Network Surveillance System

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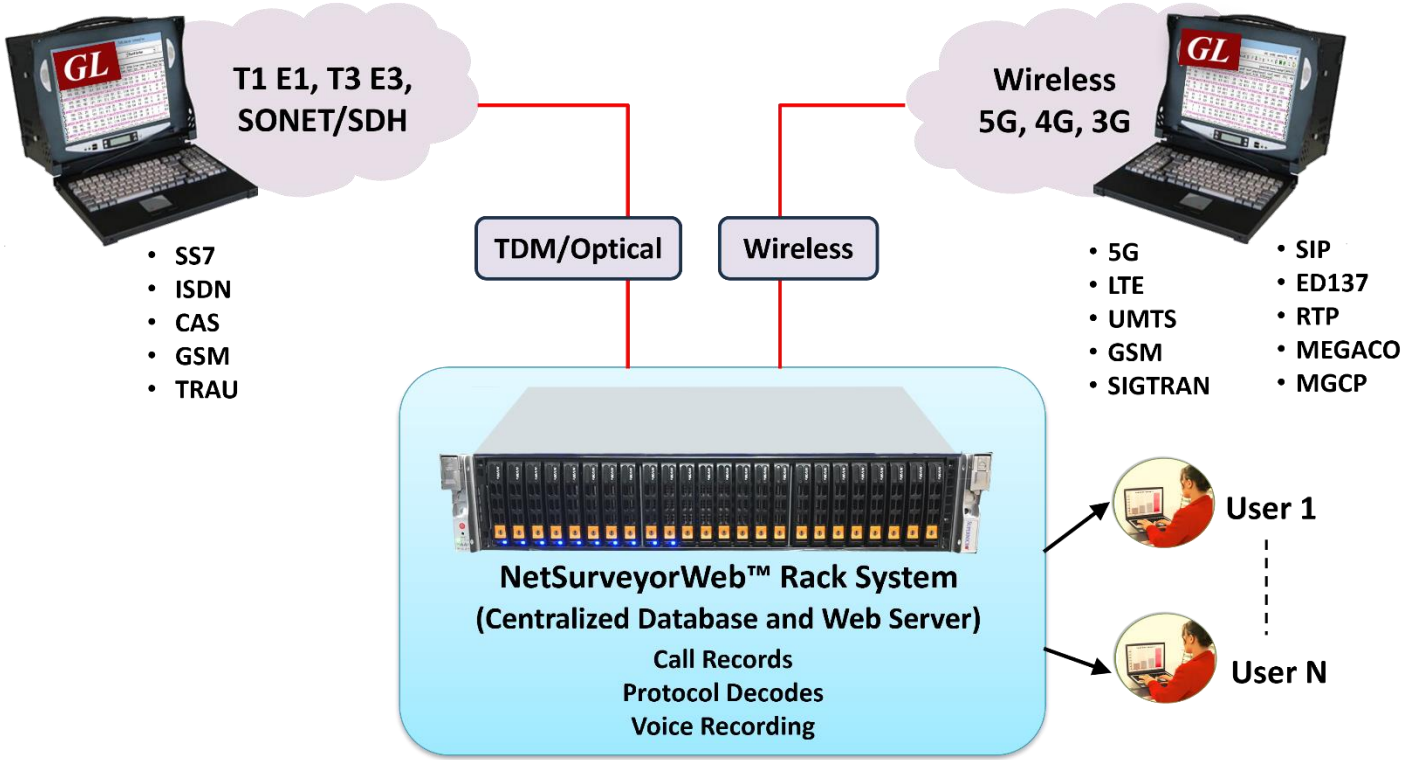
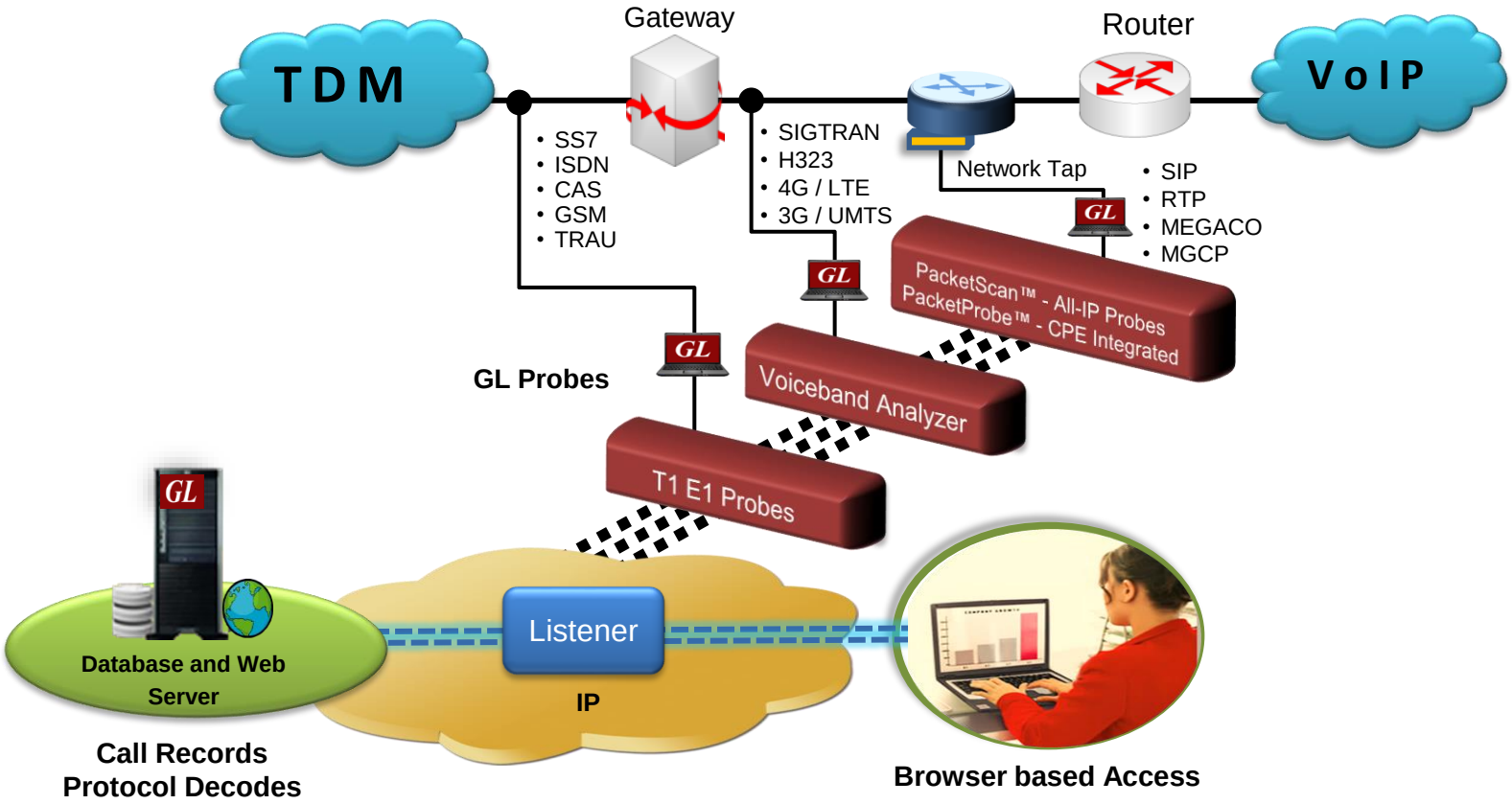
NetSurveyorWeb™ - Network Surveillance System



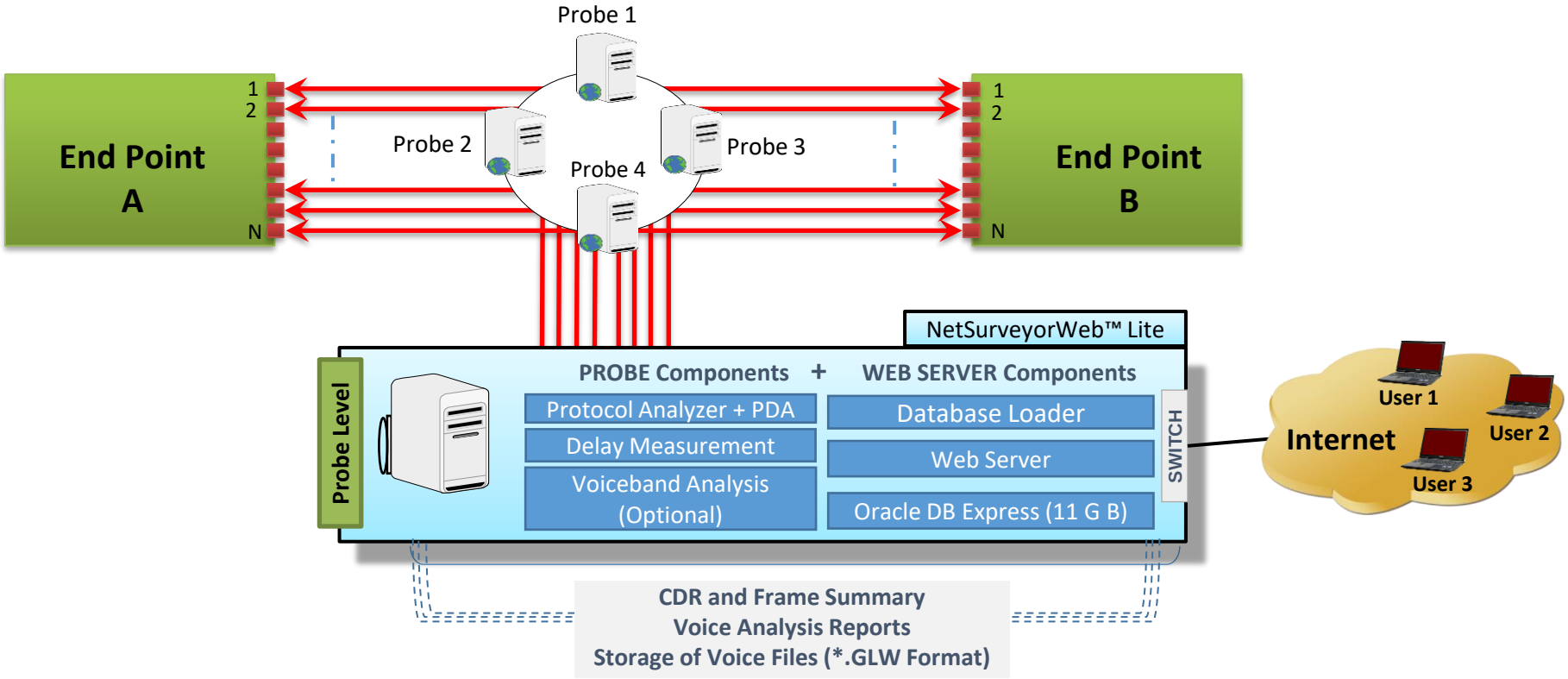
Network Overview



NetSurveyorWeb™

- Scalable and Flexible Architecture
- Multiple Probes (T1 E1/IP) non-intrusively monitor at remote locations
- Probes Feed Data to Centralized Database (Oracle, My SQL)
- Real-time and/or historical data
- Multi-user support, and user-friendly interface
- Accessible via browser based clients (locally or remotely)
- Provides database query methods to query captured results, and gather status, statistics, and events
- Results are displayed both in tabular and graphical formats
- Provides protocol signaling, traffic, and call detail records (CDRs)
- Perform filter and/or search for specific information

NetSurveyorWeb™ Lite Network Architecture



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NetSurveyorWeb™ Lite Features

- Flexible report generation
- Ability to identify and analyze CDR using Key Performance Indicators (KPI's)
- Ability to listen to the Voice calls
- Set alarm conditions and generate alerts of different types like email alert, visual alert, audible alert, or even log into tables for future analysis
- Reports are displayed both in tabular and graphical formats; customize reports and graphs based on SQL queries
- Graphs provided for Call Completion Ratio, Answer Call, Listening MOS, Conversational MOS, Failure Cause, and Call Duration
- Real-time data displays information such as called number, calling number, source & destination IP address, RTP packet details, call flow graph, frame decodes and more
- Apply single or multiple filters for data analysis; use logical operators between filters
- Historical data retention up to 9 GB
- Ability to export both graphical and tabular reports view as PDF
- Ability to export the call detail records displayed based on time filter or record index as PDF and CSV

Comparison of NetSurveyorWeb™ and NetSurveyorWeb™ Lite

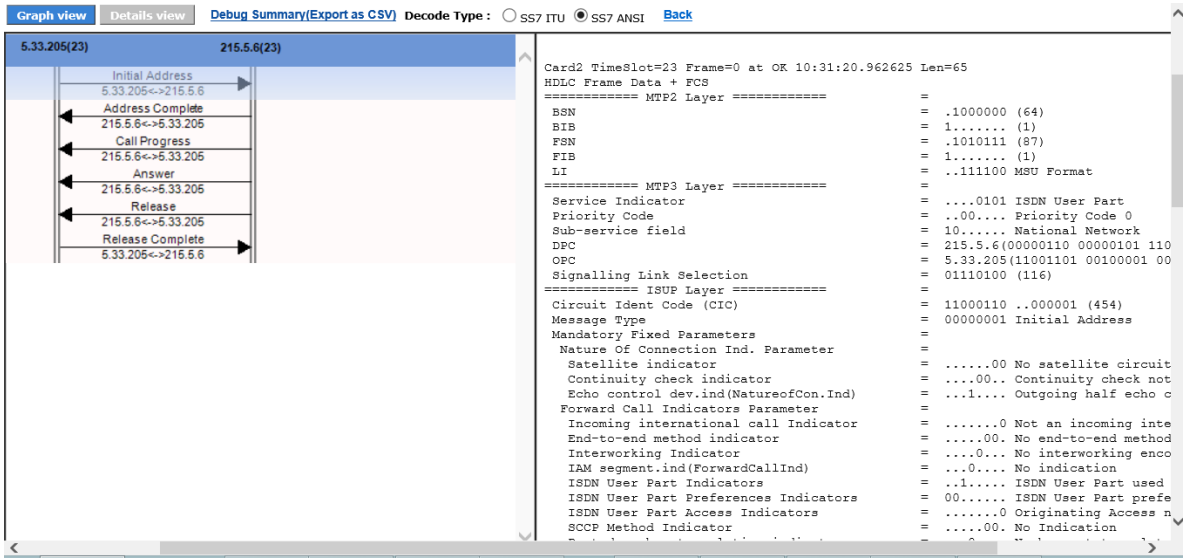
Requirements	NetSurveyorWeb™	NetSurveyorWeb™ Lite
Use Case	• Centralized reporting, analysis and surveillance system for geographically distributed networks • Works with multiple protocol analyzer probes • Unlimited Users/Nodes and data storage • Suitable for network wide monitoring and very high volumes of calls	• A simple cost-effective reporting and analysis addon to individual protocol analyzers • PKV169 addon to individual protocol analyzers enhances capability to handle larger volume of data, filter for specific calls, build custom statistics and KPIs, automate and graphical analysis features to analyze the call detail records (CDRs) in depth • Adds features which are not available in protocol Analyzers • Limited historical data retention up to 9 GB

Comparison of NetSurveyorWeb™ and NetSurveyorWeb™ Lite (Contd.)

Requirements	NetSurveyorWeb™	NetSurveyorWeb™ Lite
Capacity	Supports high speed data captures from multiple VoIP, TDM, and Optical probes. Modular system configuration permits: • STM-4 capacities for T1 - up to 16,128 voice calls ➢ (STM-4 > 336 T1's x 24 x 2 = 16,128 DS0s) • STM-4 capacities for E1 - up to 30,240 voice calls ➢ (STM-4 > 252 E1's x 30 x 4 = 30,240 DS0s) • T3 E3 TDM capacities per 2U 19" rack for 8,064 voice calls • IP capacities over 10 GigE - up to 100,000 voice calls	• Limited by data retention capacity
Additional Features	Build customized KPIs, define complex filters, perform quick search for calls of interest, and set alerts based on user defined criteria.	Build customized KPIs, define complex filters, perform quick search for calls of interest, and set alerts based on user defined criteria.
PC	Includes Standard Server-Grade Computing Platform Includes Oracle 11g Standard	To be deployed on Probe PC itself. Includes Oracle 11g Express Edition **Note**: PC not included with this item.

Applications / Value

- Remote Protocol Analysis and Troubleshooting
- Traffic Optimization Engineering
- Call Detail Records, Statistics
- Revenue and Billing Verification
- Alarm Monitoring and Logging
- Quality of Service Measurements



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Few References

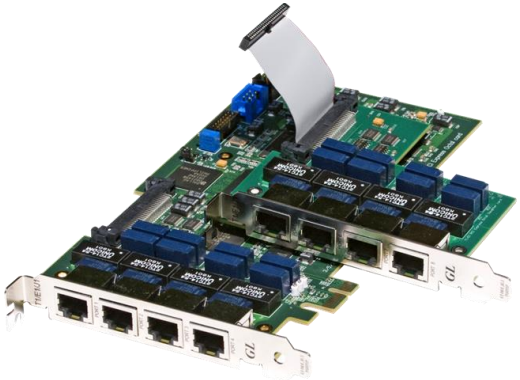
- US Postal Service - TDM & Packet Monitoring Solution
  - 600 T1 lines monitored
  - Over 100 LANs monitored
- US Air Force - SS7 & ISDN Monitoring Solution
  - 52 T1 E1 ISDN & SS7 with Voiceband Traffic
- FairPoint Communications - SS7 Monitoring Solution
  - 56 T1 SS7 - still growing
- TDM & Packet Solutions
  - Hundreds to thousands sold every year
  - Almost every major equipment manufacturer and carrier in the worlds

