

### **Overview**

GL's **PacketScan™ – a Network Monitoring** software offers powerful features to capture and monitor live signaling and traffic over IP (version 4 and 6). It captures, segregates, monitors and collects statistics on all IP calls. Almost all VoIP and Wireless protocols over IP transport layer, as listed below, can be captured and decoded for troubleshooting network problems.

- Supports decoding of almost all industry standard signaling protocols See Protocol List
  - 5G N1N2, N4, N8, N10, N11, N12, and N13 (optional)
  - SIP, SIP-I, SIP-T, MSRP, H.323, MEGACO, MGCP, Diameter, Skinny (SCCP), SCTP
  - LTE (optional)
  - SIGTRAN SS7, ISDN (optional)
  - GSM A and Abis over IP (optional)
  - GPRS Gb and Gn over IP (optional)
  - UMTS IuCS and IuPS over IP (optional)
  - T.38 Fax and Video calls
  - ED-137 / ED-138
  - All traffic supported Digits, Tones, Voice, Video, Fax
- SIP ED-137 / ED-138 for Air Traffic Monitoring (Air-to-Ground, Ground-to-Ground Calls and Record interface)
- Capture and monitor live signaling and MSRP traffic over IP interface
- Live monitoring Ipv4 and IPv6 (version 4 and version 6) networks; users can listen / record a session in real-time and extracts Fax images into TIFF format
- Segregates, captures, and collects statistics on VoIP and Wireless calls
- Provides VoNR call statistics such as caller, callee, MOS scores, discarded packets and voice storage
- Monitors QOS on voice and video calls; perform power, frequency, spectral, tone and digit analysis, and video analysis with ease and precision; get an exact picture of QoS (Quality of Service)
- Includes Packet Data Analysis (PDA)/Traffic Analyzer (TA) views
- PDA support for IP traffic over Multi-Protocol Label Switching encapsulation

GL's TCP Analytics application is an optional application with PacketScan<sup>™</sup> protocol analysis software. It analyzes TCP connections between both internal LAN and external WAN computers including servers and clients. The application helps troubleshoot large bandwidth consumption, failed TCP sessions, packet loss, poor TCP throughput and more. For more details, refer to <u>TCP Analytics</u> webpage.

For more details, refer to <u>PacketScan<sup>™</sup> Analyzer</u> and <u>Protocol Analysis for Wireless and IP Networks</u> webpages.

SL Communications Inc.

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

## **Main Features**

### As a Stand-alone tool

- Capture real-time calls over packet network for infinite time
- Enhanced to support Non Access Stratum (NAS), Next Generation Application Protocol (NGAP), Packet Forwarding Control Protocol (PFCP), XnAP protocols
- PDA feature in Packetscan<sup>™</sup> provide a complete call flow of a 5G session
- Analyze with rich graphics, ladder diagrams, call trace
- Flexibility to add any protocol field to the summary view, filtering, and search features
- Complex filtering and search capabilities to record all or filtered traffic into a trace 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 automatically create search/filter criteria from the current screen selection
- Consolidated interface allows access to all the important settings and auto-startup actions
- Permits analysis of adherence to protocol standards for the system under test or observation
- Graphical representation of statistics including ladder diagrams of VoIP calls
- Analyze recorded trace files offline
- Decrypt and analyze Voice over Long-Term Evolution (VoLTE) calls secured over Internet Protocol Security (IPsec) connection
- Decode support for multi-layer tunnelled traffic GTP, GRE, VXLAN
- Supports BFD protocol decode
- Enhanced to support export frame summary for tunnelled traffic
- Supports decoding of <u>eCPRI</u> protocol
- Supports Encapsulating Security Payload (ESP) protocol to decrypt ESP packets on both IPv4 and IPv6 by providing ESP SAs value

### As a Single Point Packet over IP CDR Analysis System

- PacketScan<sup>™</sup> can work with GL's <u>Voice Band Analyzer (VBA)</u> and <u>Call Data Records (CDR)</u> applications to generate Call Detail Records as (\*.CSV files) along with voice files for each direction
- The call detail records are used for further analysis using built-in <u>Excel®</u> tools

### As a Probe with Central Monitoring System (NetSurveyorWeb<sup>™</sup> / NetSurveyorWeb<sup>™</sup> Lite)

- PacketScan<sup>™</sup> can send protocol fields, and call detail records, along with traffic summary of captured calls to a central database <u>NetSurveyorWeb<sup>™</sup></u> displays the data from the database in a simple web-based browser, featuring rich graphics, custom search, report and filter configurations
- PacketScan<sup>™</sup> can be integrated with <u>NetSurveyorWeb<sup>™</sup> Lite</u> version, which is a simple web-based client and works at the probe level, as an addon tool to enhance the features of protocol analyzers enhancing the capability to handle larger volume of data, filter for specific calls, build custom statistics and KPIs, automate and graphical analysis features to analyze the call detail records (CDRs) in depth
- It is an easy plug-and-play system that collects data, segregates, and provides comprehensive analysis of network health, detailed protocol monitoring with historical data retention up to 9 GB

### **Supported Codecs**

- G.711 (a-Law and μ-Law), G.711 App II (a-Law and μ-Law with VAD)
- G.722, G.722.1 (Wideband)
- G.726, G.726, with VAD
- G729, G729B (8kbps)
- GSM, GSM HR and GSM EFR
- SPEEX/SPEEX\_WB (Narrow band/Wideband)
- iLBC (20ms and 30ms), SMV
- AMR/AMR\_WB (Narrow band/Wideband) (requires additional license)
- EVRC, EVRC0, EVRC-B, EVRC-B0, EVRC-C (requires additional license
- Opus (Optional codec)

For more information, refer to Voice Codec webpage.

### **Supported Protocols**

• Almost all industry standard protocols decode supported. For more information, refer to Supported Protocols webpage

### **QOS** Parameters

- E-model (G.107) based MOS/R-Factor scores
- Media Delivery Index (Delay Factor: Media Loss Rate) for video calls
- H.263, H.264 codec support

# Main Features (Contd.)

### **Traffic Handling**

- Segregation of IP traffic, and VoIP calls
- Listen and Record RTP (Audio) streams
- Audio capture/playback Listen and Record RTP (Audio) streams
- Filters based on WhiteList Calls, Criteria based Voice/Trace Recording

### **Performance Metrics**

- Signaling, audio, and video QoS parameters for each call
- Minimum, maximum, and average round trip delay
- Inband (DTMF and MF) events, Outband events as per RFC 2833 or RFC 4733 events, RTP/RTCP packet count and reports per direction

### **Triggers and Actions**

• Filter the completed calls captures based on different signaling parameters and then specify a series of actions to be taken

### Utilities

- Provides HDL File Conversion utility to convert ethereal format file (\*.PCAP, \*.CAP, and \*.PCAPNG) to GL's file format (\*.HDL) and vice-versa
- Includes Excel® tool to import CDRs into Excel® to analyze using Pivot Table, and Pivot Charts

## ATM Network Quality Monitoring Tools per ED-138

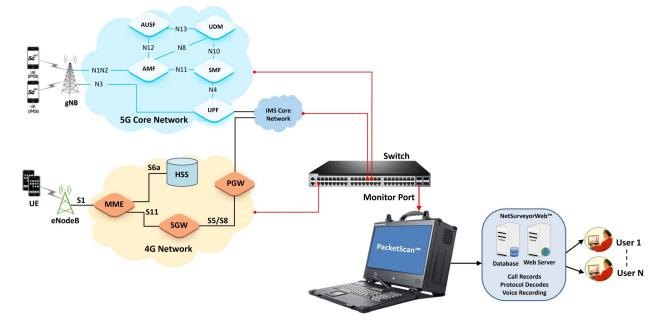
GL's PacketScan<sup>™</sup> - an All-IP Network Monitoring software offers powerful features to capture and monitor live signaling and traffic over IP. It captures, decodes, segregates, monitors and collects statistics on all IP calls, as per EUROCAE ED-138. Ease of viewing Ground-to-Ground calls and Air-to-Ground sessions is possible.For more information, refer to <u>Test-Solutions-for-VoIP-Air-Traffic-Management</u> webpage.

## eCPRI Protocol Analysis

PacketScan<sup>™</sup> supports decoding of eCPRI protocol. For more details, refer to <u>eCPRI Protocol Analysis</u> webpage.

## 5G and LTE Network Monitoring

PacketScan<sup>™</sup> <u>5G Protocol Analyzer</u> supports 5G network monitoring, capturing, segregating, and collecting statistics on calls over N1N2, N4, N8, N10, N11, N12, and N13 interfaces. It is an optional module available with PacketScan<sup>™</sup>. Additionally, GL's <u>LTE Protocol Analysis</u> (optional module available with PacketScan<sup>™</sup>) captures and monitors real-time signaling and traffic on LTE networks, collecting statistics on calls and testing eNodeB or UE over interfaces such as S1, S3, S4, S5 (or S8), S6a, S10, S11, S13, and X2.



#### Document Number: PKV100-01

### Summary, Detail, and Hex Dump Views

The Summary View displays various information such as Frame Number, Time, Length, Message Types, IP source and destination addresses, and so on. Any field from the protocol headers can be added to Summary view, i.e., summary fields are completely user-configurable. User can select a frame in Summary View to analyze and decode each frame in the Detail View. The Hex dump view displays the frame information in HEX and ASCII octet dump.

