Test Solutions for Air Traffic Management



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Overview





GL's ATM Test Solutions Overview

• ED-137 Emulators

- ➤ MAPS[™] ED-137 Radio
- > MAPS[™] ED-137 Telephone
- > MAPS™ ED-137 Recorder
- ED-138 Monitoring Solutions
 - ➢ PacketScan™
 - ➢ NetSurveyorWeb™
- Critical Delay and Voice Quality Measurements
 - Traffic Generation
 (Background, Test, Stress)
 - Audio Analyzer
 - Packet Analyzer
 - Discrete Signal Logger, Packetizer
 - IP WAN Simulation



MAPS[™] ED-137 Radio, Telephone, and Recorder



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Communications

MAPS[™] ED-137 Radio Emulator

- Emulates Air-to-Ground Calls as per EUROCAE ED-137 Volume 1 Radio Interface
- Flexible Architecture for custom testing scenarios
- Software based solution
- Easy-to-Use Graphical User
 Interface
- Scripting and Automation capability for regression testing. Support for Python APIs

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MAPS[™] ED-137 Radio Emulator Highlights



- Emulates CWP or GRS as per ED-137/1B and ED-137/1C Radio interface
- Simulates multiple CWPs or Radios in single instance of MAPS[™] using unique IP addresses
- Portable, easy to configure and use during the field installation, testing and commissioning

- Supports all Radio Call Types, PTT Types, SIP Headers and all mandatory/optional SDP attributes
- Supports Linked Session Management, WG67 Key-In Event, Multicast Routing and SELCAL tone
- Supports both IPv4 & IPv6. Validated against VOTER versions 4.1.33.1 and 4.1.33.2



MAPS[™] ED-137 Radio Emulator – Profiles

- Each profile represents a CWP/ Radio with customizable parameters such as Radio type (Tx, Rx and TxRx), PTT type, Priority, Frequency-Id etc.
- Simulates feature specific RTP header extensions - Climax Time Delay, Signal Quality Index, Radio Remote Control and Dynamic Delay Compensation
- Traffic actions send and record to file, send and detect digits/tones, Talk using microphone and play to speaker
- Impairments (Packet Loss, Duplicate, Out of sequence and Latency) can be applied to RTP traffic
- Codecs G711A, G711U and G729

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MAPS[™] ED-137 Radio Emulator – Call Reception

- Supports Call pre-emption, PTT priority handling, permitted users list
- Supports simulation of Combined and Separated Radios
- Displays Call graph and message decodes for each call
- Load generation or background traffic generation can be done using Bulk Call generation feature
- Supports automation of Call and Traffic generation (auto PTT/SQU)

or No	Script Name	Profile	Call Info	Script Execution	1	Status	Events	Events Profile	Results	
1	SipCallControl.gls	GRS0001	CWP03@192.168.12.20/	8	Stop	Sending R2S KeepAlive	None			Pass
2	SipCallControl.gls	GRS0001	CWP04@192.168.12.208, PTT	FID = 8	Stop	Sending R2S KeepAlive	Start Squelch			Pass
3	SipCallControl.gls	GRS0001	CWP02@192.168.12.208, PTT	[·ID = 9	Stop	Sending R2S KeepAlive	Start Squelch			Pass
4	SipCallControl.gls	GRS0002	CWP06@192.168.12.208, PTT	[4D = 5	Stop	Sending R2S KeepAlive	Start Squelch	_		Pass
5	SipCallControl.gls	GRS0002	CWP07@192.168.12.208	8	Stop	Sending R2S KeepAlive	None			Pass
6 7	SipUallControl.gls	GRS0003	CWP13@192.168.12.208, PT1	14D = 5	Stop	Sending R25 KeepAlive	Start Squeich	_		Pass
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			!	10.30.22.320000						
		000.01			Contact: CWPO2 <si< td=""><td>p:CWP02@192.168.12.2</td><td>D8> 0102 160 12 200</td><td></td><td></td><td></td></si<>	p:CWP02@192.168.12.2	D8> 0102 160 12 200			
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Multiple Controller and Radio Simulation





