SS7 Analysis & NetSurveyorWeb™

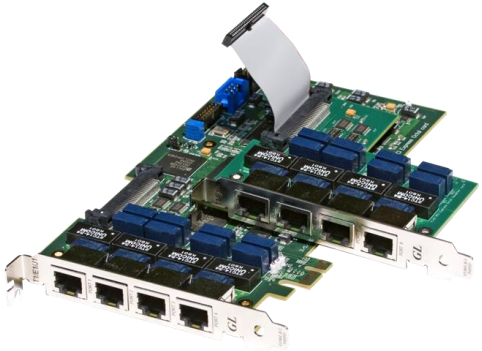
GL Communications Inc.
818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878
Phone: (301) 670-4784 Fax: (301) 670-9187 Email: info@gl.com
Website: https://www.gl.com

Platforms

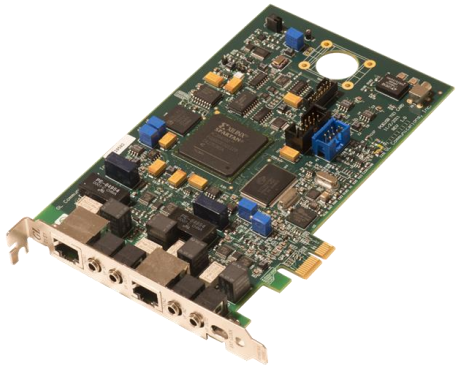
Front Panel

Back Panel

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

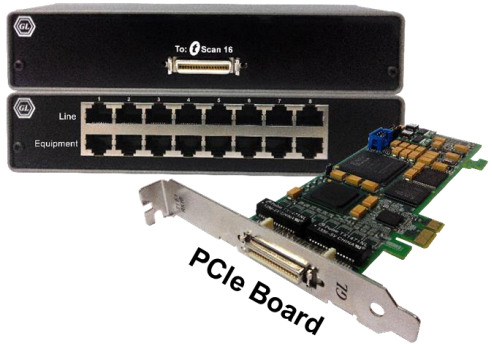


Quad / Octal T1 E1 PCIe Card



Dual T1 E1 Express (PCIe) Board

tScan16™ with
16-port T1 E1 Breakout Box



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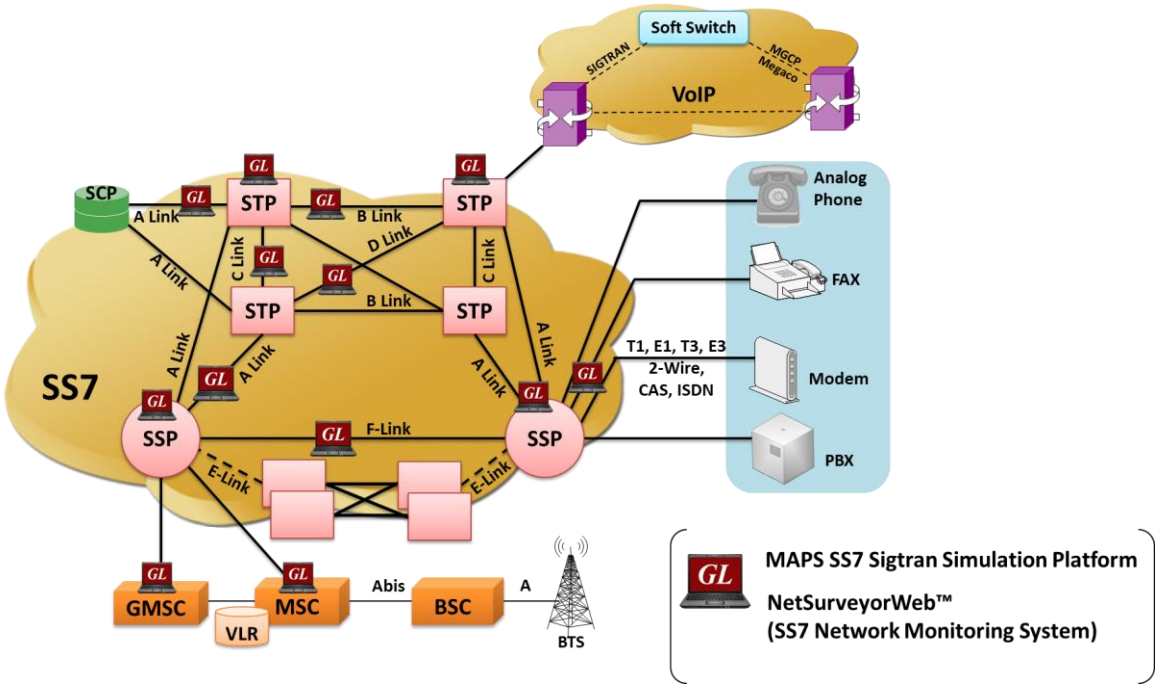
SS7 Analyzer

- Decodes different SS7 layers like MTP2, MTP3, ISUP, TUP, SCCP, INAP (CS1, CS2), IUP, BICC, BISUP, BTUP and many application layer protocols from GSM/GPRS network like MAP, CAMEL(CAP), IS 41 etc.
- Supports the following types of SS7analyzers:
  - ➢ Real-time SS7 Analyzer
  - ➢ Remote/Offline SS7 Analyzers



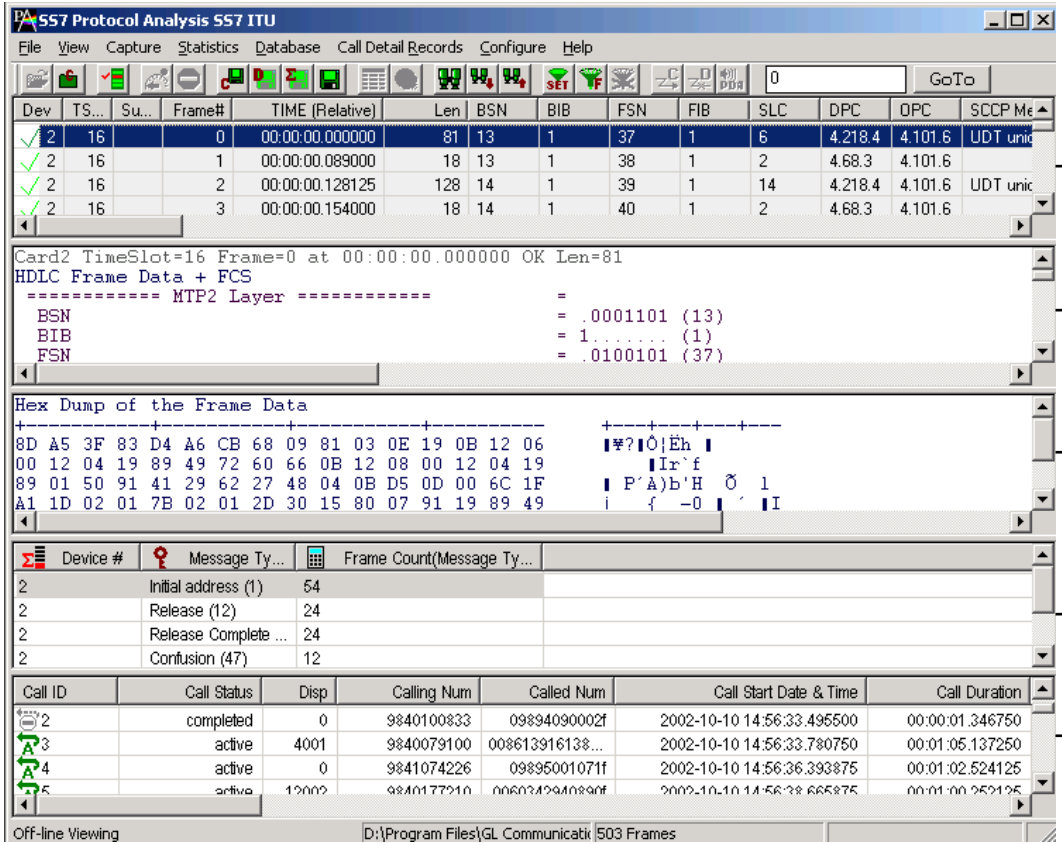
Key Features

- Perform real-time / offline / remote analysis
- Consolidated GUI – Summary of all decodes, detail & hex-dump views of each frame, statistics view, & call detail record views
- Supports various protocol standards for proper decode
- Capture options - Channel selection, CRC, bit reversion, bit inversion, scrambler and more
- Any protocol field can be added to the summary view, filtering, and search features providing users more flexibility to monitor required protocol fields.
- Call Detail Recording feature includes data link groups that help in defining the direction of the calls in a given network and form logical groups comprised of unidirectional (either 'Forward' or 'Backward') data links

Key Features (Contd.)

- Call trace defining important call specific parameters such as call ID, status (active or completed), duration, calling number, called number, and more are displayed
- Fine tune results with filtering and search capability based on OPC, DPC, ISUP message types, SCCP message types, CIC, and more
- Extensive statistics measurement ability
- Exports Summary View information to a comma delimited file for subsequent import into a database or spreadsheet
- Capability to export detail decodes information to an ASCII file
- Trace File Saving Options
- Remote-access capability

Different Views



Summary View

Detail View

Hex dump View

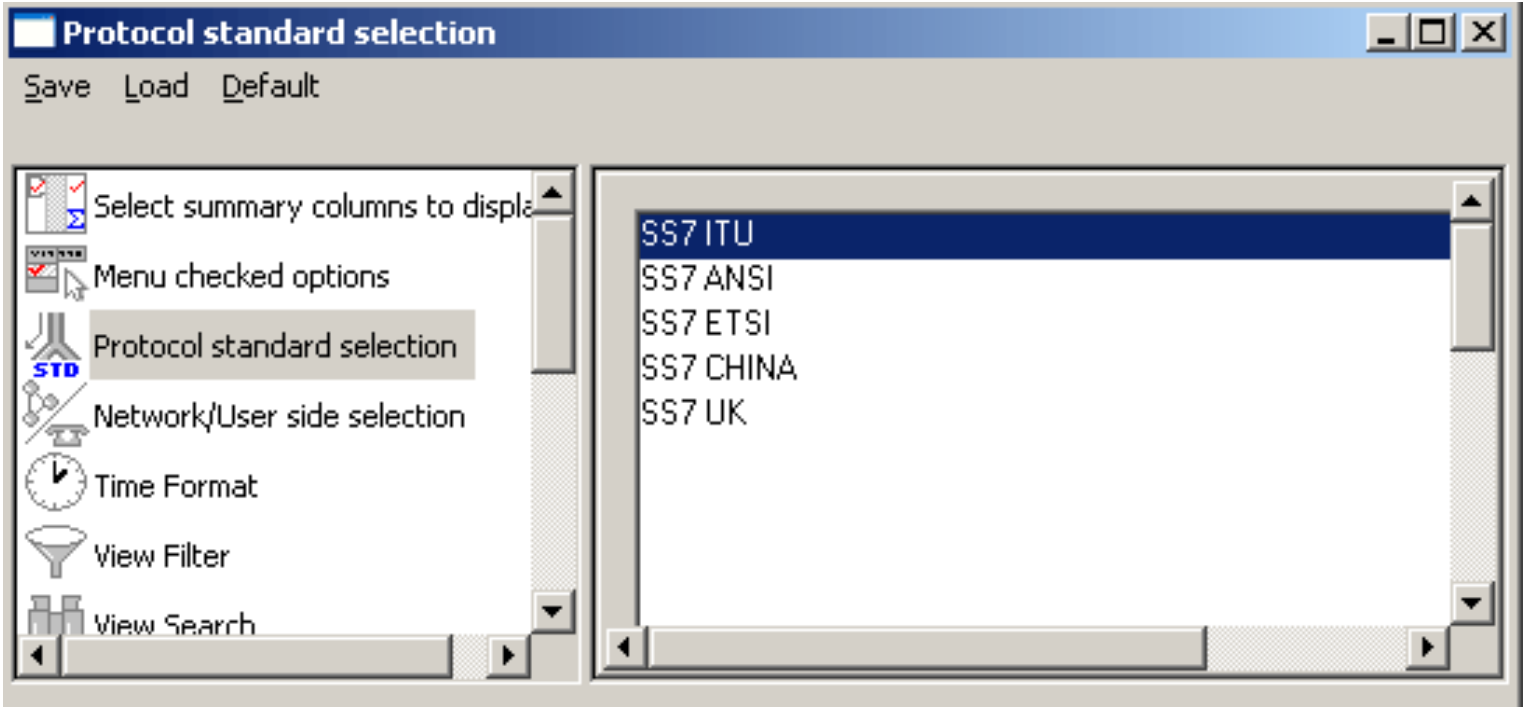
Statistics View

Call Trace View

Different Views (Contd.)

- **Summary View**: This pane displays the columns that contain Card Number, Timeslots, Frame Number, Time, Frame Error Status, DPC, OPC, Status Field, SCCP Message, CIC, ISUP Message, and more in a tabular format
- **Detail View**: This pane displays in detail about a frame to analyze and decode by selecting it in the summary view
- **Hex Dump View**: This pane displays the frame information in HEX and ASCII format
- **Statistics View**: This pane displays the statistics that are calculated based on the protocol fields
- **Call Trace View (Optional)**: This pane displays the call specific information for each individual call from the captured data and display the information in an organized fashion

