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# Channel Associated Signaling (CAS) Analysis and Simulation

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818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878  
Phone: (301) 670-4784 Fax: (301) 670-9187 Email: [info@gl.com](mailto:info@gl.com)  
Website: <https://www.gl.com>

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- CAS Protocol Analysis
- CAS Simulator (GUI)
- Bulk CAS Simulation using MAPS™
- CAS Packet Data Analysis (PDA)

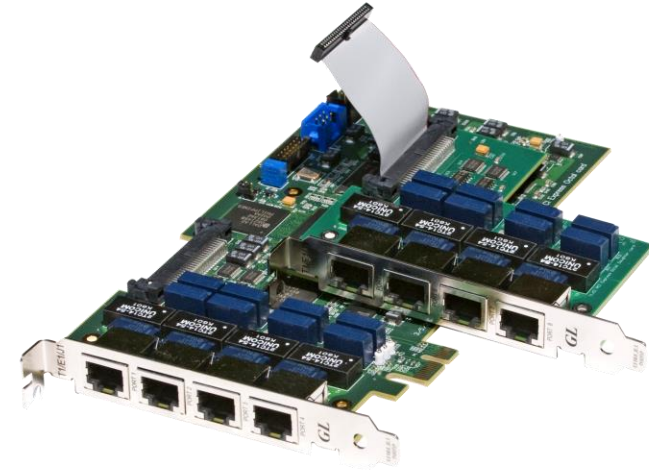
# T1 E1 Analyzer Hardware Platform



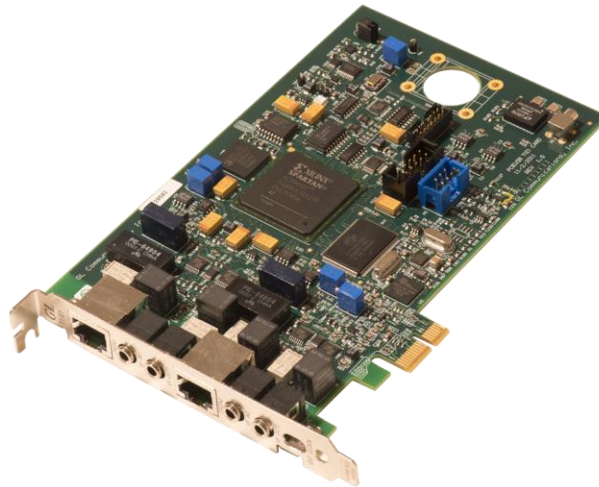
Front Panel

Back Panel

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

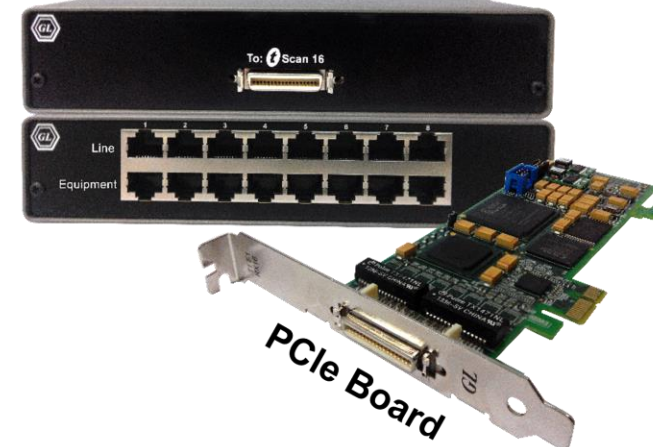


**Quad / Octal T1 E1 PCIe Card**



**Dual T1 E1 Express (PCIe) Board**

**tScan16™ with  
16-port T1 E1 Breakout Box**



**PCIe Board**

# TDM mTOP™ Solutions



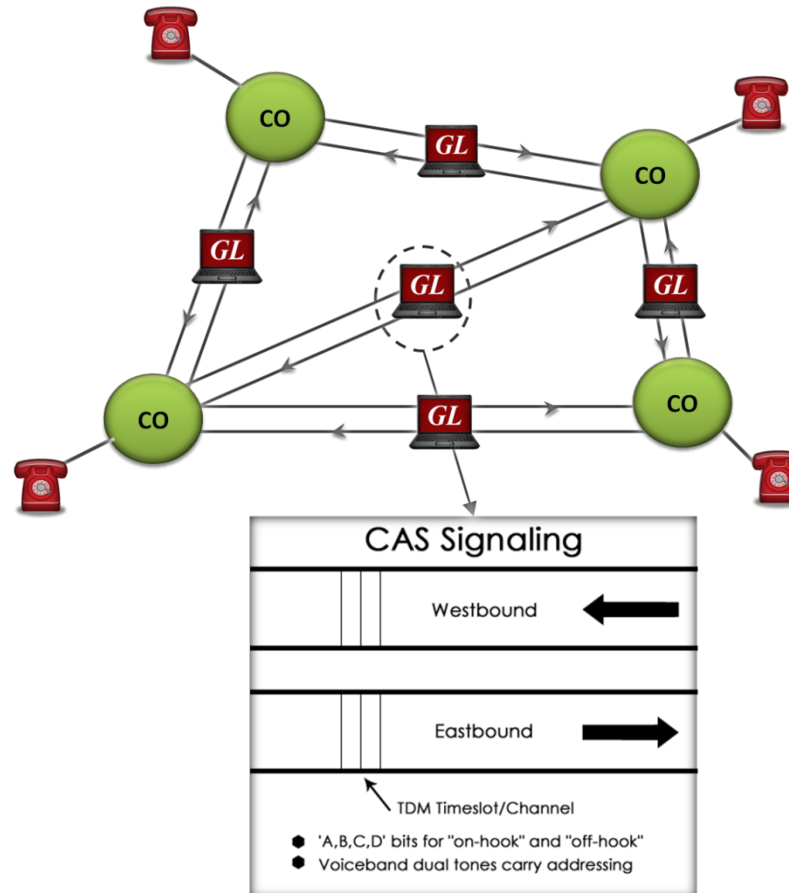
**mTOP™ tProbe™ FXO FXS with Dual UTA**



**1U tProbe™ with FXO and FXS**

# CAS Analyzer Network

- Channel Associated Signaling (CAS) is a method of signaling in telephone networks where each channel or timeslot carrying speech also carries with it the signaling and addressing to set up and tear down that same channel



# CAS Protocol Analyzer (XX092)

# Key Features

- Displays Summary, Detail, Hex Dump, Statistics, and Call Detail views
- Supports Loopstart, Groundstart, Feature Group D (FGD), Winkstart, and MFC-R2 protocols
- Detailed View
  - Displays decodes of user-selected frames from the Summary View
  - Provides options to display or hide the required protocol layers
  - Contents of this view can also be copied to clipboard
- Statistics View displays statistics based on frame count, byte count, frames/sec, bytes/sec etc for the entire capture data
- Any protocol field can be added to the summary view, filtering, and search features providing users more flexibility to monitor required protocol fields
- Hex dump View displays the frame information in HEX and ASCII format, the contents of this view can also be copied to clipboard
- Advanced filtering and search based on any user selected protocol fields
- Option to create multiple aggregate column groups and prioritize the groups as per the requirement to display the summary results efficiently
- Allows the user to create search/filter criteria automatically from the current screen selection

# CAS Protocol Analyzer

CAS Protocol Analysis MFCR2 64-bit

File View Capture Statistics Database Call Detail Records Configure Help

0 GoTo

Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Error	Event Type CAS-MFCR2	Signal CAS-MFCR2	Type CAS-MFCR2	D CAS-MFCR2
✓ 1	1		0	00:00:00.000000	2		Signal	1001 Idle Or Clear Forward		
✓ 2	1		1	00:00:00.000000	2		Signal	1001 Idle Or Clear Forward		
✓ 1	2		2	00:00:00.000000	2		Signal	1001 Idle Or Clear Forward		
✓ 2	2		3	00:00:00.000000	2		Signal	1001 Idle Or Clear Forward		
✓ 1	3		4	00:00:00.000000	2		Signal	1001 Idle Or Clear Forward		

Card1 TimeSlot=1 Frame=0 at 00:00:00.000000 OK Len=2 \*\*\* Right click to SHOW/HIDE layer c

Frame Data

```

===== CAS-MFCR2 Layer =====
0000 Event Type           = 00000001 Signal
0001 Signal               = ....1001 1001 Idle Or Clear Forward
    
```

Hex Dump of the Frame Data

```

+-----+-----+-----+-----+-----+-----+
01 09
    
```

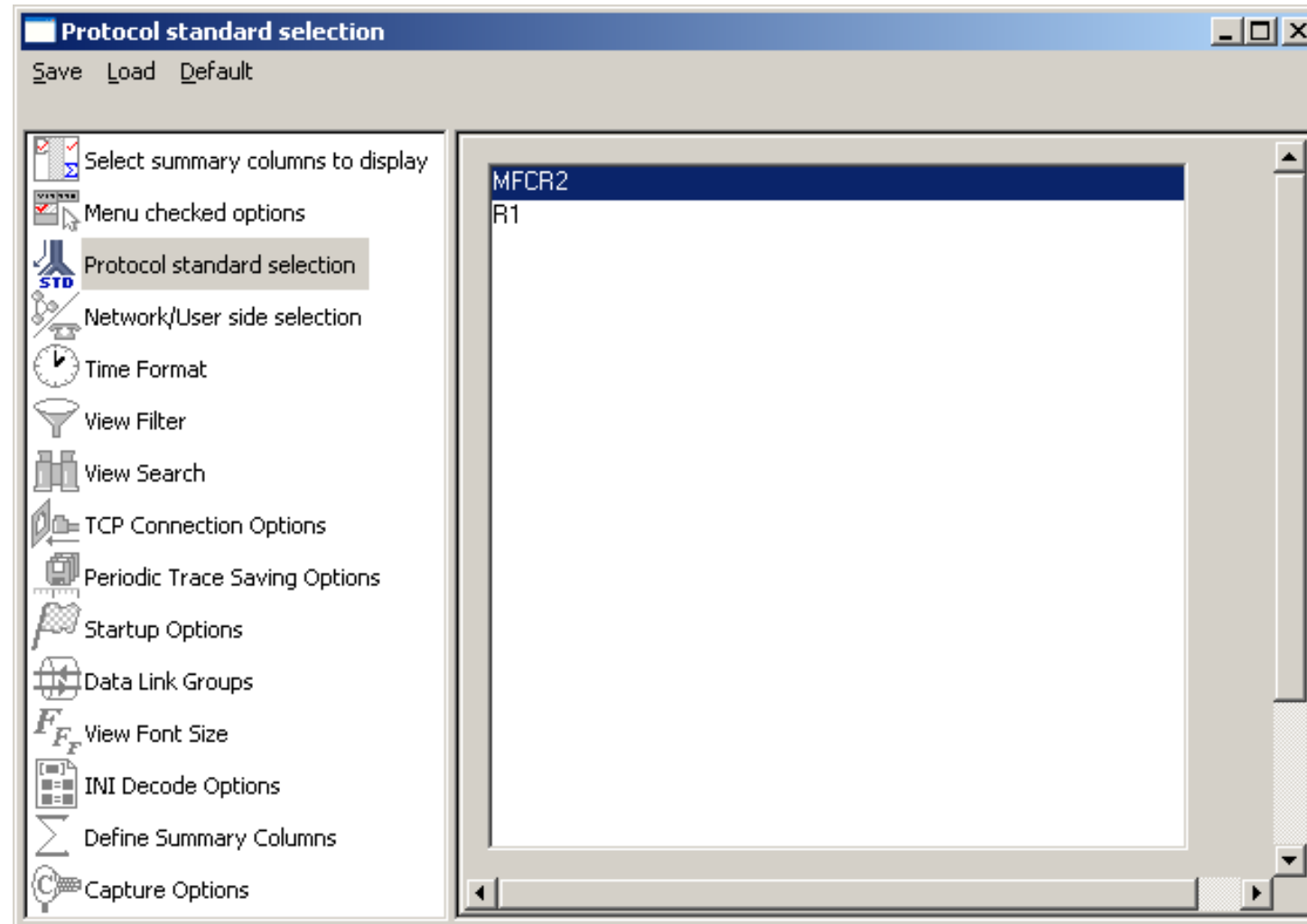
Device #	Frame Count(Device #)
1	70
total 1	70
2	66
total 2	66

Call ID	Call Status	Call Start Date & Time	Call Duration	DevNo	TS	Calling Number	Called Number	Category ID
0	completed	2021-07-13 12:13:07.456000	00:02:04.596000	2	1	5550002	6660002	0
1	completed	2021-07-13 12:16:38.726000	00:02:04.702000	2	1	5550002	6660002	0

C:\Users\GLIN112\Desktop\MFCR2.hdl 136 Frames

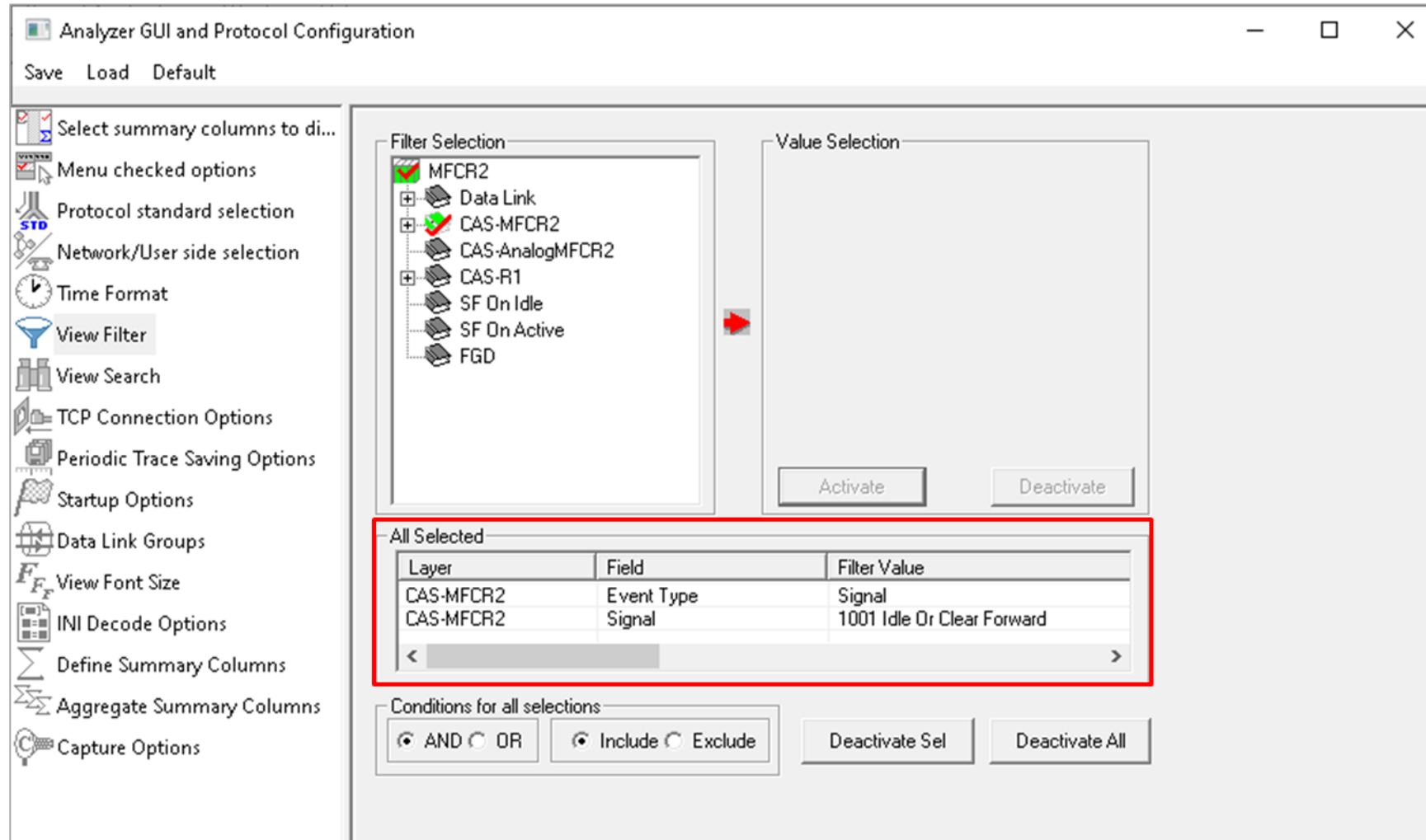


# Protocol Standard



# Filtering Criteria

- Search and Filter features provide very fast search/filter for finding the required frames



# Filtering Criteria From Screen Selection

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

The screenshot illustrates the process of creating filter criteria from a screen selection. It shows the 'CAS Protocol Analysis MFCR2 64-bit' interface with a table of data. A context menu is open over the table, and a red arrow points from the 'Set Filter Criteria as Sel Values' option to a dialog box titled 'Use Ctrl, Shift for Extended Selection'. The dialog box contains a list of selected values: 'CAS-MFCR2::Event Type' and 'CAS-MFCR2::Signal'. A red arrow points from the dialog box to the 'Filter Selection' section of the 'Analyzer GUI and Protocol Configuration' window.