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      2012-04-16 13:58:48.358273000       0K Len=82       Internet IP(IPv4)       Internet IP(IPv4)         a=0 tat       a       = x0016760CFBD4       Internet IP(IPv4)       Internet IP(IPv4)         f       = x0016760CFBD4       = x0016760CFBD4       Internet IP(IPv4)       Internet IP(IPv4)         a       = x0016760CFBD4       = x0016760CFBD4       Internet IP(IPv4)       Internet IP(IPv4)         a       = x0016760CFBD4       = x0016760CFBD4       Internet IP(IPv4)       Internet IP(IPv4)         a       = x0016760CFBD4       = x0016760CFBD4       Internet IP(IPv4)       Internet IP(IPv4)         a       = x0016760CFBD4       = x0016760CFBD4       Internet IP(IPv4)       Internet IP(IPv4)         a       = 0100(4)       =00101 (5)       Internet IP(IPv4)       Internet IP(IPv4)         a       = 000000	5       2012-04-16 1358:50.707805000       820       Internet IP(IPv4)       SIP       192.168.1.103         6       2012-04-16 1358:52.825730000       92       Internet IP(IPv4)   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**Different Views** 



### **Real-time and Offline Analysis**

Users can capture and analyze packets through real-time analysis or analyze the recorded data in offline mode. All captured or filtered traffic can be recorded into a trace file. The recorded trace file can be used for offline analysis or exported to a comma-delimited file or ASCII file.

Card & Stream Selection	
Save Load Default	Stream / Interface Selection  Ethernet Boards  Adapter for generic dialup and VPN capture Intel(R) PR0/1000 PM Network Connection (Microsoft's Packet Scheduler) 19 Intel(R) PR0/1000 MT Network Connection (Microsoft's Packet Scheduler)

**Real-time Capture** 

## **Filtering and Search**

Filter and search capabilities adds a powerful dimension to the PacketScan<sup>™</sup> analyzer. These features isolate required frames from original frames in real-time/offline. Users can record all or filtered traffic into a trace file. To analyze only particular frames of interest, user can select real-time capture filters which also includes protocol filter.

Allows real-time filtering based on parameters set in Data Link layer, MAC layer, IP, TCP/UDP, and more. The offline filter allows filtering based on Frame Number, Time, Length, Message Types, etc. The search capability helps user to filter for a particular frame based on specific search criteria.

View Filter Save Load Default	Capture Filter ×
Select summary columns to dia.       Menu checked options       Protocol standard selection       Tome Format       View Filter       View Filter       View Filter       View Filter       Poticit Type Value       Packet Type       View Filter       View Filter       Periodic Tace Saving Options       Periodic Tace Saving Options       Point Lick Groups       Free View Filter       Point Save       Data Lick Groups       Free View Filter       Network Under Saving Options       Data Lick Groups       Free View Filter       Data Lick Groups       Free View Filter       Data Lick Groups       Free View Filter       Optime Summary Columnss       Descrivate Options       Office Summary Columnss       Conditions for all selections       Conditions for all selections       Conditions for all selections	Sive Load Default  Sive Load Default  Copture File Options  Copture File  Fil

Real-time / Offline Filter

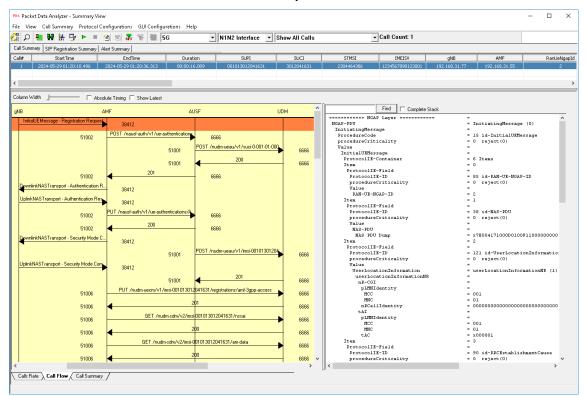


### 5G Analyzer

GL's PacketScan<sup>™</sup> 5G protocol analyzer supports monitoring of 5G networks. It captures, segregates, monitors, and collects statistics on all calls over N1/N2, N4, N8, N10, N11, N12, and N13 interfaces of the 5G network. GL's 5G Protocol Analyzer is an optional module available within PacketScan<sup>™</sup> on purchase of additional licensing.

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vice	Frame#	TIME (Relative)	Length (Bytes)	Error	Length/Protocol Type MAC	Packet Type MAC	Source IP Address IPv4	Destination IP Address IPv4
0	54	00:00:04.071183000	60		ARP			
0	55	00:00:04.078905000	60		ARP			
0	56	00:00:04.530010000	217		Internet IP(IPv4)		192.168.12.10	239.255.255.250
0	57	00:00:04.530250000	217		Internet IP(IPv4)		192.168.12.11	239.255.255.250
0	58	00:00:04.679183000	158		Internet IP(IPv4)		192.168.13.101	192.168.13.106
0	59	00:00:04.756884000	60		ARP			
0	60	00:00:04.769177000	130		Internet IP(IPv4)		192.168.13.106	192.168.13.101
0	61	00:00:04.779202000	126		Internet IP(IPv4)		192.168.13.101	192.168.13.106
:0	Length			112 (x0070)				
2	TSN		= -	448 (x000001	.C0)			
	Stream Identif:			0 (x0000)				
38	Stream Sequence Payload Protoco	s Number		448 (x01C0) x0000003C NG				
A	Payload Protoco	2 Identifier		XUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUUU	AP'			
	GAP-PDU	. 18901		CHOICE				
E	stensibility Ma	arker	=	0				
	hoice Index		=					
	InitiatingMess ProcedureCode	age		SEQUENCE				
				INTEGER	LUEWacaara			
	Contents	icality	= ;	15 id-Initia	lUEMessage			
		icality	= 1					
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	Contents procedureCrit: Contents Value Length InitialUEMessus Extensibility ProtocolIE-1 ProtocolIE-1 ProtocolIE-1 ProtocolIE-2 Contents procedureS Contents Value Length Catholical Ength Det	age Marker mtainer mtainer Field -ID P-ID		15 id-Initia ENUMERATOR 0 reject(0) Open Type 32 SEQUENCE 0 SEQUENCE OF 6 Instance 0 SEQUENCE INTEGER 85 id-RAN-UE 0 reject(0) Open Type 2 INTEGER 1	-NGAP-ID			
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	Contents procedureCrit: Contents Value Length InitialUEMess. Extensibility ProtocolIE-C ProtocolIE-C ProtocolIE-C Contents Value Length RaN-UE-MGA Length Detr Contents ProtocolIE-C	age Marker mtainer mtainer Tield -ID riticality 2-ID erninant mtainer		15 id-Initis ENUMERATOR 0 reject(0) 0pen Type 92 SEQUENCE OF 6 SEQUENCE OF 6 Instance 0 SEQUENCE INTEGER 85 id-RAN-UE ENUMERATOR 0 reject(0) 0 reject(0) 0 reject(0) 10 reject(1) 11 16 11 10 reject(1) 10 reject(1)	-NGAP-ID			
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**NGAP Layer Decode** 



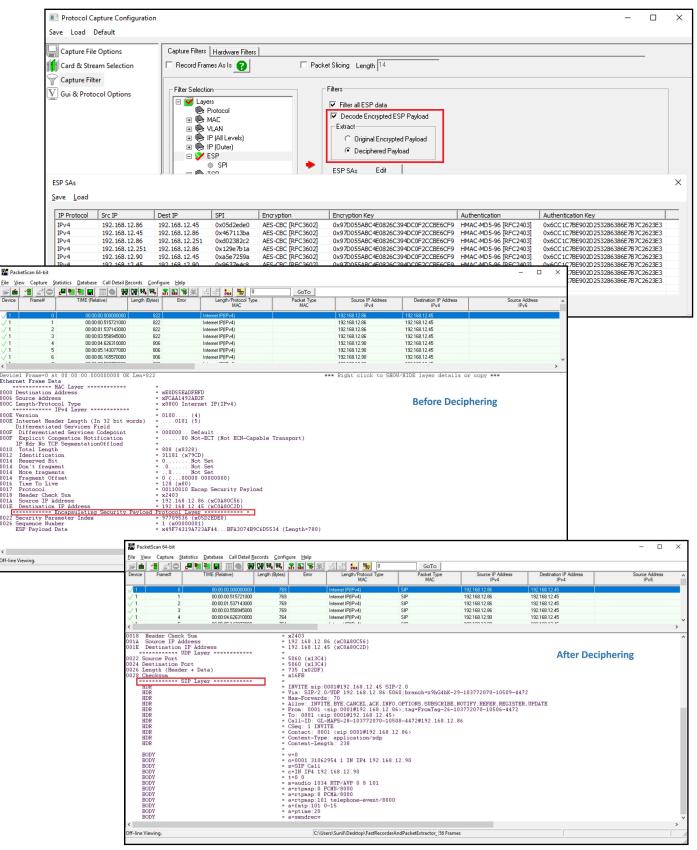
5G N1N2 Interface Call Graph

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## **Encapsulating Security Payload (ESP) Deciphering**

PacketScan<sup>™</sup> analyzer supports Encapsulating Security Payload (ESP) to decrypt ESP packets on both IPv4 and IPv6 by providing ESP SAs value.

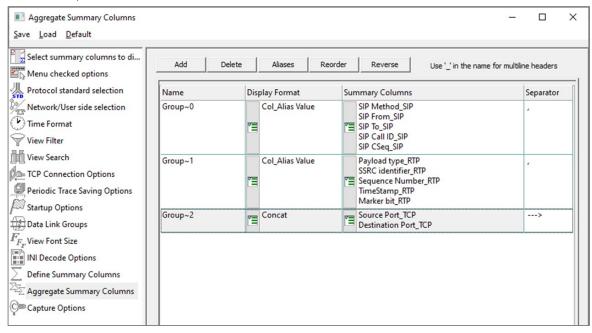


ESP Deciphering

## Aggregate Summary Column Group

The enhanced feature of the protocol analyzer is aggregate column groups which are very flexible and comprise aggregate columns from the same or different protocol layers and prioritizes the column groups based on the requirement.

If the user has five different aggregate columns depending on the requirement to prioritize some columns, then the group of aggregate columns is created with the highest priority. Accordingly, the group columns values are displayed. The aggregate columns comprising a group will have the same prefix and suffix index as ~0, ~1 ... ~N.



