
All-IP Signaling and Traffic Analysis

RTP/RTCP/Fax (T.38) Analysis

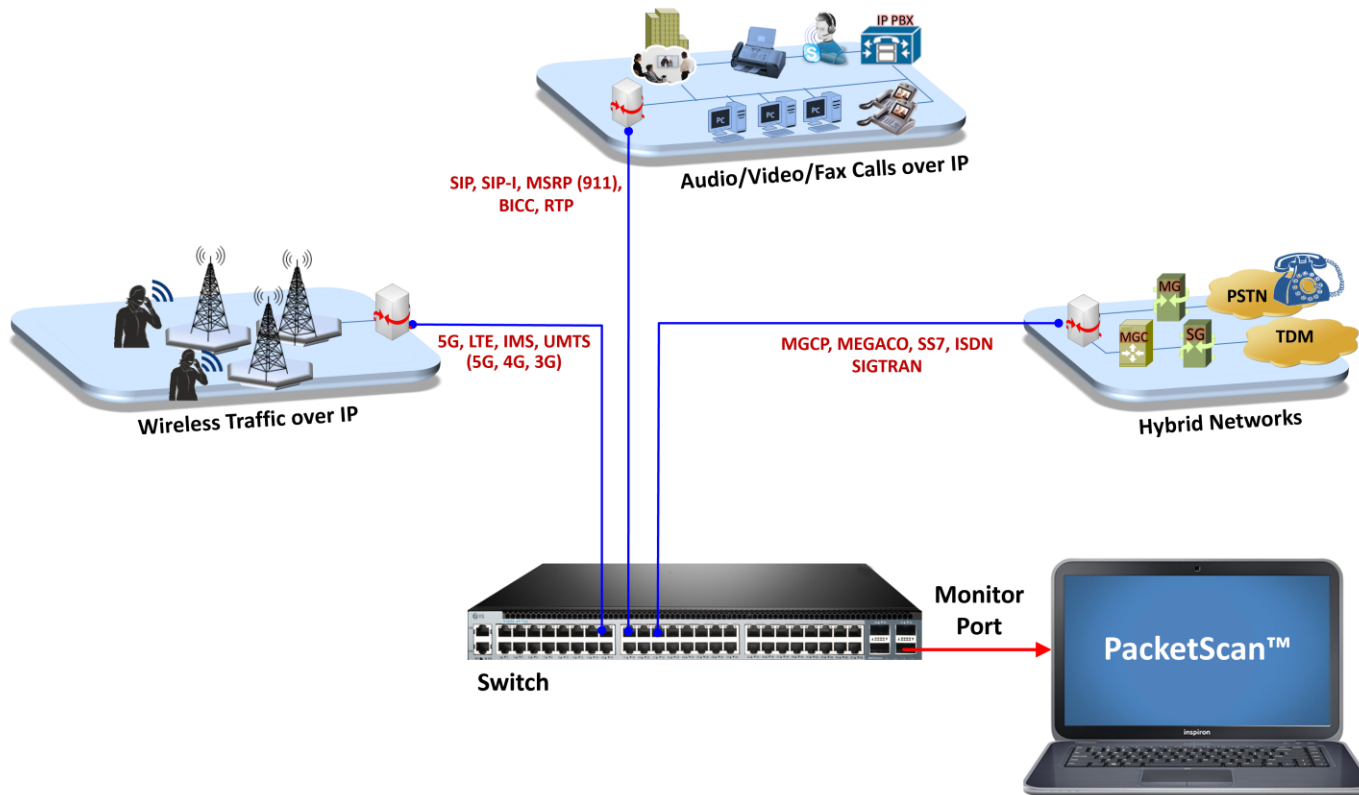
April 8, 2026



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PacketScan™ All-IP Signaling and Traffic Analysis

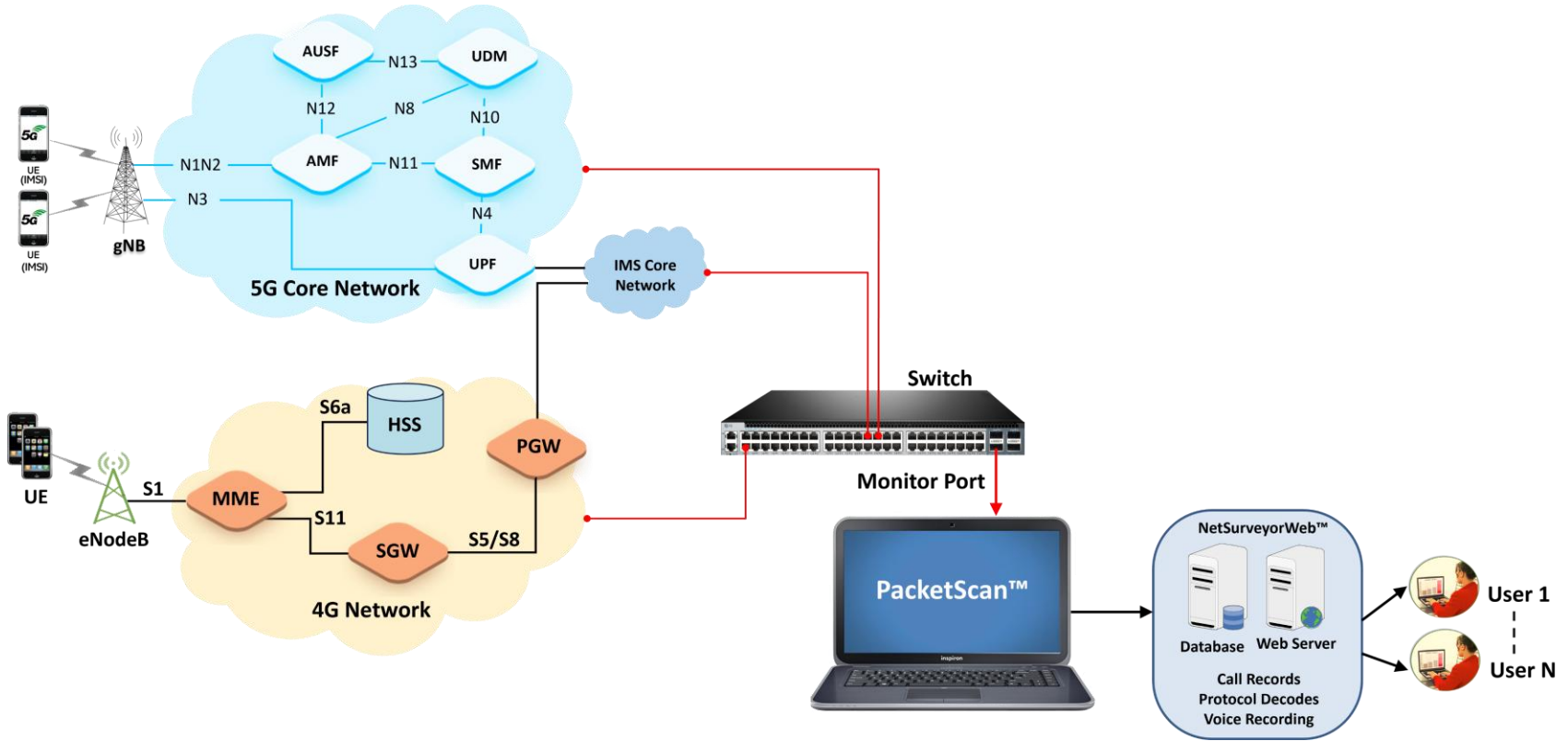
(5G/4G/3G/2G/VoIP/RTP, RTCP/ Video Analysis)



What the Software does?

- Non-Intrusively capture real time IP traffic across high speed
- Captures, segregates, and monitors packets; perform voice quality testing in real-time over VoIP network
- Wirespeed hardware filtering capability to capture packets of interest
- Non-intrusively capture real-time signaling and traffic packets for infinite time and provide call details of per call and aggregated protocol statistics
- Supports monitoring of 5G networks. It captures, segregates, monitors and collects statistics on all calls over N1N2, N4, N8, N10, N11, N12 and N13 interfaces of the 5G network
- Capable of continuous monitoring of communication over IMS network over SIP, S6a, S6d, S13, Cx/Dx, Gx, Rx, Sh, Gy/Ro interfaces
- Monitors and segregates S1AP, NAS, Diameter and eGTP interfaces, deciphers NAS and decrypts Voice over Long-Term Evolution (VoLTE) calls over Internet Secured Protocol Security (IPSEC)
- Can be deployed as a Probe for a centralized monitoring system with Oracle database

5G and LTE Protocol Analysis



Applications

- **Real-time VoIP Traffic Analysis** –
 - Analyze 5G Calls
 - View RTP, SIP, MSRP, H.323, and MEGACO Calls
 - Trigger on Called and / or Calling Party, Packet Impairments
 - Save .HDL (GL's proprietary format) or .PCAP (Ethereal format) or *.PCAPNG file format
 - Save .WAV – time stamped file names
 - Save CDRs
 - MOS R-factor – view quality as the call proceeds
 - Traffic limited only by hard drive capacity
 - T.38 Fax packets decoding
- **Network Monitoring Solutions** –
 - Multiple probes can be used for network monitoring
 - CDRs can be exported in a text format to a flat file or a remote computer
- **Network Monitoring Solutions (Contd.)** –
 - CDRs can also be exported to an Oracle data base
 - Results can be accessed remotely using NetSurveyorWeb™, a simple web browser-based application
- Air Traffic Monitoring Solution
- Gateway Delay Measurement along with our TDM Protocol Analyzer

Main Features

| | |
|--|---|
| <u>Comprehensive Analysis Tool</u> | <ul style="list-style-type: none">• Capture calls in real-time for infinite time non-intrusively• Detail Signaling, Audio, Video QoS statistics• Call flow graph and Pictorial representation of the statistics• Inband/Outband Detection, Wave graph, Audio play back, Audio/Video recording• Ability to export Call Data Records of completed calls in CSV file format• Complex Filtering and Search capabilities• 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• Decode support for multi-layer tunneled traffic - GTP, GRE, VXLAN• Support export frame summary for tunneled traffic |
| <u>QOS Parameters and Performance Metrics</u> | <ul style="list-style-type: none">• E-model (G.107) based MOS/R-Factor scores• Media Delivery Index (MDI) for video calls• Provides monitoring and QoS metrics such as delay, jitter, and MDI derived from RTP streams carrying video payloads• Minimum, maximum, and average Round Trip Delay (RTD)• Reports Inband (DTMF & MF) events, Outband events as per RFC 2833 or RFC 4733 events, RTP/RTCP packet count per direction |
| <u>Triggers and Actions</u> | <ul style="list-style-type: none">• Captures calls based on filter criteria and performs set of actions for the completed calls such as recording, sending email, extraction of voice or fax traffic file |

Main Features (Contd.)

| | |
|--|---|
| <u>SIP Registration Details</u> | <ul style="list-style-type: none">• Registration statistics and trace messages depicted graphically |
| <u>As a Probe with Central Monitoring System – NetSurveyorWeb™</u> | <ul style="list-style-type: none">• PacketScan™ can send summary fields, frame octets, status, call detail records, along with traffic summary of captured calls to a central database• NetSurveyorWeb™ displays the data from the database in a simple web-based browser. It features rich graphics, ladder diagrams, CDRs (Call Data Records), custom report and filter configurations |
| <u>Single Point Analysis System</u> | <ul style="list-style-type: none">• Enhanced to work with GL's Voice Band Analyzer and Call Data Records applications to provide useful call detail records for further analysis using built-in tool in Excel®. |
| Utilities | <ul style="list-style-type: none">• 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® Addins to import CDRs into Excel® to analyze using Pivot Table, and Pivot Charts |

Supported Protocols

- Session Initiation Protocol (SIP) - RFC 3261
- Media Gateway Control Protocol (MGCP) - RFC 2705/3435 (3991)
- Media Gateway Control (MEGACO) - RFC 3525 and 3015
- Message Session Relay Protocol (MSRP)
- RTP/RTCP
- SCTP - RFC 2960
- Connection Oriented Transport Protocol (COTP, ISO 8073)
- 5G – N1N2, N4, N8, N10, N11, N12 and N13
- SCCP (Skinny)
- SS7 SIGTRAN
- ISDN-SIGTRAN
- GSM A over IP
- GPRS over IP
- UMTS over IP
- LTE
- Diameter

Supported Codecs

- G.711 (mu-Law and A-Law), G.711 Application II (A-law and μ -law with VAD)
- G726 (40, 32, 24, 16kbps)
- GSM (13.2kbps), GSM EFR (12.2 kbit/s), GSM HR
- G729, G729B (8kbps)
- G.722, G.722.1
- ILBC_15_2 (for 20 msec), ILBC_13_33 (for 30 msec)
- SPEEX (Narrow band and Wideband)
- SMV* (Modes - 0, 1, 2 and 3)
- Other optional codec include (must be purchased with additional license)
 - AMR (Narrow band and Wideband)
 - EVRC, EVRC0 (Rates - 1/8, 1/2 and 1)
 - EVRCB, EVRCB0 (Rates - 1/8, 1/2 and 1); EVRC-C
 - Opus and EVS (Narrow Band, Wideband, Super Wideband, Full Band)

PacketScan™ Analyzer View

The screenshot displays the PacketScan 64-bit [off-line] interface with four main panes:

- Summary View:** A table listing network traffic. The first few rows are:

| Device | Frame# | TIME (Relative) | Length (Bytes) | Error | Length/Protocol Type MAC | Packet Type MAC | Source IP Address IPv4 | Destination IP Address IPv4 |
|--------|--------|--------------------|----------------|-------|--------------------------|-----------------|------------------------|-----------------------------|
| ✓ | 2 | 00:00:08:505065000 | 214 | | Internet IPI(IPv4) | RTP | 192.168.1.103 | 192.168.1.200 |
| ✓ | 179 | 00:00:08:512592000 | 214 | | Internet IPI(IPv4) | RTP | 192.168.1.200 | 192.168.1.103 |
| ✓ | 180 | 00:00:08:525697000 | 214 | | Internet IPI(IPv4) | RTP | 192.168.1.103 | 192.168.1.200 |
| ✓ | 181 | 00:00:08:534167000 | 214 | | Internet IPI(IPv4) | RTP | 192.168.1.200 | 192.168.1.103 |
| ✓ | 182 | 00:00:08:545392000 | 214 | | Internet IPI(IPv4) | RTP | 192.168.1.103 | 192.168.1.200 |
| ✓ | 183 | 00:00:08:547365000 | 92 | | Internet IPI(IPv4) | | 192.168.1.75 | 192.168.1.295 |
| ✓ | 184 | 00:00:08:553866000 | 214 | | Internet IPI(IPv4) | RTP | 192.168.1.200 | 192.168.1.103 |
- Detail View:** Shows Ethernet Frame Data for Device2 Frame#178. Fields include:
 - 0000 Destination Address = x001676122661
 - 0006 Source Address = x0011116AF6D7
 - 000C Length/Protocol Type = x0800 Internet IP(IPv4)
 - 000E Version = 0100... (4)
 - 000E Internet Header Length (In 32 bit words) = ... 0101 (5)
 - 000F Differentiated Services Codepoint = 000000.. Default
- Hex Dump View:** Displays the raw hex data of the frame, with ASCII characters on the right side.
- CDR View:** A table showing Call Detail Records:

| Call ID | Call Status | Protocol | Call Originating (Number / Address) | Call Destination (Number / Address) | Call Start Date & Time | Call Duration |
|---------|-------------|----------|-------------------------------------|-------------------------------------|---------------------------------|-----------------|
| 0 | Terminated | SIP | 0001@192.168.1.200 | 0001@192.168.1.103 | 55456-22607-00 00:00:00.542700 | 00:50:13.479600 |
| 1 | Completed | MEGACO | ain2 | rpr30000 | 55456-22607-00 40000.9107.49... | 00:29:13.080600 |
| 2 | Terminated | SIP | 4000@192.168.1.60 | 1000@192.168.1.60 | 55456-22607-00 02:00:00.724200 | 04:32:05.191900 |
| 3 | Terminated | SIP | test4@192.168.10.45 | test3@192.168.10.14 | 55456-22607-00 03:00:00.529200 | 00:47:15.034300 |

Summary View

Detail View

Hex Dump View

CDR View

- Default panes - summary, detail, and hex dump of the frame data views
- Optional panes – statistics and call trace views

Layer Copy/Show/Hide Options

- Provides option to copy the entire layer decode information to the clipboard

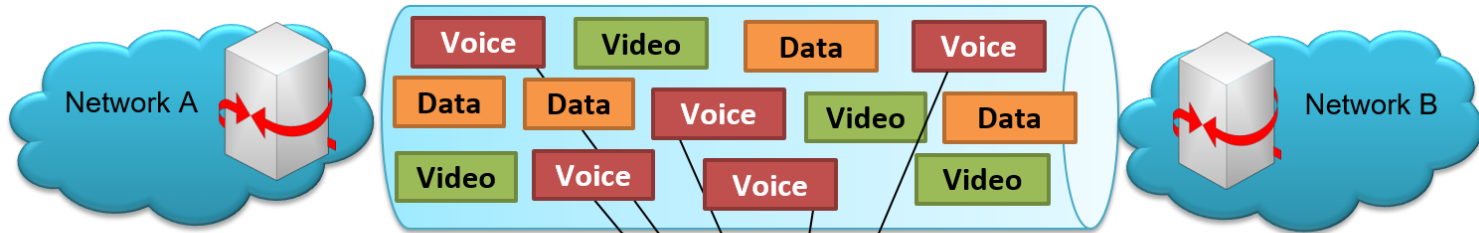
The screenshot displays the PacketScan 64-bit interface. The top section shows a table of captured packets. The bottom section shows a detailed view of an Ethernet frame (Device2 Frame=0) with a context menu open over the IPv4 layer. The context menu has two options: "Copy view to clipboard" and "Layer show/hide". A red arrow points from the "Copy view to clipboard" option to the right.

| Device | Frame# | TIME (Relative) | Length (Bytes) | Error | Length/Protocol Type | MAC | Packet Type | Source IP Address | Destination IP |
|--------|--------|--------------------|----------------|-------|----------------------|-----|-------------|-------------------|-----------------|
| ✓ 2 | 0 | 00:00:00.00000000 | 82 | | Internet IPI(IPv4) | | | 192.168.1.70 | 192.168.1.255 |
| ✓ 2 | 1 | 00:00:01.841976000 | 82 | | Internet IPI(IPv4) | | | 192.168.1.142 | 255.255.255.255 |
| ✓ 2 | 2 | 00:00:02.347154000 | 836 | | Internet IPI(IPv4) | | SIP | 192.168.1.200 | 192.168.1.103 |
| ✓ 2 | 3 | 00:00:02.347730000 | 354 | | Internet IPI(IPv4) | | SIP | 192.168.1.103 | 192.168.1.200 |
| ✓ 2 | 4 | 00:00:02.349375000 | 355 | | Internet IPI(IPv4) | | SIP | 192.168.1.103 | 192.168.1.200 |
| ✓ 2 | 5 | 00:00:02.349532000 | 820 | | Internet IPI(IPv4) | | SIP | 192.168.1.103 | 192.168.1.200 |
| ✓ 2 | 6 | 00:00:04.467457000 | 92 | | Internet IPI(IPv4) | | | | |
| ✓ 2 | 7 | 00:00:05.748389000 | 64 | | Internet IPI(IPv4) | | | | |
| ✓ 2 | 8 | 00:00:05.830627000 | 64 | | Internet IPI(IPv4) | | | | |
| ✓ 2 | 9 | 00:00:05.847465000 | 82 | | Internet IPI(IPv4) | | | | |
| ✓ 2 | 10 | 00:00:06.038879000 | 92 | | Internet IPI(IPv4) | | | | |

```
Ethernet Frame Data
***** MAC Layer *****
0000 Destination Address      = xFFFFFFFFFFFF
0006 Source Address          = x0016760CFBD4
000C Length/Protocol Type    = x0800 Internet IP(IPv4)
***** IPv4 Layer *****
000E Version                  = 010
000E Internet Header Length (In 32 bit words) = ...
000F Differentiated Services Field
Differentiated Services Field
000F Differentiated Services Codepoint          = 000000... Default
000F Explicit Congestion Notification
IP Hdr No TCP SegmentationOffload
0010 Total Length              = 68 (x0044)
0012 Identification           = 24272 (x5ED0)
0014 Reserved Bit             = 0..... Not Set
0014 Don't fragment           = .0..... Not Set
0014 More fragments           = .0..... Not Set
0014 Fragment Offset          = 0 (...00000 00000000)
0016 Time To Live             = 128 (x80)
0017 Protocol                  = 00010001 UDP
0018 Header Check Sum         = x5743
001A Source IP Address        = 192.168.1.70 (xC0A80146)
001E Destination IP Address   = 192.168.1.255 (xC0A801FF)
***** UDP Layer *****
0022 Source Port              = 1025 (x0401)
0024 Destination Port         = 1947 (x079B)
0026 Length (Header + Data)   = 48 (x0030)
0028 Checksum                  = x9AC4
```

```
***** MAC Layer *****
0000 Destination Address      = xFFFFFFFFFFFF
0006 Source Address          = x0016760CFBD4
000C Length/Protocol Type    = x0800 Internet IP(IPv4)
***** IPv4 Layer *****
000E Version                  = 0100... (4)
000E Internet Header Length (In 32 bit words) = ...0101 (5)
000F Differentiated Services Field
Differentiated Services Field
000F Differentiated Services Codepoint          = 000000... Default
000F Explicit Congestion Notification
IP Hdr No TCP SegmentationOffload
0010 Total Length              = 68 (x0044)
0012 Identification           = 24272 (x5ED0)
0014 Reserved Bit             = 0..... Not Set
0014 Don't fragment           = .0..... Not Set
0014 More fragments           = .0..... Not Set
0014 Fragment Offset          = 0 (...00000 00000000)
0016 Time To Live             = 128 (x80)
0017 Protocol                  = 00010001 UDP
0018 Header Check Sum         = x5743
001A Source IP Address        = 192.168.1.70 (xC0A80146)
001E Destination IP Address   = 192.168.1.255 (xC0A801FF)
***** UDP Layer *****
0022 Source Port              = 1025 (x0401)
0024 Destination Port         = 1947 (x079B)
0026 Length (Header + Data)   = 48 (x0030)
0028 Checksum                  = x9AC4
```

Wirespeed Filtering



Wirespeed lossless capture and filter

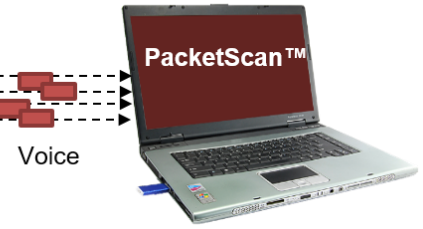
- Filtering can be based on the following:
 - Pattern match
 - Protocol information
 - Frame size

Hardware Filter

Capture Filter

View Filter

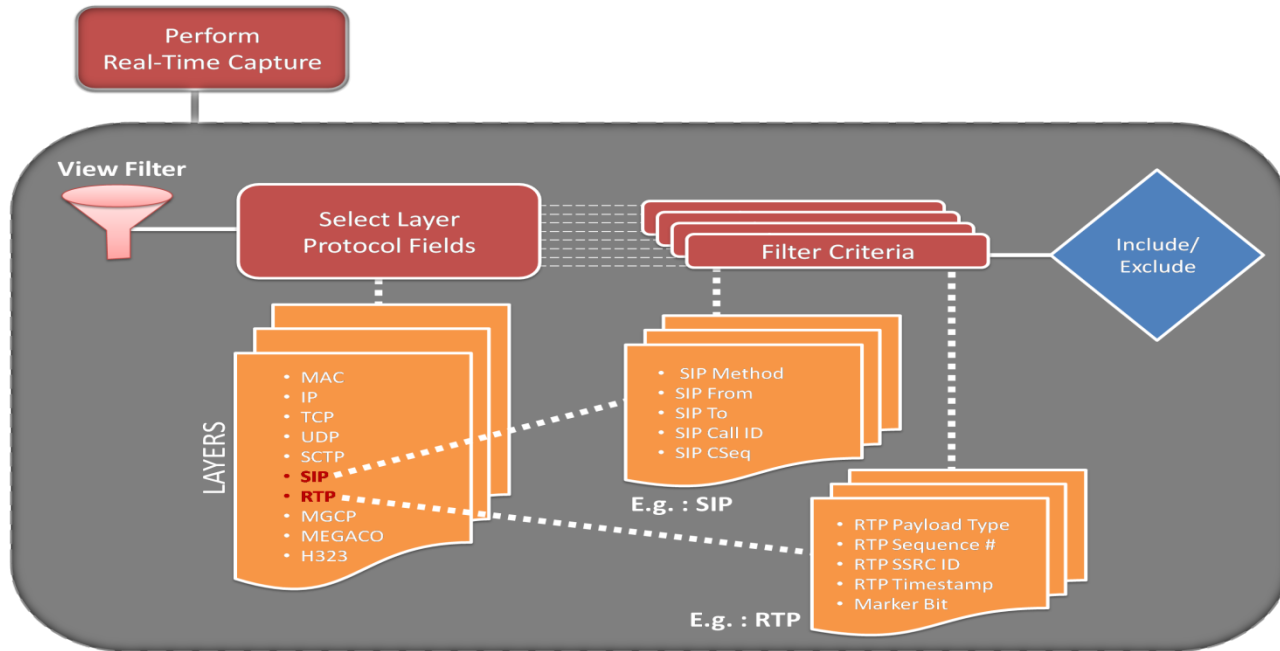
- Checksum errors
- Port number
- IP address and address ranges



3 Stages of Filtering

- Hardware Filter (HWF) – “Special NIC” with hardware filtering - very fast
- Capture Filter (CF) – Powerful software filtering but a little slower
- View Filter (VF) – applies on the captured frames to filter only frames of interest
- PacketScan™ HD captured files to/from Wireshark
- PacketScan™ HD PDA – for detailed voice, fax, and video analysis

