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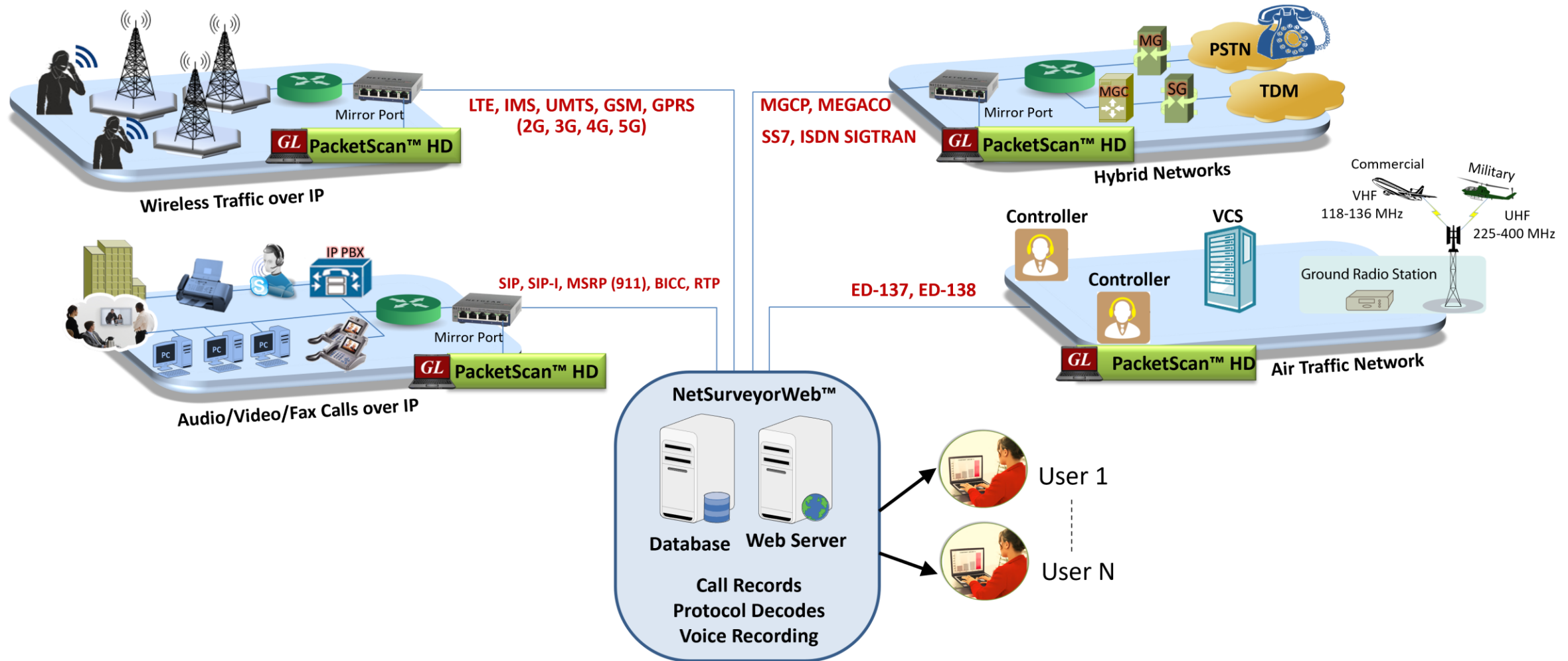
# PacketScan™ High Density All-IP Analyzer (1, 10, 25, 40, or 100 GigE Networks)

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Website: <https://www.gl.com>

# PacketScan™ HD All-IP Signaling and Traffic Analysis (2G/3G/4G/5G/VoIP/RTP, RTCP/Fax Analysis)



# PacketScan™ HD Features

- **Signaling** – Protocol analysis: SIP, MGCP, MEGACO, H.323, SCTP, SCCP (Skinny), SS7 SIGTRAN, ISDN-SIGTRAN, GSM A over IP, GPRS over IP, UMTS over IP, LTE, Diameter
- **Voice/Fax** - Captures, segregates, and monitors packets; perform voice quality testing in real-time over VoIP network. G.711, G726, GSM, GSM EFR, GSM HR, G729/B, G.722, G.722.1, ILBC, SPEEX, SMV, T.38
- **Video Calls** - Video quality statistics such as MDI (Media Delivery Index), Packet Lost, Duplicate, out of sequence and Frame Rates are provided for each video session
- **5G Analyzer** - Captures, decodes, and collects statistics over N1N2, N4, N8, N12 and N13 interfaces of the 5G network
- **NetSurveyorWeb** - Can be deployed as a Probe for a centralized monitoring system connected to an Oracle database

# Why this product?

- Lossless wirespeed capture of IP traffic across high speed (1, 10, 25, 40, and 100 GigE) links
- Non-intrusive capture and record over Ethernet (Electrical and Optical) interfaces at nano-second time precision
- Filter on inner layer of GTP tunnel traffic like inner IPv4/IPv6 addresses
- Ability to capture and analyse high volume calls with traffic. Process up to 20000 simultaneous calls with bidirectional RTP traffic. Up to 50,000 calls can be achieved by scaling with higher configurations
- PacketScan™ HD available in both Portable as well as 2U rack mounted Network Monitoring Appliance w/ 4x 1GigE (PKV120) or 2x 10GigE (PKV122) network interface cards
- Create up to 10 user defined hardware filters to filter-out traffic based on MAC, 802.1Q (VLANs), IPv4, TCP, UDP, SIP, and RTP parameters
- Supports almost all industry standard IP and Wireless Protocols (from SIP to LTE)
- Supports all RTP traffic – Voice, Video, Fax T.38, Digits, Tones, Impairments
- Capture and Call processing is enhanced to handle different Tunnel traffic (VXLAN, GRE and GTP) and multiple tunnelling
- Support for eCPRI decode

# Key Features

- User can create their own filters using custom filter option which provides flexibility to check the fields and use the logical conditions more efficiently
- Supports decoding of eCPRI protocol
- Long-Term activity reporting
- Captures, Segregates, Monitors, Build CDRs, and Collects Statistics on all IP calls
- In-depth real-time and post-process data investigation using Packet Data Analysis (PDA) feature
- Complex Filtering and Search capabilities to record all or filtered traffic into a trace file
- Supports TCP Analytics application analyzes TCP connections between both internal Local Area Network (LAN) and external Wide Area Network (WAN) computers including servers and clients. The application helps troubleshoot large bandwidth consumption, failed TCP sessions, packet loss, poor TCP throughput and more
- Provides Call Quality Scores like MOS, R-Factor, Delay, Jitter, Packet Loss and more
- Supports Centralized Remoter Network Monitoring with NetSurveyorWeb™ - a web-based client that can connect to PacketScan™ probes through a web server that facilitates display of call data records using a web interface

# Supported Protocols and Codecs

Supported Codecs	Supported Protocols
<ul style="list-style-type: none"><li>• G.711 A/μ-law</li><li>• G.722, G.722.2 (AMR-WB), G.722.1, G.726, G.729A/B</li><li>• GSM (EFR, FR and HR)</li><li>• AMR (Narrowband and Wideband)</li><li>• EVRC, EVRCB, EVRC-C, iLBC, Speex, SpeexWB, RFC 2833, and user-defined codecs for voice and tones.</li><li>• EVS OPUS</li></ul> <p>Visit <a href="#">Voice Codec</a> webpage for more details</p>	<ul style="list-style-type: none"><li>• SIP, SIP-I, SIP-T, H.323, MEGACO, MGCP, Diameter, Skinny (SCCP)</li><li>• LTE</li><li>• 5G N1N2, N4, N12, N13</li><li>• SIGTRAN – SS7, ISDN</li><li>• GSM A and Abis over IP</li><li>• GPRS Gb and Gn over IP</li><li>• UMTS IuCS and IuPS over IP</li><li>• T.38 Fax and Video calls</li></ul> <p>Visit <a href="#">Supported Protocols</a> for more details</p>

For more information on other features, refer to PacketScan™ Basic (PKV100) presentation.

# PacketScan™ HD

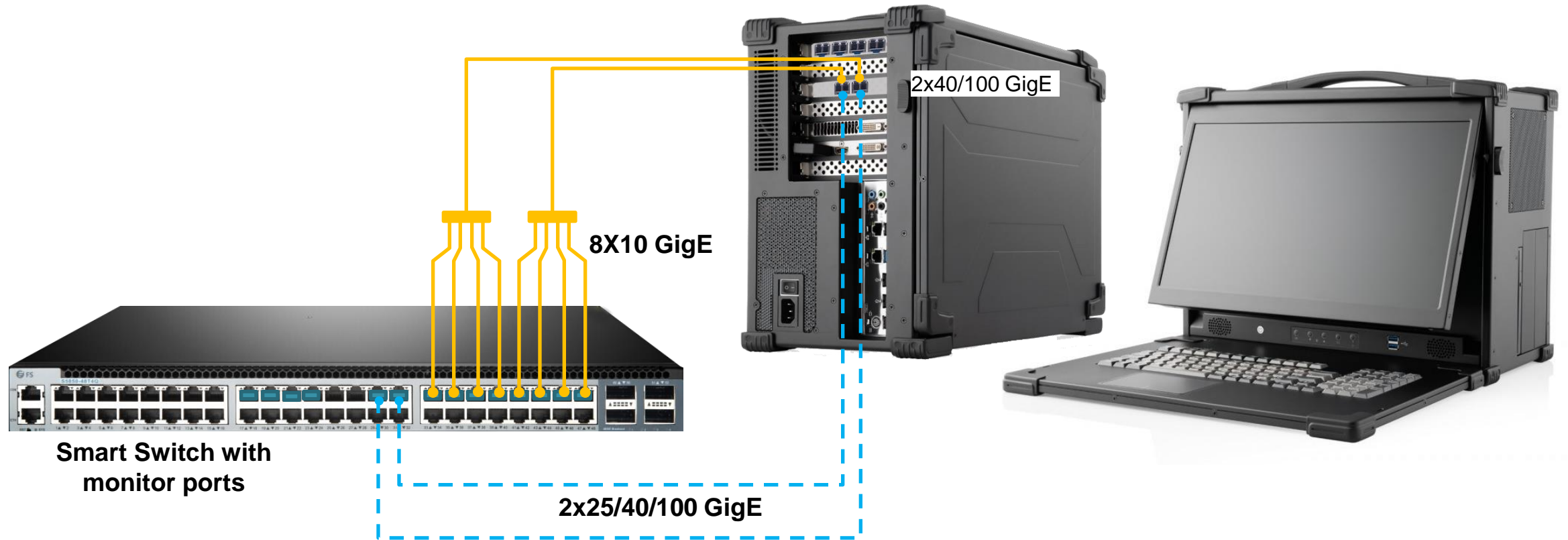
(4x1 GigE, 2x1/10 GigE, 2x25 GigE, 8x10 GigE, and 2x40/100 GigE)



**\*\*Also available as a rack mounted unit**



# PacketScan™ HD with 2 x 25/40/100 GigE or 8 x 10 GigE



The above setup could manage rates as below:

- 2 x 25/40/100 GigE card can also be used as 8 x 10 GigE (with Breakout)
- System can also be outfitted with multiple cards with easy switching



# PacketScan™ HD 2U Rack Appliance

Front Panel



Back Panel

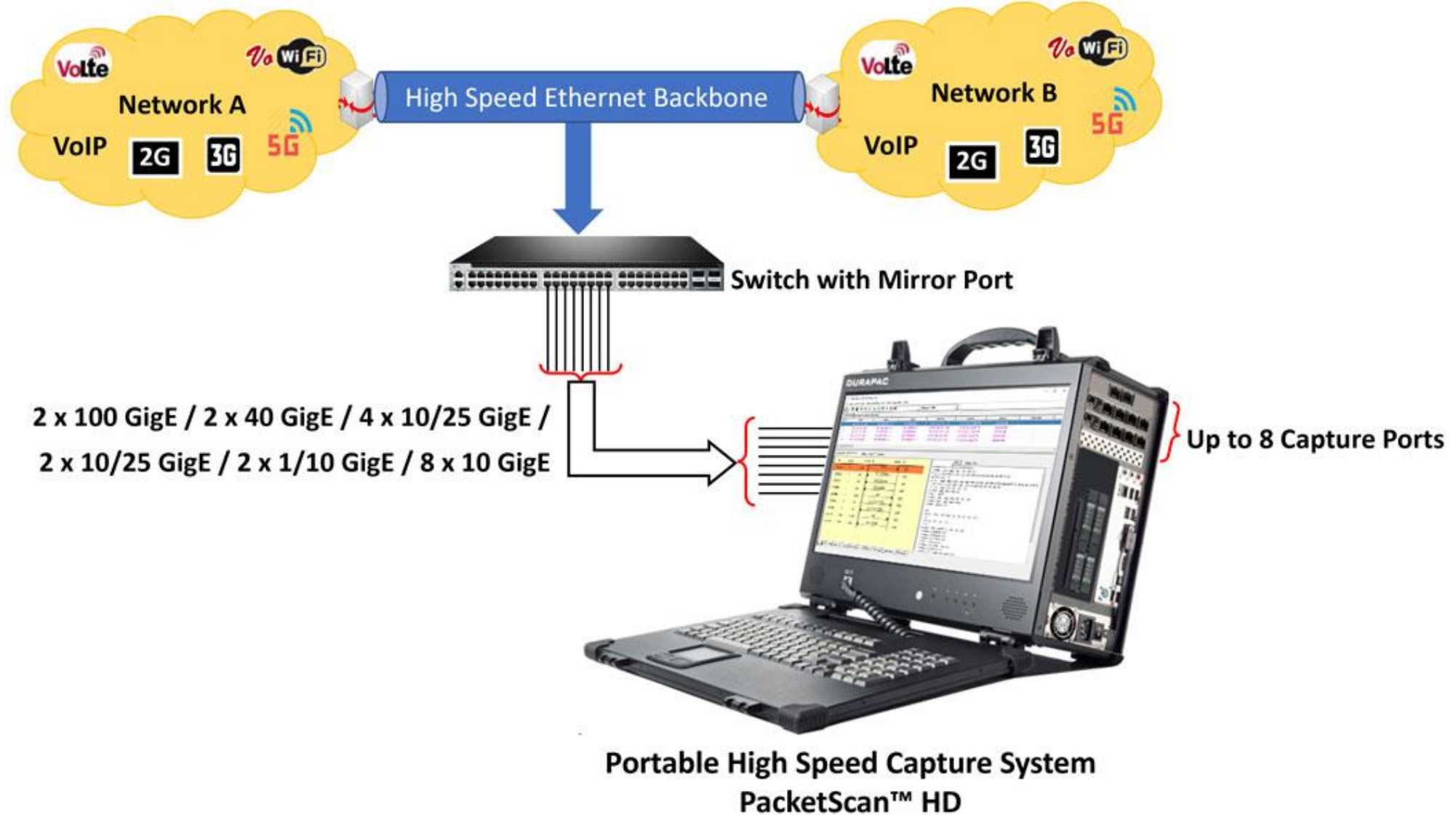


# PacketScan™ HD Systems

- PacketScan™ HD appliance is also available in three systems “**Low End**”, “**Medium End**” and “**High End**”

	Low End	Medium End	High End
<b>Data Rate</b>	4x1GigE	4x1/10GigE Or 2x1/10GigE	8x10GigE, 2x10/25GigE, 2x40GigE, 2x100GigE
<b>RAM</b>	16 GB RAM	32 GB RAM	128 GB RAM
<b>NVME Storage [SSD]</b>	2 TB	4x SSDs user configurable disk size (4x 1.92 TB in the base configuration)	8x SSDs user configurable disk size (8x 3.84 TB in the base configuration)

# High Density Traffic

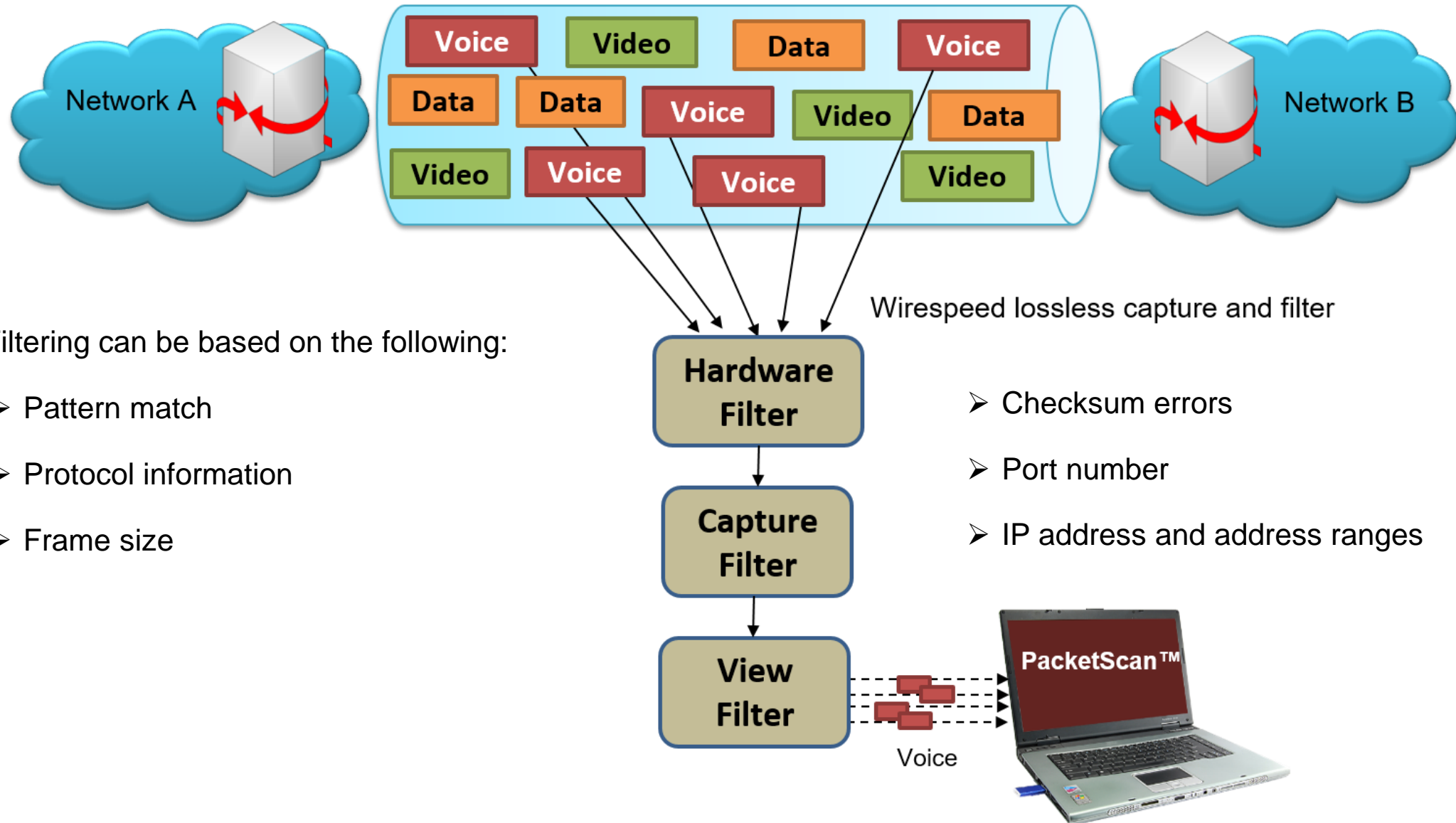


# RTP Traffic Capabilities and Performance

Product Version	Max Simultaneous Calls
	Signaling + RTP Voice Traffic
PacketScan 1G (4x 1GigE) SIP 64-bit	20000 calls with bi-directional RTP traffic Extracting/recording voice <ul style="list-style-type: none"><li>• 2500 simultaneous calls (maximum)</li><li>• Option to record filtered calls of interest only</li></ul>
PacketScan 10G (2x 10GigE) SIP 64-bit	30000 calls with bi-directional RTP traffic Extracting/recording voice <ul style="list-style-type: none"><li>• 2500 simultaneous calls (maximum)</li><li>• Option to record filtered calls of interest only</li></ul>

\*\* The above performance is evaluated on a high-end Core i7 system with typical 12GB RAM

