Protocol Analysis and Emulation T1 E1 T3 E3 Optical



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 - ISDN Emulator
 - MLPPP Emulator
 - Multilink Frame Relay Emulator
 - Inverse Multiplexing over ATM
 - ➤ MAPS[™] TDM Simulators
 - CAS Simulator
 - FAX Simulator
 - SS1 Dialer



TDM, Wireless, and VoIP Protocols



- GL Communications provides a host of analyzers and simulators for testing a variety of protocols
- Analysis can be done both in real-time and off-line



Protocol Analysis over T1 E1

- Physical Layer Analyzer
- ATM with Inverse Multiplexing
- Multilink PPP
- Multilink Frame Relay
- SS7
- ISDN
- HDLC
- E1 Maintenance Data Link Playback
- T1 Facility Data Link Playback
- CAS



Protocol Analysis over T3 E3

- ATM with Inverse Multiplexing
- Multilink PPP
- Multilink Frame Relay
- HDLC



Protocol Analysis over Optical

- ATM
- PPP over SONET (PoS)
- OC-3/OC-12/STM-1/STM-4 Transparent Payload
- Channelized access for T1 E1 T3 E3
- (For processing ISDN, SS7, CAS and other channelized protocols)



Non-Intrusive Line Monitoring (Monitor and Bridge Modes)



- Bridge and Monitor modes are used for non-intrusive monitoring on T1/E1 connection
- Example Applications : Capture and Dialed digits, Call Capture & Analysis, Automated record playback, Playback from file, Protocol Analysis, and many more



Intrusive Line Monitoring



CPE = Customer Premise Equipment CSU = Channel Service Unit

Example Applications:

• BER Testing, Transmit Tone, Gaussian Noise, Transmit Multi frames, Signaling Bits, Error Insertion, Delay Measurement, Protocol Emulation



T1 E1 Platforms



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



Dual T1 E1 Express (PCIe) Board



Quad / Octal T1 E1 PCIe Card

tScan16™ with 16-port T1 E1 Breakout Box





LightSpeed1000[™] Platform



OC3 / OC12 PCle Card LightSpeed1000 ™



USB T3 E3 Platform



Portable T3 E3 Analyzer Unit

Communications

T3E3 Analyzer

Protocol Analysis and Emulation

- ATM Analysis and Emulation
 - > ATM IMA Analysis
 - ATM IMA Emulator (GUI Based)
 - Client-Server based ATM IMA Emulation module
- Multilink Frame Relay Analysis and Emulation
 - Frame Relay Analysis
 - Multilink Frame Relay Emulator (GUI Based)
 - Client-Server based MFR Emulation module

- Multilink PPP Analysis and Emulation
 - > MLPPP Analysis
 - MC-MLPPP Emulator (GUI Based)
 - Client-Server based MLPPP Emulation module
 - ➤ MLPPP Conformance using MAPS[™]
- SS1 Analysis and Emulation
 - SS1 Signaling Analysis
 - SS1 Emulator (Dialer)



Protocol Analysis and Emulation

- SS7 Analysis and Emulation
 - SS7 (ISUP, MAP, INAP, CAP) Analysis
 - ➢ ISUP, MAP, INAP, CAP, IUP Emulator using MAPS™
 - SS7 Conformance using MAPS™
- ISDN Analysis and Emulation
 - ISDN and LAPD Analysis
 - ISDN Emulator (GUI)
 - Client-Server based ISDN Emulation module
 - ➢ ISDN and LAPD Emulator using MAPS™
 - ➢ ISDN and LAPD Conformance using MAPS™

- HDLC Analysis and Emulation
 - HDLC Analysis, Playback, Impairment, Tx and Rx Utility
 - Client –Server based HDLC Emulation modules
 - CAS Analysis and Emulation
 - CAS Analysis
 - CAS Emulation using (GUI Based)
 - DTMF, MF, MFC-R2 Emulation using GUI and Client-server



Protocol Analysis and Emulation

- GSM Analysis and Emulation
 - GSM Analysis
 - ➤ GSM A Emulator using MAPS[™]
 - ➤ GSM Abis Emulator using MAPS[™]
- TRAU Analysis and Emulation
 - > TRAU Analysis,
 - Traffic Playback, TRAU ToolBox
 - TRAU Tx/Rx Test (GUI Based)
 - Client-Server based TRAU Emulation modules
- T1 Facility Data Link
 - Facility Data Link Analysis
 - Facility Data Link Playback
 - Client-Server based FDL Emulation module

- E1 Maintenance Data Link
 - E1 Maintenance Data Link Analysis and Playback
 - Client-Server based SaBits HDLC Emulation module
- Other Protocol Analyzers
 - ➢ GPRS, UMTS, ATM, CDMA 2000
 - ➢ GR-303, V5.X, DCME
 - Protocol Identifier
 - Traffic Classifier



T1 E1 Physical Layer Analysis

🔀 T1/E1 Physical Layer Protocol Analysis Alarms and Counters												
File	View Cap	ture Statistics Datab	ase Configure	Help								
				¥ ¥4 ¥4 💦	₩₩₽	"_ 0	GoTo					
Dev	Frame#	TIME (Date)	Error	AIS Alarm Status T1/E1 Physical	Carrier Loss Alarm Status T1/E1 Physical	Sync Loss Alarm Status T1/E1 Physical	T1 Blue/E1 Remote Alarm Status T1/E1 Physical	T1 Yellow/E1 Distant Alarm Status 🔺 T1/E1 Physical				
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 ✓ 4 	3	2016-12-21 11:56:57.18	7000	ON	off	ON	ON	off				
√ 5	4	2016-12-21 11:56:57.18	7000	ON	off	ON	ON	off				
√ 6	5	2016-12-21 11:56:57.18	7000	ON	off	ON	ON	off				
√ 7	6	2016-12-21 11:56:57.18	7000	ON	off	ON	ON	off				
√ 8	7	2016-12-21 11:56:57.18	7000	ON	off	ON	ON	off				
 ✓ 9 	8	2016-12-21 11:56:57.18	7000	ON	off	ON	ON	off				
10	9	2016-12-21 11:56:57.18	7000	ON	off	ON	ON	off				
. / 11	10	2016-12-21 11-56-57 18	7000	ΩN	off	ΩN	NN	off				
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AIN F	rame Da	ta ==== T1∕E1 Physi	cal Laver =		=							
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0001	Counter			=	00000101 (5)							
	Sync I	oss Alarm		=	00000000 (0)							
	Sync 1 Carrie	oss Alarm Status n Toss Alarm	3	=	00000001 ON 00000001 (1)							
	Carrie	r Loss Alarm Sta r	tus	=	000000000 off							
	T1 Blu	e∕El Remote Alaı	ĩm	= 00000010 (2)								
	T1 Blu	e∕El Remote Alar	m Status	=	00000001 ON							
	T1 Yel	low/E1 Distant A	larm	=	00000011 (3)							
	LI YEL	low/El Distant #	larm Status	s =	UUUUUUUU OII 00000100 (A)							
	AIS AI	arm Status		=	000000001 ON							
			m					4				
Runnin	g. Utilizatio	n 0.00%		C:\Program	Files\GL Communicatio	ns Inc Captured 315 84	0 frames					

• The T1 E1 Physical Layer App monitors the T1 E1 Alarms in real-time, converts them to SNMP messages and sends them to the NOC. ON/OFF status in the Physical Layer Analyzer depicts the Alarm/No Alarm state respectively

T1 SNMP Message Generation





Protocol Analyzers



Key Features

- Consolidated GUI displays summary of all decodes, detail & hex-dump view of each frame, statistics view, & call detail record views
- Perform real-time / offline / remote analysis
- Supports various protocol standards for proper decode
- Fine tune results with filtering and search capability
- Export decode results to ASCII or CSV files
- Trace File Saving Options
- Statistics Computation
- Call Detail Records
- Advanced capture options (channel selection, CRC, bit reversion, bit inversion, scrambler,...)
- Flexibility to add any protocol fields to the summary view, filtering, and search features
- Network Monitoring
- Remote access capability



Different Views

🔛 ISDN	🕌 ISDN Protocol Analysis Q.93x 64-bit — 🗆 🗙														×		
<u>File</u> <u>V</u> iev	w Captu	re <u>S</u> tatisti	cs <u>D</u> atabase	Call D	etail <u>R</u> ecords <u>C</u> c	onfigure	<u>H</u> elp										
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√ 2	0			5	00:00:00	.379137	6	i i									
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$\sqrt{1}$	0			7	00:00:00	.380175	6	i									~
<																	>
Card1 T	imeSlot	=0 Fram	e=4 at 00	:00:0	0.378362 OK :	Len=46						*** Rig	ght cliq	ck to	SHOW/	HIDE	laye 🔺
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N																	
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A9 83 8	6 6C 08	80 35	35 35 36	30 30	30 70 08 80	Ø	11 05	556000p C									
36 37 3	0 34 37	38 34	7D 02 91	81 A1	14 4F	67	04784	4} 1 0									
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1		13	973		16												
total 1		13	973														
2		13	973														
total 2		13	973														~
Call ID	(Call Status	Calling	Num	Called Num	Ca	ll Start	Date & Time	Call	Duration	Release Co	omplete Cause	DevNo	TS	CRV		Interfe 🔨
i≣†1	C	completed	1 55!	51000	5179641	2019-03	-11 15	:06:49.165250	00:00:00	0.541387	Norm	al call clearing	1	0	1794		
2	c	completed	1 55!	52000	1626921	2019-03	-11 15	:06:49.173825	00:00:0	0.574650	Norm	al call clearing	1	0	2050		
3	C	completed	55	53000	8604110	2019-03	-11 15	:06:49.182400	00:00:0	0.566350	Norm	al call clearing	1	0	2306		
a 4	c	completed	55!	54000	9402951	2019-03	-11 15	:06:49.190887	00:00:0	0.559737	Norm	al call clearing	1	0	2562		
2 5	r	romnleter	1 551	55000	8752706	2019-03	-11 15	·06·49 199575	00.00.0	0 552900	Norm	al call clearing	1	Π	2818		~
<																	>
					C:\	Program I	Files\GL	. Communicatio	ons Inc\U 23	7 946 Frame	25						1



Different Views

- Summary View: This pane displays the columns that contain Card Number, Timeslots, Frame Number, Time, Frame Error Status, Command/Response, Length, Error, C/R, SAPI, CTL, P/F, FUNC, and more in a tabular format
- Detail View: This pane displays in detail about a frame in order to analyze and decode by selecting it in the summary view, the contents of this view can also be copied to clipboard
- Hex Dump View: This pane displays the frame information in HEX and ASCII format, the contents of this view can also be copied to clipboard
- 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



Protocols Standards

ATM Analyzer

UMTS Analyzer



- ATM
 - Please visit <u>http://www.gl.com/atmanalyzer.html</u> for a list of supported protocols & specifications for ATM
- UMTS
 - Please visit <u>http://www.gl.com/umtsanalyzer.html</u> for a list of supported protocols & specifications for UMTS



HDLC Analyzer

GR-303 Analyzer



- HDLC
 - Please visit <u>http://www.gl.com/hdlc.html</u> for a complete list of supported protocols & specifications for HDLC
- GR-303
 - Please visit <u>http://www.gl.com/GR-303analysis.html</u> for a complete list of supported protocols & specifications for GR-303



ISDN Analyzer



- ISDN
 - Please visit <u>http://www.gl.com/isdn.html</u> for a complete list of supported protocols & specifications for ISDN
- SS7
 - Please visit <u>http://www.gl.com/ss7.html</u> for a complete list of supported protocols & specifications for SS7



Frame Relay Analyzer

V5.x Analyzer



Frame Relay

- Please visit <u>http://www.gl.com/framerelay.html</u> for a complete list of supported protocols & specifications for Frame Relay
- V5.x
 - Please visit <u>http://www.gl.com/v5analyzer.html</u> for a complete list of supported protocols & specifications for V5.x



GSM Analyzer

MLPPP Analyzer



- GSM
 - Please visit <u>http://www.gl.com/gsmanalyzer.html</u> for a complete list of supported protocols & specifications for GSM
- MLPPP
 - Please visit <u>http://www.gl.com/pppanalyzer.html</u> for a complete list of supported protocols & specifications for MLPPP



TRAU Analyzer

Sa Bits HDLC Analyzer



• TRAU

- Please visit <u>http://www.gl.com/trauanalyzer.html</u> for a complete list of supported protocols & specifications for TRAU
- Sa Bits HDLC
 - Please visit <u>http://www.gl.com/sahdlc.html</u> for a complete list of supported protocols & specifications for Sa HDLC



GPRS Interface Analyzer



 Please visit <u>http://www.gl.com/gprsanalyzer.html</u> for a complete list of supported protocols & specifications for GPRS Gb Interfaces



CDMA Analyzers



Please visit <u>http://www.gl.com/cdma2000analyzer.html</u> for a complete list of supported protocols & specifications for CDMA2000 variants



CAS Analyzer



 Please visit <u>http://www.gl.com/cas-analysis.html</u> for a complete list of supported protocols & specifications for CAS Analyzer



Real-time Analysis HDLC Based Protocol Analyzers

🔜 Protocol Capture Configuration	
<u>Save Load D</u> efault	
Capture File Options Card & Stream Selection Capture Filter Capture Filter	PORT ACTIONS Port \ TS 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 ✓ ✓ ⓒ ♀ 1 1 2 3 10 1 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 ✓ ※ ⓒ ♀ 1 2 3 4 5 6 7 8 9 10 <th< td=""></th<>
	Data Transmission Rate Single Channel • 64 kbps • 56 kbps • 16 • 24 • 32 • 000



HDLC Based Protocol Analyzers

- Streams can be captured on the selected time slots (contiguous or non-contiguous), subchannels (fractional DS0 to DS1), hyper channels (n x 64 kbps, or 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 played back, analyzed offline, exported to ASCII file, or printed



ATM Based Protocol Analyzers

🕅 АТМ Р	rotocol Analysis	AAL2,5(UNI3.:	1)											
<u>File View</u>) Capture <u>S</u> tatis	ics <u>D</u> atabase	Call Detai	l <u>R</u> ecords	<u>C</u> onfigure <u>H</u>	<u>t</u> elp								
🕋 🖆														
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$\sqrt{1}$	31	0	00:00:	53	Ì	0	0	5	100		Í	ATM-Cell		Card and Time Slot Selection
2	31	1	-00:00:	53		0	0	5	100			ATM-Cell		Card1 Card2
12	31	2	-00:00:	53		100	101	0	110			ATM-Cell		
V 2	31	3	-00:00:	53		100	101	0	110			ATM-Cell		13 🔺 13 🔺
V 2	31	4	-00:00:	53		100	101	0	110			ATM-Cell		14 14
V 2	31	5	-00:00:	53		100	101	0	110			ATM-Cell		15 15
√ 2	31	6	-00:00:	53		100	101	0	110			ATM-Cell		
4 2	21	7	00-00-	ED		100	101	n	110			ATM Call	<u> </u>	
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PT					=		.101.	(5)						23 🔽 23 💌
CLP					=		1	(1)						
HEC	OMM	Tawan			=	011	00100	(100	1)					
TMA 3	Version Valu	e			=	000	00011	ТΜА	vers	ion 1	1		-	User (unchecked) / Network (checked)
IMA		-			=	1		IMA	Conti	rol Pi	rotocol C	ell		
Logio	cal ID for T	x IMA link	. range		=		00000	(0)						
IMA H	Frame Sequen	ce Number			=	83	(x53)							Bit Inversion (1 <-> 0)
Posit Tink	tion of ICP Stuffing In	cell withi diastion/T	n an 11 .ctv	MA fram	1e =	0 ()	xUU) 111	No	inning		uff or a	+		
Stati	sculling in is change in	dication(1	.51)		=	3 0	×03)	NO .		ent st	ull even	ι.		
IMA :	ID				=	2 (x02)							Octet Bit Reversion (MSB <-> LSB)
Group	p State				=	101	0	Oper	ration	nal				
Group	o Symmetry M	ode			=		.00	Sym	netrio	cal co	onfigurat	ion and operati	on	
IMA 1 Trans	rame Length	ode			=		10	M=12 TTC	28 mode				-1	ATM Mapping
	SMIC CIOCK N				-			110	mode					O Direct Mapping All 15
	(1) E				-									C PLCP Clear TS
Hex Dur	np of the Fr	ame Data				<u>н</u>				_				Court Has
00 00 0)0 0B 64 03	80 53 00 0	7 03 02	2 Å2 00	00 00	т.	dı	IS	¢	_				Scrambler
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00 00 0	00 00 00 00	00 00 00 0	0 00 00	0 00 00	00 00		_							
00 00 (JU 00 35						5							Inverse Multiplexing
•													Þ	✓ Inverse Multiplexing IMA Frame Size 128 ▼
Running, U	tilization 0.00%			C:\Temp.	Hdl			Captur	ed 176	383 fram	ies			,



ATM Based Protocol Analyzers

- Captures, decodes, filters, and reassembles AAL2 and AAL5 frames in real-time, from within the ATM cells according to user defined VPI/VCI.
- Streams can be captured on the selected time slots (contiguous or non-contiguous), or full bandwidth
- Supports capturing and decoding of ATM frames with ATM mapping, user/network side, bit reversion, octet bit inversion, and scrambler options
- ATM, CDMA on ATM (A3 A7), and UMTS protocol analyzers now support decoding with the IMA (Inverse Multiplexing over ATM) option
- Supports IMA Frame Length ranging from 32, 64, 128, or 256
- Multiple streams of ATM traffic on various T1/E1 channels can be simultaneously decoded with different GUI instances
- Recorded trace file can then be played back, analyzed offline, exported to ASCII file, or printed