#### Aggregate Summary Column Group

The updated results are as shown in the below screenshot. Here the root aggregate **Group~0** summary columns are displayed first and then **Group~1** and **Group~2** as per the assigned priority.

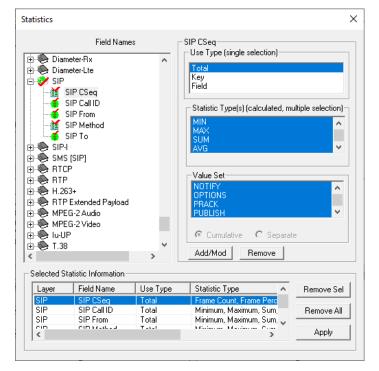
PacketScan 64-bit		-
Eile View Capture Statistics Database Call Detail Records Configure Help		
🗃 🖆 🖉 📮 🔚 🔚 📰 💭 땚 몇몇 백,백, 굶 🔛 📽 🗶 것 및 🛻 🦐 🔍 Goto		
Frame# TIME (Relative) Length (Bytes) Packet Type Group~0	Error	Length/Protocol Type MAC
3 00:00:00:000310480 823 SIP INVITE , From: 0001@192.168.12.122 , To: 0001@192.168.12.123 , CalHD: GL-MAPS-1164-274984921-14456-8240@192.168.12.122 , CSeq. 1 IN	IVITE	Internet IP(IPv4)
4         00:00:00:00511840         416         SIP         100 Typing, From: 0001@192.168.12.122, To: 0001@192.168.12.123, CalHD: GL-MAPS-1164-274984921-14456-8240@192.168.12.122, Cseq: 1           5         00:00:00:00110720         54         SIP         57494> 5060         60:00:00:00183300         775         SIP         200 0K, From: 0001@192.168.12.122, To: 0001@192.168.12.123, CalHD: GL-MAPS-1164-274984921-14456-8240@192.168.12.122, Cseq: 1 IN           7         00:00:00:00183300         775         SIP         200 0K, From: 0001@192.168.12.122, To: 0001@192.168.12.123, CalHD: GL-MAPS-1164-274984921-14456-8240@192.168.12.122, Cseq: 1 IN           7         00:00:00:00185670         444         SIP         ACK, From: 0001@192.168.12.122, To: 0001@192.168.12.12.23, CalHD: GL-MAPS-1164-274984921-14456-8240@192.168.12.122, Cseq: 1 ACK           8         00:00:00:002156670         214         RTP         PT= (0) PCMU (A - 8000 Hz - 1 Channel), SSRC= 832283305, Seq= 5136, Time 52337233, Marker= Set           9         00:00:00:00:002156600         214         RTP         PT= (0) PCMU (A - 8000 Hz - 1 Channel), SSRC= 83373388, Seq= 45155, Time 502715275, Marker= Set	IVITE	Internet IP(IPv4) Internet IP(IPv4) Internet IP(IPv4) Internet IP(IPv4) Internet IP(IPv4) Internet IP(IPv4)
Device2 Frame=3 at 00:00:00.000310480 OK Len=823 *** Right click to SHOV/HIDE 1 Ethernet Frame Data *** Right click to SHOV/HIDE 1 0000 Destination Address * xFCAA149CBF99 0000 Length/Protocol Type * x0600 Internet IP(IPv4) **** Right click to SHOV/HIDE 1 0000 Version 0 0100(4) 0000 Furierentiated Services Field 0 000F Differentiated Services Codepoint 000000. Default 000F Explicit Congestion Notification *000 Not-ECT (Not ECN-Capable Transport) IP HAY NO TCP SegmentationOffload * 809 (x0329) 0012 Identification 28511 (x6FFF) 0014 Reserved Bit 0Not Set 0014 fragment Services *Not Set 0015 frighter transport (12 (x0000 0000000) 0016 Titue Transport *00 Not-ECT (Not ECN-Capable Transport) 1014 More fragment 0 (000 Not-ECT (Not ECN-Capable Transport) 1015 Titue *00 Not-ECT (Not ECN-Capable Transport) 1016 Titue *00 Not-ECT (Not Set 0010 Total Length *00 Not-ECT (Not Set 0014 Reserved Bit *00 Not Set 0014 Nore fragments *Not Set 0015 Differentiated Services *	layer details	s or copy ***
Off-line Viewing. C:\Users\Archana\Desktop\Aggregate Summary Colum: 11 Frames		

**Display of Aggregate Summary Column Group in Summary View** 

### **Call Detail Records and Statistics View**

Important call specific parameters like call status, release cause, parties involved and more are displayed in call trace view. Additionally, users are provided with the option to search a particular call detail record from the captured traces.

Statistics can be obtained for all frames both in real-time as well as offline mode. Various statistics can be obtained to study the performance and trend in the VoIP network, based on protocol fields and different parameters.



#### **Define Statistics View**

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levice	Frame#	TIME (Date		Length (Bytes) Error	Length/Protocol MAC		Packet Type MAC		IP Address IPv4	Destination IP Address IPv4	
/ 2	0	2012-04-16 13:58:48	358273000	82	Internet IP(IPv4)			192.168.1.70	19	2 168 1 255	_
12	1	2012-04-16 13:58:50		82	Internet IP(IPv4)			192,168,1,142		5 255 255 255	
2	2	2012-04-16 13:58:50		836	Internet IP(IPv4)	SIP		192.168.1.200		2.168.1.103	
2	3	2012-04-16 13:58:50		354	Internet IP(IPv4)	SIP		192,168,1,103		2.168.1.200	
2	4	2012-04-16 13:58:50		355	Internet IP(IPv4)	SIP		192 168 1 103		2.168.1.200	
(ā	-							*******			
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	Frane Dat	a AC Laver =====		-				-			
	ination A			= = xFFFFFFFFF	FFFF						
06 Sourc	ce Addres	s		= x0013208E	22C3						
IC Leng	th/Protoc	ol Type			ernet IP(IPv4)						
		Pv4 Layer ====		- 0100	(4)						
E Vers:	iou			= 0100							
	nnet Head										
Diffe Diffe	rnet Head erentiate	er Length (In 1 Services Fie	32 bit wo eld	ords) =0101   =	(5)						
Diffe DF Dif:	erentiate ferentiat	1 Services Fie ed Services Co	depoint	= = 0000001	Default						
Diffe DF Diff DF Exp.	erentiate ferentiat licit Con	1 Services Fie ed Services Co gestion Notifi	depoint cation	= = 0000001	. ,	Capable Transp	ort)				
Diffe OF Diff OF Exp IP He	erentiate ferentiat licit Con dr No TCP	1 Services Fie ed Services Co	depoint cation	= = 0000001 =001 =	Default Not-ECT (Not ECN-4	Capable Transp	ort)				
Diffe OF Dif: OF Exp. IP He 10 Tote	erentiate ferentiat licit Con dr No TCP al Length	1 Services Fie ed Services Co gestion Notifi SegmentationC	depoint cation	= = 00000001 =00 1 = = 68 (x0044	Default Not-ECT (Not ECN-4	Capable Transp	ort)				
Diffe OF Dif: OF Exp. IP Ho 10 Tota 12 Iden 14 Rese	erentiate ferentiat licit Con dr No TCP al Length ntificati erved Bit	1 Services Fie ed Services Co gestion Notifi SegmentationC on	depoint cation	= 00000001 =001 = 68 (x0044 = 3583 (x0D1 = 01	Default Not-ECT (Not ECN- ) FF) Not Set	Capable Transp	ort)				
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Diffe DF Diff DF Exp. IP Ho 2 Iden 4 Rese 4 Rese 5 IP CS VITE (0) al INVITE	erentiate ferentiat licit Con dr No TCP al Length ntificati erved Bit	d Services Fie ed Services Cc gestion Notifi SegmentationC on  SIP Call ID 1620788079-5060 total 1620788079-	-1d depoint cation ffload -3@192.1 5060-3@	= 0000001     =00 1     = 68 (x0044     = 3553 (x004     = 01 <b>∑≣</b> SIP From     4000@192.168.1.60     total 4000@192.168.1.61	Default Not-ECT (Not ECN-4 ) FF) Not Set 1. C-1 Σ≣ SIP Method INVITE (0) total INVITE (0)	Σ≣ SIP To 1000@192. total 1000@	168.1 2 192.1 2	Frame Count(SIP	100		
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Diffe Dif Dif DF Exp. IP H. IO Tota I2 Idea I4 Reset SIP CS VITE (0) al INVITE VITE (0)	erentiate ferentiat licit Con dr No TCP al Length ntificati =rved Bit '- for en- Seq (0) (0)	I Services Field     Services Co gestion Notifi     SegmentationC     Dn     SIP Call ID     1620788079-5060     total 1520788079 211ea0268e7e46     total 211ea0268e7e46	-1d depoint cation 0ffload -3@192.1 5060-3@ 3d@dGV 7e463d@ 3d@dGV		Default Not-ECT (Not ECN-4) ) Not Set 11 C-1 IMMTE (0) INMTE (0) INMTE (0) INMTE (0) INMTE (0)	∑≣ SIP To 1000@192. total 1000@ testl@192. total test4@ test3@192.	168.1 2 192.1 2 168.1 1 192.1 1 192.1 1 168.1 1	Frame Count(SIP	100 100 100 100 100 100		
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Diff DF Dif DF Dif DF Exp IP H L0 Tota 2 Iden A SIP CS VITE (0) al INVITE VITE (0)	rentiate ferentiat formitation in No TCP al Length ntificati exved Bit (0) (0) (0) (0) (0)	I Services Fit gestion Notifi SegmentationCom In IS20788073-5060 total 1620788073- 11e00268e746 total 211e00268e746 total 211e00268e746 total 211e00268e746 total 211e00268e746 total 211e00268e746 total GLPC-48363760 total GLPC-48363760 total GLPC-4836378075- total 1620788073-	+1d depoint cation ifiload -3001921 5060-30 300dGV 7e463d0 330 3760331 -3001921 5060-30	■ 000000.1     ■	Default Not-ECT (Not ECN-4 ) Not Set SEP Method INVITE (0) INVITE (0)	x∎         SIP To           1000@192.         total 1000@           test4@192.         total test4@           total test4@         1000@192.           total test3@         0001@192           total 0001@         1000@192.           total 0001@         1000@192.           total 0001@         1000@192.	168.1         2           192.1         2           168.1         1           192.1         1           168.1         1           192.1         1           168.1         1           192.1         1           168.1         1           192.1         1           168.1         1           192.1         1           192.1         1           192.1         1           192.1         2	Frame Count(SIP	00000000000000000000000000000000000000	<u> </u>	
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Diff: DF Diff: DF Diff: DF Exp 10 Tott: 12 Iden 14 Rese VITE (0) al INVITE VITE (0) AL INVITE (0) AL INVITE VITE (0) AL INVITE (0) AL INVITE (0) AL INVITE (0) AL INVITE (0) AL INVITE (0) AL INVITE (0) AL	rentiate forentiat in to TCP al Length ntificati reved Bit (0) (0) (0) (0)	Services Field     Services Congestion Notifit     Segmentation     Description     Segmentation     Description     Segmentation     Description     Segmentation     Seg	14 depoint cation offload -3@1921 5060-3@ 3d@dGV 7e463d@ 331 3760331 -3@4GV 7e463d@ -3@1921 5060-3@ 7a6034	2000000.1     001     66 (x0044     3563 (x0D)     0     0.1     0     0.1     0     0.1     0     0.1     0	Default Not-ECT (Not ECN-4) )FP) tot Set 2. SIP Method INMTE (0) total INMTE (0) INMTE (0) total INMTE (0) INMTE (0) INMT	ziiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiiii	■           166.1         2           192.1         1           192.1         1           168.1         1           192.1         1           168.1         1           192.1         1           168.1         1           192.1         1           192.1         1           192.1         1           192.1         1           192.1         1           192.1         1           Ceall S         Ceall S	Start Date & Time	100 100 100 100 100 100 100 100 100 100		cific Inf
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#### **Call Detail Records and Statistics View**