ED-137/1C Features in MAPS[™] ED-137 Radio Emulator

- Radio Receiver Multicast Operation
- SELCAL (Selective Calling) Tone Transmission
- Simulation of Non-VoIP source PTT keying
- WG67 KEY-IN event package now includes frequency id (fid) of Radio
- Option to retain active sessions at GRS when frequency (fid) changes
- Added Test PTT
- PTT-id 63 is reserved for SELCAL tone transmission and PTT-ids 60, 61 and 62 are reserved for PTT keying from non-VoIP source
- Radio version updated to "radio.02" in WG67-Version SIP header
- Provides an option to send packets with RRC responses from GRS at defined intervals
- Supports enable/disable active voice call preemption at GRS node



MAPS™ ED-137 Telephone Emulator

- Emulates Ground-to-Ground Calls as per EUROCAE ED-137 Volume 2 Telephone Interface
- Flexible Architecture for custom testing scenarios
- Software based solution
- Easy-to-Use Graphical
 User Interface
- Scripting and Automation capability for regression testing. Support for Python APIs

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MAPS[™] ED-137 Telephone Emulator Highlights



- Emulates CWP endpoints as per ED-137/2B and ED-137/2C versions
- Simulates multiple CWPs from single instance of MAPS[™]. Each simulated CWP can have unique IP address
- Supported Codecs G711 A-law, U-Law and G729

- Supports Addendum 2: FAA Legacy Telephone Networking, Addendum 4: Override Call and Addendum 5: Voice Call optionally.
- Portable, easy to configure and use during in-the-field installation, testing and commissioning
- Supports both IPv4 and IPv6. Validated against VOTER version 4.1.33.3



MAPS[™] ED-137 Telephone Emulator – CWP Profiles

- Each profile represents a CWP with • customizable parameters
- Supports all call types (IA, DA/IDA, • Monitor etc.) and call scenarios such as Call Hold, Call Transfer (Attended and Unattended), Call Pickup, Call Intrusion etc.
- Supports simulating invalid test ٠ cases by malforming SIP and SDP messages
- Allows simulating all SIP error • responses such as 3xx, 4xx, 5xx and 6xx
- Traffic Actions send and record to file, send and detect digits/tones, Talk using microphone and play to speaker
- Impairments (Packet Loss, Packet • Effects and Latency) can be applied to RTP traffic

Insert



13



MAPS[™] ED-137 Telephone Emulator – Call Generation

- Displays Call graph and message decodes for each call
- Load generation or background traffic generation using Bulk Call Generation
- Scripts/sessions can be run repeatedly for defined number of iterations with results of each iteration
- Multiple scripts can be run simultaneously or sequentially or randomly
- Scheduler helps to run a set of scripts (test cases) at different intervals as defined by user

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Multiple Controllers Simulation





MAPS[™] ED-137 Recorder Emulator

- Emulates Recording sessions as per EUROCAE ED-137 Volume 4 Recorder Interface
- Flexible Architecture for custom testing scenarios
- Software based solution
- Easy-to-Use Graphical
 User Interface
- Scripting and Automation capability for regression testing.

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MAPS[™] ED-137 Recorder Emulator Highlights

- Emulates ED-137/4B and ED-137/4C Recorder interface at CWP, GRS and Recorder endpoints
- Simulates Recorder interface on multiple CWPs, Radios and Recorders from single instance of MAPS
- Supports all three transport types embedded binary data, independent TCP and independent UDP
- Audio codecs G711 A-law, G711 Ulaw and G729
- Supports both IPv4 and IPv6.
- Validated against **VOTER** 4.1.33.4





MAPS[™] ED-137 Recorder Use Cases

CASE 1: Simulate AG call recording towards Recorder | CASE 2: Simulate GG call recording towards Recorder



Communications

MAPS[™] ED-137 Recorder Use Cases





CASE 4: Testing Recorder interface of GRS

MAPS[™] ED-137 Recorder Emulator Highlights

- Each CWP/GRS profile allows to define its own set of parameters to emulate an AG/GG call
- Custom Call Record Data properties and operations can be added quickly
- Recorder server can record and playback voice on sessions
- Call Record Data of each
 session is stored in CSV format
- Scripts to automate PTT and Squelch operations on AG recording sessions