Multilink PPP Analysis

PPP Protocol An	alysis PPP					_		×			
Eile View Capture	Statistics Data	base <u>⊂</u> onfigure <u>H</u> e	lp								
🖻 🖆 🖉			99 W4 W4	ST 🐨 🕱 🚽	- D 朝 ステ PDst	0	G	G Add Bundle Delete Bundle			
Dev TS Su	Frame#	TIME (Relative)	Len	PPP Layer3Prot	M M	LCP Code	IF ▲	Bundle 1 Bundle 2			
√2 1·2	88	00:03:51.552562	21	Link Control		Echo-Reply		Add Link Delete Link			
√ 1 1-2	89	00:03:52.471625	21	Link Control		Echo-Reply		Card 1			
√ 1 1-2	90	00:03:59.839500	21	Link Control		Echo-Request		Timeslot Selection Data Transmission Bate			
✓ 2 1·2	91	00:04:00.791687	21	Link Control		Echo-Request		Single Channel Subchannels 8-56 kbps			
✓ 2 1·2	92	00:04:01.547750	21	Link Control		Echo-Reply					
1 1-2	93	00:04:02.498000	21	Link Control		Echo-Reply		2 0 56 kbps 0 16 1 All			
1 1.2	94	00:04:09.865812	21	Link Control		Echo-Request	_				
•								S S NyE4 kbps S S S			
Card2 TimeSlots=1-2 Frame=88 at 00:03:51.552562 OK Len=21 HDLC Frame Data + FCS Address Ct1 Protocol Cde Code Longth Code Long											
Hex Dump of th +	he Frame Da A 14 00 OF 8	ta +	4C 20 4	Bit Inversion (1 <> 0) Mlppp Options Octet Bit Reversion (MSB <> LSB) Fragment Format Maximum Differential Delay 250 ms							
Running, Utilization 0.0	02%	UnderRuns=1	J	Captured 96 frames	E	rrors 0 CRC, 0 Frame		Selected Links HC 1:131			

Multilink PPP Analysis

- Supports reassembly and decoding of multiple MLPPP bundles simultaneously. Each MLPPP bundle is created by selecting groups of timeslots on various cards
- Capture frames based on MLPPP options such as fragment format (long or short), & maximum differential delay
- Streams can be captured on the selected time slots (contiguous or non-contiguous), subchannels (fractional DS0 to DS1), hyper-channels(n x 64 kbps, or 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, exported to ASCII file, or printed



Multilink Frame Relay Analysis

Fra	me Re	elay Protoc	ol Analysis LAPF									
<u>File</u>	/iew (Capture <u>S</u> t	atistics <u>D</u> atabase	Call Detail <u>R</u> e	cords <u>C</u> onfigu	re <u>H</u> elp						
	<u>•</u> _				🙀 ¥4 ¥4	ser 🚏 🕱	고문고문			GoTo		
Dev	TS	Su Fra	TIME (Relative)	Len	E. DLCI	DE	BECN	FECN	Sequ	. Sequ 🔺		
√2	1-7	12	00:00:17.0930	20	56	0	0	0				
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2	1.7	12	00:00:17.0951	20	40	0	0	0		<u>S</u> ave Load <u>D</u> efault		
$\sqrt{1}$	1.7	12	00:00:17.0973	16	0	0	0	0		Capture File Options		
2	1.7	12	00:00:17.0973	16	0	0	0	0			Add Bundle Delete Bundle	-
$ \downarrow 1$	1.7	12	00:00:17.0993	20	56	0	0	0			Bundle 1 Bundle 2	
<u> √ 2</u>	1.7	12	00:00:17.0993	20	56	0	0	0			Add LinkDelete Link	
	1										Card 1 Card 1 Card 1	
Card	2 Tin	eSlots=	1-7 Frame=129	942 at 00):00:17.09	3000 OK Ler	1=20				Timeslot Selection Data Transmission Rate	
HDLC	Fran	ne Data	+ FCS								TS DS0 bits	
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DE						= (). (Ō)					
BE	CN					=0	. (0)				30 Vixbb Kbps (bits 2-8)	
FE G	CN					=0	(0)					
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	U 16.7	88				ac					□ _ Bit Inversion (1 <> 0) Mfr Ontions	
Ruppip	n. Liitiiz	ation 15.52°	6	C:\Temp.Hc	1	Captured 13	- 8141 frame	<		Maximum Differential Delay 250 ms		
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											Selected Links [HU1:110,HU1:1120,TS 1:2130	
												-


Frame Relay Analysis

- Each MFR bundle is created by selecting groups of timeslots on various cards
- Supports reassembly and decoding of multiple MFR bundles simultaneously. Each MFR bundle will reassemble packets from FR links
- 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, or n x 56 kbps), or full bandwidth (56kbps, or 64kbps)
- Frames may also be captured based on their FCS (16 bits, 32 bits, none), bit inversion, octet bit reversion, user/network side options
- Capture frames based on maximum differential delay
- Recorded trace file can then be analyzed offline, exported to ASCII file, or printed



TRAU Analysis

PA TO ALL	n	TD ALL						
TRAU	Protocol Anal	ysis TRAU					Card and Time Slot Selection	
<u>File Viev</u>	v Capture <u>S</u> t	atistics <u>D</u> ataba	ise <u>C</u> onfigure <u>H</u> elp					
j \min 🧉) <u>, 🖳 🎦 🏅</u>		W, W,	ST 🐨 🕱 🚅 🚚 📴	GoTo	1 2	
Dev	TSlot	SubCh	Frame# TIME (Len	Error TRAU Frame Direction	TRAU Frame Type 🔺		
$\sqrt{1}$	1	1-2	0 00:00:	40	Downlink (Network)	Adaptive Multi-Rate Narrow Bar	01 01	
$\sqrt{1}$	1	1-2	1 00:00:	40	Downlink (Network)	Adaptive Multi-Rate Narrow Bar	02 02	
√1	1	1-2	2 00:00:	40	Downlink (Network)	Adaptive Multi-Rate Narrow Bar	03 03	
√1	1	1-2	3 00:00:	40	Downlink (Network)	Adaptive Multi-Rate Narrow Bar	04 04	
√1	1	1-2	4 00:00:	40	Downlink (Network)	Adaptive Multi-Rate Narrow Bar		
1	1	1-2	5 00:00:	40	Downlink (Network)	Adaptive Multi-Rate Narrow Bar		
√1	1	1-2	6 00:00:	40	Downlink (Network)	Adaptive Multi-Rate Narrow Bar		
√1	1	1-2	7 00:00:	40	Downlink (Network)	Adaptive Multi-Rate Narrow Bar		
$\sqrt{1}$	1	1-2	8 00:00:	40	Downlink (Network)	Adaptive Multi-Rate Narrow Bar 🚽		
	· · · · · · · · · · · · · · · · · · ·							
Card1	TimeSlot=1	. SubChanne	els=1-2 Frame=0	at 00	1:00:00.000000 OK Len=40	A		
HDLC F:	rame Data	+ FCS						
	TR	AU Layer =			= - Halid Even - Come (000000000)	0000000111111111111111111		
Fram Fram	e Sync e Type (Fu	ull Rate 1	16kbps C1-C5)		= 00110 Adaptive Multi-Rate	e Narrow Band Codec (AMR-NB) - F		
Time	Alignment	(C6-C11)	for TAC_AMR		= 00 0000 No change	in frame timing	UpLink(unchecked) / DownLink(checked)	
Req	or Ind Fla	g-RIF (C12	2) for Downlink		=0 Indication (Codec)	Mode)		
Upli:	nk Frame E	Irror-UFE ((C13) (C14, C14)		=1 Uplink Frame receiv	ved without Errors	┌─ Bit Inversion (1 <-> 0)	
Mess	age No (C1	7-C18	(CI4-CI0)		=	rt TFO or TFO is disabled		
Spar	e, reserve	ed for TFO	(C19)		=1(1)		Data Transmission Rate	
Spar(e, reserve	ed for TFO	(C20)		=1(1)		- Subchannels 8-16 kbps	AII TS
A kinami	a Clacetti	Cation Is	2 Tame (121-022	``````````````````````````````````````	= 11 Speech Good	F		
Hey Du	mp of the	Frame Data	•				C	lear TS
+	+	+-	~ +		- +++			
00 00	98 04 8F E	C1 85 4D D0	C B5 AA B5 C0 0	0 80 0	ا Åע≜עÜMاغ]_ا		3	
180 OB 1	DA C3 FD 9	A 86 F2 C7	7 12 80 41 AC 2.	A BC 4	.3 I UAýIIòÇ IA¬*¼C		4 None	
DA US	84 80 BC /	E DU SF			□ □ 1 41° Đ_			
11								
						Þ		
Off-line Vie	ewing		C:\Pr	ogram Fil	es\GI Communications Inc\ 5 556 Frames			

TRAU Analysis

- Frames can be captured on the selected time slots (contiguous or non-contiguous), sub-channels or full bandwidth 32 or 24 channels
- Frames may also be captured based on bit inversion and user/network side options
- Capture and decode TRAU frames such as FR (Full Rate GSM 6.10), HR (Half Rate), EFR (Enhanced Full Rate), AMR(Adaptive Multi Rate), AMR-WB, RIF, O&M, Data at 16 kbps (GSM 08.60) & 8kbps (GSM 08.61)
- Recorded trace file can then be played back, analyzed offline and exported to ASCII file, or printed



E1 Maintenance Data Link Analysis (Sa Bit HDLC)

РАн	DLC P	rotocol A	nalysis LAPD)								
Eile	⊻iew	Capture	Statistics D	atabase <u>C</u> onfigure <u>H</u> e	lp							
	6	1			99 H4 H4	🚮 🌾 🛒 🚽	교᠁	0	GoTo			
Dev	TS.	Su	Frame#	TIME (Relative)	Len	Error C/R	SAPI	TEI	CTL P/F N(S)			
$\sqrt{2}$		0 4-8	0	00:00:00.000000	6	Co	0	0	Super 1			
12		0 4-8	1	00:00:00.042400	6	Co	0	0	Super 1			
1 2		0 4-8	2	00:00:00.084800	6	Co	0	0				
1 2		0 4-8	3	00:00:00.127200	38	Co	0	0	Protocol Capture Configuration			
1 2		0 4-8	4	00:00:00.182400	38	Co	0	0	Save Load Derault			
1 2		0 4-8	5	00:00:00.237600	38	Co	0	0				
1 2		0 4-8	6	00:00:00.292800	38	Co	0	0	Capture File Options			-
I ∎ (î			-	~~~~~~~~~	~	-	^	^	Card & Stream Selection	Card I Ime Slot All Signaling Links		
Card	12 T	imeSlot	=0_SubCh	annels=4-8 Frame	≥=0 at 00		I OK Te	n=6		C TS I Bits	Frames	
HDLC	Fr	ame Dat	a + FCS	0111013-4-0 110.00	5-0 at 00		OK 10	11-0		1 0 N 00011111	0,2,4,6,8	
			LAPD Lay	er ======		=				Signaling Frame Selection		
	R					=0.	Comman	d(Use	2	Even Frames		
TE TE	T					= 0000000	(0)			02 Odd Frames		
C t	1					=01	Superv	isory	,			
Su	per	visory	Function			=00	RR			05 Each 6th Frame		
P/	F					=1	(1)					
N	R)					= 1000110.	(70)		1			
•										09 None		
Hex	Dum	p of th	e Frame	Data								
+	1 0	1 0D 23	E0	++-		- ++-	++			Signaling Bit Selection		
00 0	0 10	1 80 37	EU			1/a				4 A4-A8		
1												
Ruppir	o. Uh	ization 0.5	5%	Cr)Temp Ho	4	Captured 54	7 frames		1		F	
TOGET IN	ig. oc	action one		Jerrempire		Coprored of	7 Homos	J	-11			
										None Delete Selected Dele	ste All	
									11			L _
									11			

E1 Maintenance Data Link Analysis (Sa Bit HDLC)

- Captures stream of Sa Bit HDLC frames on the selected even or odd frames of the E1 multiframe
- Capture HDLC frames on selected frames Sa bits, i.e. bits 4-8 of the non-frame alignment signal
- Operates at 4,8,12,16 or 20 Kbit/s
- Supports inversion/non- inversion of the data
- Recorded trace file can then be played back, analyzed offline and exported to ASCII file, or printed



T1 Facility Data Link (FDL) Analysis

EDL FDI	. Analysis								
<u>File</u>	/iew Option	าร							
	<u>•</u> 🛃						0	GoTo	
Dev	Msg #	Time	Length	Address	Ctrl	From	Туре		Information 🔺
✓2	4	0:00:01.066000	8	x8108	x08 AT&T	CI	Maintanence Request		x22414964 —
✓ 2	5	0:00:01.271400	213	x8108	x08 AT&T	CI	24-hour Performance D	Data	x25084155-64C20001-00020003-3300000
2	6	0:00:01.510600	8	xC308	x08 AT&T	NI	Maintanence Request		x22414901
2	7	0:00:01.712400	10	x8108	x08 AT&T	CI	Confirmation		x22084155-01C2
2	8	0:00:01.914600	10	x8108	x08 AT&T	CI	Confirmation		x22084155-4200
2	9	0:00:02.116800	8	xC308	x08 AT&T	NI	Maintanence Request		x22414902
2	10	0:00:02.318600	21	x8108	x08 AT&T	CI	Enhanced Configuratio	on Data	x25084155-E7C20201-00020003-0004000
2	11	0:00:02.523200	12	x8108	x08 AT&T	CI	Errored ESF Response	e	x25084155-43C21234
2	12	0:00:02.725800	8	xC308	x08 AT&T	NI	Maintanence Request		x22414942
2	13	0:00:02.927600	8	x8108	x08 AT&T	CI	Maintanence Request		x2241496E
2	14	0:00:03.130200	75	x8108	x08 AT&T	CI	1-hour Enhanced Perfo	ormanc	x25084155-67C20001-00020003-0004000!
/2	15	0.00.03 344600	37	×8108	x08.AT&T	CI	1-hour Performance Da	ata	x25084155-40C20001-00020003-3300000
									
Card	2 Frame=	4 at 0:00:01	. 066000	OK Len=8					
LAPB	Informa	tion							_
Ad	dress	=	x81						
Co:	ntrol	=	x08						
	Message-	oriented							
	REQUEST	'Maintanence	e Messag	e					
	ĈMD		=	x22					
	Origi	nating Unit	=	I (x41)					
	Targe	et Unit	=	d (x49)					
	REOUE	ST	=	100 (Send	24-hour	ES Pe	rformance Data)	
Fram	e Data +	FCS						/	
+		+	-+	+		+	-+++		
81 0	8 22 41	49 64 F5 F2				i i r	AIdõò		•
						•			
				C:\Progra	m Files\Gl Comm	nunicatio	ns II 224 Frames		



FDL Analysis

- Performs FDL decode and analysis on T1 channels real time and off-line using saved files with High Level Data Link (HDLC) frames and bit-patterned Extended Super Frame (ESF) data link messages
- Captures stream of HDLC frames on the selected cards and embedded bit-patterned ESF data link messages
- Decodes FDL messages based on the AT&T TR54016, ANSI T1.403, T1.408, I.431, G.963 and G.704
- Recorded trace file can then be played back, and analyzed offline



Offline Analysis

	rotocol Analysis X.25								
File View	Capture Statistics Databas	se Configure	e Help						
				29	₩ <u>-</u> C <u>-</u> D ∰.	0 GoTo			
Dev		Framett	TIME (Belative)	Jen	Error				
12	0.23			6	Decode Error				
$\sqrt{2}$	0-23	1	00:00:00.005239	6	Decode Error				
$\sqrt{2}$	0.23	2	00:00:00.010479	38					
1 2	0-23	3	00:00:00.015890	6	Decode Error				
V 2	0-23	4	00:00:00.021135	6	Decode Error				
12	0-23	5	00:00:00.026380	6	Decode Error				
12	0-23	6	00:00:00.031625	11					
√ 2	0-23	7	00:00:00.036895	15			-		
L ()	0.00	0	00.00.00 040107	<u></u>	DJ- F				
Card2 T: HDLC Fra	imeSlots=U-23 Frame ame Data + FCS	=U at UU	: 00 : 00 . 00000	U OK Le	n=6		_		
======	====== LAPB Layer =			=					
Addres	SS			= 000	00 C. D:/WI	DUWS\system32\cmd.e	xe		
Ct1	vicent Eurotien			=	Microso	ft Windows XP [Ve	rsion 5.1.20	6001	
P/F	visory function			=	(C) Cor	yright 1985-2001	Microsoft Co	orp.	
N(R)				= 000					
DTE	====== X.25 Layer =			=	D:∖>cd	D:\Program Files\	Gl Communica	ations Inc\Hdlc Analyzer	
Prote	ng DCE gata packet . Scol Identifier	Iormat		= 1 (vol l				
Gener	ral Format Id, Logi	cal Chan	nel _group n	umber =	D:\Prog	ram Files\Gl Comm	unications 🗌	Inc\Hdlc Analyzer>hdlcprot	hdlc\Isdr
??? In	valid frame/packet	structur	e	= Fra	me DL				
??? In	valid frame/packet	structur	e	= Fra	me				
					D:\Prog	ram Files\Gl Comm	unications .	Inc\Hdlc Analyzer>	
Hex Dump	p of the Frame Data								
00 01 0;	+		+	- +					
				1					
Off-line View	ling		C:\Program Files\G	I Communic	ations Ir 526 Frame				