# Packet Data Analysis (PDA) – Summary View

### Features

- Call Quality Of Service (QoS) for all calls with E-Model based (G.107) Mean Opinion Score [MOS (ITU-T, G.107, E-model)] and R-factor with individual and summary statistics presented in graphical and tabular formats
- Provision for H.263+ and H.264 video capture and video conference monitoring capability
- Calculates minimum, maximum, and average round trip delay values for SIP calls
- Supports decoding of AMR and AMR\_WB codec with IuUP Header
- Save calls in HDL, PCAP, or PCAPNG file format for further analysis
- Ability to copy the cell value to clipboard (Notepad)
- The PDA Summary View can also export all terminated call details as a text file (CSV format) during the live capture. This feature requires activating the Export Terminated Calls option from PDA prior to live capturing
- This structured text file can be imported into Excel<sup>®</sup> using a custom add-in (Excel-Dashboard-Tool-IP.xlsm) to generate different chart types such as call volumes, call duration, call failure causes, CMOS, LMOS, packet loss and more
- Individual and summary statistics presented in graphical and tabular formats
- Graphs are provided for key statistics for network monitoring and troubleshooting. Graphs available include Active Calls, Average
  Jitter, E-Model MOS/R-Factor/Packets Discarded, RTP Packets Summary, ladder diagram for T.38 based fax calls and call signaling, Gap,
  Jitter, Gap/Jitter Distribution, Wave and Spectral Display for media stream analysis, VoIP calls and more
- Displays a summary of signaling, audio, and video parameters such as Source/Destination Video Channels, Media Type, SSRC, Average Delay/Gap, Packet Counts, Media Delivery Index and Frame Rate for all video calls
- Calls and sessions are classified as active, completed, or failed giving the user an idea about the calls and its status in the network
- Filter CDRs (Call Detail Records) based on parameters such as caller, time, message count, etc.
- Generates VoIP Key Performance Indicators (KPI) Reports: Call Success Ratio, Calls Per Second, Post Dial Delay, Error Code Distribution, Answer Seizure Ratio, and Call Duration
- Creates SIP Registration KPI Reports: Register messages per sessions ,Registrar(s) distribution, Registration(s) vs Deregistration(s) Over Time, Error code distribution
- Export KPI Report in PDF Format
- Generates alert summary when particular vital parameters go beyond a specified value

### **Summary View**

TA Summary view displays summary of data transmission in each direction including calling number, called number, call id, start time, duration, missing packets, max/min RTD, average RTD and so on. It includes separate statistical counts on total packets, calls, failed calls, and more for SIP, H.323, MEGACO, BICC, CAMEL, ISUP, LTE, RTP, GSMA, IuCS, SCCP, and ED-137 based calls. The user can get the statistics of active calls, purged calls, and so on.

### Call Summary – Signaling, Audio, and Video QoS Statistics

The Call Summary displays the signaling, audio, and video parameters of each call for SIP, RTP, MEGACO, H.323, LTE, BICC, ISUP, CAMEL, GSMA, IuCS, SCCP, and ED-137 protocols. 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.

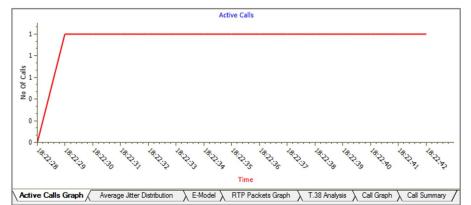
Packet Data Analyzer - Summary View ile View Call Summary Protocol Conf	Figurations GUI Configurations	lein						- 0
	🖄 🚮 📽 👯 SIP	Show All Calls		•				
Call Summary Registraton Summary Alert Sun	nmary							
Call # Caler	Calee	StartTime	Duration	Vo	viceQual	lity_L	VoiceQuality_R	ConversationalMos
1 0001@192.168.1.200	0001@192.168.1.103	2012-04-16 13:58:50.705	00:00:30.121	Ì	Good		Good	4.20
2 4000@192.168.1.60	1000@192.168.1.60	2012-04-16 14:02:03.137	00:02:39.469		Good		Good	4.20
3 test4@192.168.10.45	test3@192.168.10.14	2012-04-16 14:05:52.455	00:00:28.242		Good		Good	4.16
(								
Signaling Parameters	Value	Audio Parameters		Value	^	Video Parameters		Value
Caler	0001@192.168.1	Src RTP Channel		192.168.1.200: 10		Src Video Channel		
Calee	0001@192.168.1	Src Media Type		PCMU/8000	1	Src Media Type		
Calld	GLPG-483633760	Src SSRC		3365468417		Src SSrc		
Call Status	Terminated	Src Packets Count		1273		Src Packets Count		
		Src Missing Packets / (%)		0/0.00		Src Missing Packets		
Call Initiated Time	2012-04-16 13:58	Src Duplicate Packets / (%)		0 / 0.00		Src Duplicate Packe	37(%)	
Call Established Time	2012-04-16 13:58	Src Out of Sequence Packets / (%)		0/0.00		Src Out of Sequence	Packets / (%)	
Call Stop Time	2012-04-16 13:59	Src Conversational MOS/R-Factor		4.20 / 93		Src Video Frame cou		
Cal Duration	00:00:30.121	Src Listening MOS/R-Factor		4.20 / 93		Src Frame Rate(Fram	es/secj	
Call Terminator	Caller	Src GoodCMos/FairCMos/PoorCMo	(Seconds)	25/0/0		Src AvgDelay		
Call Failure Reason		Src Voice Quality		Good		Src AvgGap Src MDI (DF:MLR)		
Session Request Delay (msec)	2.221	Src Discarded Packets / (%) Src Average Inter Arrival Jitter (RTCF		0/0.00		Sic MUI (DF:MLH) Sic AvaMDI(DF:MLF		
Session Disconnect Delay (msec)	10.469	Stc Average litter	)	0.58	-	ыс мүдмрцрг.мцг	,	
Post PickUP Delay (msec)	4605 469	Src Average Delav		0.00		Dest Video Channel		
Fost FickOF Delay (msec)	4003.403	Src Average Gap		20.17		Dest Media Tune		
Total Signaling Frames	7	Sic Average dap		20.17		Dest SSrc		
Total Signaling Hands		Dest BTP Channel		192 168 1 103: 10		Dest Packets Count		
CalType		Dest Media Type		PCMU/8000		Dest Missing Packet	7 (2)	
SubCallType		Dest SSBC		3380545537		Dest Duplicate Pack		
PTICount	0	Dest Packets Count		1269		Dest Out of Seguence		
SqueichCount	ŏ	Dest Missing Packets / (%)		0/0.00		Dest Video Frame co		
PTTMCount	0	Dest Duplicate Packets / [%]		0/0.00	- li	Dest Frame Rate/Fra	nes/sec)	
PTTSCount	Ō	Dest Dut of Sequence Packets / (%		0/0.00		Dest AvgDelay		
PPSCTCount	0	Dest Conversational MDS/R-Factor		4.20 / 93		Dest AvgGap		
CPSCTCount	0	Dest Listening MDS/R-Factor		4.20 / 93		Dest MDI (DF:MLR)		
		Dest GoodCMos/FairCMos/PoorCM	os (Seconds)	25/0/0	1	Dest AvgMDI(DF:ML	B)	
		Dest Voice Quality		Good				
		Dest Discarded Packets / (%)		0/0.00	- 11			
		Dest Average Inter Arrival Jitter (RTC	P)	0				
		Dest Average Jitter		0.54	~			

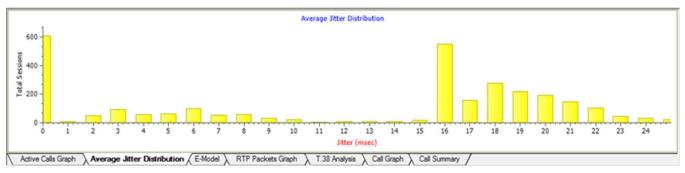
**Call Summary, Audio and Video Statistics** 