MAPS[™] ED-137 Recorder Emulator Highlights

- Provides Call Graph and message decodes
- Scripts/sessions can be run repeatedly for defined number of iterations with results of the test
- Multiple scripts can be run simultaneously or sequentially or randomly
- Scheduler helps to run a set of scripts (test cases) at different intervals as defined by user
- Hundreds of recording sessions can be made to Recorder to verify performance and load testing

MAPS (Message Automation Protocol Simulation) CWP (SIP ED-137C Volume 4 Record Source Configurations Emulator Reports Editor Debug Tools Windows Help Image: Source Image: Source Image: Source	der) - [Call Generation - CallGenDe	ault]					_	_ & ,
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Key Updates

- Emulators support both ED-137 B and C versions, including Change 1 & 2 features
- User can choose to simulate ED-137 B or C version when invoking the application. License supports both versions
- Emulators support both IPv4 and IPv6 addressing
- All Emulators (Radio, Telephone and Recorder) are validated against latest VOTER tool
- GL participated in the "FAA VoIP Interoperability Event 2019" in Atlantic City. All GL Air Traffic testing products were extensively used by all other participating Equipment Manufacturers
- GL will participate in VoIP in ATM Over IPv6 Plugtests in September 2024 (France)



Air Traffic Control Monitoring Solutions



PacketScan[™] and NetSurveyorWeb[™]

- PacketScan[™] is a capturing probe deployed on the Air Traffic Network
- Results are sent to NetSurveyorWeb[™] database for centralized analysis.
- Scalable to hundreds of probes deployed globally feeding a single database
- Infinite and nonintrusive monitoring of IP traffic



PacketScan™: Protocol Analysis Software

- Monitor up to 2000 simultaneous calls with bidirectional RTP traffic
- Capture and analyze packets at wirespeed. Save the captured trace to a disk
- Analyze in real-time or analyze recorded trace files off-line
- Aggregate statistics can be obtained for any field or parameter in the protocol headers to study the performance of the overall VoIP network
- Supports SIP ED-137 for Air Traffic Monitoring (Air-to-Ground, and Ground-to-Ground)

le <u>V</u> iew Cap ∝	pture <u>S</u> tatist	ian Databasa Call Datail B										
			lecords <u>C</u> onfig	jure <u>H</u> elp ▼ISI ❤/∞		CoTr	- 1					
evice Fran	ame#	TIME (Relative)	Length (Bytes)	sêr sêr F SK	Length/Protocol Type MAC	Packet Type MAC	Source IP Address	Destination IP Address	Source Port	Destination Port		SIP Method SIP
/ n	0	00:00:00 00000000	1031		Internet IP(IPv4)	SIP	192 168 12 208	192 168 12 218	5060	5060	INVITE	011
0	1	00:00:00.022167000	407		Internet IP(IPv4)	SIP	192.168.12.218	192.168.12.208	5060	5060	100 Trying	
0	2	00:00:00.132649000	976		Internet IP(IPv4)	SIP	192.168.12.218	192.168.12.208	5060	5060	200 OK	
0	3	00:00:00.154745000	473		Internet IP(IPv4)	SIP	192.168.12.208	192.168.12.218	5060	5060	ACK	
0	4	00:00:00.164060000	62		Internet IP(IPv4)	RTP	192.168.12.218	192.168.12.208	1028	6000		
0	5	00:00:00.183807000	62		Internet IP(IPv4)	RTP	192.168.12.208	192.168.12.218	6000	1028		
DE Interne Differe Differe DF Explic IP Hdr 10 Total 12 Identi 14 Reserv 14 Don't 14 More f 14 Fragme 16 Time T 17 Protoc 18 Header 24 Destine 24 Destine 24 Destine 24 Destine 24 Checksu 24 CSRC cc 28 Marker 28 Checksu 24 CSRC cc 28 Marker 28 Caecksu 26 TimeSta 32 SSRC id 36 Type :E 38 Length 34 PTT-typ 34 Squelch 38 PTT Mut 38 PTT Mut 38 SCT	et Header entiated S rentiated cit Conges No TCP Se Length ification ved Bit fragments ent Offset col r Check Su e IP Addre nation IP ==== UDP Port ation Port (Header - UN g ion header ount bit d type ce Number amp dentifier EURCCAE EI pe h	Length (In 32 bit of Services Field Services Codepoint stion Notification egmentationOffload t t Manages Address Layer ====================================	<pre>#ords) = # #</pre>	0101 (5) 000000 Def: 00 Not- 48 (x0030) 39415 (x99F7 0Not .0Not .0Not .0Not 128 (x90) 00010001 UDP x05CB 192.168.12.21 192.168.12.21 1028 (x0404) 6000 (x1770) 28 (x001C) x07FA 10(2) .1Pres x07FA 10Not .1111011 (12) 26218 (x66A 3796309020 (x157) 1 (x0001) 000PTT .0OFF 2 (0000Not .0OFF .0OFF .0OFF	ault -ECT (Not ECN-Capab Set Set Set 00000000) 18 (xCOA80CDA) 28 (xCOA80CDA) 28 (xCOA80CDO) 28 (xCOA80CDO) 28 (xCOA80CDO) 28 (xCOA80CDO) 28 (xCOA80CDO) 28 (xCOA80CDO) 29 (xCOA80CDO) 20 (ole Transport)						