Platforms

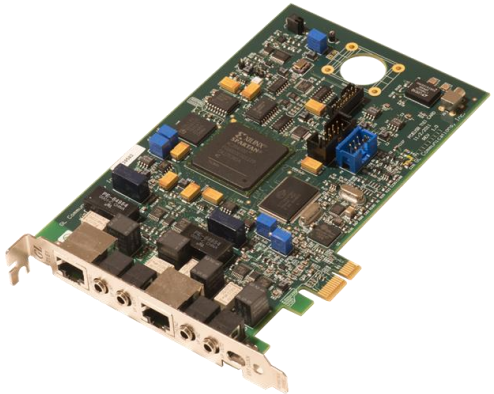
Front Panel

Back Panel

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

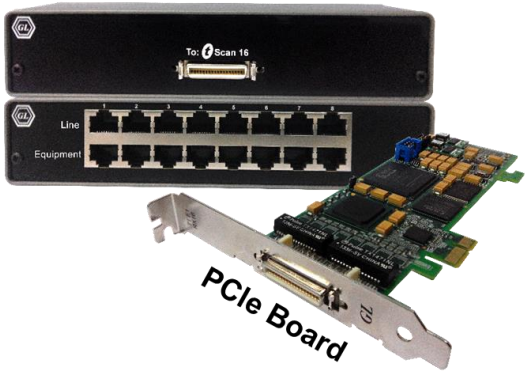


Quad / Octal T1 E1 PCIe Card



Dual T1 E1 Express (PCIe) Board

tScan16™ with
16-port T1 E1 Breakout Box



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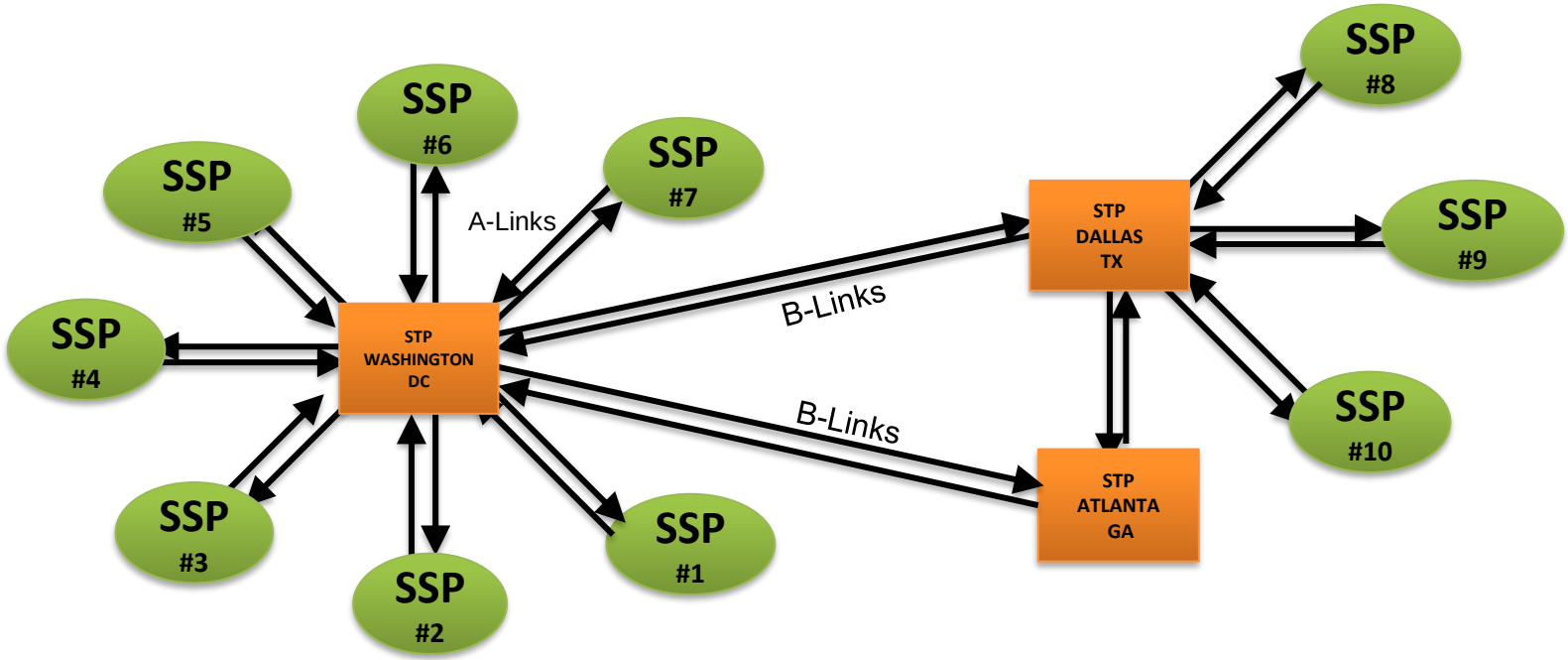
Complex SS7 Networks
Actual Customer Example



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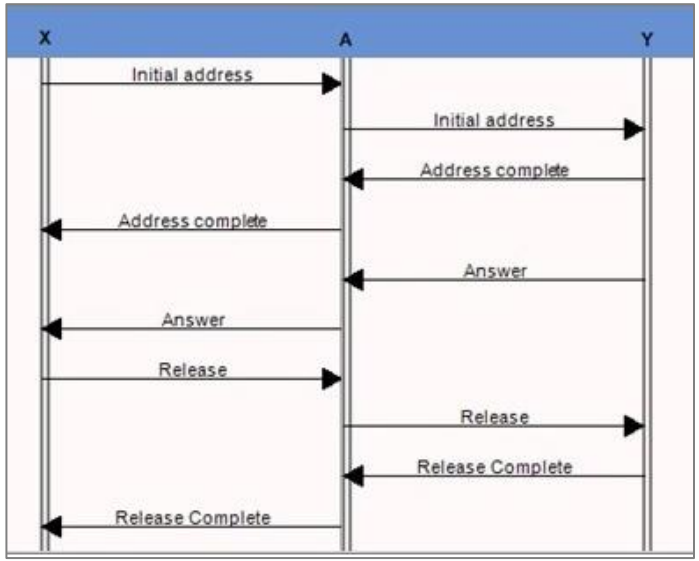
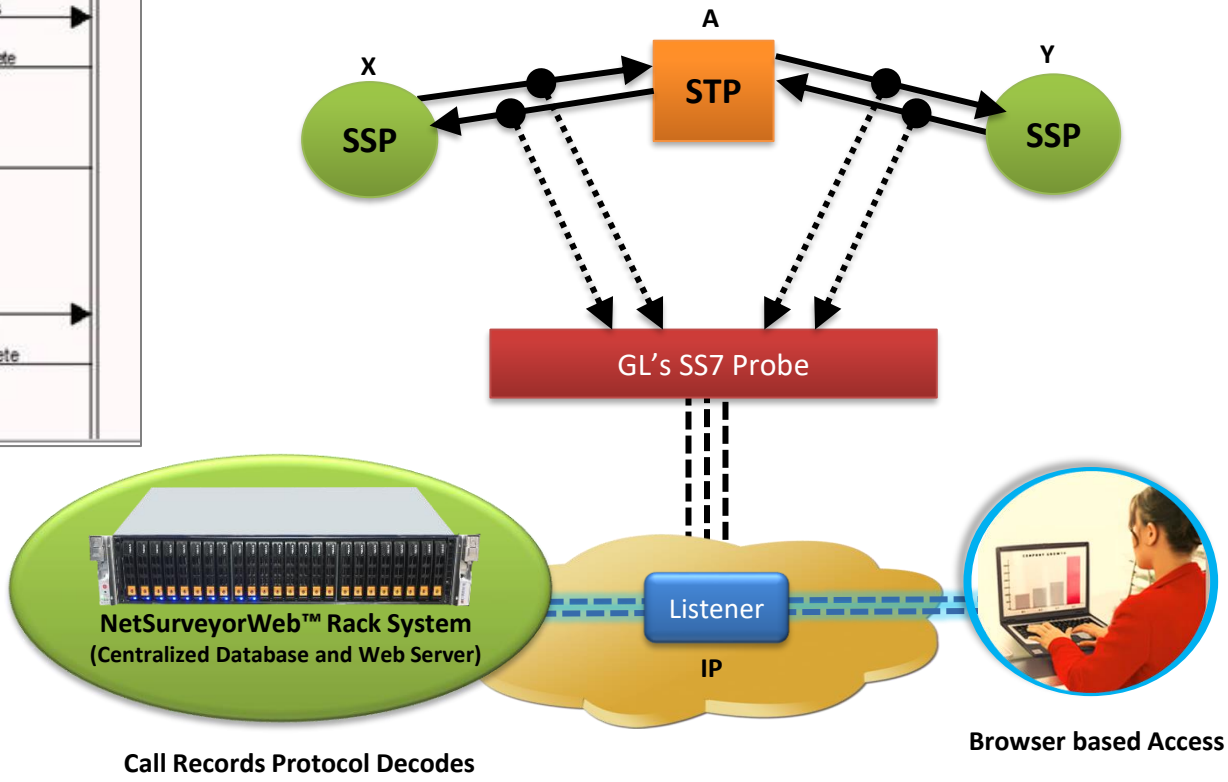
SS7 End-to-End Call Flow

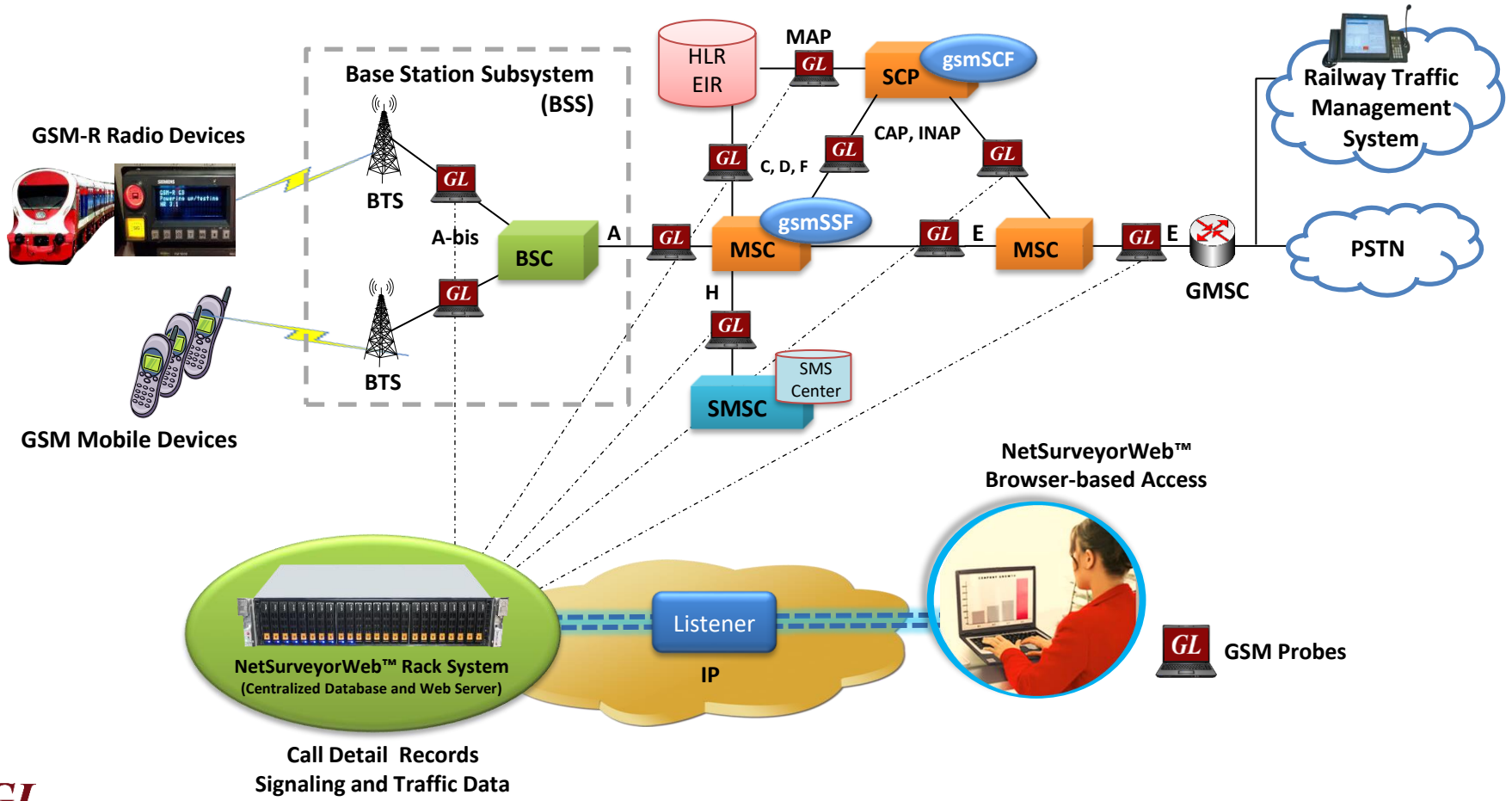




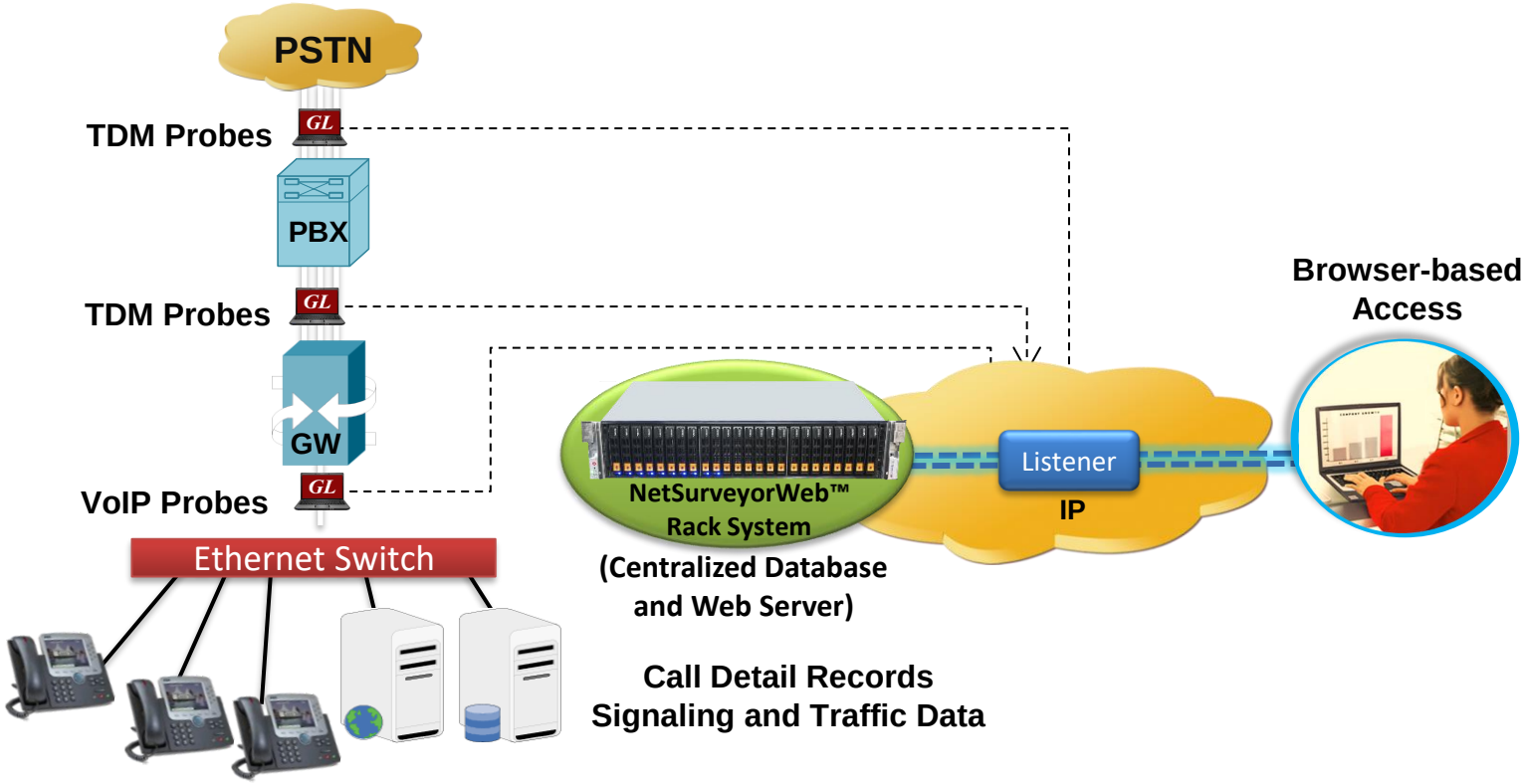
SS7 Probe Characteristics

- Scalability can be achieved with Multiple T1 E1 Cards per PC
- Multiple Link Sets Per T1 E1 (through Digital Cross Connect Grooming) – multiple 64 kbps signaling channels per T1 E1can be monitored simultaneously by grooming through a digital cross-connect
- T1 E1 Cards can also be connected non-intrusively in Monitor or Bridge Modes, or alternatively the data can be looped through the cards
- 50 to 100 SS7 signaling links per 4U rack PC probe
- SS7 Redundancy supported

Wireless Network Surveillance GSM TRAU

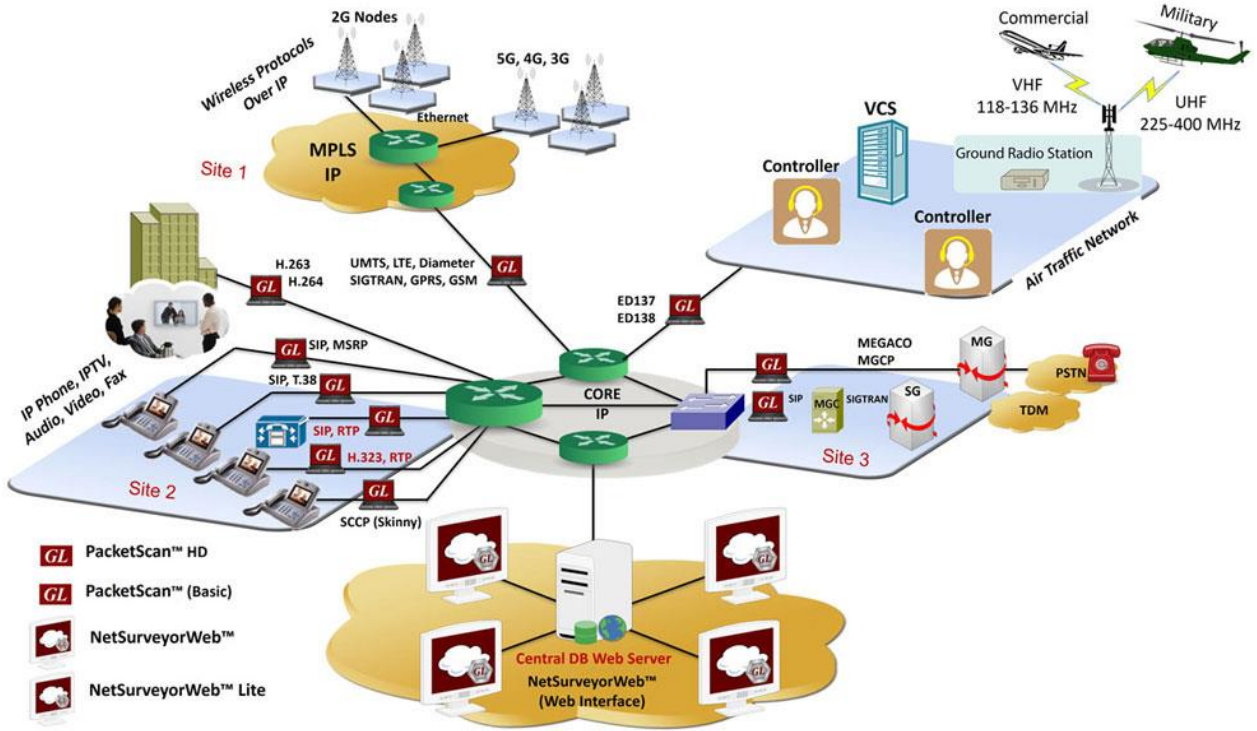


Hybrid Network Surveillance SIP-TDM (ISDN/SS7)



PacketScan™

VoIP Traffic Analysis 5G/ SIP / H323 / MEGACO / MGCP / RTP / RTCP Analysis



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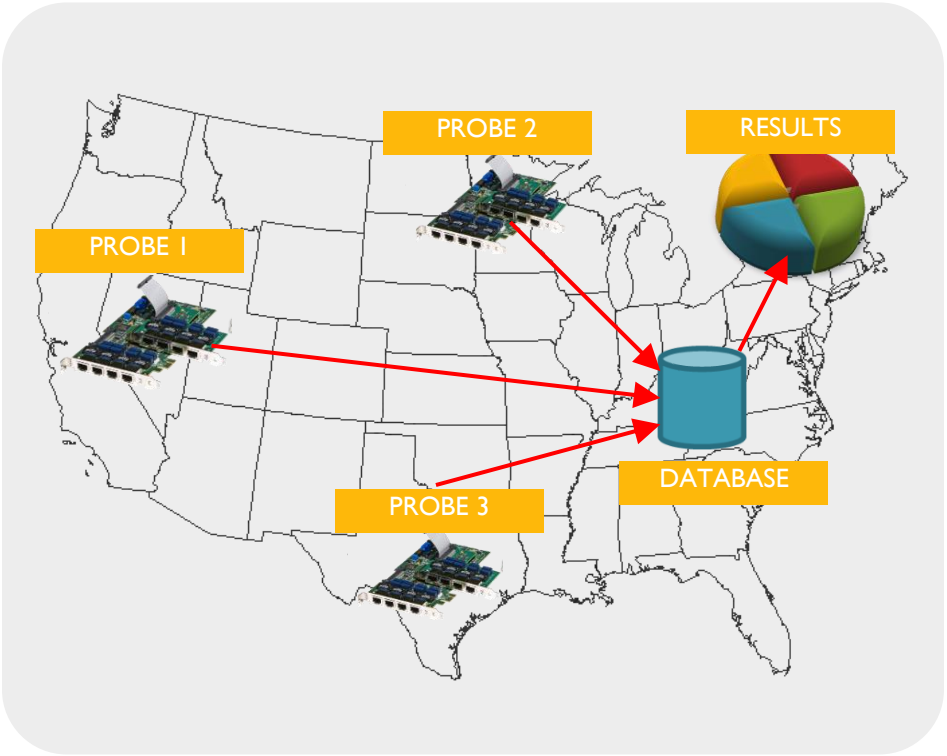
T1 E1 Physical Layer Monitoring