- Off-line analysis is equivalent to transmitting/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



Filters – Display Filter



- Isolate certain specific frames from all frames in real-time as well as offline
- Filter applies to the captured frames and is based on the data link and other decoded protocol field values



Filters - Real-time Capture Filter HDLC Based Protocol Analyzers

Capture Filter		
<u>Save Load D</u> efault		
Capture File Options Card & Stream Selection Capture Filter Gui & Protocol Options	Space Delimited Length List to Exclude 57 Exclude FISU Exclude FISU Exclude LSSU	

- 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 - Real-time Capture Filter ATM Based Protocol Analyzers

Capture Filter	
<u>S</u> ave Load Default	
Save Load Default	ATM Layer Idle Cells Capture when checked AND / OR AND OR VPI list VCI list PT 000 Select ALL 010 011 Clear ALL

• Real-time filter for ATM based protocols is done by entering the VPI and VCI values



Search Options



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



Sample Filtering Criteria From Screen Selection

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



Sample Search Criteria From Screen Selection

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



Communications

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Statistics

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

Statistics
Field Names
Selected Statistic Information Image: Layer Field Name Use Type Statistic Type Remove Sel Physical Device # Total Total Remove All Physical Time Stamp Field Frame Count Remove All LAPD C/R Total Apply



Reassembly Option in ATM Analyzers

- Specify VPI /VCI values to reassemble as per the segmentation and reassembly rules defined by the specified AAL type
- ATM cells not satisfying the user specification will be reassembled as per the default specification

Reassembly Options		_ 🗆 🗵
Save Load Default		
Capture File Options Card & Stream Selection Capture Filter Reassembly Options Gui & Protocol Options	Explicit AAL VPI/VCI specifications AAL VPI Ranges VCI Ranges AAL2 any any AAL3,4 any any AAL5 any any AAL0 any any AAL0 any any AAL0 any any AAL0 any any Add AAL VPI / VCI Ranges VPI AAL1 VPI AAL2 VI Add VCI	



Call Detail Records

	N Protocol Anal	ysis 4ESS													<u> </u>
<u>Eile Vi</u>	ew Capture <u>S</u>	tatistics <u>D</u> ata	base – Call Detail	<u>R</u> ecords	<u>C</u> onfig	gure <u>H</u> elp									
	• 🚹 🛃) 🛃 🖳		. 👷	W, W	🖌 🛐 🍞 S	x <u></u>	D H)) PDA	0		Gol	Го			
Dev	TSlot SubC	h Frame#	TIME (Relative)	Len	Error	C/R		SAPI	TEI	CTL	P/F	N(S)	N(R)	FUN	C 🔺
$\sqrt{2}$	0-23	0	00:00:00.000000	47		Response(Us	er), Comm	0	0	Infor	0	16	26		
$\sqrt{2}$	0-23	1	00:00:00.005458	6		Command(Us	er), Respo	0	0	Sup	0		27	RR	
12	0-23	2	00:00:00.010703	11		Command(Us	er), Respo	0	0	Infor	0	55	39		
V 2	0-23	3	00:00:00.015974	16		Command(Us	er), Respo	0	0	Infor	0	56	41		
42	0.22	4	00-00-00 021268	10		Command(La	or) Doopo	0	n	Infor	n	E7	40	l l	Ě
<u> </u>			, ,												<u> </u>
Call ID	Call Status	Calling Num	Called Num		Call Star	t Date & Time	Call Du	Iration	Releas	e Comple	te Cause	DevNo	TS	CRV	
*©"0	completed	6697651000	3622251234	2002-04	4-08 14:(53:24.015411	00:00:00.26	53916	N	lormal cal	l clearing	2	0	237	
* @'1	completed	6697651000	3622251234	2002-04	4-08 14:0	53:24.068354	00:00:00.26	59213	N	lormal cal	l clearing	2	0	238	
* 🗃 2	completed	6697651000	3622251234	2002-04	4-08 14:0	53:24.142375	00:00:00.28	85750	N	lormal cal	l clearing	2	0	239	
; _,3	completed	6697651000	3622251234	2002-04	4-08 14:	53:24.242770	00:00:00.28	85744	N	lormal cal	l clearing	2	0	240	
* ⊜′4	completed	6697651000	3622251234	2002-04	4-08 14:6	53:24.295697	00:00:00.30	06890	N	lormal cal	l clearing	2	0	241	
75	active	6697651000	3622251234	2002-04	4-08 14:(53:24.348645	00:00:03.46	69848	N	lormal cal	l clearing	2	0	242	
76	active	6697651000	3622251234	2002-04	4-08 14:0	53:24.401557	00:00:03.41	16937			x00	2	0	243	
7	active	6697651000	3622251234	2002-04	4-08 14:0	53:24.491406	00:00:03.32	27088			x00	2	0	244	
`₹*	active	6697651000	3622251234	2002-04	4-08 14:0	53:24.544406	00:00:03.27	74088			x00	2	0	245	
79	active	6697651000	3622251234	2002-04	4-08 14:0	53:24.623687	00:00:03.19	94807			x00	2	0	246	
⊖'10	completed	6697651000	3622251234	2002-04	4-08 14:	53:24.676583	00:00:00.20	69843	N	lormal cal	l clearing	2	0	233	
<u>@</u> '11	completed	6697651000	3622251234	2002-04	4-08 14:	53:24.718895	00:00:00.27	75203	N	lormal cal	l clearing	2	0	234	
<u></u> ⁽¹²⁾	completed	6697651000	3622251234	2002-04	4-08 14:(53:24.766572	00:00:00.29	96307	N	lormal cal	l clearing	2	0	235	
<u></u> ⁽¹³⁾	completed	6697651000	3622251234	2002-04	4-08 14:(53:24.824776	00:00:00.29	96093	N	lormal cal	l clearing	2	0	236	
<u>@</u> 14	completed	6697651000	3622251234	2002-04	4-08 14:(53:24.909317	00:00:00.28	53958	N	lormal cal	l clearing	2	0	237	
<u>@</u> 15	completed	6697651000	3622251234	2002-04	4-08 14:(53:24.962270	00:00:00.26	59260	N	lormal cal	l clearing	2	0	238	
<u>)</u> 16	completed	6697651000	3622251234	2002-04	4-08 14:(53:25.036296	00:00:00.2	85802	N	lormal cal	l clearing	2	0	239	
1 7	completed	6697651000	3622251234	2002-04	4-08 14:(53:25.136708	00:00:00.2	85786	N	lormal cal	l clearing	2	0	240	-
				D:\Prog	ram Files	s\Gl Communica	ations Ir 720 F	rames							

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



Saving options for the trace files

Periodic Trace Saving Options Save Load Default	
Select summary columns to display Menu checked options Protocol standard selection Network/User side selection Time Format View Filter	Using View Filter C All Frames (no filtering) Filtered Dnly (use view filter) Save File Names Save File Names File name prefix File name prefix Save Directory HDL File name suffix Fi
Periodic Trace Saving Options	Date/Time Formatted Names XY%M%D_%H%I IIeNamePrefix_%Y%M%D_%H%I_fileNameCont file name suffix
INI Decode Options	Image: Size Limit e.g. 1048576 or 1024K or 1M Limit Value Image: Size Limit e.g. 1048576 or 1024K or 1M 1000000 Image: Size Limit e.g. 24:00 (HH:MM) 1000000
	Restrict or Recycle After N Files Dptions 2147483647 • Keep N Latest Files • Stop After N Files • Unrestricted

- 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



Data Link Group

- Data link groups that help in defining the direction of the calls in each network and form logical groups comprised of unidirectional (either 'Forward' or 'Backward') data links
- Applicable For SS7, ISDN, GSM, GPRS, Frame Relay, GR-303, CDMA A1 Interface, and V5.x Analyzers only

- Data Li	ink Gro	oup Si	pecifi	icatior	1	
Card	I T	limes	lot	Subo	zh	Add
01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20		00 01 02 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18		0 1 2 3 4 5 6 7	Data Link Group Name East ✓ Forward Link Direction	Odd Cards Even Cards All Cards None
Card	TS	9	ic 🗌	Dir	Data Link Group Name	Dalata Cal
1	0		0	>	West	Delete Sel
2	1		1	<	West	
3	2		0	>	West	Delete All
4	3		1	<	West	
5	0		0	>	East	Default
6	1		1	<	East	
7	2		0	<	East	
8	3		1	>	East	
_						
•						



Define Summary Columns

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





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 figure shows sample aggregate column group for HDLC Protocol

Aggregate Summary Columns							_		×]						
Save Load Default																
Select summary columns to di	Add Delet	te Aliases	Rec	order	Reverse	Use '_' in ti	ne name for multil	line headers								
W Protocol standard selection	Name	Display Forma	at	Summ	arv Columns	5		Separator								
Network/User side selection	Group~0	Concat		Sur Sur	pervisory Fur	nction_LAPD		>								
Time Format				TEI	LAPD											
View Filter	Group~1	Y∃ Overlay	as Value		<)_LAPD			0.								
View Search	Group~2		> value		PI_LAPD			a								
TCP Connection Options																
Periodic Trace Saving Options			🛛 🎇 HDL(C Protocol A	Analysis LAPD) 64-bit									- C	ı ×
Startup Options			File Vie	w Captur	e Statistics	Database Co	nfigure Help		lama Lama I		1 11 1		1			
Data Link Grouns			: 🔛 💼			Framett		4 24 SET	Ser 🏋	🗶 그로 및 🔡		GoTc	Supervisory Eurotion	CADI	TEI	N(B) +
F _E View Font Size			Dev	13100	Subern	i idilic#		uvej	Len	choop o	Ellor	LAPD	LAPD	LAPD	LAPD	LAPD
INI Decode Ontions			<u>√</u> 2	0		23546	00:01	19.145525	6	RR> 0			RR	0	0	99
Define Summany Columns			$\sqrt{2}$	0		23547 23548	00:01	:19.145600	ь 11	RR> U 0			HH	0	0	99
			$\sqrt{1}$	0		23549	00:01	:19.146337	6	RR> 0			RR	0	0	72
Aggregate summary Columns			$\sqrt{2}$	0		23550	00:01	:19.146675	6	u RR> 0			RR	0	0	100
Capture Options			2	0		23552	00:01	:19.147487	11	0				0	0	100
			$\sqrt{2}$	0		23553	00:01	:19.147675	6	u RR> 0			RR	0	0	73
			$\sqrt{1}$	0		23555	00:01	:19.148150	6	RR> 0			RR	0	0	74
			<			2355h	THEFT	19 1/9567								>
			Card2 T HDLC F1	TimeSlot rame Dat	=0 Frame= a + FCS	=23546 at 0	0:01:19.145	525 OK Le	∋n=6				*** Right c.	lick to S	HOW/HIDE	3 layer c
			0000 C	 /P	== LAPD I	Layer =====		=	1	Response (II se	r) Comman	d(Network)				
			0000 Sł	API				= 000	0000	(0)	.1 / COMMON	Id(Hetwork)				
			0001 1E	tl .	-			= 000	01	(U) Supervisory						
			0002 St 0003 P/	uperviso: ⁄F	ry Functi	LON		=	0	RR (0)						
			0003 N((R)				= 110	00011.	(99)						
			<													>
			Off-line Vi	iewing.			C	:\Program F	iles\GL C	ommunications In	:\Usb E1 Anal	yzer\HDL_ [*] 27 946 Frame	es			

Configuring INI Decode Options

		Ď SS7Prot.ini - Notepad	
INI Decode Options		Eile Edit Format View Help	
<u>S</u> ave Load <u>D</u> efault		[#PDU_ASSEMBLY] PDU_ASSEMBLY_DLL_NAME.0="ProtCaptSS7SccpXudtAssembly.DLL PDU_ASSEMBLY_PARSE_LEN_VAL_FILTER_LIST =="ALL_EN_32-40	_"
Select summary columns to display	Edit INI C:\Program Files\GI Communications Inc\Usb E1 Analyzer\SS7Prot.ini	[#MAP_VERSION] MAP_VERSION_VALUE = 99 ;MAP_VERSION_VALUE = 4	
Network/User side selection	[#PDU_ASSEMBLY] PDU_ASSEMBLY_DLL_NAME.0="ProtCaptSS7SccpXudtAssembly.DLL"	[#INAP_VERSION] INAP_CS_VERSION_VALUE = 1 ;INAP_CS_VERSION_VALUE = 2	
View Filter	PDU_ASSEMBLY_PARSE_LEN_VAL_FILTER_LIST.0="ALL LEN 32-4096" [#MAP_VERSION] MAP_VERSION_VALUE=99	[#CAMEL_VERSION] CAMEL_VERSION_VALUE = 6	
	[#INAP_VERSION] INAP_CS_VERSION_VALUE=1 [#CAMEL_VERSION]	[#BTNR_PROTOCOL]	
Startup Options	CAMEL_VERSION_VALUE=6 [#BTNR_PROTOCOL] VALUE=1	(#PROTOCOL_DECODE_ITU]	
F_{F_x} View Font Size	[#PROTOCOL_DECODE_ITU] SSNINAP_MIN=12 SSNINAP_MAX=12	SSNINAP_MIN = 12 SSNINAP_MAX = 12 SSNCAP_MIN = 146	
	SSNCAP_MIN=146 SSNCAP_MAX=146 SSNMAP_MIN=147	SSNCAP_MAX = 146 SSNMAP_MIN = 147 SSNMAP_MAX = 147	
	SSNMAP_MAX=147 [#PROTOCOL_DECODE_ETSI] SSNINAP_MIN=12		
	SSNINAP_MAX=12 [#PROTOCOL_DECODE_ANSI] SSNIS41_MIN=147	SSNINAP_MIN = 12 SSNINAP_MAX = 12	
	SSNIS41_MAX=147 SSNTCAP_MIN=146 SSNTCAP_MAX=146	[#PROTOCOL_DECODE_ANSI] SSNIS41_MIN = 147	
		SSNIS41_MAX = 147 SSNTCAP_MIN = 146 SSNTCAP_MAX = 146	_

• INI configuration file enables the user to enter the required custom values depending on the protocol, for example,

show above is a screenshot SS7 protocol decode customization



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

TCP Connection Options	
<u>Save Load D</u> efault	
Select summary columns to display Menu checked options Protocol standard selection Network/User side selection Ime Format View Filter View Search Periodic Trace Saving Options Startup Options Data Link Groups Fr _F View Font Size INI Decode Options Options Capture Options	IP Address (127.0.0.1 Local) IP Port 127.0.0.1 20019 Probe Name P1 Send Call Detail Records Send Traffic Summary Select Frame/Packet Information to be sent over TCP/IP Frame Octets SubCh Status Frame## Time Len Error Error VPI VCI PT HEC 0SF AAL Type Frame Type Frame Type CCP PDU Type MessageType(UNI) Endpoint Ref.Val CRV TypeOfCall



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

Network/User sid	le selection			
Select summary of Menu checked opt Protocol standard Network/User side Save As Save in:	blumns to display tions selection selection Usb E1 Analyzer	 As Captured Inverse Captured User Defined Network Sid 	de Cards/Interfaces (comma d ? × • • • • • • • • • • • • • • • • • • •	lelimited ranges)
A-Law Samp ARP ARP atm Bin2Frame BitFiles F _{F_F} Calldata Com	oles C	CDMA Data Digital Echo Canceller docs dtmf Filter Files FrameRelay GlcView	Gprs Gr303 Gr303 Gsm hdlc_isdn hlp IsdnEmulator MLPPP Mtd Files	
 File name: Save as type: 	HdlcProtAnalyzer.A	cf *.ACF)	Cancel	



CAS Protocols - Capture and Analysis

- Other Supported Applications for CAS Analysis
- Call Capture & Analysis (CCA) application Supports signaling, tones, DTMF / MF/ MFC-R2
- DTMF/ MF / MFC-R2 Detector
- Client-Server Based applications for remote and scripted control of MFC-R2 signaling and digit capture, analysis and other functions such as transmission, and more
- MFC-R2 Digit Analysis (r2ana.exe) DOS application for analyzing R2 tones and signaling



CAS Protocols - Capture and Analysis

Capture DTMF/MF Digits - Ver. 2.1	
Mode Select	Options
Manual Scan for Offhook	Digits Only All Activity
Timeslot 0 Timeout 10 Audible Tones	Detailed Analysis
Timeslot 0 Off Hook Timeslot 0 On Hook Timeslot 0 Off Hook Busy Timeslot 0 On Hook	
Card #1 💌 💿 Stop Sa	ve Clear Options
Capture DTMF/MF Digits - Ver. 2.1	<u>_</u> _×
Capture DTMF/MF Digits - Ver. 2.1	_ D ×
Capture DTMF/MF Digits - Ver. 2.1 Mode Select Manual Scan for Offhook	Options Digits Only All Activity
Capture DTMF/MF Digits - Ver. 2.1 Mode Select Manual Scan for Offhook Timeslot 0 = Timeout 10 = Audible Tones	Options Digits Only All Activity Detailed Analysis Time-stamp
Capture DTMF/MF Digits - Ver. 2.1 Mode Select Manual Scan for Offhook Timeslot 0 : Timeout 10 : Audible Tones	Options Digits Only All Activity Detailed Analysis Time-stamp
Capture DTMF/MF Digits - Ver. 2.1 Mode Select Manual Scan for Offhook Timeslot 0 # Timeout 10 # Audible Tones Timeslot 0 Off Hook (DTMF)5 5 5 1 2 3 4 Timeslot 0 Timed Out	Options Digits Only All Activity Detailed Analysis Time-stamp