# Wirespeed Filtering

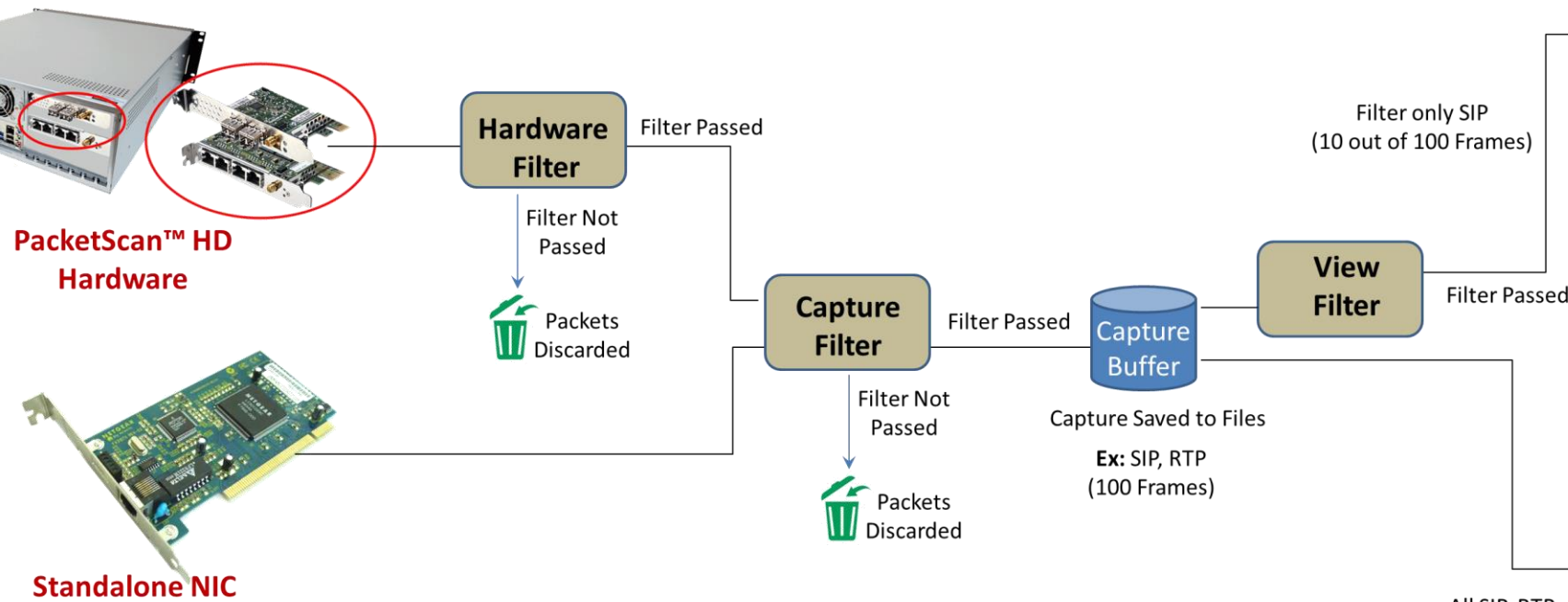


# 3 Stages of Filtering

- 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



## 3 Stages of Filtering (Contd.)



## PacketScan Summary View

The screenshot shows the Wireshark interface with the following details:

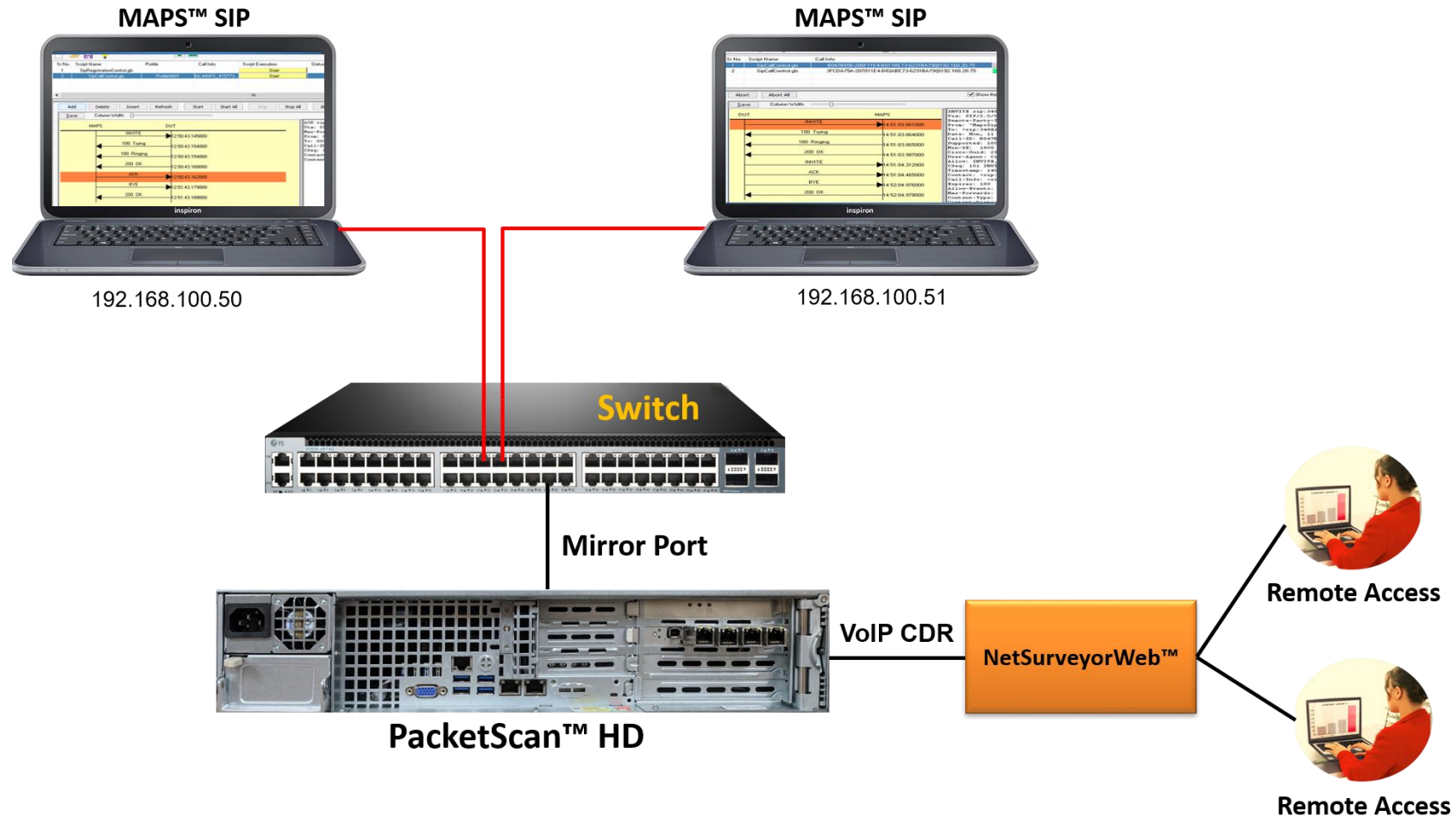
- Packet List:**
  - Packet 4 is selected, showing a timestamp of 0.000000, length 20, and protocol type 1 (Internet Protocol).
- Packet Details:**
  - Ethernet II, Frame 4:**
    - MAC Layer:**
      - Destination Address: 00:00:00:00:00:00
      - Source Address: 00:00:00:00:00:00
      - Length/Protocol type: 20/1
      - IP Layer:
        - Version: 4
        - Header Length: 20
        - Total Length: 20
        - Destination Address: 192.168.1.103

## PacketScan PDA View

[illegible]



# Demo



- Generate VoIP calls (SIP signaling and RTP traffic) with MAPS™ SIP
- Connect PacketScan™ HD to a mirror port
- Capture and analyze the VoIP calls

# Link and Ports Interface Testing

C:\Program Files\Napatech3\bin\monitoring.exe

Font

monitoring (v. 3.8.5.7-8a9442)

P	A	Type	Link	Down	Rx	Tx	Max	Temp.
0	0	SFP+	10G Full	2	499.99M	0.00M	9018	55.50 C
1	0	SFP+	10G Full	15	2.25M	0.00M	9018	53.80 C
2	1	SFP-CU	1G Full	0	0.00M	0.00M	9018	N/A
3	1	SFP-CU	1G Full	0	0.00M	0.00M	9018	N/A
4	1	SFP Empty	Down	0	0.00M	0.00M	9018	N/A
5	1	SFP Empty	Down	0	0.00M	0.00M	9018	N/A

Port 0 - Adapter 0 Intf 0: NT20E2 network adapter

RX RMON1 counters				Totals	
Packets	:	#000000000701452306	Octets	:	#0000000526089229846
Broadcast	:	#000000000000000000	Multicast	:	#000000000701451020
64 octets	:	#000000000000000000	65-127 octets	:	#000000000000000000
128-255 octets	:	#000000000000000000	256-511 octets	:	#000000000000000000
512-1023 octets	:	#000000000701452306	1024-1518 octets	:	#000000000000000000
Undersize	:	#000000000000000000	Oversize	:	#000000000000000000
Fragments	:	#000000000000000000	Collisions	:	#000000000000000000
Drop events	:	#000000000000000000	Crc/Align errors	:	#000000000000001286
Jabbers	:	#000000000000000000	Ext drops	:	#000000000011943856

Reset Tx/Rx 0RMON 1ExtrMON 2Checksum 3Decode 4Drop 5IPF Dec/Hex Tot/Spd  
Quit Sensors Color stat XTimeSync IEEE 1588 PTP Stream Dump

# Ethernet Frame Structure

RTP

Protocol - UDP

RTP ports – even

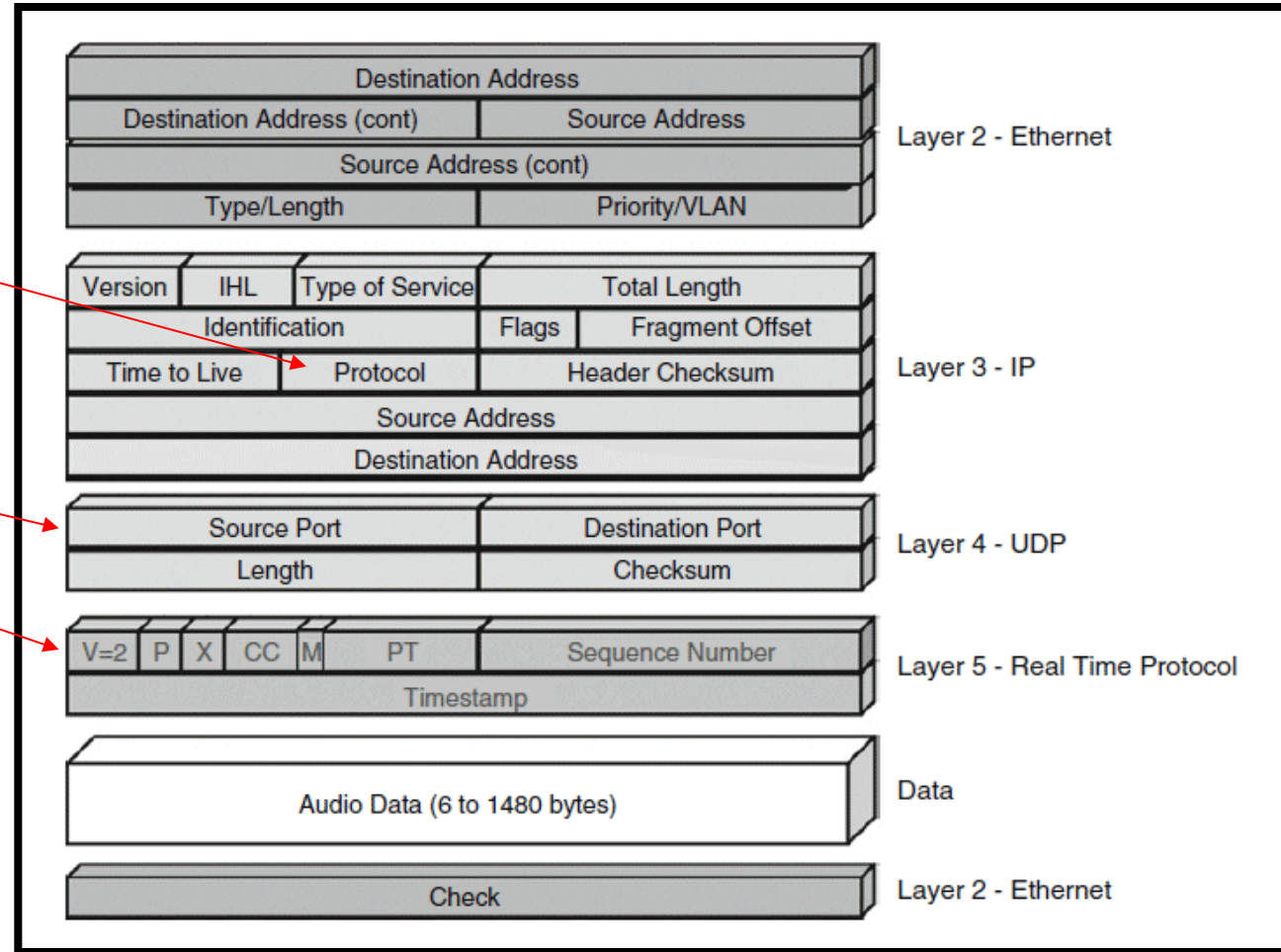
RTCP ports - odd

1024-65534

RTP Version

SIP Port 5060

TLS 5061

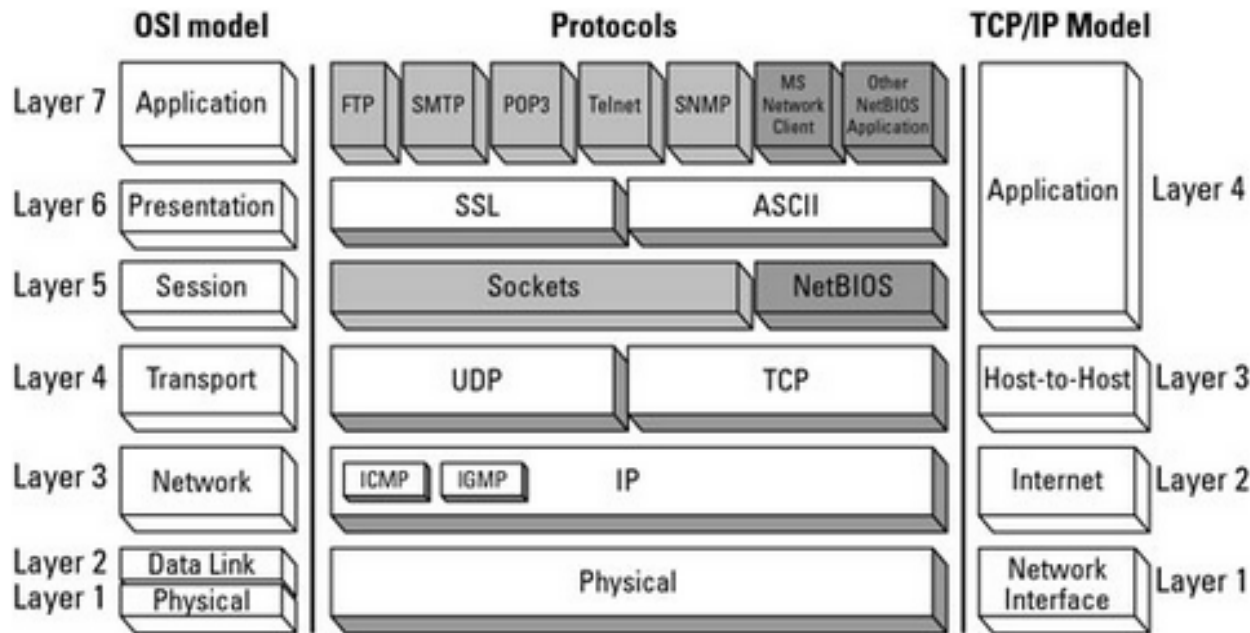


# Open System Interconnection

Layer		
Cables, NIC Hardware	1 Physical	
Basic Network 10BASE-T, 100BASE-T, 1000BASE-T	2 Data Link	Switches Link Layer – physical addressing MAC, ARP, L2TP
Routers Internet layer - packet forwarding path determination, logical addressing IPv4, IPv6, MPLS	3 Network	
	4 Transport	Transport layer – End-to-end connection and reliability UDP, TCP, SCTTP
Session/Port Layer – interhost connection. SIP, RTP, HTTP, DNS	5 Session	
	6 Presentation	Presentation layer – Data representation Encryption
Network process to application E-mail, Database	7 Application	

# OSI TCP Model

The Transmission Control Protocol/Internet Protocol (TCP/IP) suite was created by the U.S. Department of Defense (DoD) to ensure that communications could survive any conditions and that data integrity wouldn't be compromised under malicious attacks.



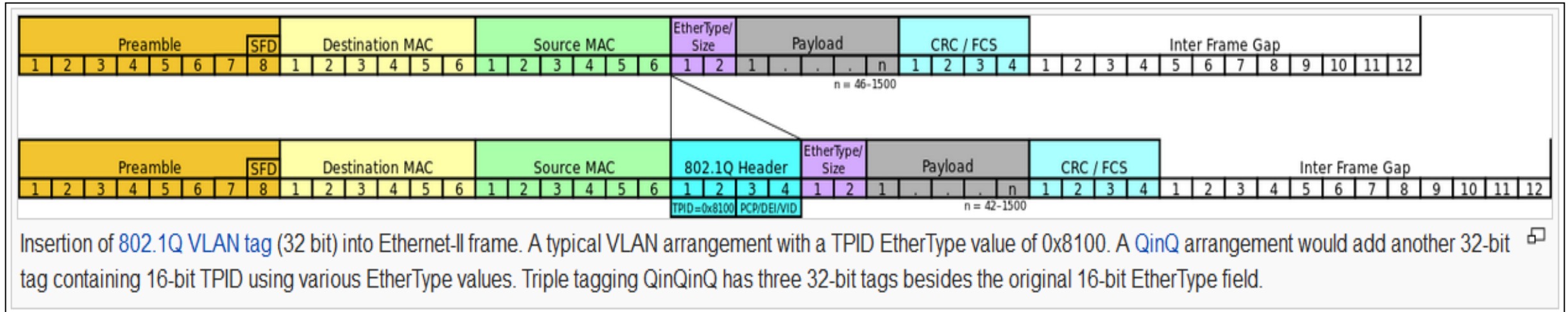
**Application (layer 4):** Acts as final endpoints at either end of a communication session between two network hosts

**Host-to-host (layer 3):** Manages the flow of traffic between two hosts or devices, ensuring that data arrives at the application on the host for which it is targeted

**Internet (layer 2):** Contains all functionality that manages the movement of data between two network devices over a routed network

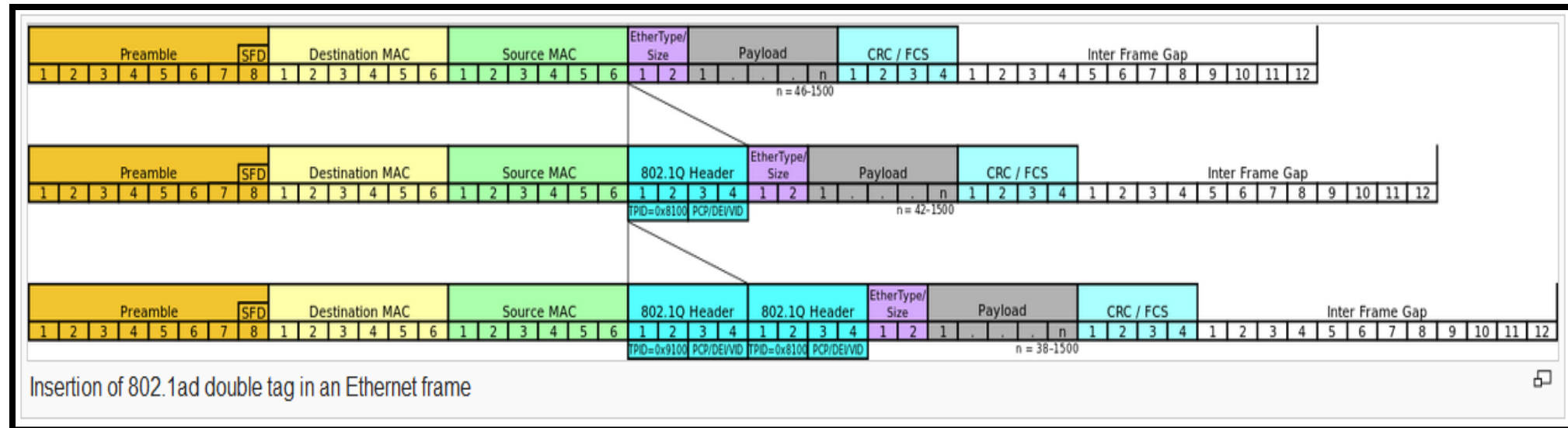
**Network interface (layer 1):** Deals with all physical components of network connectivity between the network and the IP protocol