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

### **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.

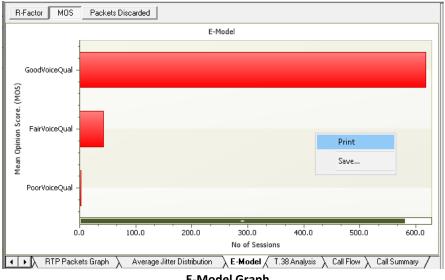




**Active Calls and Average Distribution Graphs** 

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 ٠
- 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

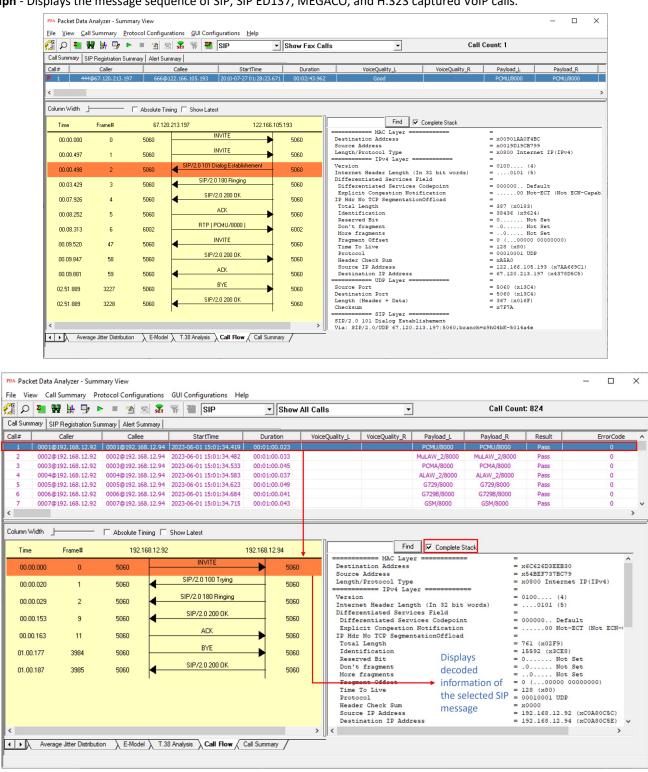




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## Packet Data Analysis (PDA) – Summary View (Contd.)

**T.38 Analysis** - Fax (T.38 data) over VoIP monitoring and decoding capability. **Call Graph** - Displays the message sequence of SIP, SIP ED137, MEGACO, and H.323 captured VoIP calls.



SIP, MEGACO, H.323, T.38, GSMA luCS, SCCP Call Graph

## Packet Data Analysis (PDA) – Detail View

### 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
- R factors/MOS is supported for audio codecs such as μ-Law, a-Law, G726 (40, 32, 24, 16 kbps), G726 (40, 32, 24, 16 kbps) with VAD, GSM610, G729, G729B, AMR, ILBC (20, 30 msec), SPEEX, EVRC, EVRCB, SMV, G711, G722, and G722.1 application.