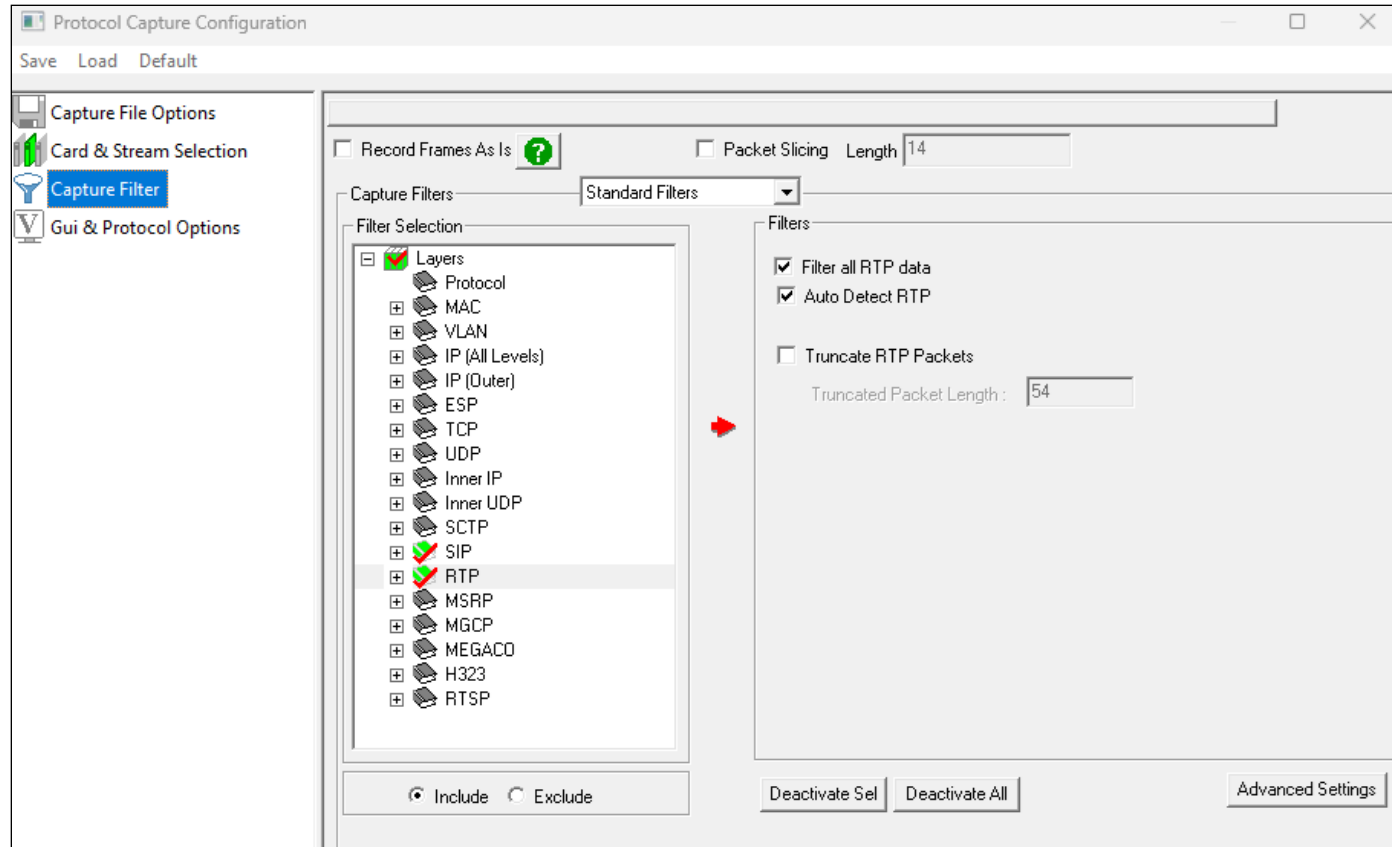
Real-time and Offline Filters



- Filtering and search capability isolates required frames from original frames in real-time / offline based on parameters set in Data Link layer, MAC layer, IP, TCP/UDP and more

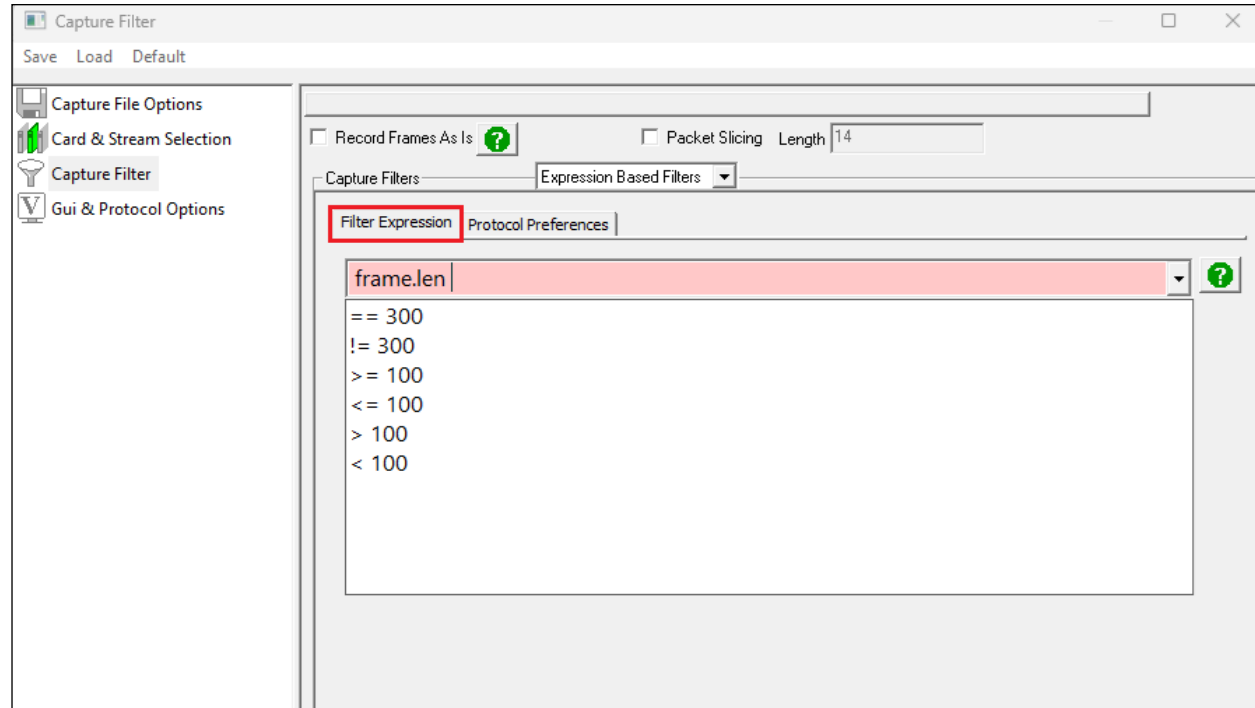
Real-time Capture Filter (Standard Filters)

- Quickly filter live traffic using predefined protocol-based filters
- Select from common protocols such as:
 - SIP, RTP, MAC, VLAN, UDP, TCP, IP and more
- Ideal for real-time monitoring and troubleshooting
- Saves time by avoiding manual filter configuration



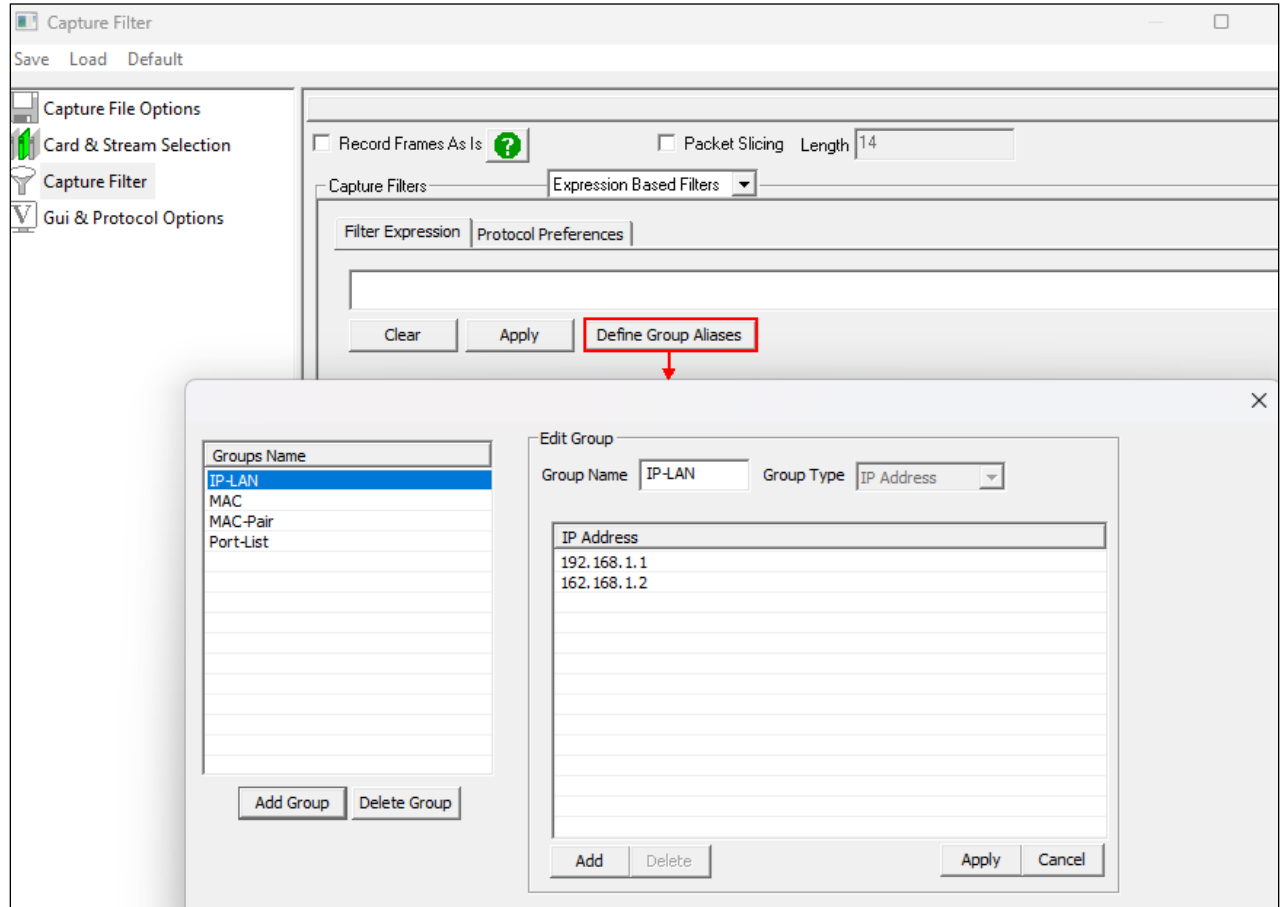
Expression Based Filters – Filter Expression

- Create powerful custom filter rules for precise packet selection
- Combine multiple conditions using logical operators (==, !=, <, >, &&, ||)
- Filter based on fields such as IP address, port, protocol, caller/callee number, packet count, etc.
- Ideal for advanced troubleshooting and targeted packet analysis
- Examples:
 - frame.len==300



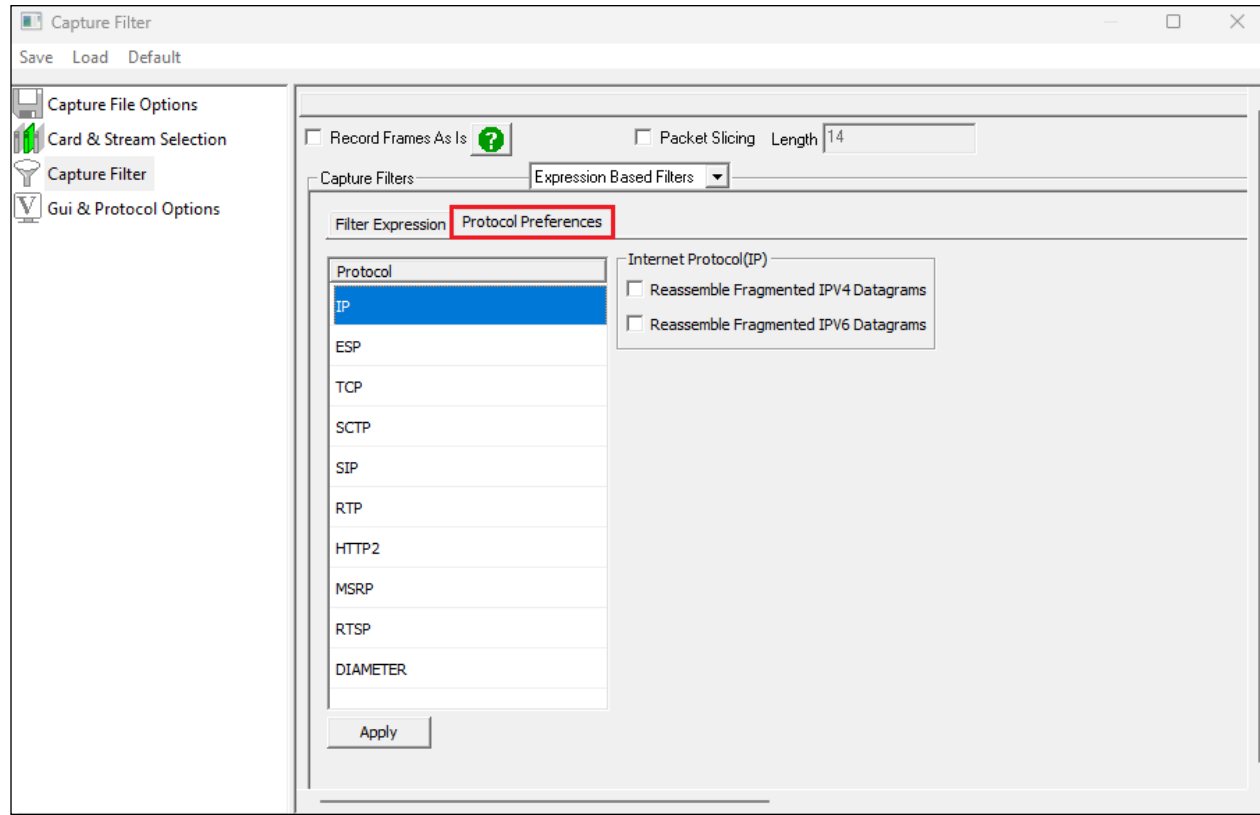
Define Group Aliases

- Organize commonly used filter expressions into reusable groups
- Apply predefined filter groups across multiple capture sessions
- Avoid repeatedly typing filter expressions
- Improve filtering efficiency and consistency
- Simplify selection of frequently used IP, MAC, and port filters



Protocol Preferences

- Optimize packet analysis with protocol-specific decoding options
- Configure preferences for accurate decoding of complex protocols
- Examples:
 - IP fragment reassembly for complete packet reconstruction
 - SIP header parsing for VoIP troubleshooting
 - RTP sequence validation for media stream integrity



Display Filter (Offline)

The screenshot shows the 'View Filter' dialog box with the following components:

- Filter Selection:** A tree view showing the following items:
 - SMS [NAS]
 - SIP
 - SIP-I
 - SMS [SIP]
 - RTCP
 - RTCP (checked)
 - Marker bit
 - Payload type (checked)
 - SSRC identifier
 - Sequence Number
 - TimeStamp
 - H.263+
- Payload type Value:** A list of values with '[13] Comfort Noise' selected:
 - (0) PCMU (A - 8000 Hz - 1 Channel)
 - (1) 1016 (A - 8000 Hz - 1 Channel)
 - (10) L16 (A - 44100 Hz - 2 Channels)
 - (11) L16 (A - 44100 Hz - 1 Channel)
 - (12) QCELP (A - 8000 Hz - 1 Channel)
 - (123) R2S Keep Alive
 - (13) Comfort Noise**
 - (14) MPA (A - 90000 Hz)
 - (15) G728 (A - 8000 Hz - 1 Channel)
 - (16) DV14 (A - 11025 Hz - 1 Channel)
 - (17) DV14 (A - 22050 Hz - 1 Channel)
 - (18) G729 (A - 8000 Hz - 1 Channel)
 - (19) Reserved (A)
- All Selected:** A table showing the current filter configuration:

| Layer | Field | Filter Value |
|-------|--------------|--------------------|
| RTP | Payload type | (13) Comfort Noise |
| | | |
| | | |
- Conditions for all selections:** Radio buttons for AND, OR, Include, and Exclude. 'OR' and 'Include' are selected.
- Buttons:** 'Activate', 'Deactivate', 'Deactivate Sel', and 'Deactivate All'.

Encapsulated Security Payload (ESP) Deciphering

The screenshot shows the Wireshark interface with the following configuration:

- Record Frames As Is:
- Packet Slicing: Length: 14
- Filter Selection: Layers (ESP selected)
- Filters: Filter all ESP data, Decode Encrypted ESP Payload. Extract: Original Encrypted Payload, Deciphered Payload.
- ESP SAs: Edit button highlighted.

The ESP SAs dialog box is open, showing a table of ESP SAs:

| IP Protocol | Src IP | Dest IP | SPI | Encryption | Encryption Key | Authentication | Authentication Key |
|-------------|----------------|----------------|-------------|-------------------|------------------------------------|-----------------------|---------------------------------|
| IPv4 | 192.168.12.86 | 192.168.12.45 | 0x05d2ede0 | AES-CBC [RFC3602] | 0x97D055ABC4E0826C394DC0F2CCBE6... | HMAC-MD5-96 [RFC2403] | 0x6CC1C7BE902D253286386E7B7C... |
| IPv4 | 192.168.12.45 | x.x.x.x | 0x4671113ba | AES-CBC [RFC3602] | 0x97D055ABC4E0826C394DC0F2CCBE6... | HMAC-MD5-96 [RFC2403] | 0x6CC1C7BE902D253286386E7B7C... |
| IPv4 | 192.168.12.86 | 192.168.12.251 | 0xd02382c2 | AES-CBC [RFC3602] | 0x97D055ABC4E0826C394DC0F2CCBE6... | HMAC-MD5-96 [RFC2403] | 0x6CC1C7BE902D253286386E7B7C... |
| IPv4 | 192.168.12.251 | 192.168.12.86 | 0x129e7b1a | AES-CBC [RFC3602] | 0x97D055ABC4E0826C394DC0F2CCBE6... | HMAC-MD5-96 [RFC2403] | 0x6CC1C7BE902D253286386E7B7C... |
| IPv4 | 192.168.12.90 | 192.168.12.45 | 0xa5e7259a | AES-CBC [RFC3602] | 0x97D055ABC4E0826C394DC0F2CCBE6... | HMAC-MD5-96 [RFC2403] | 0x6CC1C7BE902D253286386E7B7C... |
| IPv4 | 192.168.12.45 | * | 0x9637e4c8 | AES-CBC [RFC3602] | 0x97D055ABC4E0826C394DC0F2CCBE6... | HMAC-MD5-96 [RFC2403] | 0x6CC1C7BE902D253286386E7B7C... |
| IPv4 | 192.168.12.90 | 192.168.12.251 | 0x57be7f1a | AES-CBC [RFC3602] | 0x97D055ABC4E0826C394DC0F2CCBE6... | HMAC-MD5-96 [RFC2403] | 0x6CC1C7BE902D253286386E7B7C... |
| IPv4 | * | 192.168.12.90 | * | AES-CBC [RFC3602] | 0x97D055ABC4E0826C394DC0F2CCBE6... | HMAC-MD5-96 [RFC2403] | 0x6CC1C7BE902D253286386E7B7C... |

- ESP filter is used to provide **ESP SAs value** to decrypt ESP packets

Comparison of Before and After ESP Deciphering

PacketScan 64-bit

File View Capture Statistics Database Call Detail Records Configure Help

| Device | Frame# | TIME (Relative) | Length (Bytes) | Error | Length/Protocol Type | Packet Type | Source IP Address | Destination IP Address | Source Address |
|--------|--------|-----------------|--------------------|-------|----------------------|--------------------|-------------------|------------------------|----------------|
| | | | | | MAC | MAC | IPv4 | IPv4 | IPv6 |
| ✓ | 1 | 0 | 00.00.00.00000000 | | 822 | Internet (IP/IPv4) | 192.168.12.86 | 192.168.12.45 | |
| ✓ | 1 | 1 | 00.00.00.515721000 | | 822 | Internet (IP/IPv4) | 192.168.12.86 | 192.168.12.45 | |
| ✓ | 1 | 2 | 00.00.01.537143000 | | 822 | Internet (IP/IPv4) | 192.168.12.86 | 192.168.12.45 | |
| ✓ | 1 | 3 | 00.00.03.558945000 | | 822 | Internet (IP/IPv4) | 192.168.12.86 | 192.168.12.45 | |
| ✓ | 1 | 4 | 00.00.04.626310000 | | 806 | Internet (IP/IPv4) | 192.168.12.90 | 192.168.12.45 | |
| ✓ | 1 | 5 | 00.00.05.143070000 | | 806 | Internet (IP/IPv4) | 192.168.12.90 | 192.168.12.45 | |
| ✓ | 1 | 6 | 00.00.06.165570000 | | 806 | Internet (IP/IPv4) | 192.168.12.90 | 192.168.12.45 | |

Device: Frame#0 at 00.00.00.00000000 OK Len=822

Ethernet Frame Data

```

***** MAC Layer *****
0000 Destination Address      = xE0D5EADF8FD
0006 Source Address          = xFCA1492ABF
000C Length/Protocol Type    = x0800 Internet IP(IPv4)
***** IPv4 Layer *****
000E Version                  = 0100 ... (4)
000E Internet Header Length (In 32 bit words) = ...0101 (5)
000F Differentiated Services Field = 00000000 Default
000F Differentiated Services Codepoint = 00000000 Default
000F Explicit Congestion Notification = .....00 Not-ECT (Not ECN-Capable Transport)
IP Hdr No TCP SegmentationOffload
0010 Total Length            = 808 (x0328)
0012 Identification         = 31181 (x79CD)
0014 Reserved Bit           = 0..... Not Set
0014 Don't fragment         = 0..... Not Set
0014 More fragments         = 0..... Not Set
0014 Fragment Offset        = 0 (...00000 00000000)
0016 Time To Live           = 128 (x80)
0017 Protocol                = 00110010 Encap Security Payload
Header Check Sum            = x2403
001A Source IP Address       = 192.168.12.86 (xCOA80C56)
001E Destination IP Address  = 192.168.12.45 (xCOA80C2D)
***** Encapsulating Security Payload Protocol Layer *****
0022 Security Parameter Index = 9709516 (x05D2E0E0)
0026 Sequence Number        = 1 (x00000001)
ESP Payload Data            = x49F74319A723AF44...BFA3074B9C6D5534 (Len=764)
  
```

*** Right click to SHOW/HIDE layer details or copy ***

Before Deciphering

PacketScan 64-bit

File View Capture Statistics Database Call Detail Records Configure Help

| Device | Frame# | TIME (Relative) | Length (Bytes) | Error | Length/Protocol Type | Packet Type | Source IP Address | Destination IP Address | Source Address |
|--------|--------|-----------------|--------------------|-------|----------------------|--------------------|-------------------|------------------------|----------------|
| | | | | | MAC | MAC | IPv4 | IPv4 | IPv6 |
| ✓ | 1 | 0 | 00.00.00.000000000 | | 768 | Internet (IP/IPv4) | SIP | 192.168.12.86 | 192.168.12.45 |
| ✓ | 1 | 1 | 00.00.00.515721000 | | 768 | Internet (IP/IPv4) | SIP | 192.168.12.86 | 192.168.12.45 |
| ✓ | 1 | 2 | 00.00.01.537143000 | | 768 | Internet (IP/IPv4) | SIP | 192.168.12.86 | 192.168.12.45 |
| ✓ | 1 | 3 | 00.00.03.558945000 | | 768 | Internet (IP/IPv4) | SIP | 192.168.12.86 | 192.168.12.45 |
| ✓ | 1 | 4 | 00.00.04.626310000 | | 764 | Internet (IP/IPv4) | SIP | 192.168.12.90 | 192.168.12.45 |

0018 Header Check Sum = x2403

001A Source IP Address = 192.168.12.86 (xCOA80C56)

001E Destination IP Address = 192.168.12.45 (xCOA80C2D)

***** UDP Layer *****

0022 Source Port = 5060 (x13C4)

0024 Destination Port = 5060 (x13C4)

0026 Length (Header + Data) = 735 (x02DF)

0028 Checksum = x16FB

***** SIP Layer *****

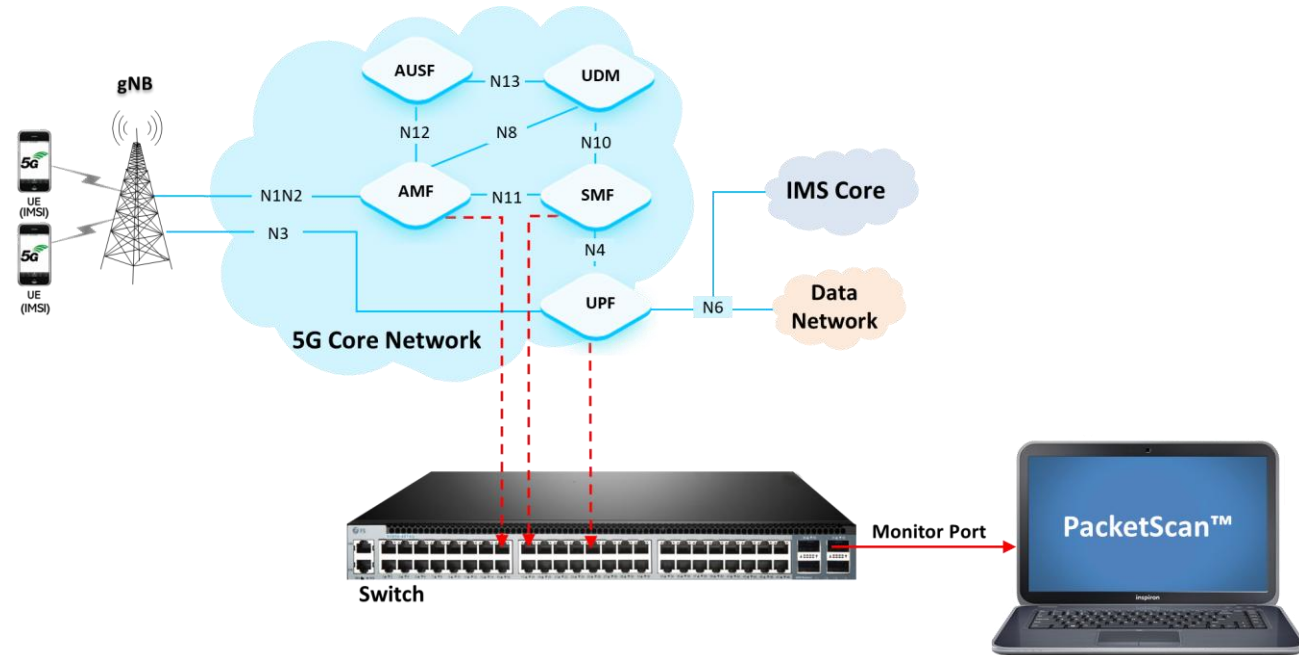
```

HDR
HDR = INVITE sip:0001@192.168.12.45 SIP/2.0
HDR = Via: SIP/2.0/UDP 192.168.12.86:5060;branch=z9hG4bK-29-103772070-10509-4472
HDR = Max-Forwards: 70
HDR = Allow: INVITE, BYE, CANCEL, ACK, INFO, OPTIONS, SUBSCRIBE, NOTIFY, REFER, REGISTER, UPDATE
HDR = From: 0001 <sip:0001@192.168.12.86>;tag=FromTag-26-103772070-10506-4472
HDR = To: 0001 <sip:0001@192.168.12.45>
HDR = Call-ID: GL-HAPS-28-103772070-10508-4472@192.168.12.86
HDR = CSeq: 1 INVITE
HDR = Contact: 0001 <sip:0001@192.168.12.86>
HDR = Content-Type: application/sdp
HDR = Content-Length: 238
HDR =
BODY
BODY = v=0
BODY = o=0001 31062954 1 IN IP4 192.168.12.90
BODY = s=SIP Call
BODY = c=IN IP4 192.168.12.90
BODY = t=0 0
BODY = m=audio 1034 RTP/AVP 0 8 101
BODY = a=rtpmap:0 PCMU/8000
BODY = a=rtpmap:8 PCMA/8000
BODY = a=rtpmap:101 telephone-event/8000
BODY = a=ftsp:101 0-15
BODY = a=ptime:20
BODY = a=sendrecv
  