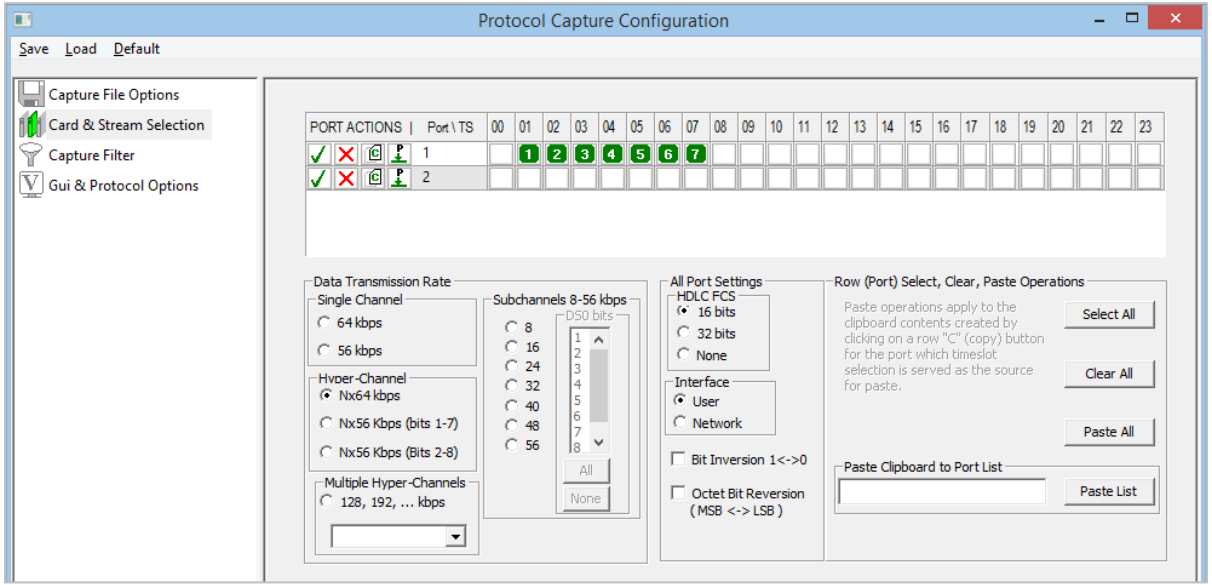
Protocol Standards



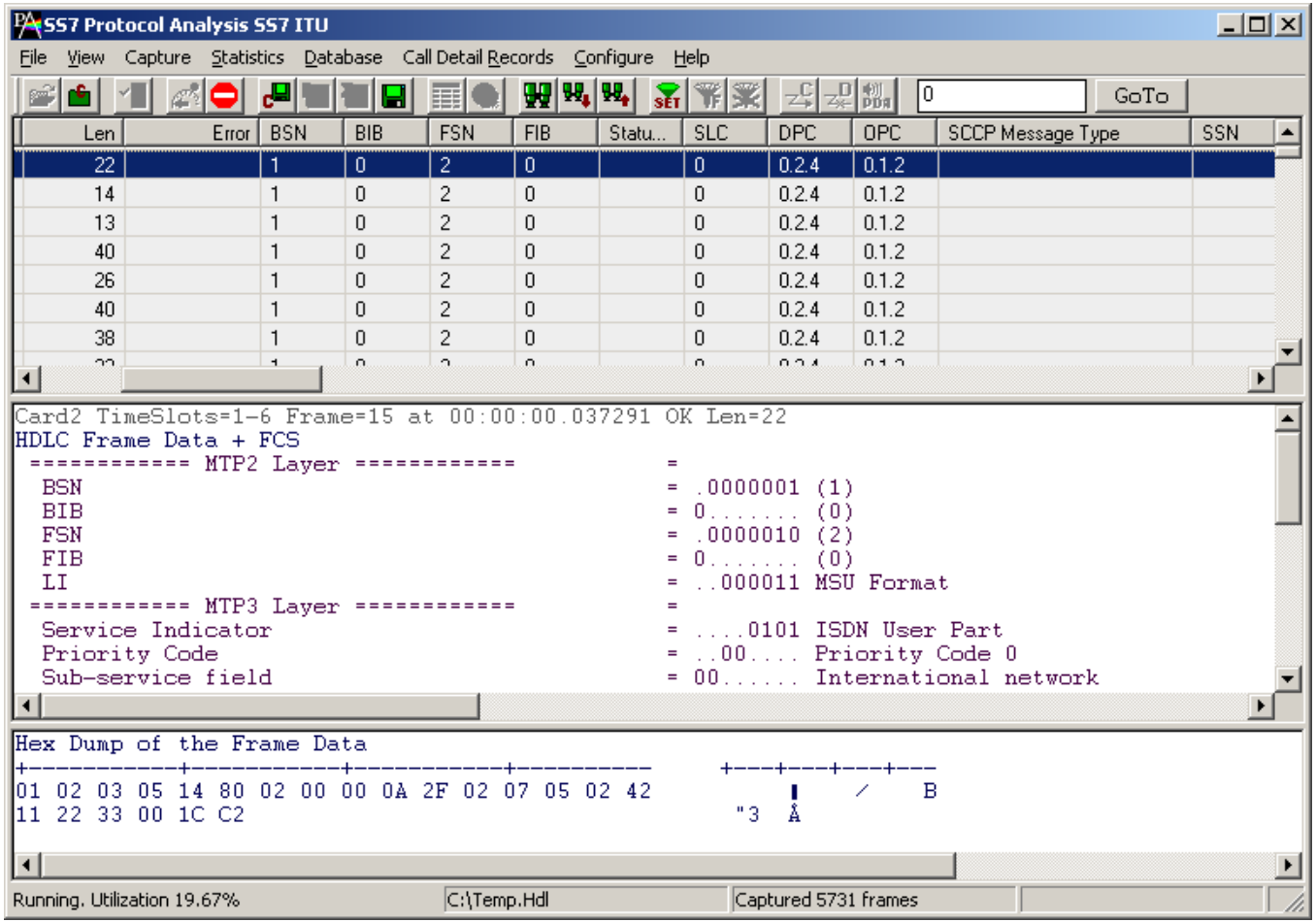
Please visit http://www.gl.com/ss7.html for a complete list of supported protocols & specifications for SS7

Real-time Analysis

- Streams can be captured on the selected time slots (contiguous or non-contiguous), sub-channels (fractional DS0 to DS1), Hyper-channels (n x 64 kbps, n x 56 kbps), or full bandwidth
- Frames may also be captured based on their FCS (16 bits, 32 bits, none), bit inversion, octet bit reversion, user/network side options
- Recorded trace file can then be analyzed offline
- Capability to export summary view details to comma separated values (CSV) format for subsequent import into a database or spreadsheet
- Capability to export detail decode information to an ASCII file

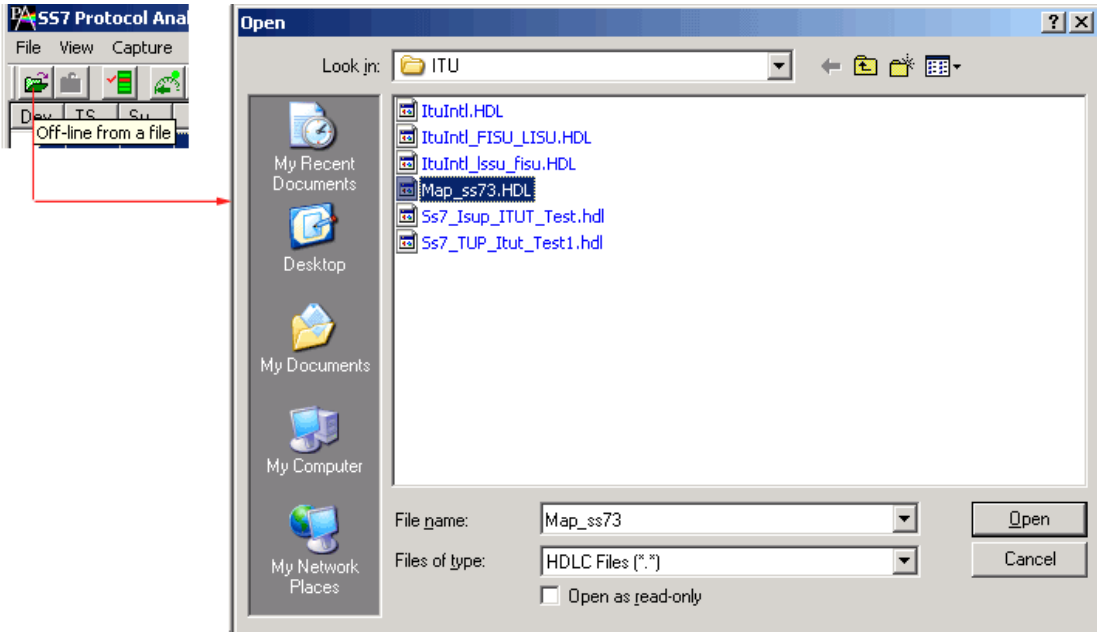


Real-Time Capture

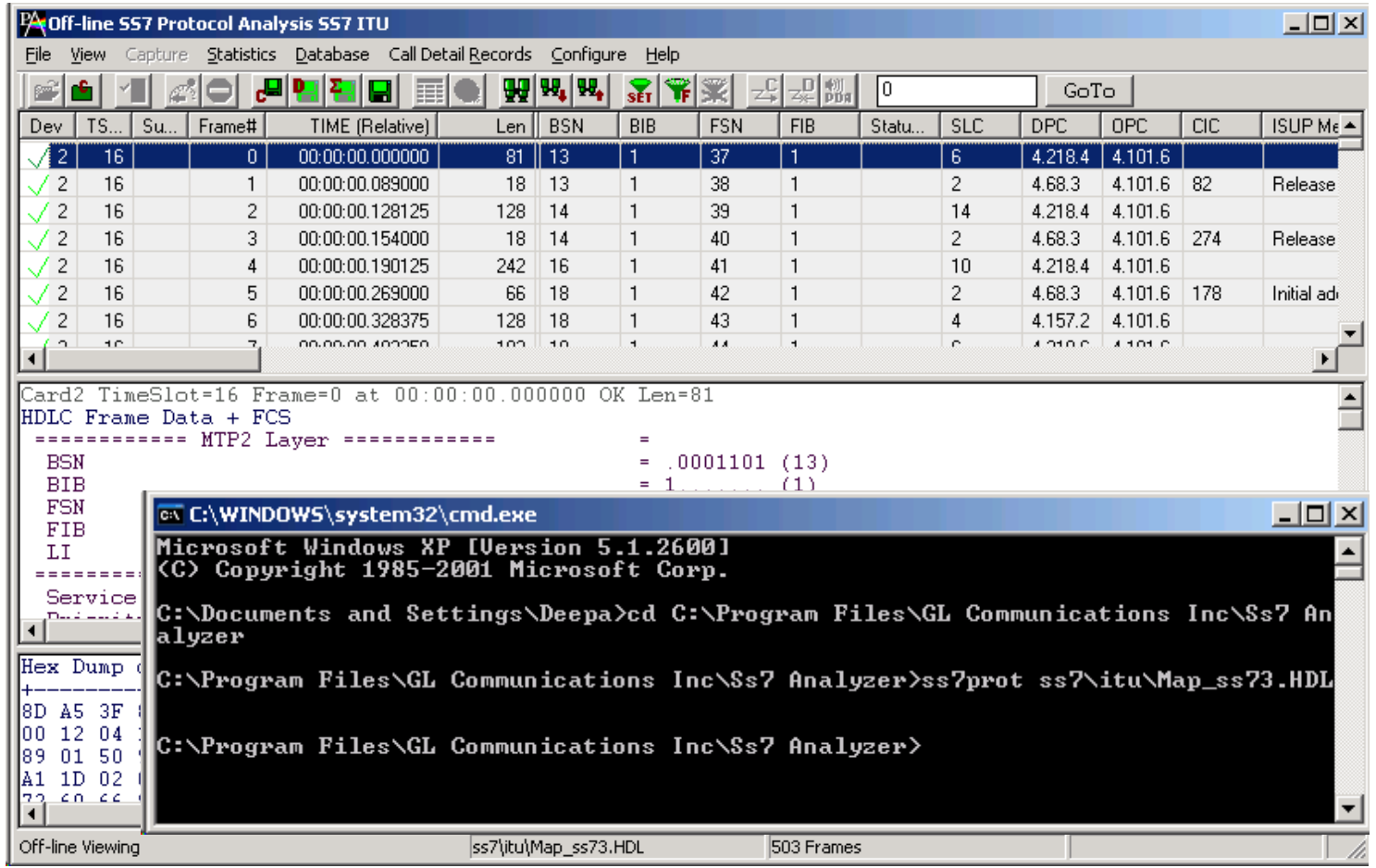


Offline Analysis

- Off-line analysis is equivalent to capturing a file in pre-defined timeslots
- Captured frames or only the filtered frames can be exported to *.HDL file for the further off-line analysis
- Trace file for offline analysis can be loaded either through analyzer GUI or through simple command-line arguments



Invoke Offline Analysis (CLI)



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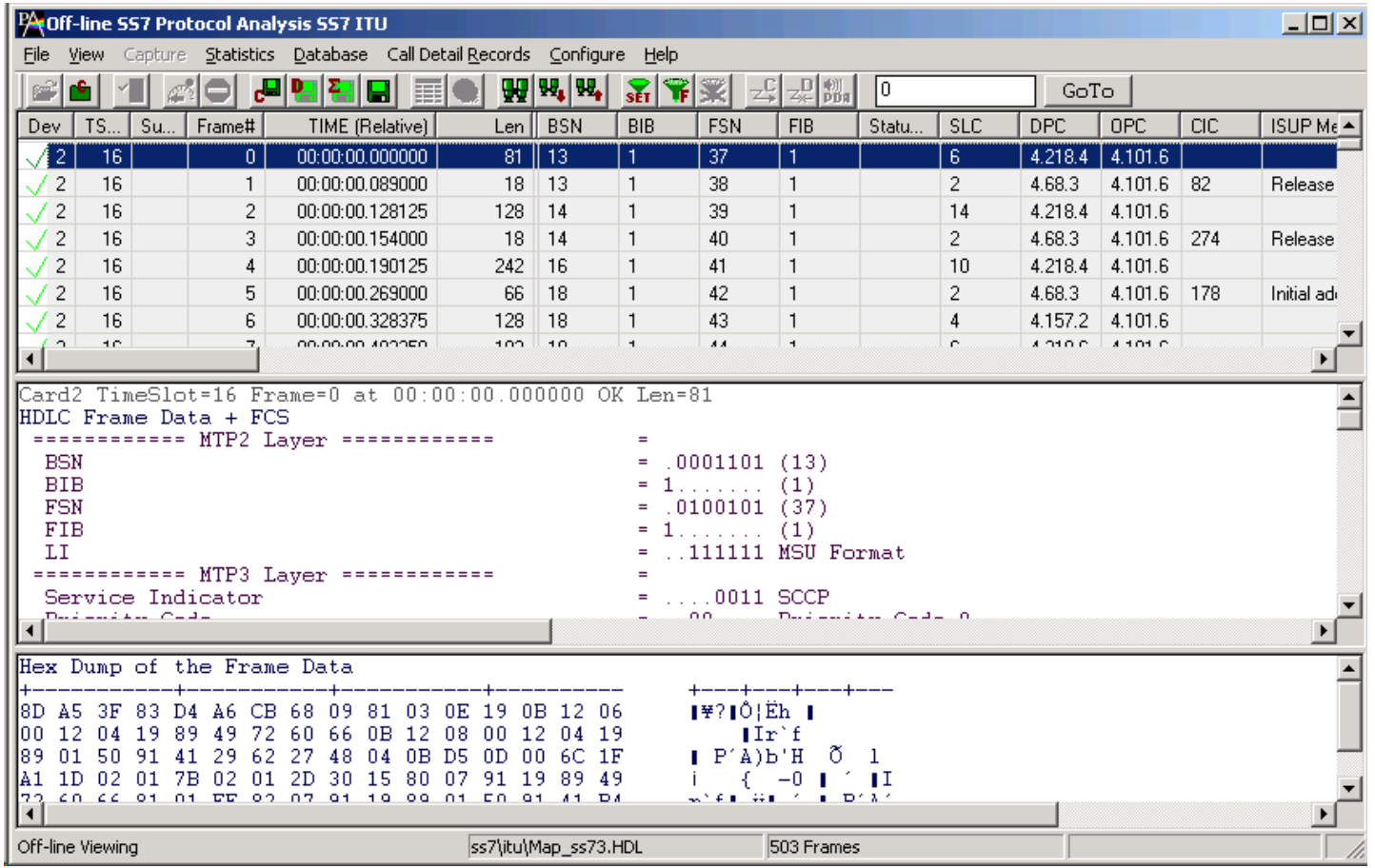
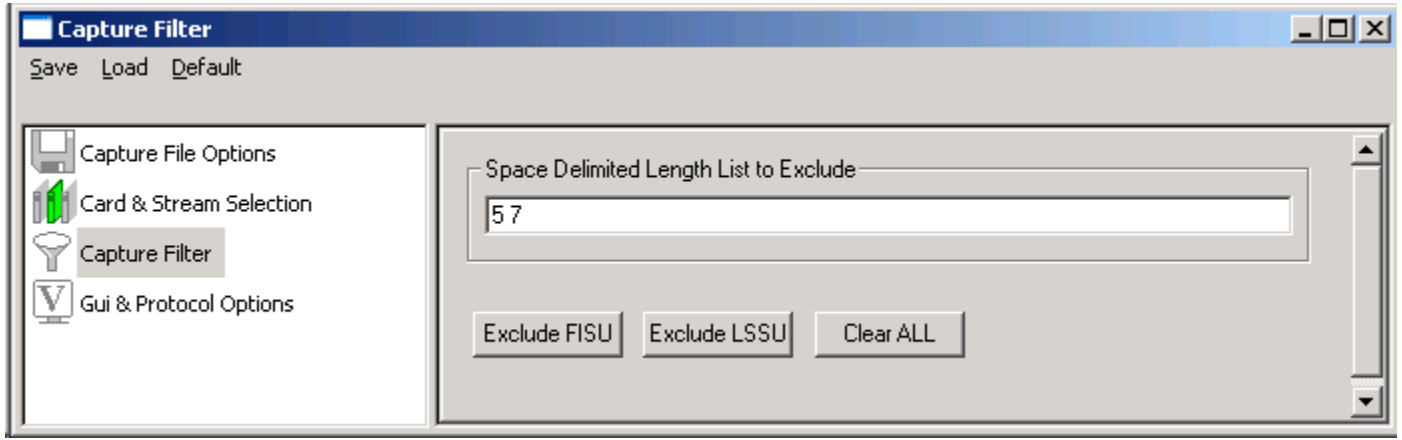
Offline Analysis GUI