**CAS Protocol Analysis MFCR2 64-bit**

Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Error	Event Type	Signal
✓ 1	1		0	00:00:00.000000	2		Signal	1001 Idle Or Clear Forward
✓ 2	1		1	00:00:00.000000	2		Signal	1001 Idle Or Clear Forward
✓ 1	2		2	00:00:00.000000	2		Signal	
✓ 2	2		3	00:00:00.000000	2		Signal	
✓ 1	3		4	00:00:00.000000	2		Signal	
✓ 2	3		5	00:00:00.000000	2		Signal	

**Use Ctrl, Shift for Extended Selection**

CAS-MFCR2::Event Type  
CAS-MFCR2::Signal

OK Select All Cancel

**Analyzer GUI and Protocol Configuration**

Save Load Default

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

**Filter Selection**

- ✓ MFCR2
  - ✗ Data Link
  - ✓ CAS-MFCR2
    - ✗ CAS-AnalogMFCR2
    - ✗ CAS-R1
    - ✗ SF On Idle
    - ✗ SF On Active
    - ✗ FGD

**Value Selection**

Activate Deactivate

**All Selected**

Layer	Field	Filter Value
CAS-MFCR2	Event Type	Signal
CAS-MFCR2	Signal	1001 Idle Or Clear Forward

Conditions for all selections  
☒ AND ☐ OR ☒ Include ☐ Exclude Deactivate Sel Deactivate All

# Search Criteria From Screen Selection

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

**CAS Protocol Analysis MFCR2 64-bit**

Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Error	Event Type CAS-MFCR2	Signal CAS-MFCR2
✓ 1	1		0	00:00:00.000000	2		Signal	1001 Idle Or Clear Forward
✓ 2	1		1	00:00:00.000000	2		Signal	1001 Idle Or Clear Forward
✓ 1	2		2	00:00:00.000000	2		Signal	
✓ 2	2		3	00:00:00.000000	2		Signal	
✓ 1	3		4	00:00:00.000000	2		Signal	
✓ 2	3		5	00:00:00.000000	2		Signal	

**Context Menu:**

- Search Selected Value
- Set Search Criteria as Sel Values**
- Set Filter Criteria as Sel Values

**Use Ctrl, Shift for Extended Selection**

CAS-MFCR2::Event Type  
CAS-MFCR2::Signal

OK Select All Cancel

**Analyzer GUI and Protocol Configuration**

Save Load Default

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

**Filter Selection**

- MFCR2
  - Data Link
  - ✓ CAS-MFCR2
  - CAS-AnalogMFCR2
  - CAS-R1
  - SF On Idle
  - SF On Active
  - FGD

**Value Selection**

Activate Deactivate

**All Selected**

Layer	Field	Filter Value
CAS-MFCR2	Event Type	Signal
CAS-MFCR2	Signal	1001 Idle Or Clear Forward

**Conditions for all selections**

☒ AND ☐ OR ☒ Include ☐ Exclude

Deactivate Sel Deactivate All

# Define Summary Columns

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

The image shows two windows from a network analysis tool. The top window is a dialog titled 'Select summary columns to display' with 'Save', 'Load', and 'Default' buttons. It has a left sidebar with various options, including 'Define Summary Columns' which is highlighted. The main area of the dialog is divided into 'DISPLAYED summary columns' and 'HIDDEN summary columns'. The 'DISPLAYED' list includes fields like Dev, TSlot, SubCh, Frame#, Time, Len, Error, and various Event Type, Signal, and Tone Type fields for CAS-MFCR2 and CAS-R1. The 'HIDDEN' list is currently empty, with a button '<--- Display Selected Columns' and a text box containing 'Event Type'.

The bottom window is titled 'CAS Protocol Analysis MFCR2 64-bit'. It has a menu bar (File, View, Capture, Statistics, Database, Call Detail Records, Configure, Help) and a toolbar. Below the toolbar is a table with columns: Dev, TSlot, SubCh, Frame#, TIME (Relative), Len, Event Type, Error, Event Type CAS-MFCR2, Signal CAS-MFCR2, and Type CAS-MFCR2. The table contains 13 rows of data, with the first row highlighted. A red box highlights the 'Event Type' column and the 'Event Type CAS-MFCR2' column. Below the table is a text area showing details for 'Card1 TimeSlot=1 Frame=63 at 00:00:10.966000 OK Len=28'. The text area displays a list of fields and their values, including Event Type, Number of Digits, Digits, Power 1, Power 2, Frequency 1, Frequency 2, On Duration, and Off Duration. The status bar at the bottom indicates 'Off-line Viewing.', the file path 'C:\Users\GLIN112\Desktop\MFCR2.hdl', and '136 Frames'.

Dev	TSlot	SubCh	Frame#	TIME (Relative)	Len	Event Type	Error	Event Type CAS-MFCR2	Signal CAS-MFCR2	Type CAS-MFCR2
✓ 1	1		63	00:00:10.966000	28	Digits -> 5		Digits		MFR2_B
✓ 2	1		64	00:00:11.130000	28	Digits -> 0		Digits		MFR2_F
✓ 1	1		65	00:00:11.200000	28	Digits -> 5		Digits		MFR2_B
✓ 2	1		66	00:00:11.364000	28	Digits -> 5		Digits		MFR2_F
✓ 1	1		67	00:00:11.434000	28	Digits -> 5		Digits		MFR2_B
✓ 2	1		68	00:00:11.598000	28	Digits -> 5		Digits		MFR2_F
✓ 1	1		69	00:00:11.668000	28	Digits -> 5		Digits		MFR2_B
✓ 2	1		70	00:00:11.832000	28	Digits -> 5		Digits		MFR2_F
✓ 1	1		71	00:00:11.902000	28	Digits -> 5		Digits		MFR2_B
✓ 2	1		72	00:00:12.064000	28	Digits -> 0		Digits		MFR2_F
✓ 1	1		73	00:00:12.136000	28	Digits -> 5		Digits		MFR2_B

```
Card1 TimeSlot=1 Frame=63 at 00:00:10.966000 OK Len=28
Frame Data
===== CAS-MFCR2 Layer =====
0000 Event Type           = 00000010 Digits
0001 Number of Digits    = 1 (x01)
0002 Digits               = 5
0003 Power 1             = -18 [hex FFFFFFFF]
0007 Power 2             = -18 [hex FFFFFFFF]
000B Frequency 1         = 780 [hex 0000030C]
000F Frequency 2         = 1021 [hex 000003FD]
0013 On Duration         = 116 [hex 00000074]
0017 Off Duration        = 0 [hex 00000000]
```

# Aggregate Group Column

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

The screenshot displays two windows from a network analysis tool. The top window, 'Aggregate Summary Columns', shows a configuration interface for creating summary column groups. It includes a list of summary columns on the left and a table for defining groups. The bottom window, 'GSM Protocol Analysis A-Interface GSM900 64-bit', shows a packet capture table with columns for Dev, TSlot, SubCh, Frame#, TME (Relative), Len, Error, and several summary columns defined in the top window. A red box highlights the 'Group~0' column in the packet table, which contains the value '8867640421 -> 9341141851'. Below the packet table, the packet details for Frame 70 are shown, including the MTP2 Layer (BSN, BIB, FSN, FIB, LI) and the MTP3 Layer (Service Indicator, Priority Code, Sub-service field, DPC, OPC, Signalling Link Code, SCCP Layer, Message Type, Mandatory Fixed Parameters, Destination Local Reference Parameter, Destination Local Reference, Segmenting Reassembling Parameter).

**Aggregate Summary Columns Dialog:**

Name	Display Format	Summary Columns	Separator
Group~0	Concat	Number Digits<>CallingPartyBCD_CC Number Digits<>CalledParty_CC	--->
Group~1	Col_Alias Value	Type of identity_MM	
Group~2	Concat	DPC_MTP3 OPC_MTP3 Message Type_GSM Phase2+	&

**GSM Protocol Analysis A-Interface GSM900 64-bit Packet Table:**

Dev	TSlot	SubCh	Frame#	TME (Relative)	Len	Error	Group~0	OPC MTP3	DPC MTP3	Message Type GSM Phase2+
1	23		70	00:01:29...	42		8867640421 -> 9341141851	2.2.2	1.1.1	
2	23		71	00:01:30...	23		2.2.2 & 1.1.1	1.1.1	2.2.2	
1	23		72	00:01:31...	40		1.1.1 & 2.2.2 & ASSIGNMENT REQUEST	2.2.2	1.1.1	ASSIGNMENT REQ.
2	23		73	00:01:31...	36		2.2.2 & 1.1.1 & ASSIGNMENT COMPLETE	1.1.1	2.2.2	ASSIGNMENT CO...
2	23		74	00:01:31...	22		2.2.2 & 1.1.1	1.1.1	2.2.2	
2	23		75	00:01:41...	22		2.2.2 & 1.1.1	1.1.1	2.2.2	
1	23		76	00:01:42...	22		1.1.1 & 2.2.2	2.2.2	1.1.1	
1	23		77	00:01:45...	29		1.1.1 & 2.2.2	2.2.2	1.1.1	
2	23		78	00:01:46...	38		2.2.2 & 1.1.1	1.1.1	2.2.2	

**Packet Details for Frame 70:**

```
Card1 TimeSlot=23 Frame=70 at 00:01:29.676375 OK Len=42
HDLc Frame Data + FCS
===== MTP2 Layer =====
0000 BSN = .1000000 (64)
0000 BIB = 1..... (1)
0001 FSN = .1001010 (74)
0001 FIB = 1..... (1)
0002 LI = ..100101 MSU Format
===== MTP3 Layer =====
0003 Service Indicator = ....0011 SCCP
0003 Priority Code = ..00.... Priority Code 0
0003 Sub-service field = 10..... National Network
0004 DPC = 1.1.1(00001001 ..001000)
0005 OPC = 2.2.2(10..... 00000100 ....0100)
0007 Signalling Link Code = 0001..... (1)
===== SCCP Layer =====
0008 Message Type = 00000110 DT1 data form 1
Mandatory Fixed Parameters
Destination Local Reference Parameter =
0009 Destination Local Reference = 458752 [hex 070000]
Segmenting Reassembling Parameter =
```



# CAS Simulator (XX625)

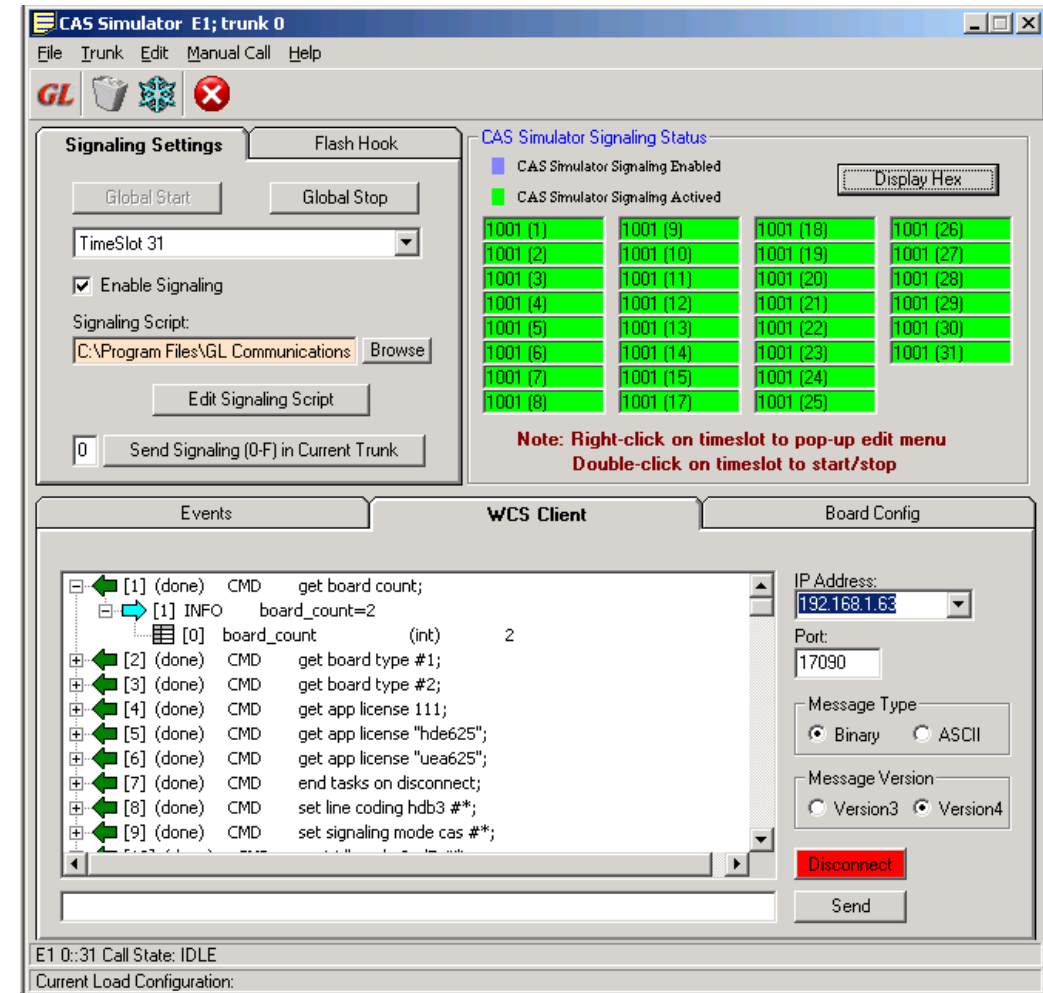


# Channel Associated Signaling Simulators

- GL offers following CAS Simulators:
- A client-side application that works along with GL's T1 E1 Analyzer Cards and Windows Client/Server software – includes a GUI as well as script editor to easily create CAS scripts
- Command-line scripts to perform CAS Simulation with GL's T1 E1 Analyzer Cards and Windows Client/Server software
- Script-based CAS Simulation using MAPS™ with GL's T1 E1 Analyzer Cards and Windows Client/Server software

# CAS Simulator (GUI)

- With GL's CAS Simulators, simulate any user-defined CAS protocol by providing signaling bit transitions and forward/backward frequency tones/digits
- Uses client-server technique and provides GUI as well as scripted CAS protocol simulation platform
- Network (NT) and Terminal (TE) - Side Support
- Implements ITU-T Signaling
- Called number and calling number identification
- Customized signaling for each channel through scripts

