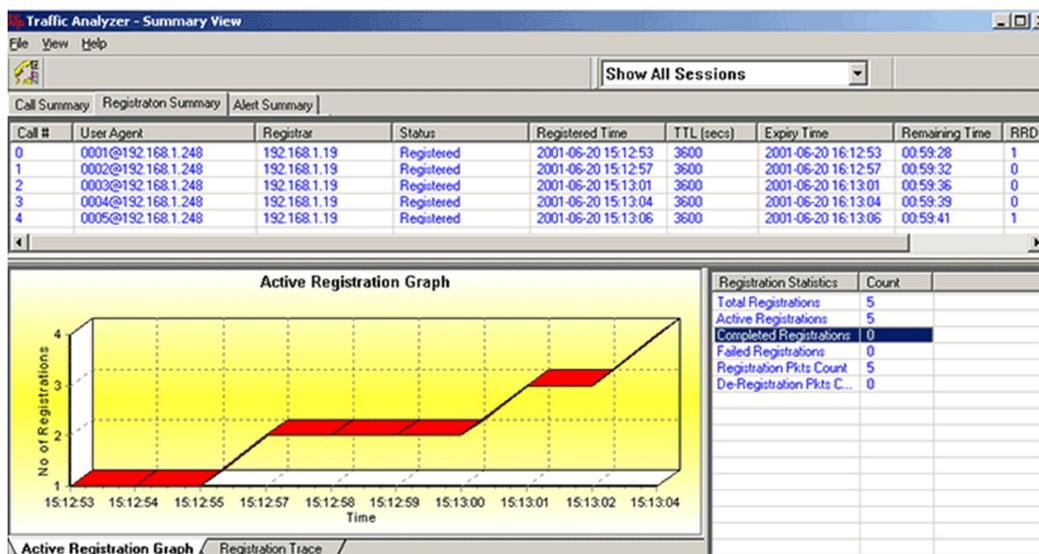


Figure: Registration Summary

Enhanced Trace Saving Options

Users can control the captured trace files by saving the trace using different conventions such as trace files with user-defined prefixes, trace file with date-time prefixes, and slider control to indicate the total number of files, file size, frame count, or time limit. This feature also allows the captured frames to be saved into a trace file based on the filtering criteria set using display filter feature

The screenshot shows the 'Protocol Trace Saving Options' dialog box. It is divided into several sections:

- Using View Filter:** Radio buttons for 'All Frames (no filtering)' (selected) and 'Filtered Only (use view filter)'.
- Save Directory:** A text box containing 'C:\' and a folder icon.
- Save File Names:**
 - Sequential File Names:** Radio button selected. Includes a 'file name prefix' text box, a 'number of digits' slider set to 123, and a 'file name suffix' dropdown set to '.HDL'.
 - Date/Time Formatted Names:** Radio button unselected. Includes a 'file name prefix' text box with the format '%Y%M%D_%H%I', a 'file name suffix' dropdown set to '.HDL', and a 'file name count' text box.
- Create a New File After the Specified Limit Has Been Reached:**
 - File Size Limit:** Radio button selected. Includes a 'Limit Value' text box.
 - Frame Count Limit:** Radio button unselected. Includes a 'Limit Value' text box containing '1000000'.
 - Time Limit:** Radio button unselected. Includes a 'Limit Value' text box.
- Restrict or Recycle After N Files Options:** Includes a 'Number of Files' text box containing '2147483647' and radio buttons for 'Keep N Latest Files' (selected), 'Stop After N Files', and 'Unrestricted'.

Figure: Protocol Trace Saving Options for PoS Protocol Analysis

Supported Protocol Standards

Available Standards	Supported Protocols	Specification Used
PPP	PPP	RFC 1331,1220,1333,1548,1661, 1570
PPP SIGTRAN	MultiPPP (PPP Multilink Protocol) Multiplexed PPP	RFC1717, RFC1990 RFC 3153
	CRTP	RFC 2508
	Cisco HDLC	http://www.protocols.com/pbook/bridge.htm#CISCOROUTER
	CHAP (Challenge Handshake Authentication Protocol)	RFC1334 http
	IPHC (IP Header Compression)	RFC 2507, RFC 3544
	LCP (Link Control Protocol)	RFC1570, RFC1661
	NCP	RFC 801
	LQR (Link Quality Report)	RFC1333
	Multi-class extensions to PPP (MC MLPPP)	RFC2686
	PPP (Point-to-Point Protocol) over HDLC	RFC1662
	PPP-BPDU (PPP Bridge Protocol Data Unit)	RFC1638
	BCP (Bridging Control Protocol)	RFC 3518
	IPCP (IP Control Protocol)	RFC1332
	IPCP Extensions for Name Server Addresses	RFC 1877
	PPPMuxCP	RFC 3153
	ISDN H.225	H.225 Q.931 Layer
	SCTP	RFC 2960
	SUA (SCCP UA)	RFC 3868
	SNMP (V1, V2)	RFC 1157,1155,1902,3416,2863, 2578,3418,2011,2012 etc.
	SIP3261, MGCP, MEGACO, RTP, and RTCP	RFC 3261, RFC 3435, RFC 3015, RFC 2833, and RFC 3550
	H.263, H.245, and H.450	ITU-T H.263, ITU-T H.245, and ITU-T H.450.1 to H.450.12

MLPPP Emulation Capabilities

Automated testing can be accomplished using client-server based PPP, MLPPP, & Multi-Channel (MC) MLPPP Emulation and Analysis (MLPPPTerr) module. The application permits traffic generation and verification over PPP links and may be accessed through a GUI or through command line scripts.

For more details, refer [MC-MLPPP Emulation using Client-Server](#) webpage.

Buyer's Guide

Item No	Product Description
TT3135 / EE3135	T3 / E3 PPP Analyzer (GUI) Analysis and decode of PPP over T3

Item No	Related Hardware
TE3001	Portable (USB) Dual T3 E3 / T1 E1 Hardware Unit– requires TT3001 or EE3001
PTE025	Optional Serial Datacom Analyzer Board for tProbe™
LTS100	Dual OC-3/ STM-1 OC-12 / STM-4 PCI Express Card
FTE001	QuadXpress T1 E1 Main Board (Quad Port)
ETE001	OctalXpress T1 E1 Daughter boards (Octal Port)
PTE001	Data Communications Board for Interfaces RS-232, RS-449, EIA-530, V.35, and many others
UTE001	Portable USB based Dual T1 or E1 Laptop Analyzer Unit

Item No	Related Software
XX600	Basic Client/Server Scripted Control Software (Included with Basic Software)
XX634	w/ Client-server Multi-Channel HDLC Emulation and Analysis, File based High Throughput HDLC Record/Playback
XX635	w/PPP Emulation and Analysis
XX636	w/Multi-Class (MC) MLPPP Emulation and Analysis

For more details, refer [T3/E3 PPP Analyzer](#) webpage.



818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A
 (Web) www.gl.com - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) info@gl.com