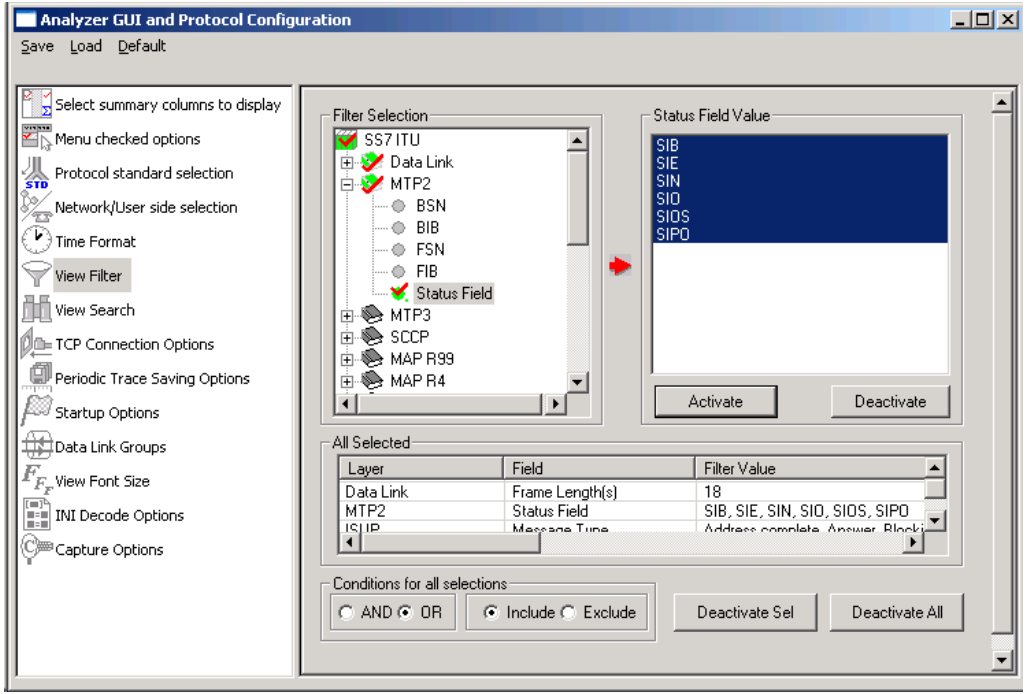
Filters - Real-time Capture Filter



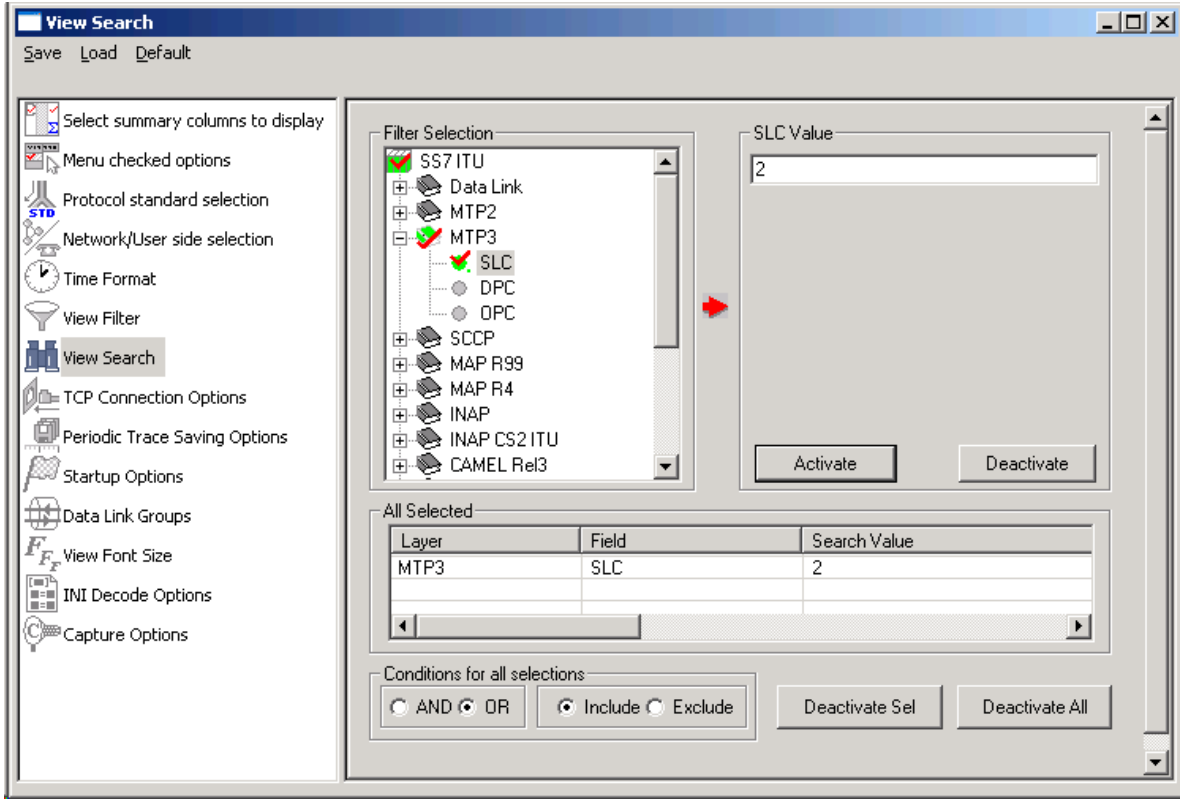
- Real-time capture filter can be set prior to capturing frames
- Real-time filter for HDLC based protocols is done by excluding LSSU (Link Status Signal Unit), FISU (Fill-in Signal Unit), or any other user-defined frame

Filters – Offline View Filter

- Isolates required frames from all frames in real-time, as well as offline
- Allows filtering according to various layers and protocol fields such as BIB, FIB, BSN, FSN, status field, DPC, OPC, SLC, SSN, ISUP message type, SCCP message type, and more



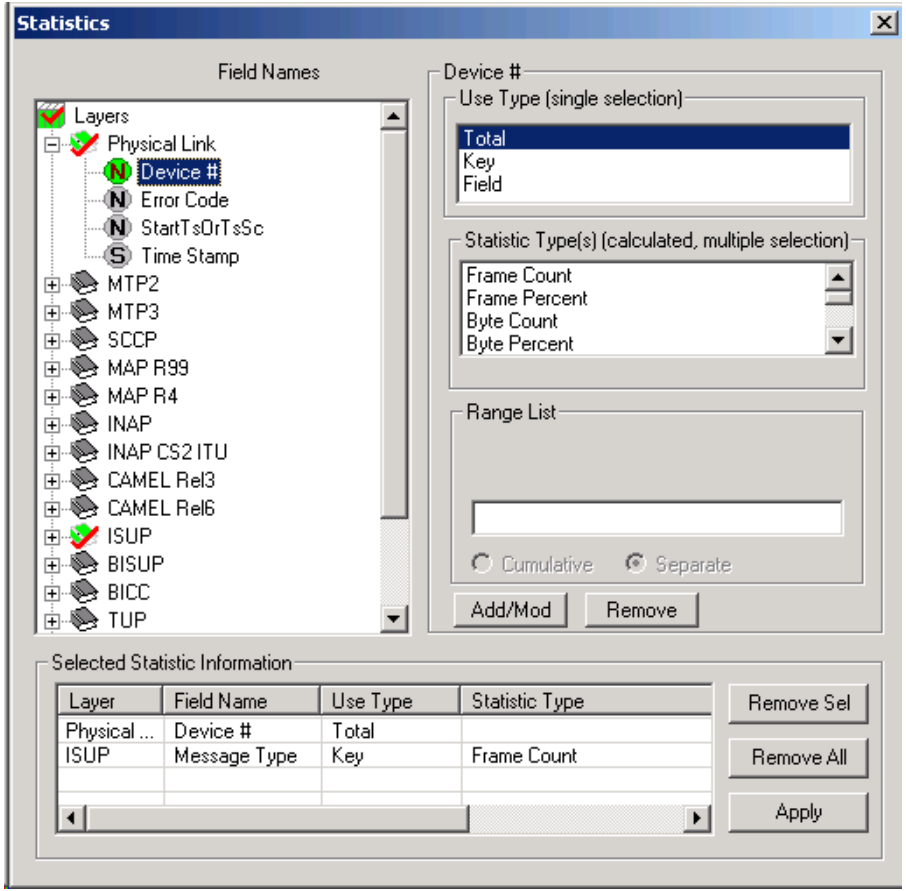
Search Options



- Search features helps users to search for a particular frame based on specific search criteria

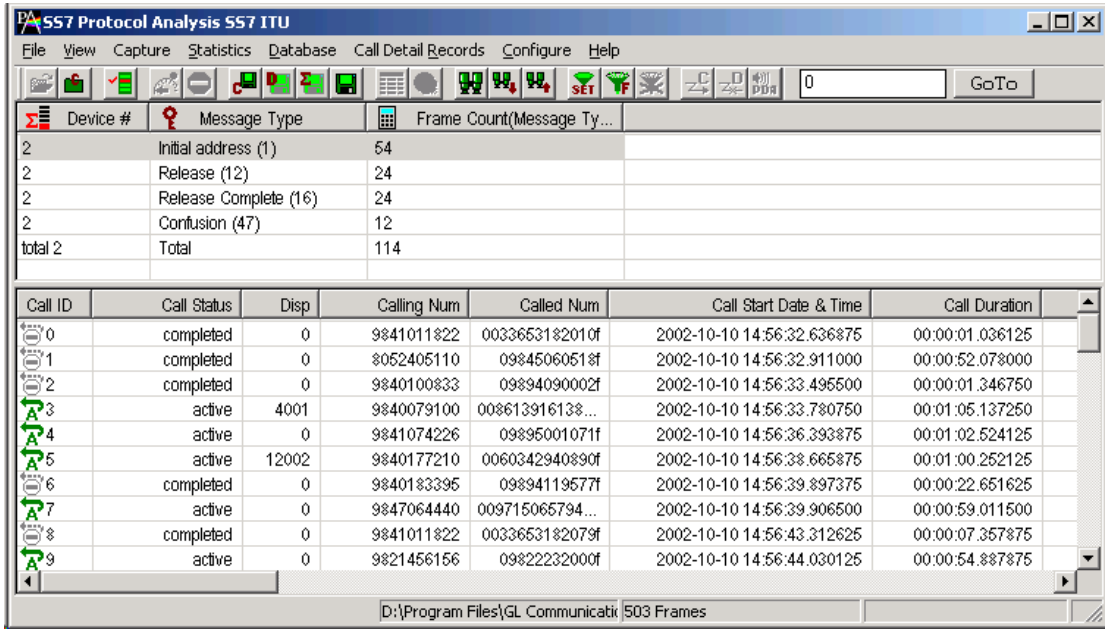
Statistics

- Statistics is an important feature available in protocol analyzer and can be obtained for all frames both in real-time as well as offline mode
- Numerous statistics can be obtained to study the performance of the network based on protocol fields and different parameters



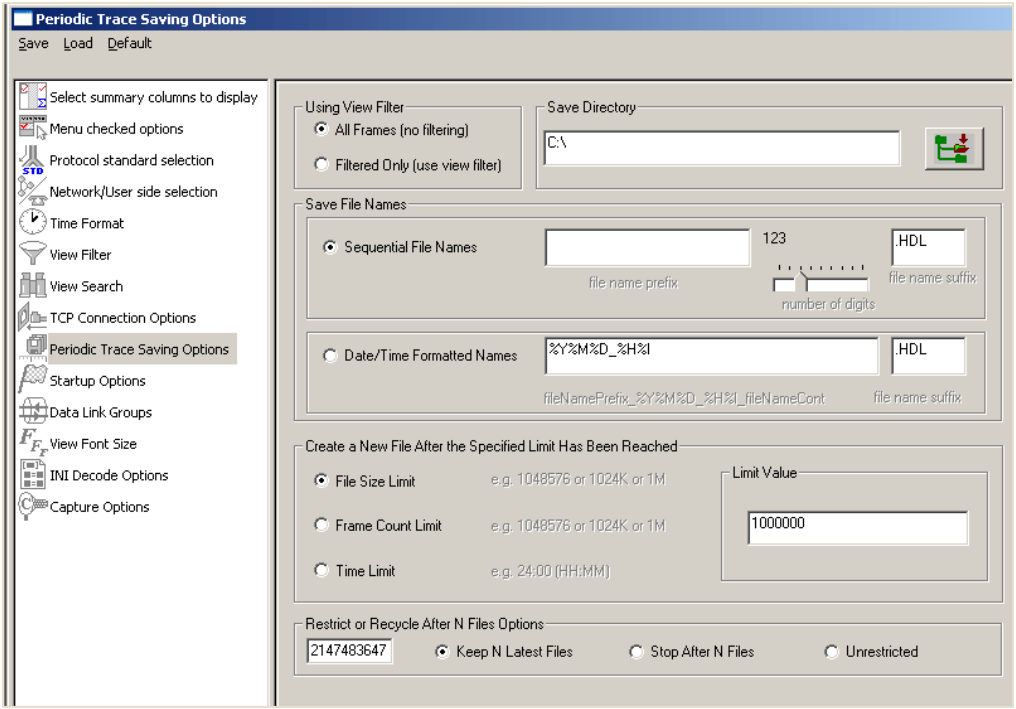
Call Detail Records

- Call trace defining important call specific parameters such as call ID, status (active or completed), duration, called number, calling number, release complete cause, OPC, DPC, etc. are displayed
- CDR Find option allows to search a particular call detail record from the captured traces