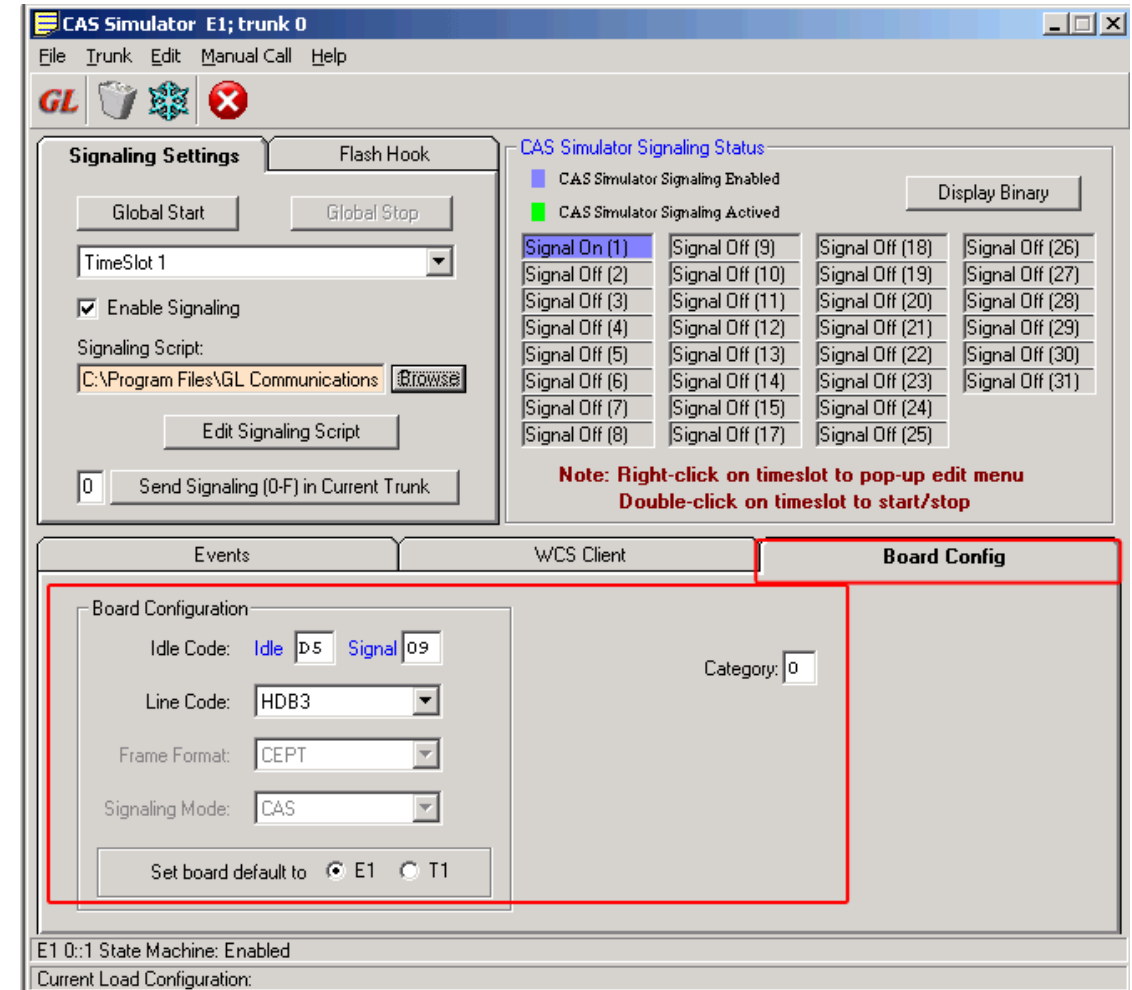


# Supported Protocols

- E1 MFC-R2 (All variants, full / semi compelled)
- T1 Winkstart (R1 wink)
- Multi-frequency compelled protocols based on the R2 standard (MFCR2)
- T1 Loopstart and T1 Groundstart
- E1 European Digital CAS (EUC)
- Any User-Defined CAS Protocol

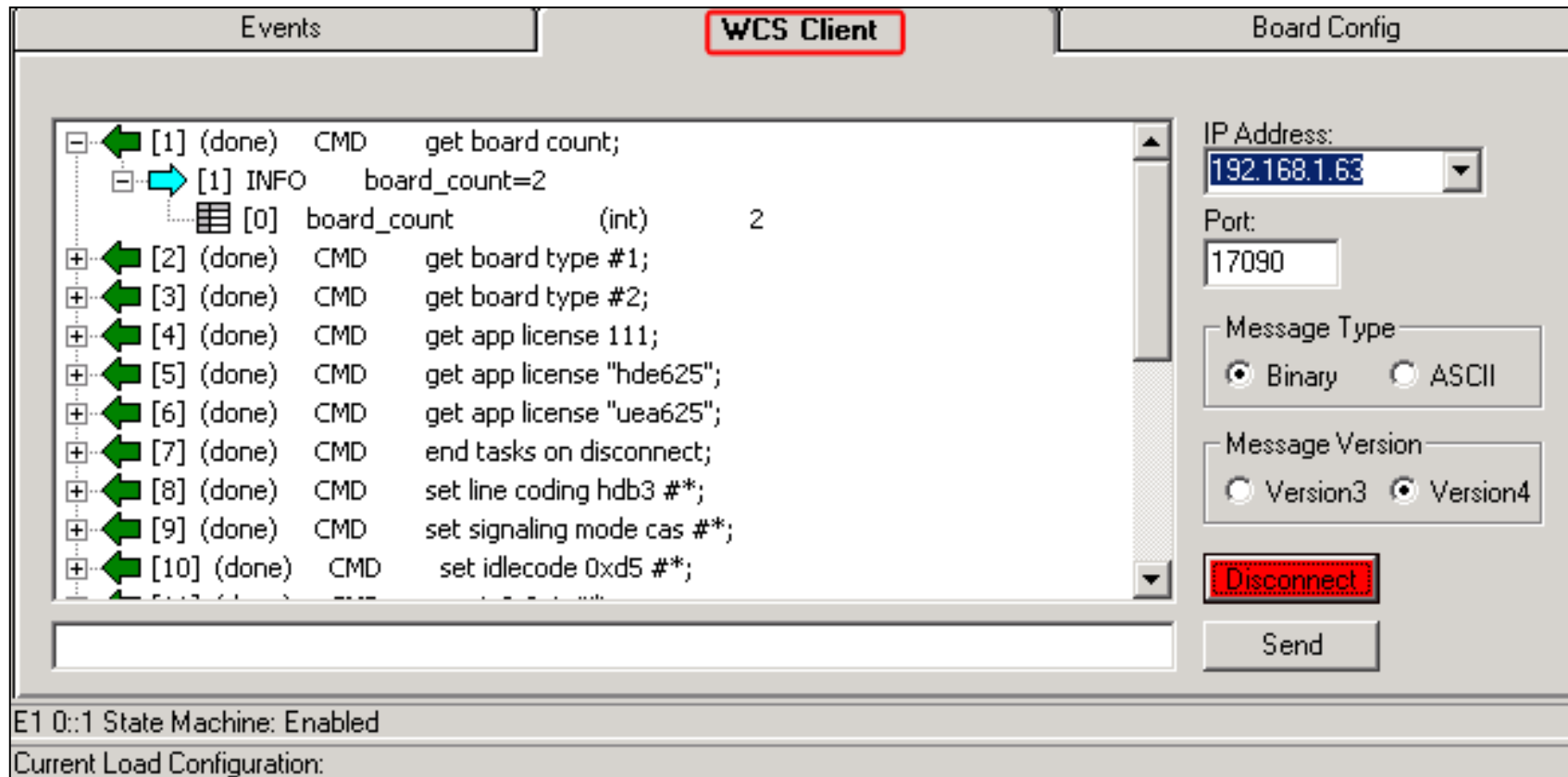
# Board Configuration

- Options are provided to set Line Codes, Idle Code, Frame Type, and Signaling Mode
  - Line Code Formats: Available formats are AMI, B8ZS (T1) or HDB3 (E1)
  - Framing Formats: Available framing formats are CAS, CCS, CAS & CRC and CCS & CRC (E1) 193S (D4) and 193E (ESF) (T1)
  - Idle Code: Default Idle code values are 7EX00 (T1) and D5X09 (E1). Line idle code and Signaling bits can be changed by the user
- If Category is set, it is sent out when a call is being placed. If the category is left blank, no category will be sent out when a call is being placed
- Provides an option to set board to either T1 or E1

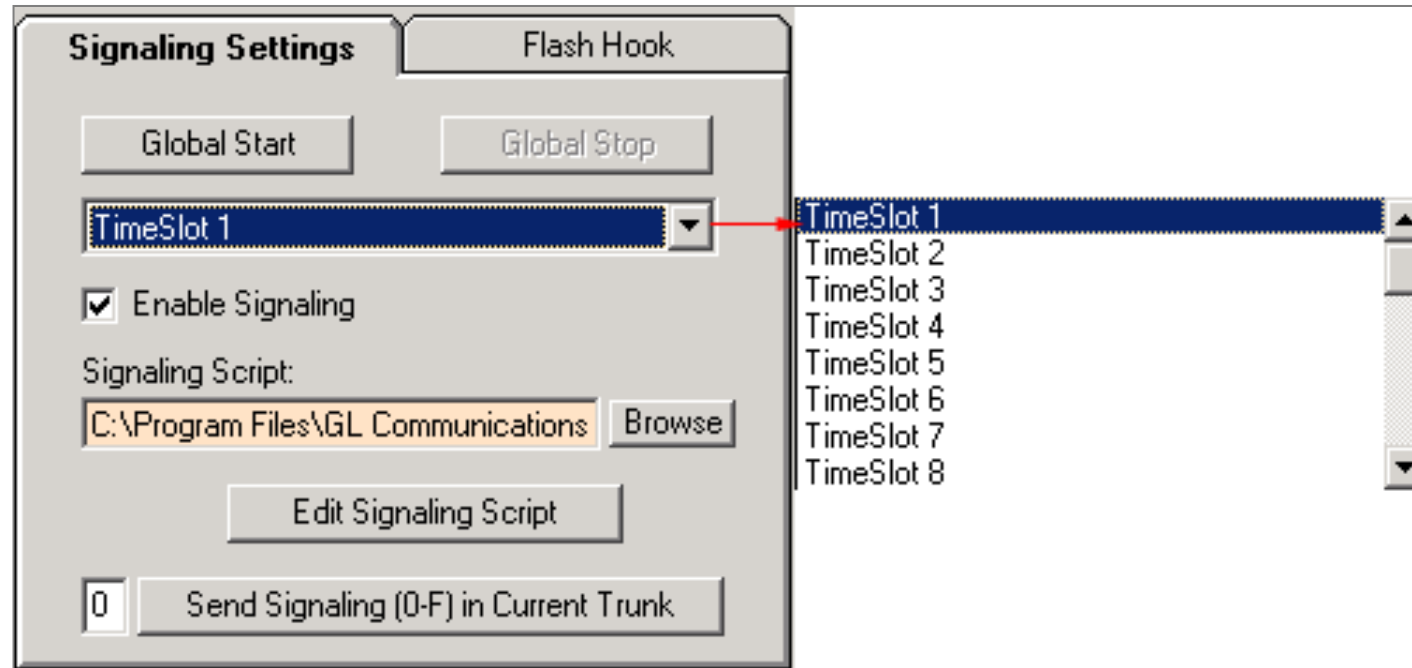


# WCS Client

- WCS Client interface allows to connect to one or more GL servers with different instances



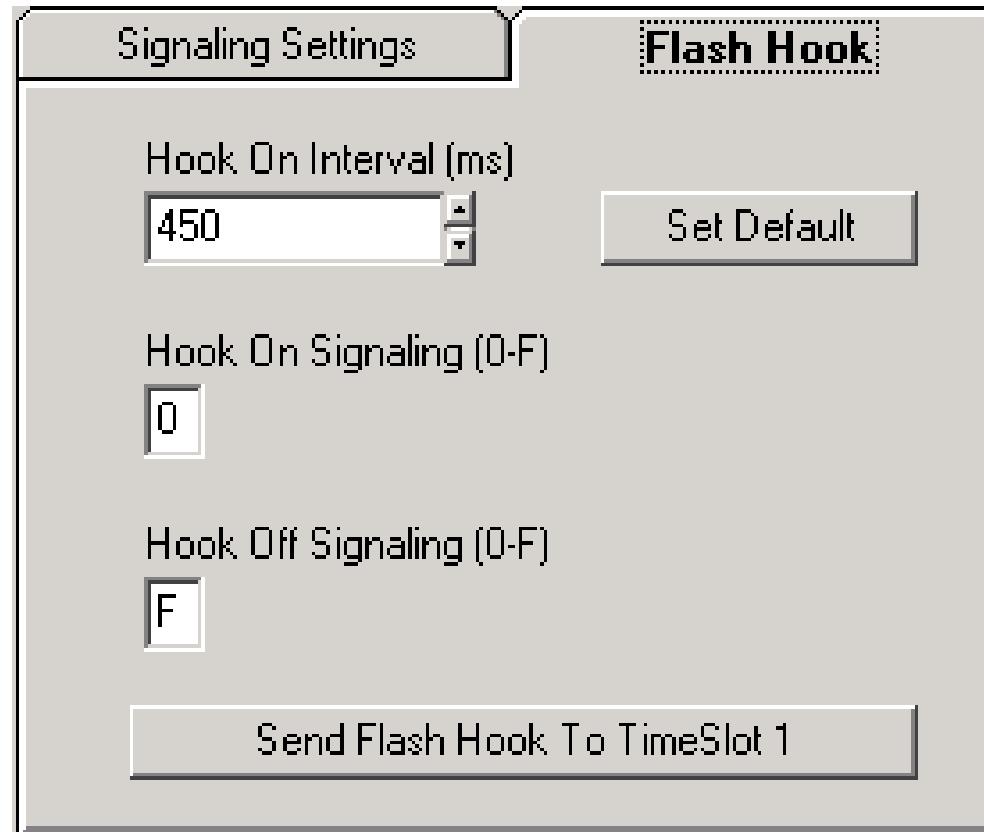
# Signaling Settings



- Signaling Settings provides an option to select the timeslots and CAS scripts
- Enabling CAS signaling on the selected timeslot
- Allows to launch CAS Script Editor to edit CAS signaling scripts

# Flash Hook

- Provides a way for the users to send Flash Hook signal manually
- Users can vary Flash Hook On Signal (0-F), Flash Hook Off Signal (0-F) and Flash Hook Interval (ms) for a given timeslot
- Flash Hook On Signal should be different than current line signal