- Retrieve and display physical link
- Status using the probes deployed world-wide
- Sync Loss
- Carrier Loss
- Blue Alarm
- Yellow Alarm
- AIS Alarms



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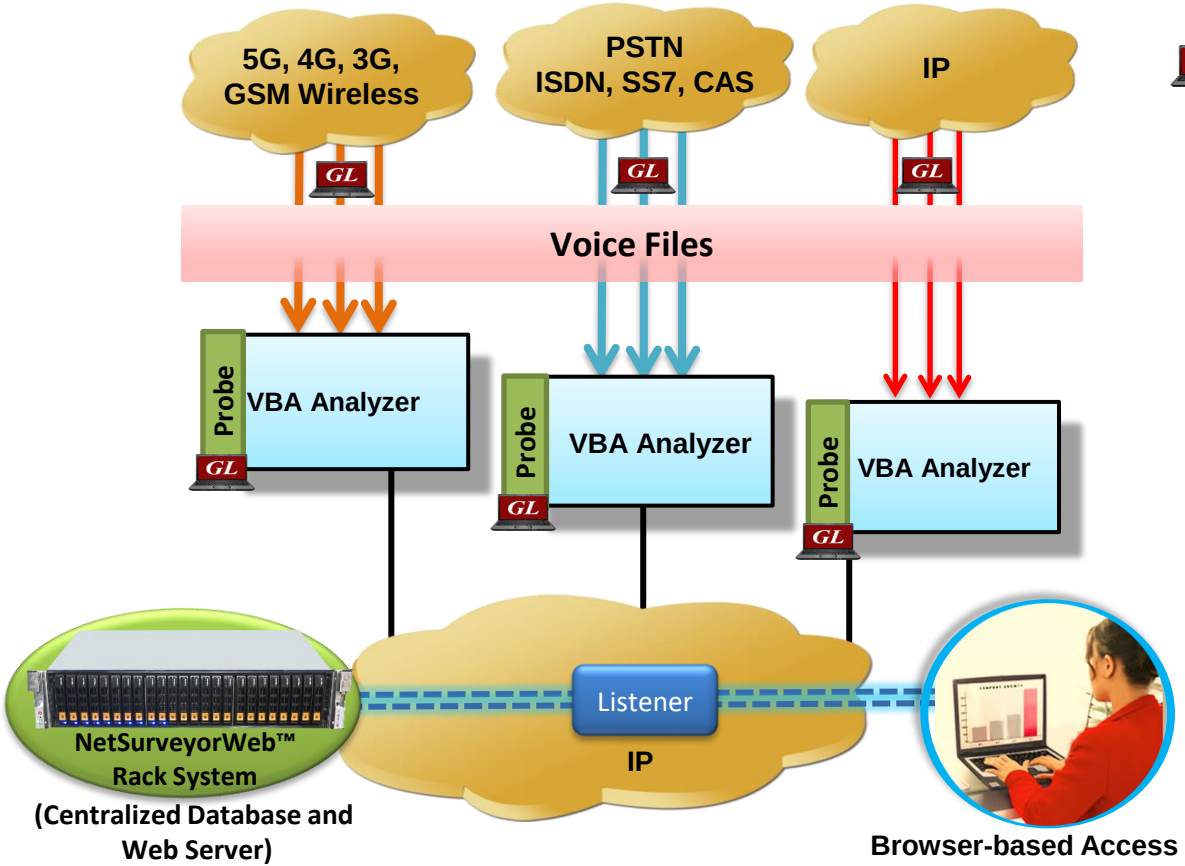
Network Wide Voice Quality



GL Probes

- Active Speech Level
- Active Factor
- RMS Factor
- Noise Level
- Max, Min & Absolute Sample values
- DC Level
- Echo Return Loss
- Echo Delay
- Echo Dispersion

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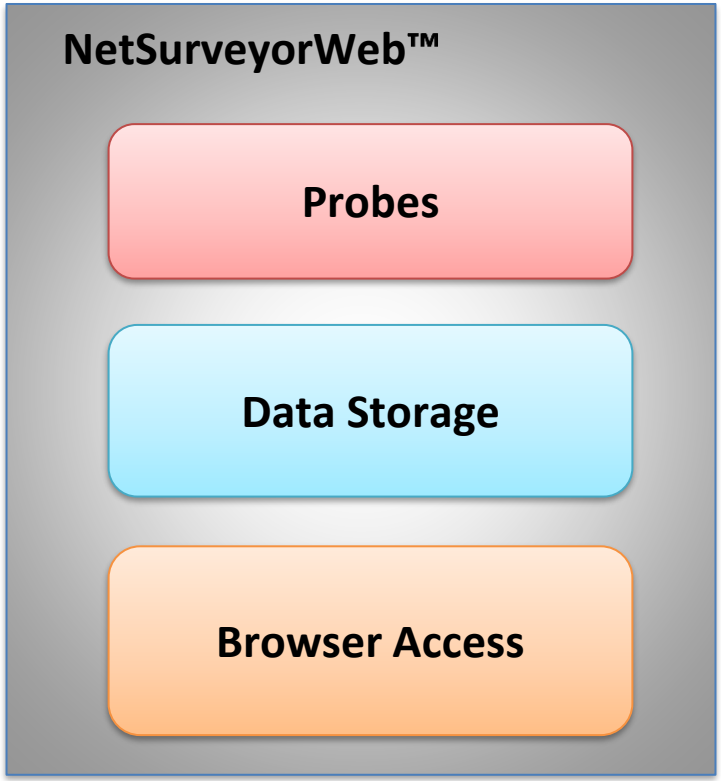
Three Tier Architecture



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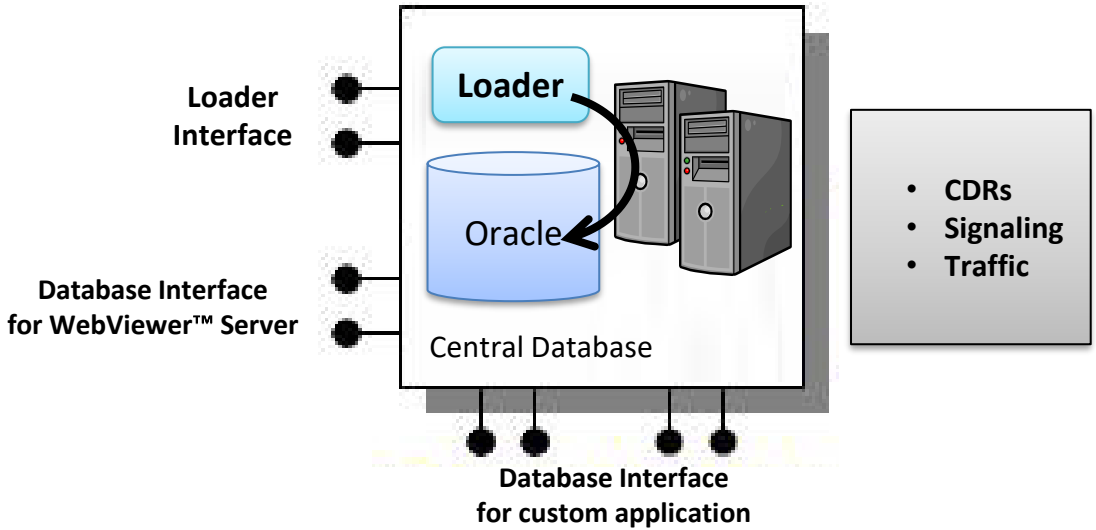
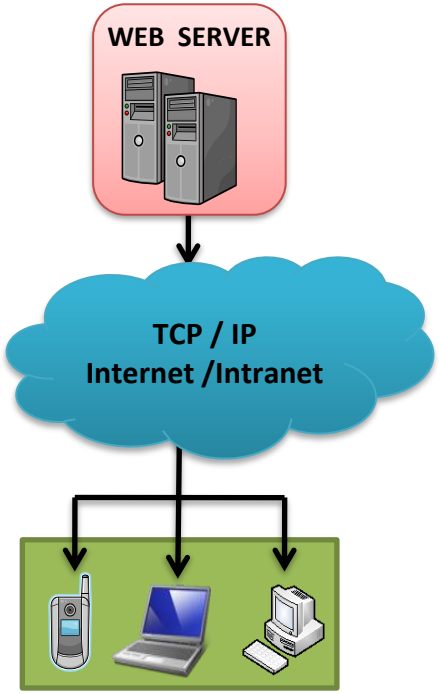
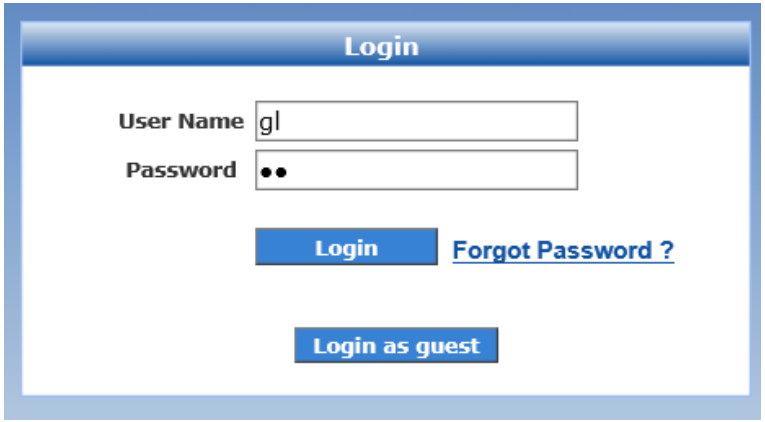
Data Storage

- A listener application is co-hosted with the database server running on the Data Layer, collecting data posted by the probes
- Supports MySQL and Oracle Database
- Stores the CDRs and Signaling Summary data



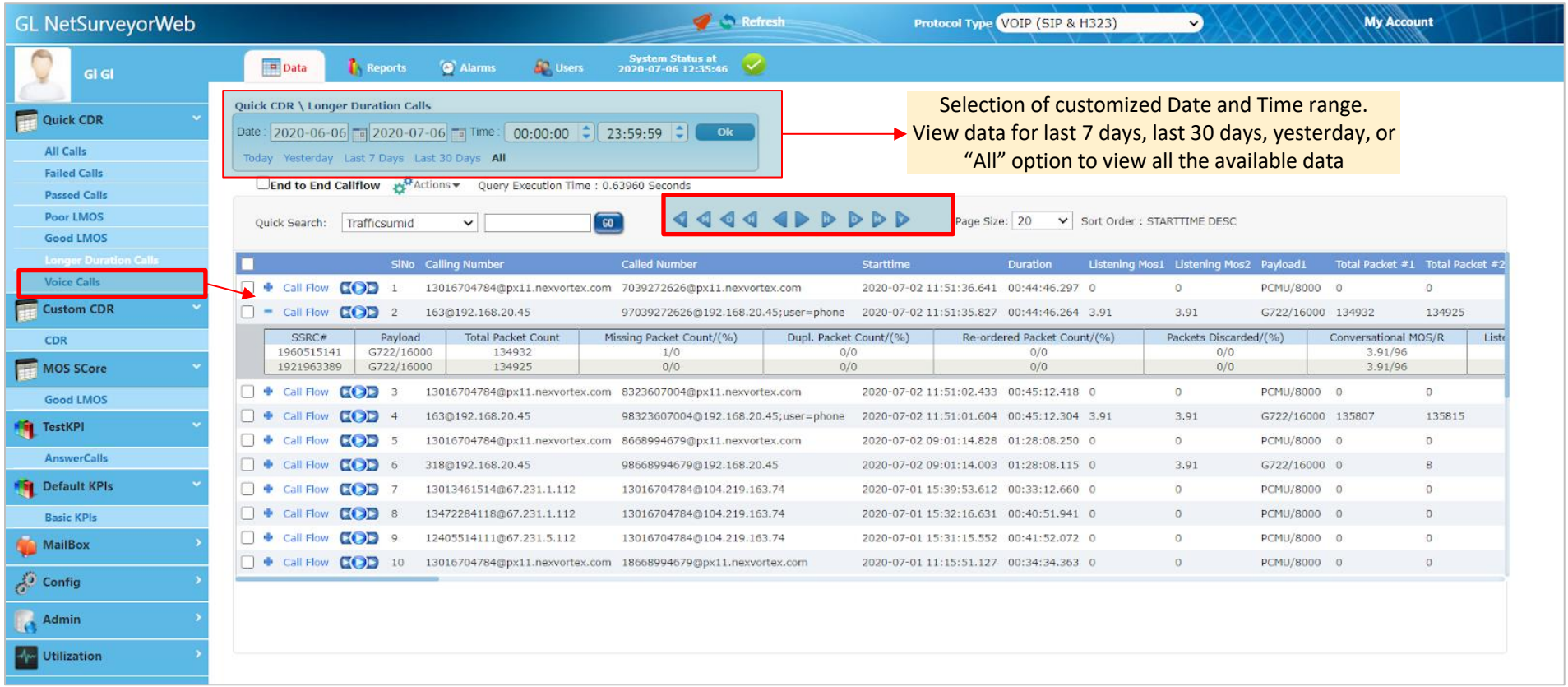
Browser Based Access





- Access captured data over the web using an application such as GL's NetSurveyorWeb™

NetSurveyorWeb™



		SlNo	Calling Number	Called Number	Starttime	Duration	Listening Mos1	Listening Mos2	Payload1	Total Packet #1	Total Packet #2
☐	Call Flow	1	13016704784@px11.nexvortex.com	7039272626@px11.nexvortex.com	2020-07-02 11:51:36.641	00:44:46.297	0	0	PCMU/8000	0	0
☐	Call Flow	2	163@192.168.20.45	97039272626@192.168.20.45;user=phone	2020-07-02 11:51:35.827	00:44:46.264	3.91	3.91	G722/16000	134932	134925

SSRC#	Payload	Total Packet Count	Missing Packet Count/(%)	Dupl. Packet Count/(%)	Re-ordered Packet Count/(%)	Packets Discarded/(%)	Conversational MOS/R	Liste
1960515141	G722/16000	134932	1/0	0/0	0/0	0/0	3.91/96	
1921963389	G722/16000	134925	0/0	0/0	0/0	0/0	3.91/96	

		SlNo	Calling Number	Called Number	Starttime	Duration	Listening Mos1	Listening Mos2	Payload1	Total Packet #1	Total Packet #2
☐	Call Flow	3	13016704784@px11.nexvortex.com	8323607004@px11.nexvortex.com	2020-07-02 11:51:02.433	00:45:12.418	0	0	PCMU/8000	0	0
☐	Call Flow	4	163@192.168.20.45	98323607004@192.168.20.45;user=phone	2020-07-02 11:51:01.604	00:45:12.304	3.91	3.91	G722/16000	135807	135815
☐	Call Flow	5	13016704784@px11.nexvortex.com	8668994679@px11.nexvortex.com	2020-07-02 09:01:14.828	01:28:08.250	0	0	PCMU/8000	0	0
☐	Call Flow	6	318@192.168.20.45	98668994679@192.168.20.45	2020-07-02 09:01:14.003	01:28:08.115	0	3.91	G722/16000	0	8
☐	Call Flow	7	13013461514@67.231.1.112	13016704784@104.219.163.74	2020-07-01 15:39:53.612	00:33:12.660	0	0	PCMU/8000	0	0
☐	Call Flow	8	13472284118@67.231.1.112	13016704784@104.219.163.74	2020-07-01 15:32:16.631	00:40:51.941	0	0	PCMU/8000	0	0
☐	Call Flow	9	12405514111@67.231.5.112	13016704784@104.219.163.74	2020-07-01 15:31:15.552	00:41:52.072	0	0	PCMU/8000	0	0
☐	Call Flow	10	13016704784@px11.nexvortex.com	18668994679@px11.nexvortex.com	2020-07-01 11:15:51.127	00:34:34.363	0	0	PCMU/8000	0	0

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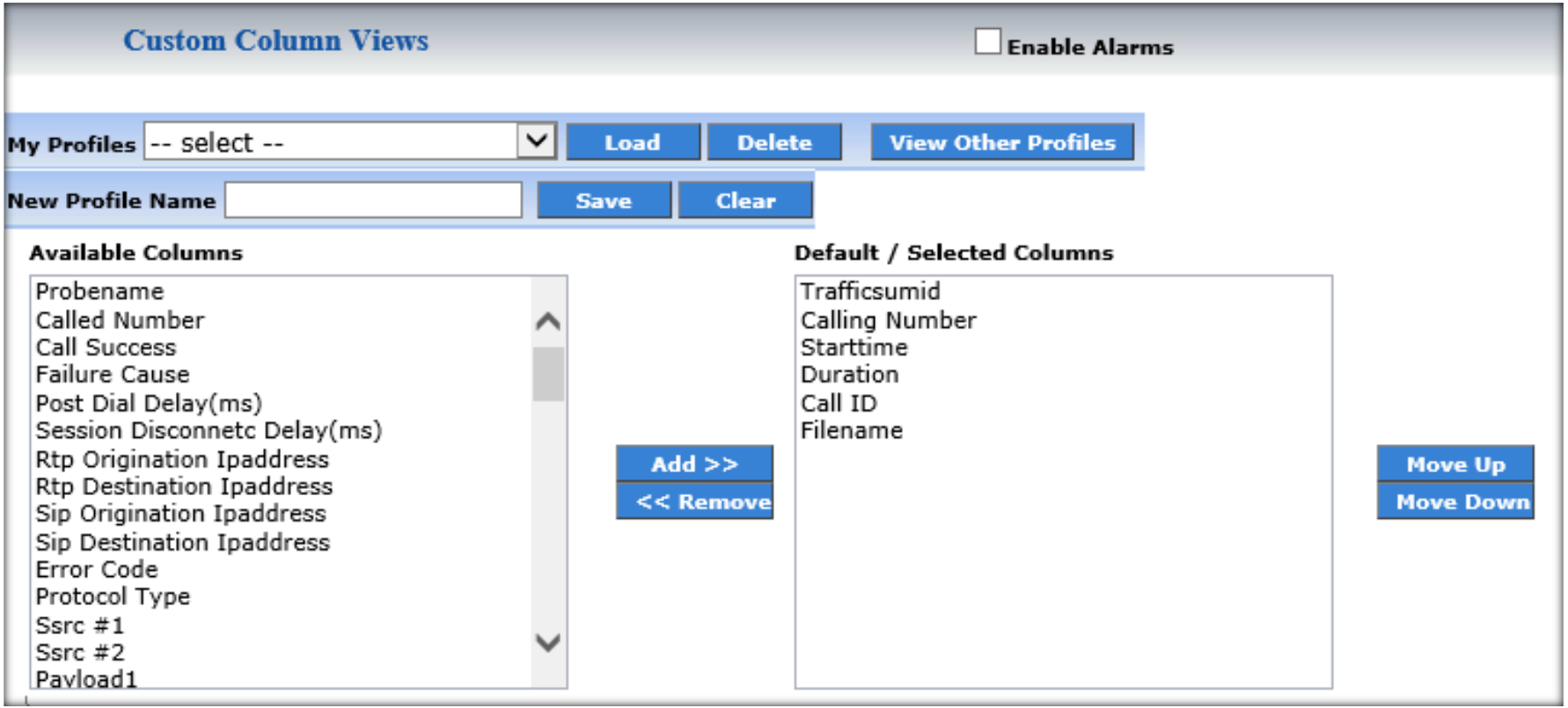
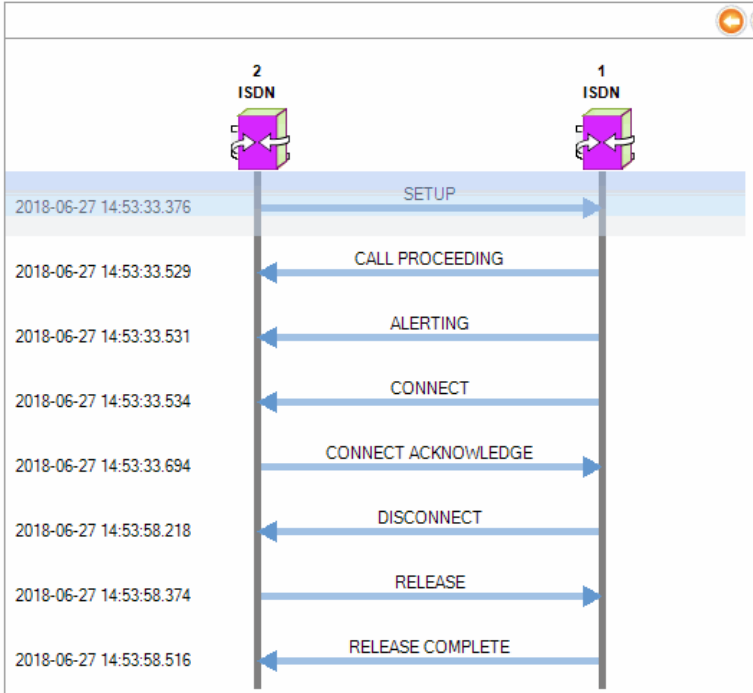
Custom Column Views