SS1 Analyzer

				Shor	t-cut To	xol bar						
	🍰 SS1 Analyzer - #2:0									[
	Configure View Connect Run Results	/										
	Setup Load Save Con	nect Disconn	nect View WCS	Rur	sto	P Real-1	ime From	File	Clear	😵 Help		
(😑 🖌 18:49:51 '23' TS=#2:0 dur=950		Seq#	Channel	Time	ID	Freq	Power	Duration	Tot Pwr	S/N	1
	B 🖌 +0.000 '2' TS=#2:0 dur=425		2-1-01	#2:0	18:49:51	SS1/mark	2601	-8.0	100	-8.0	35	
	+0.000 'SS1/mark' TS=#2:0	dur=100	2-1-02	#2:0	+0.100	SS1/space	2401	-7.9	42	-7.9	21	
	+0.100 'SS1/space' TS=#2:	0 dur=42	2-1-03	#2:0	+0.141	SS1/mark	2601	-8.0	59	-8.0	40	
Tree View 📗	+0.141 'SS1/mark' TS=#2.0	dur=59	2-1-04	#2:0	+0.201	SS1/space	2401	-8.0	224	-8.0	27	
	4 10 201 'SS1/mark 15=#2.0	0 dur=324	2-2-01	#2:0	+0.425	SS1/mark	2601	-8.0	100	-8.0	30	
1	+0.201 551/space 15=#2:	0 dur=224	2-2-02	#2:0	+0.525	SS1/space	2401	-7.9	41	-7.9	23	
4	B +0.425 3 15=#2:0 dur=525	2	2-2-03	#2:0	+0.566	SS1/mark	2601	-8.0	59	-8.0	40	
1	→ +0.425 'SS1/mark' TS=#2:0	dur=100	2-2-04	#2:0	+0.625	SS1/space	2401	-7.9	41	-7.9	24	
	+0.525 'SS1/space' TS=#2:	0 dur=41	2-2-05	#2:0	+0.666	SS1/mark	2601	-8.0	59	-8.0	40	Tone View
	+0.566 'SS1/mark' TS=#2:0	dur=59	2-2-06	#2:0	+0.726	SS1/space	2401	-8.0	224	-8.0	27	
		0 dur=41	1-1-01	#2:0	18:49:47	SS1/mark	2601	-8.0	100	-8.0	35	
	+0.666 'SS1/mark' TS=#2:0	dur=59	✓1-1-02	#2:0	+0.099	SS1/space	2401	-7.9	42	-7.9	21	
	+0 726 'SS1/coace' TS-#2	0 dur-224	1-1-03	#2:0	+0.141	SS1/mark	2601	-8.0	59	-8.0	40	
I	4 19:40:47 '45' TE #2:0 dum 1050	0 001-221	1-1-04	#2:0	+0.200	SS1/space	2401	-7.9	41	-7.9	23	
	H V 10:49:47 45 15=#2:0 dur=1350		1-1-05	#2:0	+0.241	SS1/mark	2601	-8.0	59	-8.0	40	ſ
			1-1-06	#2:0	+0.300	SS1/space	2401	-7.9	41	-7.9	21	
			1-1-07	#2:0	+0.341	SS1/mark	2601	-8.0	59	-8.0	40	
			✓1-1-08	#2:0	+0.401	SS1/space	2401	-8.0	224	-8.0	27	
			1-2-01	#2:0	+0.625	SS1/mark	2601	-8.0	100	-8.0	30	
			1-2-02	#2:0	+0.725	SS1/space	2401	-7.9	41	-7.9	23	
			1-2-03	#2:0	+0.766	SS1/mark	2601	-8.0	59	-8.0	40	
			1-2-04	#2:0	+0.825	SS1/space	2401	-7.9	41	-7.9	24	
			1-2-05	#2:0	+0.866	SS1/mark	2601	-8.0	59	-8.0	40	
			1-2-06	#2:0	+0.925	SS1/space	2401	-7.9	41	-7.9	23	
			1-2-07	#2:0	+0.966	SS1/mark	2601	-8.0	59	-8.0	40	
			1-2-08	#2:0	+1.026	SS1/space	2401	-7.9	41	-7.9	24	
			1-2-09	#2:0	+1.066	SS1/mark	2601	-8.0	59	-8.0	40	
			1-2-10	#2:0	+1.125	SS1/space	2401	-8.0	224	-8.0	27	
			<								>	2
			Rea	idy		Save to CSV F	ile		06/1	7/10 06:56	:04 PM	



Key Features

- Analyzer can capture either TDM or audio signals
- Analyzer can analyze either 2-digit or 3-digit dial codes
- Analyzer displays received dial codes, including the characteristics of the underlying tones
- Save analyzer results to Microsoft® Access and Microsoft® Excel file formats
- Operate the SS1 Analyzer either remotely from the data acquisition site, or on the local PC



Protocol Simulation



Supported Protocols

- ATM with Inverse Multiplexing
- Multilink Frame Relay
- Multilink PPP
- HDLC
- SS7 (ISUP, INAP, MAP, CAP, IUP)
- ISDN, LAPD
- GSM
- TRAU
- CAS
- SS1
- E1 Maintenance Data Link Playback
- T1 Facility Data Link Playback



HDLC Playback

- Transmits HDLC frames in the pre-recorded files over T1/E1 channels
- Provides the option to reverse or inverse bits in the selected data during transmission
- Frames can be transmitted on selected time slots (contiguous or non-contiguous), sub-channels or full bandwidth

ransmit HDLC			
ard1		Add Delete	
Time Slots			
00 01020304 0506070809	1011121314151617181920	2122232425262728293031	
Playback File			
C:\Program Files\GI Communi	cations Inc\Usb E1 Analyzer\hdl	c_isdn\lpOverLapd.HDL	Browse
Continuous Play	.imit		
	Hyper-Channel	Single Channel	Dite
Fevert Bits (msb->lsb)	C Ny64 Kbps	C 6/ Kbos	1
Invert Bits (Complement)	45. HW04 KDps	1 04 Kbps	2
Flags Between Frames	Nx56 Kbps (Bits 1-7)	C 56 Kbps (1-7)	4
- Unwood Exactional Dit			5
	C Nx56 Kbps (Bits 2-8)	C n x 8K.	7
Transmission On All Sciented	Carda		
Transmission on Air Selected	Transmitted 13 out of 18	Frames	
Start Abort			



HDLC Tx Test

eterministic Frame Length with Fixed Flags	C Random Variable Frame Length Bucket: Define Buckets			
 2 Octets Fixed without FCS 6 Octets Fix 	Probability % Min_Length Max_Length	Len Probability %	Min Length	Max Length
/aiable Incremental with FCS		20	- 10	
Vinimum Length Maximum Length		30	40	1
- Flags Between Frames -		50	60	-
	64k channels Ports: 2 Ts: 5-8			
tput HDL File to Save Frames to Browse Continuous Play	Port, Timeslot and Bandwidth Selection	Bucket minimum length of rando	om length string: 78000, mus	t be <= max
· · · · · · · · · · · · · · · · · · ·	Chart Chart Chart Chart		Deriver Deriver	Const 1

- Generates HDLC test frames, and transmits them over T1/E1 or records them to an HDLC file for subsequent use with other applications
- Provides options to define random frame length value with a probability of 100
- The probability can be defined in terms of percentage (100%)
- Different types of frame length values can be defined by distributing the Probability (100%)



HDLC Rx Test

Dev	TS	SC	Туре	Frames	Err->	Total	Frame	FCS	
1	21		2	0		0	0	0	
1	22		2	0		0	0	0	
1	23		2	0		0	0	0	
2	0		2	1089		866	426	440	
2	1		2	1083		857	435	422	
2	2		2	1062		863	413	450	
2	3		2	1106		881	417	464	
2	4		2	1082		863	414	449	
2	5		2	1106		890	441	449	
2	6		2	1094		888	452	436	
2	7		2	1065		879	444	435	
2	8		2	1090		857	443	414	
2	9		2	1090		861	435	426	
2	10		2	1090		871	446	425	
2	11		2	1073		864	455	409	
2	12		2	1070		838	418	420	
2	13		2	0		0	0	0	
2	14		2	0		0	0	0	1
2	15		2	0		0	0	0	
2	16		2	0		0	0	0	
2	17		2	0		0	0	0	

• Receive frames in real-time over T1/E1 or can verify an off-line HDL file for correct frame order and data integrity



E1 Maintenance Data Link Playback (Sa Bits HDLC)

Transmit HDLC	>	SA Bit Selection	×
Card1 SA bits SA4 SA5 SA5 SA6 SA7 SA4 SA5 SA6 SA7 Start Start	Add Delete HDLC HDLC Invert Bits (Compleme Flags Between Frames 100	Card# Card2 SA Bit Selection SA4 SA5 SA6 SA7 SA8	 Transmit HDLC Transmit Codewords Binary Codeword, e.g. 0101 Left bit is transmitted first Code Word Bits OK Cancel

- Capability to transmit HDLC and/or codewords on E1 line(s)
- Codewords can be specified via user interface
- Continuous transmission or limited transmission for a specified number of bytes
- Provides an option to enable bits inversion and to specify Flags between frames

T1 Facility Data Link (FDL) Playback

Transmit HDLC On Facility Data Link	- 🗆 ×
The Most Significant Bit from file bytes is transmitted FIRS	т —
C Transmit HDLC	
Transmit Raw Data	
Card1 Flags Between Fran 100	nes
Playback File	
alyzer\fdl\All_codeword_messages.hd Browse	
Continuous Play	
Limited 0	
Transmitted 170 out of 270 Bytes	
Start Stop	

- Capability to transmit valid HDLC frames or the raw data from a file of raw (hex) bytes (codeword strings, etc.) directly into the FDL bit stream
- Number of flags between frames may be specified for HDLC transmission
- Continuous transmission or limited transmission for a specified number of bytes



TRAU ToolBox™

7	Trau	ı Tool - GL Com	munication										<u>_ ×</u>
File View Monitor Special Application Help													
ļ	~	🖅 🍕 🤺	1 🗉 🏢		🎨 😵								
×	Sir	no 🛛 Xn Rate	Device No	Channel No	Sub Channel	Direction	Туре	Codec Type	Status	Profile	Impairments	Actions	
-	1	16kbps	1	1	1-2	DownLink	Τx	EFR	Start	Time Alignment	Impair	Terminate	
	2	16kbps	2	1	1-2	UpLink	Rx & Tx	EFR	Start	Time Alignment	Impair	Terminate	
	3	16kbps	1	2	1-2	DownLink	Tx	AMR	Stop	Time Alignment	Impair	Terminate	
	4	16kbps	2	2	1-2	UpLink	Rx & Tx	AMR	Stop	Time Alignment	Impair	Terminate	
	5	16kbps	1	1	3-4	UpLink	Τx	GSM 610	Start	Time Alignment	Impair	Terminate	
	6	16kbps	2	1	3-4	DownLink	Rx	GSM 610	Start	Time Alignment	Impair	Terminate	
		Insert Ad	d Delete	Start All	Stop All								
												NUN	M //

- Supports multiple sessions of Uplink or downlink in 8/16 Kbps
- Supports all speech codec for verification of correct voice transmission which includes GSM codecs such as GSM 6.10(FR), Half Rate (HR), Enhanced full rate (EFR), Adaptive Multi Rate (AMR - Rates 4.75, 5.15, 5.90, 6.70, 7.4, 7.95, 10.2, & 12.2 kbps), Adaptive Multi Rate-Wide Band (AMR-WB –Rates 6,60, 8,85, 12,65 kbps), and the Data codec which includes Data, Data 14.5kbps Sync, and Data 14.5kbps (Extended Data)
- Include the ability to monitor TRAU stream contents using an oscilloscope and spectrum analyzer


TRAU Traffic Generation

Digit/Tone Generation [Stream ID - 3]		Playback From File [Stream ID - 3]
Dig F1 P1 F2 P2 Pwr Twist C = 5 770 -13.01 1336 -13.01 -10.00 0.00 11 2 697 -13.01 1336 -13.01 -10.00 0.00 11 3 697 -13.01 1477 -13.01 -10.00 0.00 11 6 770 -13.01 1477 -13.01 -10.00 0.00 11 4 770 -13.01 1477 -13.01 -10.00 0.00 11 4 770 -13.01 1209 -13.01 -10.00 0.00 11 4 770 -13.01 1209 -13.01 -10.00 0.00 11 4 770 -13.01 1209 -13.01 -10.00 0.00 11 4 770 -13.01 120.00 ms 0ff Time 100 ms	1 2 3 A 4 5 6 B 7 8 9 C × 0 # D LP SP Clear Digit Generation Parameters Sample Rate 8000 /sec Randomize Starting Phase Angle Mix White Noise 10 dB	Audio File Talk Using Microphone [Stream ID] C:\Program Files\GI Communications Inc Talk Continuous Transmission Talk None Dutput Codec Name G. Limit Transmit (Bytes) Dutput Byte Count Limit Transmit (Time) Master Synchronize Operation Master Start Stop Dutput Codec Name AMR_WB Input Codec Name PCM Dutput Codec Name PCM Dutput Byte Count 496000
StartStop		

- Sends tones or digits (DTMF / MF / MFR2 (Fwd/Bkwd)) on established sessions
- Playback From File application supports voice files such as *.wav and *.pcm files
- Real-time voice is generated with the default audio device (microphone)



TRAU Traffic Detection

🛃 Capture Digits	/Tones [Strea	m ID - 4]					Record Data To File [Stream ID - 4]			
Options • Digits Only	C All Activity	Sho	w Latest	Clear			Format PCM (16bit Linear) Native	T Play to Speaker [Stre	am ID - 2]	
TimeStamp 10:40:32.064 10:40:32.458 10:40:33.267 10:40:35.658 10:40:36.052 10:40:39.252 10:40:39.649 10:40:40.458 10:40:40.458 10:40:40.458 10:40:40.458	Type DTMF DTMF DTMF DTMF DTMF DTMF DTMF DTMF	Event 2 6 0 2 6 0 2 6 0 2 6 0 2 6 0 2 6 0 2 6 0 2 6 0 2 6 0 2 6 0 2 6 0 2 6 0 0 2 6 0 0 2 6 0 0 2 6 0 0 2 6 0 0 2 6 0 0 2 6 0 0 2 6 0 0 2 6 0 0 2 6 0 0 2 6 0 0 2 6 0 0 2 6 0 0 0 2 6 0 0 0 0 0 0 0 0 0 0 0 0 0	On 102 105 90 102 105 90 102 105 90 102 105 90 102 105 90 102 105 90 102 105 90 102 105	Power -14.96 -16.66 -15.10 -14.96 -16.66 -15.10 -14.96 -16.66 -15.10 -14.96 -16.66 -15.10 -14.96 -16.66 -15.10	Freq1/Power1 697/-20.16 771/-21.09 947/-18.73 697/-20.16 771/-21.09 947/-18.73 697/-20.16 771/-21.09 947/-18.73 697/-20.16 771/-21.09 947/-18.73 697/-20.16 771/-21.09 947/-10.9	Freq2/Power2 1338/-17.28 1479/-20.00 1346/-22.32 1338/-17.28 1479/-20.00 1246/-22.32 1338/-17.28 1479/-20.00 1246/-22.32 1338/-17.28 1479/-20.00 1246/-22.32 1338/-17.28 1479/-20.00 1246/-22.32 1338/-17.28 1479/-20.00 1246/-22.32 1338/-17.28 1479/-20.00 1246/-22.32 1338/-17.28 1479/-20.00 1246/-22.32 1338/-17.28 1479/-20.00 1246/-22.32 1338/-17.28 1479/-20.00 1246/-22.32 1338/-17.28 1479/-20.00 1246/-22.32 1338/-17.28 1479/-20.00 1246/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 1346/-22.32 14479/-20.00 1246/-22.32 14479/-20.00 1446/-22.32 14479/-20.00 1446/-20.00 14	Audio File C:\Program Files\GI Communications Inc\Usb E1 C:\Program Files\GI Communications Inc\Usb E1 Limit Capture (Bytes) Limit Capture (Bytes) Synchronize Operation Master O Slave	Play Output Codec Name Input Codec Name Output Byte Count Input Byte Count Input Packet Count Input Error Packet Count	Stop PCM GSM610 68480 7410 227 0	
10:40:44.003 10:40:46.446 10:40:46.840 10:40:47.649	DTMF DTMF DTMF	0 2 6 0	30 102 105 90	-13.10 -14.96 -16.66 -15.10	Start	1340/-22.32 1338/-17.28 1479/-20.00 1346/-22.32 Stop Options	Start Stop Output Codec Name PCM Input Codec Name AMR_WB Output Byte Count 511360 Input Byte Count 48739 Input Packet Count 799 Input Error Packet Count 0			

- Capture Digits/Tones application detects digits / tones, and view all activities during capture
- Record data to file application can record the incoming data on a session to a file (*.pcm)
- Play to Speaker application supports playing of incoming voice directly to the system's speaker