PacketScan[™] Software – Call Summary

- ED-138 Statistics (MOS/R-Factor, Packet Loss, Delay and Jitter)
- Provides graphical analysis of calls like Call Ladder Diagrams, MOS and Jitter variation graphs
- Record and Playback
 audio on the call
- Detects
 inband/outband Digits
 and Tones
- Triggers and Actions feature can filter on "Calls of Interest"
- Logs Call Detailed Records to CSV files

PDA Pac	(et Data An	ialyzer - Su	mmary Vi	iew																_	
	ew <u>C</u> allS	ummary	Protocol	Configurations	GUI Configuratio	ns <u>H</u> elp							0.117	F							
<u> 7</u>		KPT		ी शि औ	TF SIP		▼ Show	All Calls	1	<u> </u>				ount: 5							
Call Sun		Registration	Summary	Alert Summary		1.		1		1	1	1.	1.		1.	1	1	1	1	[L. L.
Call #	SSRC	Payload	Packet Received	Conversationa MOS/R-Fac	Listening MOS/R-Factor	Latest MOS_Distributio	OverAll vr VoiceQ	Packets Discard	Missing Packets/(%)	Duplicate	Out Of Sequence	e Gap(ms)	Average Delay	Average Jitter	Average Inter	Cumulati Packet	VIMax/Min Gap	Max/Min Delay	Max/Min Jitter	Max/Min RTDela.	. Average I . RTDela 0
@Call#0	00001 Calle	er:CWP01 C	allee:GRS1	1 Callid:GL-MAPS	-18-32446300-10373	9692@192.168.1	2.208 Call 9	StartTime:20	24-03-13 12:15:41.624	Call Durati	on: 00:02:00	0.272									
% 1	11907	PCMA	3810	2.31 / 47	2.31 / 47	0/0/115	Poor	9/0.16	1960 / 34.02	0/0.00	0/0.00	30.31	0.38	3.20	1	0	534.67	474 /	30.04	2.969	1.127 (
Call#0	00002 Calle	PUMA er:CWP01 C	allee:GRS1	4.207 93 1 Callid:GL-MAP9	4.207 93 -17-32447696-10380	317070 14584@192.168	12.208 Call	StartTime:2	07.000 024-03-13 12:15:43.02	4 Call Dura	ion: 00:01:5	20.00	0.05	1.04	4	1790	40.48	207-20	4.067	0.201	0.184 (
% 2	11930	PCMA	603	4.20 / 93	4.20 / 93	0/0/0		0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0.00	0.00	0.00	1	0	0.00 /	0/0	0.007	4.157	1.078 (
2 2	11902	PCMA	1977	4.20 / 93	4.20 / 93	31/0/0	Good	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	20.00	0.05	0.99	0	0	39.39	197-17	3.94 /	0.327	0.234 (
	11945	PCMA	601	4.20 / 93	-17-32448144-10387 4.207.93	0/0/0	12.208 Call	Start Lime: 2	024-03-13 12:15:43.46	0 / 0.00	0 / 0.00	0.00	0.00	0.00	1	0	0.007	070	0.007	2.319	0.841 (
2 3	11908	PCMA	1977	4 20 / 93	4.20 / 93	31/0/0	Good	0/0.00	0 / 0 00	0 / 0.00	0/0.00	20.00	0.05	0.99	0	Ō	39.39	197-17	3.96 /	0.251	0.209 (