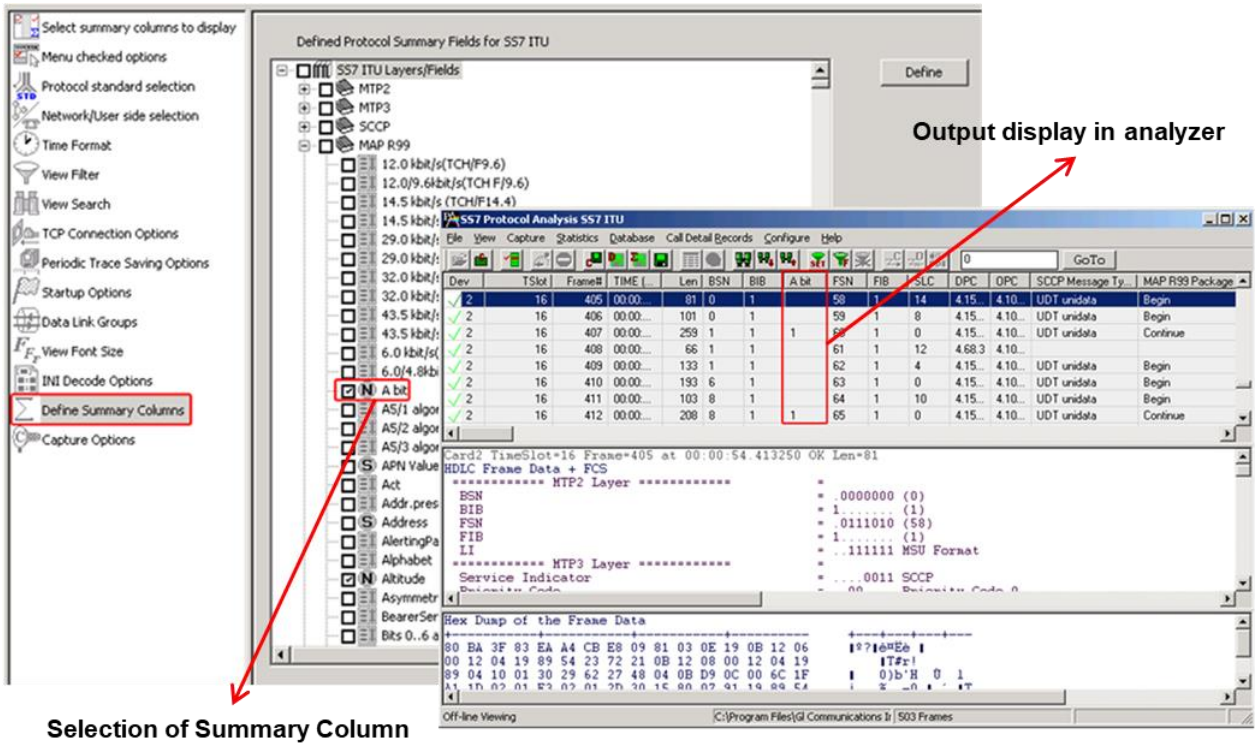
Saving options for the trace files

- Captured trace files can be controlled by saving the trace using different conventions such as –
  - Trace files with user-defined prefixes
  - Trace file with date-time prefixes
  - Slider control to indicate the total number of files, file size, frame count, or time limit



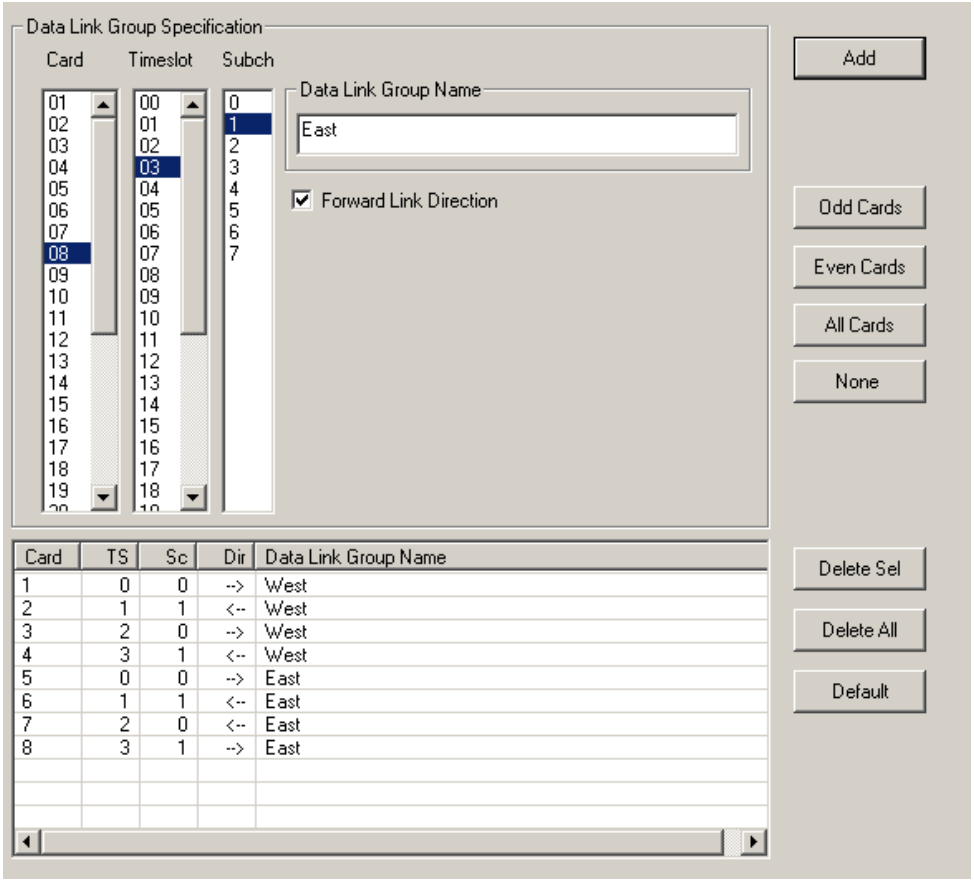
Define Summary Columns

- Required protocol fields can be added through Define summary column option
- User can remove the protocol field which is not required



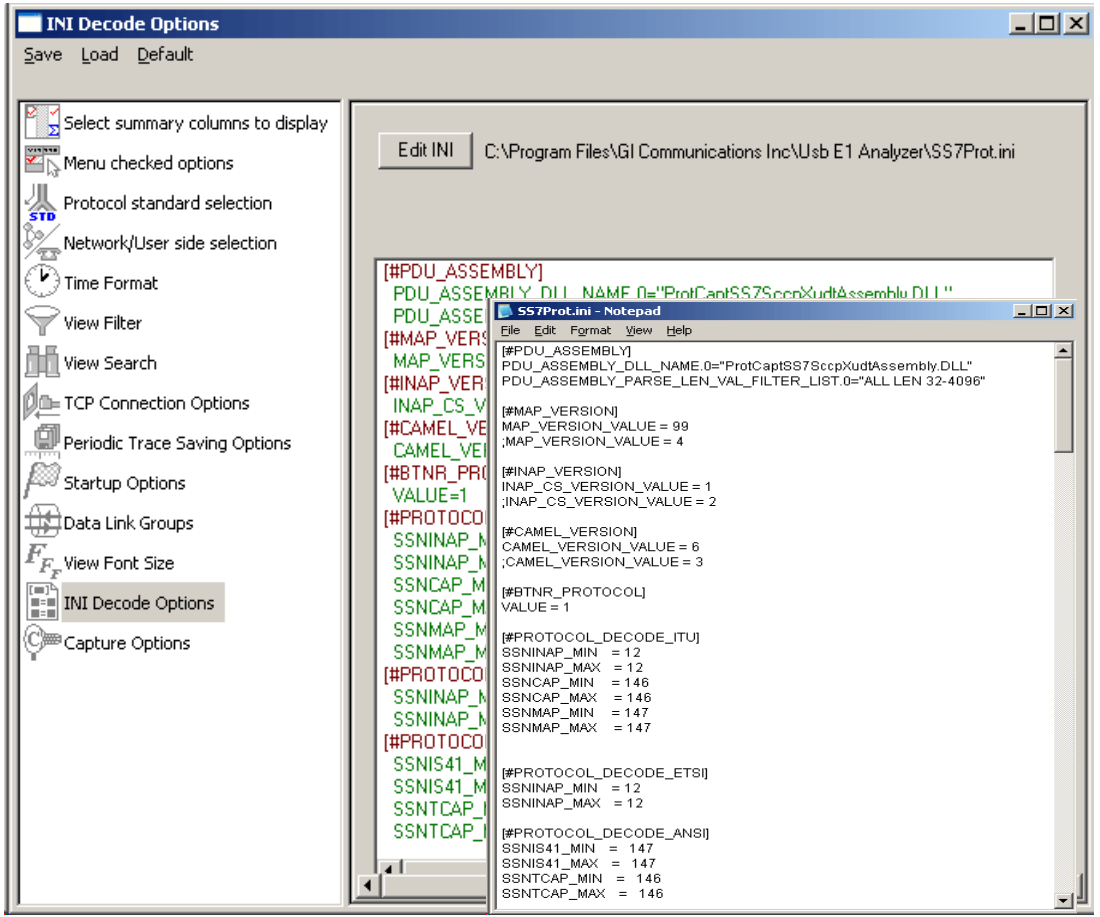
Data Link Group

- Data link groups that help in defining the direction of the calls in a given network and form logical groups comprised of unidirectional (either 'Forward' or 'Backward') data links



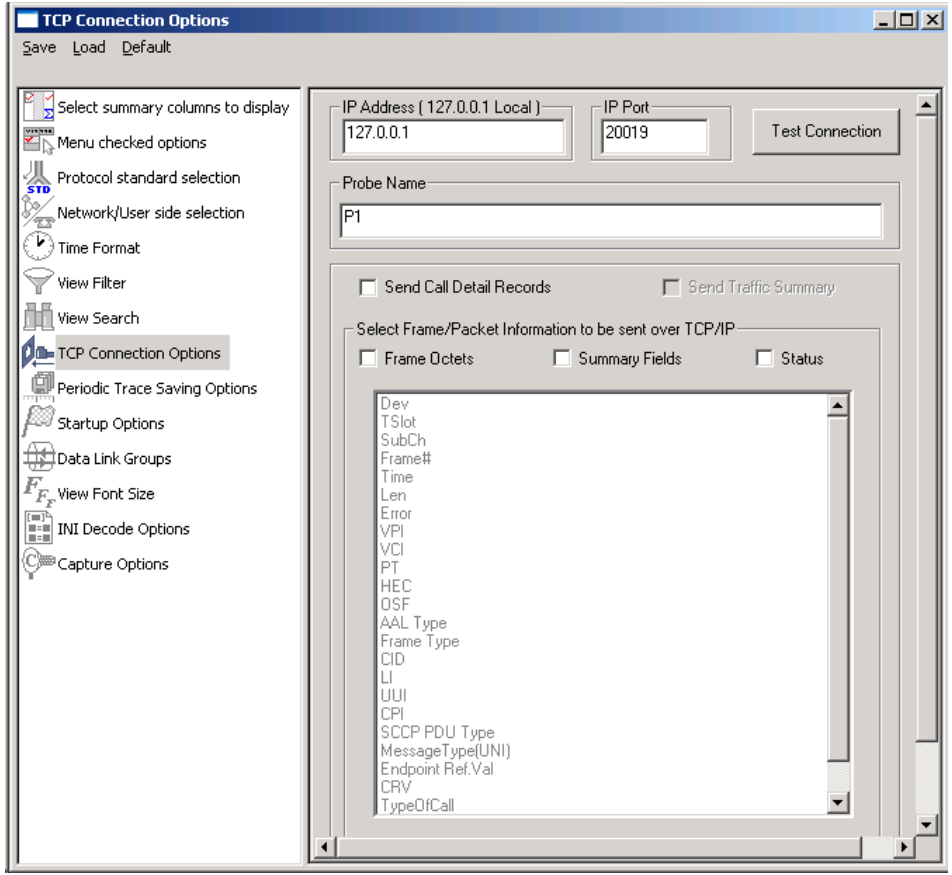
Configuring INI Decode Options

- INI configuration file enables the user to enter the required custom values depending on the protocol



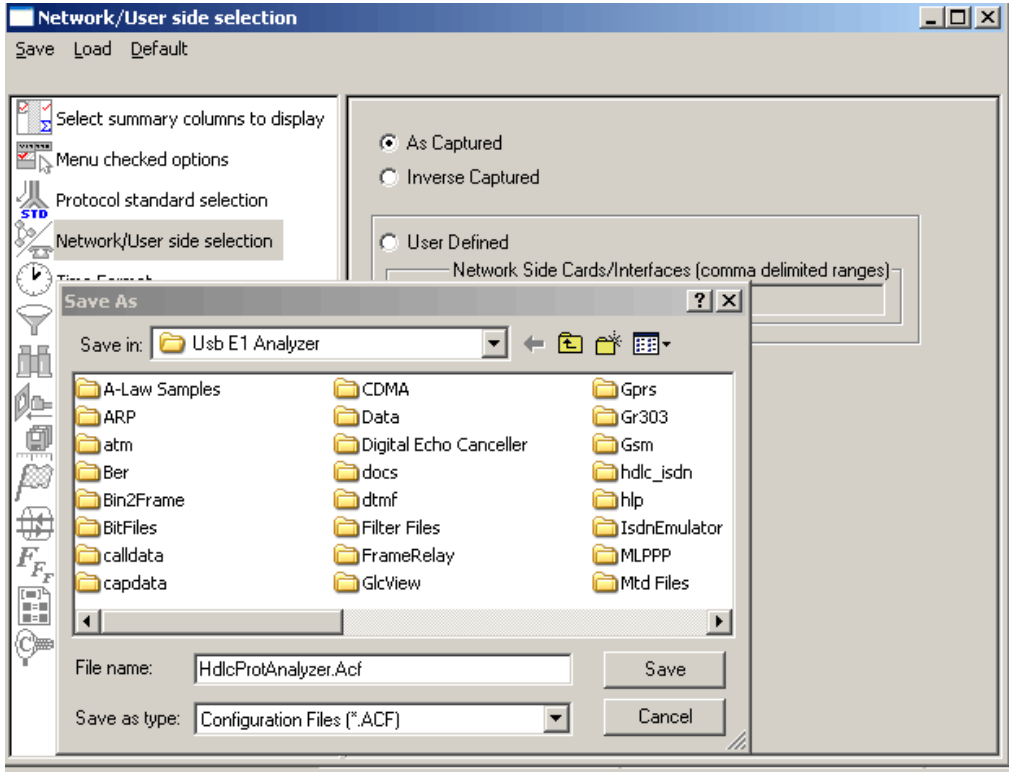
TCP Connection Options

- Used for Network Surveillance and Monitoring
- Designed to send protocol summary information and binary frame data via TCP- IP connection to a Database Loader to load data into a database