TRAU Traffic Playback

- Recorded trace files can be transmitted on specific channels/subchannels
- Data transmission rates supported includes 16kbps and 8 kbps
- Other options include Bit Inversion, Continuous transmission, Limited transmission

Trau Traffic PlayBack
<u>File H</u> elp
Card1 Add Delete Time Slots 00010203040506070809101112131415161718192021222324252627282930
Sub Channel
12345678 16kbps Sub Channels
Playback File C:\Program Files\GI Communications Inc\Usb E1 Analyzer\Trau\Combination of FR (Selected Stream for Transmission from file: Card 1, Channel 1, SuChannel 1, Number of Frames 2924) Image: Continuous Play Image: Limited
Transmit Bits As Invert Bits (Complement)
Transmission On All Selected Cards Start Abort



TRAU Tx/Rx Test

🕲 WCS TRAU En	ulator - AMR_16kbps_	1				<u> </u>					
<u>File Action Help</u>											
🖙 🖬 🤶	8										
Sino Xn B	ate Device No	Channel No	Sub Channel	Direction	Codec Tupe	Status					
0 1645	ne 1	1	1.2	Hollink	AMB	Stop					
1 16kb	os 1	2	1.2	UpLink	AMB	Stop					
2 16kb	os 2	1	1-2	DownLink	AMR	Stop					
3 16кБ	ps 2	2	1-2	DownLink	AMB	Stop					
Add Delete Start Stop											
	<u>Γ</u> Γ	5									
Action TimeAligr	ment Impairment TxRx \	/erification									
		PV param									
Cause Turn					1						
Source Type	ISEUNUM		ype ISEQNUM	<u>•</u>	1						
Source Para	neters	- Sink P	arameters		1						
Order MSB	▼ Length 4 ▼	Order	MSB 🔽 Leng	th 4 💌							
Start 0	Increment 1	Start	0 Increm	ent 1							
- Duration Spe	c		on Spec		1						
Continue	us transmission	0.0	iontinuous Receptio	n							
C Linn II	100		initial factor interesting								
	rames [100		imited frames [100								
C EOF		O E	OF								
	Start Tx		Start Rx								



- Simulates TRAU traffic over Abis and A interfaces
- Can be used to test the backhaul network
- Time Alignment can be applied in the TRAU frames
- Payload traffic generation and verification
- Supports various impairments CRC error, frame duplication, and more
- Provides detailed test (Tx/Rx) results for each TRAU link
- Ideal solution for automated testing using command line scripts



ISDN Emulator

ISDN Emulator		_ 🗆 🗡							
<u>File Functions V</u> iew									
-ISDN Setup Protocol	Variant	Protocol End							
Stop E1:1 Euro ISDN	💌 Belgium	Subscriber							
Stop E1:2 Euro ISDN	▼ Belgium	Switch							
Link Down	Link Up	 L1 Active 							

- Complete solution for testing, troubleshooting, installation and maintenance of devices and networks implementing PRI ISDN
- ISDN configuration includes selection of various ISDN standards, variants and NFAS, and more
- Send/capture PCM voice files, send/detect DTMF/MF digits, and send/detect frequency tones over an established calls

Call Managen	nent: Card #1	l (E1) - Subscr	iber End		
🔲 AutoAnswe	er <u>PlaceCa</u>	ll Trunk	Reset Calls	Card #1 💌	
TimeSlot	Called Nr	Calling Nr	Last Cause	Release Cause	
01. PlaceCall	554000	555000	No answer	No Answer	
02. Connected	554001	555001		Normal clear	
03. Connected	554002	555002		Normal clear	
04. Connected	554003	555003		Normal clear	
05. Connected	554004	555004		Normal clear	
06. Connected	554005	555005		Normal clear	
07. Connected	554006	555006		Normal clear	
08. PlaceCall	554007	555007	Normal	Normal clear	
09. Alerting	554008	555008		Normal clear	
10. Alerting	554009	555009		Normal clear	
11. Connected	554010	555010		Normal clear	
12. Connected	554011	555011		Normal clear	
13. Connected	554012	555012		Normal clear	
14. Connected	554013	555013		Normal clear	
15. Connected	554014	555014		Normal clear	
16. UnAvail	554015	555015		Normal clear	
17. PlaceCall	554016	555016	Normal	Normal clear	
18. AnswerCall	554017	555017		Normal clear	
19. Connected	554018	555018		Normal clear	
20. AnswerCall	554019	555019		Normal clear	
21. PlaceCall	554020	555020	No user resp	No Response	
22. Connected	554021	555021		Normal clear	
23. AnswerCall	554022	555022		Normal clear	
24. Connected	554023	555023		Normal clear	
25. Connected	554024	555024		Normal clear	
26. AnswerCall	554025	555025	Normal	Normal clear	
27. AnswerCall	554026	555026		Normal clear	
28. Connected	554027	555027		Normal clear	
29. AnswerCall	554028	555028		Normal clear	
30. AnswerCall	554029	555029		Normal clear	
31. AnswerCall	554030	555030		Normal clear	
 Link Up 	Euro ISDN Be	lgium Subscriber	Active Calls: 26		

• Call Management screen allows the user to place calls on a single or on all timeslots manually



MC-MLPPP Emulator



- GUI based WCS client, which simulates MC-MLPPP and PPP protocols over T1/E1 links
- Capable of generating and receiving MC-MLPPP/PPP traffic (with or without impairments)
- Traffic source can be sequence number, HDL files (containing packets/frames), flat binary file, user-defined frames (ASCII HEX file), and Ethernet data



- Performs MC-MLPPP as well as PPP simulation
- Supports LCP with the following negotiation options
 - > PPP options: MRU, ACFC, PFC, and Magic Number
 - > MLPPP Options: MRRU, Short/ Long Sequence Fragment Format, & Endpoint Discrimination
 - Multi-Class Options: Multilink Header Format
- Supports following NCP's:
 - > IPCP RFC 1332 and RFC 1877 standards
 - > BCP RFC 3518 standard
 - PPPMuxCP RFC 3153 PPP Multiplexing
- Supports LCP Echo Test at PPP and MLPPP level
- Payload traffic generation and verification (Sequence number, HDL file (containing packets/frames), Flat Binary file, Ethernet traffic, and User defined frames (ASCII HEX file))
- Transmit and receive Ethernet traffic over T1E1 links in bridge or router mode

- Differential link delay insertion between PPP links during transmission
 - User configurable bandwidth using flags
- Supports fragmentation and reassembly at MLPPP level
- Supports various impairments at PPP link layer and MLPPP Layer
- Provides detailed PPP and MLPPP statistics
- Provides detailed test (Tx/Rx) results per class / per link in GUI as well as through log file in command line
- Ideal solution for automated testing using command line scripts
- Support for HDLC framing with CRC16, CRC32 or without CRC
- Supports IP compression
 - RFC 3544 IP Header Compression over PPP
 - RFC 1144 Van Jacobson TCP/IP Compression
 - RFC 2507 IP Header Compression
 - RFC 2508 Compressed RTP



MLPPP Simulation and PPP Simulation

MLPPP View PPP View Action Tx/Rx Verification	Simulation MLPPP PPP	
MLPPP Options Fragment Format Long Sequence Maximum Receive Reconstructed Unit Endpoint Discriminator Class IP Address Address O Maximum Differential Delay 250 ms Multi-Class options Suspendable classes	✓ NCP Network Control Protocol IPCP Ncp Over MLPPP Options Option type IP Address IP Address IP Address IP Address IP Address IP Address	File Action Help MLPPP View PPP View Action Tx/Rx Verification MLPPP View PPP View Action LCP Status NCP Status Tx/Rx Status #11:0-7 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11:1-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11:1-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-1517-18 Close Link UP Tx: Not Transmitting, Rx: Not Receiving #11-18 File Configuration Intervent Tx: Statistics Impairments #120 File CP Transmitting Transmitting, Rx: Not Receiving #120 Set Flags UPP Options: Multiple 236 FIP Options: MED = 236 FIP Options: MED = 234 We could be the transmitting Transmitt



Transmission and Reception Action

MC-MLPPP Emulator	Se MC-MLPPP Emulator	_ 🗆 🗙
File Action Help	File Action Help	
MLPPP View PPP View Action Tx/Rx Venifica #1:1-7 #1:8-14 TX params Source Type SEQNUM Select Links to Add	MLPPP View Action Tx/Rx Verification Add Delete #2:1-7 #2:8-14 TX parameters Source Type Source Type SEQNUM Source Parameters Sink Type Source Parameters Sink Parameters	
Select Link #1:1-7 #1:8-14 NETWORK TRA	Order MSB Start 0 Increment 1 Start 0 Increment Prefix Header Prefix Header <td></td>	
OK Cancel	Payload Len 1500 Payload Len 1500 Multiplex PPP	
Stop Tx Stop All Tx	Start Tx Stop Rx Start All Tx Stop All Rx	



Tx Rx Verification

			Simulation C MLPPP • PPF	,	
LPPP View	PPP View Action T	x/Rx Verification			Devel 1
Link Mana	Transmitted France	Descional France Cabl	Mataland France Cat	MadiCad France Cak	Heset
	I ransmitted Frame	Received Frame Unt	Matched Frame Unt		
++'1. II 7	693	678	678	0	0
#2:0-7	240	338	336	0	0
#2:0-7	346			_	
#2:0-7 #2:14-15, Total	1039	1016	1014	0	U

 Tx Rx Verification is common GUI that shows Tx/Rx results for each class (in case of MLPPP) or for each link (in case of PPP)



MFR Emulator



- GUI based WCS client, which simulates Multi-Link Frame Relay Emulation
- Capable of generating and receiving MFR/FR traffic (with or without impairments)
- Traffic source can be sequence number, HDL files (containing packets/frames), flat binary file, user-defined frames (ASCII HEX file), and Ethernet data



FR Simulation

	in pre sedesee		aidon	
Link Name	Action	Status		
≇1:110	Open	Down		
#1:1120	Open	Down		
#1:2130	Open	Down		
	_			
	Defete			
Add	Defete	Open	Close	
Add	Delete mpairments S	Open Statistics HDLC	Close	
Add .ink Config] I	Defete mpairments S	Open Statistics HDLC	Close	
Add .ink Config I	Delete mpairments S	Open Statistics HDLC	Close Statistics	
Add Link Config I Fragment S	Defete mpairments S station	Den Ditatistics HDLC	Close Statistics lags between Hdlc frames	



MFR Simulation

MFR Emulator - MFR Simulation - U	Untitled	_ 🗆 🗙
Eile Action Simulation Help		
Server Connection Status (
Bundles Status	Link View Action VC Statistics Tx/Rx Verificaition Bundle Config & Statistics	1
1 DOWN 2 No Links	Link Name Action Status	
	#1:15 Open Down	
	#1:1115 Open Down	
	#1:610 Open Down	
	Add Delete Open Close	
	Link Config. Impairmente Statistics HDLC Statistics	
	Fragmentation	
	Fragment Size	
	C UNI NNI Fragmentation	
	C End to End Example to in	
	C End to End Pragmentation	
·		
Bundle ID 3		
Add Delete		
Open Close		



- Performs MFR as well as FR simulation on up to 16 T1/E1 lines; Group FR links to create a MFR bundle with each bundle/link configured with multiple virtual channels for traffic Tx/Rx
- Supports hyper channels with discontinuous (sparse) timeslots
- Dynamically add/remove (open/close) of Frame Relay links without loss in data
- Multiple MFR Bundles/FR links can be created
- Generate and verify end to end traffic on each Virtual Channel
- User configurable FR/MFR packet and fragment size, bandwidth using flags, and maximum link differential delay
- Supports both Interface (UNI and NNI) and End-to-End fragmentation
- Transmit and receive Ethernet traffic over T1E1 links by operating either in bridge or router mode
- Supports various Byte level, Frame level, CRC error, and Frame error impairments at link level
- Ideal solution for automated testing using command line scripts



Client-Server MFR Emulation

Sample script for Transmission and Reception of MFR Frames

🛃 FrameRelay_E1.gls - GLClient															
<u>File E</u> dit <u>V</u> iew Connect Script Log User <u>H</u> elp															
□ ☞ 묘 ∦ ☜ € ⊜ 류 않 □ ☞ 묘 ■ ⋑ ■ ₳ ま ?															
II INTORM TASK 3 "CREATE VC HC #1:131 DLCI I FRAG FORMATEND TO END FRAGSIZE 256";															
inform task 3 "Tx: HC #1:131 DLCI 1 CONT FIXLEN 1500 SEQNUM MSB4";	Fra	me Rela	y Protoco	ol Analys	is LAPF									_	
ОК	<u>File V</u>	jew Cap	oture <u>S</u> ta	itistics <u>D</u>	atabase C	all Detail <u>R</u> e	ecords 🖸	onfigure	e <u>H</u> elp						
inform task 3 "START TX HC #1:131 DLCI 1";			-							2 _c.	.D 🕬	0	CoTo		
II OK						<u>ا التقار</u>	<u></u>		SÉT UF 2		4x- pDa	<u> </u>	<u></u>	<u> </u>	
query task 3;	Dev	TS S	iu	Frame#	TIME (R	elative)	Len	DLCI	DE	BECN	FECN		NLPID	Sequenc	 ^
Task 3:	√ 2	1-31		0	-00:00:00.0	004403	264	1	0	0	0	Unnu	FRF.12 Fragme	0	
Simulation=Frame Relay, Total FR Links=1, Active FR Links=1, Selected Link=1:131, Link Sta	2	1-31		1	-00:00:00.	002935	264	1	0	0	0	Unnu	FRF.12 Fragme	1	
====== HDLC Stats ======, Tx Octets=9159516, Tx Frames=35502, Rx Octets=0, Rx Frames=	2	1-31		2	-00:00:00.	001467	264	1	0	0	0	Unnu	FRF.12 Fragme	2	
Runs=0, Hx Over/Under Runs=0, CRC Error Count=0,	2	1-31		3	00:00:00.	000000	264	1	0	0	0	Unnu	FRF.12 Fragme	3	
Violation Channel Stats ======, Number of VC's on FR Link: '1:131'=1,	2	1-31		4	00:00:00.	001467	264	1	0	0	0	Unnu	FRF.12 Fragme	4	
Volt, DECIFI, IX Frames=5917, IX Frags=35502, HX Frames=0, HX Frags=0, Lost Frags=0, I	2	1-31		5	00:00:00.	002935	228	1	0	0	0	Unnu	FRF.12 Fragme	5	
Malched count-o, Modined count-o, inseried count-o, ideleted count-o	2	1-31		6	00:00:00.	004258	264	1	0	0	0	Unnu	FRF.12 Fragme	6	
															<u> </u>
μ incre should be tragmentation with D=1,E=0 for first tragment, μ = 0 E=0 for in between frequents and B=0. E=1 for last frequent	Card2	? Time?	Slots=:	1-31 F:	rame=0 a	at -00:1	00:00.	00440	I3 OK L∈	en=264					-
AD-0, E-0 for in Detween rayments and D-0, E-1 for fast rayment.	HDLC	Frame	Data - === TA1	+ BCS PF Tave			=		=						
run task "MEBEmulatorE1'TxBx"	EA		LINI	10.9					=	0 (0)				
inform task 1 "SIMULATION FR":	C/F	2							=	0. Ċ	ommand	(User),	Response(Ne	stwork)	
inform task 1 "HC #1:131 FLAGS 100":	DLC E1	I							= 1 (0	100000.	. 0001)			
//inform task 1 'TS #1:131 FLAGS 100'':	DF										1) 0)				
//inform task 1 ''SC #1:131:18 FLAGS 100'';	BEC	CN .							=	.0 (ŏ)				
inform task 1 "ACTIVATE HC #1:131";	FEC	N							=	0 (0)				
//inform task 1 "ACTIVATE TS #1:131";															
//inform task 1 "ACTIVATE SC #1:131:18";	Hex I)ump o:	f the l	Frame 1	Data										
inform task 1 "CREATE VC HC #1:131 DLCI 1 FRAG FORMAT END TO END FRAGSIZE 500";	+	0.2 10	1 00 01		+	00.00	+		- +-	·+	++				
//inform task 1 "CREATE VC TS #1:131 DLCI 1 FRAG FORMAT END TO END FRAGSIZE 500";		. 03 B. 1 00 01	1 80 01 0 00 01	0 00 01 0 00 01	0 00 00		00 00	00 00 NN NN		Ξ					
Winform task 1 "CREATE VC SC #1:131:18 DLCI 1 FRAG FORMAT END TO END FRAGSIZE 500		00 01	0 00 01	0 00 0	0 00 00	00 00	00 00	00 00							
inform task 1 "Ix: HC #1:131 DLCI 1 FRAMES 10 FIXLEN 1500 SEQNUM MSB4";	00 00	00 00	0 00 0	0 00 0	0 00 00	00 00	00 00	00 00							-
Winform task 1 "1x: 1S #1:131 DLCI 1 FRAMES 10 FIXLEN 1500 SEQNUM MSB4";	100-00	1 00 01	0 00 01	n nn ni	n nn nn	00 00	00 00	<u>nn nn</u>							Ì
Promotorm take Linty: NEWTHERTER AND STOLEN THE RAMES TO FIX FREEDOM SETINDM MSR/"	Ruppipe	L Ibilizatio	op 21 30%			CúTe	mp. Hdl			Capturer	64186 Fr-	mes			
reav	Kunning	n ouiizadio	0121.39%	, ,		Citre	mpinur			Jeaptured	104100 [[6	anes	1		//_