```

After Deciphering

5G Protocol Analysis

- Captures, segregates, monitors and collects statistics on all calls over N1N2, N4, N8, N10, N12 and N13 interfaces of the 5G network
- Provides VoNR call statistics such as caller, callee, MOS scores, discarded packets and voice storage



Decode View - 5G NGAP Layer

PacketScan 64-bit

File View Capture Statistics Database Call Detail Records Configure Help

0 GoTo

| Device | Frame# | TIME (Relative) | Length (Bytes) | Error | Length/Protocol Type MAC | Packet Type MAC | Source IP Address IPv4 | Destination IP Address IPv4 |
|--------|--------|--------------------|----------------|-------|-----------------------------|--------------------|---------------------------|--------------------------------|
| ✓ 0 | 0 | 00:00:00.000000000 | 130 | | Internet IP(IPv4) | | 192.168.31.55 | 192.168.31.77 |
| ✓ 0 | 1 | 00:00:00.070066000 | 126 | | Internet IP(IPv4) | | 192.168.31.77 | 192.168.31.55 |
| ✓ 0 | 2 | 00:00:00.400049000 | 102 | | Internet IP(IPv4) | | 192.168.31.55 | 192.168.31.77 |
| ✓ 0 | 3 | 00:00:00.472182000 | 130 | | Internet IP(IPv4) | | 192.168.31.77 | 192.168.31.55 |
| ✓ 0 | 4 | 00:00:05.829074000 | 230 | | Internet IP(IPv4) | | 192.168.31.55 | 192.168.31.77 |
| ✓ 0 | 5 | 00:00:05.883006000 | 82 | | Internet IP(IPv4) | | 192.168.31.77 | 192.168.31.55 |

003A Payload Protocol Identifier = x0000003C NGAP
Parameter Padding = x0000
===== NGAP Layer =====

003E NGAP-PDU = InitiatingMessage (0)

003E InitiatingMessage =

003F ProcedureCode = 4 id-DownlinkNASTransport

0040 procedureCriticality = 1 ignore(1)

0042 Value =

0042 DownlinkNASTransport =

0042 ProtocolIE-Container = 3 Items

0045 Item = 0

0045 ProtocolIE-Field =

0045 ProtocolIE-ID = 10 id-AMF-UE-NGAP-ID

0047 procedureCriticality = 0 reject(0)

0049 Value =

004A AMF-UE-NGAP-ID = 2

004B Item = 1

004B ProtocolIE-Field =

004B ProtocolIE-ID = 85 id-RAN-UE-NGAP-ID

004D procedureCriticality = 0 reject(0)

004F Value =

0050 RAN-UE-NGAP-ID = 2

0051 Item = 2

0051 ProtocolIE-Field =

0051 ProtocolIE-ID = 38 id-NAS-PDU

0053 procedureCriticality = 0 reject(0)

0055 Value =

0055 NAS PDU =

0056 NAS PDU Dump = x7E0056000200002188821DE340CB350DB1EFA850501A484A20103AE3588D45F780000CBE535FE4F4B155
===== 5G NAS Layer =====

0056 Extended Protocol Discriminator = 01111110 5GS Mobility Management Messages

0057 Security Header Type = ...0000 Plain NAS message, not security protected

Filter is active. C:\Program Files\GL Communications Inc\Pa\Idle filtr 23 of 113 395 frames Missed Frames : 0

LTE Protocol Analysis

- Captures and monitors real-time signaling and traffic on LTE networks
- The application segregates, monitors and collects statistics on all calls and can test eNodeB or UE over various interfaces, including S1, S3, S4, S5 (or S8), S6a, S10, S11, S13, and X2

The screenshot displays the PacketScan 64-bit [off-line] interface. At the top, there is a menu bar (File, View, Capture, Statistics, Database, Call Detail Records, Configure, Help) and a toolbar with various icons. Below the toolbar is a table with the following columns: Device, Frame#, TIME (Relative), Length (Bytes), Error, Length/Protocol Type MAC, Packet Type MAC, Source IP Address IPv4, and Destination IP Address IPv4. The table contains three rows of data, with the second and third rows highlighted in blue.

| Device | Frame# | TIME (Relative) | Length (Bytes) | Error | Length/Protocol Type MAC | Packet Type MAC | Source IP Address IPv4 | Destination IP Address IPv4 |
|--------|--------|--------------------|----------------|-------|--------------------------|-----------------|------------------------|-----------------------------|
| ✓ 2 | 13 | 00:00:04.216954000 | 62 | | Internet IP[IPv4] | | 192.168.12.27 | 192.168.12.26 |
| ✓ 2 | 14 | 00:00:04.229370000 | 154 | | Internet IP[IPv4] | | 192.168.12.27 | 192.168.12.26 |
| ✓ 2 | 15 | 00:00:04.242932000 | 382 | | Internet IP[IPv4] | | 192.168.12.26 | 192.168.12.110 |

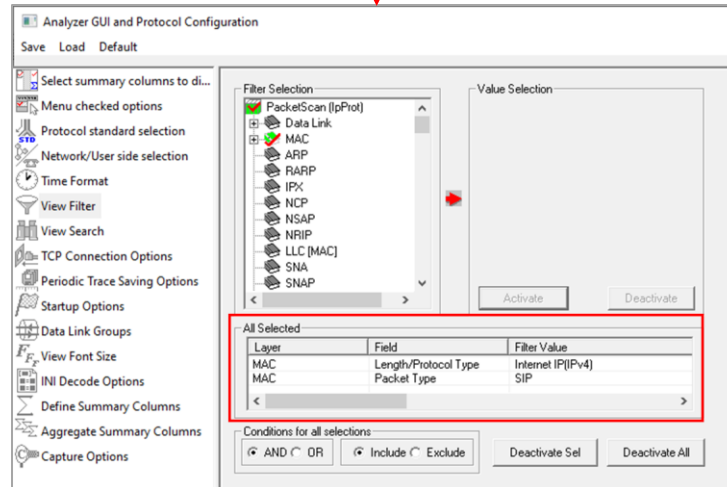
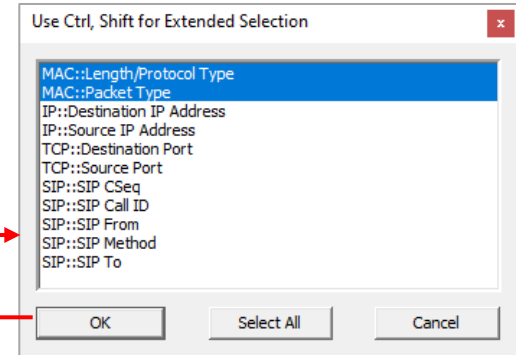
Below the table, the SIAP Layer analysis is shown in a text-based format:

```
----- SIAP Layer -----
003E SIAP-PDU                               = InitiatingMessage (0)
003E InitiatingMessage                       =
003F ProcedureCode                           = 13 id-uplinkNAStransport
0040 Criticality                             = 1 ignore(1)
0042 Value                                   =
0042 UplinkNAStransport                      =
0042 ProtocolIE-Container                    = 5 Items
0045 Item                                     = 0
0045 ProtocolIE-Field                        =
0045 ProtocolIE-ID                           = 0 id-MME-UE-SIAP-ID
0047 Criticality                             = 0 reject(0)
0049 Value                                   =
004A MME-UE-SIAP-ID                          = 17
004B Item                                     = 1
004B ProtocolIE-Field                        =
004B ProtocolIE-ID                           = 8 id-eNB-UE-SIAP-ID
004D Criticality                             = 0 reject(0)
004F Value                                   =
0050 eNB-UE-SIAP-ID                          = 10006
0052 Item                                     = 2
0052 ProtocolIE-Field                        =
0052 ProtocolIE-ID                           = 26 id-NAS-PDU
0054 Criticality                             = 0 reject(0)
0056 Value                                   =
0056 NAS PDU                                 =
0057 NAS-PDU                                 = x27F98D586700BA14F34C1D246F2948C4A5F4AB770DA52DD7E52EEEB43A6A1DAF32AF08E49C98F81D4DD3
0081 Item                                     = 3
0081 ProtocolIE-Field                        =
0081 ProtocolIE-ID                           = 100 id-EUTRAN-CGI
0083 Criticality                             = 1 ignore(1)
0085 Value                                   =
0085 EUTRAN-CGI                              =
0086 PLMNidentity                            =
0086 MCC                                     = 001
0087 MNC                                     = 01
0089 CellIdentity                            =
0001 Cell Identity                           = 00110000 00011110 01100000 0010.... (50456066)
008D Item                                     = 4
008D ProtocolIE-Field                        =
008D ProtocolIE-ID                           = 67 id-TAI
008F Criticality                             = 1 ignore(1)
0091 Value                                   =
```

Filter Criteria From Screen Selection

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

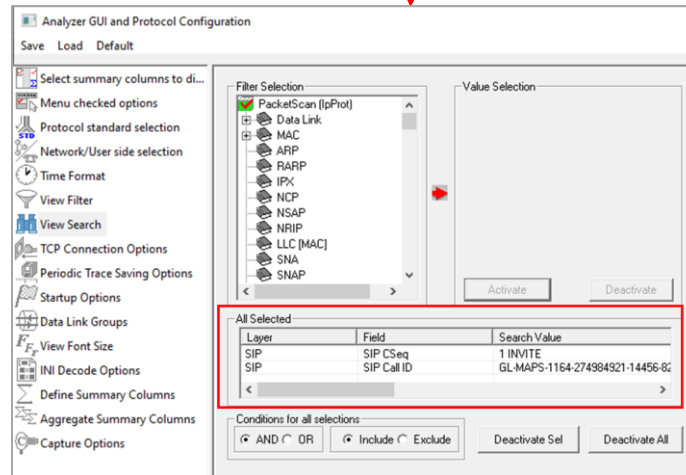
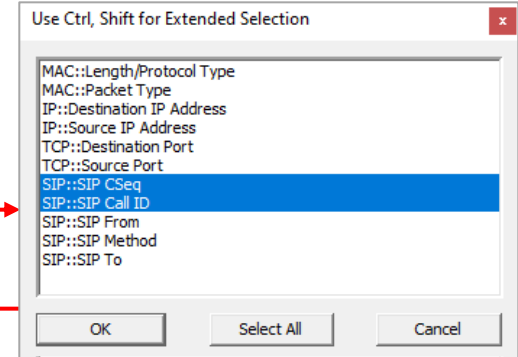
| Frame# | TIME (Relative) | Length (Bytes) | Error | Packet Type MAC | Source IP Address IP | Destination IP Address IP | Source Address IPv6 | Destination Address IPv6 |
|--------|--------------------|----------------|-------|--------------------|-------------------------|------------------------------|------------------------|-----------------------------|
| 0 | 00:00:00.000000000 | 66 | | SIP | 192.168.12.122 | 192.168.12.123 | | |
| 1 | 00:00:00.000003480 | 66 | | SIP | 192.168.12.123 | 192.168.12.122 | | |
| 2 | 00:00:00.000003870 | 54 | | SIP | 192.168.12.122 | 192.168.12.123 | | |
| 3 | 00:00:00.000310480 | 823 | | SIP | 192.168.12.122 | 192.168.12.123 | | |
| 4 | 00:00:00.000611840 | 416 | | SIP | 192.168.12.123 | 192.168.12.122 | | |
| 5 | 00:00:00.001110720 | 54 | | SIP | 192.168.12.122 | 192.168.12.123 | | |
| 6 | 00:00:00.001833300 | 779 | | SIP | 192.168.12.122 | 192.168.12.122 | | |
| 7 | 00:00:00.002150590 | 484 | | SIP | 192.168.12.122 | 192.168.12.123 | | |



Search Criteria From Screen Selection

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

| Frame# | TIME (Relative) | Length (Bytes) | Error | Packet Type MAC | Source IP Address IP | Destination IP Address IP | Source Address IPv6 | Destination Address IPv6 |
|--------|--------------------|----------------|-------|--------------------|-------------------------|------------------------------|------------------------|-----------------------------|
| 0 | 00:00:00.000000000 | 66 | | SIP | 192.168.12.122 | 192.168.12.123 | | |
| 1 | 00:00:00.000003480 | 66 | | SIP | 192.168.12.123 | 192.168.12.122 | | |
| 2 | 00:00:00.000003870 | 54 | | SIP | 192.168.12.122 | 192.168.12.123 | | |
| 3 | 00:00:00.000310480 | 823 | | SIP | 192.168.12.122 | 192.168.12.123 | | |
| 4 | 00:00:00.000611840 | 416 | | SIP | 192.168.12.123 | 192.168.12.122 | | |
| 5 | 00:00:00.001110720 | 54 | | SIP | 192.168.12.122 | 192.168.12.123 | | |
| 6 | 00:00:00.001833300 | 779 | | SIP | 192.168.12.123 | 192.168.12.122 | | |
| 7 | 00:00:00.002150580 | 484 | | SIP | 192.168.12.122 | 192.168.12.123 | | |



Aggregate Summary Columns

Aggregate Summary Columns

Save Load Default

Select summary columns to display
Menu checked options
Protocol standard selection
Network/User side selection
Time Format
View Filter
View Search
TCP Connection Options
Periodic Trace Saving Options
Startup Options
Data Link Groups
View Font Size
INI Decode Options
Define Summary Columns
Aggregate Summary Columns
Capture Options

Add Delete Aliases Reorder Reverse Use '_' in the name for multiline headers

| Name | Display Format | Summary Columns | Separator |
|-------------------------------|----------------|---|-----------|
| Source IP ---> Destination IP | Concat | Destination IP_Address_IP Source IP_Address_IP | --- |

PacketScan 64-bit

File View Capture Statistics Database Call Detail Records Configure Help

| Frame# | TIME (Relative) | Length (Bytes) | Packet Type MAC | Source IP -> Destination IP | Error | Length/Protocol Type MAC | Source IP Address IP | Destination IP Address IP | Destinat TC |
|--------|--------------------|----------------|--------------------|------------------------------------|-------|-----------------------------|-------------------------|------------------------------|----------------|
| 3 | 00:00:00.000310480 | 823 | SIP | 192.168.12.123 ---> 192.168.12.122 | | Internet IP(IPv4) | 192.168.12.122 | 192.168.12.123 | 5060 |
| 4 | 00:00:00.000611840 | 416 | SIP | 192.168.12.122 ---> 192.168.12.123 | | Internet IP(IPv4) | 192.168.12.123 | 192.168.12.122 | 57494 |
| 5 | 00:00:00.001110720 | 54 | SIP | 192.168.12.123 ---> 192.168.12.122 | | Internet IP(IPv4) | 192.168.12.122 | 192.168.12.123 | 5060 |
| 6 | 00:00:00.001833300 | 779 | SIP | 192.168.12.122 ---> 192.168.12.123 | | Internet IP(IPv4) | 192.168.12.123 | 192.168.12.122 | 57494 |
| 7 | 00:00:00.002150590 | 484 | SIP | 192.168.12.123 ---> 192.168.12.122 | | Internet IP(IPv4) | 192.168.12.122 | 192.168.12.123 | 5060 |
| 8 | 00:00:00.002188670 | 214 | FTP | 192.168.12.123 ---> 192.168.12.122 | | Internet IP(IPv4) | 192.168.12.122 | 192.168.12.123 | |
| 9 | 00:00:00.002216600 | 214 | FTP | 192.168.12.122 ---> 192.168.12.123 | | Internet IP(IPv4) | 192.168.12.123 | 192.168.12.122 | |

Device2 Frame=3 at 00:00:00.000310480 OK Len=823 *** Right click to SHOW/HIDE layer details

Ethernet Frame Data

```
***** MAC Layer *****  
0000 Destination Address      = xFCAA149CBF99  
0006 Source Address          = xFCAA149CBF9B  
000C Length/Protocol Type    = x0800 Internet IP(IPv4)  
***** IP Layer *****  
000E Version                  = 0100... (4)  
000E Internet Header Length (In 32 bit words) = ...0101 (5)  
Differentiated Services Field  
000F Differentiated Services Codepoint      = 0000000.. Default  
000F Explicit Congestion Notification      = .....00 Not-ECT (Not ECN-Capable Transport)  
IP Hdr No TCP SegmentationOffload  
0010 Total Length                = 809 (x0329)  
0012 Identification              = 28511 (x6F5F)  
0014 Reserved Bit                 = 0..... Not Set  
0014 Don't fragment               = .1..... Set  
0014 More fragments              = .0..... Not Set  
0014 Fragment Offset             = 0 (...000000 00000000)  
0016 Time To Live                 = 128 (x80)  
0017 Protocol                     = 00000110 TCP  
0018 Header Check Sum             = x0000  
001A Source IP Address            = 192.168.12.122 (xC0A80C7A)  
001E Destination IP Address       = 192.168.12.123 (xC0A80C7B)
```

Off-line Viewing. C:\Users\Archana\Desktop\Aggregate Summar 11 Frames

Aggregate Summary Column Group

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

The screenshot displays the 'Aggregate Summary Columns' configuration window in PacketScan 64-bit. The window is divided into a left sidebar with various analysis options and a main configuration area. The main area contains a table for defining aggregate column groups.

| Name | Display Format | Summary Columns | Separator |
|---------|-----------------|---|-----------|
| Group-0 | Col_Alias Value | SIP Method_SIP SIP From_SIP SIP To_SIP SIP Call_ID_SIP SIP CSeq_SIP | , |
| Group-1 | Col_Alias Value | Payload type SSRC identifier Sequence Number Time Stamp Marker bit | , |
| Group-2 | Concat | Source Port Destination | |

Below the configuration window, a network packet capture analysis is shown. A red box highlights a packet (Frame 3) with the following details:

- Frame#: 3
- TIME (Relative): 00:00:00.000310480
- Length (Bytes): 823
- Packet Type: SIP
- MAC: INVITE, From: 0001@192.168.12.122, To: 0001@192.168.12.123, CallID: GL-MAPS-1164-274984921-14456-8240@192.168.12.122, CSeq: 1 INVITE
- Error: Internet IPIPV4
- Length/Protocol Type: Internet IPIPV4
- Source IP / Port: 192.168.12.122

The packet analysis window also shows a detailed view of the packet structure, including Ethernet II, Internet Protocol Version 4, and TCP layers. The TCP layer details are as follows:

```
0010 Total Length = 809 (x0329)
0012 Identification = 28511 (x6F5E)
0014 Reserved Bit = 0
0014 Don't fragment = 1
0014 More fragments = 0
0014 Fragment Offset = 0
0016 Time To Live = 128 (x80)
0017 Protocol = 00000110 TCP
0018 Header Check Sum = x0000
001A Source IP Address = 192.168.12.122 (xC0A80C7A)
001E Destination IP Address = 192.168.12.123 (xC0A80C7B)
***** TCP Layer *****
0022 Source Port = 57494 (xE096)
0024 Destination Port = 5060 (x13C4)
0026 Sequence Number = 341469455 (x0C881A9B)
002A Acknowledgement Number = 3548904125 (xD387FABD)
002E Data Offset = 0101 (5)
003E Reserved = 0
*****
```

Copy Frames to Memory File

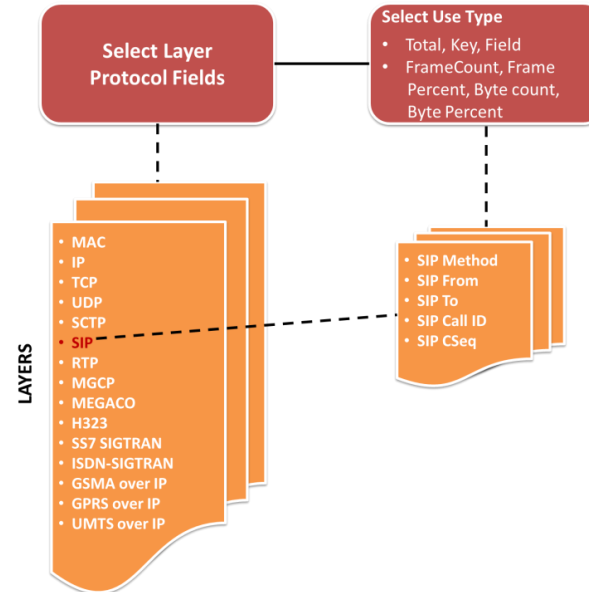
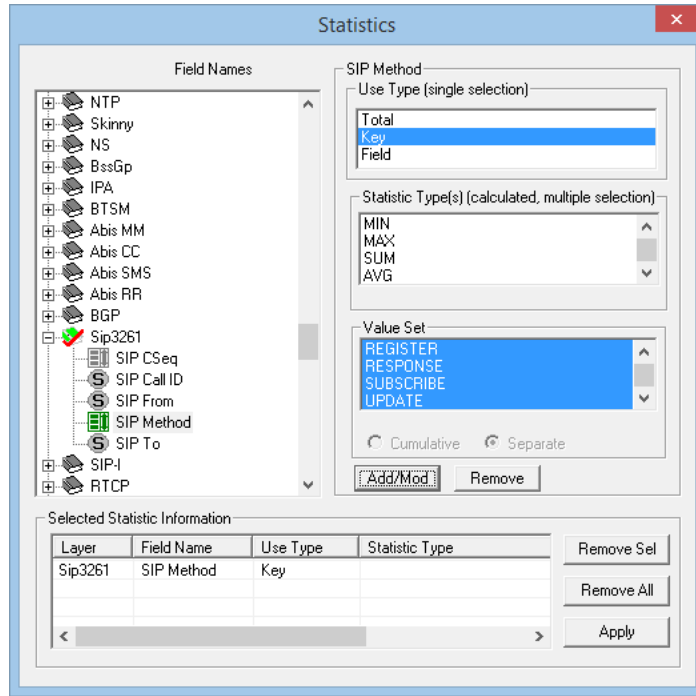
- The user can select and copy the frames (frame range) to the desired location

The screenshot displays the PacketScan 64-bit application window. The main window contains a table of captured frames with the following columns: Device, Frame#, TIME (Relative), Length (Bytes), Error, Length/Protocol Type MAC, and Packet Type MAC. The table lists frames 0 through 10, all from Device 2. Frame 0 is selected. A dialog box titled 'Copy Frames to Memory File' is overlaid on the table. The dialog has a 'Total Frames in Memory' field set to 1, a 'List of frame ranges to copy like 1 10-19 33-77' field with '10-15' entered, and buttons for 'Copy Selected', 'Copy Ranges', 'Copy All', 'Save & Exit', 'Clear Memory', and 'Exit'. Below the table, a hex dump of the selected frame (Frame 0) is visible, showing Ethernet II and Internet Protocol (IPv4) headers.

| Device | Frame# | TIME (Relative) | Length (Bytes) | Error | Length/Protocol Type MAC | Packet Type MAC |
|--------|--------|--------------------|----------------|-------|--------------------------|-----------------|
| ✓ 2 | 0 | 00:00:00.000000000 | 82 | | Internet IP(IPv4) | |
| ✓ 2 | 1 | 00:00:01.841976000 | 82 | | Internet IP(IPv4) | |
| ✓ 2 | 2 | 00:00:02.347154000 | 836 | | Internet IP(IPv4) | SIP |
| ✓ 2 | 3 | 00:00:02.347730000 | 354 | | Internet IP(IPv4) | SIP |
| ✓ 2 | 4 | 00:00:02.349375000 | 355 | | Internet IP(IPv4) | SIP |
| ✓ 2 | 5 | 00:00:02.349532000 | 820 | | Internet IP(IPv4) | SIP |
| ✓ 2 | 6 | 00:00:04.467457000 | 82 | | Internet IP(IPv4) | |
| ✓ 2 | 7 | | | | | |
| ✓ 2 | 8 | | | | | |
| ✓ 2 | 9 | | | | | |
| ✓ 2 | 10 | | | | | |

Device2 Frame=0 at
Ethernet Frame Data
===== MA
0000 Destination Ad
0006 Source Address
000C Length/Protoco
===== IPv4 bytes
000E Version = 0100.... (4)
000E Internet Header Length (In 32 bit words) =0101 (5)
Differentiated Services Field =
000F Differentiated Services Codepoint = 000000.. Default
000F Explicit Congestion Notification =00 Not-ECT (Not ECN-Capable Transport)
IP Hdr No TCP SegmentationOffload =
0010 Total Length = 68 (x0044)
0012 Identification = 24272 (x5ED0)
0014 Reserved Bit = 0..... Not Set