Ladder Diagram and Decode View

Call Graph View




```
============ LAPD Layer ============          =
 C/R                                          =  ......1. Response(User
 SAPI                                         =  000000.. (0)
 TEI                                          =  0000000. (0)
 Ctl                                          =  .......0 Information
 N(S)                                         =  0110111. (55)
 P                                            =  .......0 (0)
 N(R)                                         =  1000110. (70)
============ Q.93x Layer ============         =
 Protocol Discriminator                       =  00001000 Q931/I.451 us
 Call Reference Length                        =  ....0010 (2)
 Call Reference Value                         =  9 (.0000000 00001001)
 Call Reference Flag                          =  0....... FROM side tha
 Message Type                                 =  00000101 SETUP
        IEI Bearer Capability                 =  00000100 Bearer Capab:
        IE Bearer Capability Length           =  3 (x03)
        Information Transfer Capability       =  ...00000 Speech
        Coding Standard                       =  .00..... ITU_T (CCITT)
        Information Transfer Rate             =  ...10000 64 kbit/s
        Transfer Mode                         =  .00..... Circuit Mode
        User Information Layer 1 Protocol (LLC)  =  ...00010 Mu-law Rec (
        User Information Layer 1 Protocol Ident  =  .01..... (1)
        IEI Channel Identification            =  00011000 Channel Ident
        IE Channel Identification Length      =  3 (x03)
        Info Channel Selection                =  ......01 B1 channel
        D-channel Indicator                   =  .....0.. The channel :
        Preferred/Exclusive                   =  ....0... Indicated cha
```

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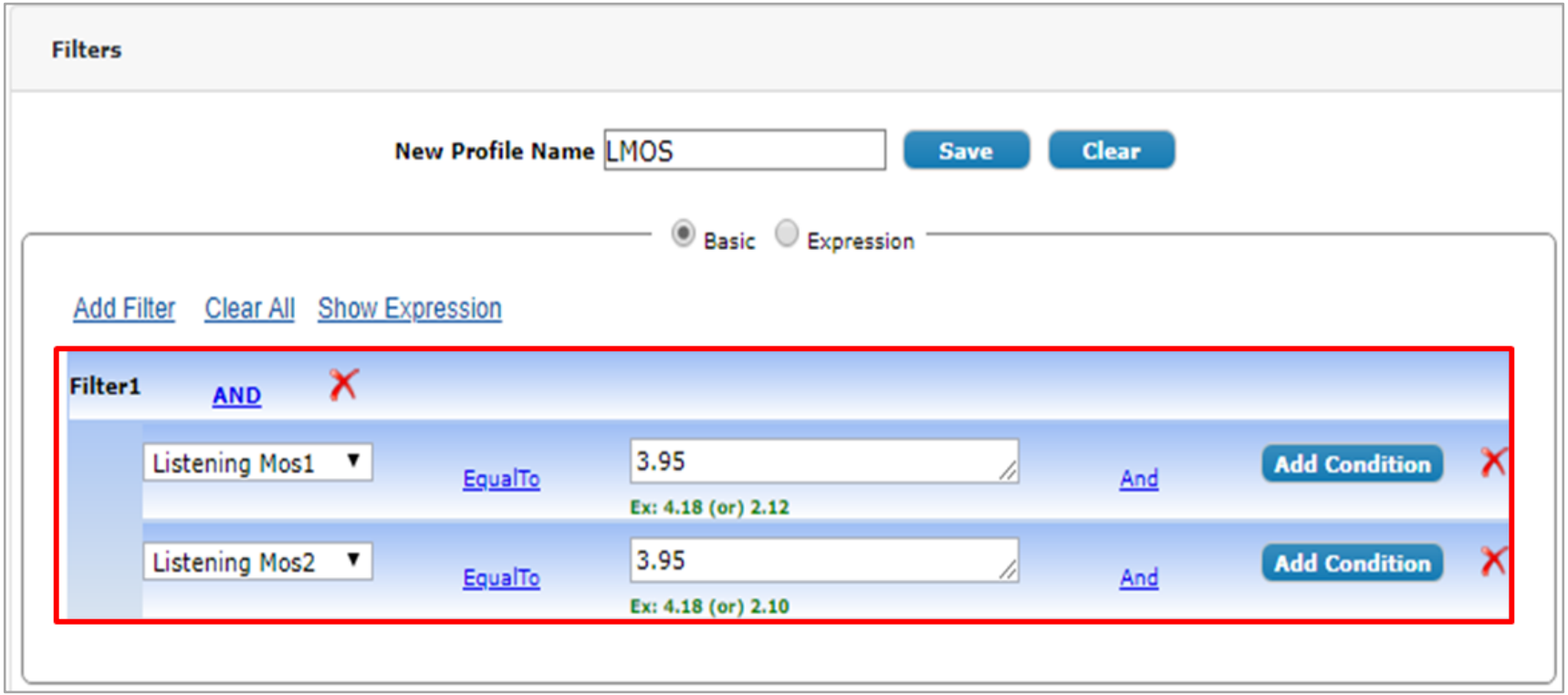
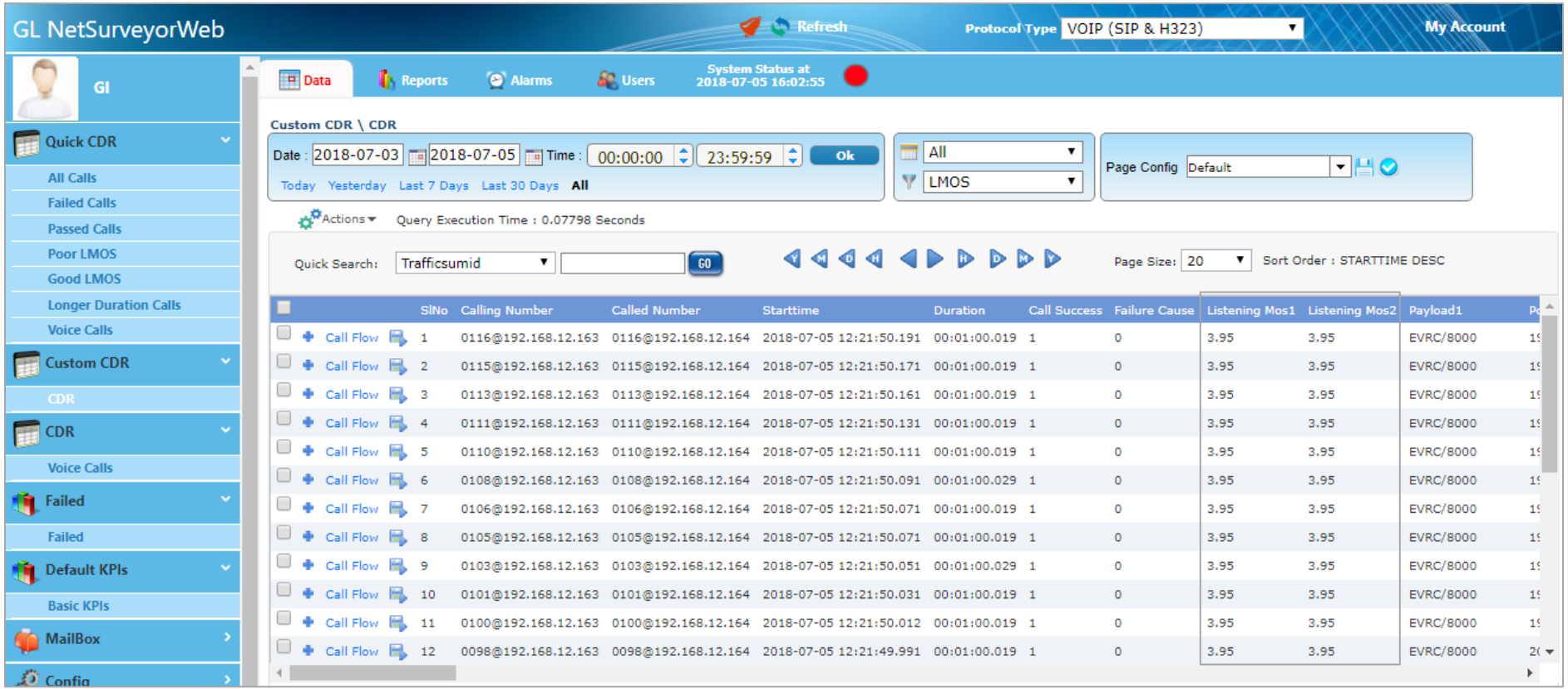
Custom Filter



Custom Filter Result



	SlNo	Calling Number	Called Number	Starttime	Duration	Call Success	Failure Cause	Listening Mos1	Listening Mos2	Payload1	Pc
Call Flow	1	0116@192.168.12.163	0116@192.168.12.164	2018-07-05 12:21:50.191	00:01:00.019	1	0	3.95	3.95	EVRC/8000	19
Call Flow	2	0115@192.168.12.163	0115@192.168.12.164	2018-07-05 12:21:50.171	00:01:00.019	1	0	3.95	3.95	EVRC/8000	19
Call Flow	3	0113@192.168.12.163	0113@192.168.12.164	2018-07-05 12:21:50.161	00:01:00.019	1	0	3.95	3.95	EVRC/8000	19
Call Flow	4	0111@192.168.12.163	0111@192.168.12.164	2018-07-05 12:21:50.131	00:01:00.019	1	0	3.95	3.95	EVRC/8000	19
Call Flow	5	0110@192.168.12.163	0110@192.168.12.164	2018-07-05 12:21:50.111	00:01:00.019	1	0	3.95	3.95	EVRC/8000	19
Call Flow	6	0108@192.168.12.163	0108@192.168.12.164	2018-07-05 12:21:50.091	00:01:00.029	1	0	3.95	3.95	EVRC/8000	19
Call Flow	7	0106@192.168.12.163	0106@192.168.12.164	2018-07-05 12:21:50.071	00:01:00.019	1	0	3.95	3.95	EVRC/8000	19
Call Flow	8	0105@192.168.12.163	0105@192.168.12.164	2018-07-05 12:21:50.071	00:01:00.019	1	0	3.95	3.95	EVRC/8000	19
Call Flow	9	0103@192.168.12.163	0103@192.168.12.164	2018-07-05 12:21:50.051	00:01:00.029	1	0	3.95	3.95	EVRC/8000	19
Call Flow	10	0101@192.168.12.163	0101@192.168.12.164	2018-07-05 12:21:50.031	00:01:00.019	1	0	3.95	3.95	EVRC/8000	19
Call Flow	11	0100@192.168.12.163	0100@192.168.12.164	2018-07-05 12:21:50.012	00:01:00.019	1	0	3.95	3.95	EVRC/8000	19
Call Flow	12	0098@192.168.12.163	0098@192.168.12.164	2018-07-05 12:21:49.991	00:01:00.019	1	0	3.95	3.95	EVRC/8000	20

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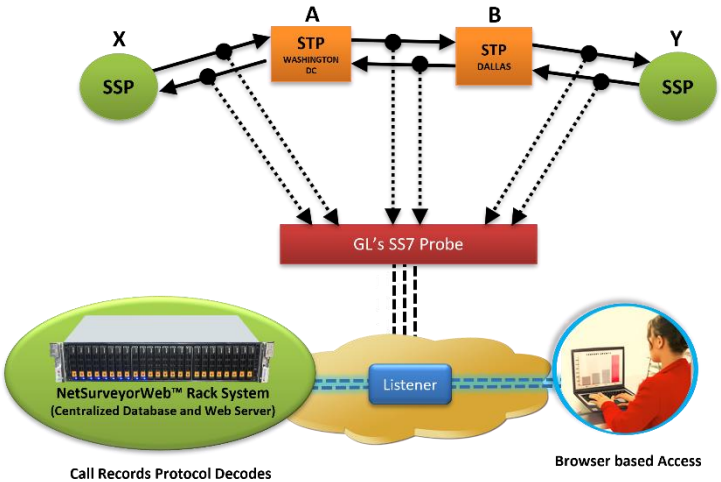
SS7 Call Flow

CALLID : 2237442 Go Back

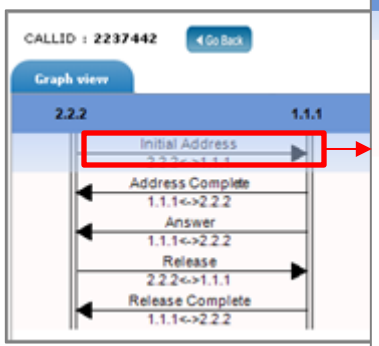
Graph view | Details view | Merge view | Decode Type : ITU ANSI | Debug Summary (Export as CSV)

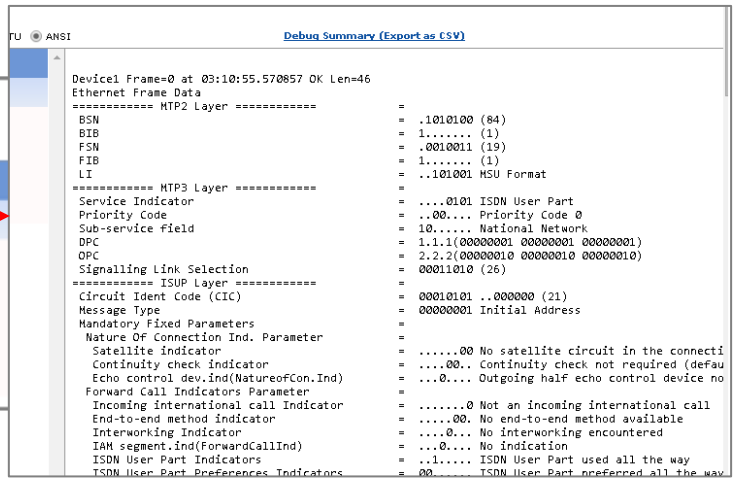
FRAMENO	Timestamp	Probename	Card	Linkname	Linkname Directional	TS1	TS2	CIC	SLS	OPC	DPC
15439877	2015-07-01 03:10:55.570857	SS7	1	1.1.1>2.2.2	2.2.2>1.1.1	0	0	21	26	2.2.2	1.1.1
15439878	2015-07-01 03:10:55.720285	SS7	1	1.1.1>2.2.2	1.1.1>2.2.2	0	0	21	26	1.1.1	2.2.2
15439879	2015-07-01 03:10:55.865857	SS7	1	1.1.1>2.2.2	1.1.1>2.2.2	0	0	21	26	1.1.1	2.2.2
15439983	2015-07-01 03:11:10.920285	SS7	1	1.1.1>2.2.2	2.2.2>1.1.1	0	0	21	26	2.2.2	1.1.1
15439984	2015-07-01 03:11:11.066142	SS7	1	1.1.1>2.2.2	1.1.1>2.2.2	0	0	21	26	1.1.1	2.2.2