### Packet Data Analysis (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.

1	2	9	🕨 🖩 👱	12	👬 🌾 📷	SIP			• St	ow All Session	s	-									
California y Registraton Summay Aet Summay Aet Summay																					
Packet #	Sequen	BTP	Payload Type	Paylo	Packet Segu	Gap(ms)	Ga	Delay	Jitter	^	Packet #	Sequen.	BTP	Payload Type	Paylo	Packet Sequ.	Gap(ms)	Ga	Delay	Jitter	
M 5	41763	4325	PCMU/8000	160	Session In Pr.	0.00	0.00	0	0.00		M 9	47038	3301	PCMU/8000	160	Session In Pr.	0.00	0.00	0	0.00	
6	41764	4325	PCMU/8000	160	Session In Pr	20.06	20.00	0	0.00		11	47039	3301	PCMU/8000	160	Session In Pr	18.81	20.00	-1	0.08	
7	41765	4325	PCMU/8000	160	In Sequence	19.53	20.00	0	0.03		13	47040	3301	PCMU/8000	160	In Sequence	20.50	20.00	0	0.10	
8	41766	4325	PCMU/8000	160	In Sequence	19.52	20.00	0	0.06		15	47041	3301	PCMU/8000	160	In Sequence	19.53	20.00	0	0.13	
10	41767	4325	PCMU/8000	160	In Sequence	21.50	20.00	1	0.14		17	47042	3301	PCMU/8000	160	In Sequence	21.49	20.00	1	0.21	
12	41768	4325	PCMU/8000	160	In Sequence	19.53	20.00	0	0.17		19	47043	3301	PCMU/8000	160	In Sequence	19.52	20.00	0	0.23	
14	41769	4325	PCMU/8000	160	In Sequence	19.53	20.00	0	0.19		21	47044	3301	PCMU/8000	160	In Sequence	19.59	20.00	0	0.24	
16	41770	4325	PCMU/8000	160	In Sequence	20.49	20.00	0	0.20		23	47045	3301	PCMU/8000	160	In Sequence	19.47	20.00	0	0.27	
18	41771	4325	PCMU/8000	160	In Sequence	19.57	20.00	0	0.22		25	47046	3301	PCMU/8000	160	In Sequence	20.51	20.00	0	0.28	
20	41772	4325	PCMU/8000	160	In Sequence	20.51	20.00	0	0.23		27	47047	3301	PCMU/8000	160	In Sequence	19.53	20.00	0	0.29	
22	41773	4325	PCMU/8000	160	In Sequence	19.52	20.00	0	0.25		29	47048	3301	PCMU/8000	160	In Sequence	20.55	20.00	0	0.31	
24	41774	4325	PCMU/8000	160	In Sequence	20.75	20.00		0.28		31	47049	3301	PCMU/8000	160	In Sequence	19.48	20.00		0.33	
26	41775	4325	PCMU/8000	160	In Sequence	19.31	20.00		0.31		33	47050	3301	PCMU/8000	160	In Sequence	20.51	20.00		0.34	
28	41776	4325	PCMU/8000	160	In Sequence	19.50	20.00	0	0.32	¥	35	47051	3301	PCMU/8000	160	In Sequence	19.53	20.00	0	0.35	
28			PCMU/8000	160	In Sequence	19.50	20.00	0			35		3301			In Sequence	19.53	20.00	0	0.35	
28 Heading			PCMU/8000	160 lue		19.50	20.00	0		×	35 Heading		3301	Va	ue	In Sequence	19.53	20.00	0	0.35	
28 Heading SSRC	41776		PCMU/8000	160	,	19.50	20.00	0			35	47051	3301	Val 33			19.53	20.00	0	0.35	
28 Heading SSRC Source IP A Destination	41776		PCMU/8000	160 lue	,	19.50	20.00	0			35 Heading SSRC Source IP Destination	47051 Address		Val 331 190 193	ue 30545537 2.168.1.10 2.168.1.20	13	19.53	20.00	0	0.35	
28 Heading SSRC Source IP A Destination Source Por	41776 Address IP Address		PCMU/8000 Va 333 19 19 10	160 lue 65468411 2.168.1.2 2.168.1.1 24	,	19.50	20.00	0			35 Heading SSRC Source IP Destination Source Po	47051 Address IP Address t		Val 333 190 130 130 130	ue 30545537 2.168.1.10 2.168.1.20 24	13	19.53	20.00	0	0.35	
28 Heading SSRC Source IP A Destination Source Por Destination	41776 Address IP Address Port		PCMU/8000 Va 33 19 19 19 10 10	160 lue 65468411 2.168.1.2 2.168.1.1 24 24	,	19.50	20.00	0			35 Heading SSRC Source IP Destination Source Po Destination	47051 Address IP Address t Port		Val 331 150 150 150 150 100	ue 30545537 2.168.1.10 2.168.1.20 24 24	13	19.53	20.00	0	0.35	
28 Heading SSRC Source IP A Destination Source Por Destination RTP Packe	41776 Iddress IP Address Port Its Count		PCMU/8000 Va 33 19 19 10 10 10	160 lue 65468411 2.168.1.2 2.168.1.1 24 24	,	19.50	20.00	0			35 Heading SSRC Source IP Destination Source Po Destination RTP Pack	47051 Address IP Address t Port ets Count		Val 333 190 130 130 130	ue 30545537 2.168.1.10 2.168.1.20 24 24	13	19.53	20.00	0	0.35	
28 Heading SSRC Source IP A Destination Source Port Destination RTP Packe RTCP Pack	41776 In Address Pot Its Count wets Count	4325	PCMU/8000 Va 33 19 19 19 10 10	160 lue 65468411 2.168.1.2 2.168.1.1 24 24	,	19.50	20.00	0			35 Heading SSRC Source IP Destination Source Po Destination RTP Pack RTCP Pac	47051 Address t Port ets Count kets Count		Val 331 150 150 150 150 100	ue 30545537 2.168.1.10 2.168.1.20 24 24	13	19.53	20.00	0	0.35	
28 Heading SSRC Source IP A Destination Source Por Destination RTP Packe RTCP Pack RTCP Packets W	41776 Address IP Address Port ets Count ets Count th Marker B	4325	PCMU/8000 Va 33 19 10 10 12 2 1	160 65468417 2.168.1.2 2.168.1.1 24 24 71	,	19.50	20.00	0			35 Heading SSRC Source IPJ Destination Source Po Destination RTCP Pack RTCP Packets W	47051 Address I IP Address t Port ets Count kets Count lith Marker E		Val 339 190 190 190 190 190 100 120 121 121 1	ue 30545537 2.168.1.10 2.168.1.20 24 24 28	13	19.53	20.00	0	0.35	
28 Heading SSRC Source Por Destination RTP Packe RTCP Pack RTCP Packets W Total Audio	41776 Address IP Address t Port ets Count th Marker B Bytes	4325 R	PCMU/8000 Va 33 19 10 10 12 2 1	160 lue 65468411 2.168.1.2 2.168.1.1 24 24	,	19.50	20.00	0			35 Heading SSRC Source IP Destination Source Po Destination RTP Pack RTCP Pac	47051 Address IP Address t Port ets Count kets Count ith Marker E Bytes	22	Val 331 150 150 150 150 100	ue 30545537 2.168.1.10 2.168.1.20 24 24 28	13	19.53	20.00	0	0.35	
28 Heading SSRC Source IP / Destination Source Por Destination RTCP Packe RTCP Packet RTCP Packet STCP Serot RTCP Serot RTCP Serot	41776 widdress IP Address t Port ts Count ts Count th Marker B Bytes Bytes be's Reports we's Report	4325 Ř s	PCMU/8000 Va 33 19 10 10 10 12 2 2 1 20 2 0	160 lue 55468417 2.168.1.2 2.168.1.1 24 24 71 3201	,	19.50	20.00	0			35 Heading SSRC Source IP, Destination Source Por Destination RTCP Pack RTCP Pack RTCP Sec	47051 Address IP Address IP Address It Port ets Count ith Marker E Bytes der's Report eiver's Report eiver's Report	3k S	Val 338 130 130 100 100 100 100 100 120 120 1 200 1 0	ue 30545537 2.168.1.10 2.168.1.20 24 24 28 28 2721	13	19.53	20.00	0	0.35	
28 Heading SSRC Source IP A Destination Source Por Destination STCP Packe RTCP Packe RTCP Packet STCP Rece Data Audio RTCP Sent RTCP Reco Dur UI Segu	41776 Widdress IP Address t Port Hs Count Hs Count Hs Marker B Bytes Jer's Report siver's Report siver's Report	4325 Ř s	PCMU/8000 Ve 333 19 19 10 10 10 10 2 2 1 2 2 0 0 10 2 0 0 10 2 0 0	160 65468413 2.168.1.2 2.168.1.1 24 71 3201 0.00	,	19.50	20.00	0			35 Heading SSRC Source IP / Destination RTP Pack RTCP Pac Packets W Total Audic RTCP Sen RTCP Rec Out 01 Sec	47051 Address IP Address I Pott ets Count kets Count th Marker E 9 Bytes der's Report eiver's Rep	3k S	Val 33 19 19 10 10 10 10 10 11 10 10 10 10 10 10 0 10 0 10	ue 30545537 2.168.1.10 2.168.1.20 24 38 38 3721 0.00	13	19.53	20.00	0	0.35	
28 Heading SSRC Source IP A Destination Source Por Destination RTCP Pack RTCP Pack RTCP Sent RTCP Sent RTCP Sent RTCP Sent Missing Pack	41776 kiddress IP Address Port ts Count sets Count th Marker B Bytes Jer's Report siver's Report siver's Report siver's Report	4325 Ř s	PCMU/8000 Va 33 39 19 10 10 10 12 2 2 2 2 2 0 0 0 0 0 0 0 0 0	160 65468411 2.168.1.2 2.168.1.1 24 24 71 3201 0.00 0.00	,	19.50	20.00	0			35 Heading SSRC Source IP, Destination Source Po Destination Source Po Destination RTCP Pack RTCP Pack RTCP Sec Out 01 Sec Missing Pack	47051 Address IP Address t Port els Count ith Marker E Bytes der's Report eiver's Rep uence Pact ckets \ %	iik s prits cets \ %	Val 331 133 133 100 100 100 122 121 1 1 200 1 1 0 0 0 \ \ 0 \ 0 \	ue 30545537 2.168.1.10 2.168.1.20 24 38 38 2721 0.00 0.00	13	19.53	20.00	0	0.35	
28 Heading SSRC Source IP A Destination Source Por Destination RTP Packets W Total Audio RTCP Seric RTCP Seric	41776 kiddress IP Address Port the Count the Marker B Bytes Jer's Reports vier's Report viers's Report viers	4325 Ř s	PCMU/8000 Va 33 39 19 10 10 10 12 2 2 2 2 2 0 0 0 0 0 0 0 0 0	160 65468413 2.168.1.2 2.168.1.1 24 71 3201 0.00	,	19.50	20.00	0			35 Heading SSRC Source IP / Destination RTP Pack RTCP Pac Packets W Total Audic RTCP Sen RTCP Rec Out 01 Sec	47051 Address IP Address t Port els Count ith Marker E Bytes der's Report eiver's Rep uence Pact ckets \ %	iik s prits cets \ %	Val 331 133 133 100 100 100 122 121 1 1 200 1 1 0 0 0 \ \ 0 \ 0 \	ue 30545537 2.168.1.10 2.168.1.20 24 38 38 3721 0.00	13	19.53	20.00	0	0.35	
28 Heading SSRC Source PA Destination Source Por Destination RTCP Pack RTCP Pack RTCP Pack RTCP Serx RTCP Serx RTCP Rec Out 01 Seg Missing Pac Duplicate F	41776 Address IP Address IP IP Address IP IP I	4325 k s uts .ets \ %	PCMU/8000 va 33 19 19 19 19 19 19 10 10 10 10 12 2 2 0 0 0 1 2 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	160 lue 55468417 2.168.1.1 24 24 24 3201 0.00 0.00 0.00	,	19.50	20.00	0			35 Heading SSRC Source IP J Destination Source Poo Destination RTP Pack RTCP Pac Poolcets W Total Audi RTCP Sen RTCP Rec Out OI Sec Missing Pa Duplicate F	47051 Address IP Address Port ets Count kets Count thit Market 9 Bytes der's Report eiver's Report eiver's Report ckets \ % Packets \ %	Sik Se Sonts Sets \ %	Val 300 130 130 100 100 102 122 12 1 1 1 200 10 0 0 \ 0 \ 0 \ 0 \ 0 \	ue 00545537 2.168.1.10 24 24 28 2721 0.00 0.00 0.00	13	19.53	20.00	0	0.35	
28 Heading SSRC Source Por Destination Source Por Destination RTCP Packe RTCP Packets W Total Audio RTCP Sec Out 01 Seq Missing Pac Duplicate P M05-CQ \	41776 Address IP Address IP Address Its Count ets Count	4325 k s uts .ets \ %	РСМU/8000 Va 33 19 19 10 10 12 2 2 0 1 20 0 1 2 0 1 4 4 4 4	160 65468411 2.168.1.2 2.168.1.1 24 24 71 3201 0.00 0.00	,	19.50	20.00	0			35 Heading SSRC Source IP J Destination Source Poo Destination RTP Pack RTCP Pac Poolcets W Total Audi RTCP Sen RTCP Rec Out OI Sec Missing Pa Duplicate F	47051 Address I Pot ets Count kets Count kets Count ith Marker Fo Bytes dar's Repource Pact dar's Repource Pact ckets \% Packets \% Corversatio	Sik Se Sonts Sets \ %	Val 333 193 100 100 120 11 1 1 200 100 100 100 100	ue 30545537 2.168.1.10 2.168.1.20 24 38 38 2721 0.00 0.00	13	19.53	20.00	0	0.35	
	41776 Address IP Address IP Address Its Count ets Count	4325 k s uts .ets \ %	РСМU/8000 33 19 19 19 19 19 19 19 10 10 10 10 2 2 2 0 0 0 0 0 0 0 0 0 0 0	160 55468417 2.168.1.2 2.168.1.1 24 71 3201 0.00 0.0	,	19.50	20.00	0			35 Heading SSRC Source IP, Destination RTP Pack RTCP Pac Packets W Total Audit RTCP Rec Out 01 Sec Missing Packets W Missing Packets W	47051 Address I Pot ets Count kets Count kets Count ith Marker Fo Bytes dar's Repource Pact dar's Repource Pact ckets \% Packets \% Corversatio	Sik Se Sonts Sets \ %	Val 333 133 133 100 100 100 1120 1120 1120	ue 10545537 2.168.1.20 24 24 27 27 27 21 0.00	13	19.53	20.00	0	0.35	

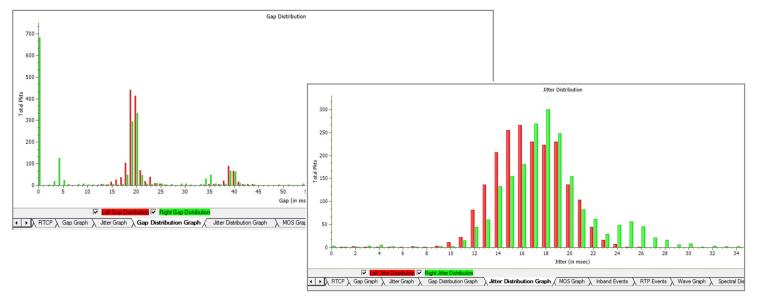
Graphs in PDA – Detail View

Traffic Analyzer 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



Gap/Jitter Distribution Graph

#### Document Number: PKV100-01

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

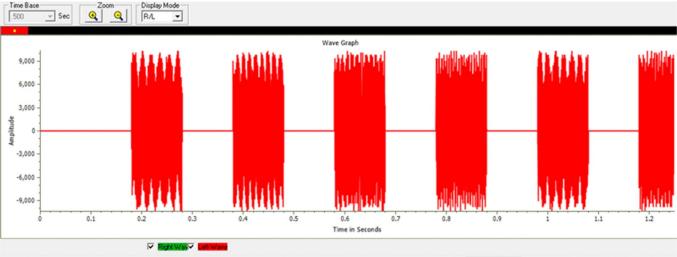
### **Graphs in PDA – Detail View**

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

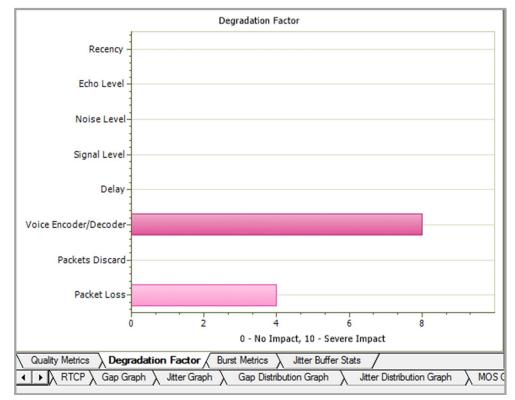
Wave graph – Displays the amplitude of the incoming signal in a selected call as a function of time.