Call#C	00004 Calle	er:CWP01 C	allee:GRS1	1 Callid:GL-MAPS	17-32449105-10394	5260@192.168.1	2.208 Call 9	StartTime:20	24-03-13 12:15:44.423	Call Durati	on: 00:01:57	7.492	0.40	0.55			142.04	0.1.10	5 00 1	0.400	0.100
4 4	11914	PCMA	2427 1977	2.12743 4.20793	2.12743 4.20793	070778 317070	Poor Good	070.00	1494738.16	0/0.00	0/0.00	32.35 20.00	0.46	3.99 0.99	2	U 1384	142.94 39.39	97-10 197-17	3.94 /	0.489	0.439 (
Call#0	00005 Calle	er:CWP01 C	allee:GRS1	1 Callid:GL-MAPS	17-32449575-10401	1840@192.168.1	2.208 Call 9	StartTime:20	24-03-13 12:15:44.908	Call Durati	on: 00:01:57	7.011									
% 5	11936	PCMA	2513	2.17 / 44	2.17 / 44	0/0/79	Poor	0/0.00	1459 / 36.79	0/0.00	0/0.00	31.64	0.34	3.41	1	0	142.55	12/-10	5.21 /	5.613	1.470 0
9 5	11953	PUMA	1977	4.20793	4.20793	317070	Good	070.00	070.00	070.00	070.00	20.00	0.05	0.99	2	1362	39.39	197-17	3.957	0.220	0.204 0
<																					>
Column	width 🕪		- 🗆 AH	osolute Timina I	Show Latest																
				solute rinning r	SHOW Edicat								F a b								
Tim	e	Frame#		192.168.12.2	38	192.168.	12.218					Find		te Stack							
00.	00.000	0	5	060	INVITE		5060	0		INVITE	==== SIP sip:GRS1	.@192.168	3.12.218	SIP/2.0							^
					SIP/2.0 100 T	rvina				Via: SI	P/2.0/UD	P 192.1€	58.12.208	:5060;b	ranch=z9	9hG4bK-1	9-3244631	00-10374	-9692		
00.	00.018	1	5	060 🕂			5060	0		Allow:	NVITE,B	YE,CANCE	L,ACK,IN	FO,OPTI	ONS,SUBS	SCRIBE,N	OTIFY,RE	FER,REGI	STER		
00.	00.140	2	5	060 🖌	SIP/2.0 200	OK	5060	0		From: C	WPOl ≺si l ≺sin:C	p:CWPOle	192.168.	12.208>	;tag=Fro	omTag-16	-3244630	0-10371-	9692		
			-		ACK		500			Contact	: CWPO1	<sip:cwf< td=""><td>010192.1</td><td>.68.12.2</td><td>08></td><td></td><td></td><td></td><td></td><td></td><td></td></sip:cwf<>	010192.1	.68.12.2	08>						
00.	JU.151	3	5	060			5061	U		Call-ID	GL-MAP	S-18-324	46300-10	373-969	20192.10	58.12.20	8				
00.0	5.185	185	6	000	Normal PTT		1050	0		Recv-In	fo:										
	E 10E	100			Normal PTT	DN	1.05			WG67-Ve Priorit	rsion: r	adio.02									
00.0	5.185	186	ы				1000	U		Subject	; radio	-									
00.0	9.628	611	6	000 🕂	Squeich Ui	N	1050	0		Support	ed: 100r -Type: a	el mplicati	on/sdp								
00.4	067	10269	C	000	Squelch OF	F	1.050	0		Content	-Length:	410									
00.4		10300	0				1000	0		v=0											
									¥ []	CWDO1	2205202	0 000500	000 TH TT	4 102 1	<u>~0 10 0</u> (20					~
	iate λ R1	IP Packets	Graph A	Average Jitter	Distribution <u>}</u> E-M	lodel λ T.38 An	ialysis λ C	all Flow	Call Summary												