Call Records Protocol Decodes

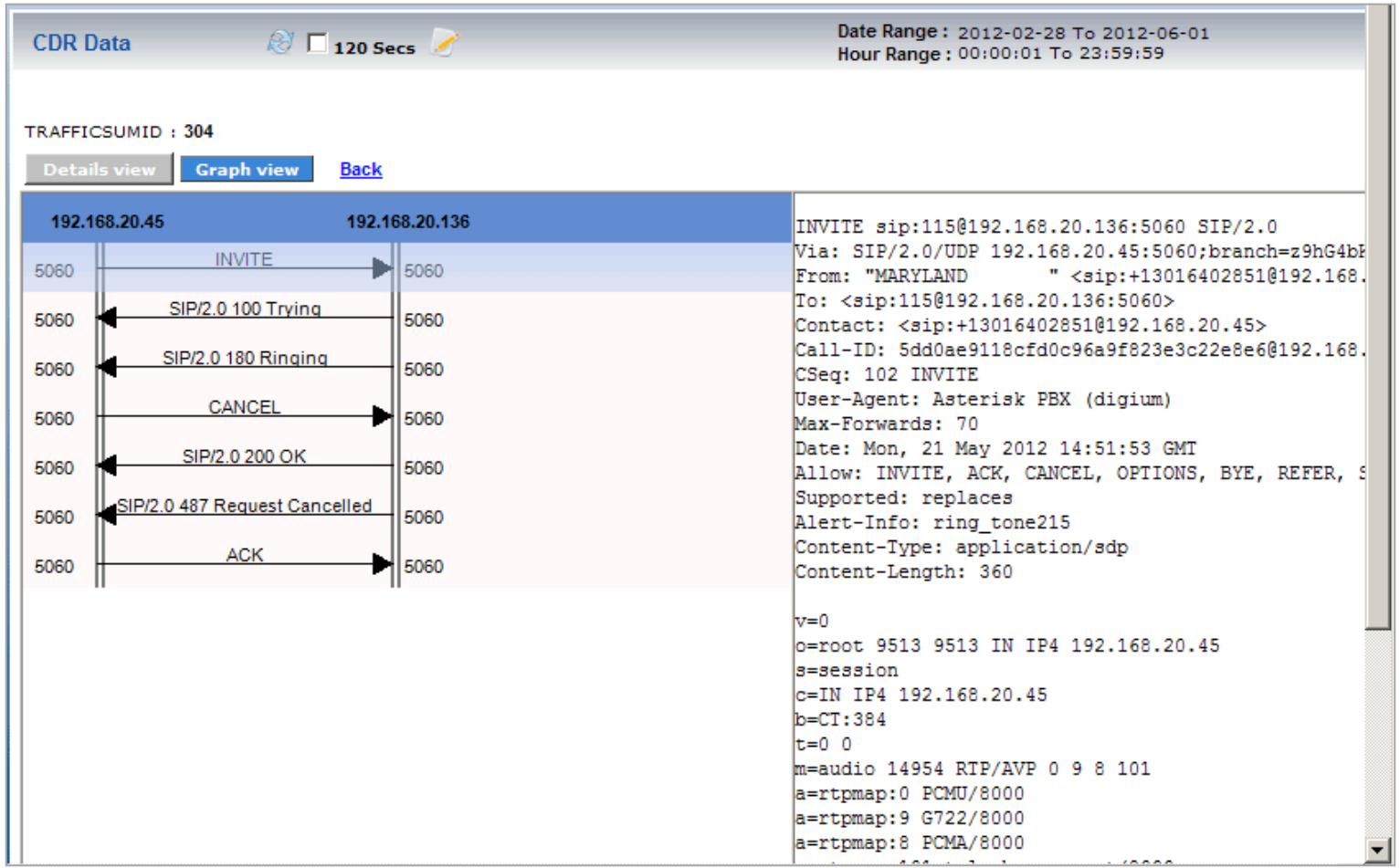
Browser based Access





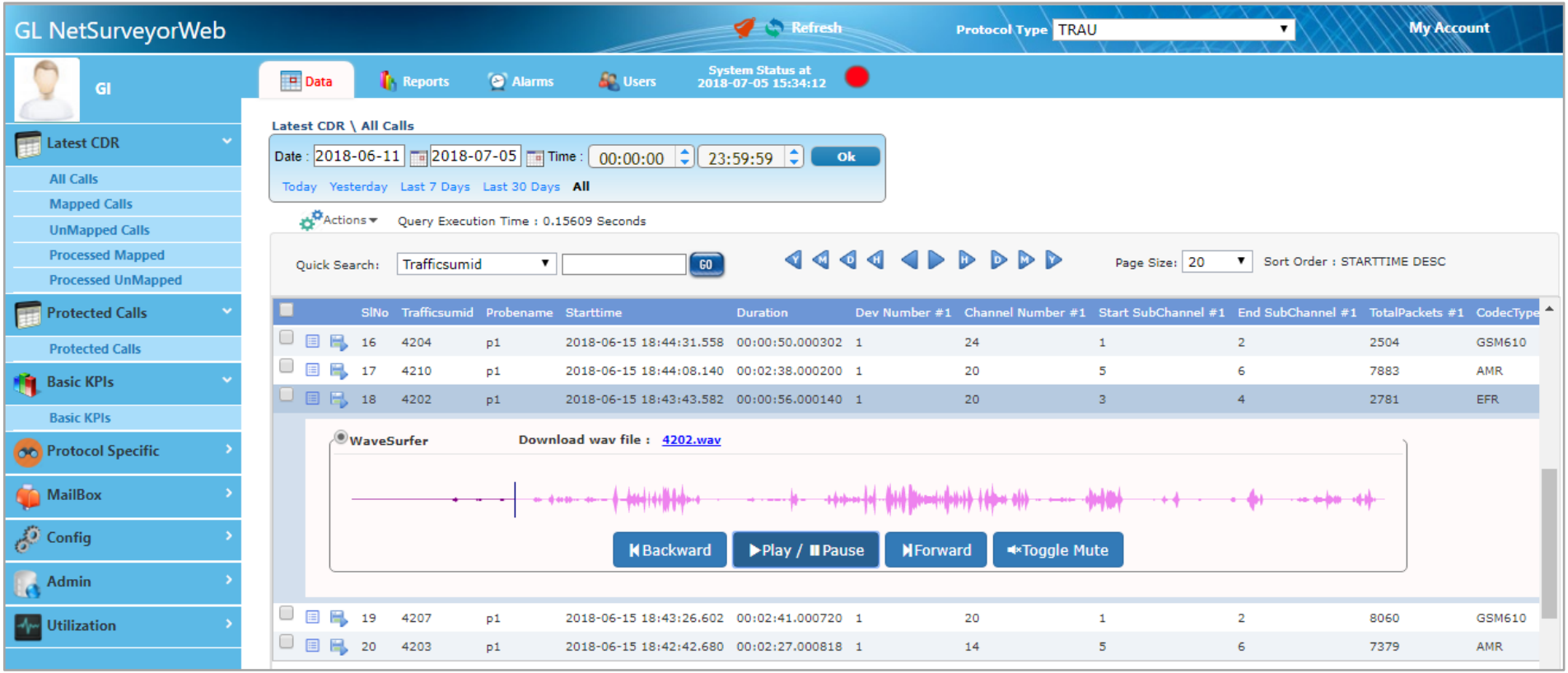
GL Communications

SIP Call Flow



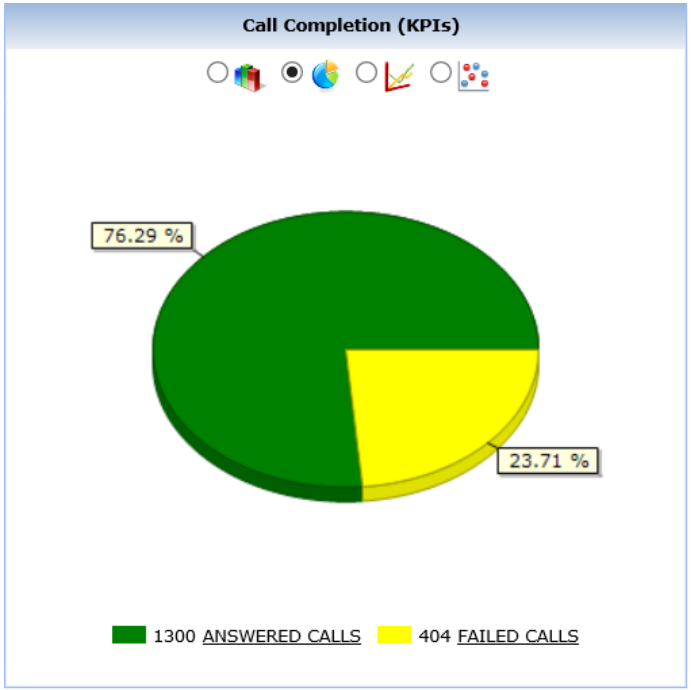
GL Communications

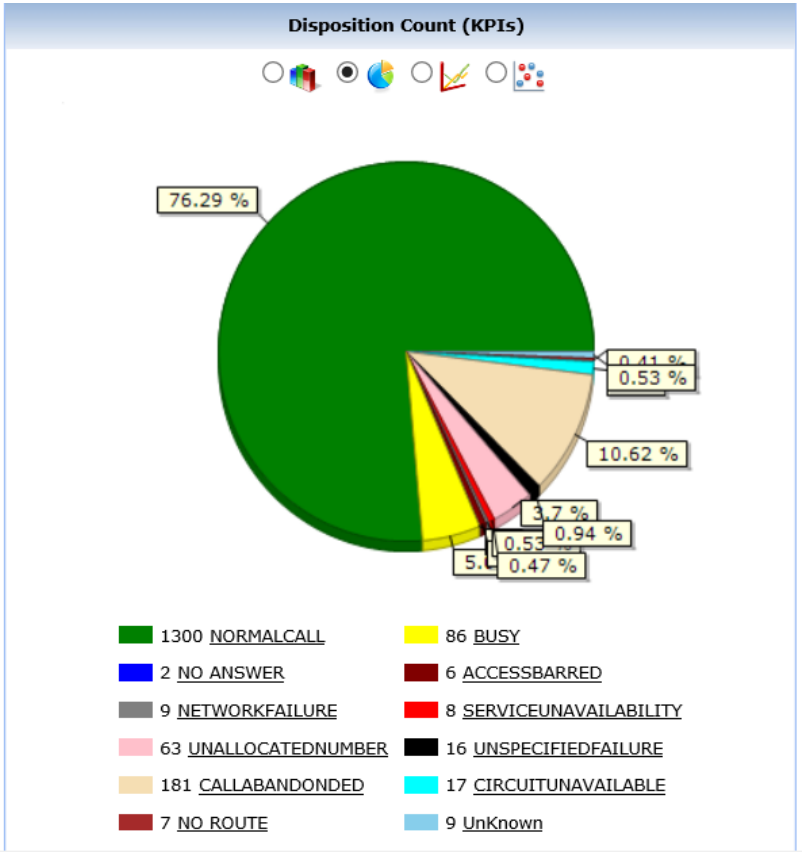
NetSurveyorWeb™ Playing Voice Calls



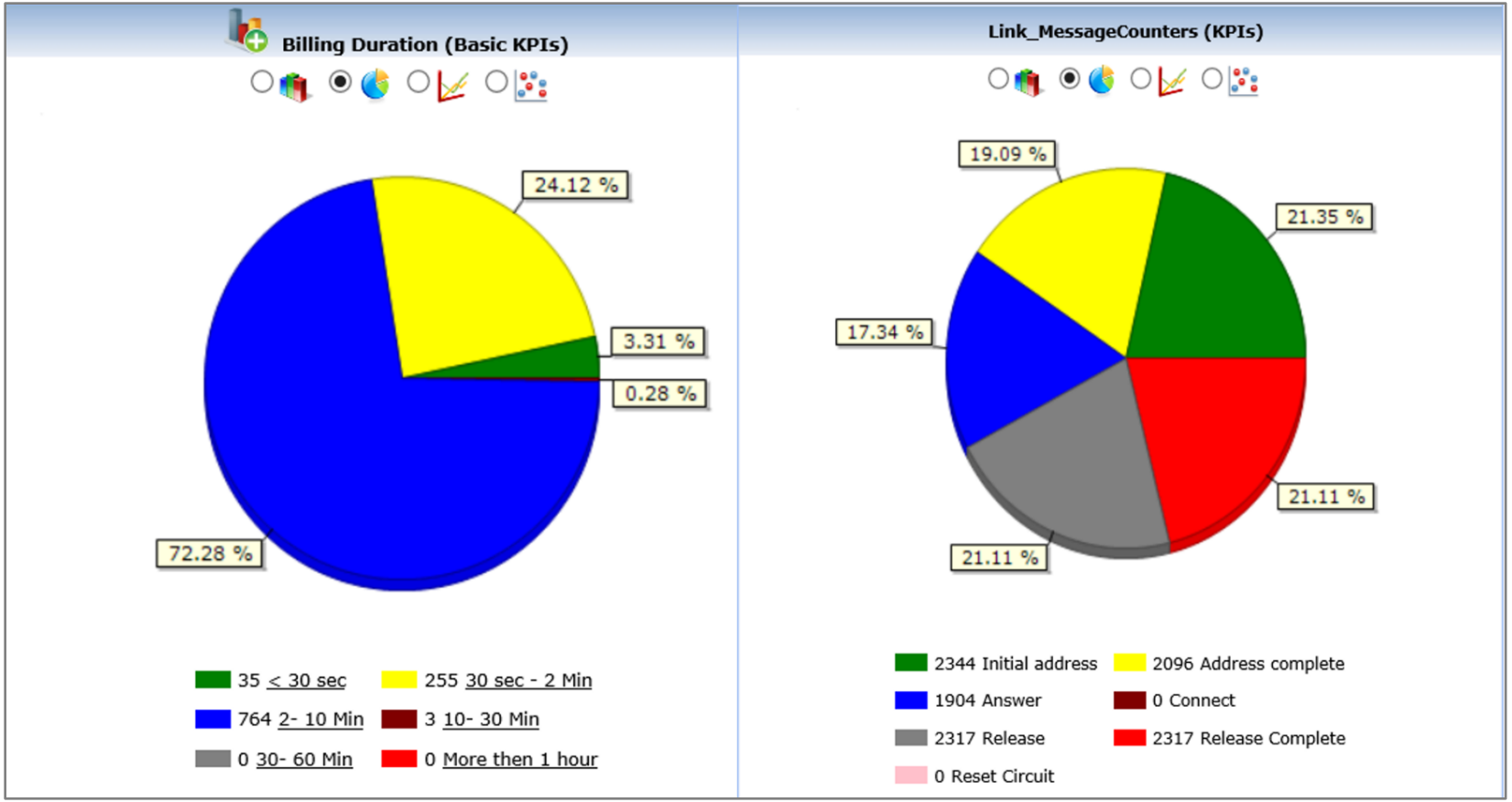
GL Communications

SS7 Key Performance Indicators (KPI)

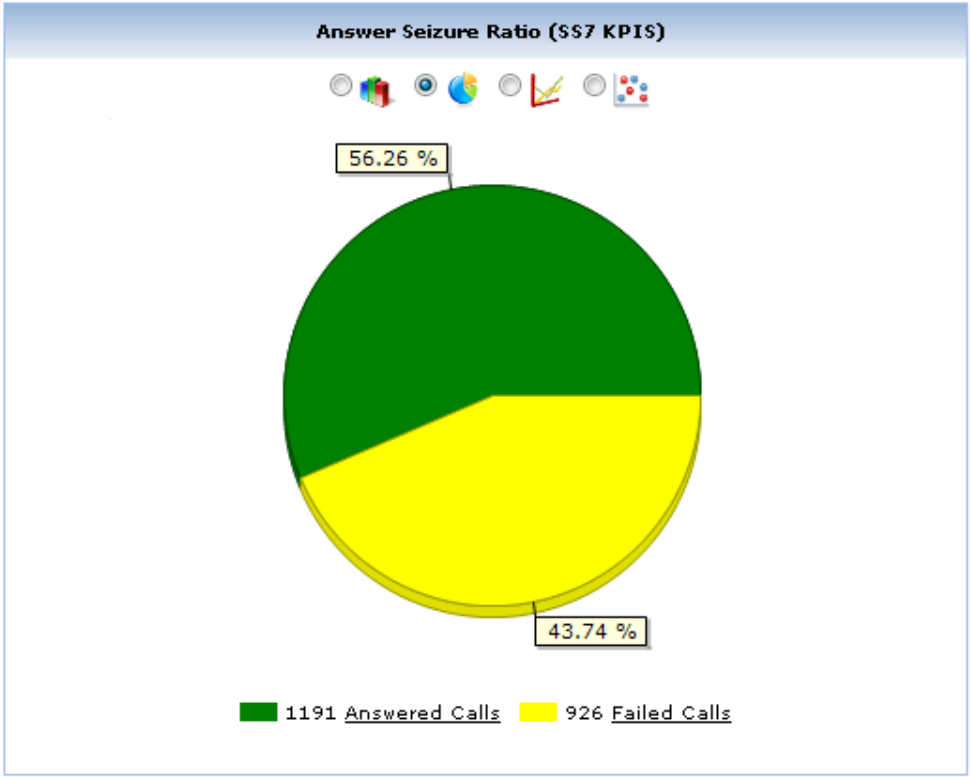


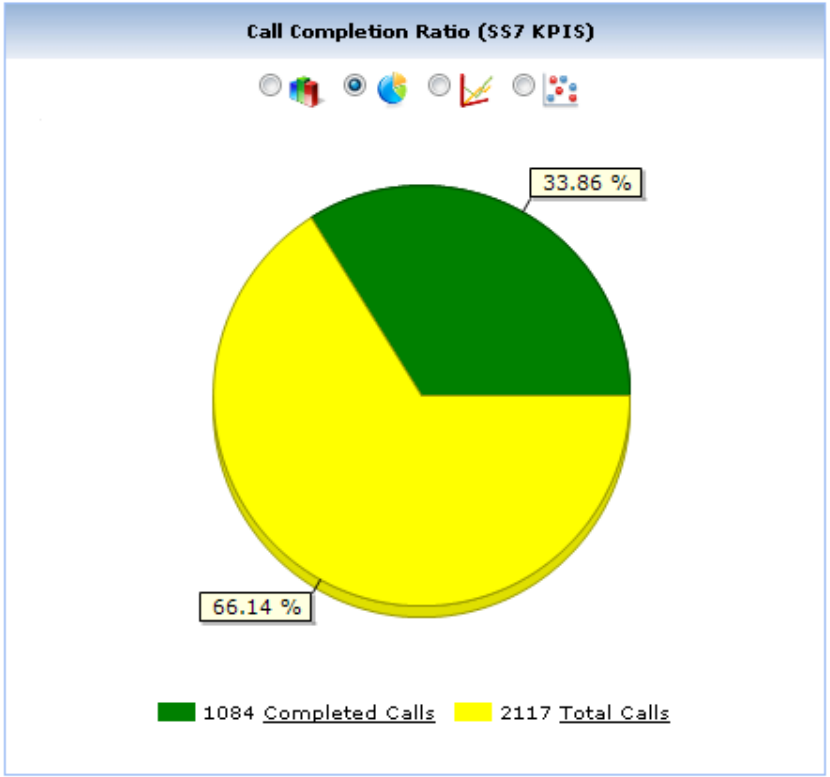


SS7 KPI – Billing Duration and Link Message Counters



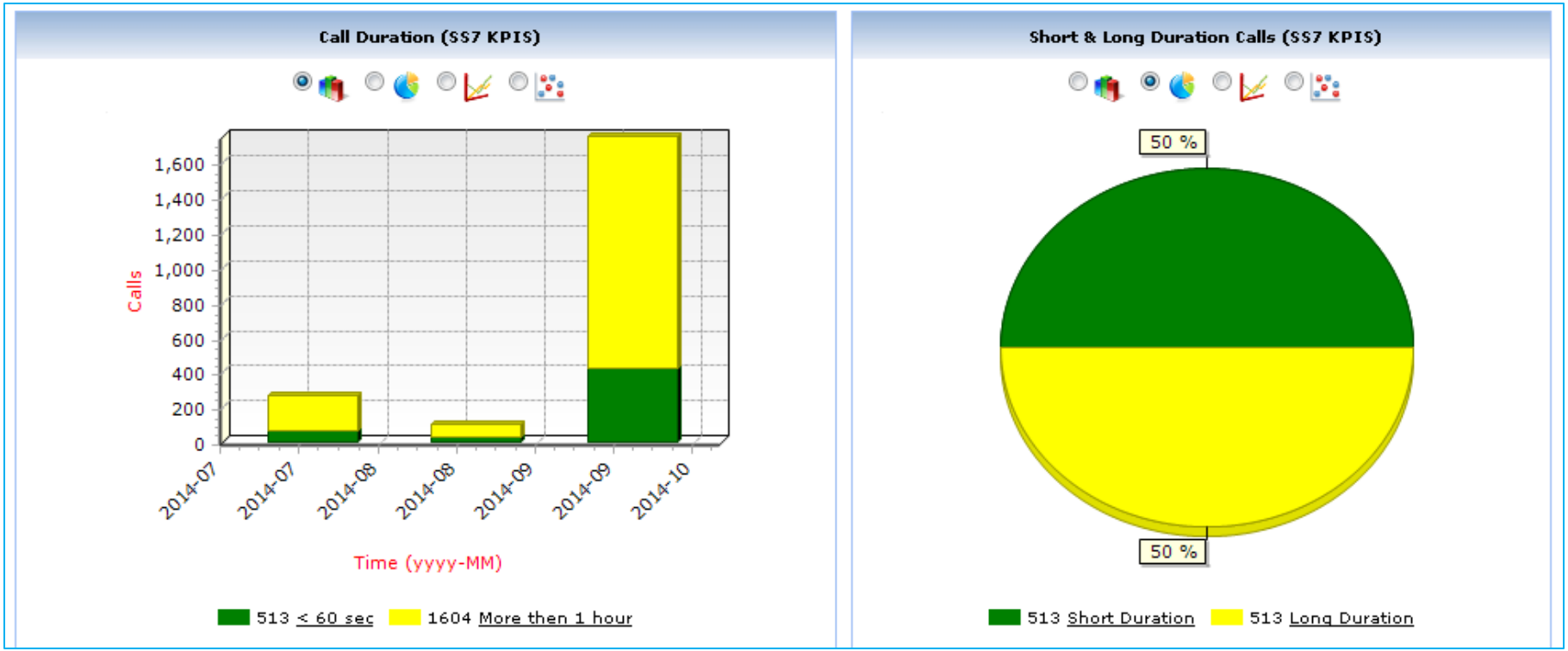
SS7 KPI - Answer Seizure and Call Completion Ratio