Statistics

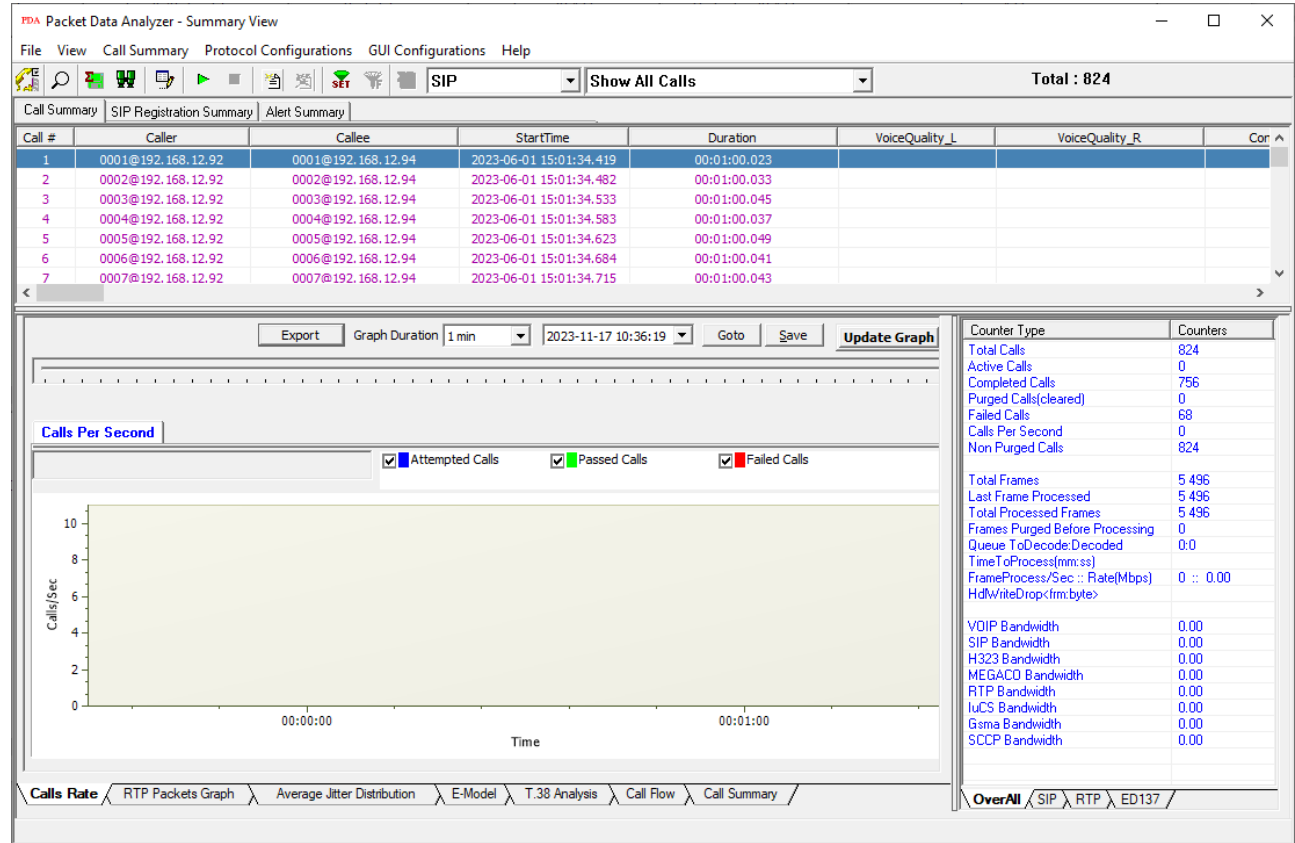


E.g. Device # (Its type Numeric)
 Timestamp (String values)
 ARP Hardware type (with predefined value set)

- Various statistics can be obtained to study the performance and trend in the VoIP network, based on protocol fields and different parameters

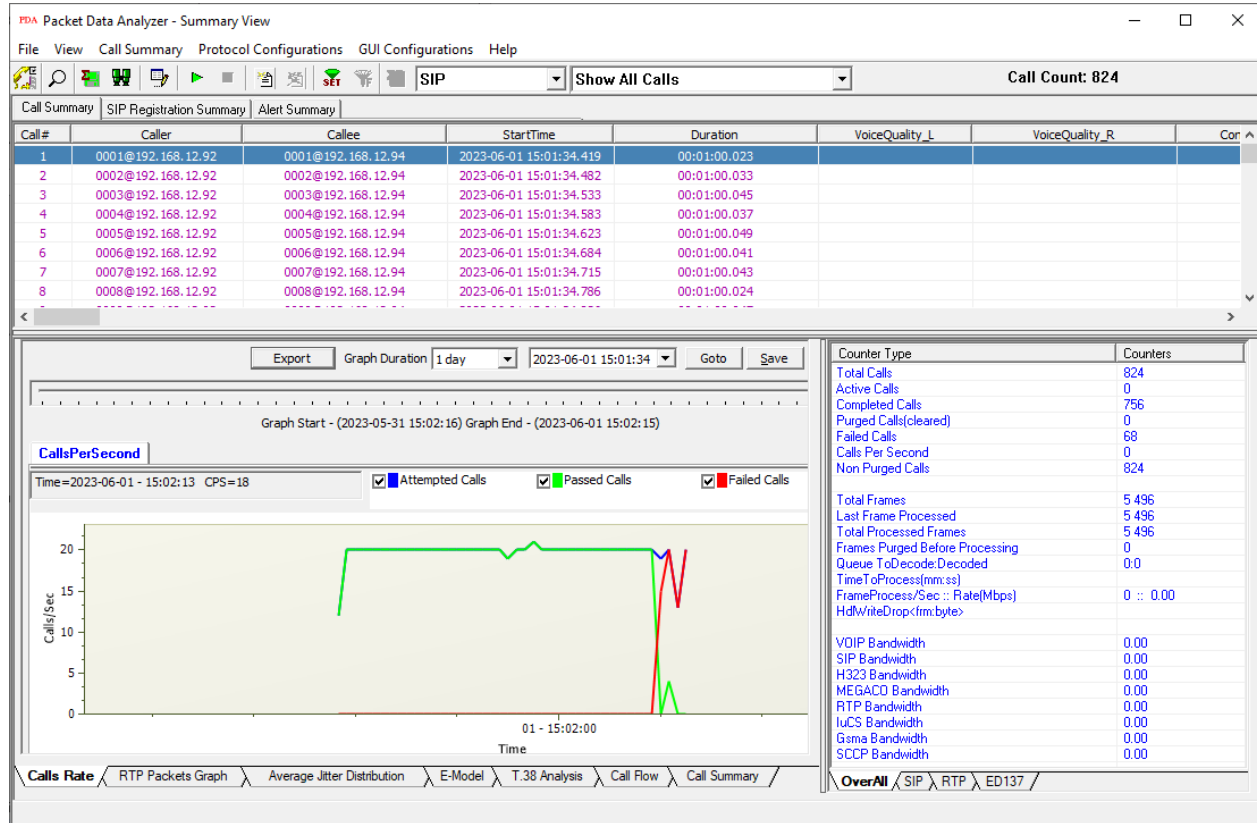
Packet Data Analysis

- Packet Data Analysis in PacketScan™ displays the following views
 - Summary view
 - Detail view
 - Registration summary view



PDA Summary View

- Summary View displays -
 - Summary of data transmission in each direction including calling number, called number, call id, start time, duration, missing packets, etc.
 - Includes separate statistical counts on total packets, calls, failed calls, captured frames, etc., for SIP, H323, MEGACO, and RTP based calls
 - Provides various graphs to view active calls, average jitter distribution, E-model based measurements for R-factor / MOS/ Packet discarded, RTP packets, T.38 fax analysis, and call signaling, Gap, Jitter, Gap/Jitter Distribution, Wave and Spectral Display for media stream analysis, VoIP calls and more



Displaying Filtered Calls using Filter Expressions

- Filter CDRs (Call Detail Records) based on parameters such as caller, time, message count, etc.
- 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

PDA Packet Data Analyzer - Summary View

File View Call Summary Protocol Configurations GUI Configurations Help

SIP Show Filtered Calls Call Count: 6

ErrorCode==400 || ErrorCode>600

| Payload_R | ErrorCode | FailureCause | CallID | EndTime | PostDialDelay | SessionDisconnectDe |
|-----------|-----------|--------------|--|-------------------------|---------------|---------------------|
| | 400 | 5 | GL-MAPS-2654-766727097-26124-3688@192.168.12.92 | 2023-06-01 15:02:12.275 | 9 | 0 |
| | 603 | 4 | GL-MAPS-2679-766728649-26314-14696@192.168.12.92 | 2023-06-01 15:02:13.828 | 9 | 0 |
| | 604 | 4 | GL-MAPS-2677-766728698-26320-13540@192.168.12.92 | 2023-06-01 15:02:13.879 | 19 | 0 |
| | 606 | 4 | GL-MAPS-2677-766728748-26326-14572@192.168.12.92 | 2023-06-01 15:02:13.919 | 9 | 0 |
| | 400 | 5 | GL-MAPS-2685-766728798-26332-6156@fe80::3f20:7953:f2df:f26a | 2023-06-01 15:02:13.973 | 18 | 0 |
| | 606 | 4 | GL-MAPS-2709-766730449-26530-14696@fe80::3f20:7953:f2df:f26a | 2023-06-01 15:02:15.632 | 9 | 0 |

Save Call in *.hdl, *.pcap, and *.pcapng Formats

The screenshot displays the PDA Packet Data Analyzer interface. The main window shows a 'Call Summary' table with columns for Call #, Caller, Callee, StartTime, Duration, VoiceQuality_L, VoiceQuality_R, and Cor. A context menu is open over the table, with 'Save Call' selected. A dialog box titled 'PDA Save Call - CallNum_3' is in the foreground, showing options for File Type (HDL File, PCAP File, PCAPNG) and a Path field. The dialog also has checkboxes for 'Overwrite Files' and buttons for 'Save Call(s)' and 'Exit'. The background interface includes a 'Calls Per Second' graph and a 'Counters' table.

| Call # | Caller | Callee | StartTime | Duration | VoiceQuality_L | VoiceQuality_R | Cor |
|--------|--------------------|--------------------|-------------------------|--------------|----------------|----------------|-----|
| 1 | 0001@192.168.12.92 | 0001@192.168.12.94 | 2023-06-01 15:01:34.419 | 00:01:00.023 | | | |
| 2 | 0002@192.168.12.92 | 0002@192.168.12.94 | 2023-06-01 15:01:34.482 | 00:01:00.033 | | | |
| 3 | 0003@192.168.12.92 | 0003@192.168.12.94 | 2023-06-01 15:01:34.533 | | | | |
| 4 | 0004@192.168.12.92 | 0004@192.168.12.94 | 2023-06-01 15:01:34.583 | | | | |
| 5 | 0005@192.168.12.92 | 0005@192.168.12.94 | 2023-06-01 15:01:34.623 | | | | |
| 6 | 0006@192.168.12.92 | 0006@192.168.12.94 | 2023-06-01 15:01:34.684 | 00:01:00.041 | | | |
| 7 | 0007@192.168.12.92 | 0007@192.168.12.94 | 2023-06-01 15:01:34.715 | 00:01:00.043 | | | |
| 8 | 0008@192.168.12.92 | 0008@192.168.12.94 | | | | | |

| Counters | Value |
|----------|-------|
| 824 | 824 |
| 0 | 0 |
| 756 | 756 |
| 0 | 0 |
| 68 | 68 |
| 0 | 0 |
| 824 | 824 |
| 5496 | 5496 |
| 5496 | 5496 |
| 5496 | 5496 |
| 0 | 0 |
| 0.0 | 0.0 |
| 0.0 | 0.0 |
| 0.0 | 0.0 |
| 0.0 | 0.0 |
| 0.0 | 0.0 |
| 0.0 | 0.0 |
| 0.0 | 0.0 |
| 0.0 | 0.0 |
| 0.0 | 0.0 |

Copy Cell Value to Clipboard

PDA Packet Data Analyzer - Summary View

File View Call Summary Protocol Configurations GUI Configurations Help

SIP Show All Calls Total : 824

Call Summary SIP Registration Summary Alert Summary

| Call # | Caller | Callee | StartTime | Duration | VoiceQuality_L | VoiceQuality_R | Cor |
|--------|--------------------|--------------------|-------------------------|--------------|----------------|----------------|-----|
| 1 | 0001@192.168.12.92 | 0001@192.168.12.94 | 2023-06-01 15:01:34.419 | 00:01:00.023 | | | |
| 2 | 0002@192.168.12.92 | 0002@192.168.12.94 | 2023-06-01 15:01:34.482 | 00:01:00.033 | | | |
| 3 | 0003@192.168.12.92 | 0003@192.168.12.94 | 2023-06-01 15:01:34.5 | | | | |
| 4 | 0004@192.168.12.92 | 0004@192.168.12.94 | 2023-06-01 15:01:34.5 | | | | |
| 5 | 0005@192.168.12.92 | 0005@192.168.12.94 | 2023-06-01 15:01:34.61 | | | | |
| 6 | 0006@192.168.12.92 | 0006@192.168.12.94 | 2023-06-01 15:01:34.684 | 00:01:00.041 | | | |
| 7 | 0007@192.168.12.92 | 0007@192.168.12.94 | 2023-06-01 15:01:34.715 | 00:01:00.043 | | | |
| 8 | 0008@192.168.12.92 | 0008@192.168.12.94 | 2023-06-01 15:01:34.786 | 00:01:00.024 | | | |
| 9 | 0009@192.168.12.92 | 0009@192.168.12.94 | 2023-06-01 15:01:34.876 | 00:01:00.047 | | | |

Save Call
Copy Cell Value

*Untitled - Notepad
File Edit Format View Help
2023-06-01 15:01:34.533
00:01:00.045
0003@192.168.12.92

Export Graph Duration 5 days 2023-06-01 15:01:34 Goto Save

Graph Start - (2023-05-27 15:02:16) Graph End - (2023-06-01 15:02:15)

Calls Per Second

Attempted Calls Passed Calls Failed Calls

01 - 15:02:00

Calls Rate RTP Packets Graph Average Jitter Distribution E-Model T.38 Analysis Call Flow Call Summary

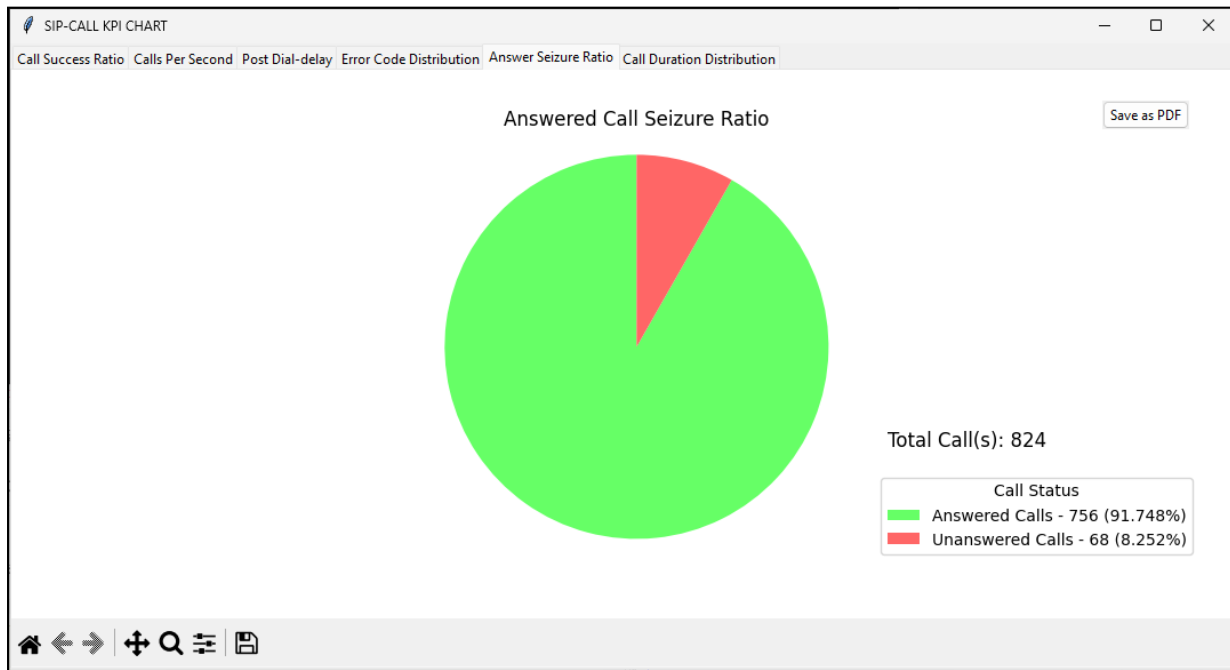
OverAll SIP RTP ED137

| | |
|---------------------------------|-----------|
| Active Calls | 0 |
| Completed Calls | 756 |
| Purged Calls(cleared) | 0 |
| Failed Calls | 68 |
| Calls Per Second | 0 |
| Non Purged Calls | 824 |
| Total Frames | 5 496 |
| Last Frame Processed | 5 496 |
| Total Processed Frames | 5 496 |
| Frames Purged Before Processing | 0 |
| Queue ToDecode:Decoded | 0:0 |
| TimeToProcess:(mm:ss) | |
| FrameProcess/Sec :: Rate(Mbps) | 0 :: 0.00 |
| HdWriteDrop:(fm.byte) | |
| VDIP Bandwidth | 0.00 |
| SIP Bandwidth | 0.00 |
| H323 Bandwidth | 0.00 |
| MEGACO Bandwidth | 0.00 |
| RTP Bandwidth | 0.00 |
| LuCS Bandwidth | 0.00 |
| Gsm Bandwidth | 0.00 |
| SCCP Bandwidth | 0.00 |

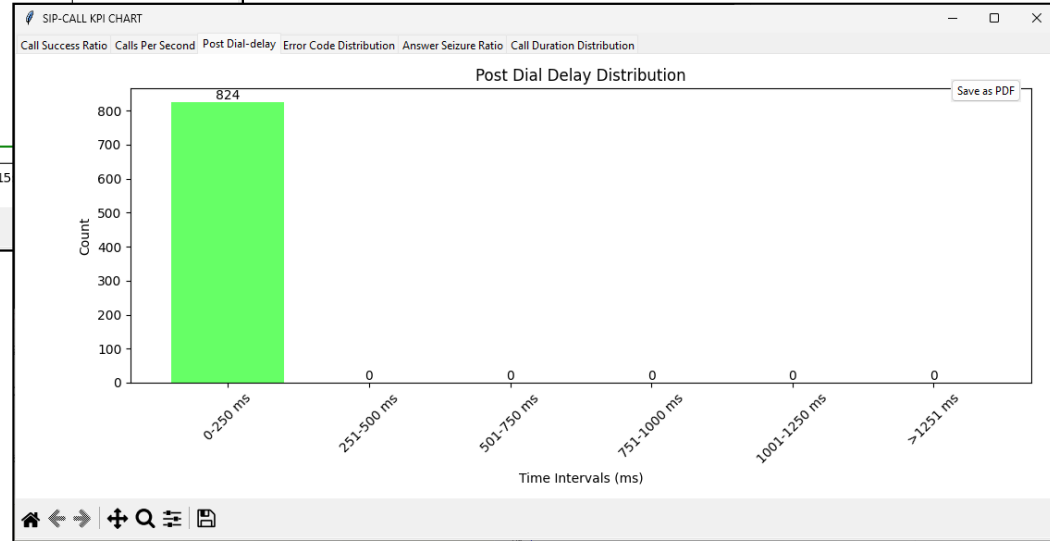
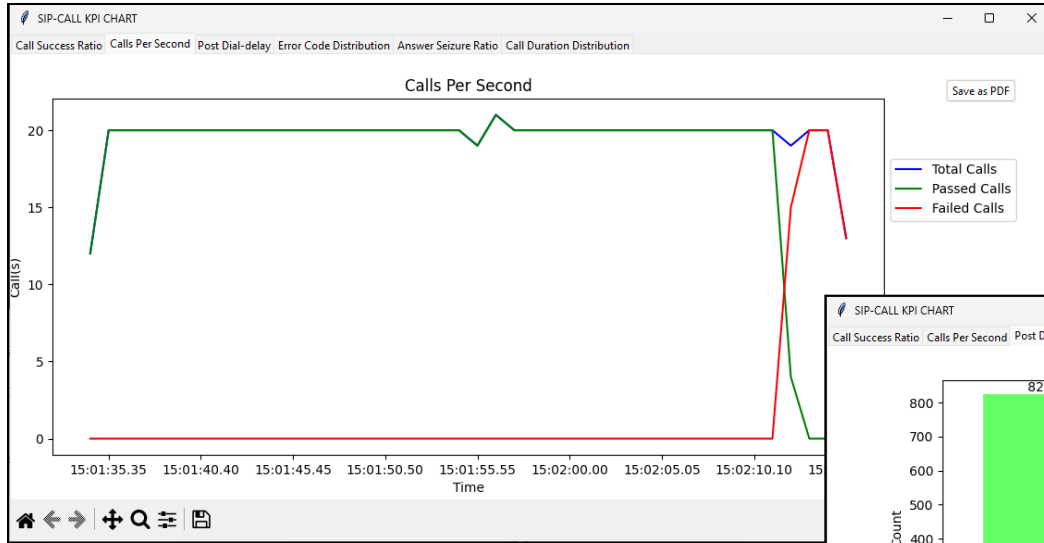
Key Performance Indicators (KPIs) Report for SIP Calls

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

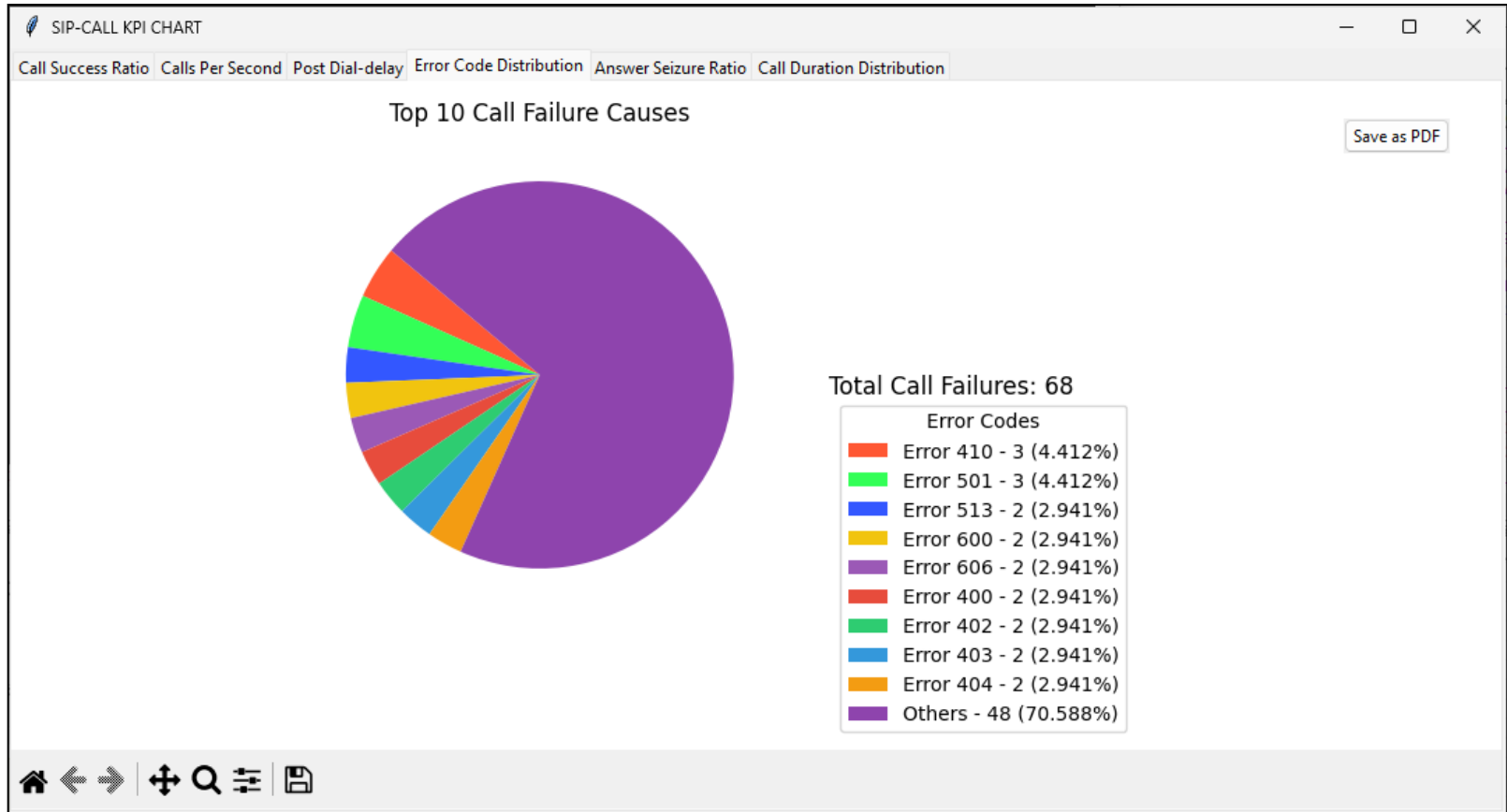
- **Call Success Ratio:** Displays graph for "Successful" and "Unsuccessful Calls," including counts and percentages (%)
- **Calls Per Second:** Shows graph "Total," "Passed," and "Failed Calls per second."
- **Post Dial Delay:** Shows delay counts in milliseconds (0-250ms, 251-500ms, etc.)
- **Error 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.)