# Ethernet Frame (FCS)



- Frame Check Sequence (FCS)
  - The FCS field contains a number that is calculated by the source node based on the data in the frame
  - TRUE/FALSE

# Ethernet Frame (VLANs)



- IEEE 802.1Q is the networking standard that supports virtual LANs (VLANs) on an Ethernet network

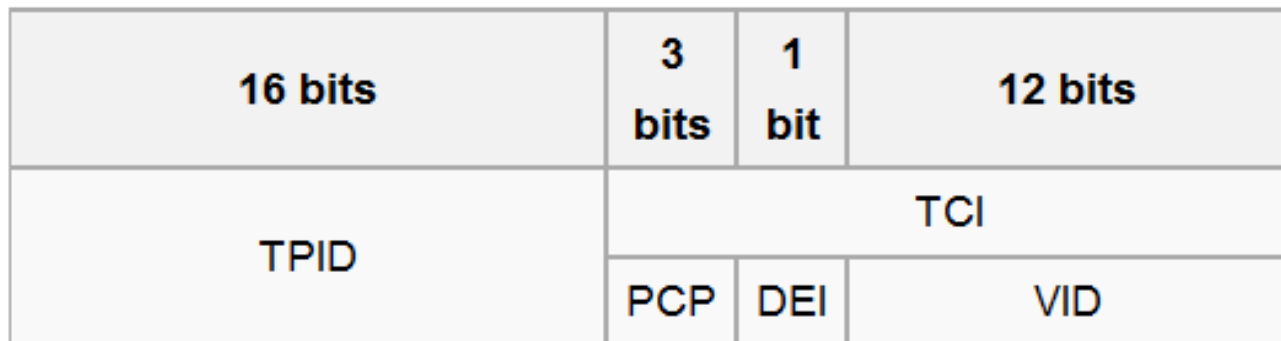
Tag Protocol Identifier (TPID)

Tag Control Information (TCI)

The TCI field is further divided into  
Priority code point (PCP)

Drop eligible indicator (DEI)

VLAN identifier (VID)





# Internet Protocol IPv4

		Internet Header Length				Differentiated Services Code Point								IPv4 Header Format								Explicit Congestion Notification													
Offsets	Octet	0				1												3																	
Octet	Bit	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
0	0	Version				IHL				DSCP				ECN				Total Length																	
4	32	Identification																Flags				Fragment Offset													
8	64	Time To Live								Protocol								Header Checksum																	
12	96	Source IP Address																																	
16	128	Destination IP Address																																	
20	160	Options (if IHL > 5)																																	

Protocol Number	Protocol Name	Abbreviation
1	Internet Control Message Protocol	ICMP
2	Internet Group Management Protocol	IGMP
6	Transmission Control Protocol	TCP
17	User Datagram Protocol	UDP
41	IPv6 encapsulation	ENCAP
89	Open Shortest Path First	OSPF
132	Stream Control Transmission Protocol	SCTP

**Identification** – Used for uniquely identifying the group of fragments of a single IP datagram.

**Flags** – Used to control or identify fragments.

**Fragment Offset** – 13 bits long and specifies the offset of a particular fragment relative to the beginning of the original unfragmented IP datagram.

# UDP Frame

UDP Port

FTP – 20 Data Transfer

FTP – 21 FTP Control

SSH – 22

Telnet – 23

SMTP – 25 E-Mail

HTTP – 80

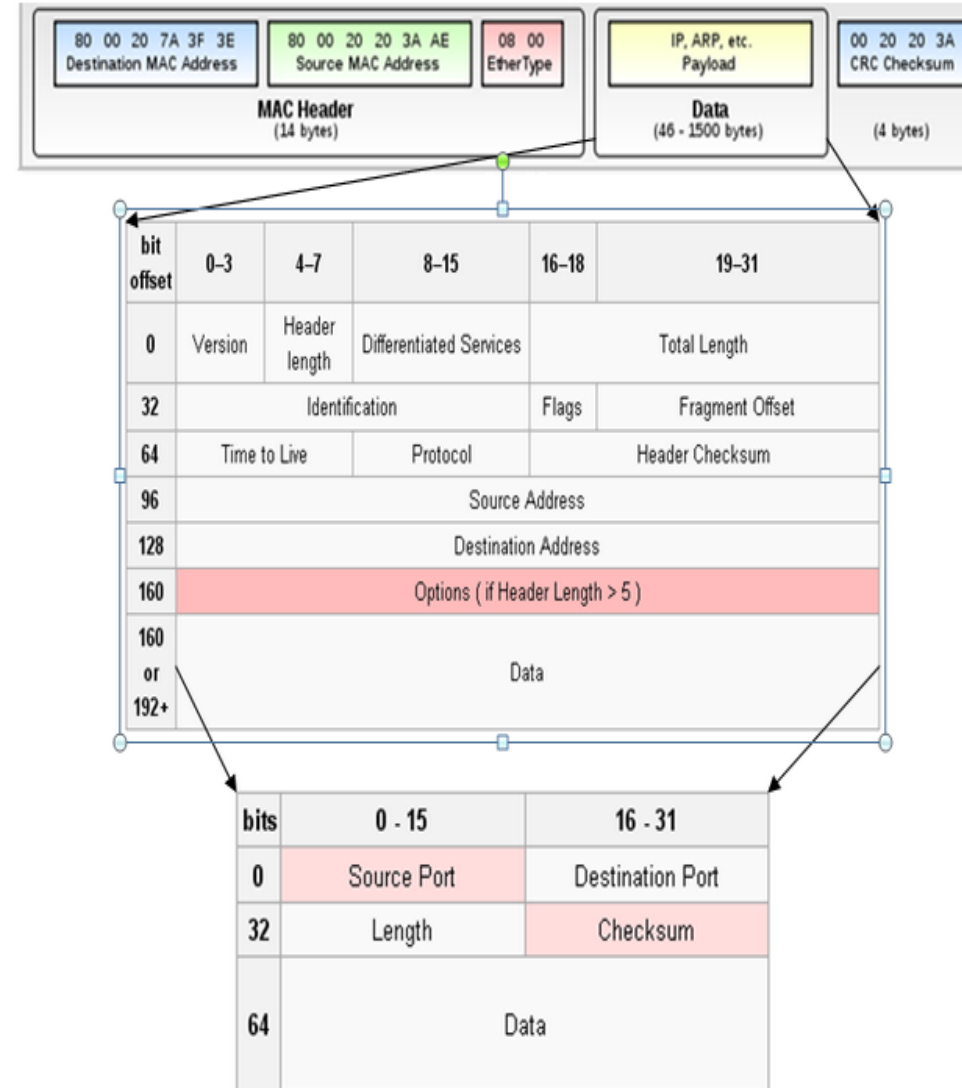
HTTPS – 443

RTP – even 1024 - 65535

RTCP – odd

SIP – 5060 (Destination Port)

SIP over TLS – 5061



# Real-time Analysis

PacketScan (IpProt) HD 64-bit

File View Capture Statistics Database Call Detail Records Configure Help

GoTo 0

Device	Frame#	TIME (Relative)	Length (Bytes)	Error	Packet Type MAC	Source IP Address IP	Destination IP Address IP	Source Address IPv6	Destination Address IPv6	Source Port UDP	Destination Port UDP	Source Port TCP	Destination Port TCP
✓ 2	0	00:00:00.000000000	836		SIP	192.168.1.200	192.168.1.103			54098	5060		INV
✓ 2	1	00:00:00.001552000	354		SIP	192.168.1.103	192.168.1.200			54098	5060		100
✓ 2	2	00:00:00.001669000	355		SIP	192.168.1.103	192.168.1.200			54098	5060		180
✓ 2	3	00:00:04.487598000	820		SIP	192.168.1.103	192.168.1.200			54098	5060		200
✓ 2	4	00:00:04.488999000	385		SIP	192.168.1.200	192.168.1.103			54098	5060		AC

Device2 Frame=0 at 00:00:00.000000000 OK Len=836 \*\*\* Right click to SHOW/HIDE layer details or copy \*\*\*

Ethernet Frame Data

```

----- MAC Layer -----
0000 Destination Address      = x0011116AF6D7
0006 Source Address          = x001676122661
000C Length/Protocol Type    = x0800 Internet IP(IPv4)
----- IP Layer -----

```

Hex Dump of the Frame Data

```

+-----+-----+-----+-----+-----+-----+-----+-----+
00 11 11 6A F6 D7 00 16 76 12 26 61 08 00 45 00   jöx v a E
03 36 02 3E 00 00 80 11 B0 F9 C0 A8 01 C8 C0 A8   6 > e "üÄ" EA
01 67 D3 52 13 C4 03 22 FA 5F 49 4E 56 49 54 45   gÖR Ä "ü_INVITE
20 73 69 70 3A 30 30 30 31 40 31 39 32 2E 31 36   sip:0001@192.16
20 2F 31 2F 31 20 22 20 C2 40 F0 2F 22 2F 20 20   0 1 103 CTB 2 0

```

Σ Device #	Σ Error Code	Σ Length	Σ Protocol Flag	Σ Time Stamp	Σ Destination Address	Σ Source Address
2	0	55	RTP (3)	x5818989F839E9AB3	x0011116AF6D7	x001676122661
total 2	total 0	total 55	total RTP (3)	total x5818989F839E9AB3	total x0011116AF6D7	total x001676122661
2	0	60	RTP (3)	x40D99FA3839E9AB3	x001676122661	x0011116AF6D7
total 2	total 0	total 60	total RTP (3)	total x40D99FA3839E9AB3	total x001676122661	total x0011116AF6D7
2	0	122	RTCP (2)	x70465EE27F9E9AB3	x0011116AF6D7	x001676122661
total 2	total 0	total 122	total RTCP (2)	total x70465EE27F9E9AB3	total x0011116AF6D7	total x001676122661

Call ID	Call Status	Protocol	Call Originating (Number / Address)	Call Destination (Number / Address)	Call Start Date & Time	Call Duration	Protocol Specific Info
0	Terminated	SIP	0001@192.168.1.200	0001@192.168.1.103	54736-11375-00 00:00:00.9...	00:49:57.772500	<SIPCallID> GLPG-48363...

Off-line Viewing. C:\Program Files\GL Communications Inc\PacketScan\E\2 550 Frames

→ Summary View

→ Detail View

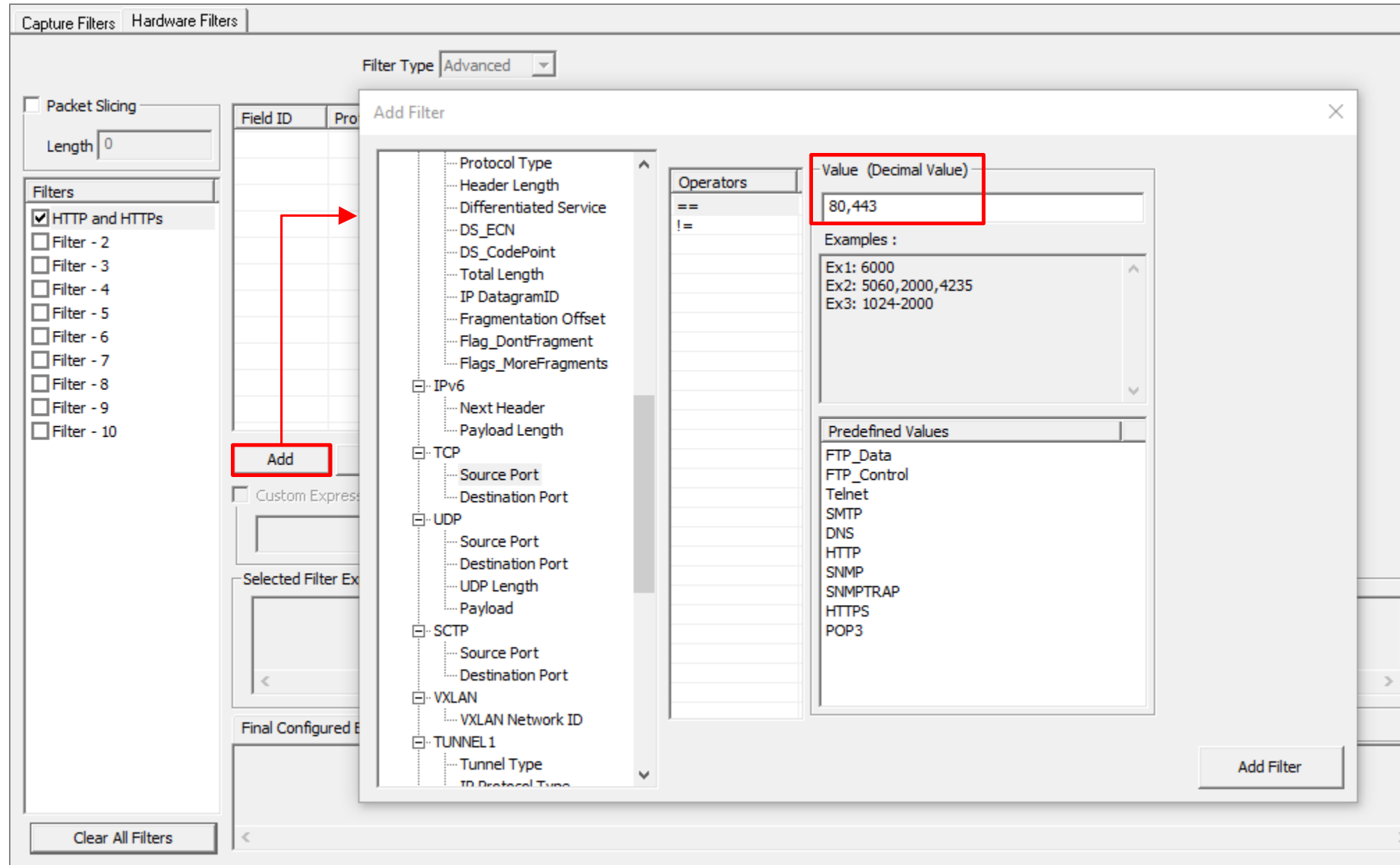
→ Hex Dump View

→ Statistics View

→ Call Detail Records View

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

# TCP Frame



# Filtering HTTP Traffic

Capture Filters Hardware Filters

Filter Type Advanced

☐ Packet Slicing  
Length

Filters

☒ HTTP  
☐ Filter - 2  
☐ Filter - 3  
☐ Filter - 4  
☐ Filter - 5  
☐ Filter - 6  
☐ Filter - 7  
☐ Filter - 8  
☐ Filter - 9  
☐ Filter - 10

Field ID	Protocol	Field Name	Operator	Value	Condition
F1	TCP	Source Port	==	80	
F2	TCP	Destination Port	==	80	

AddInsertDeleteClear All

Update

☒ Custom Expression  

Validate & Update

Selected Filter Expression  

Assign[StreamId = 10] = ((mTcpSrcPort == 80) OR (mTcpDestPort == 80))

Final Configured ExpressionsFinal Applied Expressions

Assign[StreamId = 10] = ((mTcpSrcPort == 80) OR (mTcpDestPort == 80))

Clear All Filters

Operators

Value (Decimal Value)

80

Examples :

Ex1: 6000  
Ex2: 5060,2000,4235  
Ex3: 1024-2000

Predefined Values

FTP\_Data  
FTP\_Control  
Telnet  
SMTP  
DNS  
HTTP

# Hardware Filters for Ethernet Fields

Capture FiltersHardware Filters

Filter Type Advanced

☐ Packet Slicing

Length

Filters

+

 GENERAL

+

 MAC

+

 VLAN0

+

 VLAN1

+

 VLAN2

+

 IPv4

+

 IPv6

+

 ARP

+

 TCP

+

 UDP

+

 SIP

+

 RTP

MAC (Ether Type)

802.1Q (VLANs)

IPv4

IPv6

AddInsertDeleteClear All

☐ Custom Expression

Validate & Update

Selected Filter Expression

Assign[StreamId = 10] == (mMacTypeLength == 0x0800)

Final Configured Expressions

Final Applied Expressions

Operators

Value (Hex Value)

0800

Examples :

Note: Supports single & multiple value only

Ex1: 0809

Ex2: 8100,9000,AF02

Predefined Values

AARP (0x80F3)

AppleTalk (0x809B)

ARP (0x0806)

ATA over Ethernet(0x88A2)

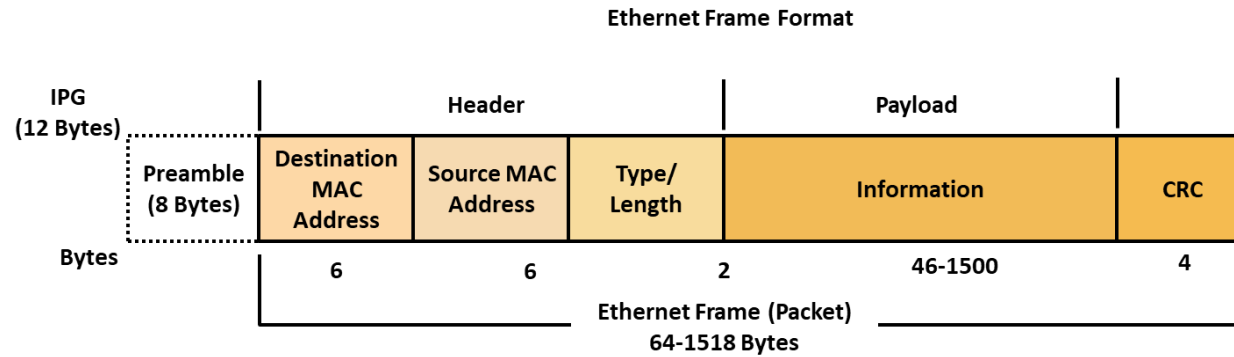
Audio Video Transport Protocol (0x22f0)

CFM Protocol / OAM (0x8902)

Update

Clear All Filters

# Ethernet Frame Structure



Filtering using fields in IP frame

MAC: Media Access Control  
IPG: Inter Packet Gap  
CRC: Cyclic Redundancy Check

## 802.3 Ethernet packet and frame structure

Layer	Preamble	Start of frame delimiter	MAC destination	MAC source	802.1Q tag (optional)	Ethertype (Ethernet II) or length (IEEE 802.3)	Payload	Frame check sequence (32-bit CRC)	Interpacket gap
	7 octets	1 octet	6 octets	6 octets	(4 octets)	2 octets	46(42) <sup>[b]</sup> –1500 octets	4 octets	12 octets
Layer 2 Ethernet frame	← 64–1518(1522) octets →								
Layer 1 Ethernet packet	← 72–1526(1530) octets →								



# Filtering SIP and RTP Traffic

Capture Filters Hardware Filters

Filter Type Advanced

☐ Packet Slicing  
Length

**Filters**

- ☒ SIP RTP
- ☐ Filter - 2
- ☐ Filter - 3
- ☐ Filter - 4
- ☐ Filter - 5
- ☐ Filter - 6
- ☐ Filter - 7
- ☐ Filter - 8
- ☐ Filter - 9
- ☐ Filter - 10

Field ID	Protocol	Field Name	Operator	Value	Condition
F1	SIP	SIP Port	==	5060	
F2	RTP	RTP Packets	==	TRUE	

☒ Custom Expression

**Layer4 Protocol**

☒ UDP  
☐ TCP  
☐ SCTP

**Value (Decimal Value)**

Examples :