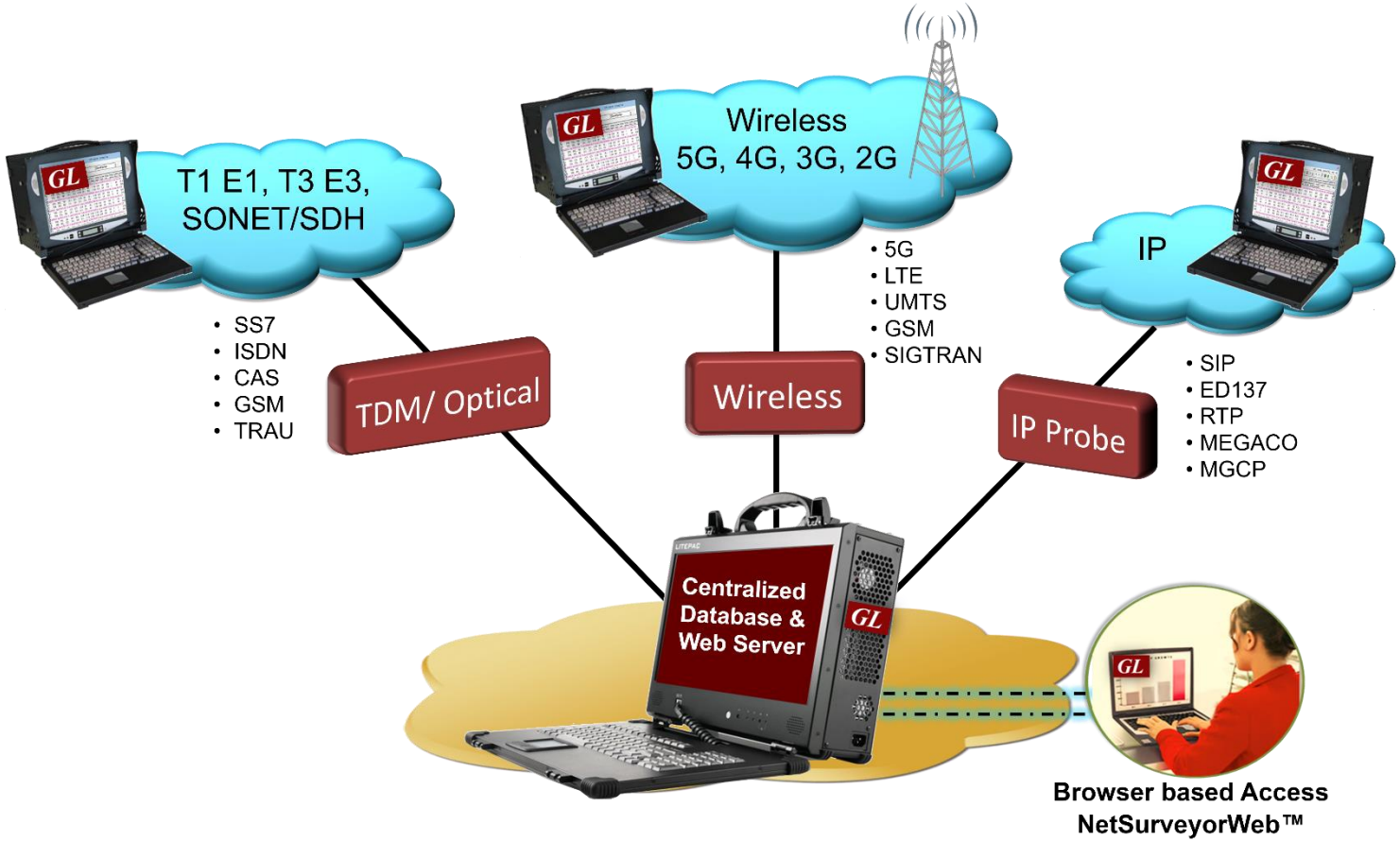


Save/Load All Configuration Settings

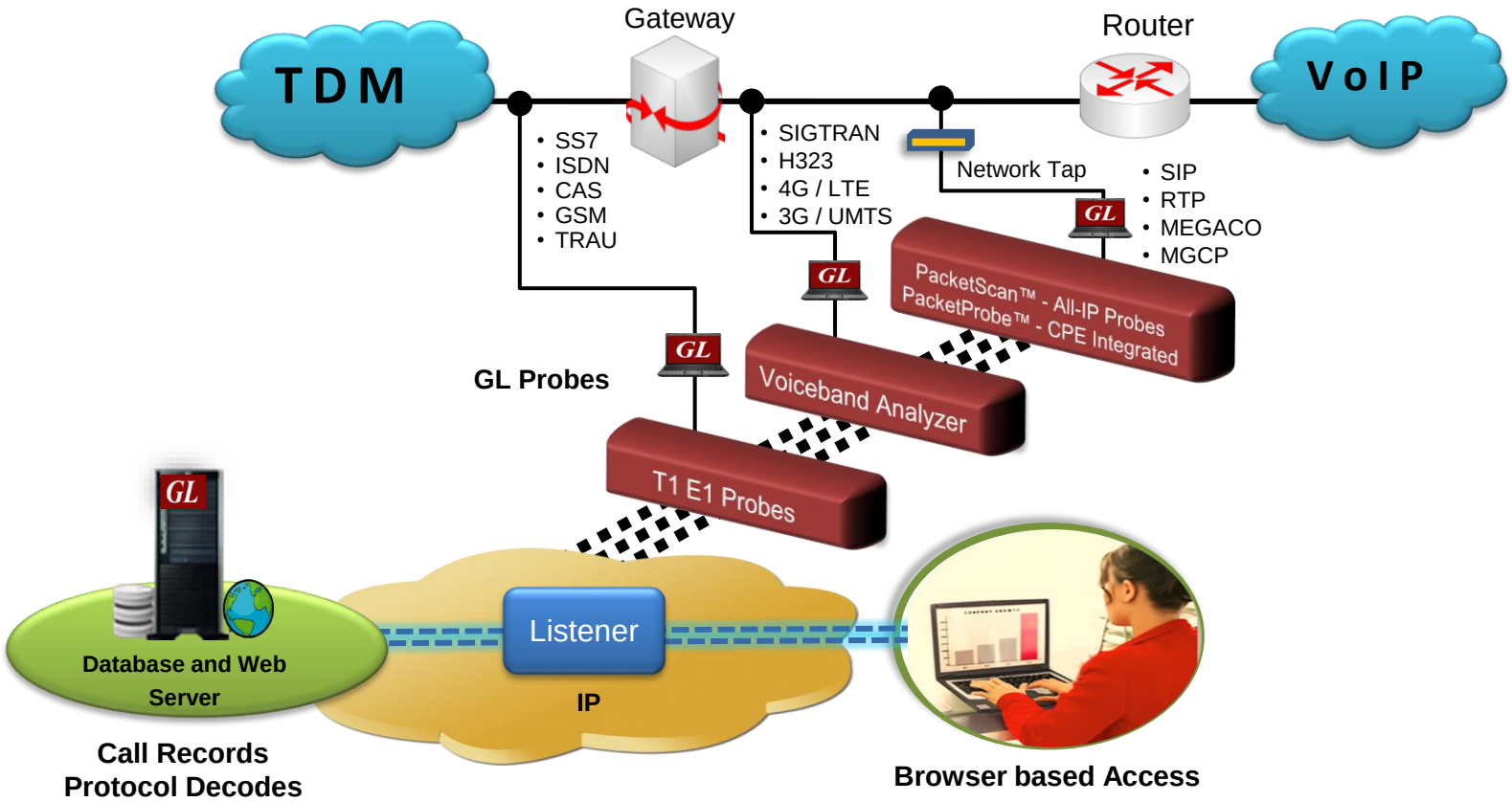
- Provides a consolidated interface for GUI and protocol settings required in the analyzer such as protocol selection, periodic saving options, etc.
- Configuration settings can be saved to a file, loaded from a configuration file, or just revert to the default values using the default option



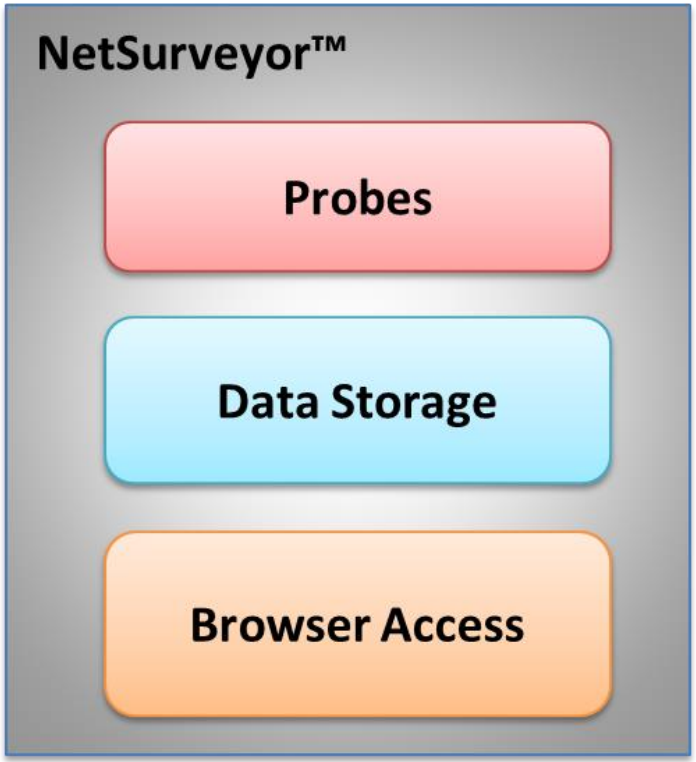
NetSurveyorWeb™- Network Surveillance System



Network Overview

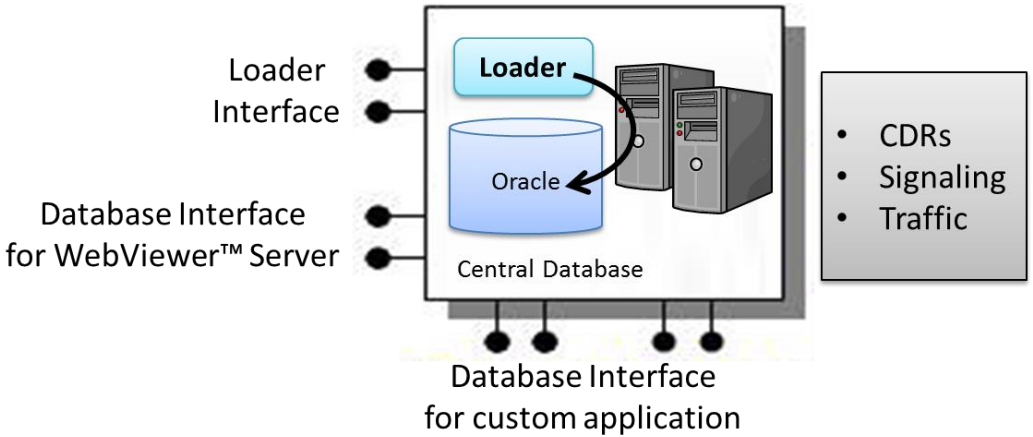


Three Tier Architecture



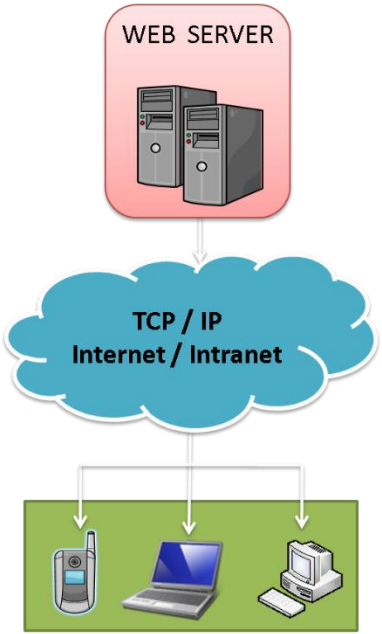
Data Storage

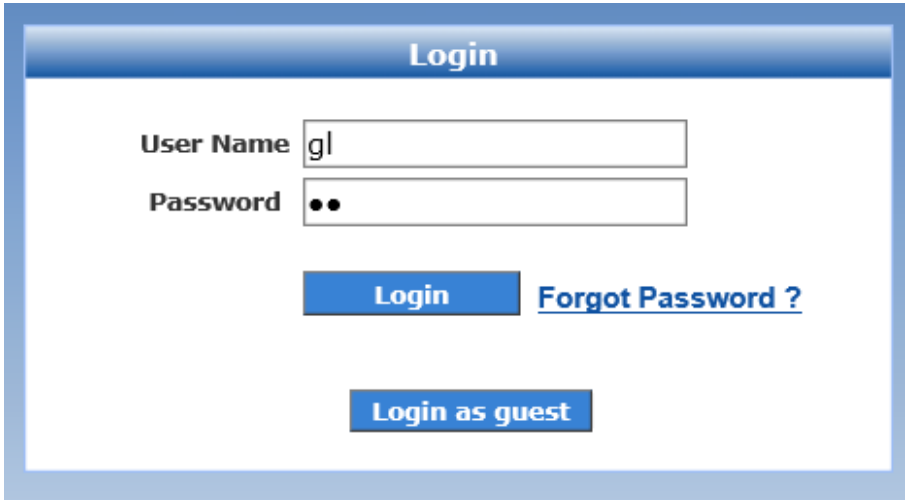
- A listener application is co-hosted with the database server running on the Data Layer, collecting data posted by the probes
- Supports MySQL and Oracle Database
- Stores the CDRs and Signaling Summary data