Good Call and Bad Call

Packet Data A	nalyzer - Summaŋ	y View	()S - 242361 3													- 0	y ×
Eile View Sal	Summary Proto	ocol Configu	rations GUI Confi	igurations Help													
2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	= 'a)	21 7 8	III SIP	• St	<u>iow A</u> ll Sessio	ns			1							
Call Summary Re	egistraton Summary	Conv	ersational		Missing					3							
Call # SSRC	Payload F	Conve	ersational	ng Pack	Missing	cate 0	ut Of Ser	\sim		age	Average Inter	Cumulative	Max/Min	Max/Min	Max/Min	Max/Min	Average I
Contraction of	Here (1001/8/192 168	MOS	/R-Eactor	R-Factor Disca	Packots[%]	ets/[%] F	ackets/1%			100	Amival Jitter [Packet Lost	Gap	Delay	Jitter	RTDela	RTDela_C
S 1 36072	PCMA/8000	INIOS		93 070	1 acket5[70]	1.00	0/0.00	20.00	0.00	0	0	991	24.99	4/-2	0.61 /	1.718	1.108
21 24488	PCMA/8000	1346 4	20/93 4.20	/93 0/000	0/0.00	0/0.00	0/0.05	19.9	9.02	00		0	25.16	5/-5	0.97/_	0.164	0.164 1
2 36019	PCMA/8000			56 0/0		1.52 Call 54	0/0.00	GO	DD C	ALL		431	260.18	240 /	15.59	1.727	1.235
2 25805.	PCMA/8000	42	20/93	93 070	0/0 00	1.00	070.00	7	\sim		Provide State	285	26.46	6/-6	1.01 /	0.217	0.217
Cal#000003 C/	aler:0001@192.168	1.2	20,33	stid GL-MAPS_3	0/0.00	1.1.52 Call St	lartTime:2018-	20.00	205 Cal	ation: 00 34.00	000.52.152	0	100.07	190 / .	79.26	1 324	1.052
3 31045	PCMA/8000	267 4	4.20/93 4.20	/93 0/0.00	0/0.00	0/0.00	0/0.00	0.00	0.00	0.00	30	2	0.007	0/0	0.007_	0.000	0.000
<																	>
						^			Find	1							
TimeStamp F	Frame Number	192.1	168.1.52	192.1	68.1.231					_							^
00.00.000	0	5060	4	NVITE	5060		INVITE Via: ST	sip:00018)	192.168.1	1.231 31	P/2.0	95G458 4 27	0759591-	13062-85	84		
00.00.007	1	5060	SIP/2	0 100 Trying	5060	_	Max-For	wards: 70			and the second sec						
			SIP/	2 0 200 OK			From: 0	INVITE, BY:	CANCEL, 00010192.	ACK, INF. 168.1.5	2>;tag=From	Tag 1 27075	9591-130	ER, REGIS 59-8584	TEP		
00.00.117	2	5060	4		5060		To: 000	1 <sip:000< th=""><td>010192.14</td><td>68.1.201</td><td>></td><td>1/0 1 /0</td><td></td><td></td><td></td><td></td><td></td></sip:000<>	010192.14	68.1.201	>	1/0 1 /0					
00.00.124	3	5060		ACK	5060		CSeq: 1	INVITE	3_2/0/65	7571-130	01-02040135	.109.1.02					
			K	eep Alive			Expires	: 180									
00.00.125	4	6000			1042		Subject	: radio									
00.00.127	5	6000	H	tep Aive	1042		Contact	: 0001 <s:< th=""><td>110.01 1p:000181</td><td>192.160.</td><td>1.52></td><td></td><td></td><td></td><td></td><td></td><td></td></s:<>	110.01 1p:000181	192.160.	1.52>						
00.09.453	100	6000	Nom	nal PTT ON	1042		Content	-Type: app	lication	n/sdp							
			K	eep Alive			Content	-Length: •	104								
00.41.192	1850	6000			1042		v=0 o=0001	11857918	11857938	-	197 168 1 5	2					
01.22.623	2270	6000	4 Sq	uelch ON	1042		S=SIP C	all									
			K	eep Alive	1010		c=IN IP t=0 0	4 192.168.	1.52								
01.42.409	3.962	6000		Post.	1042		a=audio	6000 RTP	AVP 8 0	18 101	123						
02.52.048	4066	5060	4	BIE	5060		a=rtpaa a=rtpaa	p:8 PCMA/8 p:0 PCMU/8	1000								~
			SIP/	2.0 200 OK		~	<						_				>
Active Calls Gr	aph X RTP Pack	ets Graph	Average Jitter Dis	Itribution X E-Model	λ T.38 Analysis λ C	all Graph / Call	Summary /										