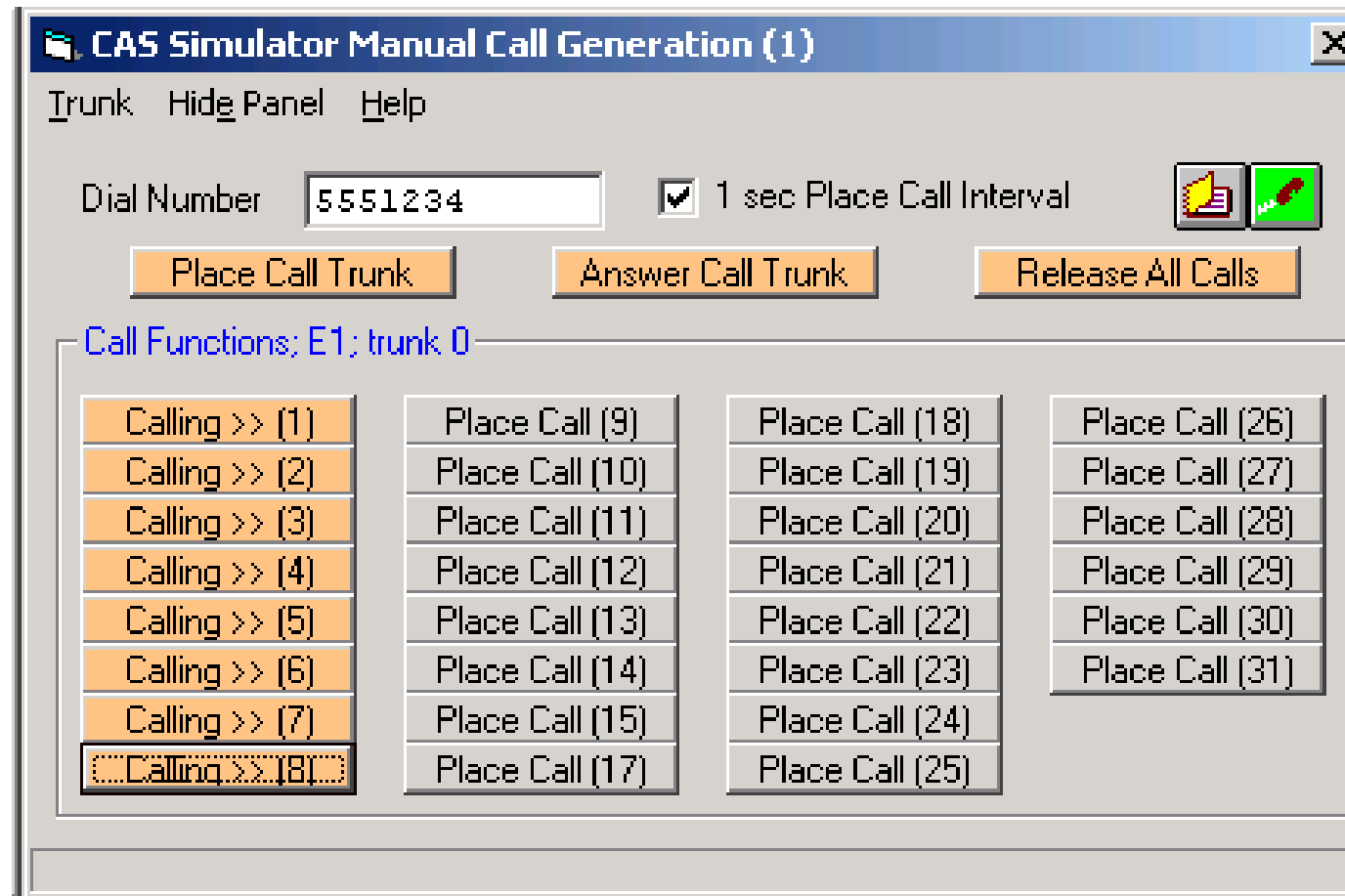


The image shows a software window titled "Flash Hook" with a "Signaling Settings" tab. It contains three input fields: "Hook On Interval (ms)" with a value of 450, "Hook On Signaling (0-F)" with a value of 0, and "Hook Off Signaling (0-F)" with a value of F. There are two buttons: "Set Default" and "Send Flash Hook To TimeSlot 1".

Field	Value
Hook On Interval (ms)	450
Hook On Signaling (0-F)	0
Hook Off Signaling (0-F)	F

# Manual Call Generation

- CAS Simulator processes the receipt of Dialed Number Identification Service (DNIS) and Automatic Number Identification (ANI) information, which is used to support addressing, routing, and other functions





# ANI Digit Setup

- Enables the user to set ANI digits manually

**CAS Simulator ANI Digit Setup**

File Help

Manual ANI Generation

<input checked="" type="checkbox"/> TS 1	5551000	<input checked="" type="checkbox"/> TS 12	5551212	<input checked="" type="checkbox"/> TS 23	5552323
<input checked="" type="checkbox"/> TS 2	5552000	<input checked="" type="checkbox"/> TS 13	5551313	<input checked="" type="checkbox"/> TS 24	5552424
<input checked="" type="checkbox"/> TS 3	5553000	<input checked="" type="checkbox"/> TS 14	5551414	<input checked="" type="checkbox"/> TS 25	5552525
<input checked="" type="checkbox"/> TS 4	5554000	<input checked="" type="checkbox"/> TS 15	5551515	<input checked="" type="checkbox"/> TS 26	5552626
<input checked="" type="checkbox"/> TS 5	5555000	<input checked="" type="checkbox"/> TS 16	5551616	<input checked="" type="checkbox"/> TS 27	5552727
<input checked="" type="checkbox"/> TS 6	5556000	<input checked="" type="checkbox"/> TS 17	5551717	<input checked="" type="checkbox"/> TS 28	5552828
<input checked="" type="checkbox"/> TS 7	5557000	<input checked="" type="checkbox"/> TS 18	5551818	<input checked="" type="checkbox"/> TS 29	5552929
<input checked="" type="checkbox"/> TS 8	5558000	<input checked="" type="checkbox"/> TS 19	5551919	<input checked="" type="checkbox"/> TS 30	5553030
<input checked="" type="checkbox"/> TS 9	5559000	<input checked="" type="checkbox"/> TS 20	5552020	<input checked="" type="checkbox"/> TS 31	5553131
<input checked="" type="checkbox"/> TS 10	5551010	<input checked="" type="checkbox"/> TS 21	5552121		
<input checked="" type="checkbox"/> TS 11	5551111	<input checked="" type="checkbox"/> TS 22	5552222		

# Signal Status - Enabled

The screenshot shows the 'Signaling Settings' and 'CAS Simulator Signaling Status' windows. In the 'Signaling Settings' window, the 'Enable Signaling' checkbox is checked and highlighted with a red box. A red arrow points from this checkbox to the 'Signal On (3)' button in the 'CAS Simulator Signaling Status' window. The 'CAS Simulator Signaling Status' window displays a grid of 32 buttons, each representing a signal status for a specific timeslot. The buttons are arranged in a 4x8 grid. The first four columns represent 'Signal On' and 'Signal Off' for timeslots 1 through 31. The fifth column represents 'Signal Off' for timeslots 18 through 25. The sixth column represents 'Signal Off' for timeslots 26 through 31. The buttons are color-coded: blue for 'Signal On' and green for 'Signal Off'. The 'Signal On (3)' button is highlighted with a red box. A red arrow points from the 'Enable Signaling' checkbox to this button. A 'Display Binary' button is located in the top right corner of the 'CAS Simulator Signaling Status' window. A note at the bottom of the window states: 'Note: Right-click on timeslot to pop-up edit menu Double-click on timeslot to start/stop'.

**Signaling Settings**

Flash Hook

Global Start Global Stop

TimeSlot 31

☒ Enable Signaling

Signaling Script:  
C:\Program Files\GL Communications Browse

Edit Signaling Script

0 Send Signaling (0-F) in Current Trunk

**CAS Simulator Signaling Status**

CAS Simulator Signaling Enabled  
CAS Simulator Signaling Activated

Display Binary

Signal On (1)	Signal Off (9)	Signal Off (18)	Signal Off (26)
Signal On (2)	Signal Off (10)	Signal Off (19)	Signal Off (27)
Signal On (3)	Signal Off (11)	Signal Off (20)	Signal Off (28)
Signal On (4)	Signal On (12)	Signal Off (21)	Signal Off (29)
Signal Off (5)	Signal On (13)	Signal On (22)	Signal Off (30)
Signal Off (6)	Signal Off (14)	Signal On (23)	Signal On (31)
Signal Off (7)	Signal Off (15)	Signal Off (24)	
Signal Off (8)	Signal Off (17)	Signal Off (25)	

**Note: Right-click on timeslot to pop-up edit menu  
Double-click on timeslot to start/stop**

# Signal Status - Started

**Signal Status - Started**

**Signaling Settings** | Flash Hook

Global Start | Global Stop

TimeSlot 31

☒ Enable Signaling

Signaling Script: C:\Program Files\GL Communications | Browse

Edit Signaling Script

0 | Send Signaling (0-F) in

**CAS Simulator Signaling Status**

☐ CAS Simulator Signaling Enabled

☒ CAS Simulator Signaling Activated

Display Binary

Hex 9 (1)	Signal Off (9)	Signal Off (18)	Signal Off (26)
Hex 9 (2)	Signal Off (10)	Signal Off (19)	Signal Off (27)
Hex 9 (3)	Signal Off (11)	Signal Off (20)	Signal Off (28)
Hex 9 (4)	Hex 9 (12)	Signal Off (21)	Signal Off (29)
Signal Off (5)	Hex 9 (13)	Hex 9 (22)	Signal Off (30)
Signal Off (6)	Signal Off (14)	Hex 9 (23)	Hex 9 (31)
Signal Off (7)	Signal Off (15)	Signal Off (24)	
Signal Off (8)	Signal Off (17)	Signal Off (25)	

**Signal Status - Started**

**Signaling Settings** | Flash Hook

Global Start | Global Stop

TimeSlot 31

☒ Enable Signaling

Signaling Script: C:\Program Files\GL Communications | Browse

Edit Signaling Script

0 | Send Signaling (0-F) in Current Trunk

**CAS Simulator Signaling Status**

☐ CAS Simulator Signaling Enabled

☒ CAS Simulator Signaling Activated

Display Hex

1001 (1)	Signal Off (9)	Signal Off (18)	Signal Off (26)
1001 (2)	Signal Off (10)	Signal Off (19)	Signal Off (27)
1001 (3)	Signal Off (11)	Signal Off (20)	Signal Off (28)
1001 (4)	1001 (12)	Signal Off (21)	Signal Off (29)
Signal Off (5)	1001 (13)	1001 (22)	Signal Off (30)
Signal Off (6)	Signal Off (14)	1001 (23)	1001 (31)
Signal Off (7)	Signal Off (15)	Signal Off (24)	
Signal Off (8)	Signal Off (17)	Signal Off (25)	

**Note: Right-click on timeslot to pop-up edit menu**  
**Double-click on timeslot to start/stop**

# Signaling Events

Timestamp	Setup Time	TS	Trunk	Send Signaling	Receive Signaling
11:11:09		1	E1:0	1,1,1,1	
11:11:09		1	E1:0	CALL_RELEASED	
11:11:09		2	E1:0	1,1,1,1	
11:11:09		2	E1:0	CALL_RELEASED	
11:11:09		3	E1:0	1,1,1,1	
11:11:09		3	E1:0	CALL_RELEASED	
11:11:09		4	E1:0	1,1,1,1	
11:11:09		4	E1:0	CALL_RELEASED	
11:11:09		12	E1:0	1,1,1,1	
11:11:09		12	E1:0	CALL_RELEASED	
11:11:09		13	E1:0	1,1,1,1	
11:11:09		13	E1:0	CALL_RELEASED	
11:11:09		22	E1:0	1,1,1,1	
11:11:09		22	E1:0	CALL_RELEASED	

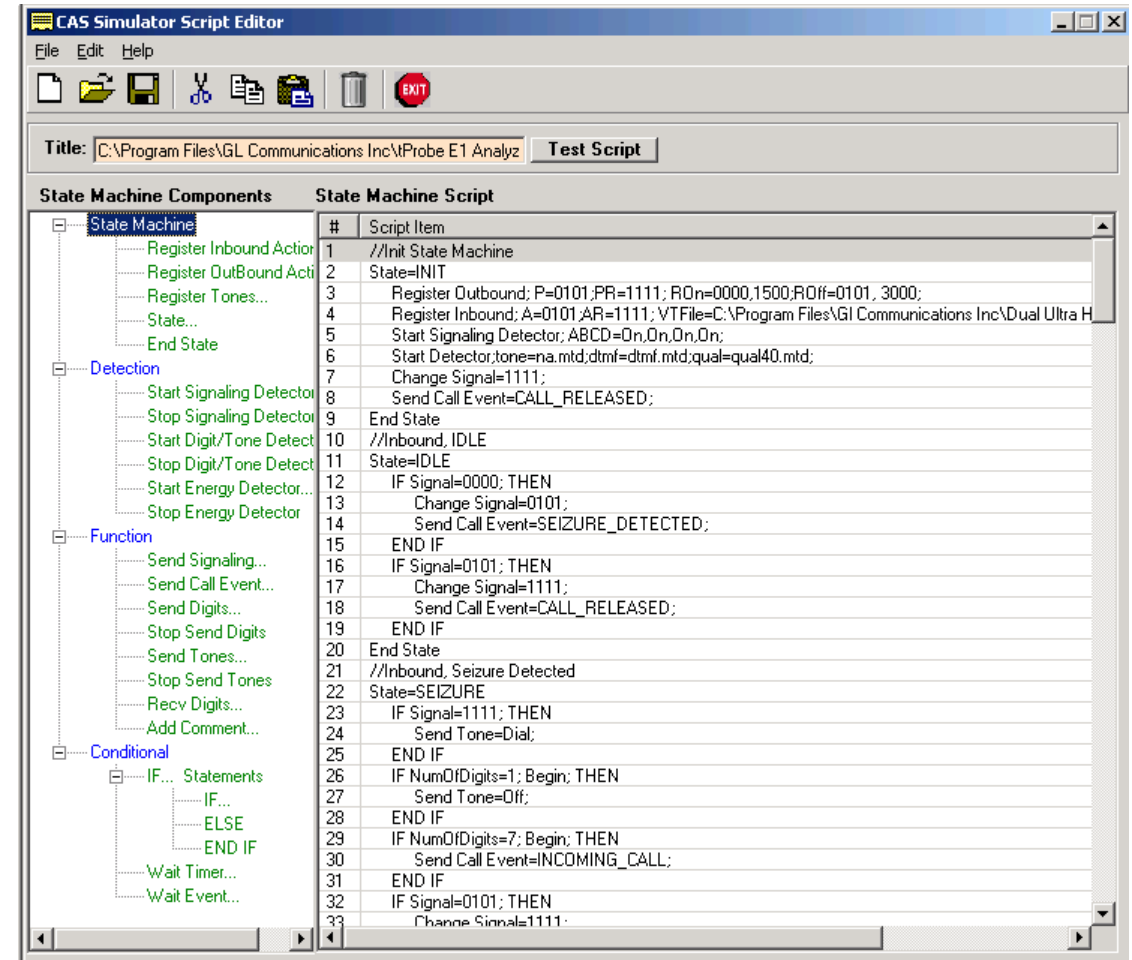
☐ Capture State Machine Events to File   Counter 36

E1 0:31 State Machine: Enabled  
Current Load Configuration:

- Information displayed includes all signaling bit transitions as they are processed, and includes a timestamp with date, timeslot and trunk
- The Signals sent and received during the Signaling transition appears in the “Send Signaling” and “Receive Signaling” columns
- Status Events screen chronologically lists the entire signaling bit transitions, digit detections, and tone detections generated by each timeslot of all trunks