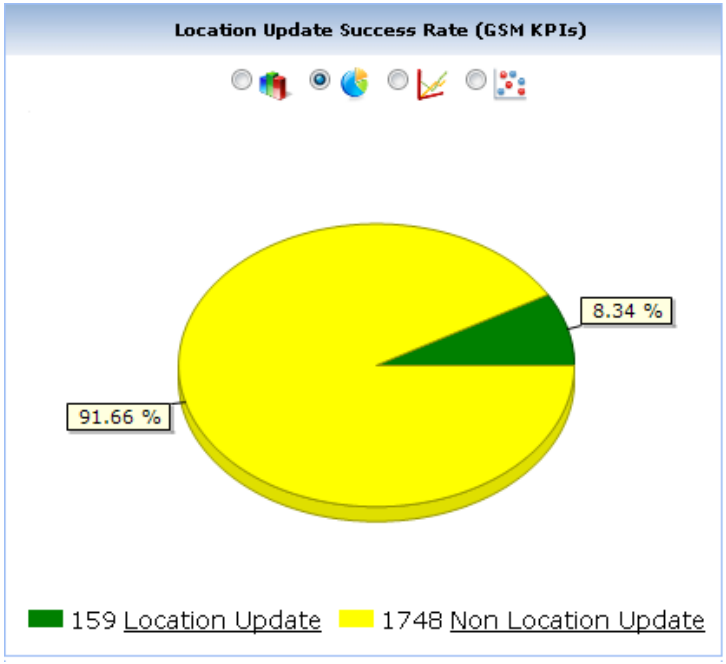


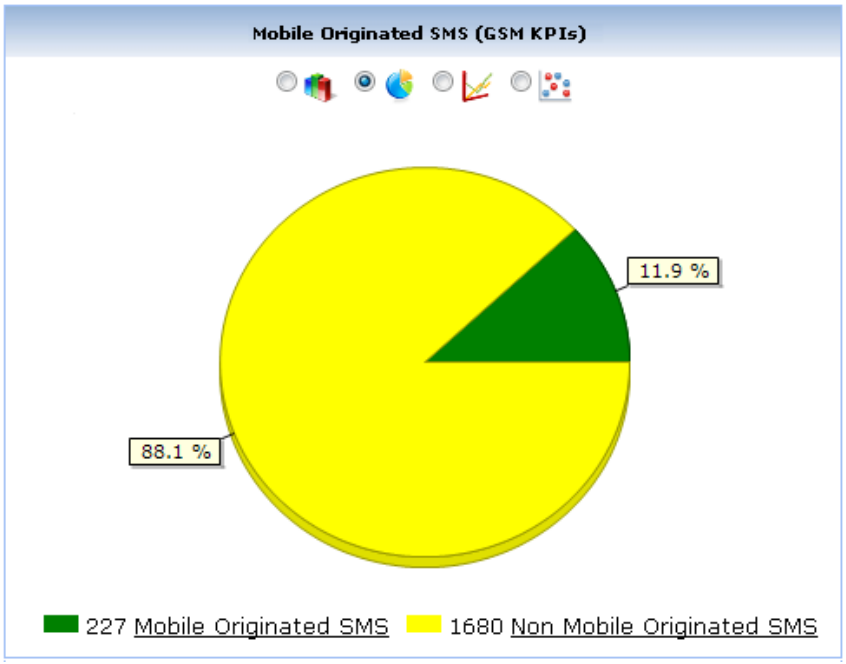
GL Communications

SS7 KPI – Call Duration

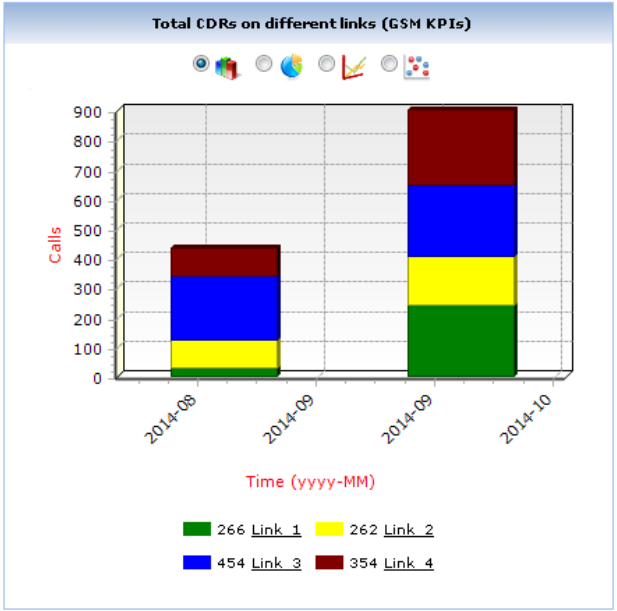


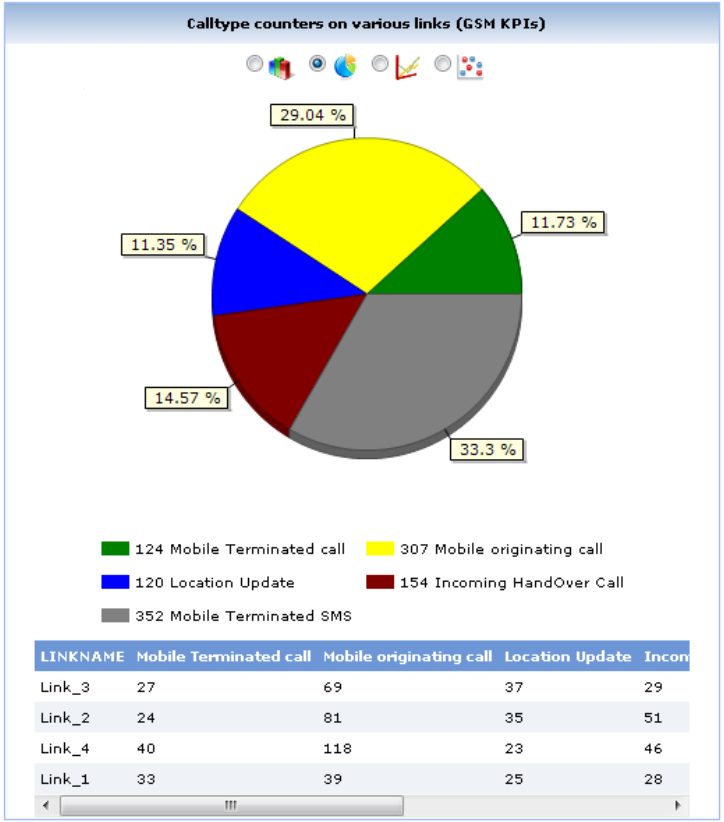
GSM KPI – Location Update and Mobile Originated SMS





GSM KPI – Total CDRs and Call type Counters on Different Links

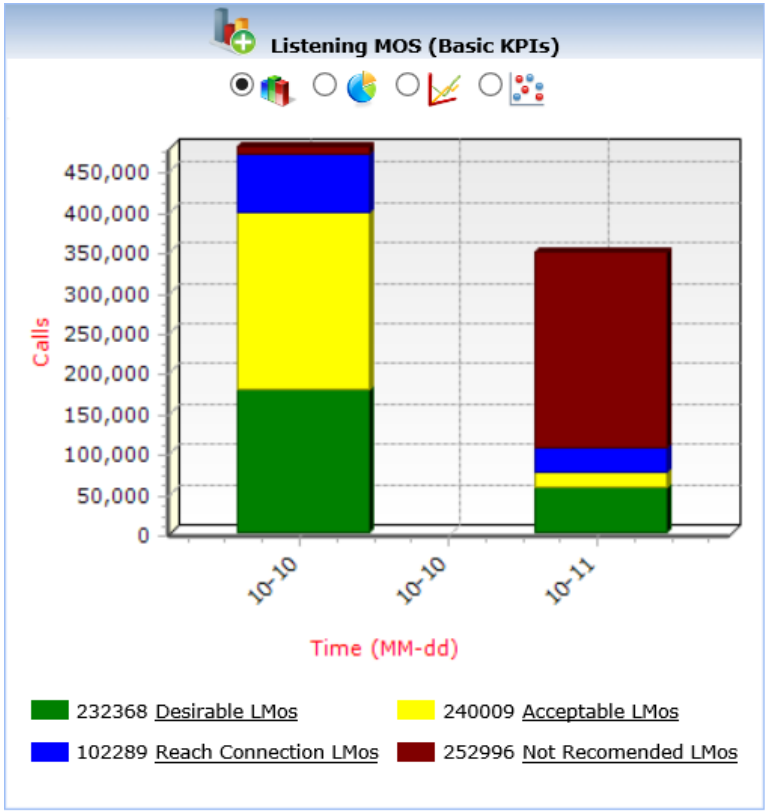


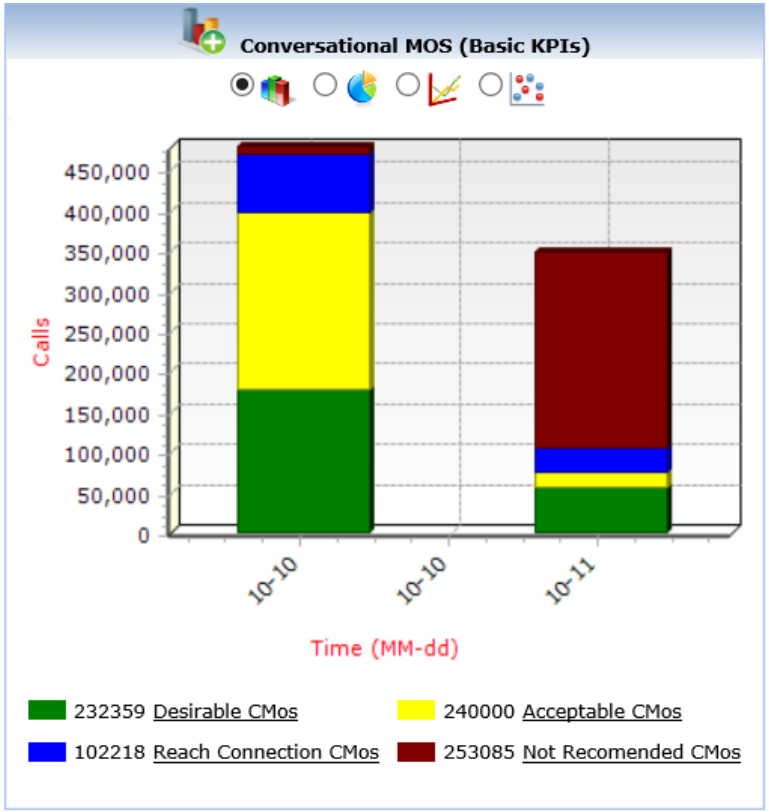


LINKNAME	Mobile Terminated call	Mobile originating call	Location Update	Incon
Link_3	27	69	37	29
Link_2	24	81	35	51
Link_4	40	118	23	46
Link_1	33	39	25	28

GL Communications

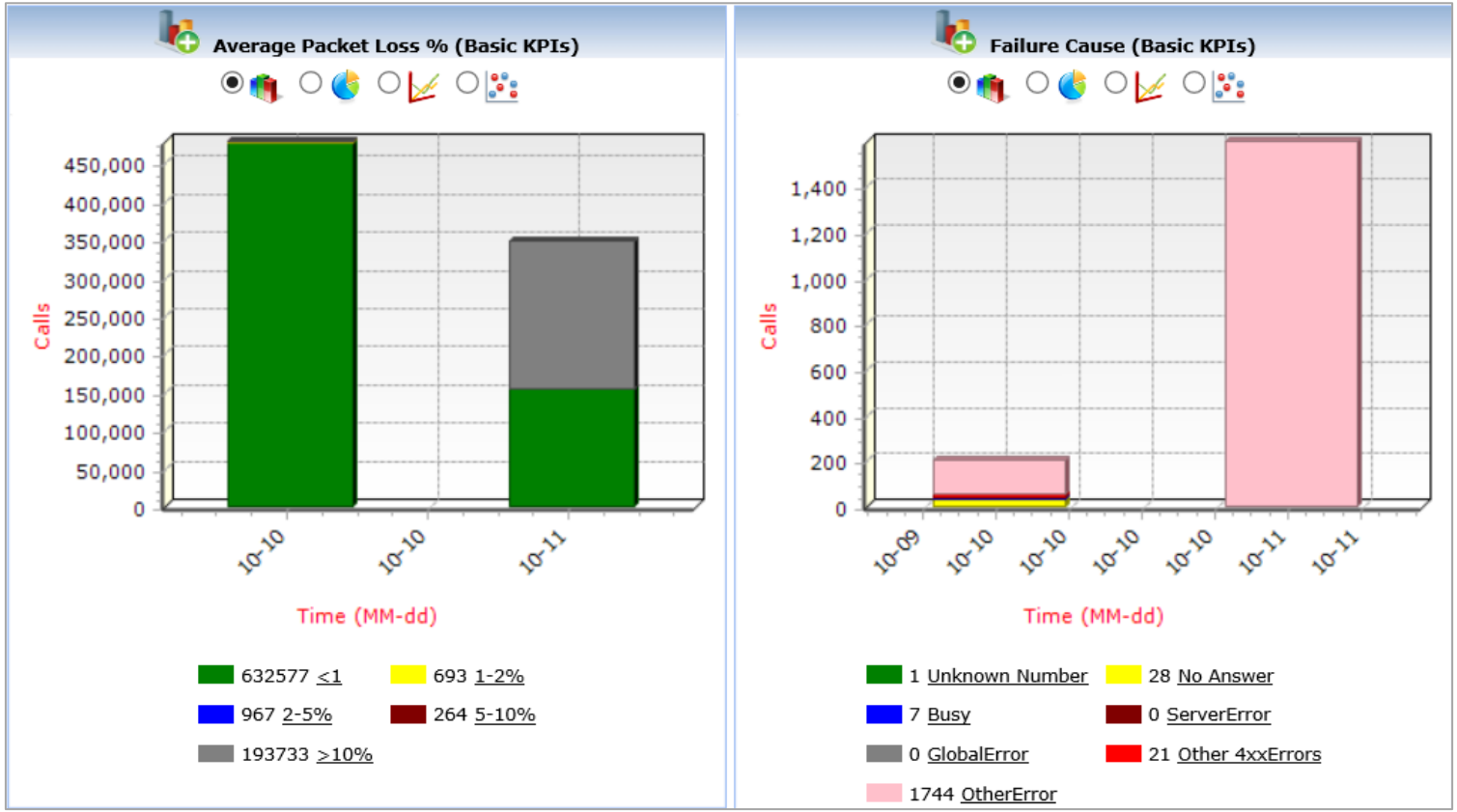
VoIP KPI





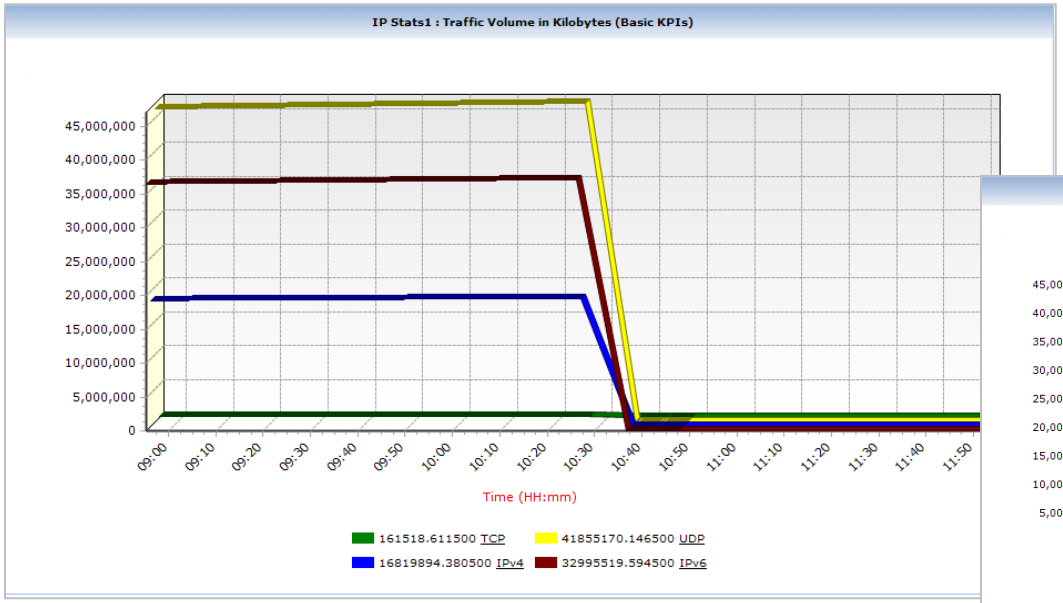
GL Communications

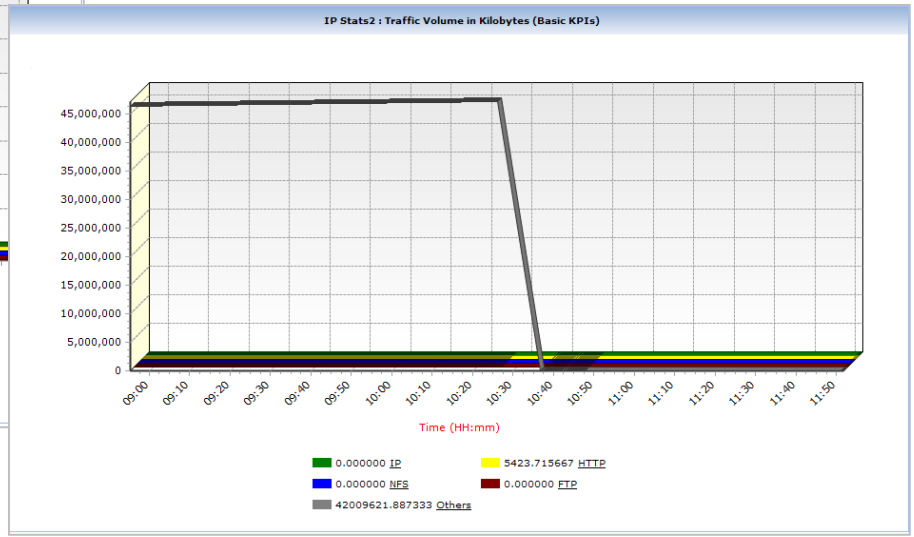
VoIP KPI – Average Packet Loss and Failure Cause