- Activate/deactivate the individual bundle links in the MFR bundle
- Create/delete the virtual channels on the links
- Sends MFR frames with or without impairments
- Receives MFR frames
- Generates & receives traffic using source and sink types
 - Sequence numbers
 - ➢ Hex string frame
 - Binary flat files
 - HDL trace files (GL's proprietary file format)
- Various impairments can be applied on each individual FR links and virtual channels



IMA Network



- GUI based WCS client, which simulates IMA Emulation
- Capable of generating and receiving ATM traffic
- Traffic source can be sequence number, HDL files (containing packets/frames), flat binary file, user-defined frames (ASCII HEX file), and Ethernet data



- Performs IMA simulation
- Supports 16 T1/E1 ports
- Support for Full or Fractional Timeslots for ATM Link
- Supports hyper channels with discontinuous (sparse) timeslots
- Supports IMA Frame Length ranging from 32, 64, 128, or 256
- Dynamically add/remove (Open/Close) of ATM links without loss in data
- Multiple IMA groups can be created in IMA Simulation
- Create and delete Virtual Channels on IMA group
- Generate and verify end to end traffic on each Virtual Channel
- User configurable AAL5 packet size
- Payload traffic generation and verification using Sequence number, HDL file (containing packets/frames), Flat Binary file, and User defined frame (ASCII HEX file) for each Virtual Channel independently



Adding links to form an IMA Group

Added Links

Link Selection

IMA Emulator - IMA Simulation - Untitled	Port And Timeslot Selection	×
Server Connection Status	Port Number Timeslot Subchannels 8-56 kbps	
IMA Group Status Link View Action VC Statistics Tx/Rx Verification IMA Config & Statistics 1 None 2 None 1 Link Name Action Status 1 Unit Name Action Status 1 Open Not In Group	1 ▲ C 8 2 3 C 16	
Add Delete Open Close	4 C 24 3 4 5 6 C 32 4 5 All 7 C 40 6 7 None 9 C 56 8 7 None 10 C 56 8 0 10 11 0 64 12 13 14 15 15 1 15 1	
IMA Id 3 Add Delete Open Close	Clear TS Add	

- Various links (of any bandwidth varying from 64Kbps to n*64Kpbs or sub channels) can be added to form an IMA Group. Within a group all links should be of equal bandwidth
- IMA group, channels into a single network-layer channel



Client Server Inverse Multiplex for ATM

🖧 atm script, Hexstr.ols - GLClient												
File Edit View Connect Script Log User Help		1										
		-										
inform task 1 "START";		[]										
ОК												
run task "AtmimaServerE1:StartAtmima";			tocol Analysis	AAL2.5(UNI	(3.1)							
Task 2: Task 2 started		File View	Capture Statis	tics Databa	se Call Detail Reco	rds Confiau	ure Help					
inform task 2 "ENABLE ICP";						ual 99, 199,		C[] ∎01 [0	CoTo L	
						<u> </u>	SET IF 2K		E PDA			
INTORM TASK 2 "CONFIG: IMAID I IMAFRAMELEN 128 SYMMETRYMODE 0";		Dev	I Scount	Frame#	TIME (Relative)	Len	Error VPI		PI	HEL USF	AAL Type	
inform tack 2 "ADDLINK: HC #2:1_31 LINKID 0"			31	27	00:00:00.005556	53	100	200	0	210		ATM-Cell
OK			31	20	00.00.00.005770	53	100	200	0	210		ATM-Cell
inform task 2 "STABT":		$\sqrt{1}$	31	30	00:00:00.006197	53	100	200	0	210		ATM-Cell
OK		$\sqrt{1}$	31	31	00:00:00.006411	53	100	200	0	210		ATM-Cell
inform task 1 'Tx: VPI 100 VCI 200 AALTYPE 5 CONT FIXLEN 1500 HEXSTR ABCD'';		√ 1	31	32	00:00:00.006625	53	100	200	0	210		ATM-Cell
ОК		√1	31	33	00:00:00.006838	53	100	200	0	210		ATM-Cell
inform task 2 "Tx: VPI 100 VCI 200 AALTYPE 5 CONT FIXLEN 1500 HEXSTR ABCD";			21	24	00-00-00 007052	E0	100	200	0	210		
ОК		Device1	TScount=31	Frame=2	7 at 00:00:0	0 005556	5 OK Len=50	3				-
	•	ATM Fram	e Data					-				
run task "AtmlmaServerE1:StartAtmlma":	_	GEC	===== ATM	Layer ==			=	7.0	`			
inform task 1 "ENABLE ICP";		VPI					= 100 (ío 010	0)		
		VCI					= 200 (00	00 000	01100 10	00)	
inform task 1 "CONFIG: IMAID 2 IMAFRAMELEN 128 SYMMETRYMODE 0" ;		CLP					=	00. (0 0 (0)			
		HEC					= 110100	010 (2	í0)			
inform task 1 "ADDLINK: HC #1:131 LINKID 0";						-						•
			-6 +1 - F	Dete								<u></u>
Inform task 1 "START";		Hex Dump	OI the Fi	ame Data +-	+-		+	-++	+			
run task "åtmimaServerF1:Startåtmima"		06 40 OC	80 D2 AB	CD AB CD	AB CD AB CD	AB CD A	4B _́@_∣	∎Ò≪Í«Í	ǒǒǒ	~		
inform task 2 "ENABLE ICP":		CD AB CD	AB CD AB	CD AB CD	ABCDABCD	ABCDA	AB I«I« NB Í»Í	«I«I«I«I·	~I~I~I // 1 // // //	« 		
		CD AB CD	AB CD AD	CD AD CD	AD CD AD CD			«Í		**		
inform task 2 "CONFIG: IMAID 1 IMAFRAMELEN 128 SYMMETRYMODE 0" ;												-
									1.477			•
inform task 2 "ADDLINK: HC #2:131 LINKID 0";	_	Running, Utili	ation 0.00%		C:\T	emp.Hdl		Capt	ured 405	031 framés		
Ready Ver 4 B NL	JM /	1										



- Create and delete Virtual Channels on IMA group
- Generate and verify end to end traffic on each Virtual Channel
- Payload traffic generation and verification using Sequence number, HDL file (containing packets/frames), Flat Binary file, and User defined frame (ASCII HEX file) for each Virtual Channel independently
- Provides detailed statistics for IMA group and each Virtual Channel
- Dynamically add/remove (Open/Close) of ATM links without loss in data



CAS Simulation

• Features

- > 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
- Supports the following 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



💑 GL Protocol State Machine E1; trunk 1		
Eile Irunk Edit Manual Call Help	CAS Simulator Script Editor	
GL 👕 🎕 😥 🕐	Eile Edit Help	
	🗋 🗁 🔚 👗 🕮 🚾 📗 🥶	
Signaling Settings Flash Hook Signaling Status		
State Machine Signaling Enabled	Title: C:\Program Files\GI Communications Inc\Usb E1 Analyzer\ Test Script	
Global Start Global Stop State Machine Signaling Actived		
Time Clab E Signal Off (1) Signal Off (9) Signal Off (18) Signal Off (26)	State Machine Lomponents State Machine Script	
Signal Off (2) Signal Off (10) Signal Off (19) Signal Off (27)	The Machine The Script Item	<u> </u>
✓ Enable Signaling Signal Off (3) Signal Off (11) Signal Off (20) Signal Off (28)	Register Inbound Action 1 //Initial Signaling Definitions	
Signal Off (4) Signal Off (12) Signal Off (21) Signal Off (29)	Pegister Uutsound Acti 2 State=INIT	
Signaling Script: Hex 5 (5) Signal Off (13) Signal Off (22) Signal Off (30)	Register Fones	
C:\Program Files\GL Communications Browse Signal Off (6) Signal Off (14) Signal Off (23) Signal Off (31)	State	
Signal Off (7) Signal Off (15) Signal Off (24)	Data Endo State 6 Change Signal=1001;	
Edit Signaling Script Signal Off (8) Signal Off (17) Signal Off (25)	7 Send Call Event=CALL_RELEASED;	
Note: left slick on timeslet to non-up odit monu	Star Signaling Detector 8 End State	
0 Send Signaling (0-F) in Current Trunk	Chard Diright Tang Detection 9	
	Char Digit/Tone Detect 10 //Outsound initial state,	
	Chart Exercise Databaser 12 //Call Connected state when receives A=0100 signaling	
Events with the source of the	Char Every Detection 13 IF Signal=0101; THEN	
	The stop Energy Detector 14 Send Call Event=CALL_CONNECTED;	
Timestamp Setup Time TS Trunk Send Signaling Receive Signaling	15 END IF	
14:47:21 5 E1:0 CALL_RELEASED	Send Call Sugnaling	
14:47:21 5 B1:1 0,1,0,1	Sand Dialte 19 Charge Signal=11001	
14:47:21 5 EI:1 CALL_RELEASED	Charge and Digits 10 Charge agrant Total Events CALL BELEASED	
14:47:21 5 B1:0 1001	Cand Tanas 20 END IF	
14:47:21 5 K1:1 0101	Chan Canadi Tanana 21 End State	
	Registration 22	
14:47:37 5 B1:1 0000	Add Conversel	
14:47:37 0.000 5 EI:1 SEIZURE DETECTED	Constitutional Constitution Constation Constation Constit Constitu	
14:47:37 0.001 5 E1:1 INCOMING_CALL	E Statemente 25 Statemente 25 Statemente 25 Statemente 2001BUUND	
14:47:40 3.006 5 B1:0 0,0,0,0	Wait Timer 27 Change Signal=1001	
14:47:41 4.507 5 B1:0 0,1,0,1	Wait Fuent 28 Send Call Event=CALL RELEASED;	
14:47:42 4.425 5 E1:1 0101	29 END IF	
	30 End State	
Capture State Machine Events to File Browse Counter 63	31 32	
E1 1:5 Call State: IDLE	33	
Current Load Configuration:		
Current Lood Configuration.		

SS1 Emulator ("SS1 Dialer")





Key Features

- Generate and introduce SS1 Dial Codes on Transmit Channels using SS1 Dialer
- Control 'mark' & 'space' frequency, duration, and power during transmission of SS1 Tones
- Dual monitoring capability allowing multiple instances of SS1 analyzer to simultaneously tap E and W direction traffic
- Spectral Graph feature presents a captured dial code as a graphical waveform



FAX Simulator

🚰 FAX_Simulator_E1.gls - GLClient	×
File Edit View Connect Script Log User Help	
🗅 🖆 🖬 🖏 🚑 🚝 😤 🗋 📽 🔛 🛤 🌇 👺 📥 🖁 🧏	
Connected to GL Server on 'madhusudan' run task "FaxSimulatorE1:StartFaxSim"; Task 1: Task 1 started inform task 1 "START"; OK inform task 1 "TXFAX #1:1 TIFF_FILE "WinClientServer\FAX Simulator\send\3.tif" CODEC_TYPE 2 MODEM_TYPE 16 MIN_RATE_TYPE 7 MAX_RATE_TYPE 16 PAGESIZE_TYPE 16 RESOLUTION_TYPE 16 ECMENABLED 0"; OK inform task 1 "RXFAX #2:1 TIFF_FILE "WinClientServer\FAX Simulator\Recv\rcv.tif" CODEC_TYPE 2 MODEM_TYPE 16 MIN_RATE_TYPE 7 MAX_RATE_TYPE 16 PAGESIZE_TYPE 16 RESOLUTION_TYPE 16 ECMENABLED 0"; OK inform task 1 "RXFAX #2:1 TIFF_FILE "WinClientServer\FAX Simulator\Recv\rcv.tif" CODEC_TYPE 2 MODEM_TYPE 16 MIN_RATE_TYPE 7 MAX_RATE_TYPE 16 PAGESIZE_TYPE 16 RESOLUTION_TYPE 16 ECMENABLED 0"; OK Task 1: Fax Session Completed, PortNo: 1, TS: 1 Task 1: Fax Session Completed, PortNo: 2, TS: 1	'E
//* FAX Simulator Commands *//	•
//* Single FAX session in a task using A law codec type *//	
run task "FaxSimulatorE1:StartFaxSim";	
inform task 1 "START";	
inform task 1 'TXFAX #1:1 TIFF_FILE 'WinClientServer\FAX Simulator\send\3.tif' CODEC_TYPE 2 MODEM_TYPE 16 MIN_RATE_TYPE 7 MAX_RATE_TYPE 16 PAGESIZE_TYPE 16 RESOLUTION_TYPE 16 ECMENABLED 0'';	
inform task 1 ''RXFAX #2:1 TIFF_FILE 'WinClientServer\FAX Simulator\Recv\rcv.tif' CODEC_TYPE 2 MODEM_TYPE 16 MIN_RATE_TYPE 7 MAX_RATE_TYPE 16 PAGESIZE_TYPE 16 RESOLUTION_TYPE 16 ECMENABLED 0'';	
inform task 1 ''STOPFAX #1:1''; inform task 1 ''STOPFAX #2:1''; end task*;	
Ready	



MAPS[™] – Script Based Emulation

- Script based protocol simulation and conformance test tool covers solutions for both protocol simulation and protocol analysis
- Supports a variety of protocols such as ISUP, MAP, CAS, ISDN, MLPPP, GSM A, GSM Abis and others
- Includes various ready-to-use test plans and test cases to support the testing of a required real-time scenario
- Provides the unlimited ability to edit messages and control scenarios (message sequences)
- "Message sequences" are generated through scripts; Generate and respond to calls / messages
- Impairments can be applied to messages to simulate error conditions
- Supports transmission/detection of various TDM traffic such as, digits, voice file, single & dual tones



MAPS[™] Working Principle

Message Automation and Protocol Simulation





Working Principle

- The message templates form the backbone of MAPS[™] application
- Message templates are created using an utility Message Editor with user-selected protocol fields and default values for each protocol field
- The protocol fields can be accessed by scripts as variables using import / export files
- Scripts comprises of sequence of commands that performs the required operation using pre-defined message templates
- Script Editor is another powerful utility of MAPS, in which sequences of message templates can be grouped together in an order to create call flow (scripts)
- Profile consists of values assigned to the variables
- Profiles can be created using a utility called Profile Editor where the values can be assigned to the variables
- Event Profiles consists of values assigned to the variables during run-time. Event Profile Editor allows you to create Event Profiles for user-defined events in a script. The value in the profiles can be changed during script execution.
- MAPS[™] provides the ability to create any number of scripts to simulate a real-time scenario with MAPS[™] and DUT



Supported Protocols

- Testing binary based protocols over T1 E1
 - ➢ ISDN, LAPD
 - ➢ SS7 (ISUP, INAP, MAP, CAP, IUP)
 - ➢ GSM A, Abis
 - > MLPPP Conformance
 - ≻ CAS

- Testing protocols over IP
 - ➢ SIP, SIP-I
 - ➢ MEGACO, MGCP
 - ISDN SIGTRAN (ISDN over IP)
 - SS7 SIGTRAN (SS7 over IP)
 - GSMAoIP (GSM A over IP)
 - ➤ LTE (S1, eGTP)
 - UMTS (luCS, luH, luPS)
 - ➢ UMTS GnGp



Call Generation

<u>@</u> ма Ку Со	¼ MAPS (Message Automation Protocol Simulation) Subscriber (ISDN ITU) - [Call Generation - BulkCall_Card1] 🗾 🗶 🐁 Configurations Emulator Reports Editor Windows Help										
	🏶 🗐 📁 🎭 🔌 🐇 🎺 🐒 🕘										
	🚘 🖬 🔤			8 66							
S	Script Name	Profile	Call Info	Script Executio	n	Status	Events	Events	Result	Total Iteratio	Completed Iterations
1	Placecall.gls	Card1TS01	1,1	Start		Call Released	None		Pass	1	1
2	Placecall.gls	Card1TS02	1,2	Abort		File Sent	DisconnectCall		Pass	1	0
3	Placecall.gls	Card1TS03	1,3	Abort		File Sent	DisconnectCall		Pass	1	0
4	Placecall.gls	Card1TS04	1,4	Abort		File Sent	DisconnectCall		Pass	1	0
5	Placecall.gls	Card1TS05	1,5	Abort		File Sent	DisconnectCall		Pass	1	0
6	Placecall.gls	Card1TS06	1,6	Abort		File Sent	DisconnectCall		Pass	1	0
7	Placecall.gls	Card1TS07	1,7	Abort		File Sent	DisconnectCall		Pass	1	0
8	Placecall.gls	Card1TS08	1,8	Abort		File Sent	DisconnectCall		Pass	1	0
9	Placecall.gls	Card1TS09	1,9	Abort		File Sent	DisconnectCall		Pass	1	0
10	Placecall.gls	Card1TS10	1,10	Abort		File Sent	DisconnectCall		Pass	1	0
	Add Deleti	e Insert	Refresh	Start	Sta	rt All Stop Sto	p All Abort	Abort All			
				·	·						
	Save Lolum					10					
	MAPS		DU	г	-	Q.	93x Layer 3 Layer		=== =		
	MALS			1	_	0000 Protocol Discr	iminator Length		= 00001000 Q	2.931/I.451 · 2 But es	user-network
		SETUP	 1	6:49:32.259000		0001 Call Reference	Value		= 24 (.00000	. Dyces)00 00011000)
	C/		IC I		-	0002 Call Reference	Flag		= 0 H	ROM side th	at originated
			1	6:49:32.607000		0004 Message Type			= 00000101 8	SETUP	
		ALEBTING				Bearer capabil	ity		=		ilitar TR Tian
	•			6:49:32.607000		0005 INI Bearer Ca 0006 IK Bearer Can	pability shility Length		= 3 (x03)	searer capab	IIICY IK Iden
		CONNECT	L			0007 Information T	ransfer Capabilit	y	=00000 8	Speech	
			1	6:49:32.607000		0007 Coding Standa	rd		= .00 1	тто_т (ссітт) standardize
	CONN	ECT ACKNOWL	EDGE	6-49-32 609000		0007 Oct 3 Extensi	on Bit (Oct 3)		= 1 N	Jext Octet N	ot Present
				0.43.32.000000		0008 Information T	ransier Kate		=10000 6	04 KB1t/s 'irguit Mode	
	SendFile ::	a-law samples\c	ount10.pcm	6:49:52.644000		0008 Oct 4 Extensi	on Bit (Oct 4)		= 1	Next Octet N	ot Present
		DISCONNECT				0009 Layer 1 Inden	t Choice		= .01 I	ayer l Iden	tifier
		DISCONNECT	— 1	6:49:55.076000		0009 User Informat	ion Layer 1 Proto	col (BC)	=00011 A	A-law, Rec G	.711
						0009 Layer 1 Ident	ifier		= .01 I	ayer 1 Id.	
$ \setminus$	Scripts A Messag	e Sequence /	Event Config	λ Script Flow	/						
,						Error	Events	Captured	Errors	Link Status	Up=0 Down=1