NetSurveyorWeb™

- Web-based network
 surveillance system for
 air traffic monitoring
- Works with multiple PacketScan[™] Probes to non-intrusively monitor remote locations
- Real-time and/or historical analysis
- Multi-user support, and user-friendly interface
- Filter and Search Options. Provides quick database query methods
- Generates Reports, Alarms and E-mail notifications

NetSurveyorWeb						🥰 🌍 Refres	h		Protocol VOI	P (SIP & P	RTP)	👻 Туре	CDR	•			gl	
Quick CDR ~		😐 Data	🚯 Repor	ts 🛛 🔗 Ala	rms 🧸 Users a	System Status at 2024-03-13 12:23:	58											
Air to Ground Calls Ground to Ground Calls	Quick	CDR \ Air to	Ground (Calls														
Good Quality Calls	Date :	2024-03-13	1 202	4-03-13 📷 T	ime: 00:00:00 🗘 23:	:59:59 🗘 🧰 🕻)k											
Poor Quality Calls	Tod	ay Yesterday	Last 7 D	ays Last 30 D	ays All													
Fair Quality Calls		A Pefresh	Show	Latest	Actions - Query Ever	aution Time : 0.39	DEE Secondo	Sort Order	STADTTIME DES	_								
Failed Calls		V Ken can	SHOW	Latest	Query Exer	couon nine : 0.39	000 Seconds	Sont Order .	STARTTINE DES	<u> </u>								
All Calls	9	Trafficsumid		•	Trafficsumid	pply Clear	▲				Pa	ige Size: 20	*					
Custom CDR 💦 👻	_	Ex:Trafficsumid																
CDR			SINo	Trafficsumid	Call Starttime	Calling Number	Called Number	Call Success	Duration	PTT Count	Squelch Count	PTTS Count	PTTM Count	Pilot-Pilot SCT Count	Controller-Pi	lot SCT Count	Call Endtime Fail	ure Cause
		Call Flow	3	223362	2024-03-13 06:47:53.424	0011	0011	1	00:00:11.139	1	3	0	0	1	0		0	
Default KPIs		Call Flow	4	223361	2024-03-13 06:47:45.737	0005	0005	1	00:00:18.844	1	2	0	0	0	2		0	
ED137 Reports																		
Basic KPIs		1263395585	PCMU/800	00 321	0/0		0/0	0	1/0	0,	/0	4.2/93	4	1.2/93	0	0.00/39.33/20.0	J7 0.00/1.93/	.58 0.000/
Config >		1264432897	PCMU/800	00 190	0/0		0/0	0	/0	0,	/0	0/0		0/0	0	0.00/21.69/20.0	0 0.00/0.71/	.47 0.000/
ê alancia 💦 🔪		Call Flow	5	223360	2024-03-13 06:47:45.465	0019	0019	0	00:00:00.000)	0	0	0	0	0		Ne	twork Failure
Admin		Call Flow	6	223359	2024-03-13 06:47:45.449	0003	0003	1	00:00:19.122	1	2	0	0	0	2		0	
Utilization		Call Flow	7	223358	2024-03-13 06:47:44.946	0020	0020	0	00:00:00.000)	0	0	0	0	0		Ne	twork Failure
·		Call Flow	8	223357	2024-03-13 06:47:42.156	0018	0018	0	00:00:00.000)	0	0	0	0	0		0	
		Call Flow	9	223356	2024-03-13 06:47:34.458	0012	0012	1	00:00:30.101	2	4	0	0	0	4		0	
		Call Flow	10	223355	2024-03-13 06:47:32.044	0020	0020	0	00:00:00.000)	0	0	0	0	0		0	
		Call Flow	11	223354	2024-03-13 06:47:31.576	0019	0019	0	00:00:00.000)	0	0	0	0	0		0	
		Call Flow	12	223353	2024-03-13 06:47:31.394	0018	0018	0	00:00:00.000)	0	0	0	0	0		0	
		Call Flow	13	223352	2024-03-13 06:47:28.096	0004	0004	1	00:00:36.481	2	3	0	0	0	3		0	
		Call Flow	14	223351	2024-03-13 06:47:20.312	0014	0014	1	00:00:44.260)	3	0	0	0	0		0	
		SSRC#	Payload	Total Packe	t Count Missing Packet Cou	unt/(%) Dupl. Pac	:ket Count/(%)	Re-ordered Pa	cket Count/(%)	Packets Dis	carded/(%) C	onversational I	40S/R Lister	ing MOS/R Cumulative	e Packet Loss	Gap (Min/Max/A	v) Jitter(Min/Ma	(/AV) RTD(M
		1263165441	PCMA/800	00 224	0/0		0/0	0	/0	0,	/0	4.2/93		1.2/93	0	0.00/0.00/0.0	0.00/0.00	/0 0.802/
		1261130753	PCMA/800	00 258	0/0		0/0	C	/0	0,	/0	4.2/93		4.2/93	0	0.00/21.39/20.0	0.00/0.66/	.42 0.000/
		Call Flow	15	223350	2024-03-13 06:47:20.011	0019	0019	0	00:00:00.000)	0	0	0	0	0		0	