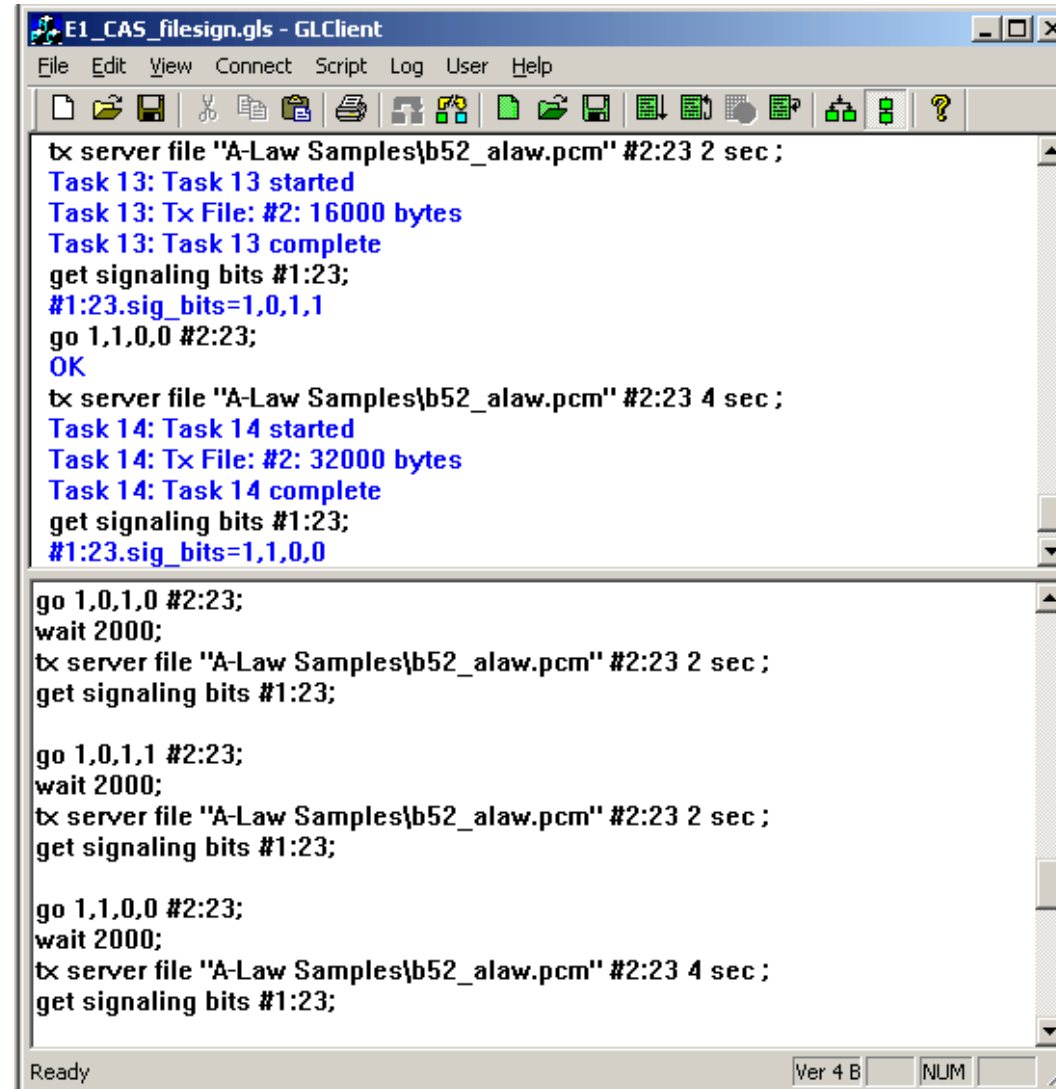
# CAS Script Editor

- CAS Simulator script editor is a self-descriptive language that can define the behaviour of CAS Call Control procedure
- Functions such as Place Call, Answer Call, Incoming Call, and Disconnect Call are defined within the script
- Additionally, more advanced script may also be defined in the script editor
- User may define Signaling Bit Transitions and forward/backward digits/tones within each script



# CAS Simulator using Command Line

- CAS simulation using client-server command line application



The screenshot shows a window titled "E1\_CAS\_filesig.gls - GLClient" with a menu bar (File, Edit, View, Connect, Script, Log, User, Help) and a toolbar. The main text area contains the following output:

```
tx server file "A-Law Samples\b52_alaw.pcm" #2:23 2 sec ;
Task 13: Task 13 started
Task 13: Tx File: #2: 16000 bytes
Task 13: Task 13 complete
get signaling bits #1:23;
#1:23.sig_bits=1,0,1,1
go 1,1,0,0 #2:23;
OK
tx server file "A-Law Samples\b52_alaw.pcm" #2:23 4 sec ;
Task 14: Task 14 started
Task 14: Tx File: #2: 32000 bytes
Task 14: Task 14 complete
get signaling bits #1:23;
#1:23.sig_bits=1,1,0,0

go 1,0,1,0 #2:23;
wait 2000;
tx server file "A-Law Samples\b52_alaw.pcm" #2:23 2 sec ;
get signaling bits #1:23;

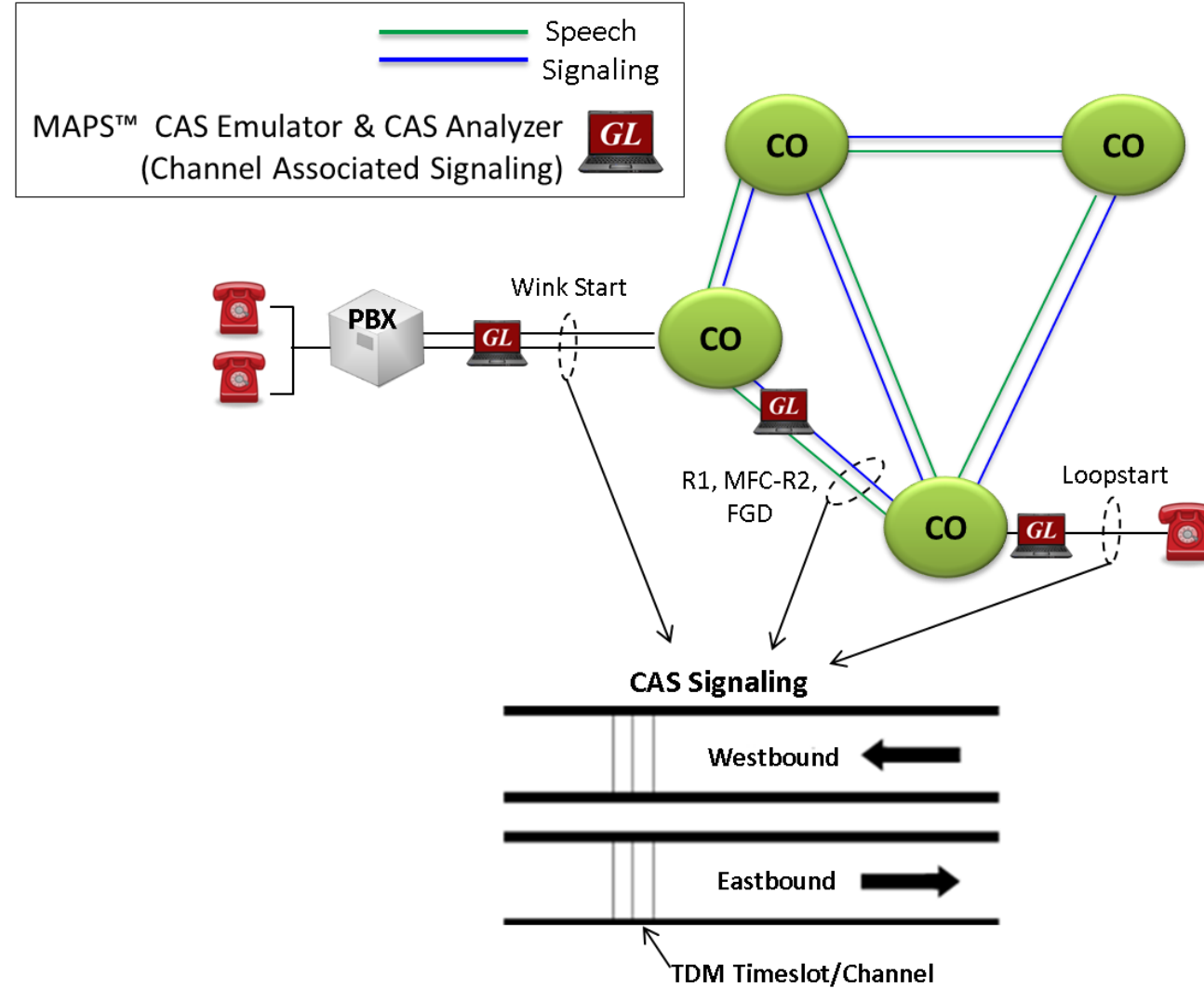
go 1,0,1,1 #2:23;
wait 2000;
tx server file "A-Law Samples\b52_alaw.pcm" #2:23 2 sec ;
get signaling bits #1:23;

go 1,1,0,0 #2:23;
wait 2000;
tx server file "A-Law Samples\b52_alaw.pcm" #2:23 4 sec ;
get signaling bits #1:23;
```

The status bar at the bottom shows "Ready", "Ver 4 B", and "NUM".

# MAPS™ CAS SMULATOR (XX651)

# Channel Associated Signaling (CAS)





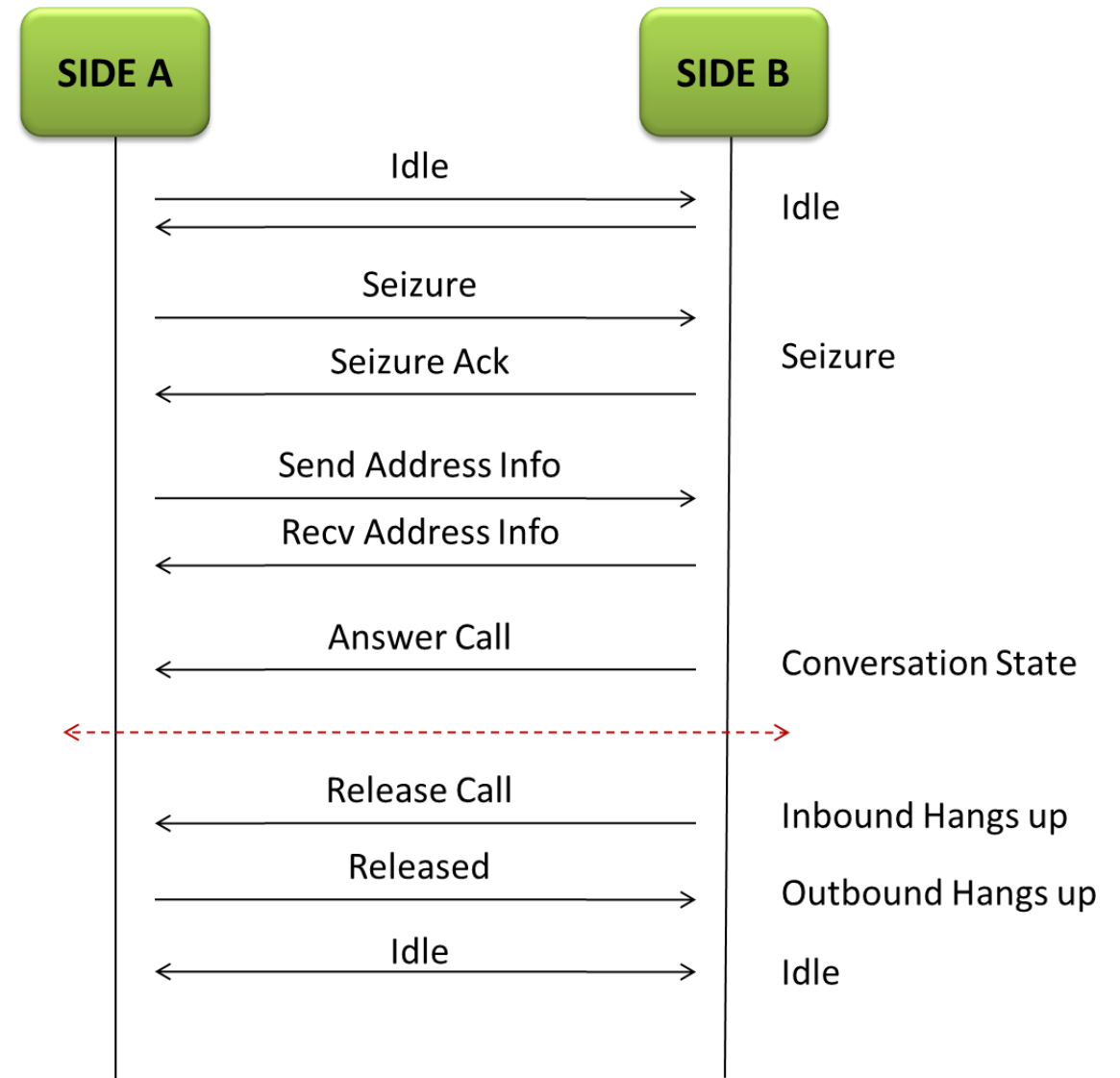
# Supported Protocols

MAPS™ CAS Simulator supports the following CAS protocols:

- Winkstart (R1 wink)
- T1 Loopstart
- T1 Groundstart
- T1 Feature Group D
- T1 Immediate Start
- E1 MFC-R2 (All variants, full /semi compelled) - Defined by the ITU Recommendations Q.421-Q.442
- E1 European Digital CAS (EUC)
- E1 Digital E&M
- E1 International Wink Start
- Any User-defined CAS Protocol

# Typical CAS Signaling Procedure

- MFC-R2 Signaling - uses a multi-frequency compelled signaling protocol to exchange address information
- T1 Winkstart (R1 wink) - uses one-bit signaling, and the wink (brief presence of current or variation of the signaling bit) that the inbound side uses to indicate readiness to receive address signaling



# Call Generation and Bulk Call Settings

- Supports generation and detection of TDM traffic using CAS
- Supports transmission and detection of signaling information such as signaling bits, DTMF/MF Digits, or Tones

**Active Calls** ← **Completed Calls**

**Load Scripts and Profiles**

**Script Contents**

**Commands already executed**

**Events**

Data/Time	Call Trace Id	Script Id	Captured Events
2011-10-28 16:46:56.000177	1	ProtScriptId_115055160-372	Detected Signal=0, 0, 0, 1
2011-10-28 16:46:58.000193	1	ProtScriptId_115055160-372	Placing Call5,5,5,2,0,0,0
2011-10-28 16:46:58.000677	1	ProtScriptId_115055160-372	Detected Signal=1, 0, 0, 1
2011-10-28 16:46:59.000177	1	ProtScriptId_115055160-372	Detected Signal=0, 0, 0, 1
2011-10-28 16:46:59.000177	1	ProtScriptId_115055160-372	Seizure Acknowledged
2011-10-28 16:46:59.000177	1	ProtScriptId_115055160-372	Dialing
2011-10-28 16:47:04.000193	1	ProtScriptId_115055160-372	Detected Signal=0, 0, 0, 1
2011-10-28 16:47:07.000677	1	ProtScriptId_115055160-372	Detected Signal=1, 0, 0, 1
2011-10-28 16:47:07.000677	1	ProtScriptId_115055160-372	Remote User Answered Call
2011-10-28 16:47:07.000677	1	ProtScriptId_115055160-372	TxRx Traffic Done
2011-10-28 16:47:12.000693	1	ProtScriptId_115055160-372	Detected Signal=1, 0, 0, 1
2011-10-28 16:47:17.000708	1	ProtScriptId_115055160-372	Detected Signal=1, 0, 0, 1
2011-10-28 16:47:22.000724	1	ProtScriptId_115055160-372	Detected Signal=1, 0, 0, 1
2011-10-28 16:47:27.000740	1	ProtScriptId_115055160-372	Detected Signal=1, 0, 0, 1
2011-10-28 16:47:32.000771	1	ProtScriptId_115055160-372	Detected Signal=1, 0, 0, 1
2011-10-28 16:47:37.000677	1	ProtScriptId_115055160-372	Detected Signal=0, 0, 0, 1
2011-10-28 16:47:37.000677	1	ProtScriptId_115055160-372	Call Released