GL Communications

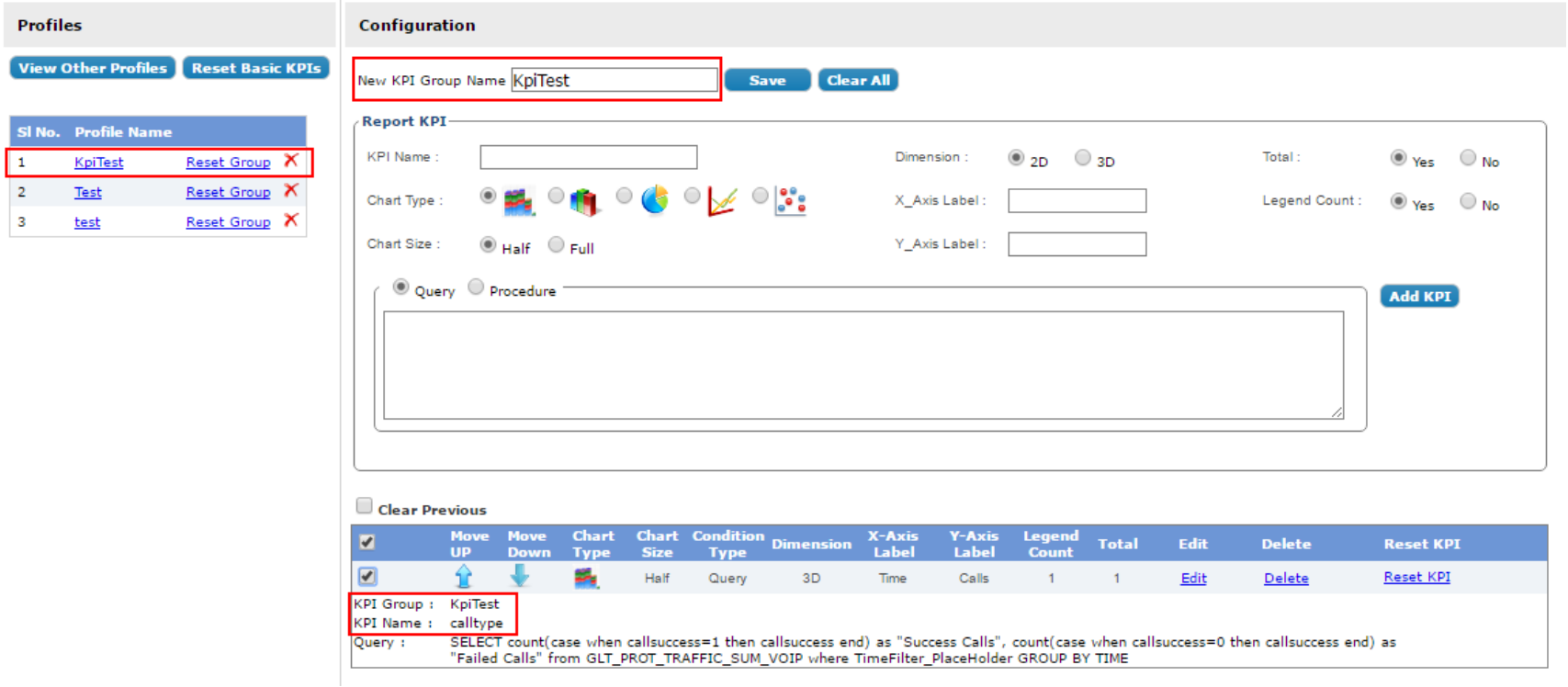
IP Stats - Traffic Volume in Kilobytes





- Depicts total instantaneous traffic captured in Kilobytes for TCP, UDP, IPV4, IPV6 packets

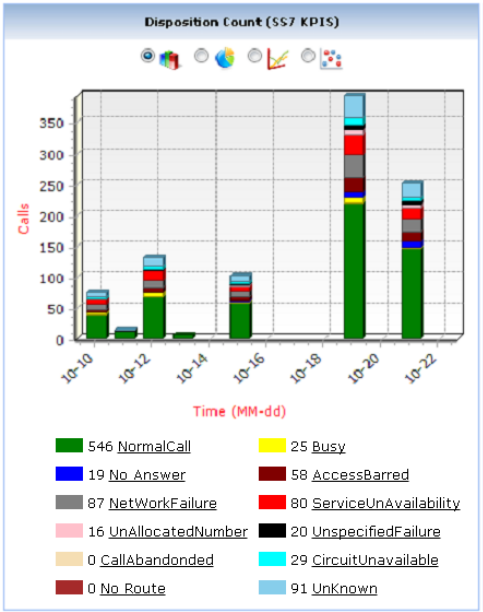
Report Configuration

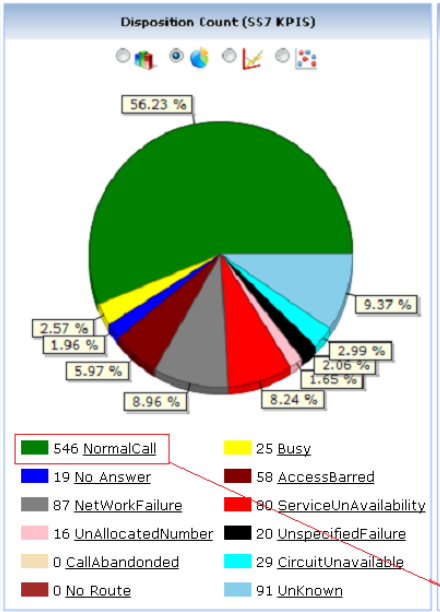


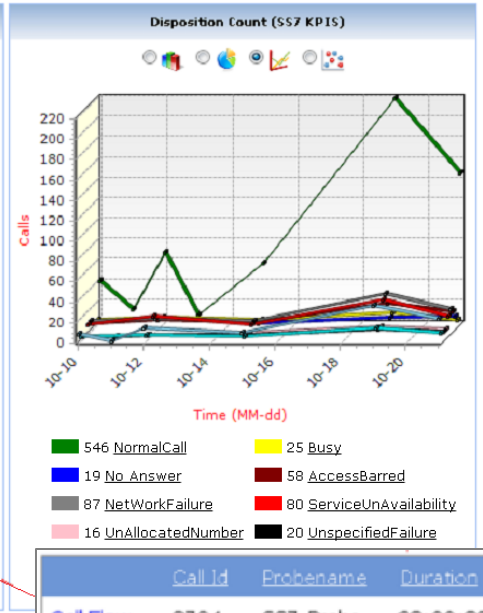
- In addition to the default KPIs displayed in reports view, NetSurveyorWeb™ allows users to add new KPIs and customize the reports using Report Configuration feature

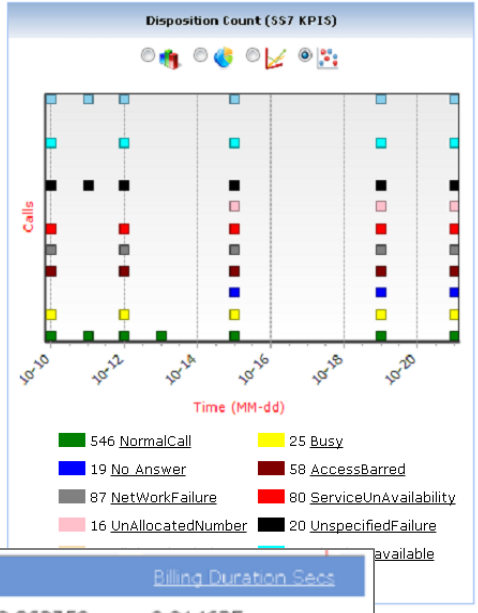
GL Communications

Report Generation





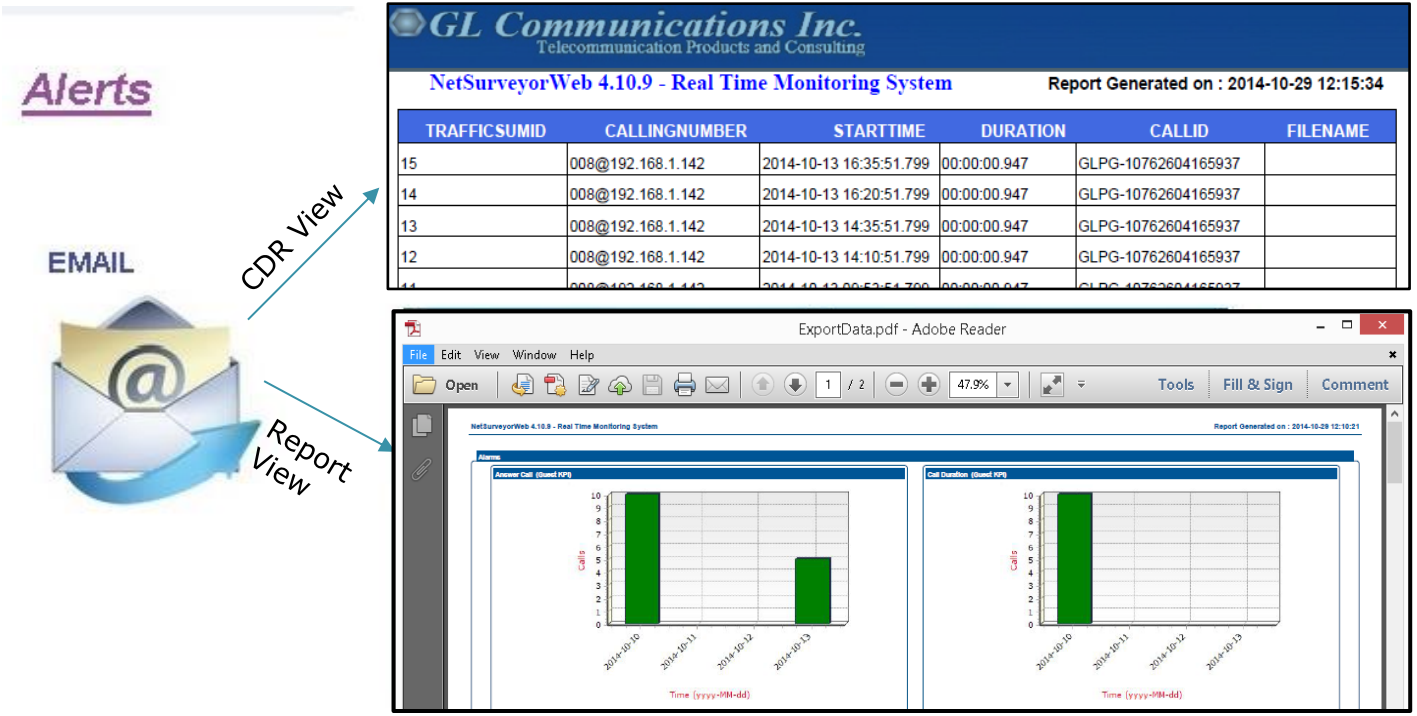




	Call Id	Probename	Duration	Billing Duration Secs
Call Flow	8704	SS7-Probe	00:00:00.062750	0.014625
Call Flow	8703	SS7-Probe	00:00:00.062875	0.014625
Call Flow	8702	SS7-Probe	00:00:00.062750	0.014625
Call Flow	8701	SS7-Probe	00:00:00.062750	0.014625
Call Flow	8700	SS7-Probe	00:00:00.062875	0.014625
Call Flow	8699	SS7-Probe	00:61:00.048250	0.014625
Call Flow	8698	SS7-Probe	00:00:00.048250	0.014625

GL Communications

Notifications / Alarm Alerts

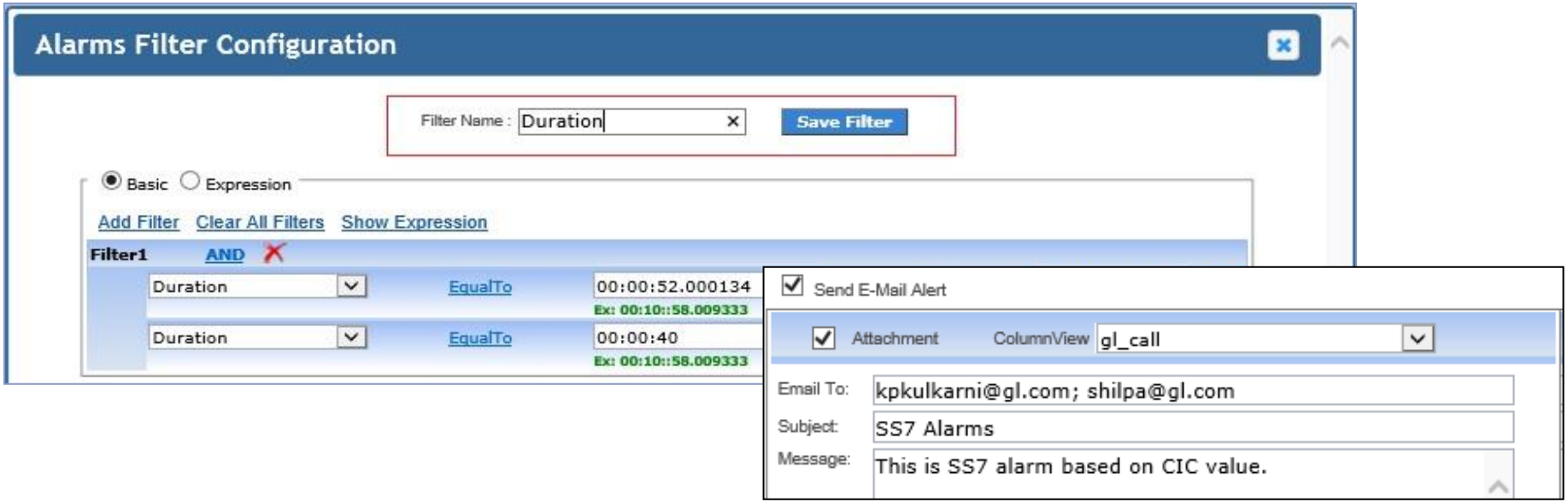


Alert Types

- Email Alerts
- Visual Alarm
- Audible Alarm
- Set Alarm Severity
- Log to File

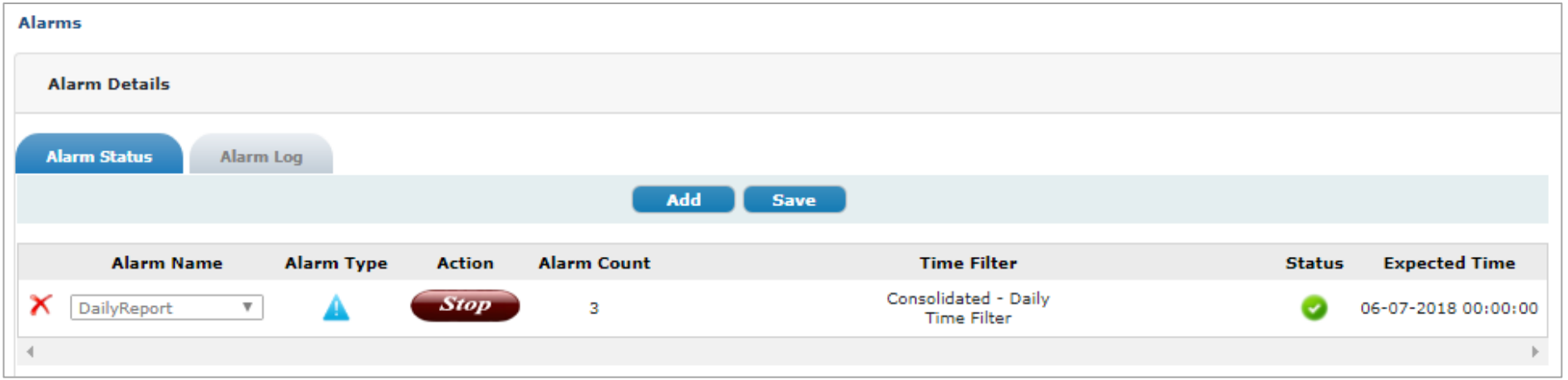
- Define real-time network conditions to generate alarms
- Define different actions based on the generated alarms

Alarm Configuration



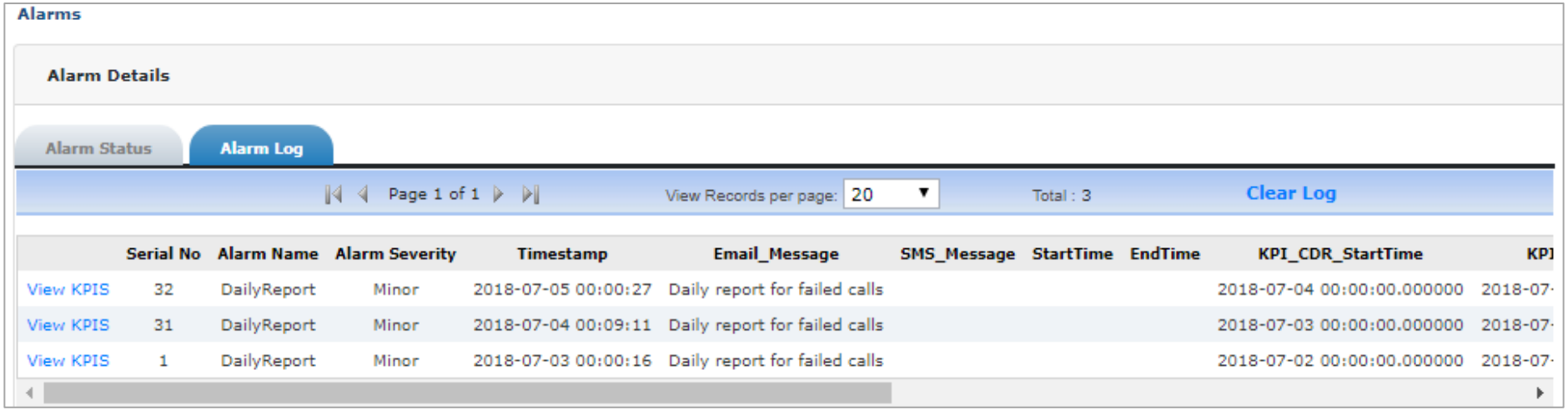
- Alarm Condition provides the options to set the filter conditions for the alarm
- Alarm Action provides options to set the actions to be taken when an alarm is detected such as the visual alarm type, audible alarm type, exporting data, set alarm severity, log to file, and generate email alerts

Alarm Status

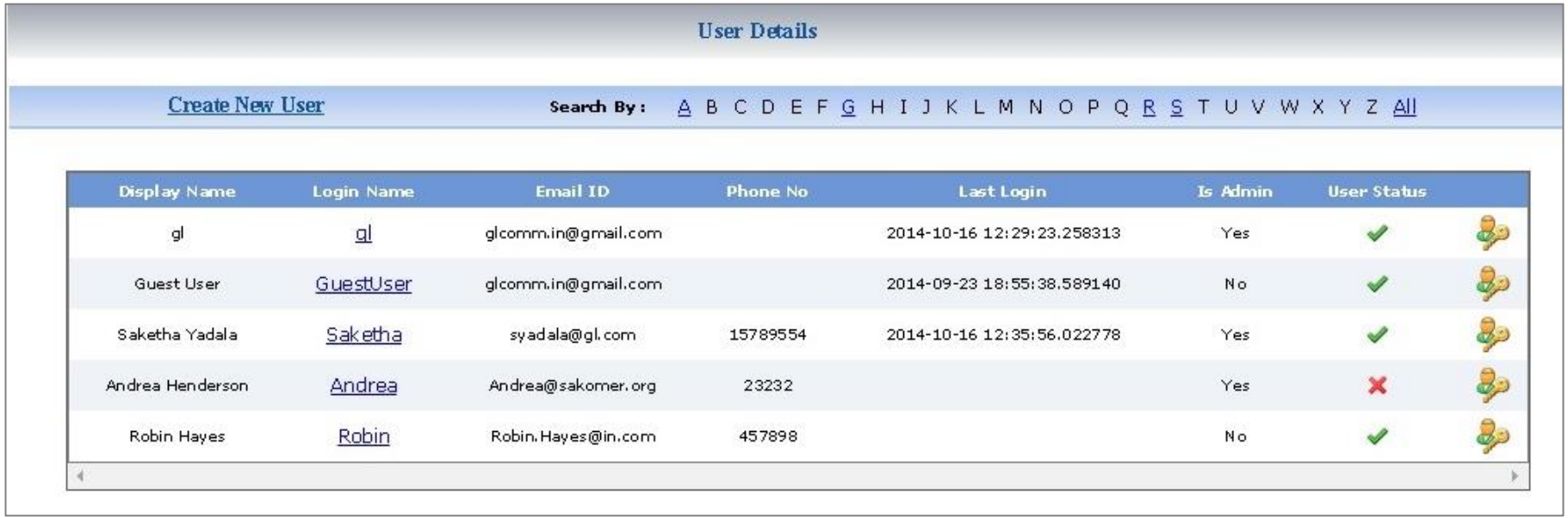


- Each alarm profile can be set against Date-Time, and Sampling Rate condition during which the selected Alarm Condition is said to be active
- For example, if the user selects 5 minutes as the sampling rate, NetSurveyorWeb™ will check for the alarm conditions every 5 minutes and triggers the actions such as a visible alert or sending an email alert as set in the alarm configuration