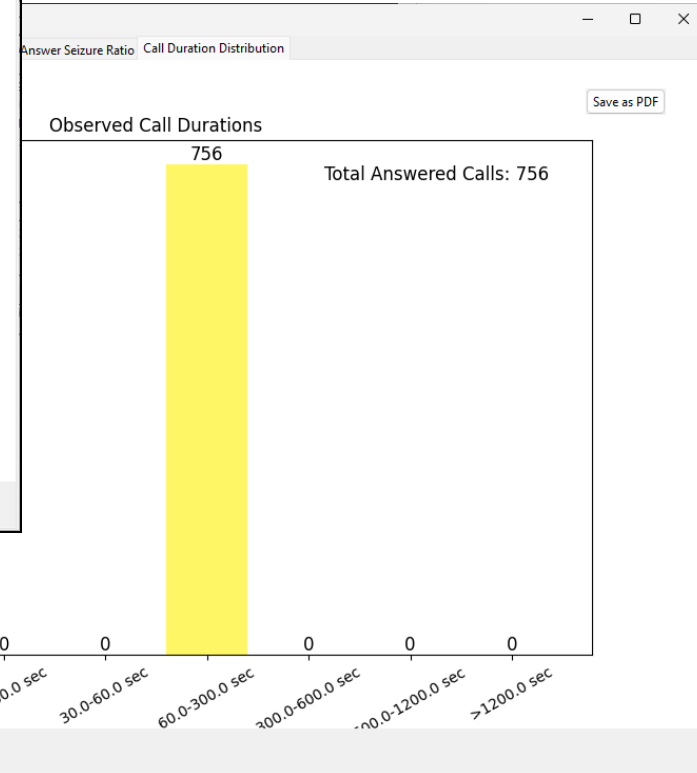
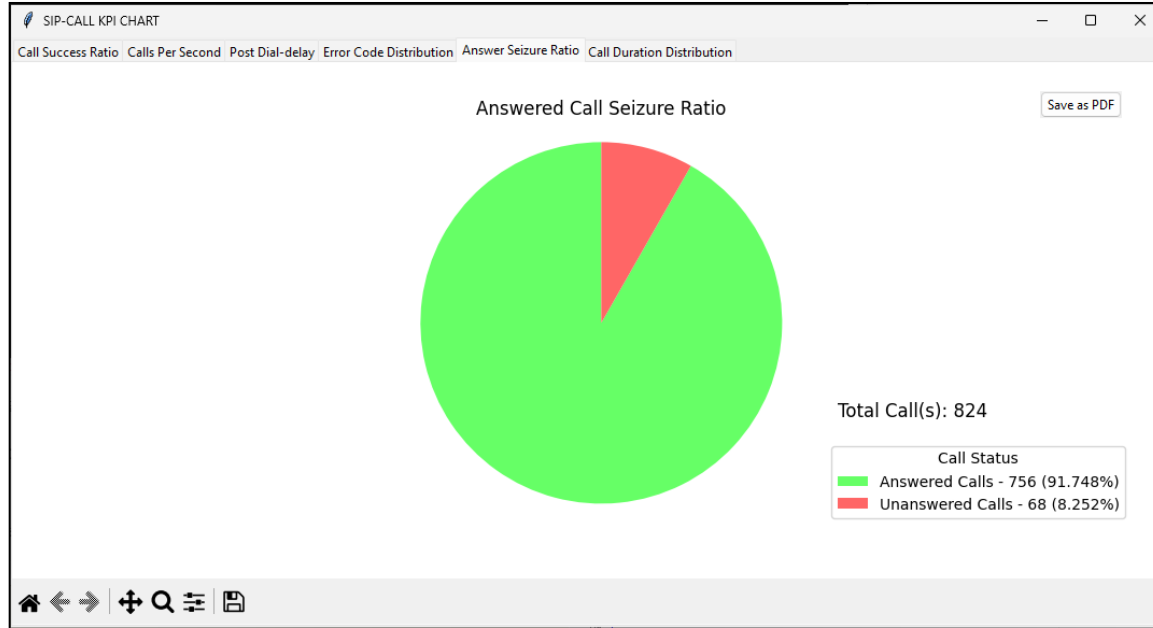
Calls Per Second and Post Delay KPIs



Error Code Distribution KPI



Answer Seizure Ratio and Call Duration Distribution KPIs



Call Graph – SIP Call

- Displays the message sequences of captured VoIP calls
- Decodes of the selected SIP message is displayed on the right pane
- The Complete Stack option enables the user to view the full call details for the selected message on the ladder diagram

The screenshot shows the PDA Packet Data Analyzer interface. At the top, the 'Call Summary' tab is active, displaying a table of call records. A red box highlights the first call record (Call # 1) with the following details:

| Call # | Caller | Callee | StartTime | Duration | VoiceQuality_L | VoiceQuality_R | Cor |
|--------|--------------------|--------------------|-------------------------|--------------|----------------|----------------|-----|
| 1 | 0001@192.168.12.92 | 0001@192.168.12.94 | 2023-06-01 15:01:34.419 | 00:01:00.023 | | | |

Below the call summary, the 'Ladder Diagram' pane shows a sequence of SIP messages between two endpoints (192.168.12.92 and 192.168.12.94). A red box highlights the 'INVITE' message at time 00.00.000. A red arrow points from this message to the 'Decoded Information' pane on the right. The 'Decoded Information' pane shows the full protocol stack for the selected message, with the 'Complete Stack' option checked. The stack includes MAC, IP, and UDP layers, with detailed fields for each. A blue text box with a red arrow points to the decoded information, stating: 'Displays decoded information of the selected SIP message'.

Call Graph – SIP ED-137

- Displays the message sequences of SIP ED-137 call
- Decodes of the selected SIP message is displayed on the right pane

The screenshot shows the Packet Data Analyzer (PDA) interface. The top pane displays a call summary table with columns for Call #, Caller, Callee, CallID, StartTime, Duration, Src_L, Payload_L, TotalPackets_L, ConversationalMos_L, ConversationalR_L, and Listen. The bottom pane shows a detailed view of a selected SIP message, including a sequence diagram and a protocol stack decode.

| Call # | Caller | Callee | CallID | StartTime | Duration | Src_L | Payload_L | TotalPackets_L | ConversationalMos_L | ConversationalR_L | Listen |
|--------|-------------------|---------------------|------------------------|---------------------|--------------|------------|-----------|----------------|---------------------|-------------------|--------|
| 1 | 0001@192.168.1.52 | 0001@192.168.12.105 | GL-MAPS_3_1879751-8... | 2017-01-13 12:31:10 | 00:00:29.844 | 29014389 | PCMA/8000 | 444 | 4.20 | 93 | 4 |
| 2 | 0001@192.168.1.52 | 0001@192.168.12.105 | GL-MAPS_10_2093727-... | 2017-01-13 12:34:44 | 00:00:00.000 | | | | | | |
| 3 | 0001@192.168.1.52 | 0001@192.168.12.105 | GL-MAPS_10_2145086-... | 2017-01-13 12:35:35 | 00:00:37.021 | 21949045 | G729/8000 | 550 | 4.06 | 87 | 4 |
| 4 | 0005@192.168.1.52 | 0005@192.168.12.117 | GL-MAPS_44_2802778-... | 2017-01-13 12:46:33 | 00:00:00.000 | | | | | | |
| 5 | 0005@192.168.1.52 | 0001@192.168.12.105 | GL-MAPS_3_2920954-1... | 2017-01-13 12:48:31 | 00:00:28.116 | 2092952065 | PCMA/8000 | 1399 | 4.20 | 93 | 4 |

| TimeStamp | Frame Number | 192.168.1.52 | 192.168.12.105 |
|-----------|--------------|--------------|---------------------------|
| 00.00.000 | 0 | 5060 | INVITE → 5060 |
| 00.00.023 | 1 | 5060 | SIP/2.0 100 Trying ← 5060 |
| 00.00.148 | 2 | 5060 | SIP/2.0 200 OK ← 5060 |
| 00.00.154 | 3 | 5060 | ACK → 5060 |
| 00.00.155 | 4 | 6000 | Keep Alive → 6000 |
| 00.00.161 | 5 | 6000 | Keep Alive ← 6000 |
| 00.01.170 | 16 | 5060 | SUBSCRIBE → 5060 |
| 00.01.176 | 17 | 5060 | SIP/2.0 200 OK ← 5060 |
| 00.01.178 | 18 | 5060 | NOTIFY ← 5060 |
| 00.01.182 | 19 | 5060 | SIP/2.0 200 OK → 5060 |


```
===== MAC Layer =====  
Destination Address = xCOEAE484BA90  
Source Address = x54BEF737BC42  
Length/Protocol Type = x0800 Internet IP(IPv4)  
===== IP Layer =====  
Version = 0100.... (4)  
Internet Header Length (In 32 bit words) = ....0101 (5)  
Differentiated Services Field =  
Differentiated Services Codepoint = 100010.. Assured Forwarding 41  
Explicit Congestion Notification = .....00 Not-ECT (Not ECN-Capable Tran  
Total Length = 961 (x03C1)  
Identification = 22542 (x580E)  
Reserved Bit = 0..... Not Set  
Don't fragment = .0..... Not Set  
More fragments = .0..... Not Set  
Fragment Offset = 0 (...000000 00000000)  
Time To Live = 128 (x80)  
Protocol = 00010001 User Datagram  
Header Check Sum = x0000  
Source IP Address = 192.168.1.52 (xCOA80134)  
Destination IP Address = 192.168.12.105 (xCOA80C69)  
===== UDP Layer =====  
Source Port = 5060 (x13C4)  
Destination Port = 5060 (x13C4)
```

Call Graph – MSRP Call

- Decodes of the selected MSRP message is displayed on the right pane

The screenshot displays the PDA Packet Data Analyzer interface. At the top, there is a menu bar with options: File, View, Call Summary, Protocol Configurations, GUI Configurations, and Help. Below the menu is a toolbar with various icons and a dropdown menu set to 'SIP'. The main window is divided into two panes. The upper pane shows a 'Call Summary' table with columns for Call #, Caller, Callee, CallID, StartTime, Duration, EndTime, and CallSuccess. The lower pane shows a 'Column Width' section with checkboxes for 'Absolute Timing' and 'Show Latest'. Below this is a sequence diagram showing the call flow between 192.168.10.13 and 192.168.10.14. The messages include INVITE, SIP/2.0 100 Trying, SIP/2.0 180 Ringing, SIP/2.0 200 OK, ACK, MSRP/SEND, MSRP/200 OK, MSRP/REPORT, and another MSRP/SEND. The selected MSRP/SEND message is highlighted in orange. To the right of the sequence diagram is a 'Find' pane with a search box and a 'Complete Stack' checkbox. The message decode for the selected MSRP/SEND is shown in the right pane, including fields like To-Path, From-Path, Message-ID, Success-Report, Failure-Report, Byte-Range, and Content-Type.

| Call # | Caller | Callee | CallID | StartTime | Duration | EndTime | CallSuccess |
|--------|--------------------|--------------------|---------------------------------|-------------------------|--------------|-------------------------|-------------|
| 2 | 0002@192.168.10.13 | 0002@192.168.10.14 | GL-MAPS-24652-493054435-1755... | 2021-05-11 01:43:17.742 | 00:02:00.037 | 2021-05-11 01:45:17.909 | 1 |
| 3 | 0003@192.168.10.13 | 0003@192.168.10.14 | GL-MAPS-24656-493054534-1755... | 2021-05-11 01:43:17.828 | 00:02:00.057 | 2021-05-11 01:45:18.028 | 1 |
| 4 | 0004@192.168.10.13 | 0004@192.168.10.14 | GL-MAPS-24587-493054633-1755... | 2021-05-11 01:43:17.915 | 00:02:00.024 | 2021-05-11 01:45:18.081 | 1 |
| 5 | 0005@192.168.10.13 | 0005@192.168.10.14 | GL-MAPS-24670-493054734-1755... | 2021-05-11 01:43:18.013 | 00:02:00.055 | 2021-05-11 01:45:18.210 | 1 |
| 6 | 0006@192.168.10.13 | 0006@192.168.10.14 | GL-MAPS-24591-493054834-1755... | 2021-05-11 01:43:18.123 | 00:02:00.022 | 2021-05-11 01:45:18.297 | 1 |
| 7 | 0007@192.168.10.13 | 0007@192.168.10.14 | GL-MAPS-24699-493054933-1755... | 2021-05-11 01:43:18.231 | 00:02:00.023 | 2021-05-11 01:45:18.394 | 1 |
| 8 | 0008@192.168.10.13 | 0008@192.168.10.14 | GL-MAPS-24659-493055033-1755... | 2021-05-11 01:43:18.318 | 00:00:00.000 | 2021-05-11 01:43:18.328 | 0 |
| 9 | 0009@192.168.10.13 | 0009@192.168.10.14 | GL-MAPS-24663-493055133-1755... | 2021-05-11 01:43:18.415 | 00:00:00.000 | 2021-05-11 01:43:18.425 | 0 |

```
TimeStamp      Frame Number  192.168.10.13      192.168.10.14
00.00.000      8             5060               5060
                INVITE
00.00.010      9             5060               5060
                SIP/2.0 100 Trying
00.00.021      12            5060               5060
                SIP/2.0 180 Ringing
00.00.130      28            5060               5060
                SIP/2.0 200 OK
00.00.140      31            5060               5060
                ACK
00.00.194      38            24339              21366
                MSRP/SEND
00.00.205      41            24339              21366
                MSRP/200 OK
00.00.216      43            24339              21366
                MSRP/REPORT
00.00.227      45            24339              21366
                MSRP/SEND
00.00.249      48            24339              21366
                MSRP/200 OK
00.00.271      51            24339              21366
                MSRP/REPORT
00.01.218      215           24339              21366
                MSRP/SEND
00.01.230      220           24339              21366
                MSRP/200 OK
```

MSRP glMapsMrsp226789 SEND
To-Path: msrp://192.168.10.14:21366/GL_MAPS_0CA5E3B3;tcp
From-Path: msrp://192.168.10.13:24339/GL_MAPS_3B40F48D;tcp
Message-ID: glMapsMrsp226788
Success-Report: no
Failure-Report: yes
Byte-Range: 1-270/270
Content-Type: text/plain
GL's Message Automation & Protocol Simulation (MAPS™) is a protocol simulation and
-----glMapsMrsp226789#

LTE Call Flow

Packet Data Analyzer - Summary View

File View Call Summary Protocol Configurations GUI Configurations Help

LTE Show All Calls Call Count: 1

| Call# | IMSI | M_TMSI | Result | EmmCause | EsmCause | APN | SIAuthenticationResult | S6a Authentic |
|-------|-----------------|------------|-----------------|-------------------------|----------------------|--------------|------------------------|---------------|
| 1 | 001013012041631 | 1549201847 | Attach Accepted | CS domain not available | Regular deactivation | internet-ims | SI Authenticated | Authenti |

Column Width Absolute Timing Show Latest

| 192.168.12.27 | 192.168.12.26 | 192.168.12.110 |
|---------------|---|----------------|
| 36412 | InitialUEMessage - Attach Request-PDN C... | 36412 |
| | 3868 Authentication-Information Request | 3868 |
| | 3868 Authentication-Information Answer | 3868 |
| 36412 | DownlinkNASTransport - Authentication R... | 36412 |
| 36412 | UplinkNASTransport - Authentication Res... | 36412 |
| 36412 | DownlinkNASTransport - Security Mode C... | 36412 |
| 36412 | UplinkNASTransport - Security Mode Con... | 36412 |
| 36412 | DownlinkNASTransport - ESM Information... | 36412 |
| 36412 | UplinkNASTransport - ESM Information Re... | 36412 |
| | 3868 Update-Location Request | 3868 |
| | 3868 Insert-Subscriber-Data Request | 3868 |
| | 3868 Insert-Subscriber-Data Answer | 3868 |
| | 3868 Update-Location Answer | 3868 |
| 36412 | InitialContextSetupRequest - Attach Acco... | 36412 |
| 36412 | InitialContextSetupResponse | 36412 |
| 36412 | UplinkNASTransport - Attach Complete Ac... | 36412 |
| 36412 | UplinkNASTransport - PDN Connectivity R... | 36412 |

Find Complete Stack

```

----- SIAP Layer -----
SIAP-PDU =
  InitiatingMessage = InitiatingMessage (0)
  ProcedureCode = 12 id-initialUEMessage
  Criticality = 1 ignore(1)
  Value =
    InitialUEMessage =
      ProtocolIE-Container = 5 Items
      Item = 0
      ProtocolIE-Field =
        ProtocolIE-ID = 8 id-eNB-UE-SIAP-ID
        Criticality = 0 reject(0)
        value =
          eNB-UE-SIAP-ID = 10006
      Item = 1
      ProtocolIE-Field =
        ProtocolIE-ID = 26 id-NAS-PDU
        Criticality = 0 reject(0)
        value =
          NAS-PDU =
            NAS-PDU = x0741720BF600F110000201DAD46F3504E06
            Item = 2
            ProtocolIE-Field =
              ProtocolIE-ID = 67 id-TAI
              Criticality = 0 reject(0)
              value =
                TAI =
                  pLMNidentity =
                    MCC = 001
                    MNC = 01
                    TAC = x0002
            Item = 3
            ProtocolIE-Field =
              ProtocolIE-ID = 100 id-EUTRAN-CCI
              Criticality = 1 ignore(1)
              value =
                EUTRAN-CCI =
                  pLMNidentity =
  
```

Calls Rate Call Flow Call Summary

Call Graph – 5G N1N2 Call

Packet Data Analyzer - Summary View

File View Call Summary Protocol Configurations GUI Configurations Help

5G N1N2 Interface Show All Calls Call Count: 1

| Call# | StartTime | EndTime | Duration | SUPI | SUCI | STMSI | IMEISV | gNB | AMF | RanUeNgapId |
|-------|-------------------------|-------------------------|--------------|-----------------|------------|-----------|------------------|---------------|---------------|-------------|
| 1 | 2024-05-29 01:20:10.496 | 2024-05-29 01:20:36.313 | 00:00:16.009 | 001013012041631 | 3012041631 | 230464386 | 1234567890123001 | 192.168.31.77 | 192.168.31.55 | 2 |

Column Width Absolute Timing Show Latest

| gNB | AMF | AUSF | UDM |
|--|---|------|-----|
| InitialUEMessage - Registration Request | 38412 | | |
| 51002 POST /nausf-auth/v1/ue-authentications | | 6666 | |
| | 51001 POST /nudm-ueau/v1/suci-0-001-01-000 | 6666 | |
| | 51001 200 | 6666 | |
| 51002 201 | | 6666 | |
| DownlinkNASTransport - Authentication R... | 38412 | | |
| UplinkNASTransport - Authentication Res... | 38412 | | |
| 51002 PUT /nausf-auth/v1/ue-authentications/A | | 6666 | |
| 51002 200 | | 6666 | |
| DownlinkNASTransport - Security Mode C... | 38412 | | |
| | 51001 POST /nudm-ueau/v1/imsi-001013012041631 | 6666 | |
| UplinkNASTransport - Security Mode Com... | 38412 | | |
| | 51001 201 | 6666 | |
| 51006 PUT /nudm-uecm/v1/imsi-001013012041631/registrations/amf-3gpp-access | | 6666 | |
| 51006 201 | | 6666 | |
| 51006 GET /nudm-sdm/v2/imsi-001013012041631/nssai | | 6666 | |
| 51006 200 | | 6666 | |
| 51006 GET /nudm-sdm/v2/imsi-001013012041631/am-data | | 6666 | |
| 51006 200 | | 6666 | |

```

Find Complete Stack
===== NGAP Layer =====
NGAP-PDU
InitiatingMessage
  ProcedureCode
    = 15 id-InitialUEMessage
  procedureCriticality
    = 0 reject(0)
  Value
    InitialUEMessage
      ProtocolIE-Container
        = 6 Items
      Item
        ProtocolIE-Field
          ProtocolIE-ID
            = 85 id-RAN-UE-NGAP-ID
          procedureCriticality
            = 0 reject(0)
          Value
            RAN-UE-NGAP-ID
              = 2
            Item
              ProtocolIE-Field
                ProtocolIE-ID
                  = 38 id-NAS-PDU
                procedureCriticality
                  = 0 reject(0)
                Value
                  NAS-PDU
                    NAS PDU Dump
                      = x7E004171000D0100F11000000000
                    = 2
                ProtocolIE-Field
                  ProtocolIE-ID
                    = 121 id-UserLocationInformation
                  procedureCriticality
                    = 0 reject(0)
                  Value
                    UserLocationInformation
                      userLocationInformationNR (1)
                        nR-CGI
                          =
                        pLMNIdentity
                          MCC
                            = 001
                          MNC
                            = 01
                          nRCellIdentity
                            = 00000000000000000000000000000000
                        tAI
                          =
                        pLMNIdentity
                          MCC
                            = 001
                          MNC
                            = 01
                          tAC
                            = x000001
                        = 3
                ProtocolIE-Field
                  ProtocolIE-ID
                    = 90 id-RRCEstablishmentCause
                  procedureCriticality
                    = 0 reject(0)
                    
```

Calls Rate Call Flow Call Summary

Signaling / Audio/ Video QoS Parameters

Packet Data Analyzer - Summary View

File View Call Summary Protocol Configurations GUI Configurations Help

SIP Show All Calls Call Count: 824

Call Summary SIP Registration Summary Alert Summary

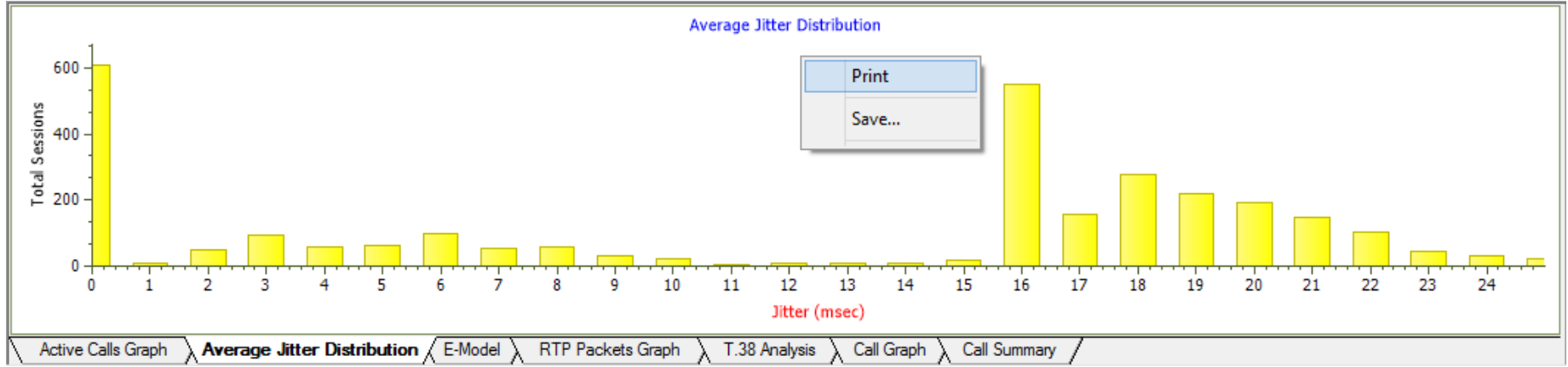
| Call # | SSRC | Payload | Packet Received | Conversational MOS/R... | Listening MOS/R... | Latest MOS_Dist | OverAll VoiceQ... | Packets Discard... | Missing Packets... | Duplicate Packets... | Out Of Sequence | Average Gap(ms) | Average Delay | Average Jitter | Average Inter | Cumulative Packet | Max/Min Gap | Max/Min Delay | Max/Min Jitter | Max/Min RTDela... | Average RTDela... | IuupHdr CRC | Iu CI |
|--|----------|---------|-----------------|-------------------------|--------------------|-----------------|-------------------|--------------------|--------------------|----------------------|-----------------|-----------------|---------------|----------------|---------------|-------------------|-------------|---------------|----------------|-------------------|-------------------|-------------|-------|
| Call#000001 Caller:0001 Callee:0001 CallId:GL-MAPS-1898-766689277-20836-3688@192.168.12.92 Call StartTime:2023-06-01 15:01:34.419 Call Duration: 00:01:00.023 | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 42949... | PCMU... | 0 | 0.00 / 0 | 0.00 / 0 | 0 / 0 / 0 | | 0 / 0.00 | 0 / 0.00 | 0 / 0.00 | 0 / 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 / ... | 0 / 0 | 0.00 / ... | 0.000 ... | 0.000 | 0 / 0 | 0 |
| 1 | 42949... | PCMU... | 0 | 0.00 / 0 | 0.00 / 0 | 0 / 0 / 0 | | 0 / 0.00 | 0 / 0.00 | 0 / 0.00 | 0 / 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 / ... | 0 / 0 | 0.00 / ... | 0.000 ... | 0.000 | 0 / 0 | 0 |
| Call#000002 Caller:0002 Callee:0002 CallId:GL-MAPS-1898-766689328-20842-14696@192.168.12.92 Call StartTime:2023-06-01 15:01:34.482 Call Duration: 00:01:00.033 | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 42949... | MuLA... | 0 | 0.00 / 0 | 0.00 / 0 | 0 / 0 / 0 | | 0 / 0.00 | 0 / 0.00 | 0 / 0.00 | 0 / 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 / ... | 0 / 0 | 0.00 / ... | 0.000 ... | 0.000 | 0 / 0 | 0 |
| 2 | 42949... | MuLA... | 0 | 0.00 / 0 | 0.00 / 0 | 0 / 0 / 0 | | 0 / 0.00 | 0 / 0.00 | 0 / 0.00 | 0 / 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 / ... | 0 / 0 | 0.00 / ... | 0.000 ... | 0.000 | 0 / 0 | 0 |
| Call#000003 Caller:0003 Callee:0003 CallId:GL-MAPS-1898-766689378-20848-13540@192.168.12.92 Call StartTime:2023-06-01 15:01:34.533 Call Duration: 00:01:00.045 | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 42949... | PCMA... | 0 | 0.00 / 0 | 0.00 / 0 | 0 / 0 / 0 | | 0 / 0.00 | 0 / 0.00 | 0 / 0.00 | 0 / 0.00 | 0.00 | 0.00 | 0.00 | 0 | 0 | 0.00 / ... | 0 / 0 | 0.00 / ... | 0.000 ... | 0.000 | 0 / 0 | 0 |

| Signaling Parameters | Value | Audio Parameters | Value | Video Parameters | Value |
|---------------------------------|-----------------------|--|---------------------|------------------------------------|-------|
| Caller | 0001 | Src RTP Channel | 192.168.12.92: 1026 | Src Video Channel | |
| Callee | 0001 | Src Media Type | PCMU/8000 | Src Media Type | |
| CallId | GL-MAPS-1898-766... | Src SSRC | 4294967295 | Src SSrc | |
| Call Status | Terminated | Src Packets Count | 0 | Src Packets Count | |
| Call Initiated Time | 2023-06-01 15:01:3... | Src Missing Packets / (%) | 0 / 0.00 | Src Missing Packets / (%) | |
| Call Established Time | 2023-06-01 15:01:3... | Src Duplicate Packets / (%) | 0 / 0.00 | Src Duplicate Packets / (%) | |
| Call Stop Time | 2023-06-01 15:02:3... | Src Out of Sequence Packets / (%) | 0 / 0.00 | Src Out of Sequence Packets / (%) | |
| Call Duration | 00:01:00.023 | Src Conversational MOS/R-Factor | 0.00 / 0 | Src Video Frame count | |
| Call Terminator | Callee | Src Listening MOS/R-Factor | 0.00 / 0 | Src Frame Rate(Frames/sec) | |
| Call Failure Reason | | Src GoodCMos/FairCMos/PoorCMos (Seconds) | 0 / 0 / 0 | Src AvgDelay | |
| Session Request Delay (msec) | 29.972 | Src Voice Quality | | Src AvgGap | |
| Session Disconnect Delay (msec) | 9.886 | Src Discarded Packets / (%) | 0 / 0.00 | Src MDI (DF:MLR) | |
| Post Pickup Delay (msec) | 00.00 | Src Average Inter Arrival Jitter (RTCP) | 0 | Src AvgMDI(DF:MLR) | |
| Total Signaling Frames | 7 | Src Average Jitter | 0.00 | Dest Video Channel | |
| Call Type | | Src Average Delay | 0.00 | Dest Media Type | |
| SubCallType | | Src Average Gap | 0.00 | Dest SSrc | |
| PTTCount | 0 | Dest RTP Channel | 192.168.12.94: 1026 | Dest Packets Count | |
| SquelchCount | 0 | Dest Media Type | PCMU/8000 | Dest Missing Packets / (%) | |
| PTTMCount | 0 | Dest SSRC | 4294967295 | Dest Duplicate Packets / (%) | |
| PTTSCount | 0 | Dest Packets Count | 0 | Dest Out of Sequence Packets / (%) | |
| PPSCTCount | 0 | Dest Missing Packets / (%) | 0 / 0.00 | Dest Video Frame count | |
| | | Dest Duplicate Packets / (%) | 0 / 0.00 | Dest Frame Rate(Frames/sec) | |
| | | Dest Out of Sequence Packets / (%) | 0 / 0.00 | Dest AvgDelay | |
| | | Dest Conversational MOS/R-Factor | 0.00 / 0 | Dest AvgGap | |