# Call Reception

- MAPS™-CAS acting as inbound switch and responds to the incoming signals
- Provides Event Log, Error Events, and Captured Errors report log encountered during the progress of the call

**Active Calls** ← **Completed Calls**

**Load Scripts and Profiles**

**Script Contents**

**Commands already executed**

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Eve...	Result	Total Iterati...	Completed Iterz
1	E1_R1_Answer Call.gls	card2_TS0...	0	Abort	Idle	None		Unknown	1	0
2	E1_R1_Answer Call.gls	card2_TS1...	1	Abort	Ringing	AnswerCall		Unknown	1	0
3	E1_R1_Answer Call.gls	card2_TS2...	2	Abort	Ringing	AnswerCall		Unknown	1	0
4	E1_R1_Answer Call.gls	card2_TS3...	3	Abort	Ringing	AnswerCall		Unknown	1	0
5	E1_R1_Answer Call.gls	card2_TS4...	4	Abort	Ringing	AnswerCall		Unknown	1	0
6	E1_R1_Answer Call.gls	card2_TS5...	5	Abort	Ringing	AnswerCall		Unknown	1	0
7	E1_R1_Answer Call.gls	card2_TS6...	6	Abort	Ringing	AnswerCall		Unknown	1	0
8	E1_R1_Answer Call.gls	card2_TS7...	7	Start	Call Released...	None		Pass	1	1
9	E1_R1_Answer Call.gls	card2_TS8...	8	Abort	Ringing	AnswerCall		Unknown	1	0

Script Contents

```
//// MAPS CAS Emulator: R1 Wink ////  
  
//// Initialization ////  
dcount=0;  
P="1, 0, 0, 1";  
A="1, 0, 0, 1";  
PR="0, 0, 0, 1";  
AR="0, 0, 0, 1";  
Idle="0, 0, 0, 1";  
SeizureAck="0, 0, 0, 1";  
incr Gicounter 1;
```

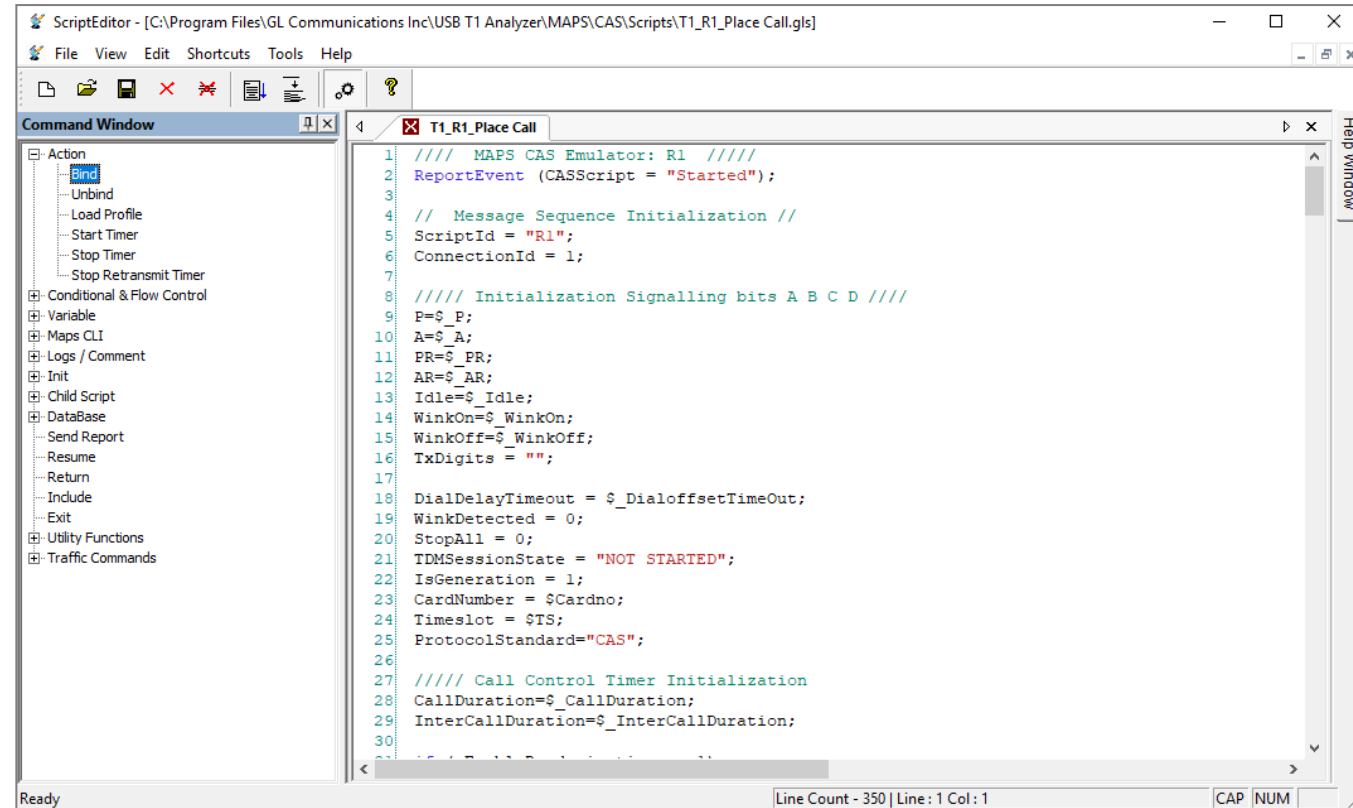
**Events**

Event Log | Error Events | Captured Errors

Data/Time	Call Trace Id	Script Id	Captured Events
2011-10-28 16:51:23.000052	1	ProtScriptId_382164160-2495	Detected Signal=0, 0, 0, 1
2011-10-28 16:51:27.000052	1	ProtScriptId_382164160-2495	Detected Signal=1, 0, 0, 1
2011-10-28 16:51:27.000052	1	ProtScriptId_382164160-2495	Seizure Detected
2011-10-28 16:51:27.000271	1	ProtScriptId_382164160-2495	Seizure Acknowledged
2011-10-28 16:51:32.000287	1	ProtScriptId_382164160-2495	Digit Type=
2011-10-28 16:51:32.000287	1	ProtScriptId_382164160-2495	digits=5551234
2011-10-28 16:51:32.000287	1	ProtScriptId_382164160-2495	Alerting
2011-10-28 16:51:36.000333	1	ProtScriptId_382164160-2495	Incoming Call
2011-10-28 16:51:36.000333	1	ProtScriptId_382164160-2495	Call Connected
2011-10-28 16:51:36.000333	1	ProtScriptId_382164160-2495	TxRx Traffic Done
2011-10-28 16:51:37.000302	1	ProtScriptId_382164160-2495	Detected Signal=1, 0, 0, 1
2011-10-28 16:51:42.000302	1	ProtScriptId_382164160-2495	Incoming Call
2011-10-28 16:51:42.000302	1	ProtScriptId_382164160-2495	Call Connected
2011-10-28 16:51:42.000318	1	ProtScriptId_382164160-2495	TxRx Traffic Done
2011-10-28 16:51:42.000333	1	ProtScriptId_382164160-2495	Detected Signal=1, 0, 0, 1
2011-10-28 16:51:47.000349	1	ProtScriptId_382164160-2495	Detected Signal=1, 0, 0, 1
2011-10-28 16:51:52.000365	1	ProtScriptId_382164160-2495	Detected Signal=1, 0, 0, 1
2011-10-28 16:51:57.000380	1	ProtScriptId_382164160-2495	Detected Signal=1, 0, 0, 1
2011-10-28 16:52:02.000412	1	ProtScriptId_382164160-2495	Detected Signal=1, 0, 0, 1
2011-10-28 16:52:06.000349	1	ProtScriptId_382164160-2495	Call Released

Clear

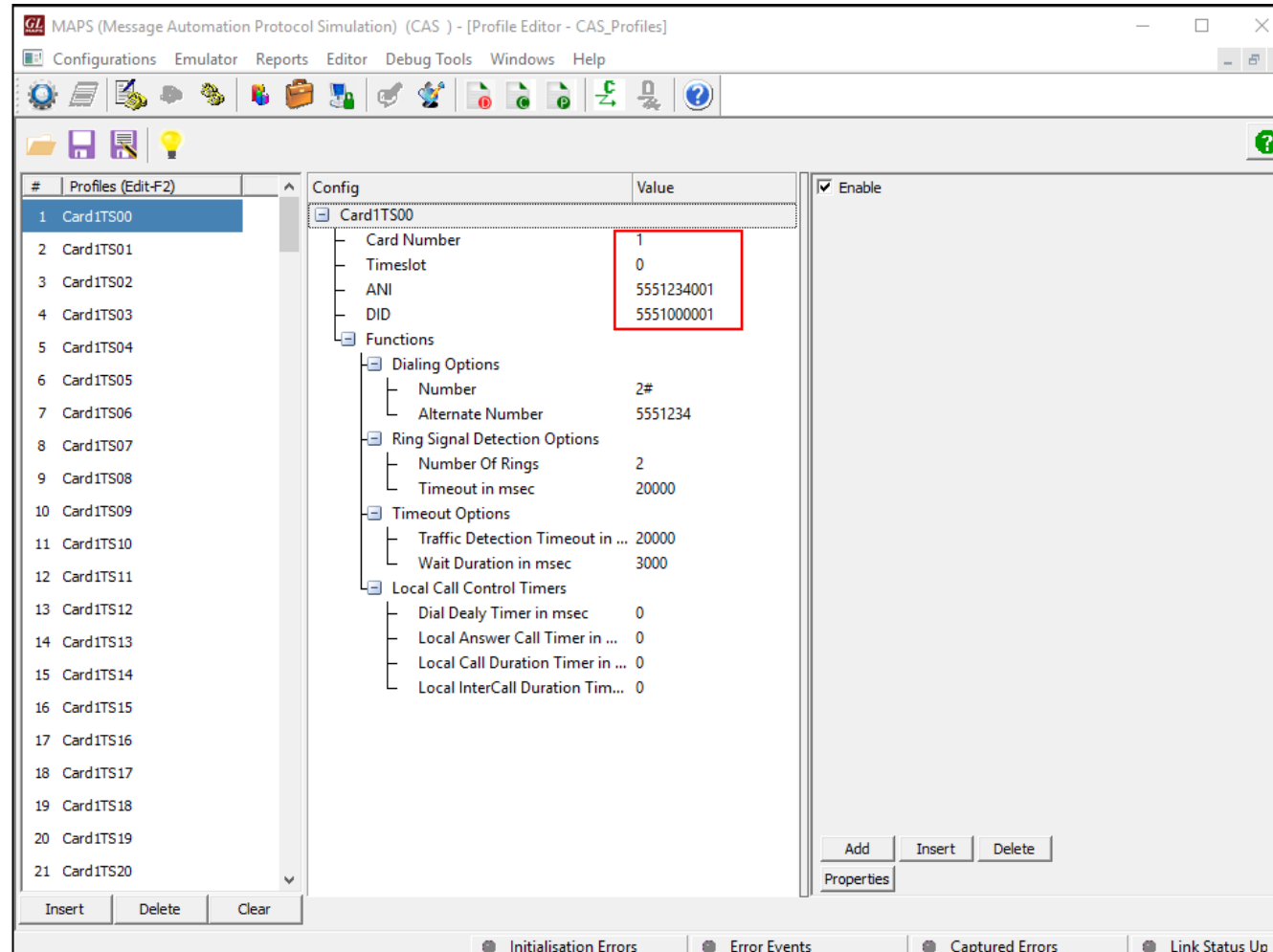
# Script Editor



- Script editor allows the user to create / edit scripts and to define variables for the protocol fields
- Uses pre-defined templates to build call flow and perform send and receive actions
- Provides options to run the test for multiple iterations in sequential or random flow
- Commands allow retransmission with specific interval

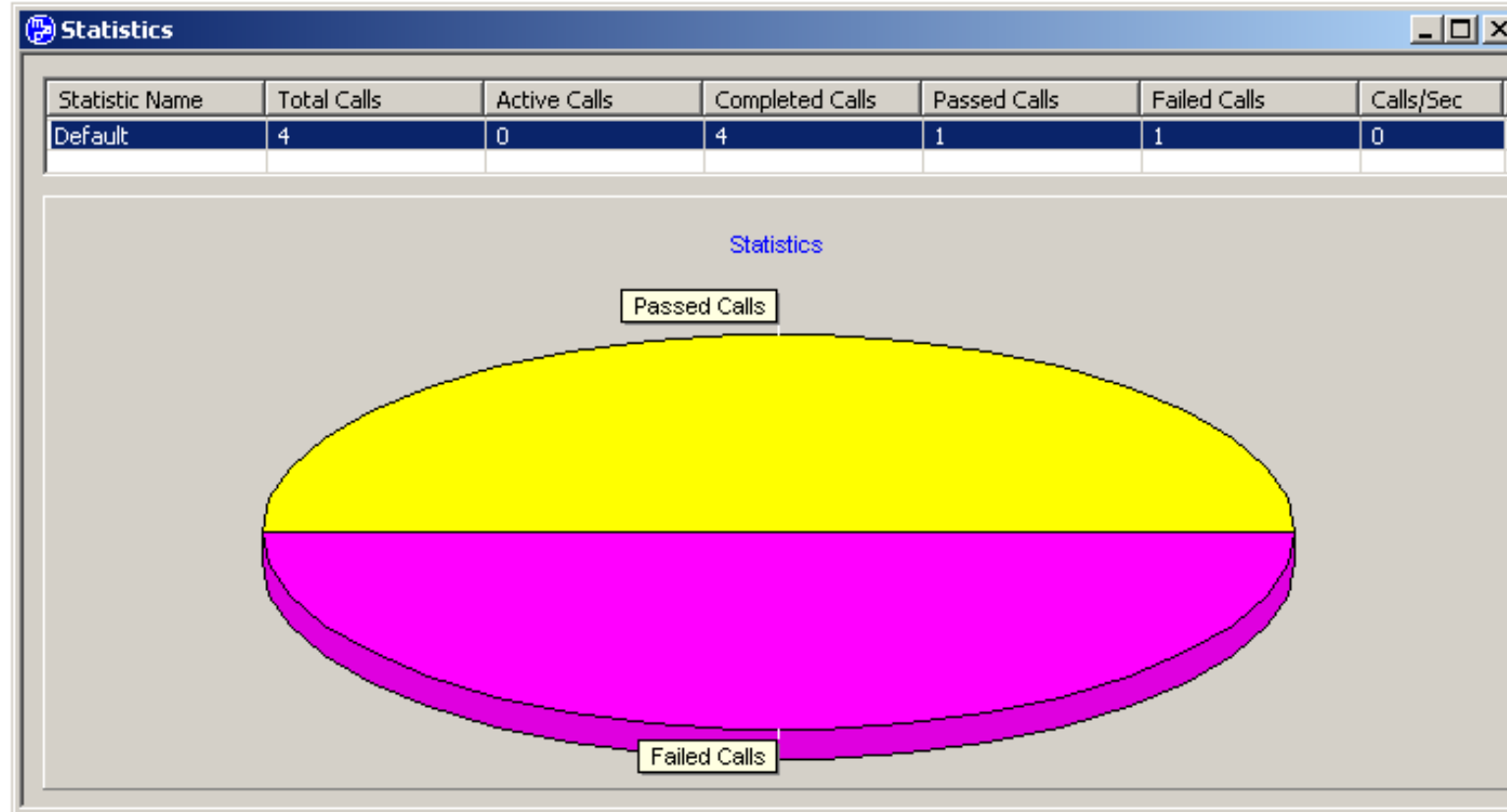
# Profile Editor

- Profiles are used to provide the user configured values to the fields through variables which are replaced during a call