Ex1: 5060  
Ex2: 5060,2000,4235  
Ex3: 5060-5070

**Selected Filter Expression**

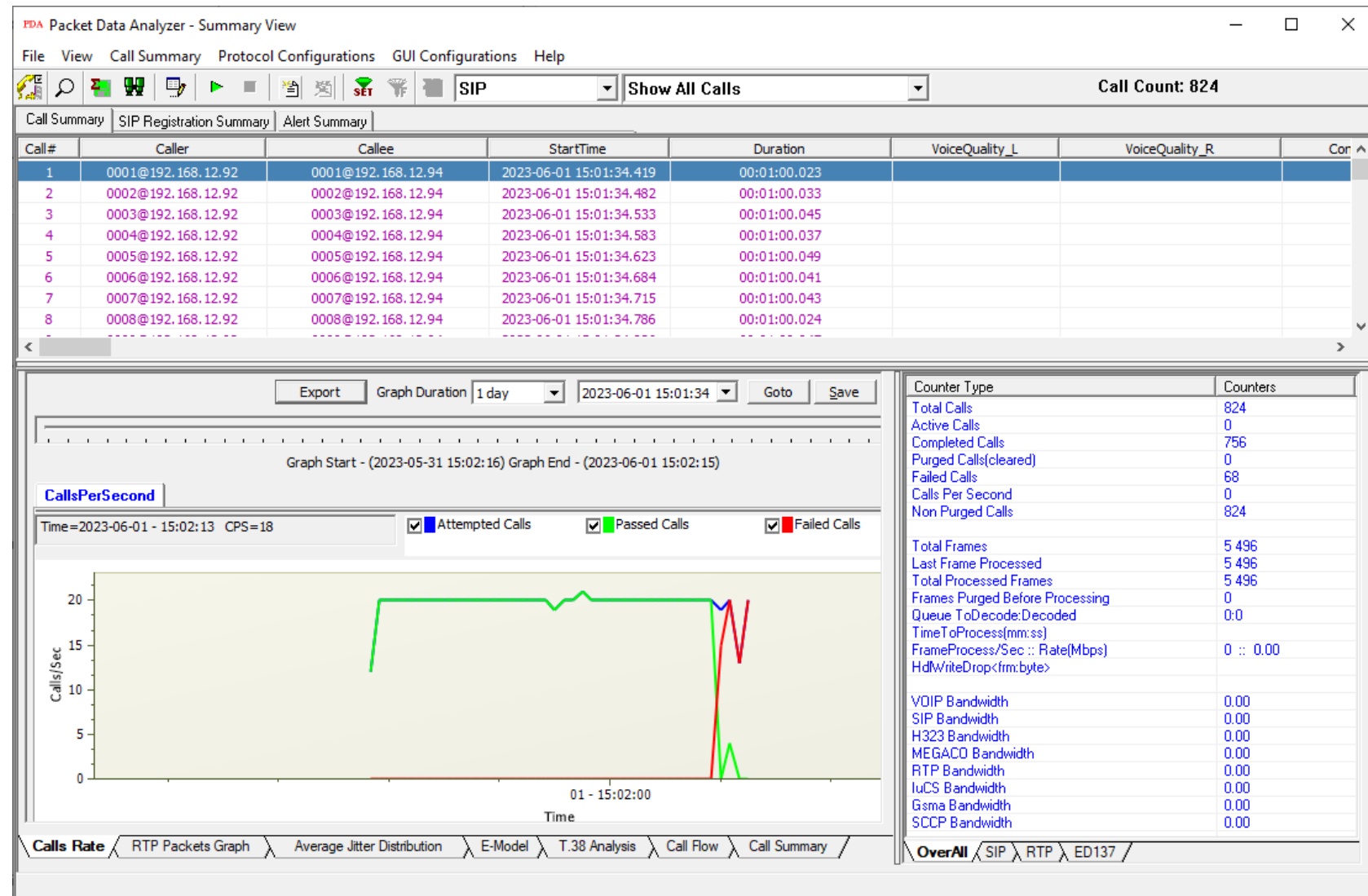
```
HashMask[mHashMaskSrcPort = 0xFFFFE; mHashMaskDstPort = 0xFFFFE] = Hash5Tuple  
Assign[StreamId = 10] = (((Layer4Protocol == UDP)) AND (mSrcPort == 5060 OR mDestPort == 5060)) OR ((mUdpSrcPort != (0..1023)) AND (mRtpVersion==2)))
```

**Final Configured Expressions** **Final Applied Expressions**

```
HashMask[mHashMaskSrcPort = 0xFFFFE; mHashMaskDstPort = 0xFFFFE] = Hash5Tuple  
Assign[StreamId = 10] = (((Layer4Protocol == UDP)) AND (mSrcPort == 5060 OR mDestPort == 5060)) OR ((mUdpSrcPort != (0..1023)) AND (mRtpVersion==2)))
```

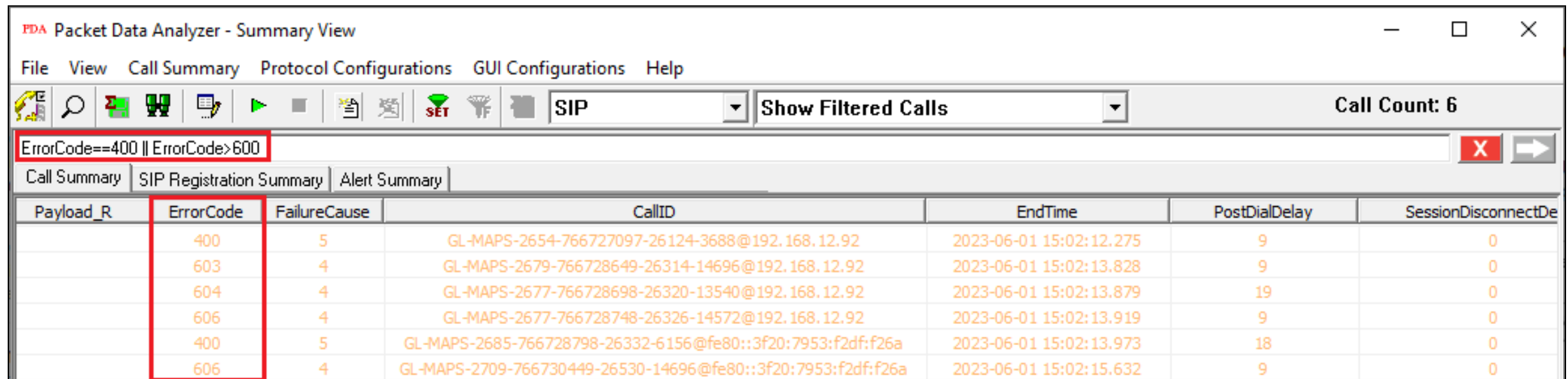
# Packet Data Analyzer (PDA) Summary View

- 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 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 "Error Code==400||Error Code>600" will display calls with Error Code equal to 400 and calls with Error Code greater than 600



The screenshot shows the 'Packet Data Analyzer - Summary View' window. The 'Call Summary' tab is active, displaying a table of filtered calls. The filter expression 'ErrorCode==400 || ErrorCode>600' is entered in the filter field. The table has columns: Payload\_R, ErrorCode, FailureCause, CallID, EndTime, PostDialDelay, and SessionDisconnectDe. The 'ErrorCode' column is highlighted with a red box, and the filter expression is also highlighted with a red box. The 'Call Count' is 6.

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

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 15:01:34.533				
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					

Save Call  
Copy Cell Value

Save Call - CallNum\_3

File Type  
☒ HDL File ☒ PCAP File ☒ PCAPNG Link Type 0

Path C:\Program Files\GL Communications Inc\PacketScan\

☒ Overwrite Files Save Call(s) Exit

Export Graph Duration

Graph Start - (2023-05-27 15:00:00)

Calls Per Second

Att

01 - 15:02:00

Time

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

OverAll SIP RTP ED137

Counters

824
0
756
0
68
0
824
5 496
5 496
5 496
0
0.0
0 :: 0.00
0.00
0.00
0.00
0.00
0.00
0.00
0.00

Last Frame Processed  
Total Processed Frames  
Frames Purged Before Processing  
Queue ToDecode/Decoded  
TimeToProcess(mm:ss)  
FrameProcess/Sec :: Rate(Mbps)  
HdlWriteDrop<frm:byte>

VDIP Bandwidth  
SIP Bandwidth  
H323 Bandwidth  
MEGACO Bandwidth  
RTP Bandwidth  
IuCS Bandwidth  
Gsm Bandwidth  
SCCP Bandwidth

# 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 15:01:34.533	00:01:00.045			
4	0004@192.168.12.92	0004@192.168.12.94	2023-06-01 15:01:34.584	00:01:00.041			
5	0005@192.168.12.92	0005@192.168.12.94	2023-06-01 15:01:34.635	00:01:00.043			
6	0006@192.168.12.92	0006@192.168.12.94	2023-06-01 15:01:34.684	00:01:00.024			
7	0007@192.168.12.92	0007@192.168.12.94	2023-06-01 15:01:34.715	00:01:00.024			
8	0008@192.168.12.92	0008@192.168.12.94	2023-06-01 15:01:34.786	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

20  
15  
10  
5  
0

01 - 15:02:00

Time

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<frm:byte>

VOIP Bandwidth 0.00  
SIP Bandwidth 0.00  
H323 Bandwidth 0.00  
MEGACO Bandwidth 0.00  
RTP Bandwidth 0.00  
IuCS Bandwidth 0.00  
Gsm Bandwidth 0.00  
SCCP Bandwidth 0.00

OverAll SIP RTP ED137

GL Communications

# Packet Data Analysis (PDA) 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 screenshot displays the PDA Packet Data Analyzer interface. The top section shows a summary of 824 calls. Below this, a table lists individual calls with columns for Call#, Caller, Callee, StartTime, Duration, VoiceQuality\_L, VoiceQuality\_R, Payload\_L, Payload\_R, Result, and ErrorCode. A red arrow points from the first call (Call# 1) to a detailed packet capture view.

The detailed view shows a sequence of frames between 192.168.12.92 and 192.168.12.94. The frames include an INVITE message, SIP/2.0 100 Trying, SIP/2.0 180 Ringing, SIP/2.0 200 OK, ACK, and BYE messages. A red arrow points from the INVITE message to the right pane, which displays the decoded information of the selected SIP message.

The right pane shows the decoded information of the selected SIP message, including the MAC Layer, IPv4 Layer, and various fields such as Destination Address, Source Address, Length/Protocol Type, Version, Internet Header Length, Differentiated Services Field, Differentiated Services Codepoint, Explicit Congestion Notification, IP Hdr No TCP SegmentationOffload, Total Length, Identification, Reserved Bit, Don't fragment, More fragments, Fragment Offset, Time To Live, Protocol, Header Check Sum, Source IP Address, and Destination IP Address.

Displays decoded information of the selected SIP message

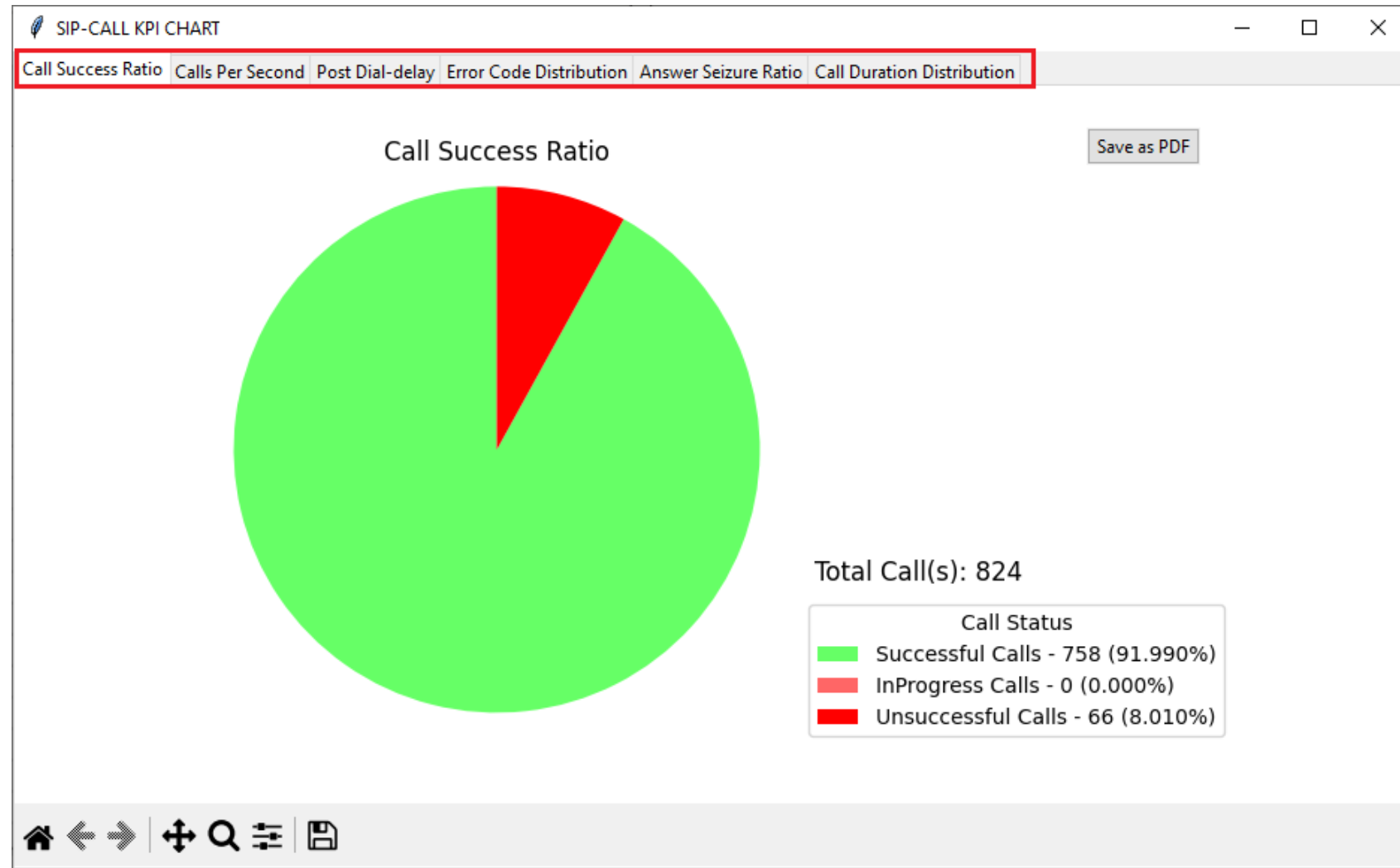


# Key Performance Indicators (KPIs) Report for SIP Calls

## Call Success Ratio KPI

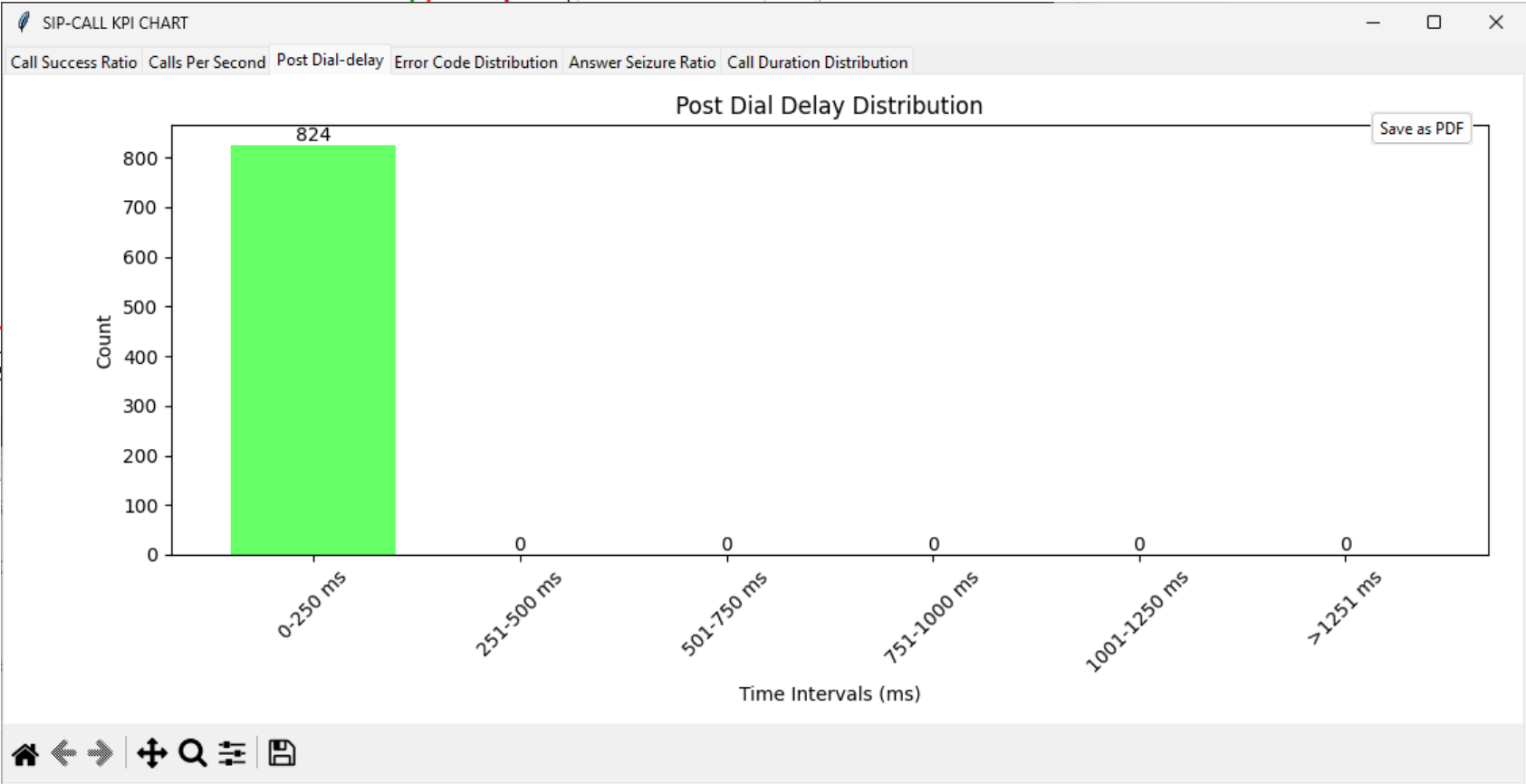
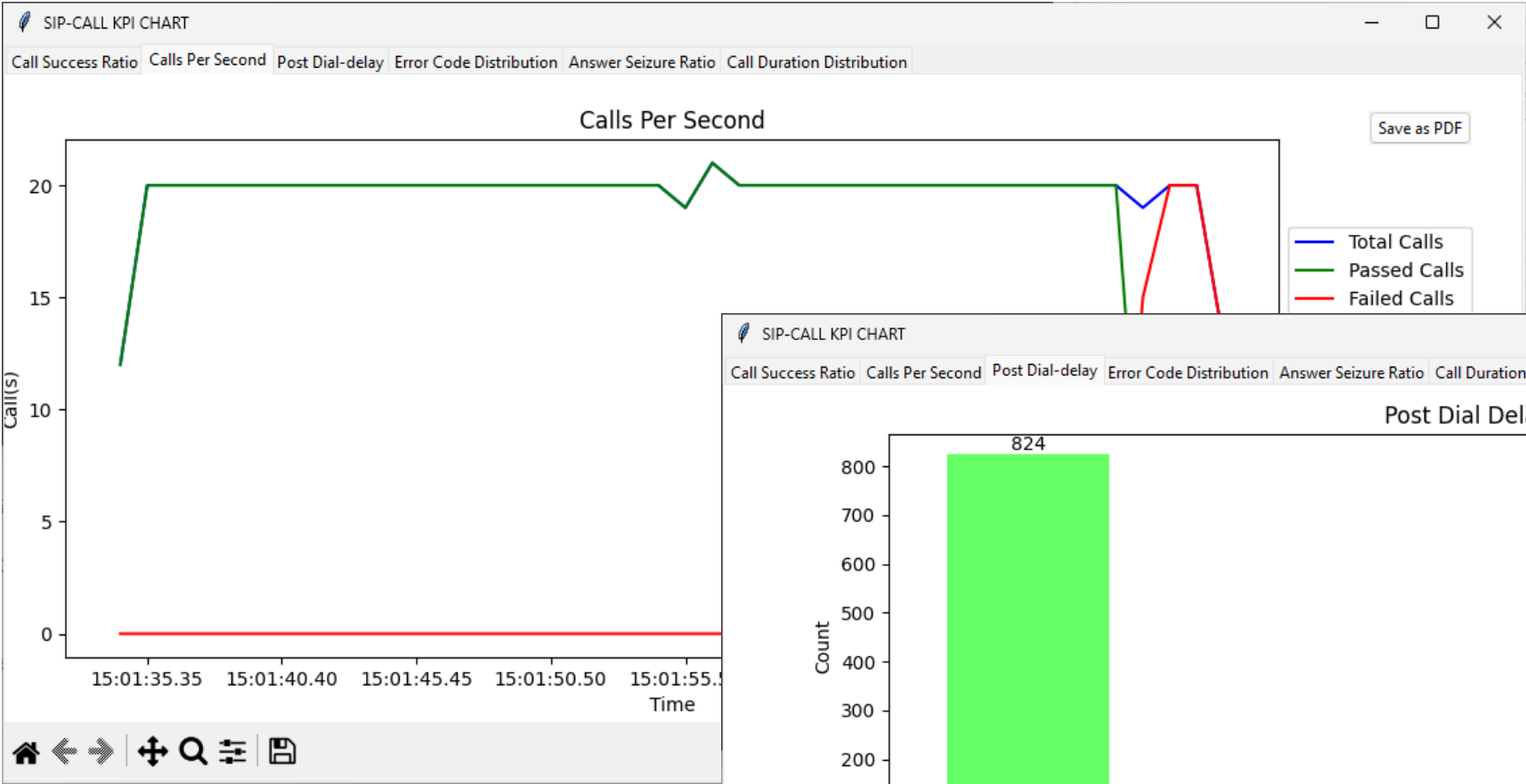
The **SIP Call Summary KPI** chart includes KPIs for the following:

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

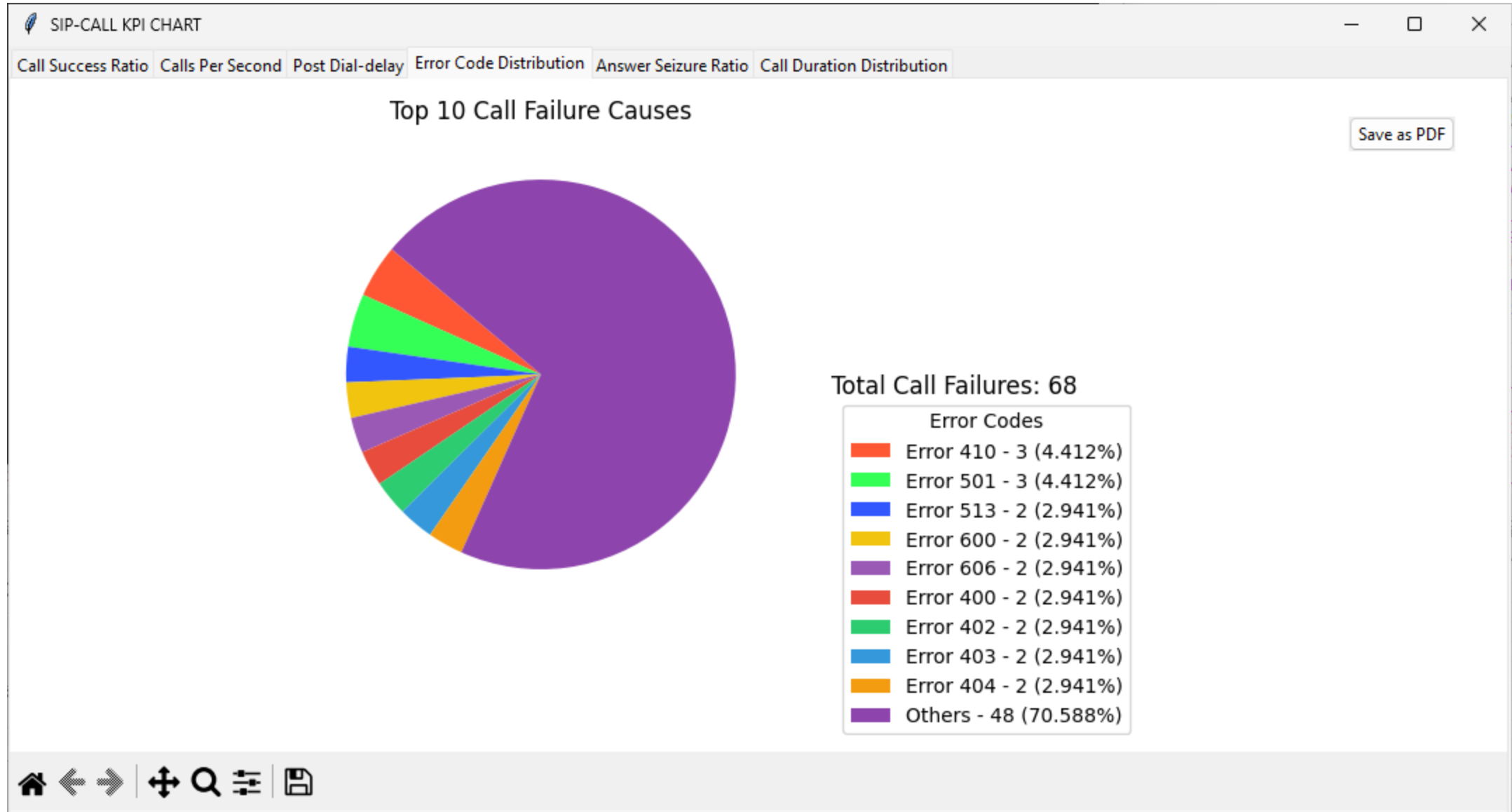




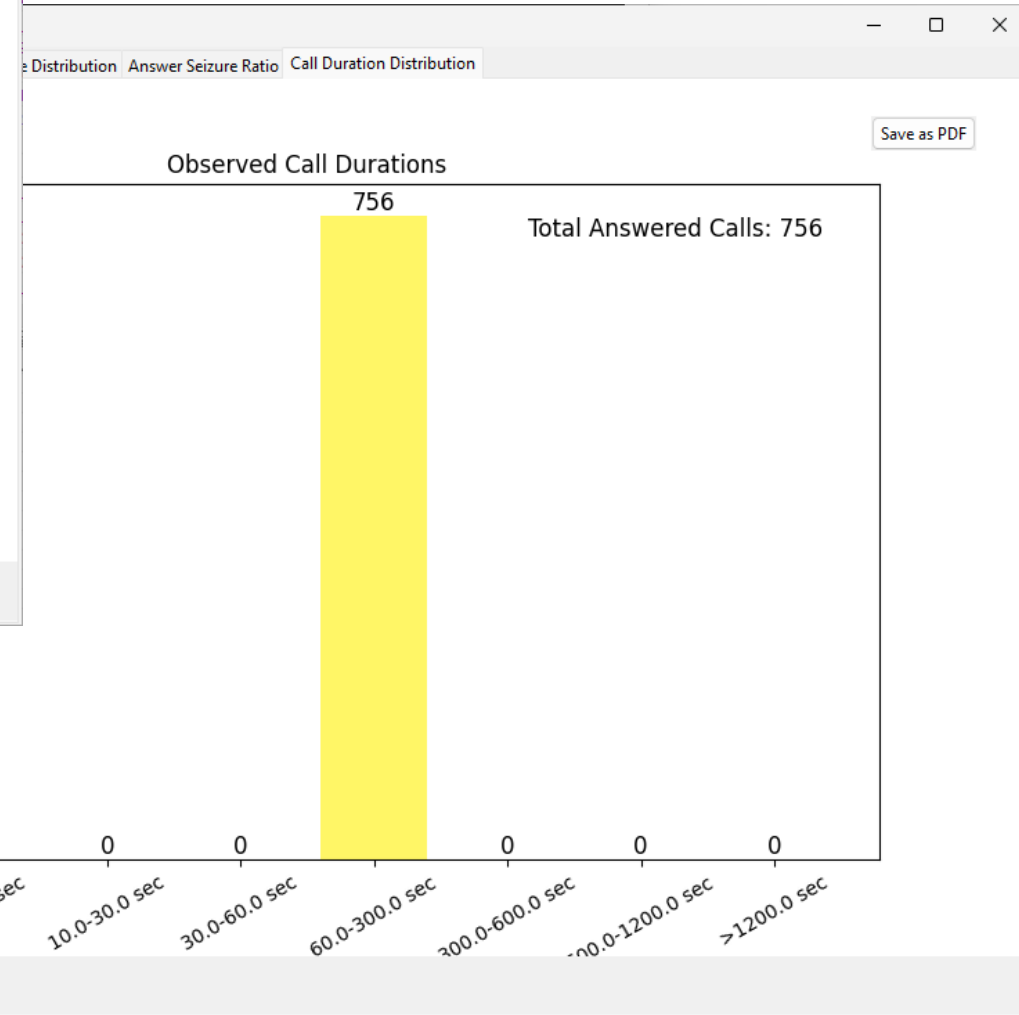
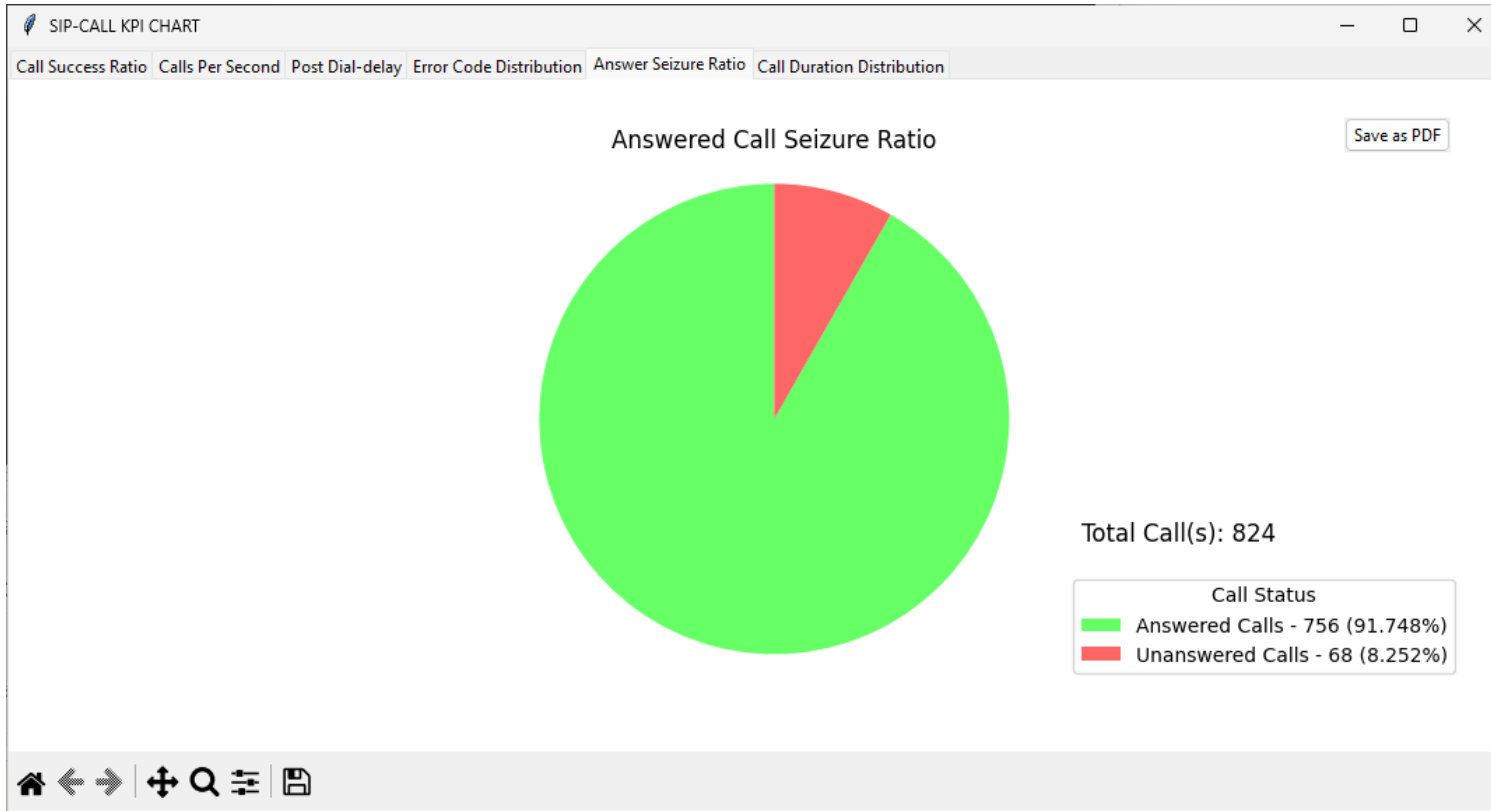
# Calls Per Second and Post Delay KPIs



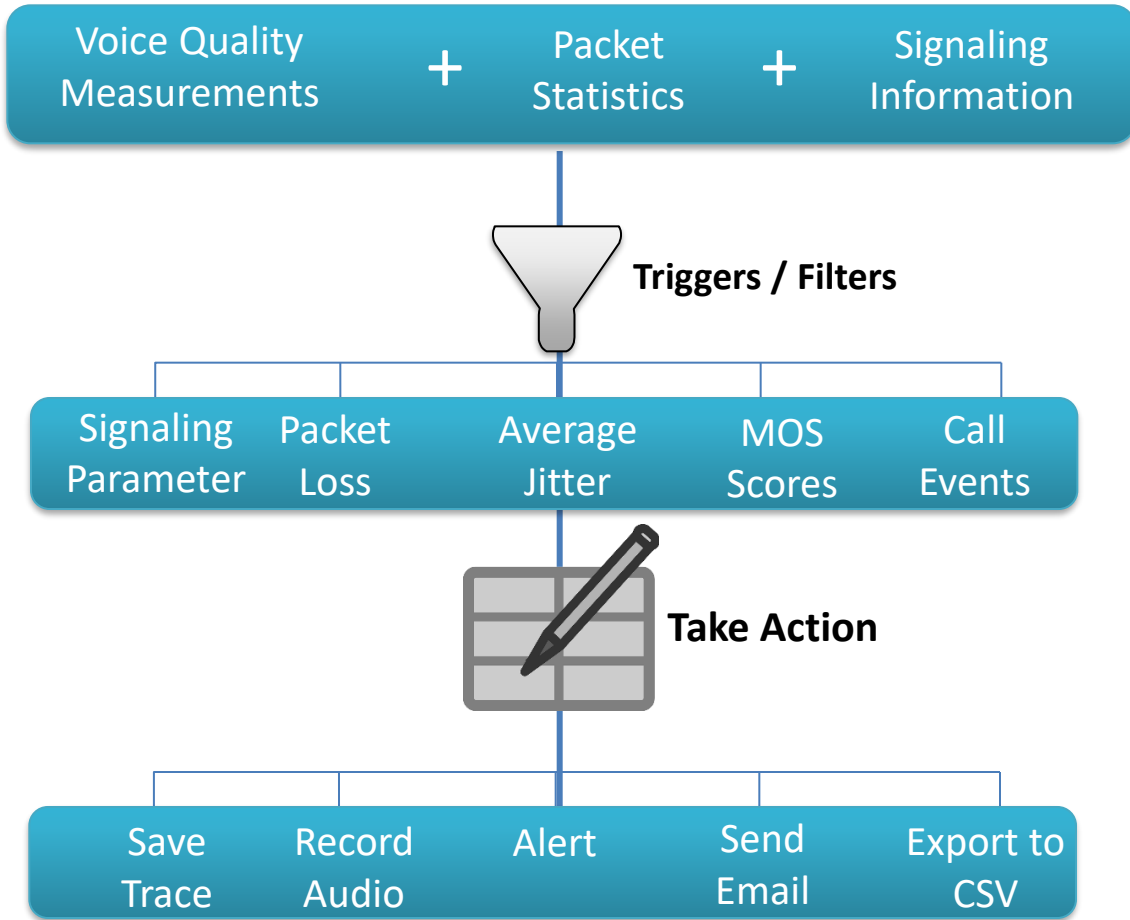
# Error Code Distribution KPI



# Answer Seizure Ratio and Call Duration Distribution KPIs



# Triggers and Actions



- Triggers can be:
  - Calling/Called Number, Pass/Fail Calls, Voice/SMS/Fax Calls, Call Duration, MOS, SIP Error Code
- Follow on actions can be performed:
  - Saves call in HDL or Wireshark file format
  - Export selected call detail records to CSV file
  - Record audio to file and send email alerts
  - Extracts fax image in the TIFF format from the selected fax call

# Voice Quality Metrics (Sample based)

- MOS is calculated periodically throughout the call which can help to mark the calls with Good, Average and Poor voice quality

Voice Quality Settings

File

Codec based MOS Distribution

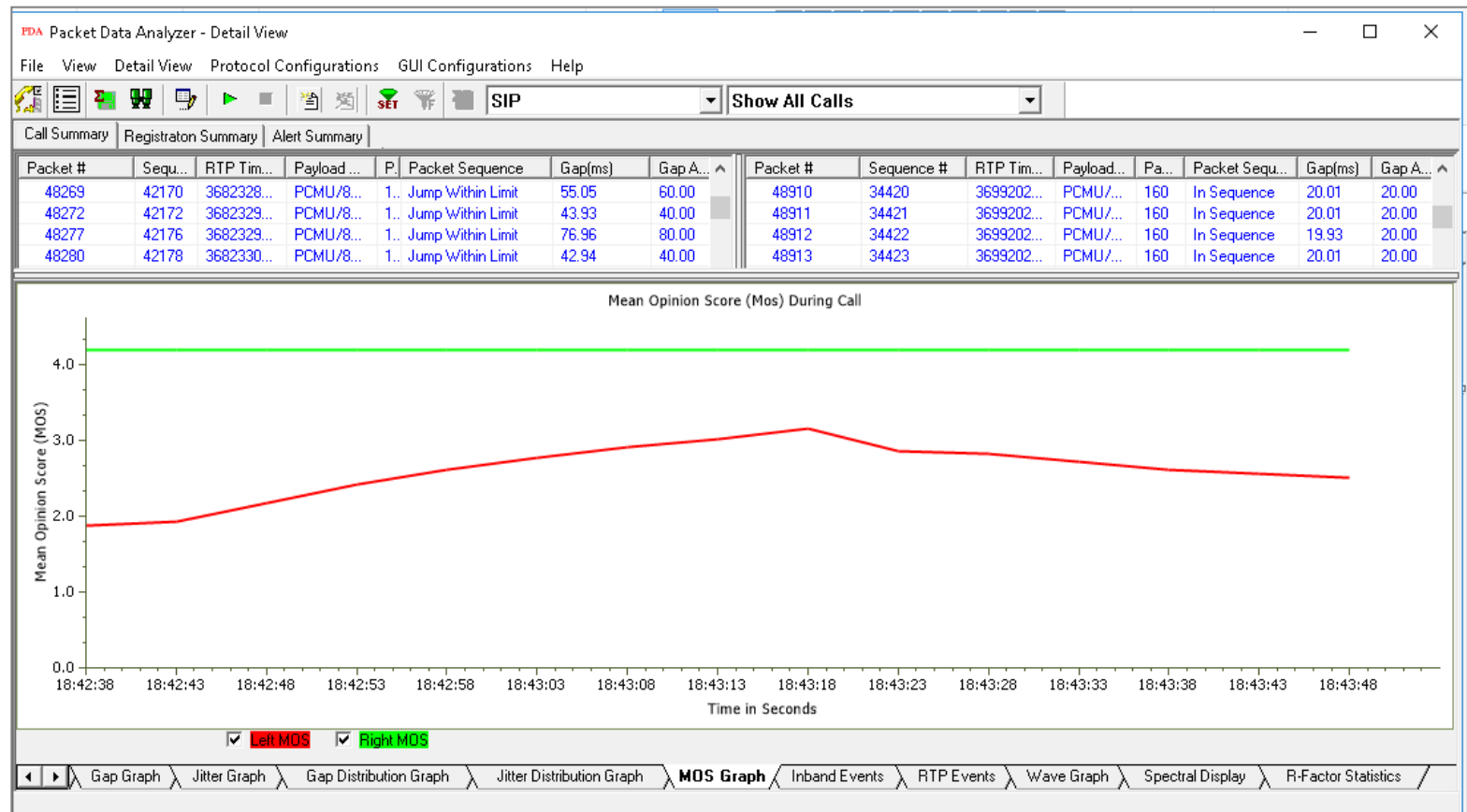
Codec	Poor MOS Value	Average MOS Value	Good MOS Value
PCMA	0.00-3.00	3.00-4.00	4.00-4.50
PCMU	0.00-3.00	3.00-4.00	4.00-4.50
G726-40	0.00-2.60	2.60-3.90	3.90-4.18
G726-32	0.00-2.40	2.40-3.70	3.70-4.09
G726-24	0.00-2.00	2.00-3.10	3.10-3.44
G726-16	0.00-1.50	1.50-2.60	2.60-2.92
G729	0.00-2.40	2.40-3.70	3.70-4.01
G729B	0.00-2.40	2.40-3.70	3.70-4.01
GSM	0.00-2.20	2.20-3.30	3.30-3.68
GSM-EFR	0.00-2.60	2.60-3.90	3.90-4.16
AMR	0.00-2.20	2.20-3.30	3.30-4.16
GSM-HR	0.00-2.20	2.20-3.30	3.30-3.53
EVRC	0.00-2.20	2.20-3.30	3.30-3.95
ILBC	0.00-2.40	2.40-3.70	3.70-4.01
SPEEX	0.00-1.80	1.80-2.90	2.90-4.14
ILBC-13-33	0.00-2.40	2.40-3.70	3.70-4.01
G722	0.00-2.40	2.40-3.70	3.70-3.91
SPEEX-WB	0.00-2.40	2.40-3.70	3.70-4.14
AMR-WB	0.00-2.00	2.00-3.10	3.10-4.18
EVRCB	0.00-2.20	2.20-3.30	3.30-3.95
EVS-NB	0.00-2.60	2.60-3.90	3.90-4.20
EVS-WB	0.00-2.60	2.60-3.90	3.90-4.20
EVS-SWB	0.00-2.60	2.60-3.90	3.90-4.20
EVS-FB	0.00-2.60	2.60-3.90	3.90-4.20
OPUS-NB	0.00-2.40	2.40-3.70	3.70-4.06