Communications

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Call Reception

MAPS (Message Automatio Configurations Emulator Re	n Protocol Simulation) Switch (I eports Editor Windows Help	5DN ITU) - [Call Receptio	n]				
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Sr No Script Name	Call Info	Script Execution	Status	Events	Events Results		
1 Recycall.gls	2,1	Abort	File Sent	DisconnectCall	Pass		
2 Recycall.gls	2,2	Abort	File Sent	DisconnectCall	Pass		
3 Recycall.gls	2,3	Abort	File Sent	DisconnectCall	Pass		
4 Recycall.gls	2,4	Abort	File Sent	DisconnectCall	Pass		
5 Recycall.gls	2,5	Abort	File Sent	DisconnectCall	Pass		
6 Recycall.gls	2,6	Abort	File Sent	DisconnectCall	Pass		
7 Recycellals	27	Abort	File Sent	DisconnectCall	Parr		
Abort All	_ <u>j</u>		Show Records 🗌 A	uto Trash			
DUT	MAPS	0000 Protocol Dis	Q.93x Layer 3 Laye criminator	er ====== = = 000010	000 Q.931/I.451 user-net		
SETU	IP 16:52:15.860000	0001 Call Reference Length =0010 2 Bytes 0002 Call Reference Value = 35 (.0000000 00100011)					
CALL PROC	EEDING	0002 Call Referen	ice Flag	= 0	FROM side that origi		
	16:52:15.861000	Bearer capab	: Dilitv	= 00000.	IOI SRIOP		
ALERT	ING 16:52:15.862000	0005 IEI Bearer	Capability	= 00000.	00000100 Bearer Capability IE		
CONNE	ECT 16:52:15.862000	0005 Ik Bearer C 0007 Information	JS) JOOO Speech TTU T (CCITT) standa				
CONNECT ACK		0007 Oct 3 Exten	aard Asion Bit (Oct 3)	= .00	Next Octet Not Prese		
	16:52:16.208000	0008 Information	n Transfer Rate	=10	000 64 kbit/s		
SendFile :: a-law sam	ples\count10.pcm	0008 Transfer Mo	de de Die John Al	= .00	Circuit Mode		
	16:52:35.909000	0008 Uct 4 Exten	Ision Bit (Uct 4) Nort Choice	= 1	Next Uctet Not Prese		
		0009 User Inform	ation Laver 1 Prot	cocol (BC) =00	011 A-law, Rec G.711		
0009 Layer 1 Identifier					Layer 1 Id		
		= 1	Next Octet Not Prese				
		Channel iden	tification	=			
		UUUA IK Identifi	.er	= 00011	JUU Unannel Identificati V		
<u></u>							
Scripts Message Sequ	ence \langle Event Config \rangle Script Flo	w/					



Call Generation and Reception

MAPS (Message Automation Protocol Simulation) SSP (ISUP ITU E1) - [Call Gen	eration - Ma	laster Configuration]]	- - ×					
🧏 Configurations E <u>m</u> ulator <u>R</u> eports <u>E</u> ditor <u>W</u> indows <u>H</u> elp				_ & ×	<				
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S Script Name Profile Call Info Script Evecution Status Events	F	Event Begult	Total Iterations Com	leted Iterations	1				
1 Jour Call de Card ITS01 1112221 Start ISUP Call Balageed N	ne l	Pace	1	1					
2 Isup Call als Card TS02 1.1.1.2.2.2.2 Abort Transmitting File Termi	ate Call	Pass	1	0					
3 Isup_Call.gls Card1TS03 1.1.1,2.2.2,3 Abort Transmitting File Termi	ate (-					
4 Isup_Call.gls Card1TS04 1.1.1,2.2.2,4 Abort Transmitting File Termi	ate C		MAPS (Me	ssage Autom	ation Protocol	Simulation) SSP (ISUP ITU E1) -	 [Call Reception] 		
5 Isup_Call.gls Card1TS05 1.1.1,2.2.2,5 Abort Transmitting File Termi	ate C 🌯 🖸 Con	nfigurations E <u>m</u> ulator !	<u>R</u> eports <u>E</u> ditor <u>W</u> ind	ws <u>H</u> elp					_ & ×
6 Isup_Call.gls Card1TS06 1.1.1,2.2.2,6 Abort Transmitting File Termi	ate 🕻 🏽 🌺 🖉	🗐 🧯 🍇 🦻 🛛	🦠 🖏 🧭 🔮						
7 Isup_Call.gls Card1TS07 1.1.1,2.2,7 Abort Transmitting File Termi	ate C								
8 Isup_Lali.gis Lard ITSU8 I.I.I.2.2.2.8 Abort Transmitting File Termi	ate L Sr No	Script Name	Call Inf		Script Execution	Status	Events	Event Results	^
10 Isup Call de Card ITS10 11122210 About Transmitting File Termin	ate [SLTM.gls	2.2	2,1.1.1,1	Abort	MTP3 Active	Initiate SLTM	Pass	
	3	Isup_Calig	ls 2.	21112	Abort	Transmitting File	Terminate Call	Pass	
	4	Isup_Call.g	ls 2.2	2,1.1.1,3	Abort	Transmitting File	Terminate Call	Pass	
Add Delete Insert Refresh Start Start All Stop Stop All Add	5	Isup_Call.g	ls 2.2	2,1.1.1,4	Abort	Transmitting File	Terminate Call	Pass	=
Save Column Width	6	Isup_Call.g	ls 2.2	2,1.1.1,5	Abort	Transmitting File	Terminate Call	Pass	
MTP3 Layer	7	Isup_Call.g	ls 2.2	2,1.1.1,6	Abort	Transmitting File	Terminate Call	Pass	
MAPS DUI 0000 Service Indicator	8	Isup_Call.g	ls 2.2	2,1.1.1,7	Abort	I ransmitting File	Terminate Call	Pass Dave	
Initial Address	10	Isup_Call.gi	ns 2.2 Is 22	2,1.1.1,8	Abort	Transmitting File	Terminate Call	Pass	
Address Complete								_	~
	Ab	bort All			•	Show Records 📃 Auto Trash 🛛 Tra	ash		
Answer Higher Laver Data									
11:48:52.92/000	<u><u>S</u>a</u>	Save Column Width							
Release		DUT	MAPS		Council of Andrew	TP3 Layer ===============	= 0101 TCDN Haar D		<u> </u>
Policies Complete		Initial Addre		0000	Priority Code	acor	=00 Priority Co	de O	
11:48:57.308000 Nature Of Connection Indicators Par	amet	midd Addie	11:50:10.3	0000 0000	Sub-service f:	ield	= 10 National Ne	twork	
0008 Satellite indicator		Address Comp	plete 11:50:10.3	3000	DPC OPC		= 2.2.2(00010010010 = 1.1.1(01 00000	000) 0100010)	
0008 Echo ctrl dev.ind(Nat.Conn.Ind)		A	11.00.10.0.	0004	Signalling Lim	nk Code	= 0001 (1)	·	
Forward Call Indicators Parameter		Answei	11:50:10.3	3000	Higher Layer I ======= TS	Data SUP Laver ==========	= x0100010220010A00020 =	907031024567305200A07011165473	350220
0009 National/international call ind		Release	11-50-14-7	4000 0005	Circuit Ident:	ification Code	= 000000010000 (1)	
			11.00.14.7	4000 0007	Message Type	A Devenetors	= 00000001 Initial add	ress	
\langle Scripts \rangle Message Sequence \langle Event Config \rangle Script Flow \rangle Capture Events \langle			11:50:14.7	5000	Nature Of Con	nnection Indicators Parameter	=		
		I	1	0008	Satellite in	ndicator	=10 two satelli	te circuits in the connection	
Error Events				0008	Echo ctrl de	rneck indicator ev.ind(Nat.Conn.Ind)	=0 continuity =0 outgoing ec	cnecx not required ho control device not included	a
					Forward Call	Indicators Parameter	=		
				0009	National/int End-to-end r	ternational call ind method indicator	=0 treated as =00. No end-to-e	a national call nd method available	
				0009	Interworking	g Indicator	=0 no interwor	king encountered (No. 7 signal	lling 🔤
	L C			ennn •	Rnd-to-end	infor ind/ForwardCall Ind)	= 0 not availab	le I	
	Sc	cripts A Message Sequer	nce Event Config λ	icript Flow λ Ca	apture Events /				
			(~ ~ ~	· · · · · ·	Error Events	Captured Error	s 🔹 🕘 Link Status Up=0 Dowr	n=1


GL MAPS (Message Automation Protocol Simulation) gsm55F (INAP 3GP	P) - [Call Generation - CallGenI	Default]								
🌜 Configurations Emulator Reports Editor Windows Help										
🏟 🗐 🎉 🤌 🦠 💺 💞 🔮										
S Script Name Profile Call Info	o Script Execution S	tatus	Events	Events Result	Total Iterations	Completed Iterations				
1 ApplyCharging_SSF.gls MSProfile01 0x00	000002 Start	Call Released from both side	None	Pass	: 1	1				
2 ConnectToResource_SSF.gls MSProfile02	Start		None	Unkno	wn 1	0				
3 EstablishTemporaryConnection_SSF.gls MSProfile03	Start		None	Unkno	wn 1	0				
4 TollFreeCallFlow_SSF.gls MSProfile04	Start		None	Unkno	wn 1	0				
		👖 🔐 MAPS (Message Auto	omation Protocol Simulat	ion) gsmSCF (INAP	3GPP) - [Call Recep	tion]				
Add Delete Insert Refresh Start Start	rt All Stop Stop All	🗕 🧆 Configurations Emula	tor Reports Editor Wind	lows Help						_ 8 ×
Save Column Width —			. 🔊 🚳 🛍 🎻	A 🔊						
	MTP3 La	aye: 🚺 🕊 🗐	• • • • • • •	<u> </u>						
MAPS DOI	0000 Service Indicator	Sr No Script Name		Call Info	Script Execution	Status	Events	Events.	Results	
Initial UP	0000 Sub-service field	1	SLTM.gls	3.3.3,2.2.2	Abort	MTP3 Active	Initiate S	LTM	Pass	
Request Report BCSM Event	0001 DPC	2	SCMG.gls	1	Abort	Subsystem-Allowed	Initiate 9	SST	Pass	
18:11:51.828000	0002 OFC 0004 Signalling Link Cod	de 3 Apply0	Charging_SCF.gls	0x00000002	Completed	IN Transaction Complete	None	e 🛛	Pass	
Apply Charging 18:11:51.837000	Higher Layer Data	4 Apply0	Charging_SCF.gls	0x00000003	Abort	Apply Charging Sent	None	e	Unknown	
Connect	========== SCCP La	aye:								
18:11:51.848000	Mandatory Fixed Par	ram								
Event Report BCSM	Protocol Class Par	ram Abort Abort A	All (Show Records Auto Trash	Trash			
Event Benort BCSM	0006 Message Handling	(c								
18:11:54.889000	0007 Pointer to Mandato	ory <u>S</u> ave Column	n Width 🚽							
Release Call 18:11:56 218000	0008 Pointer to Mandato 0009 Pointer to Mandato	ory	MAD	.c 🔺		== MTP3 Layer =========				_
return Descriptions	Mandatory Variable	Lei	MAE	3	0000 Service I:	ndicator Code	=001	11 SCCP Priority Code		
returnHesuitLast	Called Party Addre	ess	Initial DP	8:11:51.146000	0000 Sub-servi	ce field	= 10	National Net:	= 5 Jork	
	Address Indicator	rs Beques	st Benort BCSM Event		0001 DPC		= 3.3.3(0	0001101101100	00)	
			18	8:11:51.149000	0002 OPC	g Link Code	= 2.2.2()	(1)	000100)	
Scripts Message Sequence Event Config Script Flow			Apply Charging	9-11-51 150000	Higher La	yer Data	= x090003	(1) 3081908920C3F110	002143658575080B920C	3F110045
			Connect	0.11.01.100000		== SCCP Layer ========				
		-	Lonnect 18	8:11:51.152000	0005 Message T Mandatory	ype Fixed Darameters	= 000010()l UDT unidata		
		Ev	ent Report BCSM		Protocol	Class Parameter	=			
			- 18	8:11:52.535000	0006 Class		=000	DO Class O		
		Ev	ent Report BCSM	8:11:55 555000	0006 Message	Handling (Class U and 1) to Mandatory Parameter	oniy) = 0000 = ParmO (No Special Up offset, xO3 (3)	ptions	
			Balaasa Call		0008 Pointer	to Mandatory Parameter	= Parml o	offset xOE (14))	
			Telease Call	8:11:55.557000	0009 Pointer	to Mandatory Parameter	= Parm2 (offset x19 (25))	
		r III III III	eturnResultLast 💦		Called P	variable Length Paramete: artv Address	rs = = mandat(orv parameter		
				8:11:56.885000	000A Paramet	er length	= 11			
		Scripts Message	e Sequence / Event Confi	ig λ Script Flow /						
)				C Error Europe	0 Cm	tured Errors	Link Status Lin=0 Dr.	own=1
						 Error Events 	l 🖷 Cah	carea Errors	 Link Status Op=0 Dt 	5991-1 //s