# Call Statistics and Status

- By default, all call handling scripts (irrespective of the type of the functions) are assessed by MAPS™ to provide statistical information about total calls, active calls, completed calls, passed calls, and failed calls

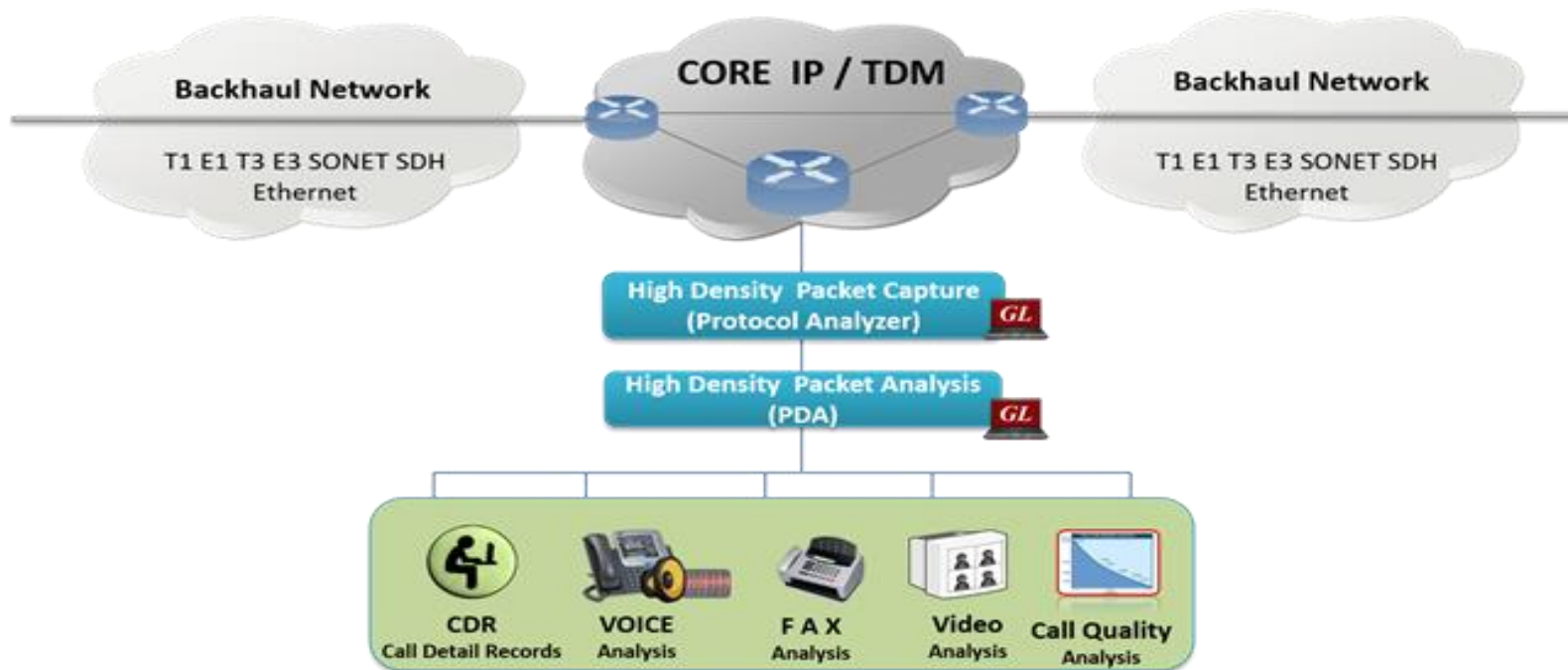



# CAS Packet Data Analysis (PDA)



# Packet Data Analyzer over TDM

- Monitors live TDM networks including capture, analysis, and reporting of every call-in detail. Supported protocols include CAS, ISDN, ISUP, CAMEL, MAP, INAP, and GSM



 **GL's Packet Capture Module**  
PacketScan, LightSpeed1000, T1 E1 T3 E3 Analyzer Pods

 **GL's Packet Analysis Module**  
H.323, LTE, IMS, SIP, MGCP, MEGACO, UMTS, GPRS, GSM A, BICC, CAP, MAP, SIGTRAN

# Main Features

CDR, Call Flow, Statistics, and Report Generation	<ul style="list-style-type: none"><li>• Isolates call specific information for each individual call from the captured data and displays the information in an organized fashion</li><li>• A host of call and message counters gives the user an instantaneous snapshot of the traffic on the network.</li><li>• Pictorial representation of the statistics including ladder diagrams for the calls of various protocols.</li><li>• Ability to export and analyze call detail records of completed calls in CSV file format.</li><li>• These reports can be further fed to DB and accessed using GL's NetSurveyorWeb™ Lite for analysis.</li><li>• Isolates calls, a graphical call flow diagram can be created from a call trace.</li><li>• Filters on CDR information feature is used to search required calls by using "key" as CDR parameters.</li><li>• Event counters on CDR information provides over all count of completed events such as total calls, active calls, completed calls, purged calls, failed calls, calls per second, remaining calls and more.</li><li>• Flexible options are provided to interchange/hide the columns as required.</li></ul>
Traffic Recording	<ul style="list-style-type: none"><li>• Supports capturing of voice, digits, tones and FAX etc to *.PCM file format.</li></ul>
Triggers and Actions	<ul style="list-style-type: none"><li>• Filter captures based on protocol parameters such as OPC, DPC or CIC in case of ISUP followed by a set of actions such as save call, send mail, trigger alarm notification etc for the completed calls..</li></ul>
Exporting Calls	<ul style="list-style-type: none"><li>• Supports saving the selected calls from traffic analyzer into *.HDL, *.PCAP, or *.PCAPNG formats.</li></ul>

# CAS Data Link Group

CAS Data Link Group

File

Device Selection

East 1West 2

East	West
1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20
21	22

Add

Delete

Delete All

Close

# Traffic Recording Configurations

Traffic Recording Configuration ✕

File

Traffic Recording

☒ Recording (Non Segmented)

Directory

Record Duration  sec {0 to Record Entire Call Duration}

☐ Include Absolute Path in CDR

☒ Segmented Recording

Directory

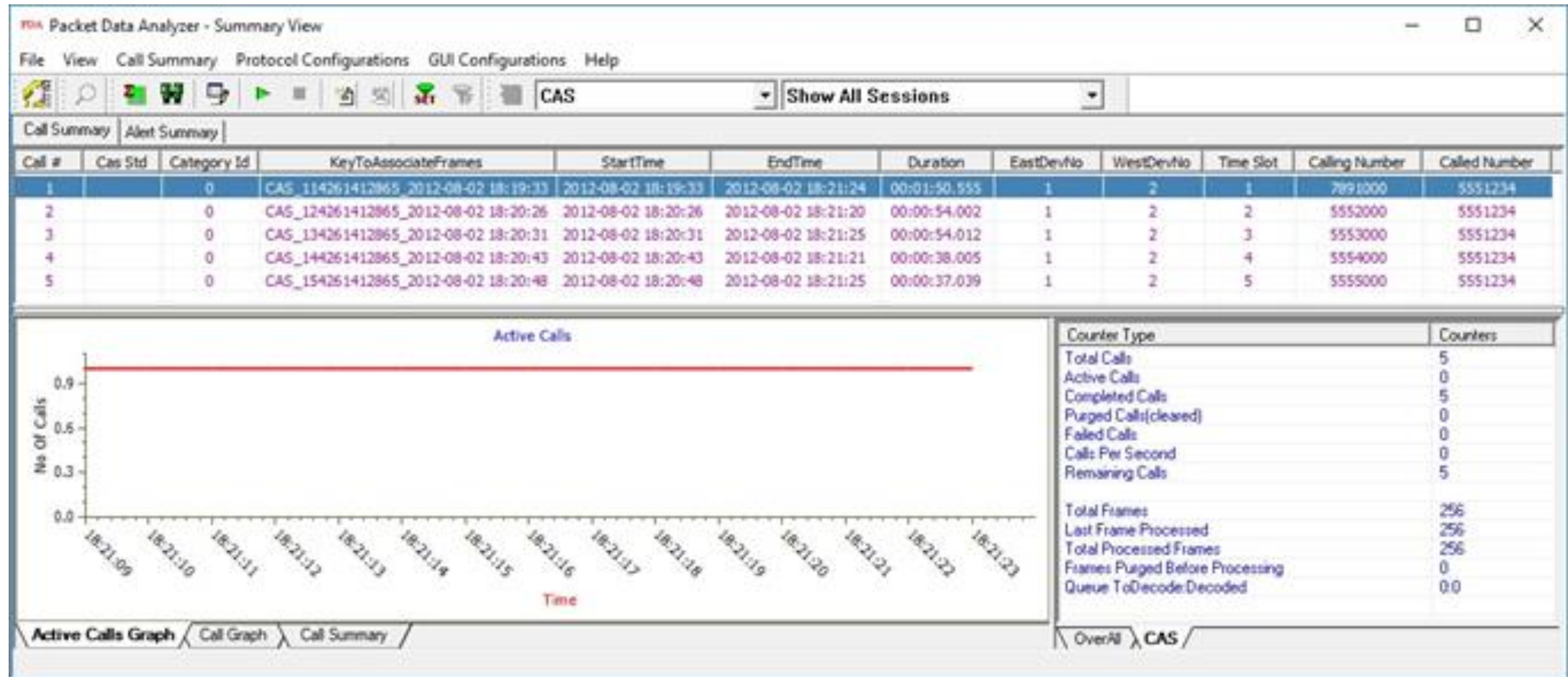
No. of Segments  Segment Length  sec

Max Simultaneous Recordings

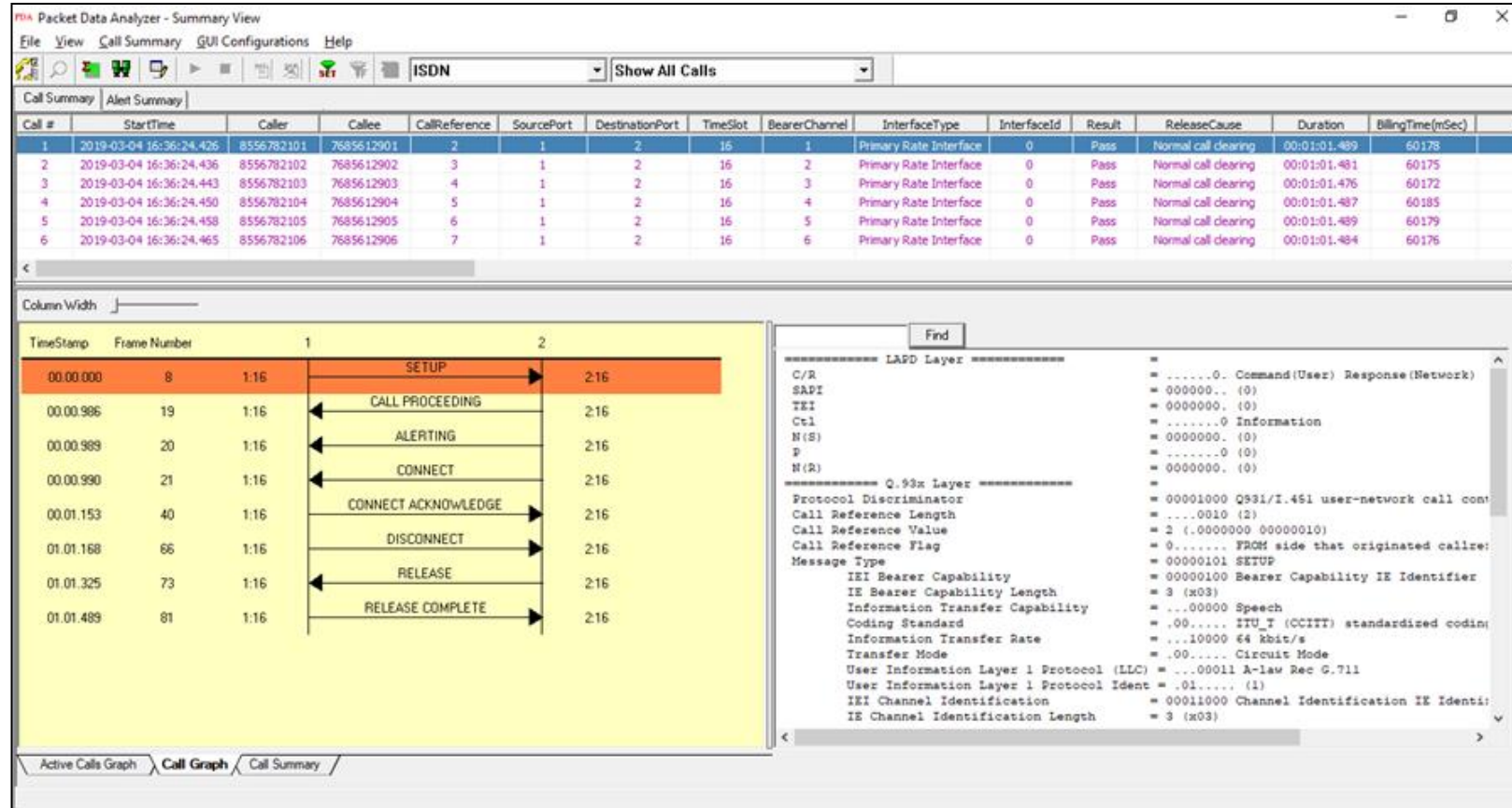
Create Subfolder Every  min

# CAS Call Summary

# Active Call Graph



# Call Graph

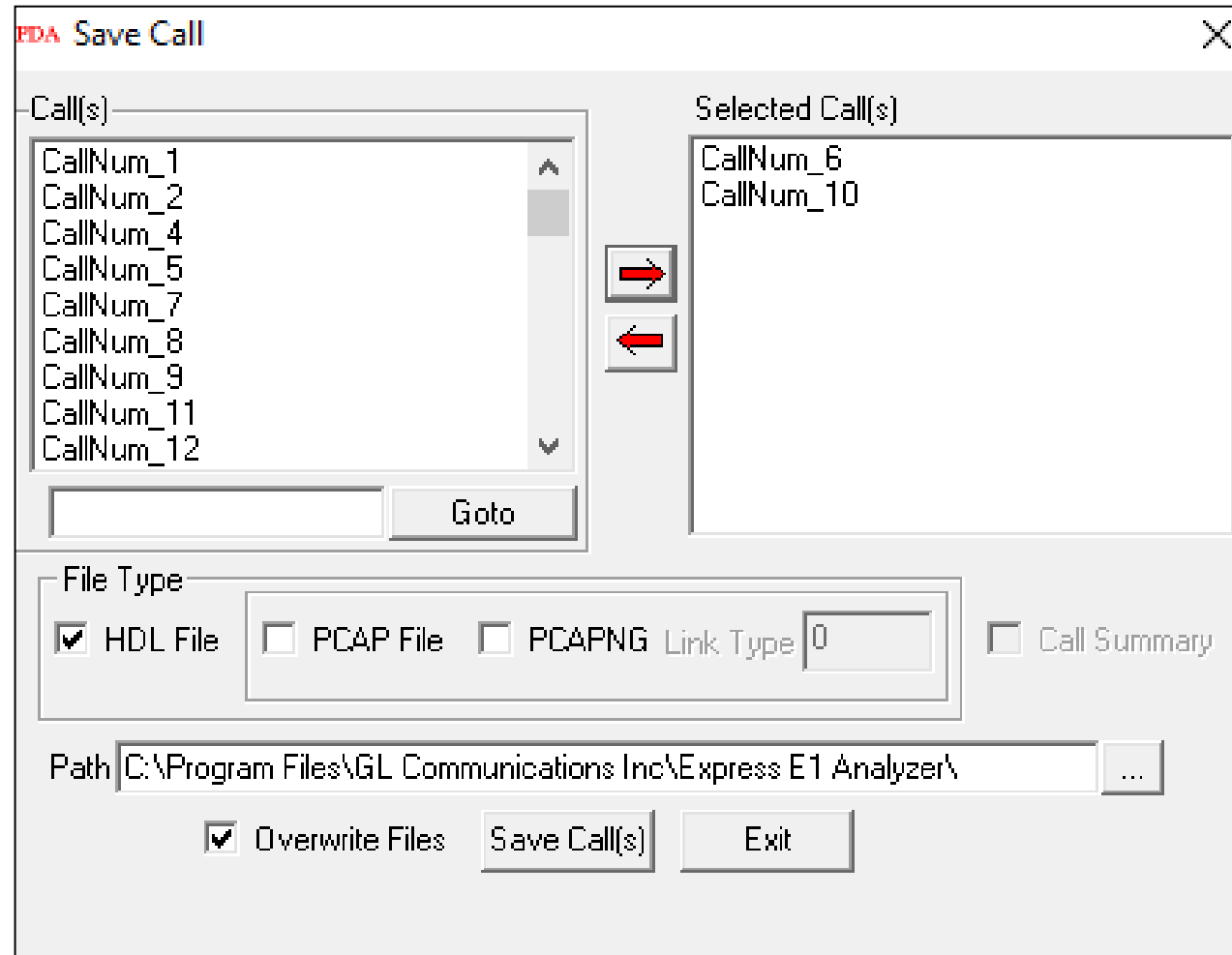


# Triggers and Action Settings



# Save Call to File

- Allows the users to save the filtered files either in \*.HDL, \*.PCAP, or \*.PCAPNG format



# Audio Recording

- Allows to save the filtered files as the voice files in \*.wav format

Action

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

Audio Recording Options

Audio File Name Mask

%\_ %Y\_ %M\_ %D\_ %h- %m- %s.wav

Audio Files Destination Directory

\\GL Communications Inc\

...