Browser Based Access

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



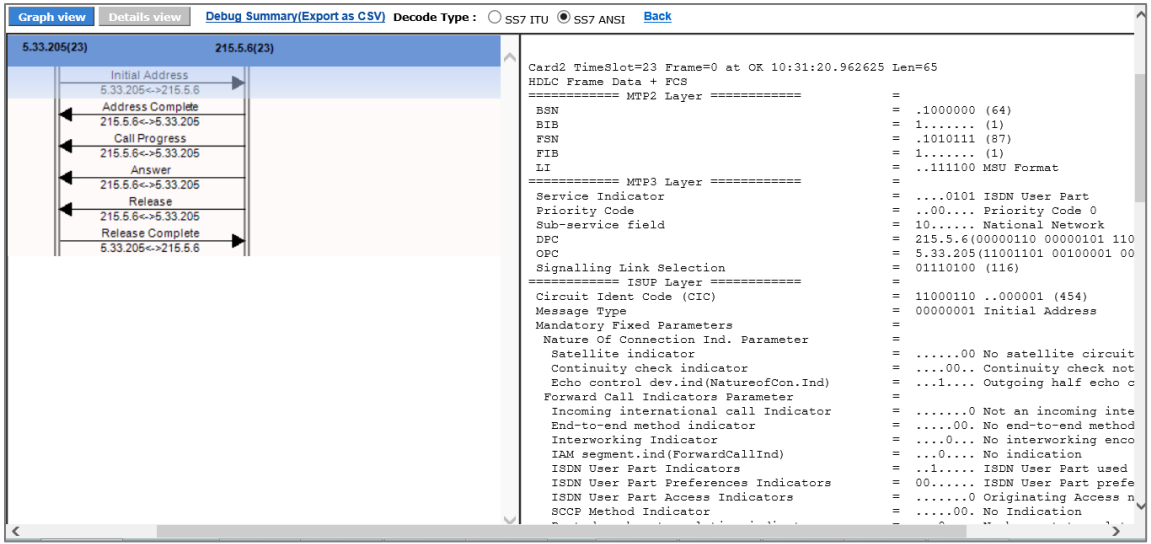


NetSurveyorWeb™

- 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

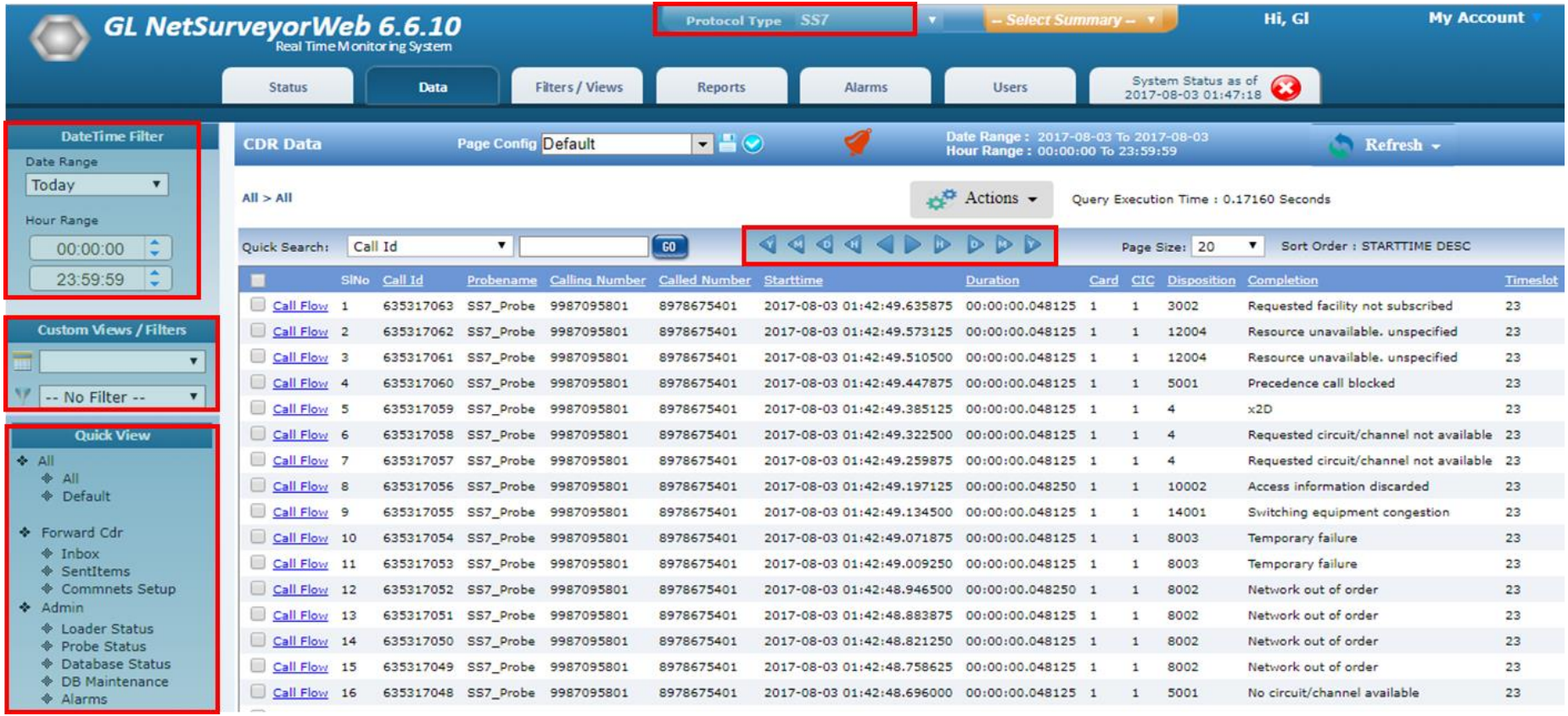
Applications / Value

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



GL Communications

NetSurveyorWeb™



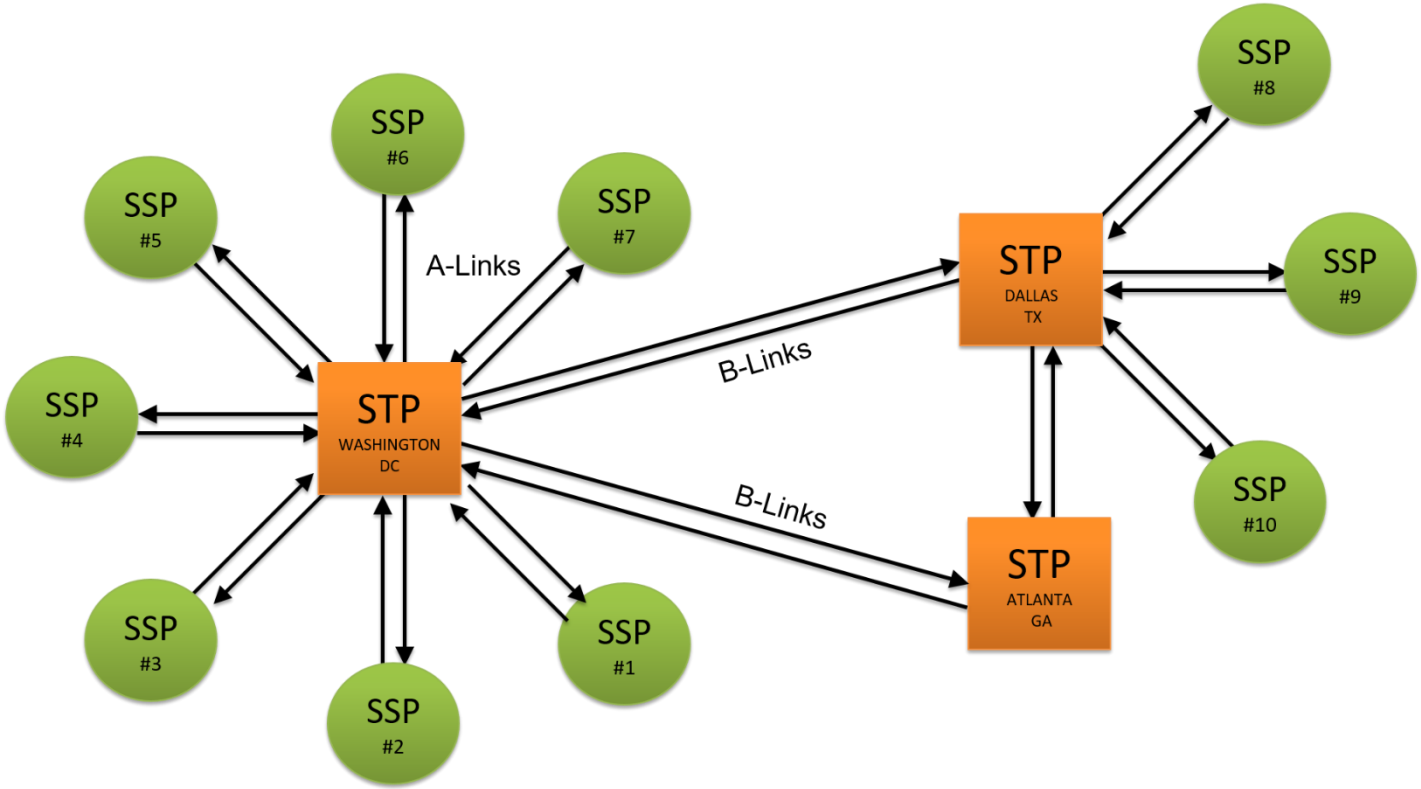
	SlNo	Call Id	Probename	Calling Number	Called Number	Starttime	Duration	Card	CIC	Disposition	Completion	Timeslot
Call Flow	1	635317063	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:49.635875	00:00:00.048125	1	1	3002	Requested facility not subscribed	23
Call Flow	2	635317062	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:49.573125	00:00:00.048125	1	1	12004	Resource unavailable. unspecified	23
Call Flow	3	635317061	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:49.510500	00:00:00.048125	1	1	12004	Resource unavailable. unspecified	23
Call Flow	4	635317060	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:49.447875	00:00:00.048125	1	1	5001	Precedence call blocked	23
Call Flow	5	635317059	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:49.385125	00:00:00.048125	1	1	4	x2D	23
Call Flow	6	635317058	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:49.322500	00:00:00.048125	1	1	4	Requested circuit/channel not available	23
Call Flow	7	635317057	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:49.259875	00:00:00.048125	1	1	4	Requested circuit/channel not available	23
Call Flow	8	635317056	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:49.197125	00:00:00.048250	1	1	10002	Access information discarded	23
Call Flow	9	635317055	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:49.134500	00:00:00.048125	1	1	14001	Switching equipment congestion	23
Call Flow	10	635317054	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:49.071875	00:00:00.048125	1	1	8003	Temporary failure	23
Call Flow	11	635317053	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:49.009250	00:00:00.048125	1	1	8003	Temporary failure	23
Call Flow	12	635317052	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:48.946500	00:00:00.048250	1	1	8002	Network out of order	23
Call Flow	13	635317051	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:48.883875	00:00:00.048125	1	1	8002	Network out of order	23
Call Flow	14	635317050	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:48.821250	00:00:00.048125	1	1	8002	Network out of order	23
Call Flow	15	635317049	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:48.758625	00:00:00.048125	1	1	8002	Network out of order	23
Call Flow	16	635317048	SS7_Probe	9987095801	8978675401	2017-08-03 01:42:48.696000	00:00:00.048125	1	1	5001	No circuit/channel available	23

GL Communications

Few References

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

Complex SS7 Networks - Actual Customer Example

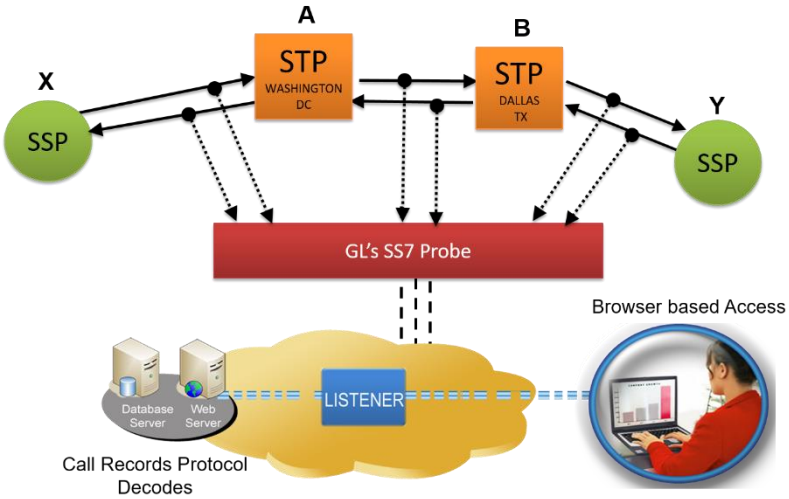


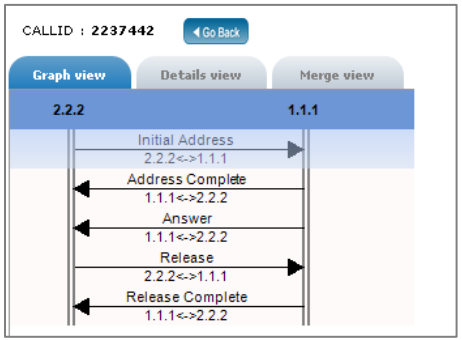
SS7 Call Flow

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





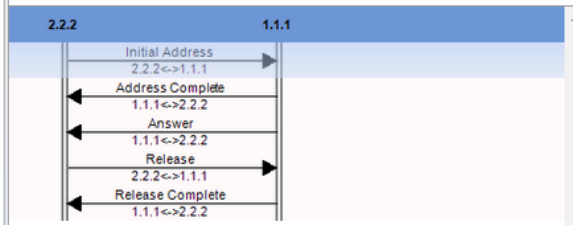
GL Communications

Merge View

CALLID : **2237442** Go Back

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

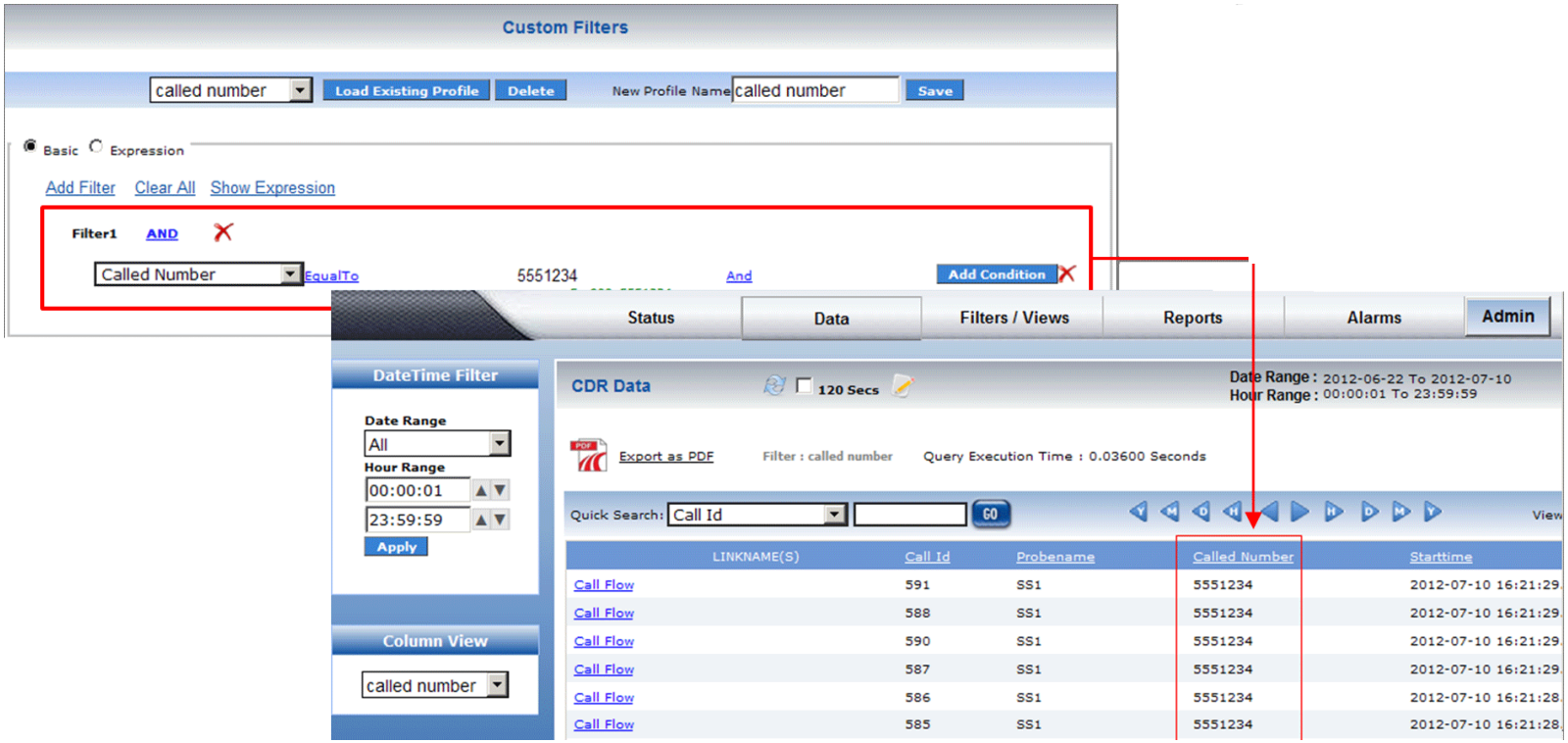
FRAMENO	Timestamp	Probename	Card	Linkname	Linkname Directional	TS1	TS2	CIC	SLS	OPC	DPC	ISUP Message Type
15439877	2015-07-01 03:10:55.570857	SS7	1	1.1.1>2.2.2	2.2.2>1.1.1	0	0	21	26	2.2.2	1.1.1	Initial Address
15439878	2015-07-01 03:10:55.720285	SS7	1	1.1.1>2.2.2	1.1.1>2.2.2	0	0	21	26	1.1.1	2.2.2	Address Complete
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	Answer
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	Release
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	Release Complete




```
Device1 Frame=0 at 03:10:55.570857 OK Len=46
Ethernet Frame Data
============ MTP2 Layer ============          =
 BSN                                          =  .1010100 (84)
 BIB                                          =  1....... (1)
 FSN                                          =  .0010011 (19)
 FIB                                          =  1....... (1)
 LI                                           =  ..101001 MSU Format
============ MTP3 Layer ============          =
 Service Indicator                            =  ....0101 ISDN User Part
 Priority Code                                =  ..00.... Priority Code 0
 Sub-service field                            =  10...... National Network
 DPC                                          =  1.1.1(00000001 00000001 00000001)
 OPC                                          =  2.2.2(00000010 00000010 00000010)
 Signalling Link Selection                    =  00011010 (26)
============ ISUP Layer ============          =
 Circuit Ident Code (CIC)                     =  00010101 ..000000 (21)
 Message Type                                 =  00000001 Initial Address
 Mandatory Fixed Parameters                   =
  Nature Of Connection Ind. Parameter         =
   Satellite indicator                        =  ......00 No satellite circuit in the connection
   Continuity check indicator                 =  ....00.. Continuity check not required (default)
   Echo control dev.ind(NatureofCon.Ind)      =  ...0.... Outgoing half echo control device not included
  Forward Call Indicators Parameter           =
   Incoming international call Indicator      =  .......0 Not an incoming international call
   End-to-end method indicator                =  .....00. No end-to-end method available
   Interworking Indicator                     =  ....0... No interworking encountered
   IAM segment.ind(ForwardCallInd)            =  ...0.... No indication
   ISDN User Part Indicators                  =  ..1..... ISDN User Part used all the way
   ISDN User Part Preferences Indicators      =  00...... ISDN User Part preferred all the way (default)
   ISDN User Part Access Indicators           =  .......1 Originating Access ISDN
```