Alarm Log

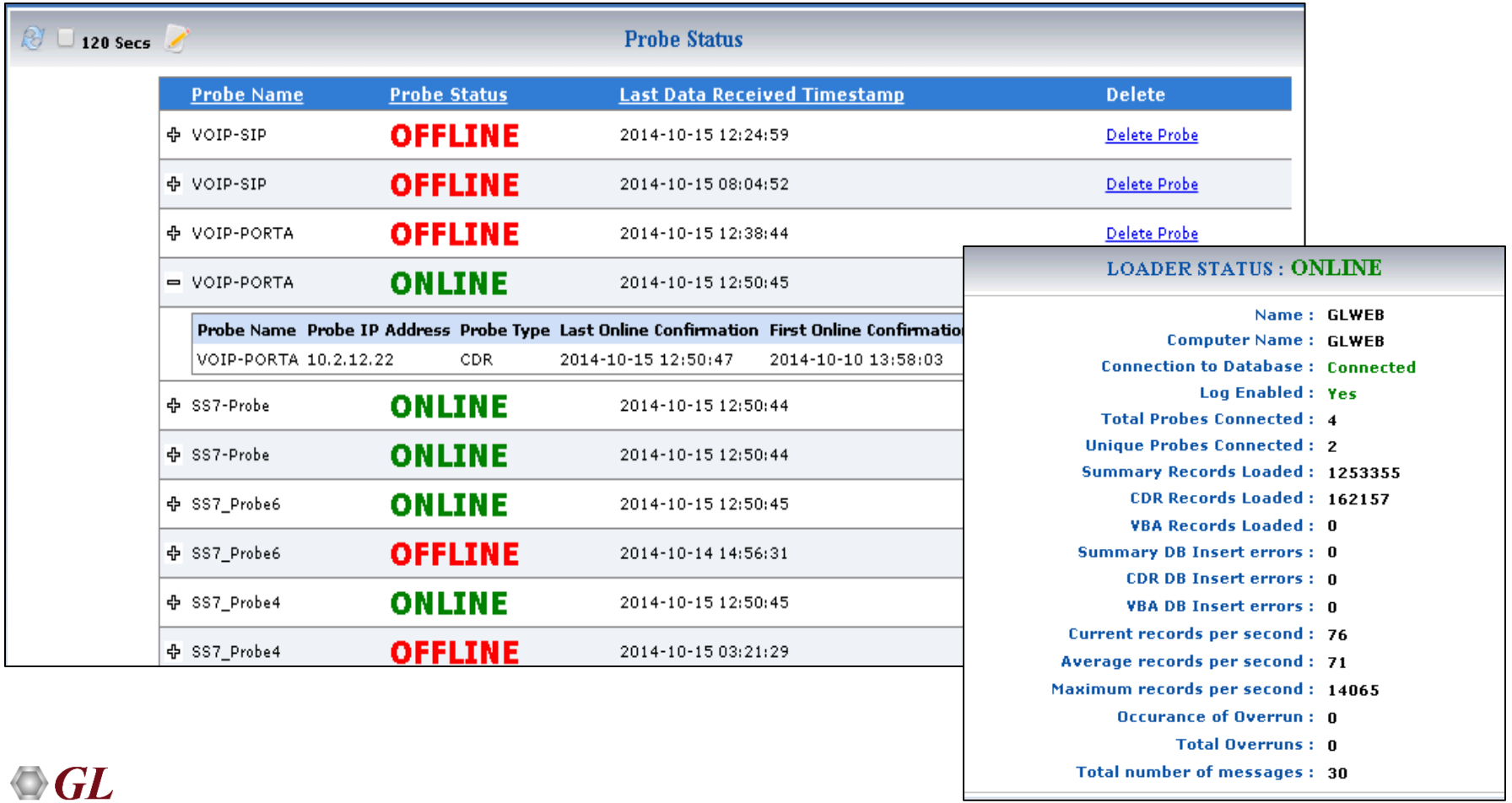

Alarms
Alarm Details
Alarm Status
Alarm Log
Page 1 of 1
View Records per page: 20
Total : 3
Clear Log
Serial No
Alarm Name
Alarm Severity
Timestamp
Email_Message
SMS_Message
StartTime
EndTime
KPI_CDR_StartTime
KPI
View KPIS 32 DailyReport Minor 2018-07-05 00:00:27 Daily report for failed calls 2018-07-04 00:00:00.000000 2018-07-
View KPIS 31 DailyReport Minor 2018-07-04 00:09:11 Daily report for failed calls 2018-07-03 00:00:00.000000 2018-07-
View KPIS 1 DailyReport Minor 2018-07-03 00:00:16 Daily report for failed calls 2018-07-02 00:00:00.000000 2018-07-

User Management (Security)



GL Communications

Probe / Loader Status



120 Secs

Probe Status

Probe Name	Probe Status	Last Data Received Timestamp	Delete
VOIP-SIP	OFFLINE	2014-10-15 12:24:59	Delete Probe
VOIP-SIP	OFFLINE	2014-10-15 08:04:52	Delete Probe
VOIP-PORTA	OFFLINE	2014-10-15 12:38:44	Delete Probe
VOIP-PORTA	ONLINE	2014-10-15 12:50:45	

Probe Name	Probe IP Address	Probe Type	Last Online Confirmation	First Online Confirmatio
VOIP-PORTA	10.2.12.22	CDR	2014-10-15 12:50:47	2014-10-10 13:58:03

SS7-Probe	ONLINE	2014-10-15 12:50:44	
SS7-Probe	ONLINE	2014-10-15 12:50:44	
SS7_Probe6	ONLINE	2014-10-15 12:50:45	
SS7_Probe6	OFFLINE	2014-10-14 14:56:31	
SS7_Probe4	ONLINE	2014-10-15 12:50:45	
SS7_Probe4	OFFLINE	2014-10-15 03:21:29	

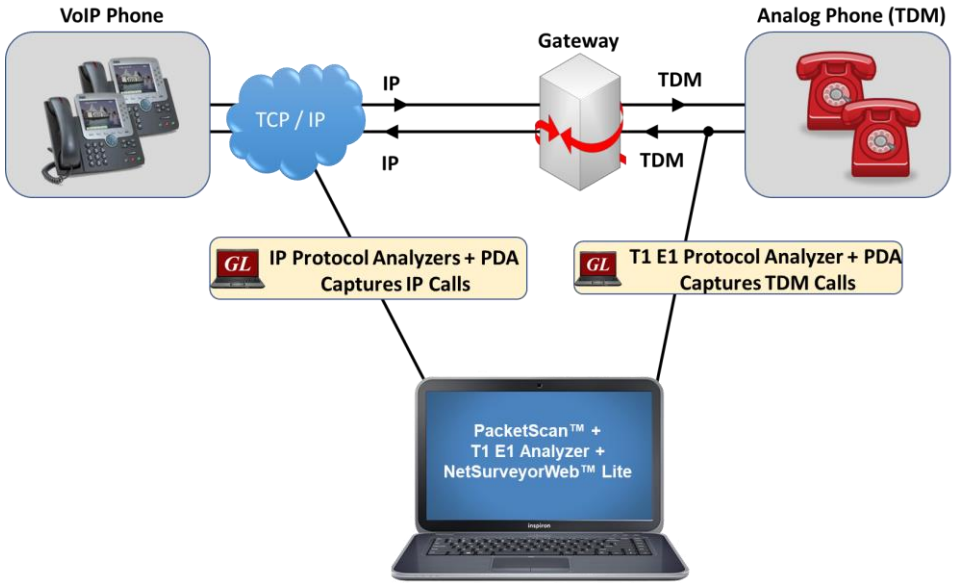
LOADER STATUS : ONLINE

Name :	GLWEB
Computer Name :	GLWEB
Connection to Database :	Connected
Log Enabled :	Yes
Total Probes Connected :	4
Unique Probes Connected :	2
Summary Records Loaded :	1253355
CDR Records Loaded :	162157
VBA Records Loaded :	0
Summary DB Insert errors :	0
CDR DB Insert errors :	0
VBA DB Insert errors :	0
Current records per second :	76
Average records per second :	71
Maximum records per second :	14065
Occurance of Overrun :	0
Total Overruns :	0
Total number of messages :	30

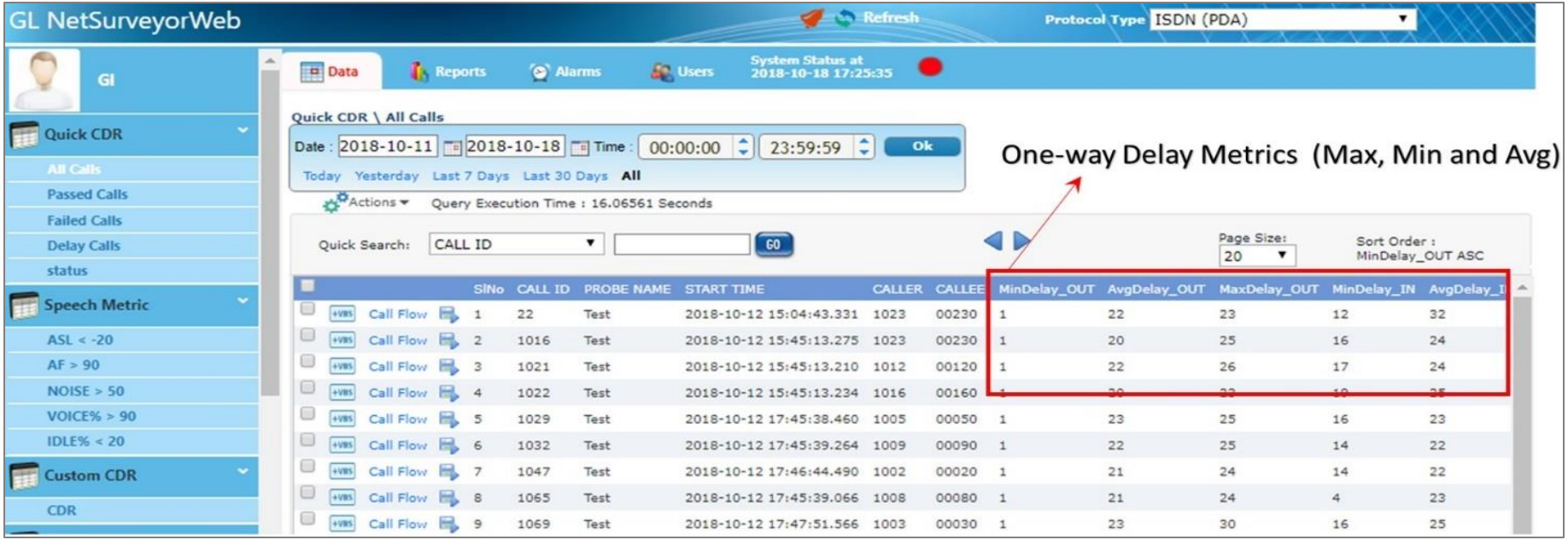
GL Communications

Measuring Delay (VoIP and TDM)

- Works with Delay Measurement tools to analyse captured voice traffic and provide precise one-way delay metrics
- For a given call which traverse through Gateway, traffic is sampled at both TDM and IP analyzer at the same point of time running in the same server. These captured segments of SIP and ISDN calls will be saved in *.pcm formats. These samples will be given to delay measurement module which compares the samples based on the timestamp and provides the delay metrics



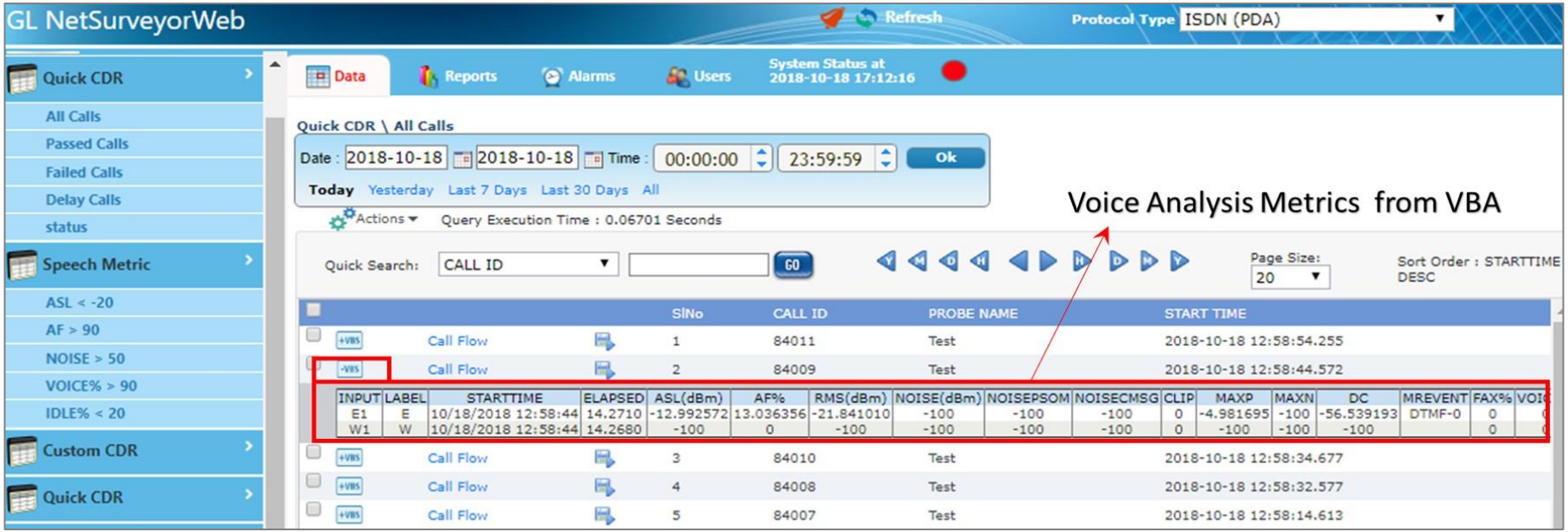
Delay Metrics



SlNo	CALL ID	PROBE NAME	START TIME	CALLER	CALLEE	MinDelay_OUT	AvgDelay_OUT	MaxDelay_OUT	MinDelay_IN	AvgDelay_I
1	22	Test	2018-10-12 15:04:43.331	1023	00230	1	22	23	12	32
2	1016	Test	2018-10-12 15:45:13.275	1023	00230	1	20	25	16	24
3	1021	Test	2018-10-12 15:45:13.210	1012	00120	1	22	26	17	24
4	1022	Test	2018-10-12 15:45:13.234	1016	00160	1	20	22	19	25
5	1029	Test	2018-10-12 17:45:38.460	1005	00050	1	23	25	16	23
6	1032	Test	2018-10-12 17:45:39.264	1009	00090	1	22	25	14	22
7	1047	Test	2018-10-12 17:46:44.490	1002	00020	1	21	24	14	22
8	1065	Test	2018-10-12 17:45:39.066	1008	00080	1	21	24	4	23
9	1069	Test	2018-10-12 17:47:51.566	1003	00030	1	23	30	16	25

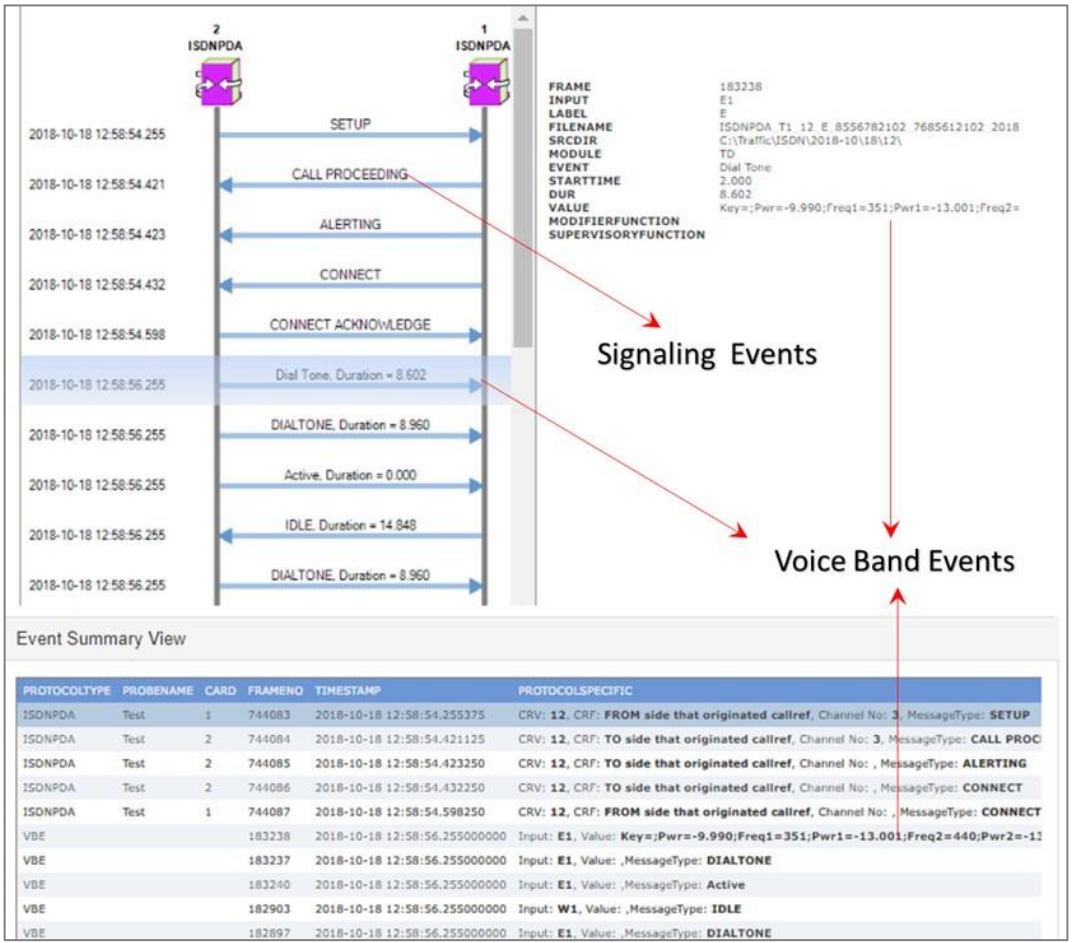
- The NetSurveyorWeb™ application along with Delay Measurement application helps to monitor the delays such as Minimum Delay, Maximum Delay, and Average Delay for each call

Voiceband Metrics



- NetSurveyorWeb™ Lite application works with Voice Band Analyzer (VBA) application to analyse captured voice/fax traffic and provide useful metrics that are of interest to service providers

Voiceband Event Summary and Message Sequence



GL Communications

Related Products

Voice Quality Testing:

- Provides Intrusive method of voice, video, data quality testing and monitoring for any networks.
- Real-time voice, video, and data quality measurements across a diverse set of networks
- Supports international standard voice quality test methods, including, PESQ, POLQA, MOS (Mean Opinion Score), Round Trip Delay (RTD), Jitter, Clipping, Voice band quality metrics, etc.

WebViewer™ (Web Based Client for Voice and Data Quality Testing):

- The WebViewer™ uses a simple web browser with facilities to query the results either manually or automatically as well as output the results/statistics

Thank you