Audio Mixing Options

☒ Mix ☐ Stereo ☐ To Separate Wave File

Create File Options -- If File Exists

☒ Overwrite ☐ Skip Operation ☐ Append Sequence Number

# Send e-mail

- With this option, the Packet Data Analyzer sends an e-mail containing useful information about each filtered call

The screenshot shows a configuration window for the Packet Data Analyzer. On the left, under the 'Action' tab, a list of actions is shown with checkboxes: 'Save Call', 'Audio Recording', 'User Defined', 'Send e-mail', 'Alert Summary', 'Call Detail Record', and 'Extract Fax Image'. The 'Send e-mail' option is checked. On the right, the 'Audio Recording Options' section is expanded, showing the 'Audio File Name Mask' as '%I\_%Y\_%M\_%D\_%h-%m-%s.wav' and the 'Audio Files Destination Directory' as '\\GL Communications Inc\\'. Below this, the 'Audio Mixing Options' section shows three radio buttons: 'Mix' (selected), 'Stereo', and 'To Separate Wave File'. At the bottom, the 'Create File Options -- If File Exists' section shows three radio buttons: 'Overwrite' (selected), 'Skip Operation', and 'Append Sequence Number'.

Action

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

Audio Recording Options

Audio File Name Mask

%I\_%Y\_%M\_%D\_%h-%m-%s.wav

Audio Files Destination Directory

\\GL Communications Inc\\ ...

Audio Mixing Options

☒ Mix ☐ Stereo ☐ To Separate Wave File

Create File Options -- If File Exists

☒ Overwrite ☐ Skip Operation ☐ Append Sequence Number

# Alert Summary

- With this option, the user can set the alarm type and alarm message for the selected triggering type

Action

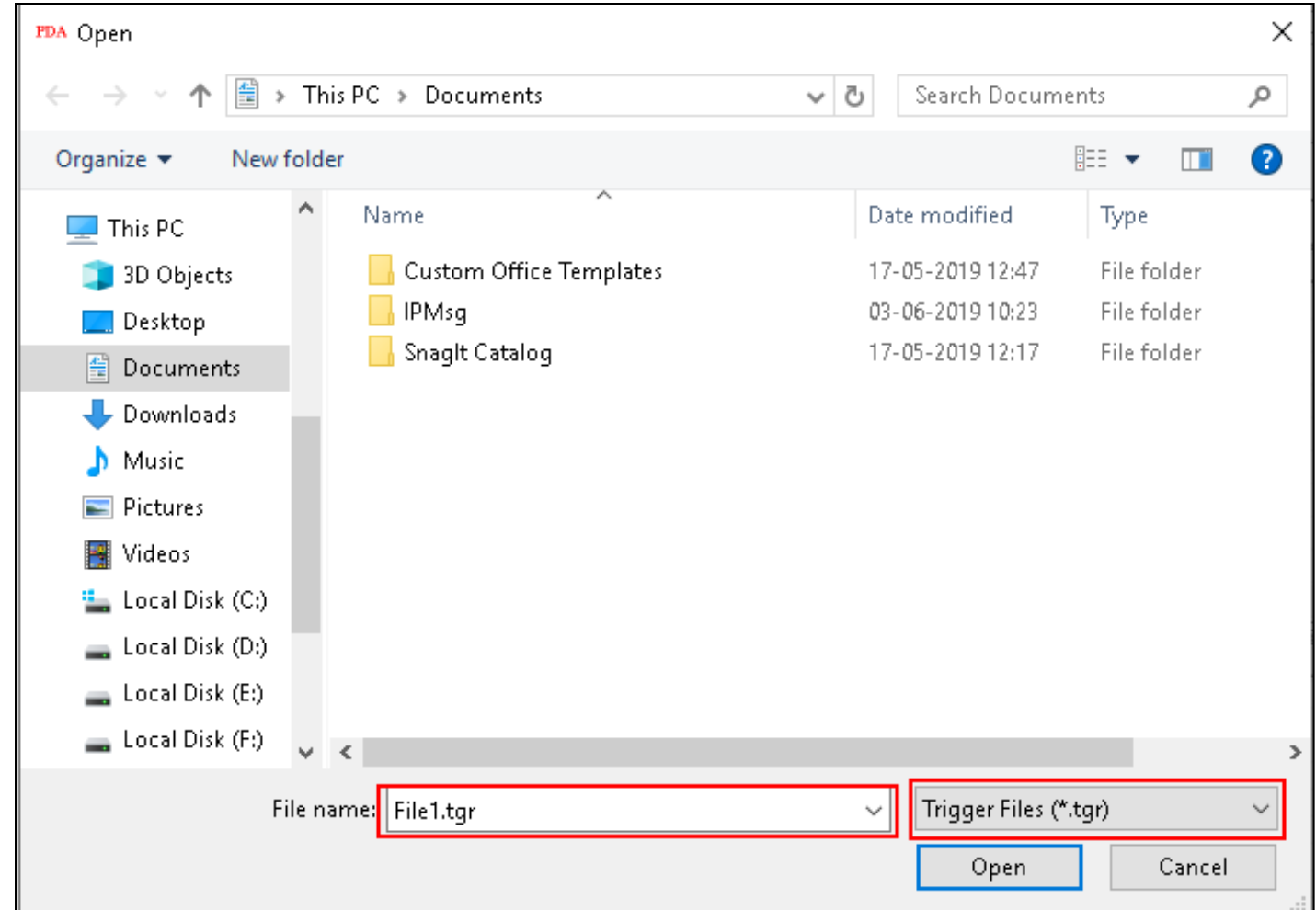
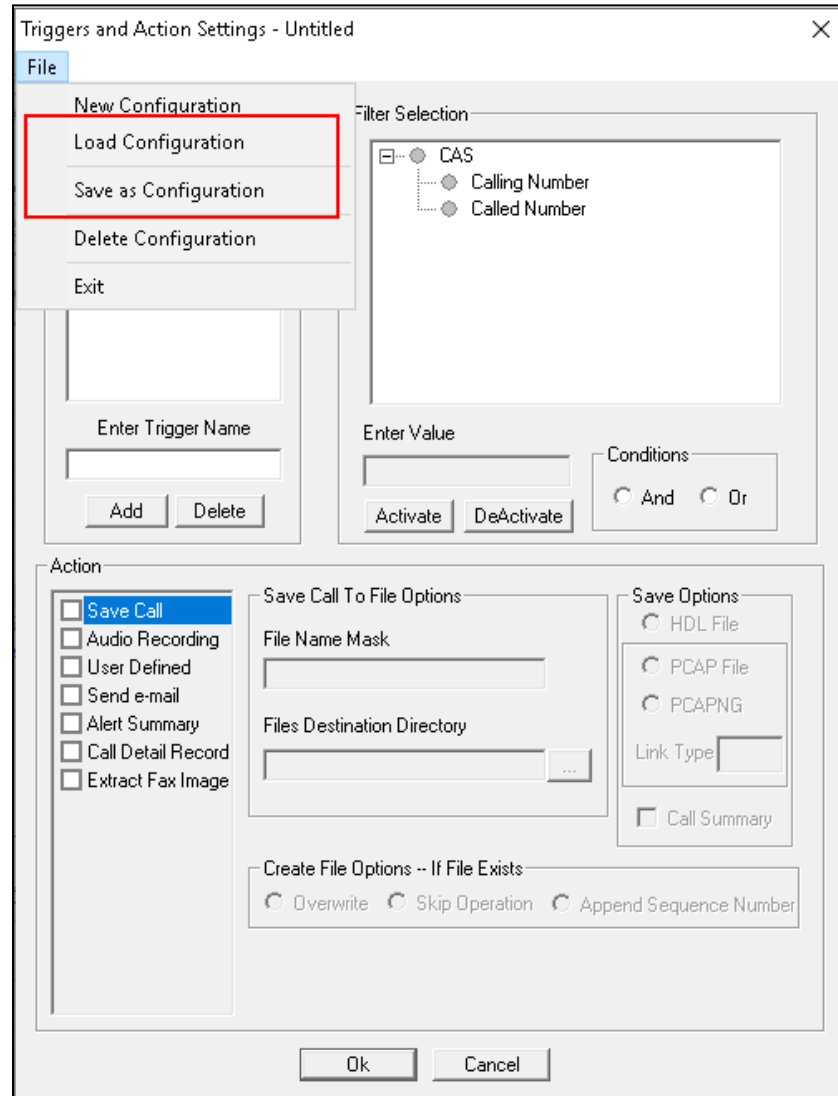
<input checked="" type="checkbox"/> Save Call	Alarm Type	Warning
<input type="checkbox"/> Audio Recording		
<input type="checkbox"/> User Defined	Alarm Message	Triggers at the specified value
<input type="checkbox"/> Send e-mail		
<input checked="" type="checkbox"/> Alert Summary		
<input type="checkbox"/> Call Detail Record		
<input type="checkbox"/> Extract Fax Image		

# Call Detail Record (CDR)

- With this option, the Packet Data Analyzer can output call detail records (CDR) in the form of three Comma Separated Value (CSV) files such as Call Side Record, Call Master Record, and Call Events

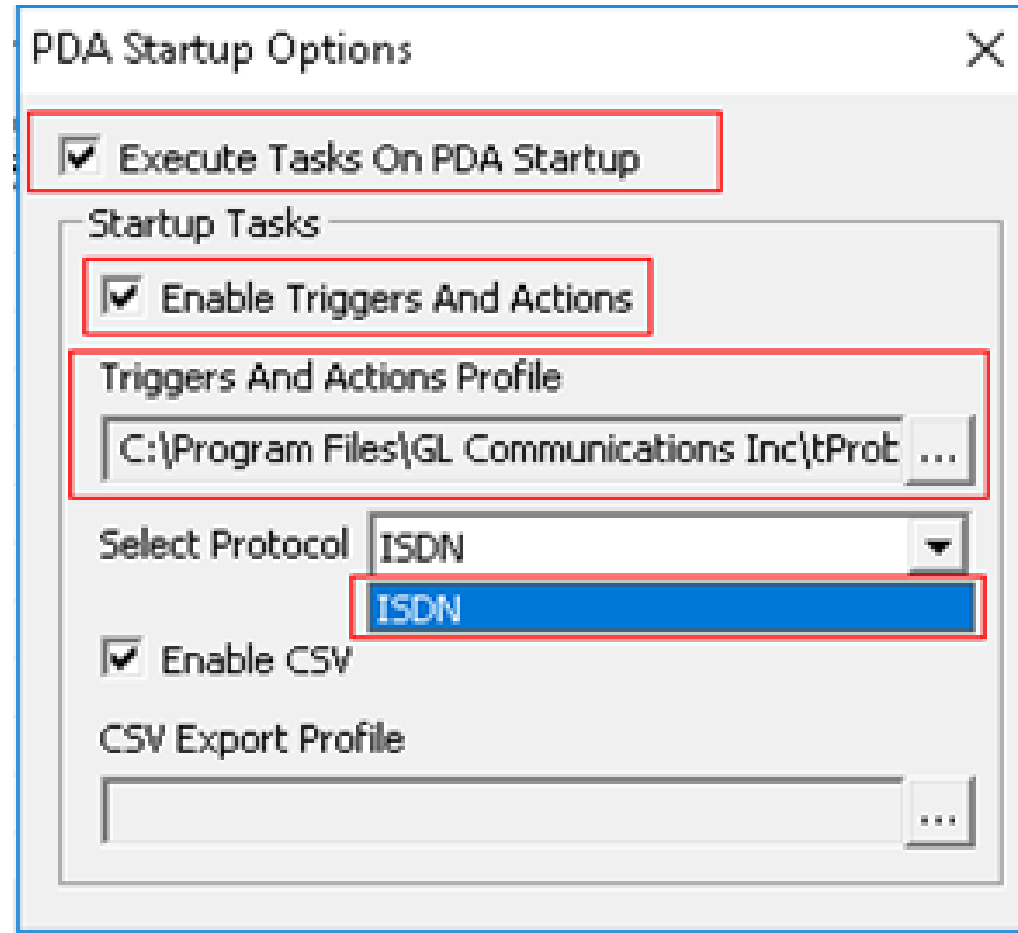
The screenshot shows a software configuration window titled "Action". On the left is a vertical list of actions, each with a checked checkbox: "Save Call", "Audio Recording", "User Defined", "Send e-mail", "Alert Summary", "Call Detail Record", and "Extract Fax Image". The "Call Detail Record" option is highlighted. To the right of this list, there are several configuration options. A "Probe Name" field contains the text "TDMProbe". Below it, three checkboxes are checked: "Call Side Record", "Call Master Record", and "Call Events Record". Further down is a section for "CSV Files Destination Directory" with a text field containing "C:\Program Files\GL Communications I" and a browse button "...". Below this is a checked checkbox for "Use Sub Folders". Underneath is a "Folder Prefix" field with "TDMCaptures" and a "Create Subfolder Every" dropdown set to "1" with the unit "hr". At the bottom is a section titled "Create File Options -- If File Exists" containing three radio buttons: "Overwrite" (selected), "Skip Operation", and "Append Sequence Number".

# Load or Save Configurations



# PDA Startup Options

- Allows user to configure start-up tasks which will be started automatically whenever PDA is launched
- Loads the selected Triggers and Actions profile while invoking PDA



The screenshot shows a dialog box titled "PDA Startup Options" with a close button (X) in the top right corner. The dialog contains several configuration options:

- ☒ Execute Tasks On PDA Startup
- Startup Tasks
  - ☒ Enable Triggers And Actions
  - Triggers And Actions Profile
    - C:\Program Files\GL Communications Inc\tProt ...
  - Select Protocol
    - ISDN
    - ISDN
  - ☒ Enable CSV
  - CSV Export Profile
    -

Thank you