GL Communications

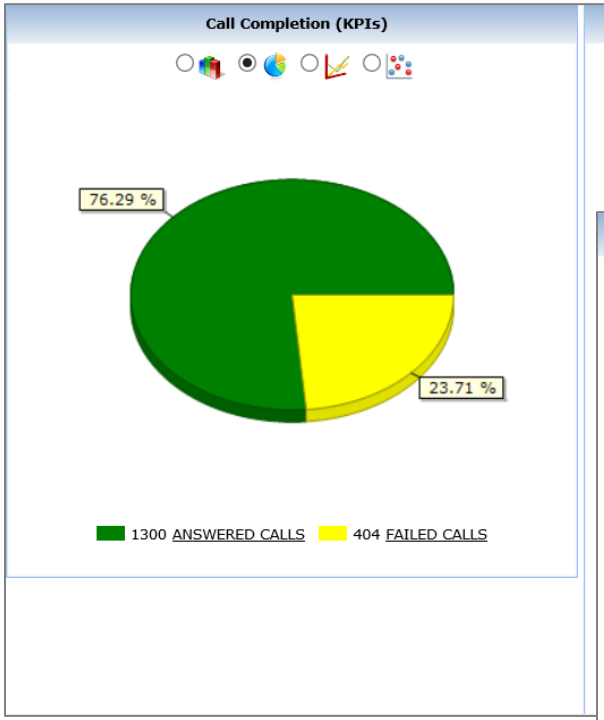
Customized Filters

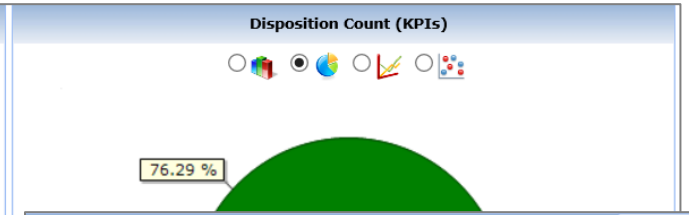


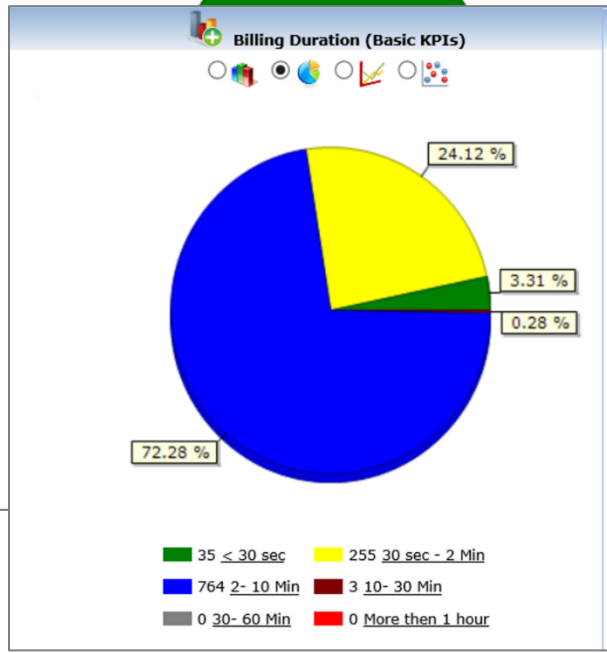
- User can filter the data displayed by defining one or more Custom Filters profiles. Multiple Filter option allows users to filter the data by multiple filter profiles

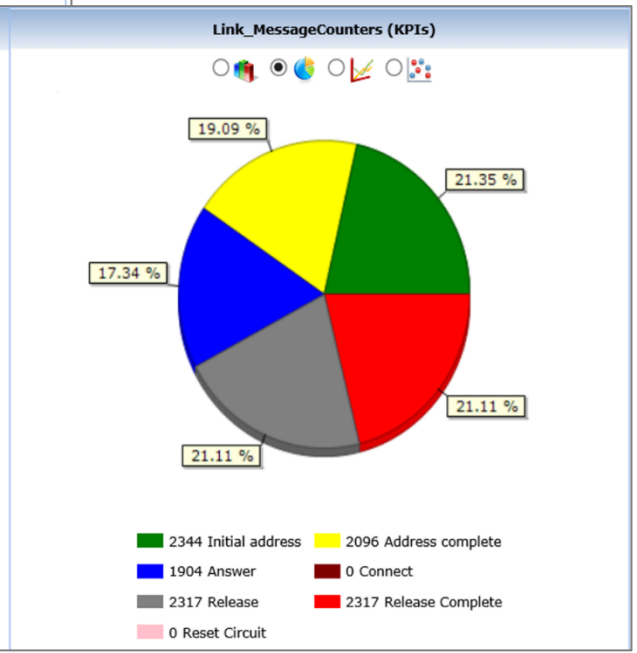
GL Communications

SS7 Key Performance Indicators (KPI)









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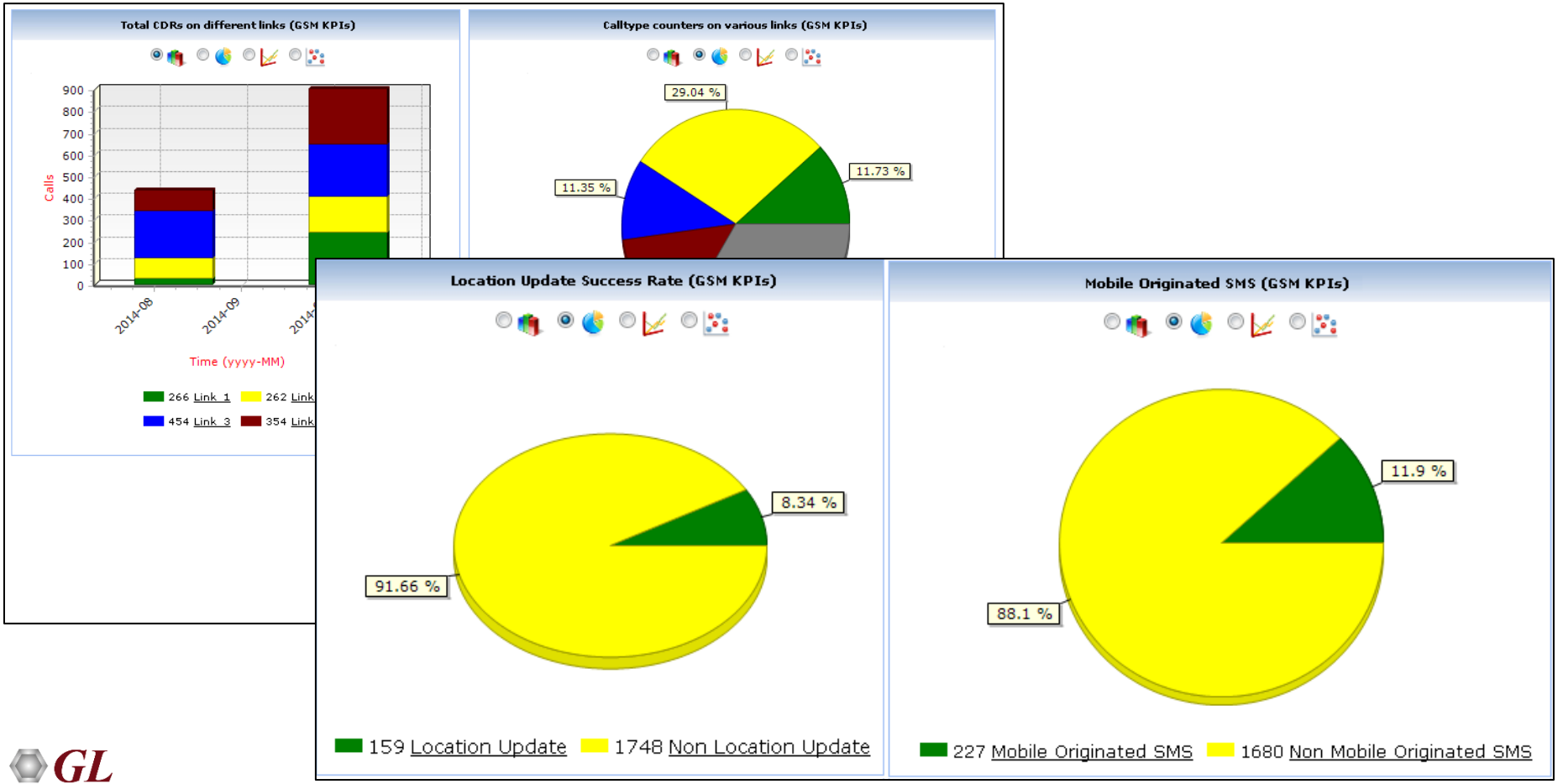
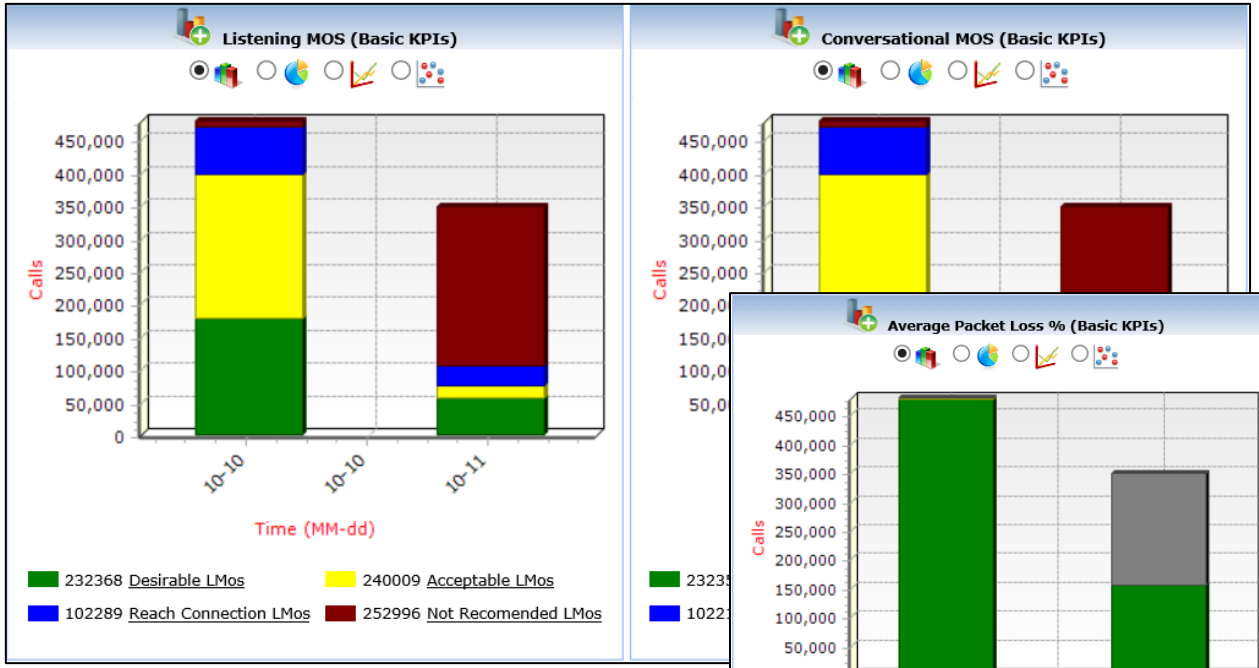
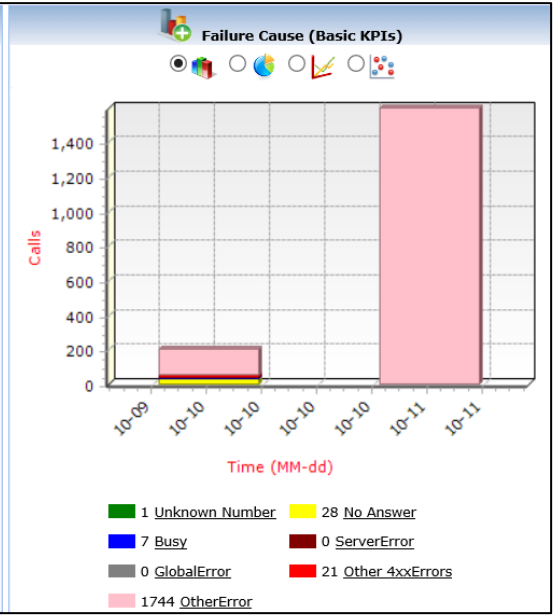
GSM KPI