Voice Quality Settings

Sample MOS Every 10 secs Voice Quality Range 75-90%

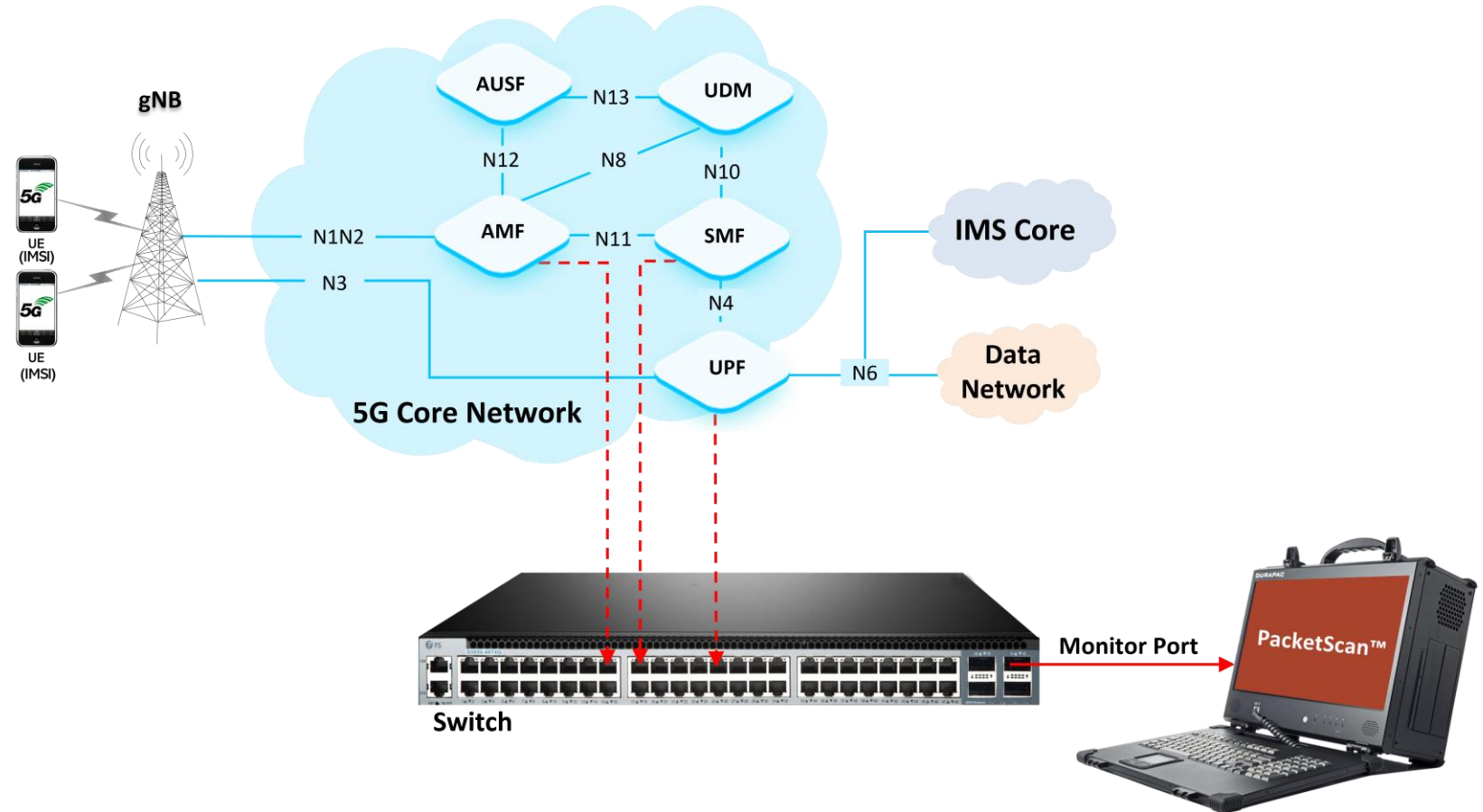
Poor%::0-75  
Average%::76-89  
Good%::90-100

OK Default



# 5G Protocol Analyzer

- Capture, Decode, and Analysis of Calls in 5G Network
- Supported protocols - Non-Access Stratum (NAS), Next Generation Application Protocol (NGAP), Packet Forwarding Control Protocol (PFCP), XnAP, SCTP, UDP, TCP, and IP
- Following interfaces are supported in Packet Data Analyzer:
  - N1 N2, N4, N8, N10, N11, N12, and N13
  - Packet Data Analyzer feature in PacketScan™ HD provide a complete call flow of a 5G session



# 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 =====

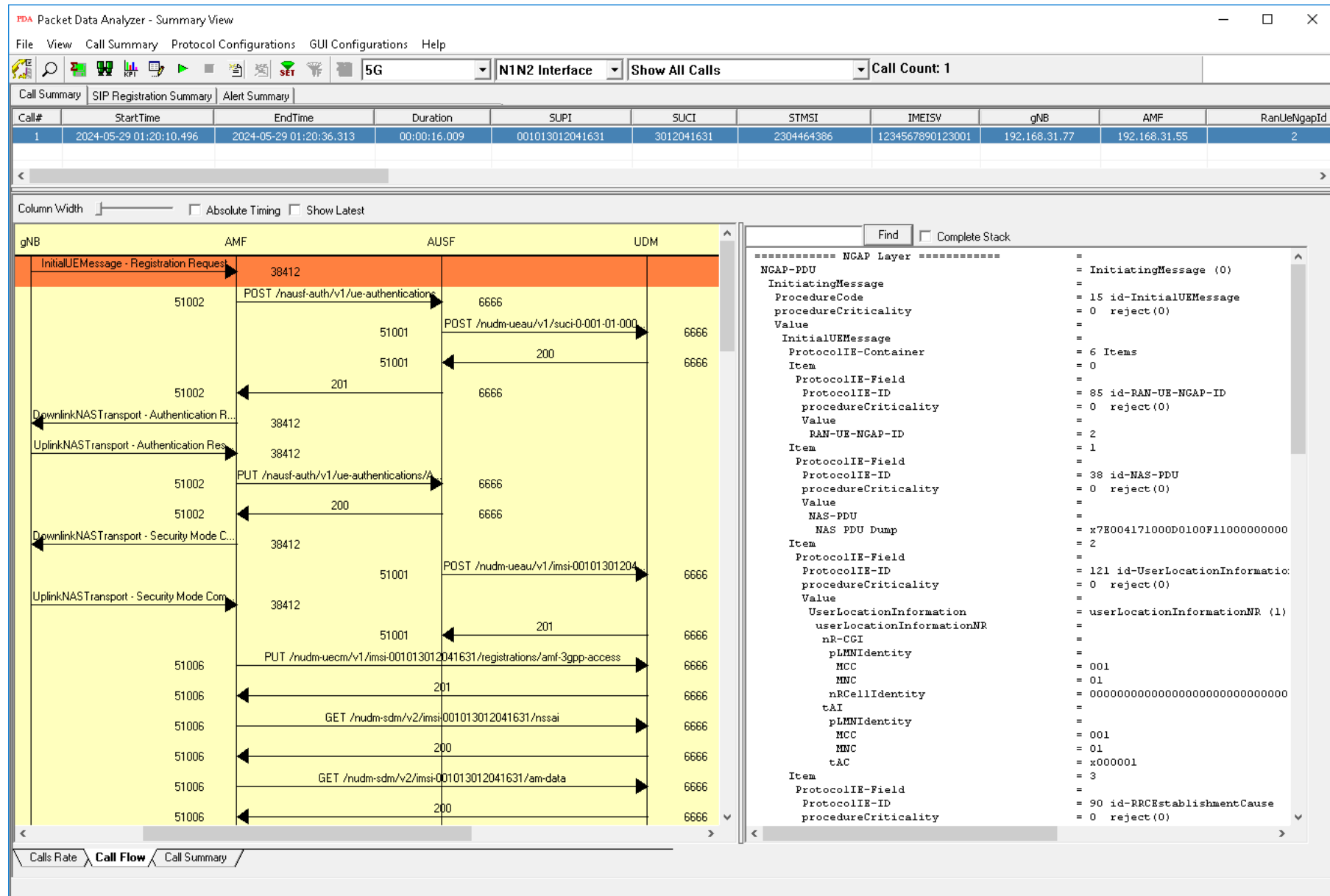
003E NGAP-PDU = InitiatingMessage (0)  
003E InitiatingMessage =  
003F ProcedureCode = 4 id-DownlinkNASTransport  
0040 procedureCriticality = 1 ignore(1)  
0042 Value =  
0042 DownlinkNASTransport =  
0042 ProtocolIE-Container = 3 Items  
0045 Item = 0  
0045 ProtocolIE-Field =  
0045 ProtocolIE-ID = 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 filr 23 of 113 395 frames Missed Frames : 0

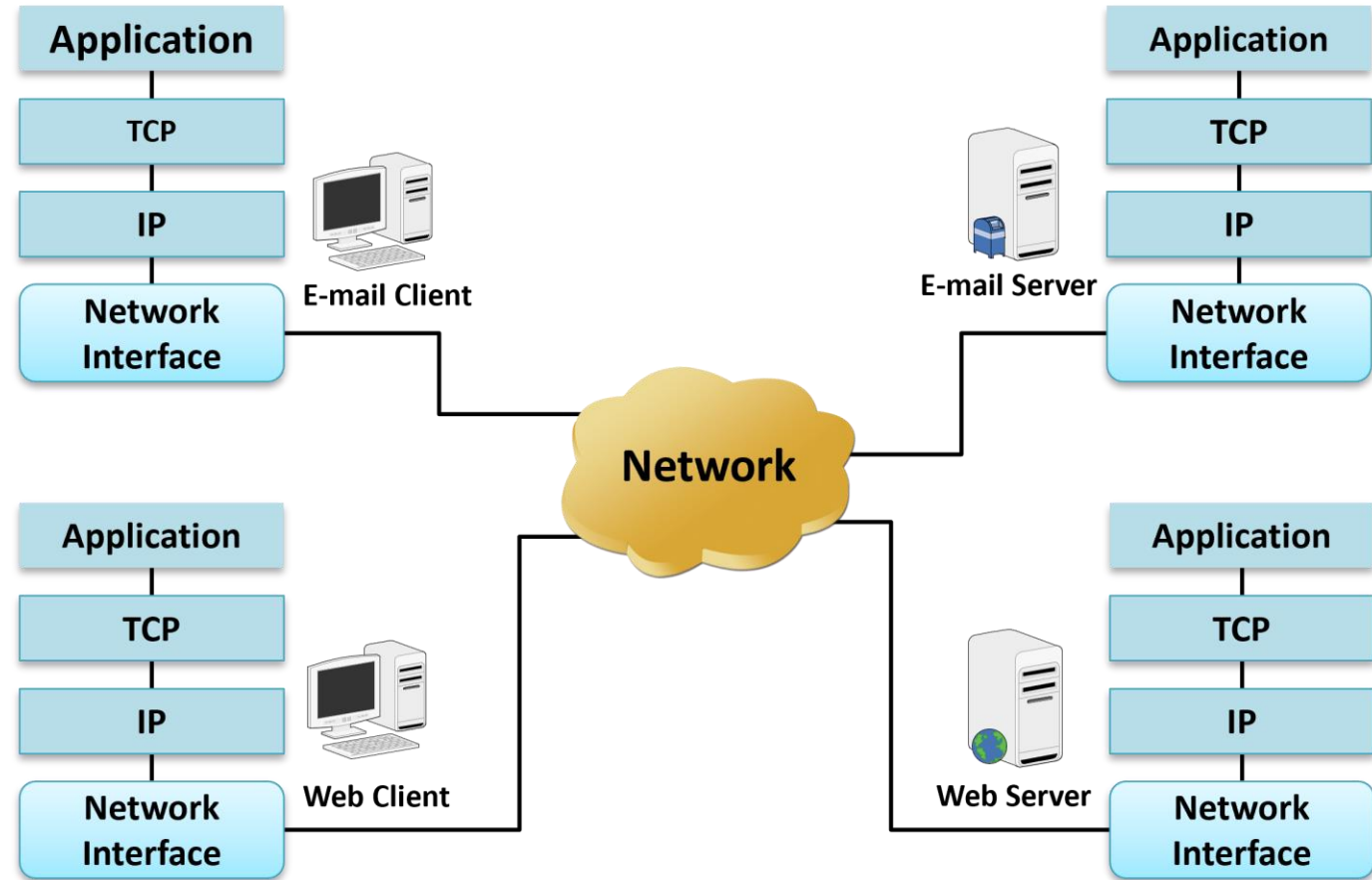
# Call Graph – 5G N1N2





# TCP Analytics Network

- Analyze TCP connections between internal company LAN connected computers and outside computers on the WAN
- Analyze TCP connections of a particular client server pair
- Analyze TCP connections on a subset of a LAN
- Display top level statistics
- Communicate with PacketScan™ to display packets that belong to a selected TCP connection
- Export information to CSV files for subsequent Excel or a database import
- Sort tabular information by column values



# TCP Data Processing

PacketScan (IpProt) 64-bit [off-line]

File View Capture Statistics Database Call Detail Records Configure Help

0 GoTo

Device	Frame#	TIME (Date)	Length (Bytes)	Error	Destination Port	FIN Finish Data Flag	Protocol	RST Reset Connection Flag	Sequence Number	Source IP Address	Source Port	Source Port	Source Port	SYN Synchron
					UDP	TCP	IP	TCP	TCP	IP	TCP	UDP		
✓ 1	144	2022-07-29 17:33:24.556410000	54			- more data from sender	TCP	- do not reset connection	2753544325	192.168.12.92	54791			- not set
✓ 1	145	2022-07-29 17:33:24.728730000	86											
✓ 1	146	2022-07-29 17:33:24.812591000	60											
✓ 1	147	2022-07-29 17:33:25.045551000	105			- more data from sender	TCP	- do not reset connection	2510704147	192.168.30.155	3389			- not set
✓ 1	148	2022-07-29 17:33:25.056367000								192.168.30.155		3389		
✓ 1	149	2022-07-29 17:33:25.056368000								192.168.30.155		3389		
✓ 1	150	2022-07-29 17:33:25.056552000								192.168.12.92		54511		
✓ 1	151	2022-07-29 17:33:25.058647000								192.168.30.155		3389		
✓ 1	152	2022-07-29 17:33:25.077041000								192.168.30.155		3389		
✓ 1	153	2022-07-29 17:33:25.077213000	54		3389		UDP			192.168.12.92		54511		
✓ 1	154	2022-07-29 17:33:25.094835000	54			- more data from sender	TCP	- do not reset connection	1890036032	192.168.12.92	57522			- not set
✓ 1	155	2022-07-29 17:33:25.095795000	60											
✓ 1	156	2022-07-29 17:33:25.141539000	137		3389		UDP			192.168.12.92		54511		
✓ 1	157	2022-07-29 17:33:25.186258000	60											
✓ 1	158	2022-07-29 17:33:25.479651000	105			- more data from sender	TCP	- do not reset connection	2131187858	192.168.30.146	3389			- not set
✓ 1	159	2022-07-29 17:33:25.508338000	105			- more data from sender	TCP	- do not reset connection	3823082860	192.168.30.104	3389			- not set
✓ 1	160	2022-07-29 17:33:25.521455000	60		54511		UDP			192.168.30.155		3389		
✓ 1	161	2022-07-29 17:33:25.526595000	54			- more data from sender	TCP	- do not reset connection	3047300261	192.168.12.92	54789			- not set
✓ 1	162	2022-07-29 17:33:25.557192000	54			- more data from sender	TCP	- do not reset connection	1417555879	192.168.12.92	56829			- not set
✓ 1	163	2022-07-29 17:33:25.723157000	86											
✓ 1	164	2022-07-29 17:33:25.868552000	126			- more data from sender	TCP	- do not reset connection	267330076	192.168.12.92	49292			- not set
✓ 1	165	2022-07-29 17:33:25.869198000	126			- more data from sender	TCP	- do not reset connection	544278709	192.168.1.3	445			- not set
✓ 1	166	2022-07-29 17:33:25.869293000	126			- more data from sender	TCP	- do not reset connection	267330148	192.168.12.92	49292			- not set
✓ 1	167	2022-07-29 17:33:25.869893000	126			- more data from sender	TCP	- do not reset connection	544278781	192.168.1.3	445			- not set
✓ 1	168	2022-07-29 17:33:25.870038000	54			- more data from sender	TCP	RST	267330220	192.168.12.92	49292			- not set
✓ 1	169	2022-07-29 17:33:26.056672000	60											

Processed 20 000 000

Progress indicator. Click cancel to stop the process.

Cancel

Device1 Frame=144 at 2022-07-29 17:33:24.556410000 OK Len=54

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

Ethernet Frame Data

\*\*\*\*\* MAC Layer \*\*\*\*\*

0000 Destination Address = xC0EAE484BA92

0006 Source Address = x54BEF737BC79

000C Length/Protocol Type = x0800 Internet IP(IPv4)

\*\*\*\*\* IP Layer \*\*\*\*\*

000E Version = 0100.... (4)

000E Internet Header Length (In 32 bit words) = ....0101 (5)

000F Differentiated Services Field = 000000... Default

000F Explicit Congestion Notification = .....00 Not-ECT (Not ECN-Capable Transport)

IP Hdr No TCP SegmentationOffload =

0010 Total Length = 40 (x0028)

0012 Identification = 52172 (xCBCC)

0014 Reserved Bit = 0..... Not Set

0014 Don't fragment = .1..... Set

0014 More fragments = ..0..... Not Set

0014 Fragment Offset = 0 ( 000000 000000000)

Off-line Viewing. E:\GL People\Sunil\TCP Analytics\Trace\20220801.hdl 24 704 523 Frames

# ESP Deciphering

- ESP deciphered packets as shown

PacketScan 64-bit

File View Capture Statistics Database Call Detail Records Configure Help

Device Frame# TIME (Relative) Length (Bytes) Error Length/Protocol Type MAC Packet Type MAC Source IP Address IPv4 Destination IP Address IPv4 Source Address IPv6

✓ 1	0	00:00:00.000000000	769		Internet IP(IPv4)	SIP	192.168.12.86	192.168.12.45	
✓ 1	1	00:00:00.515721000	769		Internet IP(IPv4)	SIP	192.168.12.86	192.168.12.45	
✓ 1	2	00:00:01.537143000	769		Internet IP(IPv4)	SIP	192.168.12.86	192.168.12.45	
✓ 1	3	00:00:03.558945000	769		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 (xC0A80C56)  
001E Destination IP Address = 192.168.12.45 (xC0A80C2D)  
===== UDP Layer =====  
0022 Source Port = 5060 (x13C4)  
0024 Destination Port = 5060 (x13C4)  
0026 Length (Header + Data) = 735 (x02DF)  
0028 Checksum = x16FB  
===== SIP Layer =====  
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-MAPS-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  
=   
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=fmtp:101 0-15  
BODY = aptime:20  
BODY = a=sendrecv

Off-line Viewing. C:\Users\Sunil\Desktop\FastRecorderAndPacketExtractor\_56 Frames

## Comparison of Before and After Deciphering

PacketScan 64-bit

File View Capture Statistics Database Call Detail Records Configure Help

Device Frame# TIME (Relative) Length (Bytes) Error Length/Protocol Type MAC Packet Type MAC Source IP Address IPv4 Destination IP Address IPv4 Source Address IPv6

Device	Frame#	TIME (Relative)	Length (Bytes)	Error	Length/Protocol Type	MAC	Packet Type	MAC	Source IP Address IPv4	Destination IP Address IPv4	Source Address IPv6
✓ 1	0	00:00:00.000000000	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	00:00:05.143077000	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 00:00:00.000000000 OK Len=822

Ethernet Frame Data

\*\*\*\*\* MAC Layer \*\*\*\*\*

0000 Destination Address = xE0D55EADFBD

0006 Source Address = xFCA01492AB2F

000C Length/Protocol Type = x0800 Internet IP (IPv4)