GL MAPS (Message Autor	mation Protocol Si	mulation) (IUP U	IK) - [Call Generation	- Untitled]											
Sconfigurations Emulato	or Reports Editor	Windows Help								_ 1	<u> I</u> X				
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🗅 🚄 🔒 🏆		8 क													
S Script Name	Profile	Call Info	Script Execution	Status		Events	Events P	Result	Total Iteration	s Completed Iterations					
1 IUP Call.gls	Card1TS01	1.1.1,2.2.2,1	Abort	Recor	ding File	IUPTerminate		Pass	1	0					
2 IUP_Call.gls	Card1TS02	1.1.1,2.2.2,2	Abort	Transmi	tting Tone	IUPTerminate	i	Pass	1	0					
3 IUP_Call.gls	Card1TS03	1.1.1,2.2.2,3	Abort	Transmi	tting Tone	IUPTerminate	1	Pass	1	0					
4 IUP_Call.gls	Card1TS04	1.1.1,2.2.2,4	Abort	Transmi	tting Tone	IUPTerminate		Pass	1	0					
5 IUP_Call.gls	Card1TS05	1.1.1,2.2.2,5	Abort	Transm	🔐 MAP5 (Me	ssage Automation Prot	ocol Simulati	ion) (IUP UK) - [Call Reception]					_ 🗆 ×
6 IUP_Call.gls	Card1TS06	1.1.1,2.2.2,6	Abort	Transm	🤌 Configurati	ions Emulator Reports	Editor Wind	ows Help							_ 8 ×
7 IUP_Call.gls 8 IUP Call.gls	Card1TS07 Card1TS08	1.1.1,2.2.2,7	Abort Abort	Transm Transm	* 🗐	🔪 🗞 🖗	👪 🥩	🔮 🕐							
				-	Cello L Sorie	at Mama		Call lafe	Corint Europ	ution Chatura		Eucente	Euconto	Desults	
	1					SITM als		2221111		ation Status	MTP3 Active	None		Pass	
Add Delete	Insert H	Refresh 5ta	art Start All		2	IUP Call.ols		2.2.2.1.1.1.1	Abo	ort	Digits Transmitted	IUPTerminate		Fail	
Save Column	Width				3	IUP_Call.gls		2.2.2,1.1.1,2	Abo	ort	Transmitting Tone	IUPTerminate		Pass	
					4	IUP_Call.gls		2.2.2,1.1.1,3	Abo	ort	Transmitting Tone	IUPTerminate		Pass	
MAPS		DUT	000	0 Service	5	IUP_Call.gls		2.2.2,1.1.1,4	Abo	ort	Transmitting Tone	IUPTerminate	_	Pass	
IUP	Initial Address Messa IUP Send N Digits	ge 16:3	7:16.243000	0 Priority 0 Sub-serv 1 DPC 2 OPC	Abort <u>S</u> ave	Abort All	-1		4	Show Records	Auto Trash Trash				
IUP Sul IUP IUP Addition IUP Addition IUP Addition IUP Addition	bsequent Address Me IUP Send N Digits Final Address Messag nal Call Information - A nal Call Information - A nal Call Information - A nal Call Information - A Sequence / Ever	issage 16:3 ge 16:3 icl Type 7 16:3 icl Type 1 16:3 icl Type 7 16:3 icl Type 1 16:3 icl Type 1 16:3 icl Type 1 16:3	7:17:577000 7:18:917000 7:18:917000 7:20.246000 7:20.246000 7:21.607000 7:21.608000 Flow	Higher L Higher L Circuit 6 Message IAM/IFAM 8 Calling 9 Calling 9 Calling 9 Calling 9 Calling 9 Interwo 9 Priorit 9 Meter D 9 Protect A Service A Release A Long Pr		IUP Initial Address M IUP Send N Dig IUP Subsequent Addres IUP Send N Dig IUP Final Address M UP Additional Call Informatio UP Additional Call Informatio IUP Additional Call Informatio	jits ss Message gits essage on - ACI Type 7 on - ACI	MAPS 16:40:32.2370 16:40:32.2400 16:40:33.5550 16:40:34.8850 7 16:40:34.8850 7 16:40:34.8850 7 16:40:36.2150 7 16:40:37.5650 16:40:37.5670	0000 0000 0000 0000 0000 0000 0000 0002 0000 0002 0000 0002 0000 0002 0000 0003 0000 0008 0000 0009 0000 0009 0000 0009 0000 0009 0000 0004 0000 0009 0000 0004 0000 0004 0000 0009 0000 0004 0000 0004 0000 0004 0000 0004 0000 0004 0000 0004	Service Indicator Priority Code Sub-service field DPC OPC Higher Layer Data ======== IUP La; Circuit Identificat Message Types IAM/IFAM Message I Calling Party Cat Calling Party Cat Calling Line Idem CLI Blocking Indi Interworking (IW) Priority Access I Neter Delay Guard Protection Indicat Service Handling : Release Protocol : Cong Propagation I NML-Call Type Ind:	yer ====================================	=0100 Tel =00 Pri = 10 Nat = 2.2.2(000100 = 1.1.1(01 = x0000001088 = = 1 (0001 = x0000 Initia =000001 Ord =1. Cal =0 No =0 No	ephone Us prity Covi ional Net 100100 013020799 000000000 1 Address inary (Re inary (Re)) (Re) (Re)) (Re)	er Part e 0 work 00) 100010) 877605A04663476610 Message sidential) Identity (CLI) ir er may not be disco- ing involved ty Access call ut required r, non-protected cs : (telephony) call sage supported tion delay path no e Indicator Bit wi) hclu 2los_ L or all prc ot i ith
CI						V wessage bedrence	V 2 veni conii	g <u>A</u> scipicridw	/	e E	rror Events	Captured Errors		Link Status Up=0 Down=1	





MAPS (Message Automation Protocol Simulation) BTS (GsmAbis GS	1900) - [Call Generation - Master Configuration] – 🗖 💌	
🖌 Configurations Emulator Reports Editor Windows Help	_ <i>8</i> ×	
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Sr No Script Name Profile Call Info Script Execution Status	Events Event Result Total Iterations Completed Iterations	
1 BTS_MOC.gls BTSProfile001 IMSI:,40406000000001,TMSI Start SMS Call Release 2 DTC_LUC_L DTCD_SI_0002 MCL_0002000000001,TMSI Start SMS Call Release	None Pass 1 1	
2 BTS_LUC.gis BTSPronie002 [MSI:,40406000000002,TMSI] Start Released Air Interface Re	MAPS (Message Automation Protocol Simulation) BSC (GsmAbis GSM	900.) - [Call Recention] – 🗆 🗙
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MAPS DUT	Sr No Script Name Call Info Script Execution Status	Events Events Results
CHANnel ReQuireD 0000 Message Group	1 BSC_MOC.gls Completed	None Pass
Immediate Assignment	3 BSC_MOC.gls IMSI:,40406000000002,TMSI:,0 Completed Air Interface Resources Rele	eased None Pass
11:10:17.546000 0002 IE Identifier 0003 Channel Type		
LOCATION UPDATING REQUEST	Abort Abort All 🔽 Show Records 🗌 Auto Trash T	irash
AUTHENTICATION REQUEST 11:0:17 898000 0004 IB Identifier		
AUTHENTICATION RESPONSE		
	DUT MAPS 0000 T-bit	=0 Non-Trasparent Messsage
CIPHERING MUDE CUMMAND 11:10:18.229000 Access Delay	CHANnel ReQuireD 11:11:40.287000 0000 Message Croup	= 0000110. Common Channel Agmt = 00010011 CHANnel ReQuireD
CIPHERING MODE COMPLETE	CHANnel ACTIVation Channel number 11.11.40.288000 0002 IE Identifier(Ch No)	= = 00000001 Channel number
IDENTITY REQUEST	CHANnel ACTIVation ACKnowledge	= 10001 Uplink CCCH (RACH)
	11:11:40.626000 Request Reference	=
11:10:18.559000	Inmediate Assignment 11:11:40.627000 0004 IE Identifier (ReqRef)	= 00010011 Request Reference = 00000101 (5)
LOCATION UPDATING ACCEPT 11:10:18.964000		= 5 () = 00101 ()
TMSI REALLOCATION COMPLETE	AUTHENTICATION REQUEST	=00101 (5)
	AUTHENTICATION DECONNEL AUTHENTICATION DECONNEL	= = 00010001 Access Delay
Scripts Message Sequence Event Config Script Flow	11:11:41.319000 0009 Access Delay	= 55 (x37)
Error Ev	CIPHERING MODE COMMAND 11:11:41.321000	
		>
	Scripts Message Sequence Event Config Script Flow Capture Events	
	Error Events Ca	ptured Errors Link Status Up=1 Down=0

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<u>MAPS</u> (Message Automation Pr	otocol Simulation) (CAS) - [Call Gener	ation - Default-R1]							
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S Script Name	Profile	Call Info	Script Execution	Status	Events	Events Result Total Iterations Comple	eted Iterations			
1 T1 R1 Place Call.gls	Card1TS00	1,0	Abort	Transmitting File	OutboundReleaseCall	Pass 1	0			
2 T1 B1 Answer Call ols	Card2TS00	2.0	Abort	Transmitting File	InboundReleaseCall	Pass 1	0			
3 T1 B1 Beset Timeslots als			Start	Timeslots Restarte	d None	Pass 1	1			
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		Joane Joane)ate/Time	Captured Events	Call Trace Id	Script Name	Script Id	
View Executing Line				2	014-8-27 12:57:21.596000	Timeslots Restarted	1	T1 FGD Reset Timeslots.gls	CGProtScriptId 94501006-1988-3436	
Script Contents				2	014-8-27 12:57:49.862000	Timeslots Restarted		T1_R1 Reset Timeslots.gls	CGProtScriptId_94529274-1989-3436	
//// MAPS CAS Emulator:	R1 /////			2	014-8-27 12:57:56.595000	P: Placing Call	1,0	T1_R1_Place Call.gls	CGProtScriptId_94535819-1991-3436	
				2	014-8-27 12:57:56.611000	A: CASDetectedSignals = 0, 0, 0, 0	2,0	T1_R1_Answer Call.gls	CGProtScriptId_94535323-1990-3436	
//// Initialization ///	9			2	014-8-27 12:57:57.089000	A: CASDetectedSignals = 1, 1, 1, 1	2,0	T1_R1_Answer Call.gls	CGProtScriptId_94535323-1990-3436	
P = "1 + 1 + 1 + 1"; //P; Pla	, 			2	014-8-27 12:57:57.089000	A: Seizure Detected	2,0	T1_R1_Answer Call.gls	CGProtScriptId_94535323-1990-3436	
A="1, 1, 1, 1, 1": //A: Ans	wer //			2	014-8-27 12:57:57.100000	P: CASDetectedSignals = 0, 0, 0, 0	1,0	T1_R1_Place Call.gls	CGProtScriptId_94535819-1991-3436	
PR="0 0 0 0" · //PR P	/WCL // /lace Release /	9		2	014-8-27 12:57:57.102000	P: CASDetectedSignals = 1, 1, 1, 1	1,0	T1_R1_Place Call.gls	CGProtScriptId_94535819-1991-3436	
AP="0 0 0 0": //AP: A	newer Delease	, , , , , , , , , , , , , , , , , , , ,		2	014-8-27 12:57:57.296000	A: Seizure Acknowledged	2,0	T1_R1_Answer Call.gls	CGProtScriptId_94535323-1990-3436	
Idle="0 0 0 0".	diswer Refedse	//		2	014-8-27 12:57:57.603000	P: CASD etected Signals = 0, 0, 0, 0	1,0	T1_R1_Place Call.gls	CGProtScriptId_94535819-1991-3436	
Seiguredck-"0 0 0 0".				2	014-8-27 12:57:57.603000	P: Seizure Acknowledged	1,0	T1_R1_Place Call.gls	CGProtScriptId_94535819-1991-3436	
HinkOn-"1 1 1 1".				2	014-8-27 12:57:57.603000	RndDialDigitsDID = 5551809	1,0	T1_R1_Place Call.gls	CGProtScriptId_94535819-1991-3436	
Winkon- 1, 1, 1, 1, 1,				2	014-8-27 12:57:57.603000	RndDialDigitsANI = 4441809	1,0	T1_R1_Place Call.gls	CGProtScriptId_94535819-1991-3436	
WINKOIL = 0, 0, 0, 0 ;				2	014-8-27 12:57:57.603000	P: Dialing	1,0	T1_R1_Place Call.gls	CGProtScriptId_94535819-1991-3436	
				2	014-8-27 12:58:02.096000	A: Digit Type=DTMF	2,0	T1_R1_Answer Call.gls	CGProtScriptId_94535323-1990-3436	
				2	014-8-27 12:58:02.096000	A: digits=5551809*4441809	2,0	T1_R1_Answer Call.gls	CGProtScriptId_94535323-1990-3436	
Seriete Massage Sequence		Script Flow	ura Evento /	2	014-8-27 12:58:02.096000	A: Alerting	2,0	T1_R1_Answer Call.gls	CGProtScriptId_94535323-1990-3436	
J Scripts A Message Sequence				2	014-8-27 12:58:05.188000	A: Call Connected	2,0	T1_R1_Answer Call.gls	CGProtScriptId_94535323-1990-3436	
, ,				Error Eval 2	014-8-27 12:58:05.188000	RndFileSel = 7	2,0	T1_R1_Answer Call.gls	CGProtScriptId_94535323-1990-3436	
				2	014-8-27 12:58:05.188000	A: Tx-FileName: mu-law samples\kerryc	2,0	T1_R1_Answer Call.gls	CGProtScriptId_94535323-1990-3436	
				2	014-8-27 12:58:05.603000	P: CASDetectedSignals = 1, 1, 1, 1	1,0	T1_R1_Place Call.gls	CGProtScriptId_94535819-1991-3436	Ţ
				2	014-8-27 12:58:05 603000	P: Remote User Answered Call	10	T1_B1_Place Call ofs	CGProtScriptLd_94535819-1991-3436	Ë,
					- Save Ever	nts				
					Lear Captur	re Events to file				
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Call Generation

- Interactive GUI to view status, results, call information, total iterations to be done, and number of completed iterations
- Uses profiles to change the field values in the messages during a call
- Events allow redirection of script execution on-the-go. The custom parameters in the events can also be changed during script execution using event profiles
- Impairments can be applied to messages to simulate error conditions
- Provides protocol trace with full message decoding, custom trace, and graphical ladder diagrams of call flow with time stamp while simulation is running
- Call flow graph allows to easily verify the messages exchanged between MAPS[™] and DUT
- Support for Bulk Call Simulation with option to configure stress/load testing parameters such as Call per second (CPS), Busy hour call attempts (BHCA), Max Simultaneous Calls and Burst parameters
- Provides the associated captured events and error events during call simulation



Call Reception

- Once the calls are successfully established, the received call instances are displayed in the Call Reception window automatically
- Triggers the execution on reception of pre-defined messages. To receive calls, the scripts are configured against the messages to be received
- Provide the result of the test with detail protocol decode and ladder diagram



Protocol Emulation using Client-Server Scripts

- Provides various modules for analysis and emulation of protocols such as CAS, SS7, ISDN, HDLC, Multilink PPP, TRAU, ATM IMA, and Multi-Link Frame Relay
- Best suited for remote script based operations
- Easy control of T1/E1 servers through software clients via TCP/ IP / UDP

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AK AK A A A A A A A A A A A A A A A A A	
Inform took 2 "STADT TV #1:1:1 2 EDAMES 1000 SEONIIM MSD1"	
OK	
inform task 2 "STABT TX #1:1:1, 2 FBAMES 1000 SEQNUM MSB1"	
OK	
inform task 2 "ERROR REP 10 SKIP 1 #1:1:12 FRAME";	
ОК	
query task 2;	
Task 2: Session Status=true, true, Task State=0x02, TxRx State=0x80, 0x00, Session Name=	
1:1:12, Verification Stats=905, 0, 0, 0, 0, 0, Session Name=2:1:12, Verification Stats=0, 998	· _
998, U, U, Z	
UK	_
run task "TRAUTerrT1:help Tx/Rx";	
run task'TrauTerrT1:TxRx'';	
Inform task 2 "SU #1:1:12 RATE 16K DIRECTION OPLINK CODEC EFR";	
INTORM TASK 2 "SU #2:1:12 RATE TOK DIRECTION DUWNLINK CODEC EFR";	
inform task 2 START RA #2.1.12 FRAMES 1000 SEQNOM MSD1 , inform task 2 "START TX #1:1:1 2 EDAMES 1000 SEGNUM MSB1"	
inform task 2 "FBBOB BEP 10 SKIP 1 #1:1:1.2 FBAME":	
guery task 2:	
	-



Remote Protocol Analyzers



What are Remote Protocol Analyzers?

- "Remote Protocol Analyzer" or RPA functionality is an extension of the feature rich capability available with GL's GUI based Protocol Analyzers
- · Supported protocols for remote analysis includes -
 - > HDLC
 - > ISDN
 - ➢ SS7
 - ➤ GR303
 - Frame Relay
 - ≻ V5.x
- HDLC based protocols can be monitored remotely via a set of hardware and software features available with our T1 or E1 based protocol analyzers
- The RPA functionality permits:
 - unattended and 24/7 operation
 - remote accessibility for difficult connection situations
 - remote non-intrusive operation
 - remote detailed diagnostic capability



Key Features

- Client side consists of a PC with Ethernet connectivity and GUI Remote Protocol Analysis software no special T1 or E1 hardware is required
- Multiple T1/E1 servers may be simultaneously connected to a single remote client using a single GUI
- Multiple remote clients may access a single T1/E1 server. Also, the T1/E1 server is fully functional while being accessed as a server. Thus, a user may perform T1/E1 operations locally on the server while a remote client is accessing the same server, in real time
- Supports real-time and offline analysis at the remote client location
- Remote analyzers support capturing of encapsulated protocols and long frames
- Common filtering criteria can be set for T1/E1 cards located on multiple servers



Pre-requisites

- At the site of monitoring
 - Dual T1/E1 PCI based cards or USB based T1/E1 units
 - T1/E1 Server software with HDLC capture software
- At the client location
 - > Appropriate GUI based "Remote Protocol Analyzer" such as ISDN, SS7, and others licensed via "Dongle"
 - LAN/WAN TCP/IP Network with sufficient bandwidth to transport HDLC frames



Remote Analysis

WCS Server Connect	X
WCS Server IP Address 192.168.1.58 IP Port 17080 I7080 Connected Servers I27.0.0.1:17080 192.168.1.58:17080 Interface	Add Remote Protocol Analysis Single User License
OK Cancel	GL Communications Inc. Copyright © 1999 This program is protected by U.S. and international copyright laws as described in the About Box. Remote Analysis Off-line Only

- Users are required to enter IP address of the WCS server and an IP Port
- Multiple Server IP Addresses can be added to connect simultaneously to all T1E1 cards
- Lists an IP addresses and the IP port numbers
- Option is provided for an user to select the desired IP address of the server



Stream Selection

👷 Protocol Capture Configur	ation	
Save Load Default	Г	
Capture File Options	Port and Time Slot Selection	
Card & Stream Selection	1 2 3 4	
P Capture Filter		
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	13 13 13 13	
	16 16 16 16	
	19 19 19 19	
	20 20 20 20	
	23 23 23 23	
	Data Transmission Bate	
	Single Channel Subchannels 8-56 kbps	AILTS
	C 64 kbps	
	C 56 kbps C 16 1 All	
	Hyper-Channel	All as Port1
	© Nx64 kbps C 32 5	All as Ports1,2
	C 40 5 7	
	C 56	IP Addr / Cards



Stream Selection

- Streams can be captured on the selected time slots (contiguous or non-contiguous), sub-channels (fractional DS0 to DS1) or full bandwidth
- Frames may also be contained in n x 64 kbps
- Recorded trace file can then be analyzed offline, exported to ASCII file, or printed



Capture Filter

Capture Filter		
<u>Save Load D</u> efault		
Capture File Options Card & Stream Selection Capture Filter Control Options Gui & Protocol Options	Filter Definition Image: Second Sec	Exclude FISU Exclude LSSU Excl FISU+LSSU Clear ALL



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



Thank you