Average Jitter Distribution E-Model T.38 Analysis Call Flow Call Summary

Average Jitter Distribution Graph

- Distribution of the Average Jitter values across Total Sessions

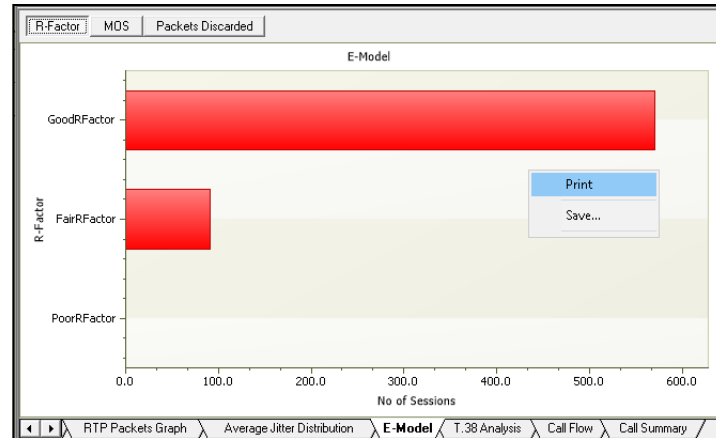


MOS Graph and R-Factor Graph

- E-Model 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 across No. of Sessions
 - Packets Discarded – A bar graph that plots Packets Discarded across No. of Sessions

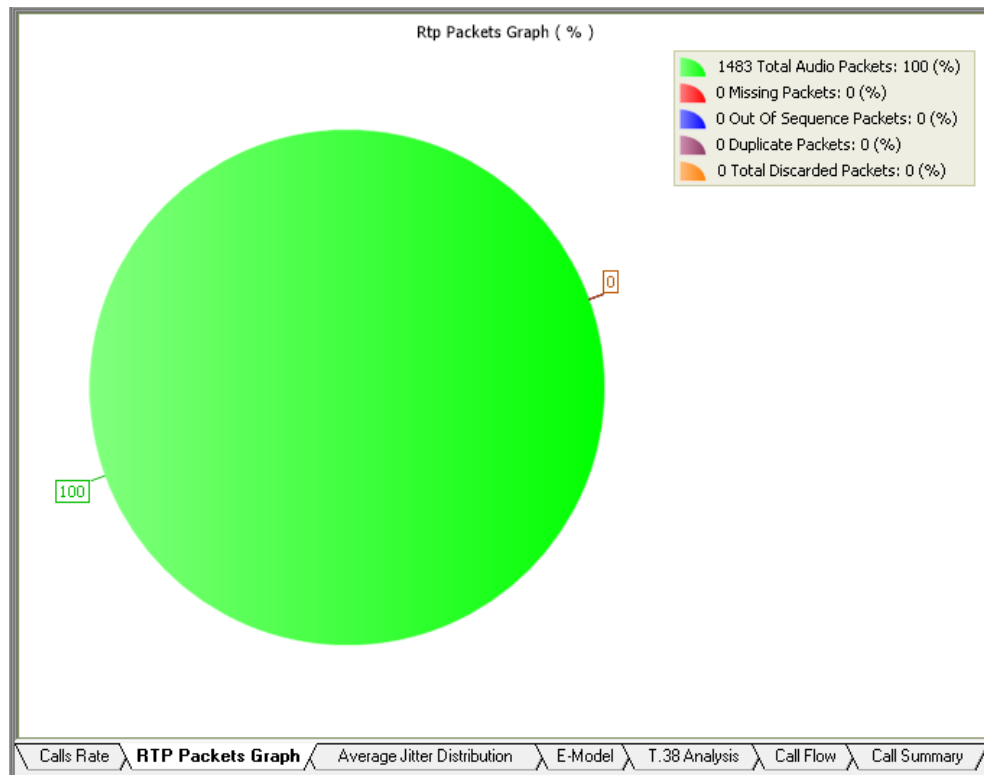


MOS



R Factor

RTP Packets Graph



- RTP Packets graph plots and compares out of ordered packets, missing packets and duplicate packets against Total Audio Packets

T.38 Analysis - Fax over IP

- Supports capturing and decoding of Fax (T.38 data) calls over VoIP
- Decodes of selected FAX message is displayed on the right pane
- Captured fax calls by PacketScan™ can also be analyzed using GLInsight™ by saving the fax calls directly in (*.PCAP) Ethereal file format

The screenshot displays the Packet Data Analyzer (PDA) interface. At the top, the 'Show Fax Calls' button is highlighted with a red box. Below it, a table shows call details for call #1, including source and destination IP addresses (390089559 and 93) and durations (4.20). The main pane shows a list of packets, with the selected packet (00.27.343) highlighted in orange. The right pane shows the decoded T.38 Layer information, including fields like seq-number, Contents, primary-ifp-packet, Length, and type-of-msg. A blue arrow points from the selected packet in the list to the decoded information on the right, with the text 'Displays decoded information of the selected FAX message'.

| Call # | Src_L | Conv_Mos_L | Conv_R_L | Listening_Mos_L | Listening_R_L | PacketsDiscarded_L | PacketsDiscarded(%)_L |
|--------|-----------|------------|----------|-----------------|---------------|--------------------|-----------------------|
| 1 | 390089559 | 4.20 | 93 | 4.20 | 93 | 0 | 0.00 |

| TimeStamp | 192.168.1.244 | 192.168.1.60 | |
|--------------|---------------|--|------|
| 00.17.274... | 5004 | (Frm:1409)Msg:no-signal | 5004 |
| 00.17.274... | 5004 | (Frm:1410)Msg:no-signal | 5004 |
| 00.17.275... | 5004 | (Frm:1411)Msg:no-signal | 5004 |
| 00.27.343... | 5004 | (Frm:1419)Msg:no-signal | 5004 |
| 00.27.343... | 5004 | (Frm:1419)Msg:ced | 5004 |
| 00.30.538... | 5004 | (Frm:1420)Msg:v21-preamble | 5004 |
| 00.31.580... | 5004 | (Frm:1421)Msg:NSF | 5004 |
| 00.31.955... | 5004 | (Frm:1422)Msg:CSI NUM 918040468401et | 5004 |
| 00.32.648... | 5004 | (Frm:1440)Msg:DIS.DSRU.T.V.27 ter and V.29 | 5004 |
| 00.33.110... | 5004 | (Frm:1451)Msg:no-signal | 5004 |
| 00.39.617... | 5004 | (Frm:1561)Msg:v21-preamble | 5004 |
| 00.40.659... | 5004 | (Frm:1563)Msg:CFR | 5004 |
| 00.40.834... | 5004 | (Frm:1566)Msg:no-signal | 5004 |
| 01.11.404... | 5004 | (Frm:2368)Msg:v21-preamble | 5004 |

```
===== T.38 Layer =====
UDTLPacket = SEQUENCE
seq-number = INTEGER
Contents = 3
primary-ifp-packet = Open Type
Length = 1
IFPPacket = SEQUENCE
Preamble = 0
type-of-msg = CHOICE
Choice Index = 0
t30-indicator = ENUMERATOR
Extensibility Marker = 0
Contents = 0 no-signal(0)
error-recovery = CHOICE
Choice Index = 0
secondary-ifp-packets = SEQUENCE OF
Iteration Count = 1
secondary-ifp-packets = Instance 0
primary-ifp-packet = Open Type
Length = 1
IFPPacket = SEQUENCE
Preamble = 0
type-of-msg = CHOICE
Choice Index = 0
t30-indicator = ENUMERATOR
Extensibility Marker = 0
Contents = 0 no-signal(0)
===== MAC Layer =====
Padding octets = x401188E4C0A8
FCS = x013CCA38 [Invalid FCS. Correct FCS is xA72500]
```

Displays decoded information of the selected FAX message

Call Detail View

- Provides a detail look at the two (or one) RTP sessions that are part of a single call
- Left and right panes accommodate the two sessions

Packet Data Analyzer - Detail View

File View Detail View Protocol Configurations GUI Configurations Help

SIP Show All Calls Call Count: 1

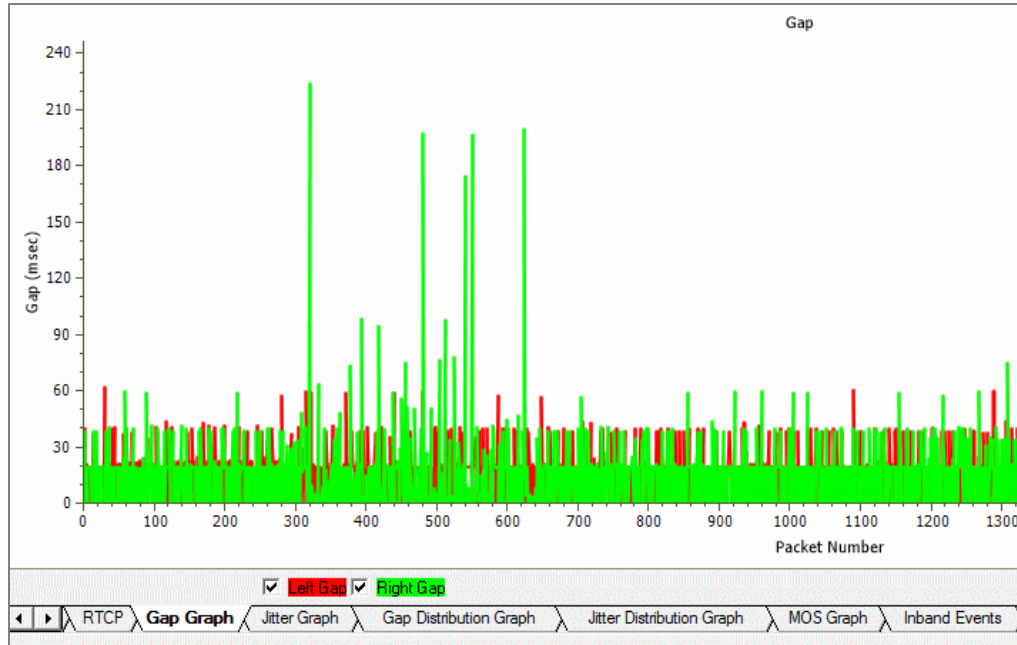
Call Summary SIP Registration Summary Alert Summary

| Packet # | Sequence # | RTP Tim... | Payload Type | Payload ... | Packet Sequence | Gap(ms) | Gap A... | Packet # | Sequence # | RTP Tim... | Payload Type | Payload ... | Packet Sequence | Gap(ms) | Gap A... |
|----------|------------|------------|--------------|-------------|----------------------|---------|----------|----------|------------|------------|--------------|-------------|----------------------|---------|----------|
| 12 | 41768 | 432562512 | PCMU/8000 | 160 | Session In Probation | 0.00 | 0.00 | 19 | 47043 | 3301552... | PCMU/8000 | 160 | Session In Probation | 0.00 | 0.00 |
| 14 | 41769 | 432562672 | PCMU/8000 | 160 | Session In Probation | 19.53 | 20.00 | 21 | 47044 | 3301553... | PCMU/8000 | 160 | Session In Probation | 19.53 | 20.00 |
| 16 | 41770 | 432562832 | PCMU/8000 | 160 | In Sequence | 20.49 | 20.00 | 23 | 47045 | 3301553... | PCMU/8000 | 160 | In Sequence | 19.47 | 20.00 |
| 18 | 41771 | 432562992 | PCMU/8000 | 160 | In Sequence | 19.57 | 20.00 | 25 | 47046 | 3301553... | PCMU/8000 | 160 | In Sequence | 20.51 | 20.00 |
| 20 | 41772 | 432563152 | PCMU/8000 | 160 | In Sequence | 20.51 | 20.00 | 27 | 47047 | 3301553... | PCMU/8000 | 160 | In Sequence | 19.53 | 20.00 |
| 22 | 41773 | 432563312 | PCMU/8000 | 160 | In Sequence | 19.52 | 20.00 | 29 | 47048 | 3301553... | PCMU/8000 | 160 | In Sequence | 20.55 | 20.00 |
| 24 | 41774 | 432563472 | PCMU/8000 | 160 | In Sequence | 20.75 | 20.00 | 31 | 47049 | 3301553... | PCMU/8000 | 160 | In Sequence | 19.48 | 20.00 |
| 26 | 41775 | 432563632 | PCMU/8000 | 160 | In Sequence | 19.31 | 20.00 | 33 | 47050 | 3301554... | PCMU/8000 | 160 | In Sequence | 20.51 | 20.00 |
| 28 | 41776 | 432563792 | PCMU/8000 | 160 | In Sequence | 19.50 | 20.00 | 35 | 47051 | 3301554... | PCMU/8000 | 160 | In Sequence | 19.53 | 20.00 |
| 30 | 41777 | 432563952 | PCMU/8000 | 160 | In Sequence | 19.56 | 20.00 | 37 | 47052 | 3301554... | PCMU/8000 | 160 | In Sequence | 21.48 | 20.00 |
| 32 | 41778 | 432564112 | PCMU/8000 | 160 | In Sequence | 21.46 | 20.00 | 39 | 47053 | 3301554... | PCMU/8000 | 160 | In Sequence | 19.53 | 20.00 |
| 34 | 41779 | 432564272 | PCMU/8000 | 160 | In Sequence | 19.57 | 20.00 | 41 | 47054 | 3301554... | PCMU/8000 | 160 | In Sequence | 19.53 | 20.00 |
| 36 | 41780 | 432564432 | PCMU/8000 | 160 | In Sequence | 20.44 | 20.00 | 43 | 47055 | 3301554... | PCMU/8000 | 160 | In Sequence | 19.53 | 20.00 |
| 38 | 41781 | 432564592 | PCMU/8000 | 160 | In Sequence | 19.54 | 20.00 | 45 | 47056 | 3301554... | PCMU/8000 | 160 | In Sequence | 20.51 | 20.00 |
| 40 | 41782 | 432564752 | PCMU/8000 | 160 | In Sequence | 19.51 | 20.00 | 47 | 47057 | 3301555... | PCMU/8000 | 160 | In Sequence | 20.50 | 20.00 |
| 42 | 41783 | 432564912 | PCMU/8000 | 160 | In Sequence | 20.51 | 20.00 | 49 | 47058 | 3301555... | PCMU/8000 | 160 | In Sequence | 19.53 | 20.00 |

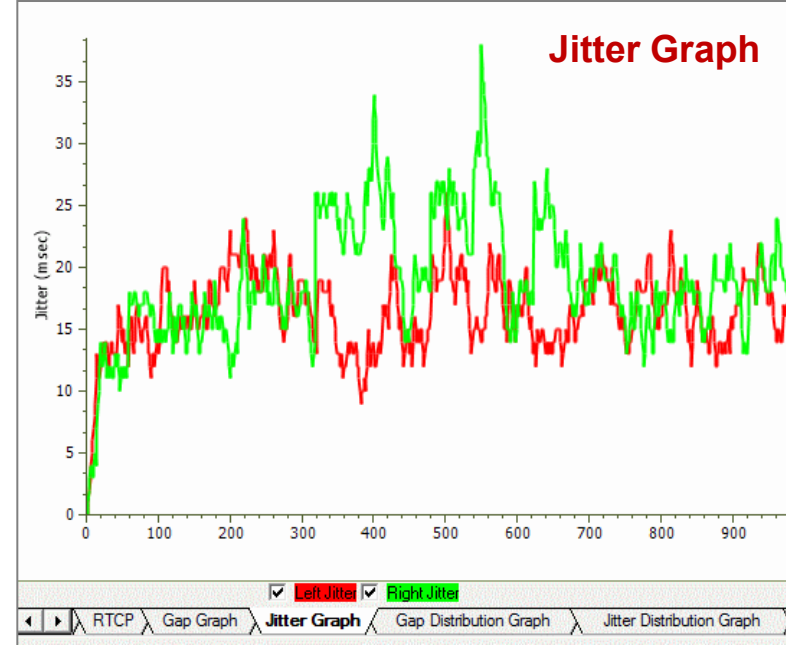
| Heading | Value | Heading | Value |
|-----------------------------|---------------|-----------------------------|---------------|
| SSRC | 3365468417 | SSRC | 3380545537 |
| Source IP Address | 192.168.1.200 | Source IP Address | 192.168.1.103 |
| Destination IP Address | 192.168.1.103 | Destination IP Address | 192.168.1.200 |
| Source Port | 1024 | Source Port | 1024 |
| Destination Port | 1024 | Destination Port | 1024 |
| RTP Packets Count | 1266 | RTP Packets Count | 1263 |
| RTCP Packets Count | 2 | RTCP Packets Count | 1 |
| Packets With Marker Bit | 0 | Packets With Marker Bit | 0 |
| Total Audio Bytes | 202401 | Total Audio Bytes | 201921 |
| RTCP Sender's Reports | 2 | RTCP Sender's Reports | 1 |
| RTCP Receiver's Reports | 0 | RTCP Receiver's Reports | 0 |
| Out Of Sequence Packets \ % | 0 \ 0.00 | Out Of Sequence Packets \ % | 0 \ 0.00 |
| Missing Packets \ % | 0 \ 0.00 | Missing Packets \ % | 0 \ 0.00 |
| Duplicate Packets \ % | 0 \ 0.00 | Duplicate Packets \ % | 0 \ 0.00 |

RTP Statistics RTCP Gap Graph Jitter Graph Gap Distribution Graph Jitter Distribution Graph MOS Graph Inband Events RTP Events Wave Graph Spectral Display R-Factor Statistics

Gap and Jitter Graph

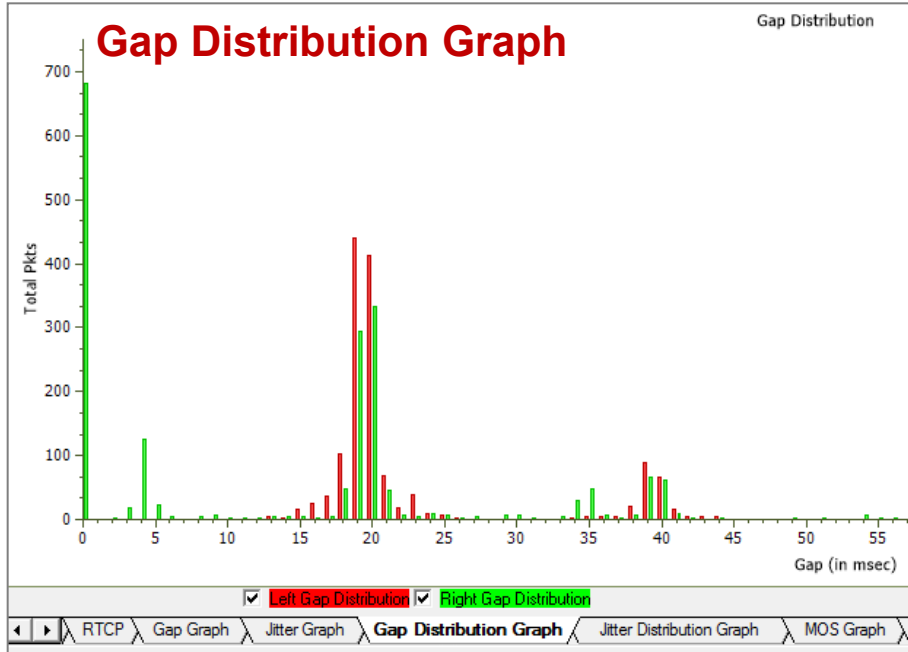


- Gap graph plots the Gap (in milliseconds) versus the packet number

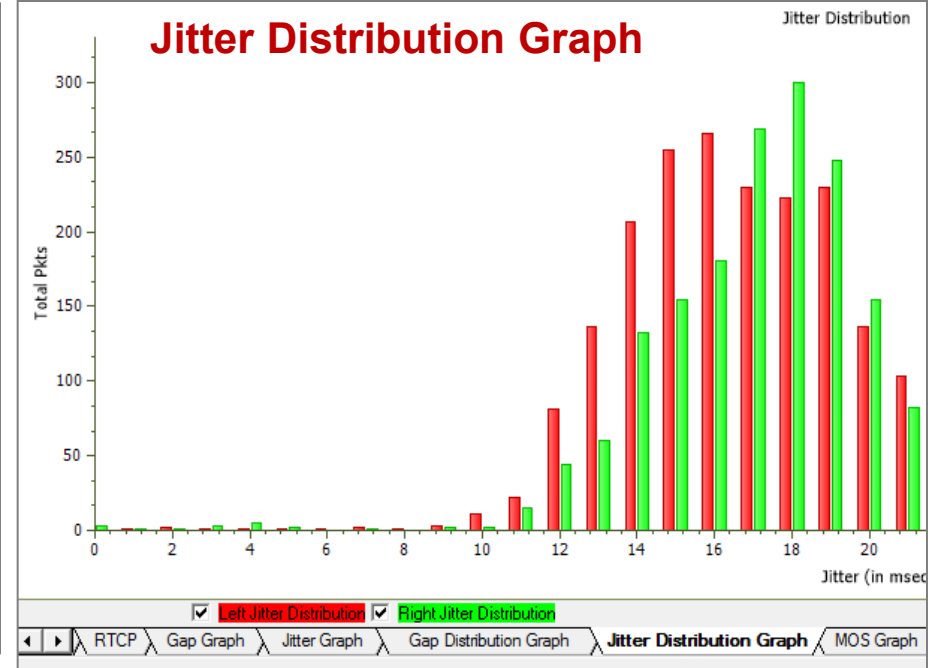


- Jitter graph plots the Jitter versus the packet number

Gap and Jitter Distribution Graph



- Number of packets with a particular value of gap is plotted against the (gap) value



- Number of packets with a particular value of jitter is plotted against the jitter value

MOS Graph



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

Inband and Outband (RTP) Events

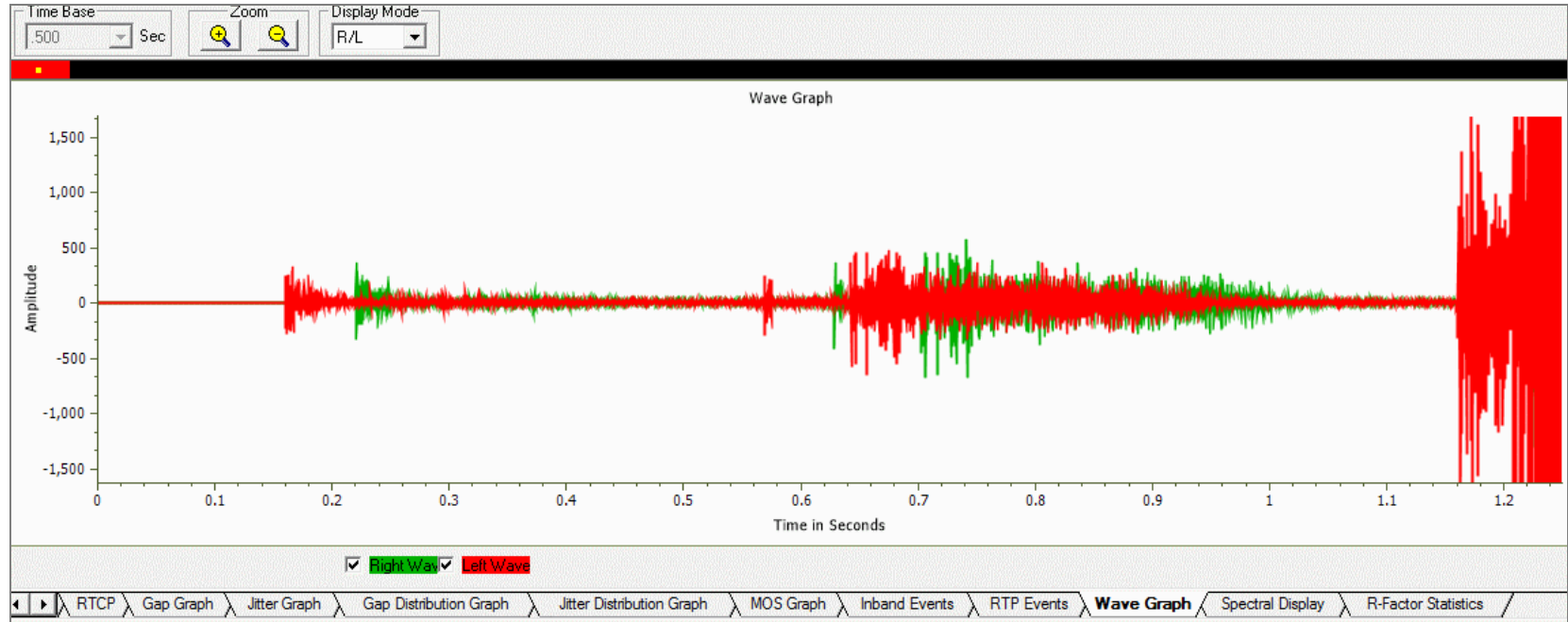
| TimeStamp | Type | Event | On(ms) | Power(dBm) | Freq1(Hz)/Pow... | Freq2(Hz)/Pow... |
|--------------|------|-------|--------|------------|------------------|------------------|
| 00:00:00.000 | IDLE | | 45470 | 0.00 | | |
| 00:00:45.470 | DTMF | 1 | 80 | -1.89 | 698/-6.01 | 1210/-4.01 |
| 00:00:45.550 | IDLE | | 80 | 0.00 | | |
| 00:00:45.630 | DTMF | 2 | 80 | -1.87 | 698/-6.00 | 1337/-3.99 |
| 00:00:45.710 | IDLE | | 80 | 0.00 | | |
| 00:00:45.790 | DTMF | 3 | 80 | -1.85 | 698/-5.98 | 1478/-3.99 |
| 00:00:45.870 | IDLE | | 80 | 0.00 | | |
| 00:00:45.950 | DTMF | 4 | 80 | -1.86 | 771/-5.98 | 1210/-4.01 |
| 00:00:46.030 | IDLE | | 80 | 0.00 | | |
| 00:00:46.110 | DTMF | 5 | 80 | -1.86 | 771/-5.98 | 1337/-3.99 |
| 00:00:46.190 | IDLE | | 80 | 0.00 | | |
| 00:00:46.270 | DTMF | 6 | 80 | -1.87 | 771/-5.99 | 1478/-3.99 |
| 00:00:46.350 | IDLE | | 80 | 0.00 | | |
| 00:00:46.430 | DTMF | 7 | 80 | -1.86 | 853/-5.98 | 1210/-4.01 |
| 00:00:46.509 | IDLE | | 80 | 0.00 | | |
| 00:00:46.590 | DTMF | 8 | 80 | -1.89 | 853/-6.01 | 1337/-3.99 |
| 00:00:46.670 | IDLE | | 80 | 0.00 | | |

| TimeStamp | Event | Volume (-dBm) | Duration (ms) |
|--------------|--------|---------------|---------------|
| 12:09:02.652 | DTMF 1 | 6 | 80 |
| 12:09:02.812 | DTMF 2 | 6 | 80 |
| 12:09:02.971 | DTMF 3 | 6 | 80 |
| 12:09:03.132 | DTMF 4 | 6 | 80 |
| 12:09:03.292 | DTMF 5 | 6 | 80 |
| 12:09:03.452 | DTMF 6 | 6 | 80 |
| 12:09:03.612 | DTMF 7 | 6 | 80 |
| 12:09:03.772 | DTMF 8 | 6 | 80 |
| 12:09:03.931 | DTMF 9 | 6 | 80 |
| 12:09:04.092 | DTMF 0 | 6 | 80 |
| 12:09:04.252 | DTMF A | 6 | 80 |
| 12:09:04.412 | DTMF B | 6 | 80 |
| 12:09:04.572 | DTMF C | 6 | 80 |
| 12:09:04.732 | DTMF D | 6 | 80 |
| 12:09:04.891 | DTMF # | 6 | 80 |
| 12:09:36.324 | MF 1 | 6 | 80 |