\*\*\*\*\* IPv4 Layer \*\*\*\*\*

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

Before Deciphering

### 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 MAC	Packet Type MAC	Source IP Address IPv4	Destination IP Address IPv4	Source Address IPv6
✓ 1	0	00:00:00.000000000	769		Internet IP(IPv4)	SIP	192.168.12.86	192.168.12.45	
✓ 1	1	00:00:00.515721000	769		Internet IP(IPv4)	SIP	192.168.12.86	192.168.12.45	
✓ 1	2	00:00:01.537143000	769		Internet IP(IPv4)	SIP	192.168.12.86	192.168.12.45	
✓ 1	3	00:00:03.558945000	769		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 (xC0A80C56)  
 001E Destination IP Address = 192.168.12.45 (xC0A80C2D)  
 ===== 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-MAPS-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 = 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 = a=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=fmtp:101 0-15  
 BODY = a=ptime:20  
 BODY = a=sendrecv

After Deciphering

Off-line Viewing. C:\Users\Sunil\Desktop\FastRecorderAndPacketExtractor\_56 Frames

# Analysis of eCPRI Decodes in Offline PacketScan™ HD

## Over UDP

```
Device0 Frame=6 at 2022-06-09 06:07:36.711206000 OK Len=112 *** Right d
Ethernet Frame Data
===== MAC Layer =====
0000 Destination Address      = xFCAA149225C4
0006 Source Address          = x54BEF737CB9A
000C Length/Protocol Type    = x86DD IPv6
===== IPv6 Layer =====
000E Protocol Version        = 0110.... (6)
000E Traffic Class           = 0 (....0000 0000....)
000F Flow Label              = 834513 (....1100 10111011 11010001)
0012 Payload Length          = 58 (x003A)
0014 Next Header              = 00010001 User Datagram Protocol (UDP)
0015 Hop Limit                = 64 (x40)
0016 Source Address           = fe80::64f2:5e84:f1db:502
0026 Destination Address     = fe80::589e:b2d5:9074:2bec
===== UDP Layer =====
0036 Source Port              = 64000 (xFA00)
0038 Destination Port        = 64000 (xFA00)
003A Length (Header + Data)   = 58 (x003A)
003C Checksum                 = x7F76
===== eCPRI Layer =====
003E C                        = .....0 eCPRI message is the last one inside the eCPRI PDU
003E eCPRI Protocol Revision = 0001.... (1)
003F eCPRI Message Type      = 00000100 Remote Memory Access
0040 eCPRI Payload Size      = 28 (x001C)
0042 Remote Memory Access ID = 17 (x11)
0043 Req/Resp                 = ....0010 Failure
0043 Read/Write               = 0010.... Write_No_Resp
0044 Element ID               = 8755 (x2233)
0046 Address                  = x050403020100
004C Length                   = 16 (x0010)
    User Data                  = xFFEEDDCCBBAA99887766554433221100
```

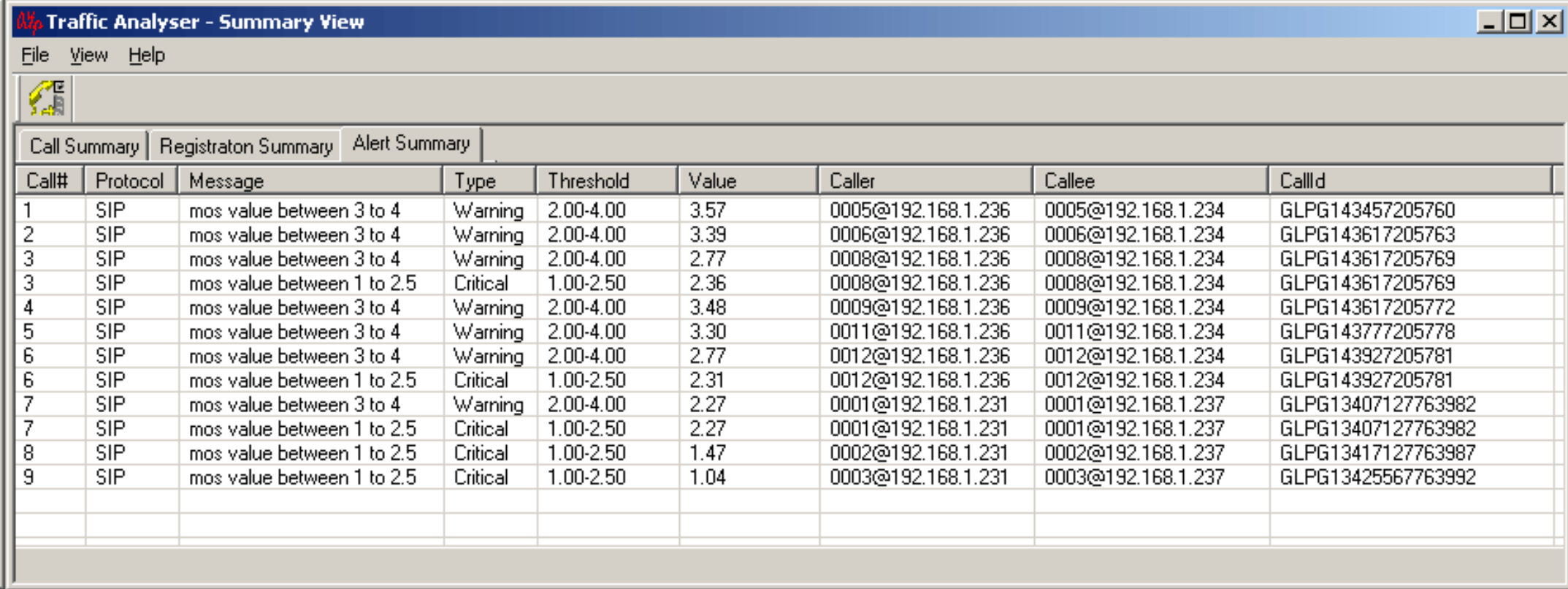
# Analysis of eCPRI Decodes in Offline PacketScan™ HD (Contd.)

## Over MAC

```
Device0 Frame=0 at 2019-02-13 11:36:46.000000000 OK Len=64 *** Right
Ethernet Frame Data
===== MAC Layer =====
0000 Destination Address      = x008016000000
0006 Source Address          = x008016884EFF
000C Length/Protocol Type    = xAEFE eCPRI
===== eCPRI Layer =====
000E C                        = .....0 eCPRI message is the last one inside the eCPRI PDU
000E eCPRI Protocol Revision = 0001.... (1)
000F eCPRI Message Type      = 00000000 IQ Data
0010 eCPRI Payload Size      = 20 (x0014)
    eCPRI Payload            = x123487650F0E0D0C0B0A09080706050403020100
===== O-RAN Fronthaul CUS Layer =====
    ecpriPcid                =
0012 BandSector_ID           = ..010010 (18)
0012 DU_Port_ID              = 00..... (0)
0013 RU_Port_ID              = ....0100 (4)
0013 CC_ID                   = 0011.... (3)
    ecpriSeqid               =
0014 Sequence ID             = 135 (x87)
0015 Subsequence ID          = .1100101 (101)
0015 E bit                   = 0..... More fragments follow
0016 FilterIndex             = ....1111 Reserved
0016 payloadVersion          = .000.... (0)
0016 dataDirection           = 0..... UpLink
0017 frameId                 = 14 (x0E)
0018 subframeId              = 0000.... (0)
0018 slotId                  = 52 (....1101 00.....)
0019 startSymbolId           = ..001100 (12)
001A sectionId               = 176 (00001011 0000....)
001B symInc                  = .....0.. use the current symbol number
001B rb                      = ....1... every other RB used
001B startPrbu               = 521 (.....10 00001001)
001D numPrbu                 = 8 (x08)
    udCompHdr                =
001E udCompMeth              = ....0111 Reserved
001E udIqWidth               = 0000.... I and Q are each 16 bit wide
    Dump                     = x050403020100
```



# PDA - Alert Summary



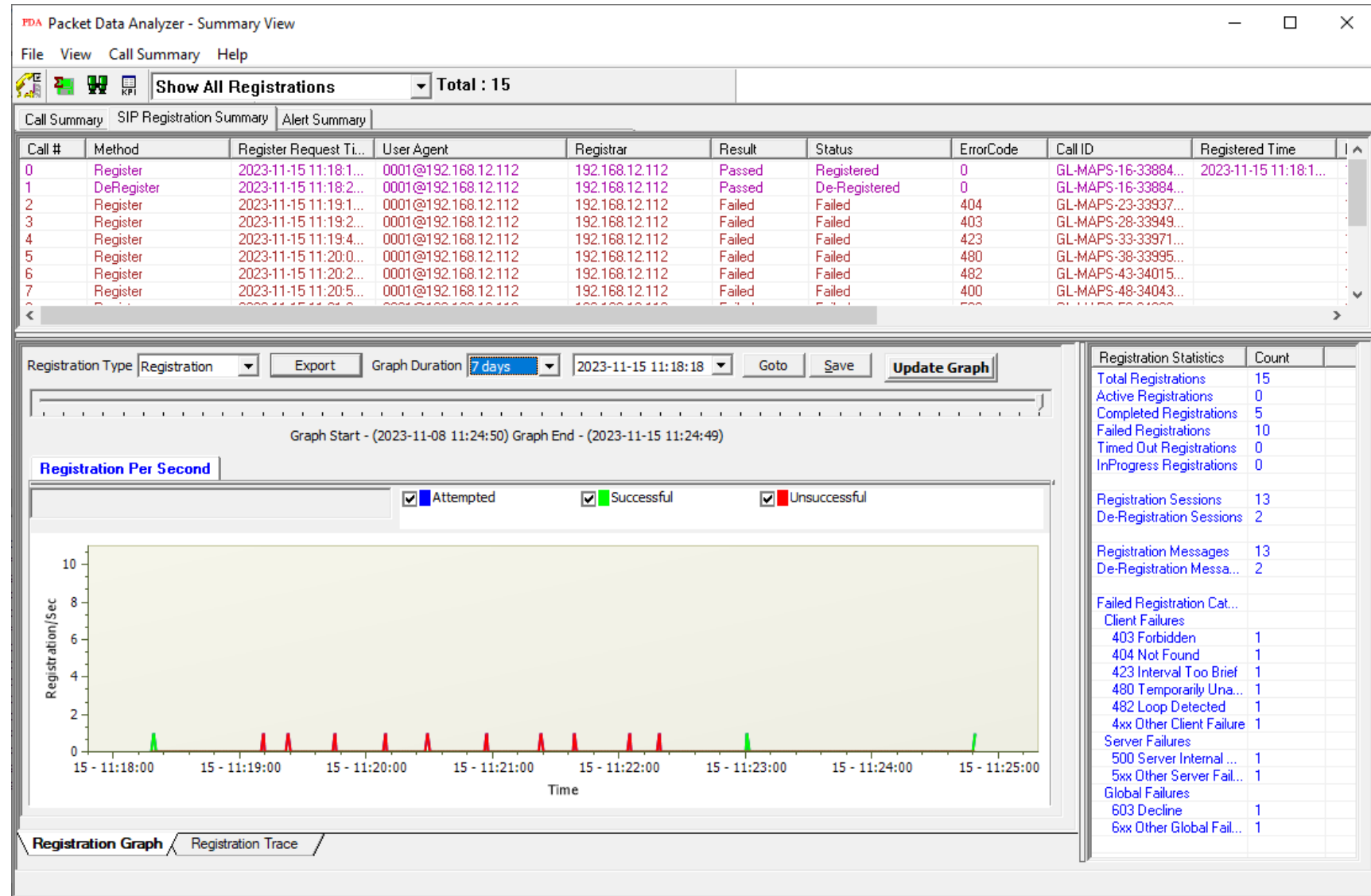
The screenshot shows a software window titled "Traffic Analyser - Summary View". It has a menu bar with "File", "View", and "Help". Below the menu bar is a toolbar with a small icon. The main area contains a tabbed interface with three tabs: "Call Summary", "Registraton Summary", and "Alert Summary". The "Alert Summary" tab is selected, displaying a table with the following data:

Call#	Protocol	Message	Type	Threshold	Value	Caller	Callee	CallId
1	SIP	mos value between 3 to 4	Warning	2.00-4.00	3.57	0005@192.168.1.236	0005@192.168.1.234	GLPG143457205760
2	SIP	mos value between 3 to 4	Warning	2.00-4.00	3.39	0006@192.168.1.236	0006@192.168.1.234	GLPG143617205763
3	SIP	mos value between 3 to 4	Warning	2.00-4.00	2.77	0008@192.168.1.236	0008@192.168.1.234	GLPG143617205769
3	SIP	mos value between 1 to 2.5	Critical	1.00-2.50	2.36	0008@192.168.1.236	0008@192.168.1.234	GLPG143617205769
4	SIP	mos value between 3 to 4	Warning	2.00-4.00	3.48	0009@192.168.1.236	0009@192.168.1.234	GLPG143617205772
5	SIP	mos value between 3 to 4	Warning	2.00-4.00	3.30	0011@192.168.1.236	0011@192.168.1.234	GLPG143777205778
6	SIP	mos value between 3 to 4	Warning	2.00-4.00	2.77	0012@192.168.1.236	0012@192.168.1.234	GLPG143927205781
6	SIP	mos value between 1 to 2.5	Critical	1.00-2.50	2.31	0012@192.168.1.236	0012@192.168.1.234	GLPG143927205781
7	SIP	mos value between 3 to 4	Warning	2.00-4.00	2.27	0001@192.168.1.231	0001@192.168.1.237	GLPG13407127763982
7	SIP	mos value between 1 to 2.5	Critical	1.00-2.50	2.27	0001@192.168.1.231	0001@192.168.1.237	GLPG13407127763982
8	SIP	mos value between 1 to 2.5	Critical	1.00-2.50	1.47	0002@192.168.1.231	0002@192.168.1.237	GLPG13417127763987
9	SIP	mos value between 1 to 2.5	Critical	1.00-2.50	1.04	0003@192.168.1.231	0003@192.168.1.237	GLPG13425567763992

- 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

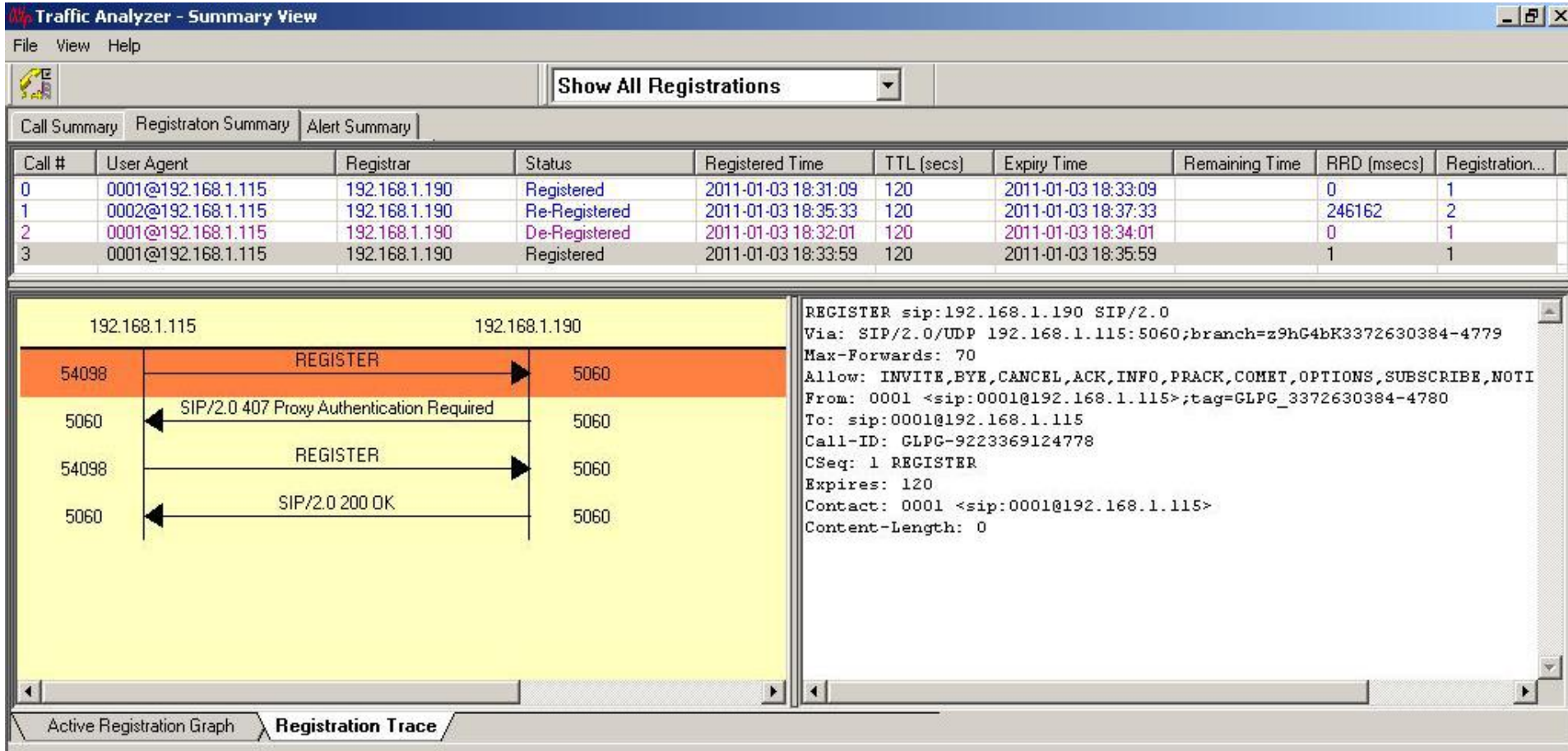
# Registration Summary

- 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

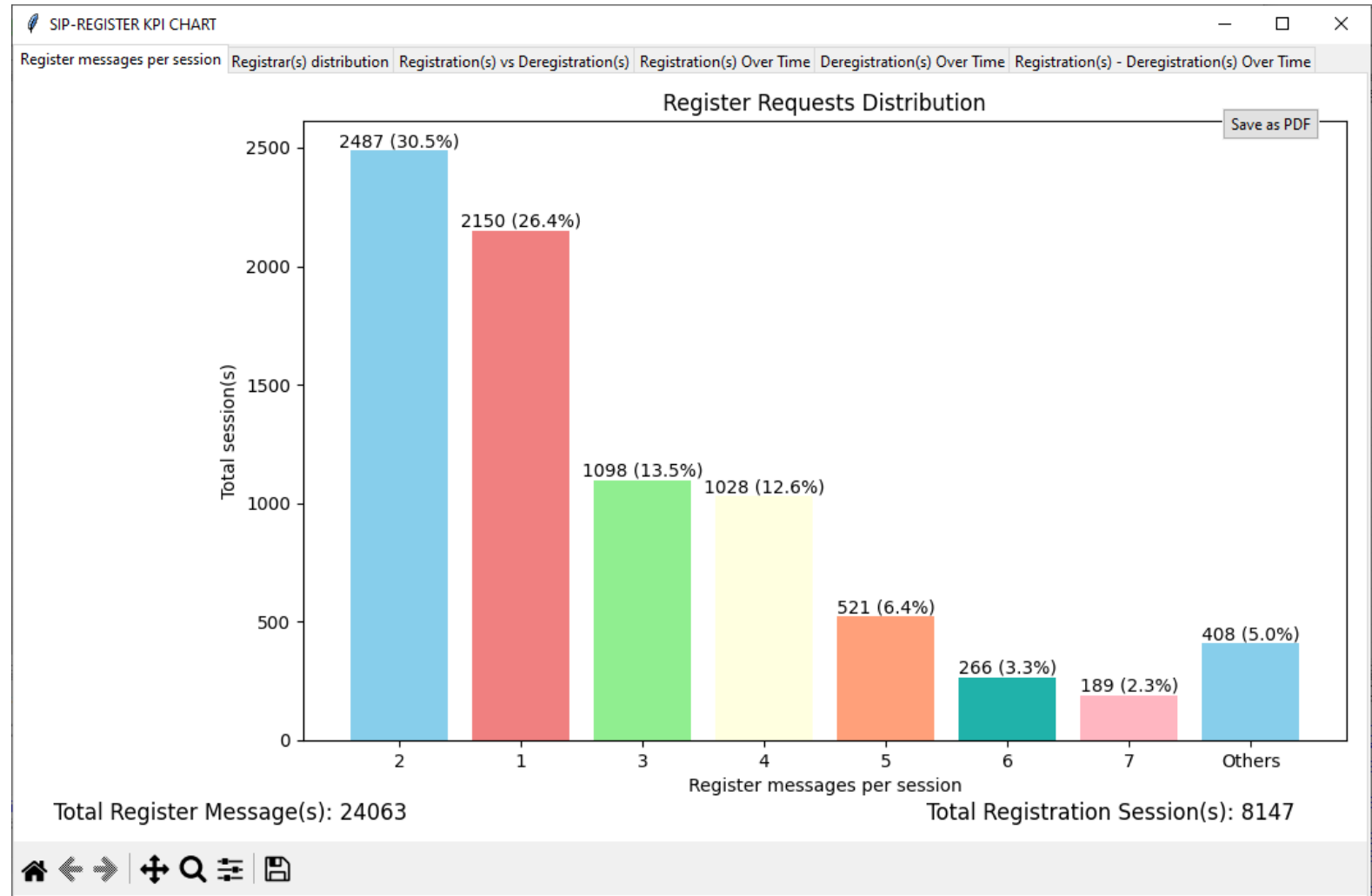


- Displays the message sequence of registered calls
- Message sequence pictorially displays the messages exchanged for a particular scenario between a user agent and the registrar