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

**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.



▲ JRTCP \Lambda Graph \Lambda Jitter Graph \Lambda Graph Lambda Graph \Lambda Jitter Distribution Graph \Lambda Jitter Distribution Graph \Lambda MOS Graph \Lambda Sectral Display \Lambda R-Factor Statistics /



Wave Graph and Degradation Factors

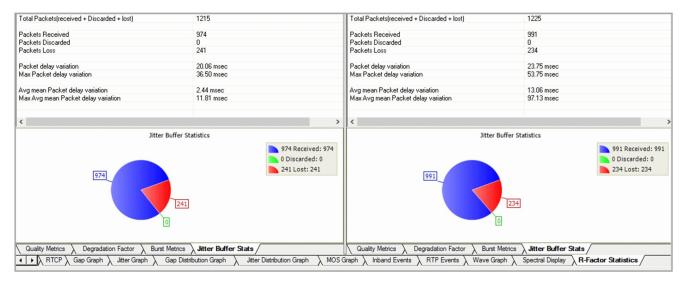
## Packet Data Analysis (PDA) – Detail View (Contd.)

### **R-Factor Statistics**

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.

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.



#### **Jitter Buffer Statistics**

### **Other Features in PDA**

#### Play Audio and Write to File

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.

Play - Jitter Options	×	Write To File - Jitter Options	×
Corrected     C As Is     Extract      Mix Option     Mix     Stereo     Separate	Jitter Buffer Option C Static  Dynamic Jitter Buffer Len 100 msec Dynamic Jitter Buffer Option Min Delay 40 msec Max Delay 100 msec Fill with Last Packet Set Default Select other Sessions for Playback OK Cancel	C Extract Dynamic Jitter Buffer Option Mix Option Mix Mix S Stereo Dynamic Jitter Buffer Option Min Delay 40 Max Delay 100	msec msec efault
	Play Audio	OK Cancel	

Write To File

## Other Features in PDA (Contd.)

#### 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 or \*.PCAPNG file format. Call Summary details could also be saved for a particular call 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.

🗤 Save Call	×
Call(s)	Selected Call(s)
CallNum_2 CallNum_3	CallNum_1
C HDL File 💿 PCAP File C PCAPN	G Call Summary
Path D:\Program Files\GL Communicatio	ns Inc\PacketScan\Examples\Othe
Overwrite Files     Save Call(s)	Exit

Save Call

### **RTP/RTCP Statistics, Inband Events, Outband 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, and more.

Inband Events display Inband DTMF and MF digits as they are received with details such as Timestamp, Type, Event, On-Time, Power, and Frequency. Outband Events display RTP events as per RFC 2833 or 4733 with details such as Timestamp, Event, Power, and Duration.

### **Triggers and Action Settings**

Triggers and Action Settings allow the user to filter calls based on certain SIP, RTP, MEGACO, H.323, GSMA, and IuCS parameters followed by a set of actions for the completed calls.

The filtered file can be saved in either GL's proprietary HDL file, Ethereal PCAP, or PCAPNG file format. It extracts fax image for the selected fax calls.

Additionally, a summary of call signaling and audio parameters can be saved as \*.rtf file, or generate Call Detail Records in CSV file format along with voice files for each direction. The CSV files can be used for further analysis and retrieval of **calls of interest**.

rigger List	Filter Selection
Trigger1	Calling Party Called Party Called Party Called Party Faied Calls Sig Error Code Call Duration (mins) Session Request Delay (msecs) Session Disconnect Delay (msecs)
Enter Trigger Name Trigger1 Add Delete	Conditions
ttion 2 Save Call 2 Audo Recording User Defined 3 Send e-mail 3 Alert Summary 2 Call Detail Record 2 Extract Fax Image	Save Call To File Options File Name Mask [%_2Y_3M_%D_%h-%m-%s Files Destination Directory [C-VProgram Files/GL Communications [C-VProgram Files/GL Communications Ceate File Options - If File Exists © Overwrite C Skip Operation C Append Sequence Number

**Trigger and Action Settings** 



## Other Features in PDA (Contd.)

### **Alert Summary**

PacketScan<sup>™</sup> 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.

<u>File V</u>	iew <u>H</u> elp							
	ummary [ R	egistraton Summary Alert Sumr	naul					
Call#		Message	Type	Threshold	Value	Caller	Callee	Calld
-	SIP			2.00-4.00	3.57	0005@192.168.1.236	0005@192.168.1.234	GLPG143457205760
1		mos value between 3 to 4	Warning					
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	GLPG143777205778
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

**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, registration request delay (RRD), and Re-registration Attempts
- Provides graphical view of the active registrations and registration trace of each registration

	🙀 🛄	Show All	Registrations	<ul> <li>Call Count: 1</li> </ul>	4153							
all Summ	nary SIP Re	egistration S	ummary Alert Summary									
all#	Method		RegisterRequestTime	UserAgent	Registrar	Result	Status	ErrorCode	CallD	RegisteredTime	Requests	Resp
	DeRegiste		2023-10-04 23:47:3	4056501944	stas-att1-007-cts2.k	Passed	De-Registered	0	gr2oY4t8BTpYWXR		2	2
	DeRegiste	er	2023-10-04 23:47:3	310280110542293	one.att.net	Passed	De-Registered	0	yi2UiCH4n9lYLm3z		2	2
	Register		2023-10-04 23:47:3	310410342947386	scsf-att1.imsgroup0	Failed	Failed	480	9ganngCPYvp3lloT		1	1
	Register		2023-10-04 23:47:3	310150750381449	smile.cricketwireless	Passed	Registered	0	vUbJ40_j75zA94Zs	2023-10-04 23:47:3	2	2
	Register		2023-10-04 23:47:3	310280068104377	one.att.net	Passed	Registered	0	9f7d5e775c645ad4	2023-10-04 23:47:3	2	2
	Register		2023-10-04 23:47:3	310280068991809	one.att.net	Failed	TimeOut	0	1735520760_28600		2	2
)	Register		2023-10-04 23:47:3	310170866282501	scsf-att1.imsgroup0	Passed Epilod	Registered TimeQut	0	1794145595_11689 Cam90.bl 950.m.Zo	2023-10-04 23:47:3	2	2
				REGISTER			SIP La					^
00:00	:00.000	460	5060	REGISTER	5060	RI	GISTER sip:smile	.cricketwire	less.net SIP/2.0	branch=g9bC4bV409	-824096-71	^
			5060	REGISTER	5060	RI V:	GISTER sip:smile .a: SIP/2.0/UDP (	.cricketwire 2001:1890:fc	less.net SIP/2.0 :1176::1:1]:5060;1			
	:00.000	460 467	5060	REGISTER	5060	RI V: V:	GISTER sip:smile .a: SIP/2.0/UDP   .a: SIP/2.0/UDP ]	.cricketwire 2001:1890:fc 27.0.0.1;bra	less.net SIP/2.0	1491448011-140006	886143404;	lss
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00:00:			5060	REGISTER	5060	R3 V: V: Ma R6	CGISTER sip:smile .a: SIP/2.0/UDP   .a: SIP/2.0/UDP 1 .a: SIP/2.0/TCP   ax-Forwards: 69 equire: Path	.cricketwire 2001:1890:fc 27.0.0.1;bra 2600:381:a76	<pre>less.net SIP/2.0 :1176::1:1]:5060; nch=z9hG4bK_0001_ 8:7b1b:0:10:28a3:</pre>	1491448011-140006 9c01]:8100;receiv	886143404;: ed=2600:38:	lss l:a
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00:00: 00:00:	:00.000	467	5060		5060	RI V3 V3 V4 Re C(	CGISTER sip:smile La: SIP/2.0/UDP   La: SIP/2.0/UDP 1 La: SIP/2.0/UDP 1 La: SIP/2.0/TCP   MX-Forwards: 69 sequire: Path wntact: <sip:3101 50: <sip:310150750< td=""><td>.cricketwire 2001:1890:fc 27.0.0.1;bra 2600:381:a76 50750381449@ 381449@smile</td><td><pre>less.net SIP/2.0 :1176::1:1]:5060;h nch=z9hG4bK_0001_1 8:7blb:0:10:20a3: [2600:381:a768:7bl .cricketwireless.netwireles.netwireles.netwireles.netwireles.netwireles.netwireles.netwireless.netwireless.netwireless.netwireless.netwireless.netwireless.netwireless.netwireles.netwireles.netwireles.netwireles.netwireles.netwireles.netwireles.netwireless.netwirele</pre></td><td>1491448011-140006 9c01]:8100;receiv 1b:0:10:28a3:9c01 net&gt;</td><td>886143404;: ed=2600:38: ]:8100&gt;;+s:</td><td>lss l:a</td></sip:310150750<></sip:3101 	.cricketwire 2001:1890:fc 27.0.0.1;bra 2600:381:a76 50750381449@ 381449@smile	<pre>less.net SIP/2.0 :1176::1:1]:5060;h nch=z9hG4bK_0001_1 8:7blb:0:10:20a3: [2600:381:a768:7bl .cricketwireless.netwireles.netwireles.netwireles.netwireles.netwireles.netwireles.netwireless.netwireless.netwireless.netwireless.netwireless.netwireless.netwireless.netwireles.netwireles.netwireles.netwireles.netwireles.netwireles.netwireles.netwireless.netwirele</pre>	1491448011-140006 9c01]:8100;receiv 1b:0:10:28a3:9c01 net>	886143404;: ed=2600:38: ]:8100>;+s:	lss l:a
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#### **Registration Summary**

## **Filtered Calls using Filter Expressions**

The PacketScan<sup>™</sup> analyzer offers the option to filter call detail records based on parameters such as caller, time, and message count. The expression supports the following mathematical operators: ==, <=, >=, !=, <, >, &&, ||. For example, the filter expression "'ErrorCode==400||ErrorCode>600" will display calls with ErrorCode equal to 400 and calls with ErrorCode greater than 600 as shown in the below screenshot.