Inband Events | RTP Events | Wave Graph | Spectral Display | R-Factor Statistics

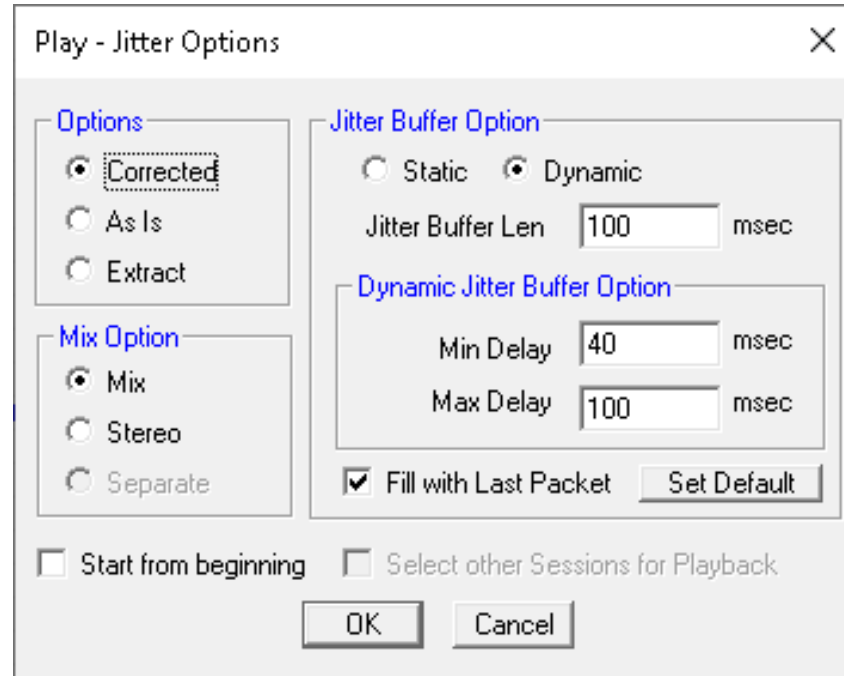
- Inband Event tab displays Inband DTMF and MF digits as they are received on selected RTP stream
- Outband (RTP) Events tab displays all Outband RTP events defined in RFC 2833 or RFC 4733

Wave and Spectral Graphs



- 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

Play Audio



- Plays the RTP streams of a call to the PC speaker using a soundcard
- Provides a host of options such as jitter buffer settings, audio mixing, and so on to play a live call in real-time or play captured voice files

Write to File

- Various options are provided to save captured calls
- Use the files with voice quality analysis software to calculate the mean opinion score of the call
- Records the RTP stream to a file in *.wav format

Write To File - Jitter Options

Options

Corrected
 As Is
 Extract

Mix Option

Mix
 Stereo
 Separate

Jitter Buffer Option

Static Dynamic
Jitter Buffer Len msec

Dynamic Jitter Buffer Option

Min Delay msec
Max Delay msec

Fill with Last Packet

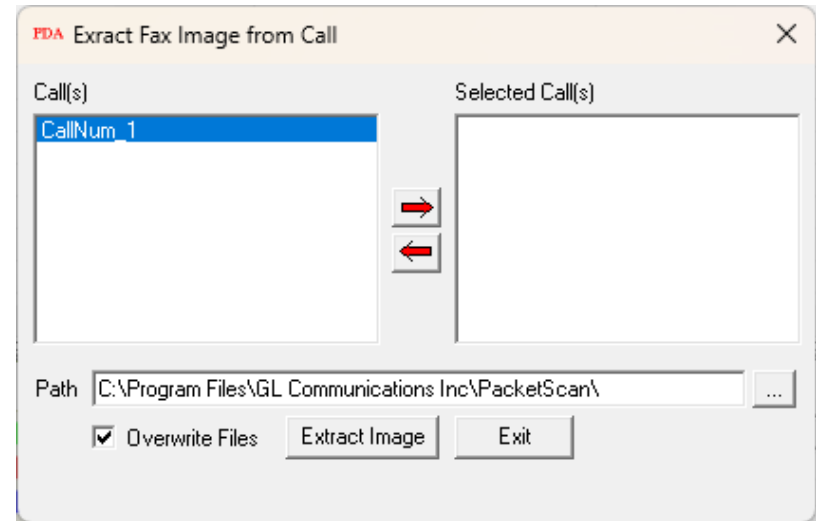
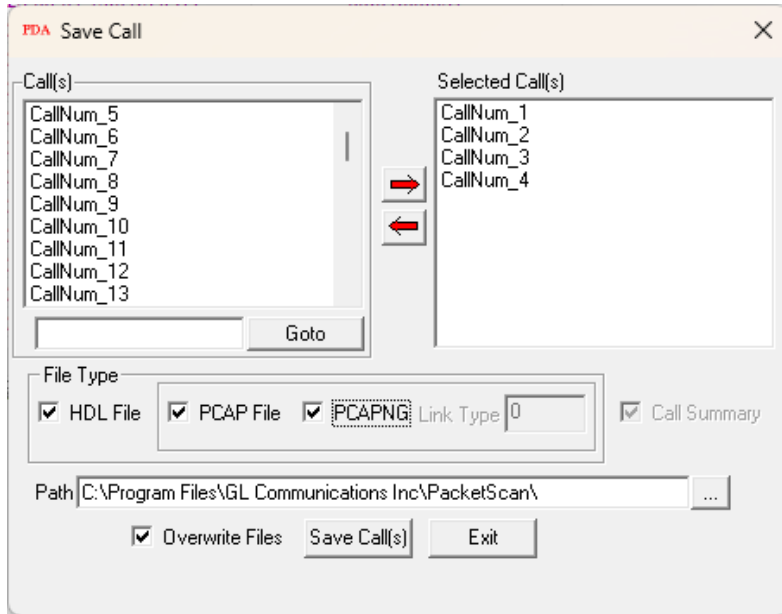
Start from beginning

File Record

Use SSRC for File Name

C:\Program Files\GL Communications Inc\PacketScan\Sample...

Save Call and Extract Fax Image



- Saves a particular call in either GL's proprietary HDL file format or Ethernet PCAP file format or PCAPNG file format
- Saves the Call Summary details including signaling and audio / fax/ video parameters for a particular call in *.rtf file
- Helps in getting data from real-time traffic locations to the lab for detailed analysis

- Extracts Fax image in the TIFF format from the selected fax call

Trigger and Action Settings

Triggers and Action Settings - Untitled

File

Trigger List

- Trigger1

Filter Selection

- SIP
 - Calling Party
 - Called Party
 - Fax Calls
 - Incomplete Calls
 - Failed Calls
 - Sip Error Code
 - Call Duration (mins)
 - Session Request Delay (msecs)

Enter Trigger Name

Trigger1

Add Delete

Enter String Value

123456

Conditions

And Or

Activate DeActivate

Action

- Save Call
- Audio Recording
- User Defined
- Send e-mail
- Alert Summary
- Call Detail Record
- Extract Fax Image

Save Call To File Options

File Name Mask

%l_%Y_%M_%D_%h-%m-%s

Files Destination Directory

C:\Program Files\VGL Communicat...

Save Options

- HDL File
- PCAP File
- PCAPNG

Link Type 0

Call Summary

Create File Options - If File Exists

Overwrite Skip Operation Append Sequence Number

Ok Cancel

- Set the triggers and actions criteria to filter calls and perform additional actions on the completed calls
- Trigger actions on certain SIP, RTP, MEGACO, and H.323 parameters
- Triggering factors includes calling number, called number, incomplete calls, fax calls, call duration, MOS factor, sip error code, average jitter, and more
- Actions include
 - Saving call to a file `/*.hdl`, `*.pcap`, or `*.pcapng`
 - Recording audio to a file
 - Sending an email alert
 - Generates alerts when particular vital parameters go beyond a specified value
 - Outputs call detail records as CSV
 - Extract Fax in Tiff format

Call Detail Records (CSV)

- Creates three types of Comma Separated Value (CSV) files such as Call Side Record, Call Master Record, and Call Events Record
 - **Call Side Record:** It is a record concerning each party participating in the call. For example: Probe ID, Call ID, Side, Address, File Name, SSRC, Codec, Total Packets, and so on
 - **Call Master Record:** It contains fields concerning the call, For example: Probe ID, CALL ID, Side 1, Side 2, Protocol name, Start & Released dated and time, and so on
 - **Call Event Record:** It gives an event-by-event account of the call. For example: Probe ID, Call ID, Side, Class ID, Start, Duration, Source IP address, Destination IP Address, and so on
- Use Sub Folders option to automatically create the subfolders after some time duration

The screenshot shows a configuration dialog box titled "Action". It contains several sections for setting up call recording and CSV file generation.

- Action:** A list of checkboxes on the left side, with "Call Detail Record" selected and highlighted in blue. Other checked options include "Save Call", "Audio Recording", "User Defined", "Send e-mail", "Alert Summary", and "Extract Fax Image".
- Call Recording Options:** Three checkboxes on the right: "Call Side Record", "Call Master Record", and "Call Events Record", all of which are checked.
- Probe Name:** A text input field containing "VoIPProbe".
- CSV Files Destination Directory:** A text input field containing "C:\Program Files\GL Communications I" followed by a browse button "...".
- Use Sub Folders:** A checkbox that is currently unchecked.
- Folder Prefix:** A text input field containing "VoIPCaptures".
- Create Subfolder Every:** A dropdown menu set to "1" and a unit selector set to "hr".
- Create File Options -- If File Exists:** Three radio buttons: "Overwrite" (selected), "Skip Operation", and "Append Sequence Number".
- Buttons:** "Ok" and "Cancel" buttons at the bottom.

Alert Summary

Packet Data Analyzer - Summary View

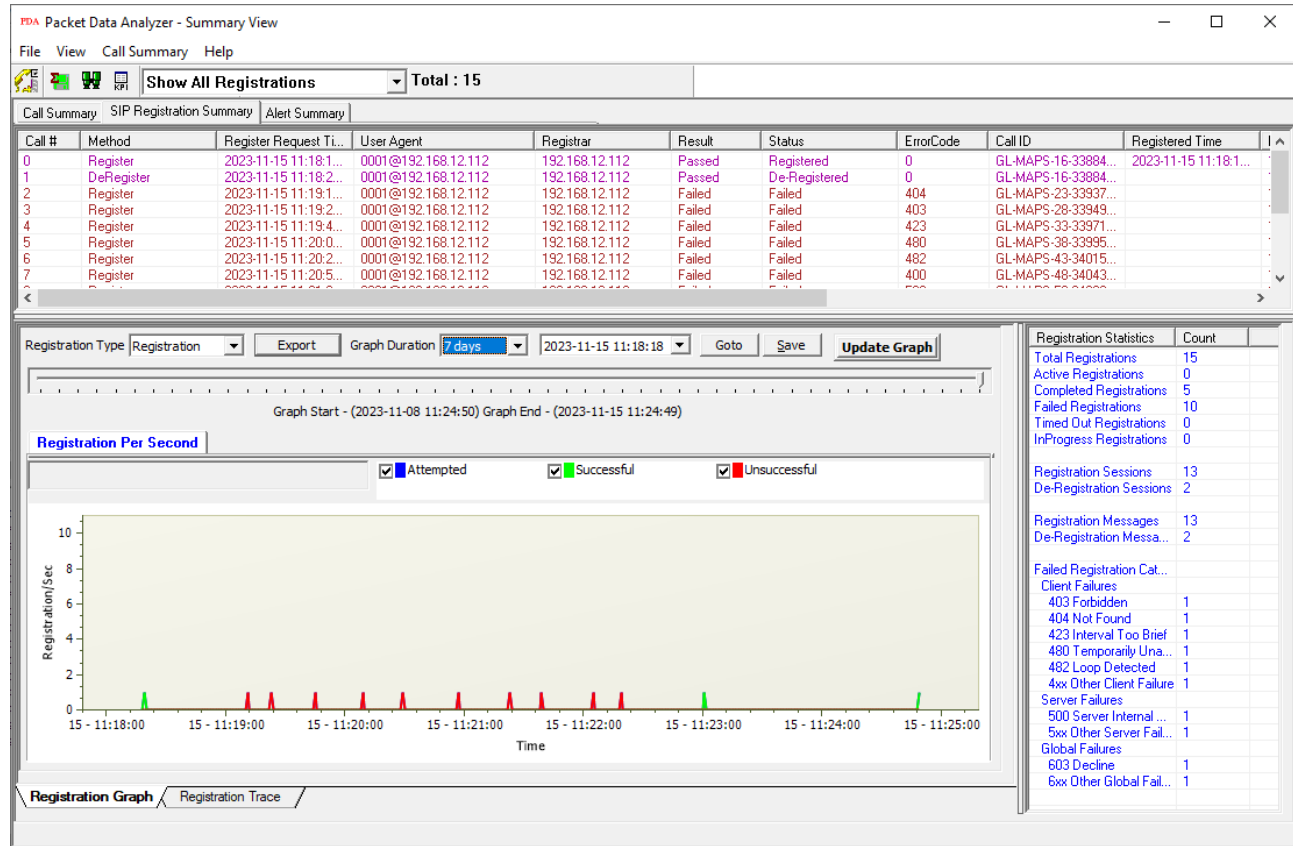
File View Call Summary Help

Call Summary SIP Registration Summary Alert Summary

| Call# | Protocol | Message | Type | Threshold | Value | Caller | Callee | Callid |
|-------|----------|---------------------------------|----------|-----------|-------|--------|--------|-----------------------------|
| 1 | SIP | Call Duration more than 1 min | Warning | 1 | 1 | 0002 | 0002 | GL-MAPS-2678-9727462-276... |
| 2 | SIP | Calling Party between 0001-0005 | Critical | 0003 | 0003 | 0003 | 0003 | GL-MAPS-2682-9728464-276... |
| 2 | SIP | Call Duration more than 1 min | Warning | 1 | 1 | 0003 | 0003 | GL-MAPS-2682-9728464-276... |
| 5 | SIP | Call Duration more than 1 min | Warning | 1 | 1 | 0797 | 0797 | GL-MAPS-3589-10523257-33... |
| 3 | SIP | Session Request between 6-10 | Critical | 6-10 | 9 | 0379 | 0379 | GL-MAPS-3109-10104839-30... |
| 3 | SIP | Error Code 400 | Critical | 400 | 400 | 0379 | 0379 | GL-MAPS-3109-10104839-30... |
| 6 | SIP | Session Request between 6-10 | Critical | 6-10 | 9 | 0799 | 0799 | GL-MAPS-3587-10525259-33... |
| 6 | SIP | Error Code 400 | Critical | 400 | 400 | 0799 | 0799 | GL-MAPS-3587-10525259-33... |

- Generates alerts when vital parameters go beyond a specified value
- Provides an active list of the alerts for the events in a tabular column
- Displays the summary of call#, user-defined message, threshold value, actual value for which the alert occurred, callee, caller, and callid

Registration Summary



- Displays the SIP registration information in a tabular format which includes user agent, registrar, registered time, status, and so on for each user agent
- Displays the active registration graph of the entire registration summary
- Provides the trace display of each registration

Registration Trace

- Displays the message sequence of registered calls. Message sequence pictorially displays the messages exchanged for a particular scenario between a user agent and the registrar

Packet Data Analyzer - Summary View

File View Call Summary Help

Show All Registrations Call Count: 179100

Call Summary SIP Registration Summary Alert Summary

| Call# | Method | RegisterRequestTime | UserAgent | Registrar | Result | Status | ErrorCode | CallID | RegisteredTime | Requests | Responses | Exp |
|-------|----------|-----------------------|-----------------|---------------------|--------|------------|-----------|---------------------|-----------------------|----------|-----------|-----|
| 0 | Register | 2023-11-15 18:49:0... | 001013012041632 | ims.mnc001.mcc00... | Passed | Registered | 0 | GL-MAPS-27303-29... | 2023-11-15 18:49:0... | 2 | 2 | 360 |
| 1 | Register | 2023-11-15 18:49:0... | 001013012041638 | ims.mnc001.mcc00... | Passed | Registered | 0 | GL-MAPS-27309-29... | 2023-11-15 18:49:0... | 2 | 2 | 360 |
| 2 | Register | 2023-11-15 18:49:0... | 001013012041631 | ims.mnc001.mcc00... | Passed | Registered | 0 | GL-MAPS-27293-29... | 2023-11-15 18:49:0... | 2 | 2 | 360 |
| 3 | Register | 2023-11-15 18:49:0... | 001013012041633 | ims.mnc001.mcc00... | Passed | Registered | 0 | GL-MAPS-27273-29... | 2023-11-15 18:49:0... | 2 | 2 | 360 |
| 4 | Register | 2023-11-15 18:49:0... | 001013012041636 | ims.mnc001.mcc00... | Passed | Registered | 0 | GL-MAPS-27352-29... | 2023-11-15 18:49:0... | 2 | 2 | 360 |
| 5 | Register | 2023-11-15 18:49:0... | 001013012041634 | ims.mnc001.mcc00... | Passed | Registered | 0 | GL-MAPS-27296-29... | 2023-11-15 18:49:0... | 2 | 2 | 360 |
| 6 | Register | 2023-11-15 18:49:0... | 001013012041639 | ims.mnc001.mcc00... | Passed | Registered | 0 | GL-MAPS-27278-29... | 2023-11-15 18:49:0... | 2 | 2 | 360 |
| 7 | Register | 2023-11-15 18:49:0... | 001013012041637 | ims.mnc001.mcc00... | Passed | Registered | 0 | GL-MAPS-27298-29... | 2023-11-15 18:49:0... | 2 | 2 | 360 |

Column Width Absolute Timing Show Latest

| Time | Frame# | 192.168.191.1 | 192.168.12.18 |
|--------------|--------|---------------|---------------|
| 00:00:00.000 | 5781 | 5060 | 5060 |
| 00:00:00.134 | 5864 | 5060 | 5060 |
| 00:00:00.145 | 5872 | 5060 | 5060 |
| 00:00:00.167 | 5942 | 5060 | 5060 |

Find Complete Stack

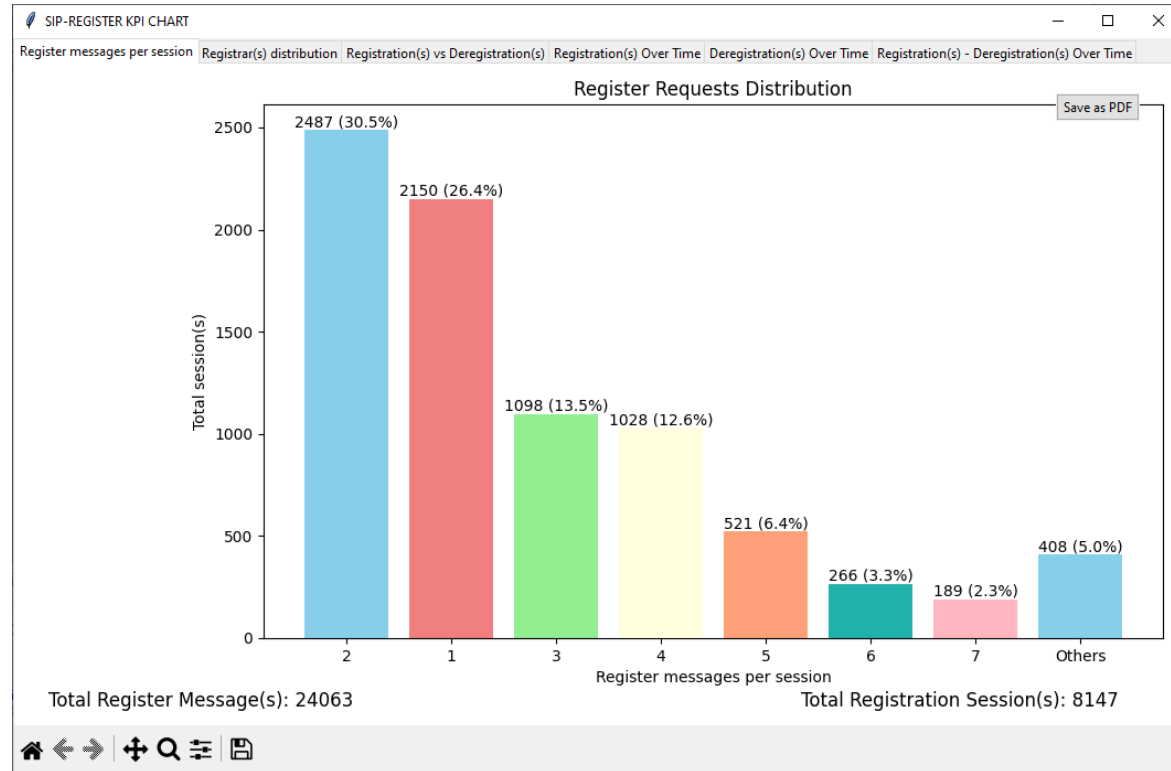
```

===== SIP Layer =====
REGISTER sip:ims.mnc001.mcc001.3gppnetwork.org SIP/2.0
Via: SIP/2.0/UDP 192.168.191.1:5060;branch=z9hG4bK-27306-29450043-189206-8912
Max-Forwards: 70
Allow: INVITE, BYE, CANCEL, ACK, INFO, PRACK, COMET, OPTIONS, SUBSCRIBE, NOTIFY, REGISTER, UPDATE
From: <sip:001013012041632@ims.mnc001.mcc001.3gppnetwork.org>;tag=FromTag-27304-2945000
To: <sip:001013012041632@ims.mnc001.mcc001.3gppnetwork.org>
Call-ID: GL-MAPS-27303-29450009-189203-8912@192.168.191.1
CSeq: 1 REGISTER
Supported: path, sec-agree
Authorization: Digest username="001013012041632@ims.mnc001.mcc001.3gppnetwork.org", realm=
Expires: 30
Contact: <sip:001013012041632@192.168.191.1>;+g.3gpp.smsip
P-Preferred-Identity: 001013012041632 <sip:001013012041632@ims.mnc001.mcc001.3gppnetwork.org>
P-Access-Network-Info: 3GPP-NR-TDD; utran-cell-id-3gpp=00101000001000000001
Privacy: None
Content-Length: 0
    
```