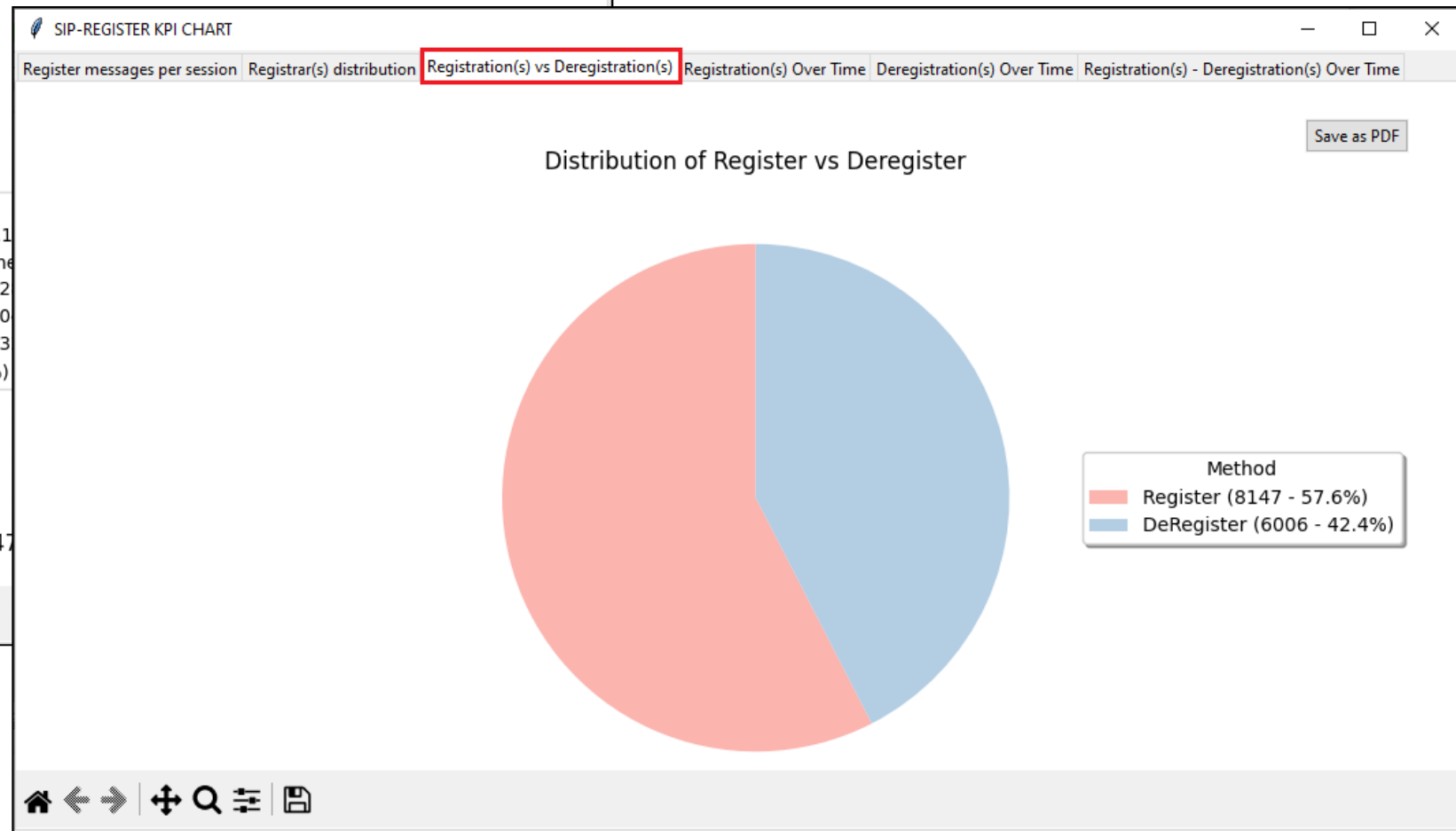
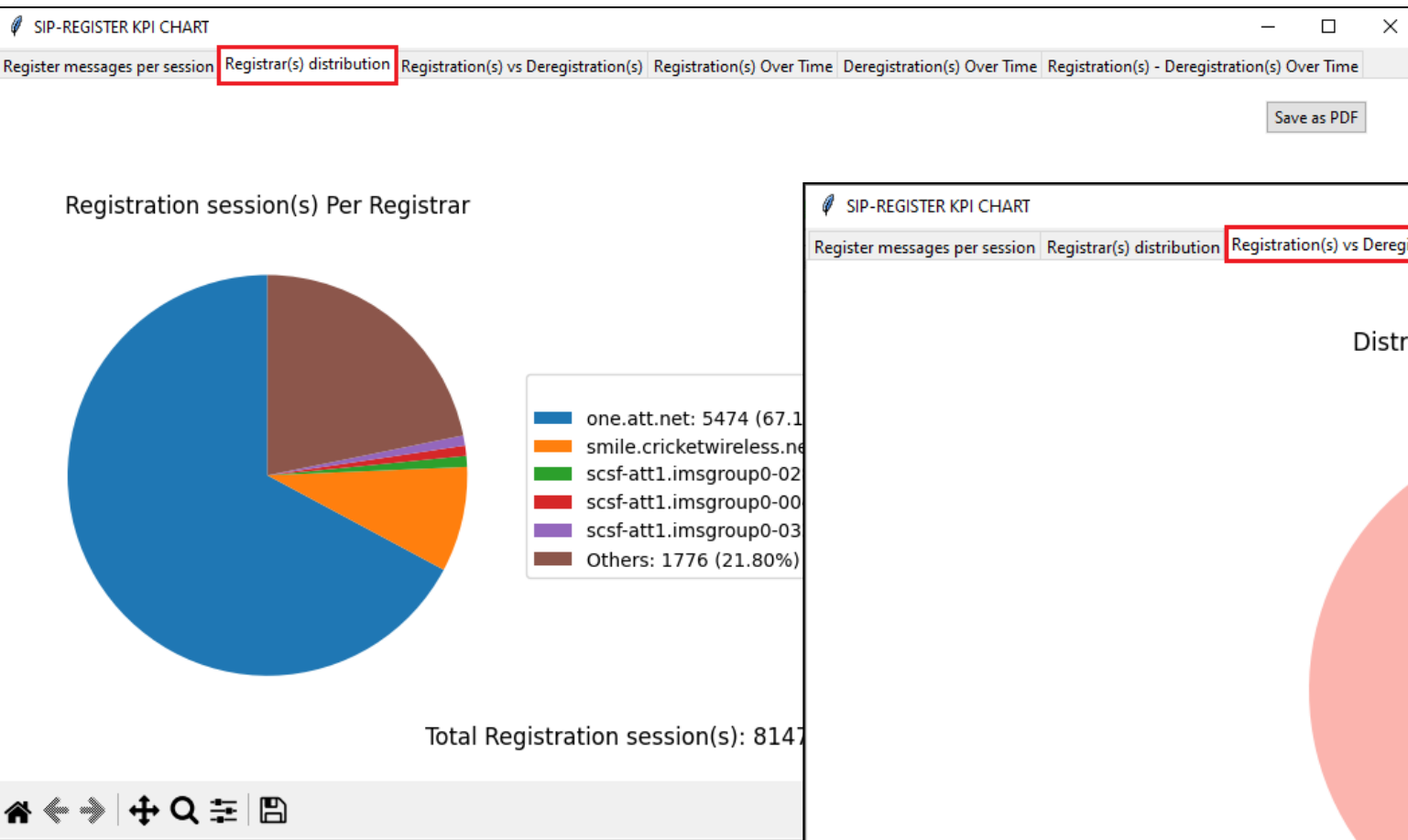
# KPI Report (Registration)

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

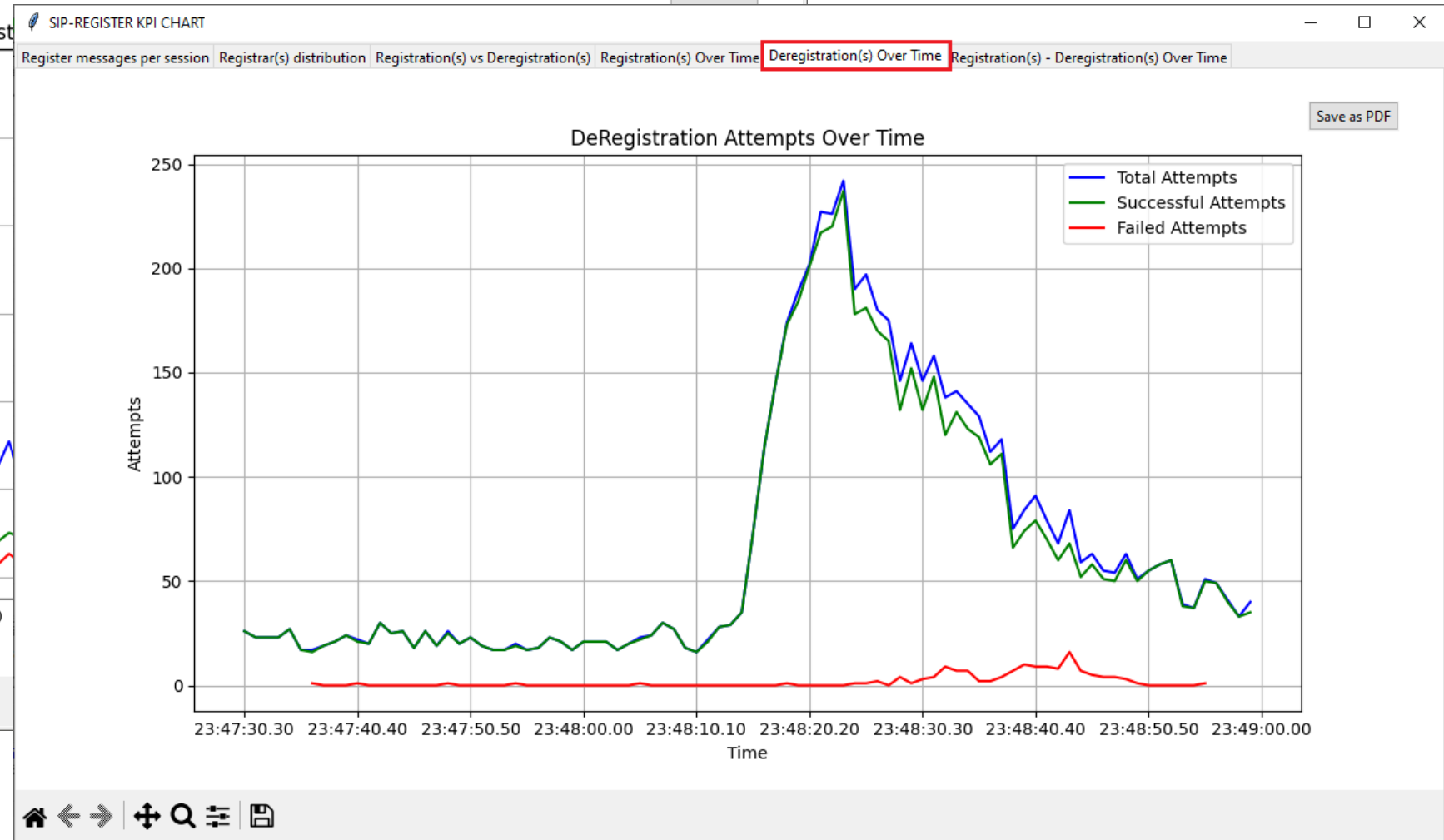
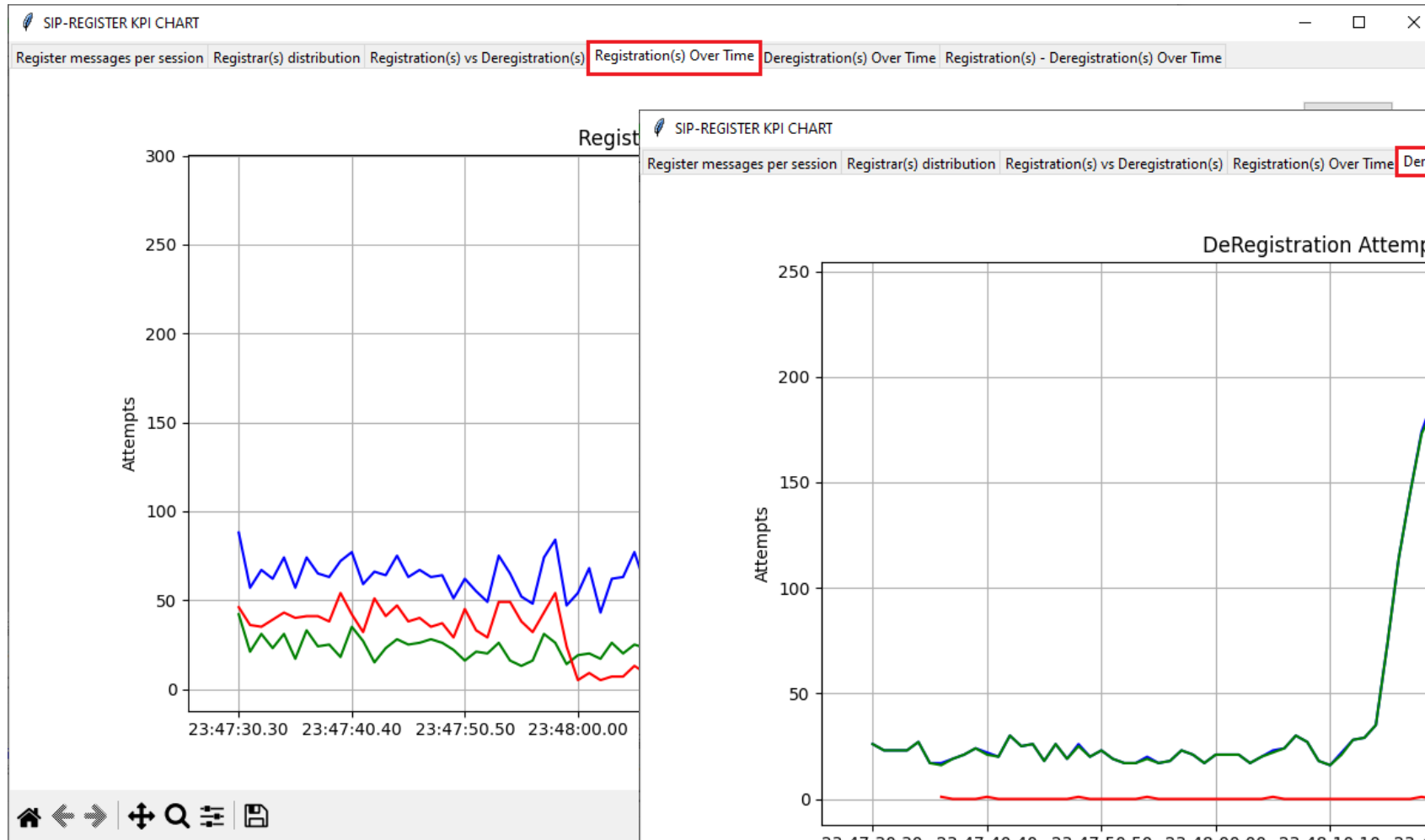
- **Register Messages per Session:** Shows a graph for the distribution of Register Requests
- **Registrar(s) Distribution:** Displays a graph for the number of Registration sessions per Registrar
- **Registration(s) vs Deregistration(s):** Illustrates a graph comparing the distribution of Register and 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



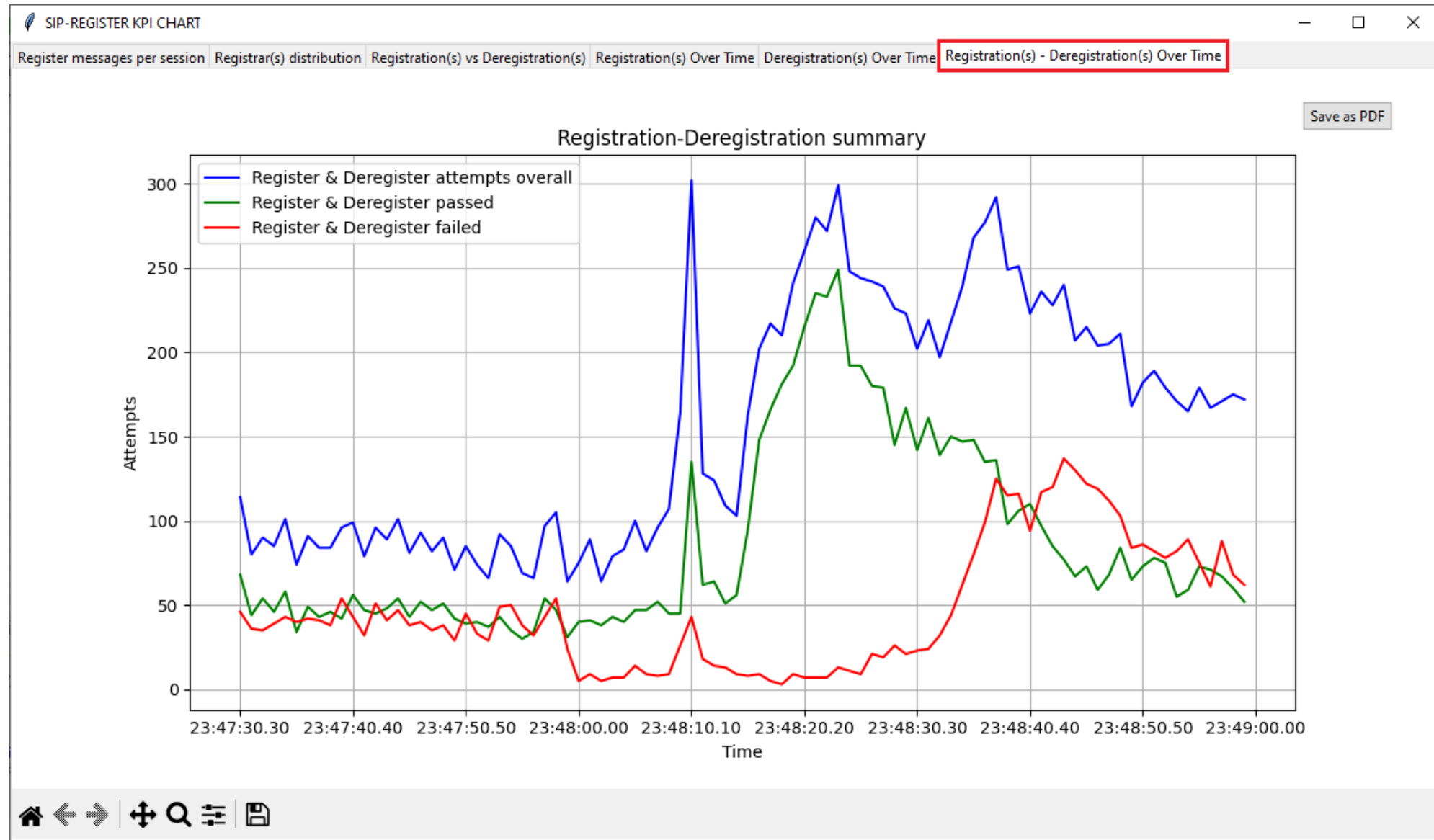
# Registrar Distribution, Registration vs Deregistration KPIs



# Registration over Time, Deregistration over Time KPIs



# Registration-Deregistration over Time KPI



**Thank you**