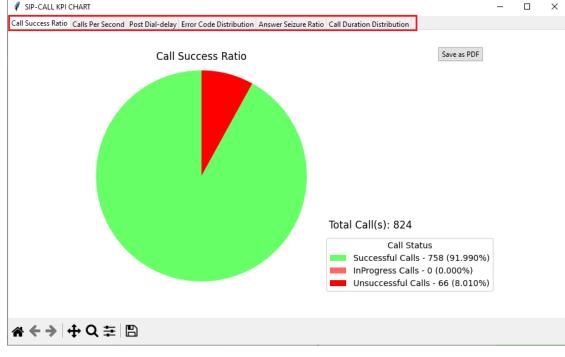
PDA Packet Data	Analyzer - Sur	nmary View				– 🗆 🗙		
File View Ca	II Summary	Protocol Config	urations GUI Configurations Help					
🚝 🔎 🏭 🖞	H   🗗   🕨	· • • •	🖺 🚮 🍿 📲 SIP 💽 Show Filtered Ca	lls 🔹	Ca	all Count: 6		
ErrorCode==400	ErrorCode>600					X 🔿		
Call Summary SIP Registration Summary Alert Summary								
Payload_R		FailureCause	CallID	EndTime	PostDialDelay	SessionDisconnectDe		
				EndTime 2023-06-01 15:02:12.275	PostDialDelay 9	SessionDisconnectDe		
	ErrorCode		CallID			SessionDisconnectDe 0 0		
	ErrorCode 400	FailureCause 5	CalID GL-MAPS-2654-766727097-26124-3688@192.168.12.92	2023-06-01 15:02:12.275	9	SessionDisconnectDe 0 0 0		
	ErrorCode 400 603	FailureCause 5 4	CalID GL-MAPS-2654-766727097-26124-3688@192.168.12.92 GL-MAPS-2679-766728649-26314-14696@192.168.12.92	2023-06-01 15:02:12.275 2023-06-01 15:02:13.828	9	SessionDisconnectDe 0 0 0 0		
	ErrorCode 400 603 604	FailureCause 5 4 4	CalID GL-MAPS-2654-766727097-26124-3688@192.168.12.92 GL-MAPS-2679-766728649-26314-14696@192.168.12.92 GL-MAPS-2677-766728698-26320-13540@192.168.12.92	2023-06-01 15:02: 12.275 2023-06-01 15:02: 13.828 2023-06-01 15:02: 13.879	9 9 19	SessionDisconnectDe 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		

#### **Displaying Filtered Calls using Expressions**

## **KPI Report for SIP Calls**

The SIP Call Summary KPI Report includes KPIs for the following:

- Call Success Ratio: Displays graph for "Successful" and "Unsuccessful Calls", including counts and percentages (%)
- Calls Per Second: Shows graph "Total", "Passed", and "Failed Calls per second."
- Post Dial Delay: Shows delay counts in milliseconds (0-250ms, 251-500ms, etc.)
- Error Code Distribution: Lists Top 10 Call Failure Causes with counts and percentages (%)
- Answer Seizure Ratio: Shows "Answered" and "Unanswered Calls", with counts and percentages (%)
- Call Duration Distribution: Provides call counts for different durations (0-1 sec, 1-10 sec, etc.)

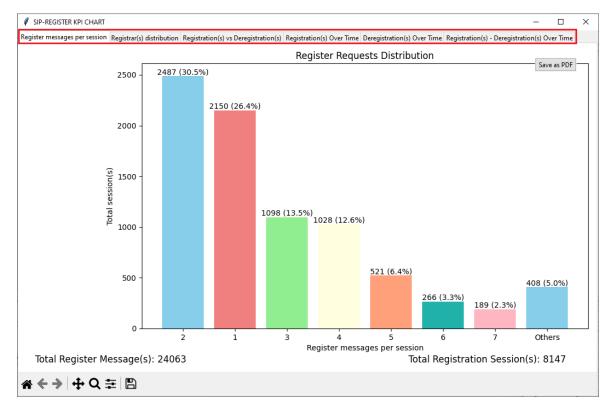


#### SIP-Call KPI Chart

## **KPI Report for SIP Registration**

The SIP Registration Summary KPI Report includes KPIs for the following:

- Register Messages per Session: Shows a graph for the distribution of Register Requests
- Registrar(s) Distribution: Displays a graph for the number of Registration sessions per Registrar
- Registration(s) vs Deregistration(s): Illustrates a graph comparing the distribution of Register and Deregister counts with percentages (%)
- Registration(s) Over Time: Show the graphs for "Successful", "Failed", and "Total Attempts" per second
- Deregistration(s) Over Time: Displays a graph for "Successful" and "Total Attempts" per second
- Registration(s) Deregistration(s) Over Time: Shows a graph for overall "Register & Deregister attempts", "Register & Deregister passed", and "Register & Deregister failed" attempts per second Register messages per session



**SIP-Registration KPI Chart** 



# Supported Protocol Standards

The supported protocol standards in PacketScan<sup>™</sup> are 5G N1N2, N4, N8, N12, N13, SIP-3261, MSRP, MEGACO 3525, MEGACO 3015, H.323, SS7 SIGTRAN, ISDN-SIGTRAN, GSMA over IP, GPRS over IP, UMTS over IP, and LTE.

	Supported Protocols		Supported Protocols
	МАС		N1N2, N4
	IP / TCP / UDP	5G	N8, N10, N11, N12, N13
	ICMP	SS7 SIGTRAN	ISUP ITU
	SIP, SIP Extensions		ISUP ETSI
	MSRP		ISUP ANSI
	RTSP		Q.931
	RTCP	ISDN-SIGTRAN	DASS2
	RTP		DPNSS
	MEGACO		BSSAP+
	MGCP	GSMA over IP	BSSAP-LE (BSSMAP-LE/DTAP-LE)
	H245		CC, MM, RR
	RAS		SMG
	ISDN H225	GPRS over IP	SNDCP
SIP, MSRP,	STUN		RANAP
MEGACO, MGCP,	DNS	UMTS over IP	RNSAP
RTP	ОНСР		S1AP
	SMTP	LTE	X2AP
	РОРЗ		S6a, S6d, S13
	НТТР		Rx
	FTP		Cx/Dx
	SNMP		Gx
	T38	Diameter	Zn/Zh
	RFC 2833		
	H263		Wx
	STP		Gx
	IPv6		Gy
	РРРОЕ		Gq
	ISUP ITU		Sh/Dh
	Skinny		Rf/RO
			Wg/Wm/Wa/Wd/Pr

For more information, refer to <u>Protocol Supported in PacketScan</u><sup>™</sup> webpage



# **Buyer's Guide**

Item No	Product Description
<u>PKV100</u>	PacketScan™ (Real-time and Offline)
<u>PKV101</u>	PacketScan™ - Offline
Item No	Related Software
PCD103	AMR Narrowband Codec for PacketScan™
<u>PCD107</u>	Optional Codec – AMR Wideband
<u>PCD104</u>	EVRC Codec for PacketScan™
PCD105	EVRC-B Codec for PacketScan™
PCD106	EVRC-C Codec for PacketScan™
For more info	ormation on Codecs refer to <u>Voice Codecs</u>
<u>PKV400</u>	TCP Analytics
<u>PKV105</u>	SIGTRAN Analysis
<u>PKV103</u>	IP Based GSM and UMTS Analysis
<u>PKV110</u>	IMS Protocol Decodes (Optional with PacketScan™)
<u>PKV107</u>	LTE (Long Term Evolution) Analyzer (Optional with PacketScan™)
<u>PKV112</u>	5G Analyzer (Optional with PacketScan™)
<u>PKV113</u>	Offline 5G Analyzer (Optional with PacketScan™ and NetSurveyorWeb™)
<u>PKV104</u>	FaxScan™ – Decodes T.38 Fax images in TIFF format from captured PCAP files
<u>PKV170</u>	NetSurveyorWeb™
<u>PKV171</u>	Network Surveillance Agent Toolkit
<u>PKV172</u>	Network Surveillance for GSM – GPRS Systems
<u>PKV169</u>	NetSurveyorWeb™ Lite

# GL Communications Inc.

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

# Buyer's Guide (*Contd*.)

Item No	Related Software
<u>PKS118</u>	MAPS™ ED137 Radio (Includes PKS102 and PKS107)
<u>PKS119</u>	MAPS™ ED137 Telephone (Includes PKS102)
<u>PKS117</u>	MAPS™ ED137 Recorder (Includes PKS102)
<u>PKS107</u>	RTP EUROCAE ED137
<u>PKV169</u>	NetSurveyorWeb™ Lite
ltem No	Related Hardware
<u>PKV120</u>	PacketScan™ HD – High Density IP Traffic Analyzer w/ 4x1GigE - includes PKV100 – Online (not Offline) for tempo- rary audio codec support
<u>PKV122</u>	PacketScan™ HD – High Density IP Traffic Analyzer w/ 2x10GigE - includes PKV100 – Online (not Offline) for tem- porary audio codec support
<u>PKV123</u>	FastRecorder™ and PacketExtractor™ (Optional with PacketScan™ HD)
PKV301	LAN Switch w/ Mirror Port

<u>Note</u>: PCs which include GL hardware/software require Intel or AMD processors for compliance.

For more information, refer to <u>PacketScan<sup>™</sup> - Analyzer</u> webpage.



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