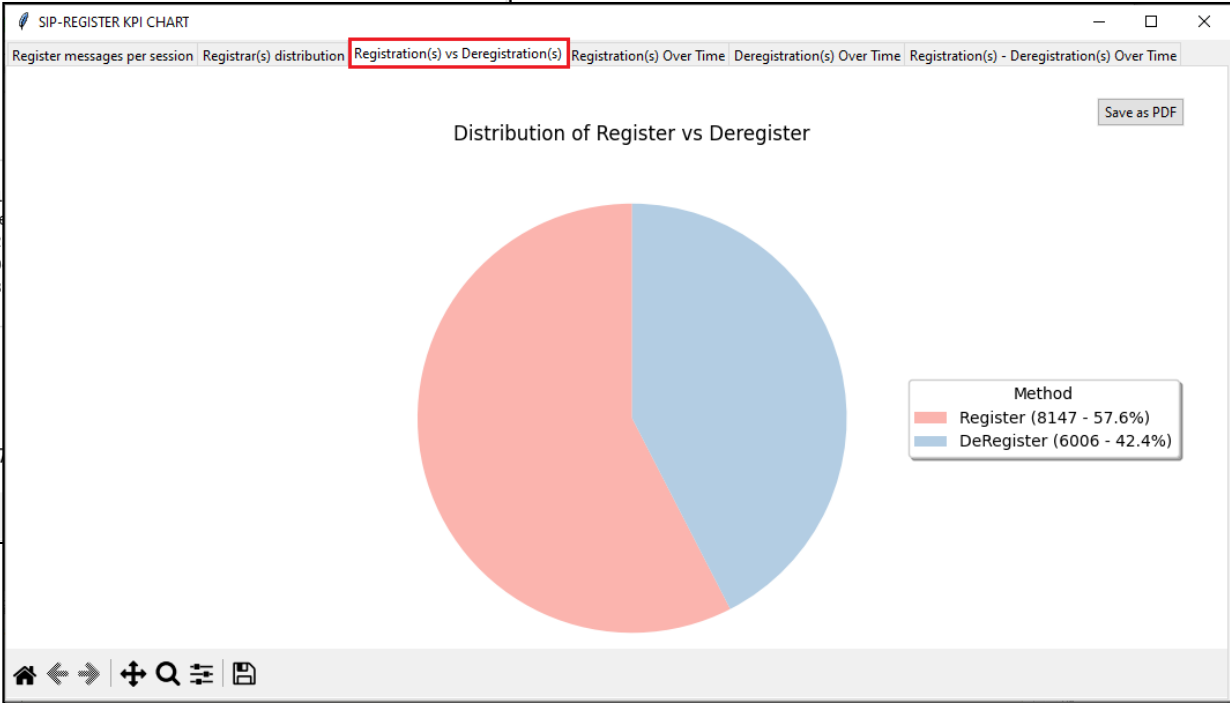
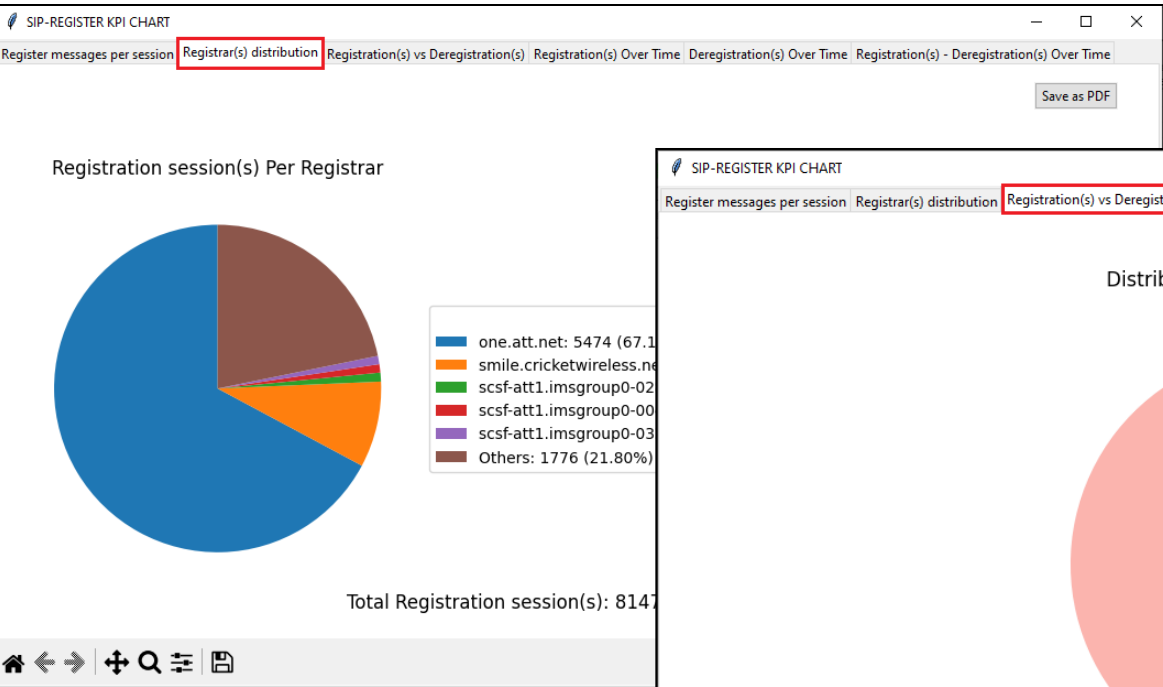
Registration Graph Registration Trace

KPI Report (Registration)

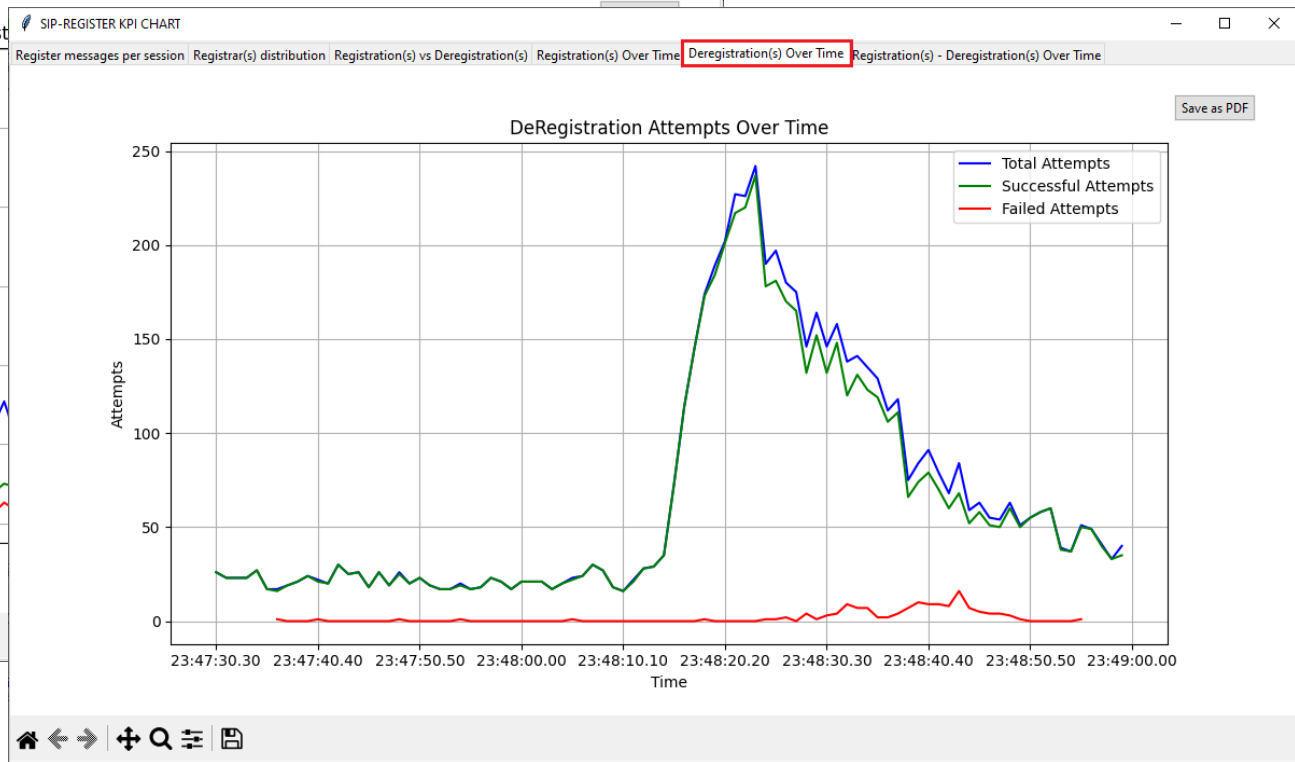
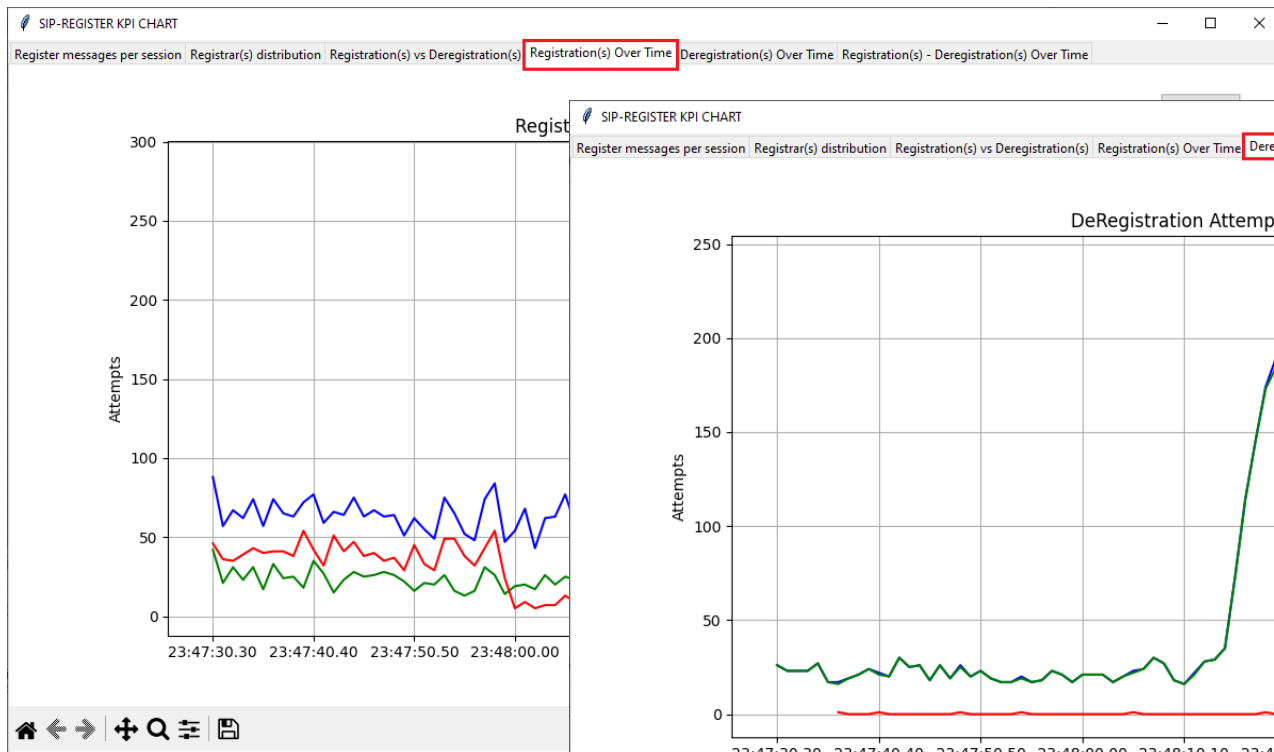
- The SIP Registration Summary KPI Report includes KPIs for the following:
- **Register Messages per Session:** Shows a graph for the distribution of Register Requests
- **Registrar(s) Distribution:** Displays a graph for the number of Registration sessions per Registrar
- **Registration(s) vs Deregistration(s):** 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



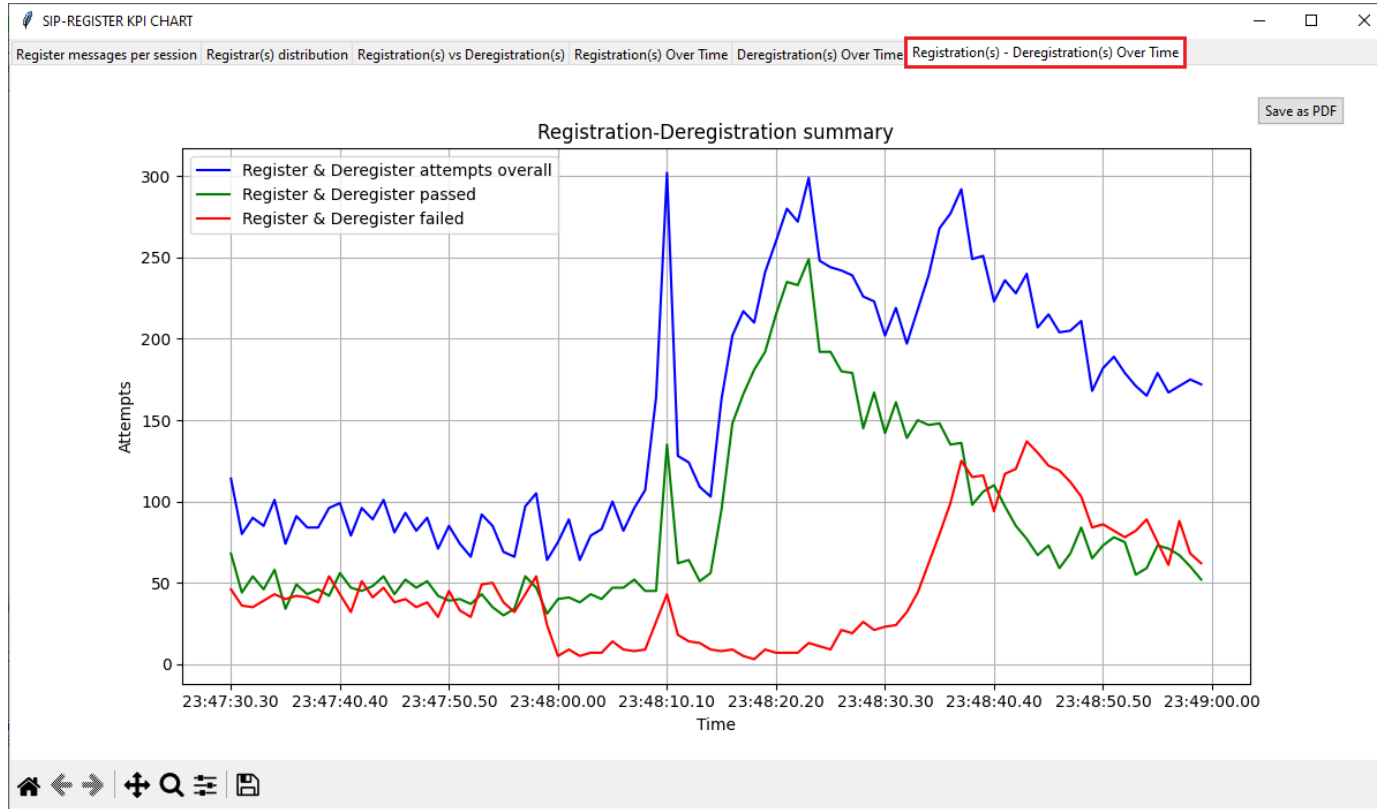
Registrar(s) Distribution, Registration vs Deregistration KPIs



Registration(s) over Time, Deregistration over Time KPIs

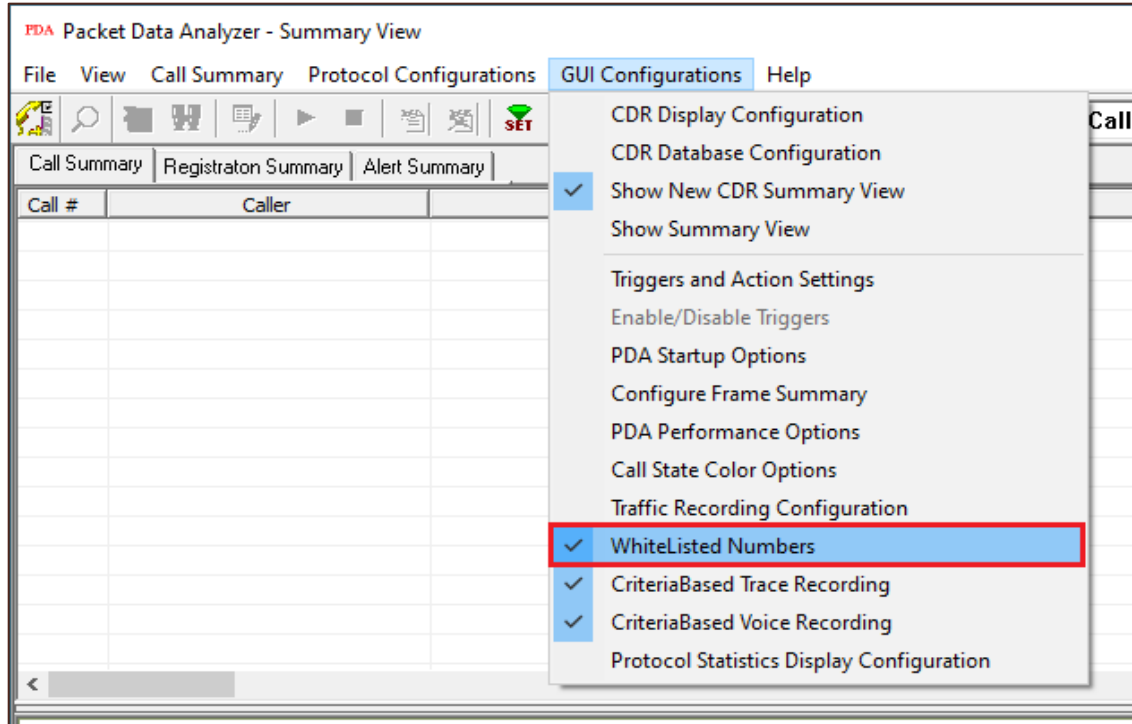


Registration(s)-Deregistration(s) over Time KPI



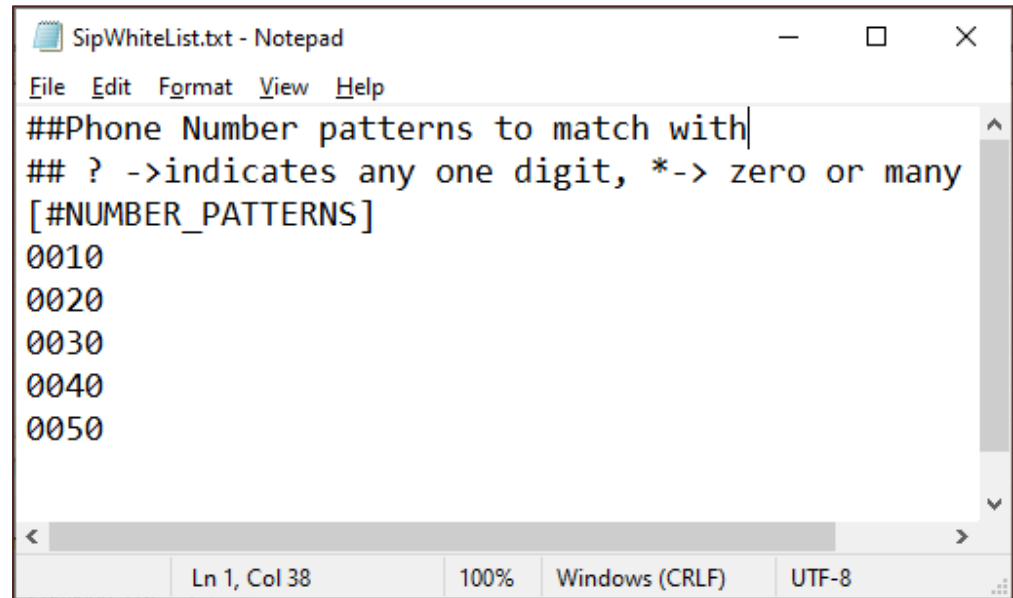
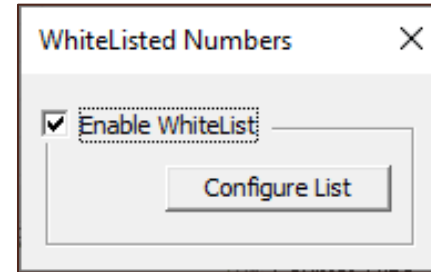
Whitelist Configuration

- On the **PDA** main window, click on **GUI Configurations** → **WhiteListed Numbers** to configure Whitelist number



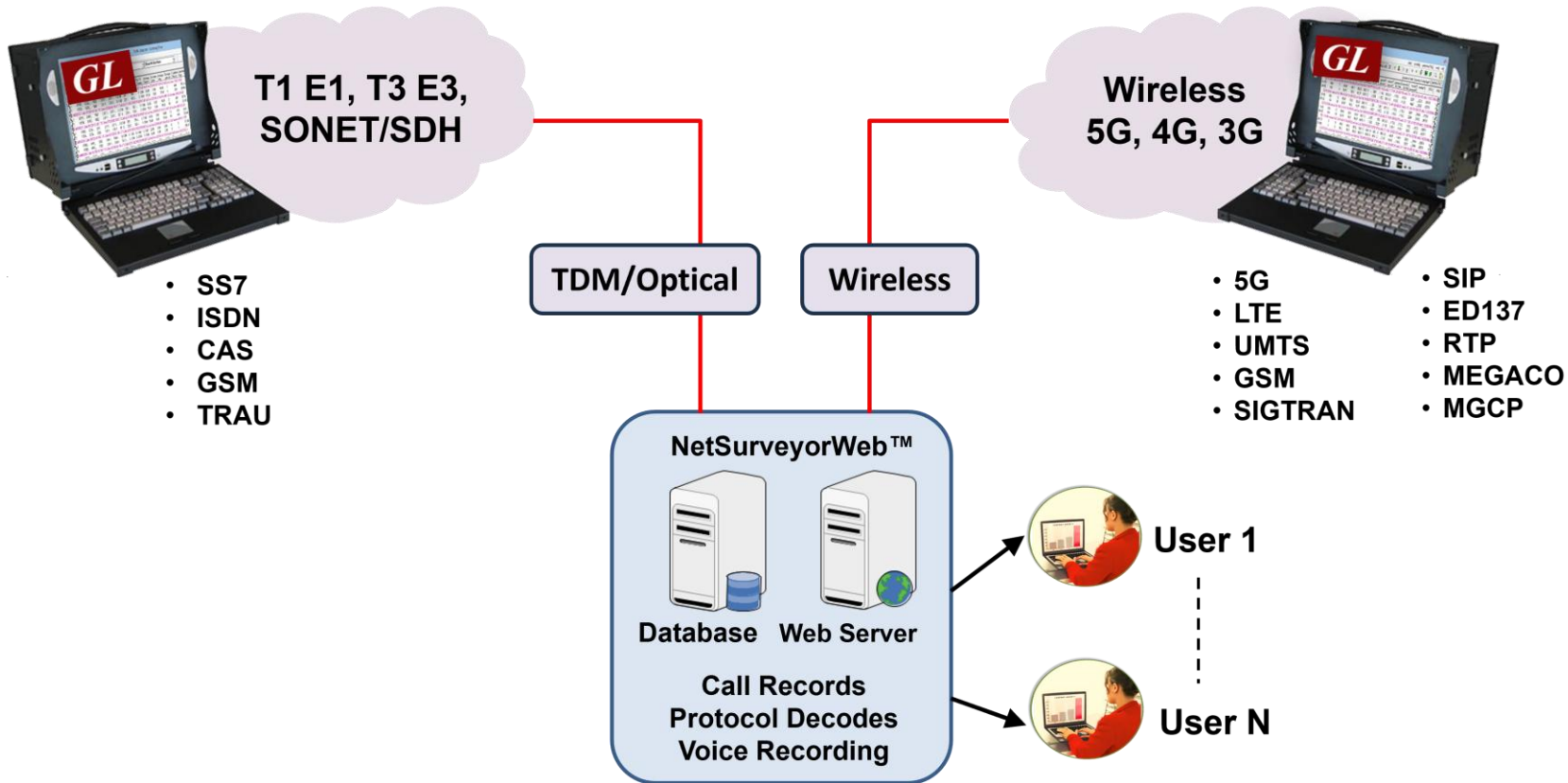
Whitelist Configuration (Contd.)

- Check the **Enable WhiteList** option and click on **Configure List**. This will invoke **SIPWhiteList.txt** in the Notepad application
- Enter the **SIP Caller** or **Callee** Number
- The following numbers should be added in the **SipWhiteList.txt** file
 - 0010
 - 0020
 - 0030
 - 0040
 - 0050
- **Save** and **Close** the file



```
SipWhiteList.txt - Notepad
File Edit Format View Help
##Phone Number patterns to match with
## ? ->indicates any one digit, *-> zero or many
[#NUMBER_PATTERNS]
0010
0020
0030
0040
0050
Ln 1, Col 38 100% Windows (CRLF) UTF-8
```

NetSurveyorWeb™ - Network Surveillance System



NetSurveyorWeb™ Main GUI

The screenshot displays the NetSurveyorWeb main GUI. At the top, it shows 'GL NetSurveyorWeb' and 'Protocol Type' set to 'VOIP (SIP & H323)'. The user 'GI' is logged in. The interface includes a navigation menu on the left with options like 'Quick CDR', 'Custom CDR', 'Failed', 'Default KPIs', 'MailBox', 'Config', 'Admin', and 'Utilization'. The main content area shows a 'Quick CDR \ All Calls' view for the date '2018-07-05'. A table of call records is displayed with the following columns: SIno, Calling Number, Called Number, Starttime, Duration, Call Success, Failure Cause, Listening Mos1, Listening Mos2, and Payload1. The table contains 12 rows of call data.

| SIno | Calling Number | Called Number | Starttime | Duration | Call Success | Failure Cause | Listening Mos1 | Listening Mos2 | Payload1 |
|------|---------------------|---------------------|-------------------------|--------------|--------------|---------------|----------------|----------------|-----------------|
| 1 | 0159@192.168.12.163 | 0159@192.168.12.164 | 2018-07-05 12:12:47.134 | 00:01:00.024 | 1 | 0 | 3.02 | 3.02 | SPEEX/8000 |
| 2 | 0160@192.168.12.163 | 0160@192.168.12.164 | 2018-07-05 12:12:47.134 | 00:01:00.024 | 1 | 0 | 3.02 | 3.02 | SPEEX/8000 |
| 3 | 0161@192.168.12.163 | 0161@192.168.12.164 | 2018-07-05 12:12:47.134 | 00:01:00.024 | 1 | 0 | 4.16 | 4.16 | SPEEX/8000 |
| 4 | 0158@192.168.12.163 | 0158@192.168.12.164 | 2018-07-05 12:12:47.104 | 00:01:00.024 | 1 | 0 | 4.16 | 4.16 | SPEEX/8000 |
| 5 | 0157@192.168.12.163 | 0157@192.168.12.164 | 2018-07-05 12:12:47.094 | 00:01:00.024 | 1 | 0 | 4.16 | 4.16 | SPEEX/8000 |
| 6 | 0156@192.168.12.163 | 0156@192.168.12.164 | 2018-07-05 12:12:47.094 | 00:01:00.024 | 1 | 0 | 3.02 | 3.02 | SPEEX/8000 |
| 7 | 0155@192.168.12.163 | 0155@192.168.12.164 | 2018-07-05 12:12:47.064 | 00:01:00.024 | 1 | 0 | 4.16 | 4.16 | SPEEX/8000 |
| 8 | 0153@192.168.12.163 | 0153@192.168.12.164 | 2018-07-05 12:12:47.044 | 00:01:00.024 | 1 | 0 | 4.01 | 4.01 | iLBC_15_2/8000 |
| 9 | 0154@192.168.12.163 | 0154@192.168.12.164 | 2018-07-05 12:12:47.044 | 00:01:00.024 | 1 | 0 | 3.95 | 3.95 | iLBC_13_33/8000 |
| 10 | 0152@192.168.12.163 | 0152@192.168.12.164 | 2018-07-05 12:12:47.034 | 00:01:00.024 | 1 | 0 | 3.98 | 3.98 | EVRCB/8000 |
| 11 | 0151@192.168.12.163 | 0151@192.168.12.164 | 2018-07-05 12:12:47.024 | 00:01:00.024 | 1 | 0 | 3.98 | 3.98 | EVRCB/8000 |
| 12 | 0150@192.168.12.163 | 0150@192.168.12.164 | 2018-07-05 12:12:47.014 | 00:01:00.024 | 1 | 0 | 3.77 | 3.77 | EVRCB/8000 |

- Multiple PacketScan™ probes can be used for network monitoring, with call detail reports exported to a central data base
- Results can be accessed remotely using NetSurveyorWeb™, a simple web browser-based application

Thank you