GL Communications

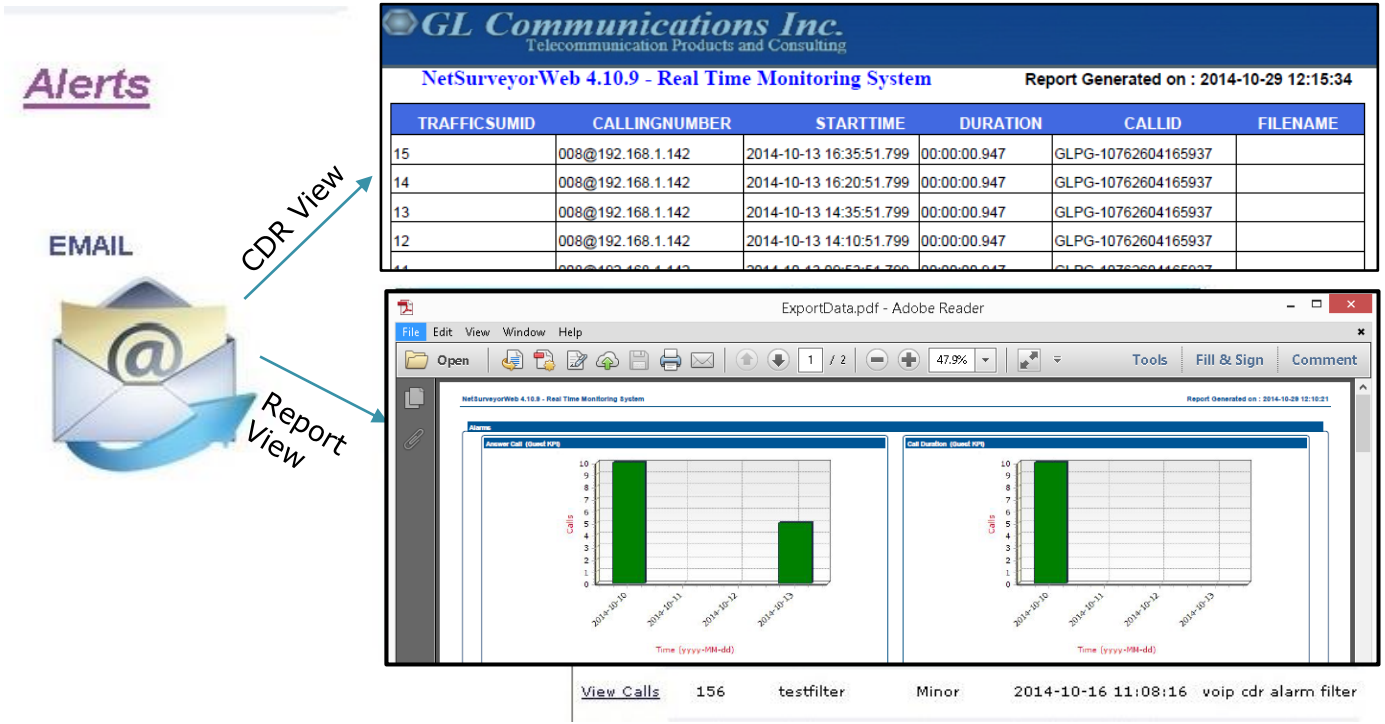
VoIP Key Performance Indicators (KPI)





GL Communications

Notifications / Alarm Alerts



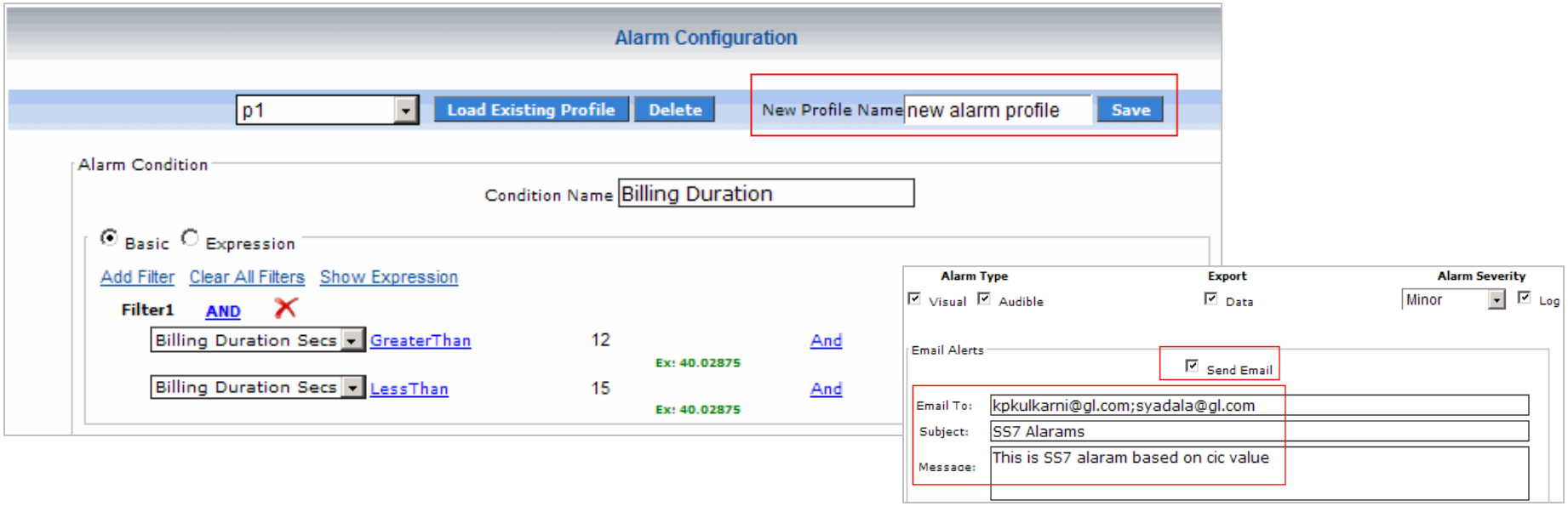
Alert Types

- 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

GL Communications

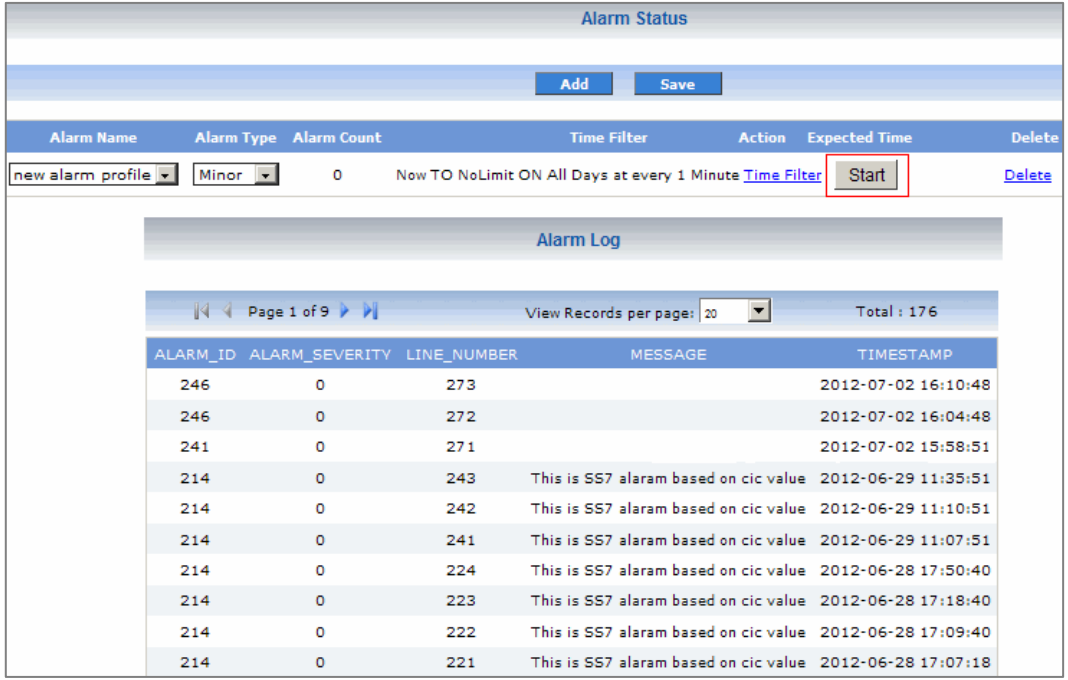
Alarm Configuration



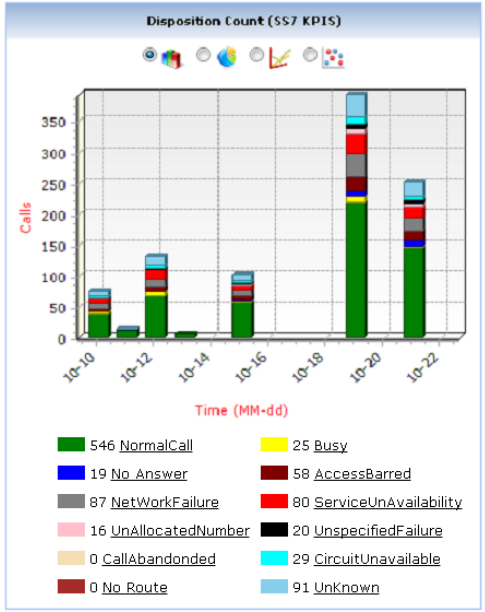
- Alarm Condition provides the options to set the filter conditions for the alarm
- Alarm Action provides options to set the actions to be taken when an alarm is detected such as the visual alarm type, audible alarm type, exporting data, set alarm severity, log to file, and generate email alerts

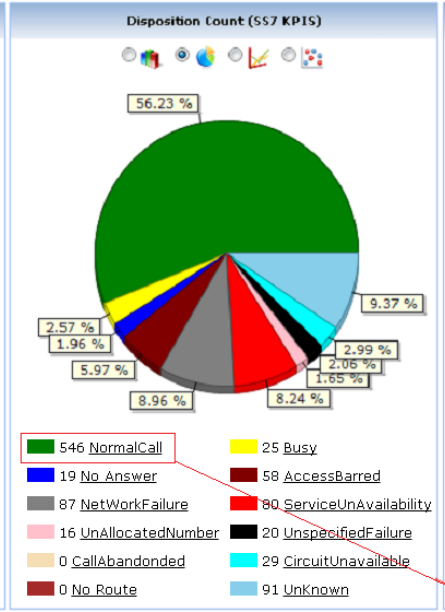
Alarm Status and Log

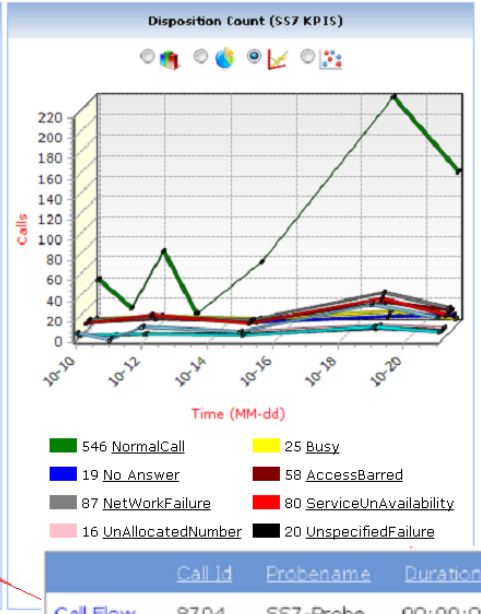
- Each alarm profile can be set against Date-Time, and Sampling Rate condition during which the selected Alarm Condition is said to be active
- For example, if the user selects 5 minutes as the sampling rate, NetSurveyorWeb™ will check for the alarm conditions every 5 minutes and triggers the actions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

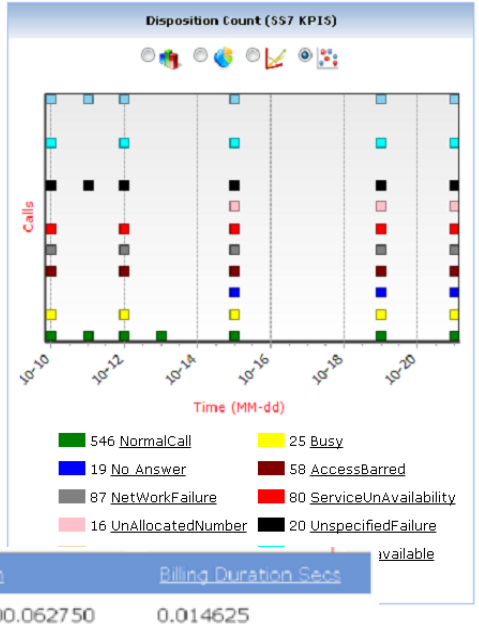


Report Generation









	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

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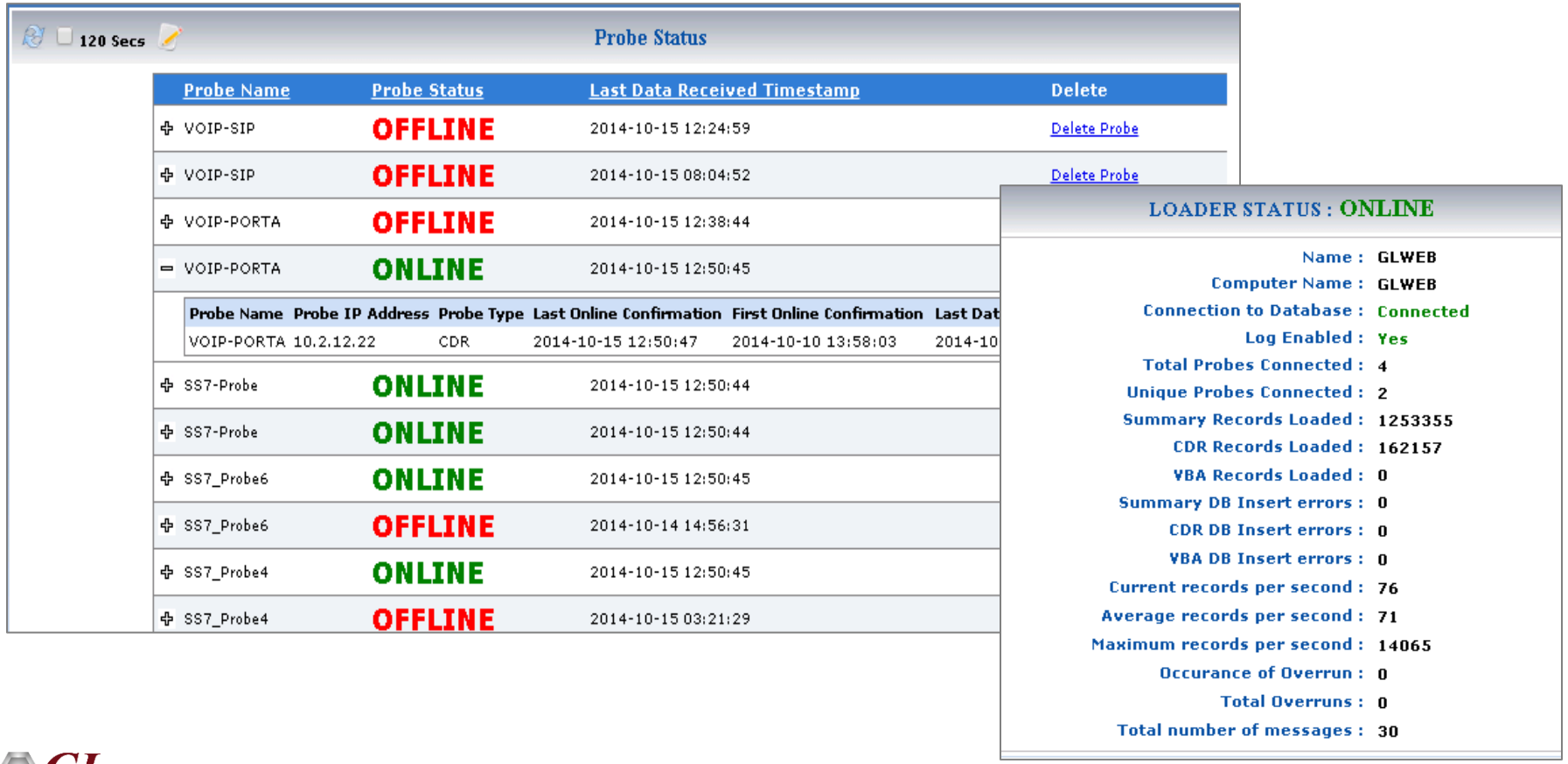
Probe / Loader Status



GL Communications

Thank you