NetSurveyorWeb[™] – Call Detail View

GL NetSurveyorWeb					Pro	tocol VOIP (SIF	8 RTP)	💙 Туре (CDR	~		$\Lambda \Lambda$	al 🖉
📻 Quick CDR 🛛 👻	😐 Data	🚯 Reports	🕑 Alarm s	🍂 Users	System Stati 2024-03-13 12:	15 at 126:58							
Air to Ground Calls Ground to Ground Calls Good Quality Calls Poor Quality Calls Fair Quality Calls		to Ground Calls	TRAFFICSUMI) : 223361	E>	port as PDF	Export as HTM	IL Response	Time : 0.0000	10 Seconds			
All Calls	Call Oraph	1000											
Custom CDR						$\bigcirc \bigcirc$	📀 🗆 Comple	ete Stack Downlo	ad Decode				
CDR		192.	168.15.5		192.168.15.	25							
n Default KPIs		6	SIP		SIP								
ED 137 Reports		-	à china the second s		and the			S	IP Layer ====		=		
Basic KP Is	2024 02 12 06	-47-45 727 EDC0	Ĭ	INVITE	50	c0		INVITE sip:0 Via: SIP/2.0	0005@192.168.1)/UDP 192.168.	L5.25 SIP/2.0 .15.5:5060;brar	nch=z9hG4bK-6590	-479926236-16280	07-81408
🧬 Config 💦 🔹 👌	2024-03-13 00	.47.43.737 3000	/		50	00		Max-Forwards	: 70 E BYE CANCEL	ACK THEO OPTTO	NS SUBSCOTEE NO	TTEV DEEED DEGT	TED
强 Admin 🔷	2024-03-13 06	:47:45.744 5060	•	100 Trying	50	60		From: 0005 < To: 0005 <si< th=""><th>sip:0005@192.16</th><th>168.15.5>;tag= 68.15.25></th><th>=FromTag-6587-47</th><th>9926236-162804-8</th><th>31408</th></si<>	sip:0005@192.16	168.15.5>;tag= 68.15.25>	=FromTag-6587-47	9926236-162804-8	31408
🕂 Utilization 🔹 🔸	2024-03-13 06	:47:45.858 5060	•	200 OK	50	60		Contact: 000 Call-ID: GL-	95 <sip:0005@1 MAPS-6589-479</sip:0005@1 	192.168.15.5> 9926236-162806-	-81408@192.168.1	5.5	
	2024-03-13 06	:47:45.870 5060)	ACK	50	60		CSeq: 1 INVI Recv-Info: WG67-Version Priority: no	TE : radio.02 rmal				
	Event	Summary	^v View		Quick	Search: Quick S Ex.Value	Search 1,Value2	•				Apply Clea	2
	Time Stamp	R	Packet Type	Frame Length	Source IP	Destination IP	Event Type	PTT Type PTT Id	Conversational	Mos Missing Pac	ket Count Packet Di	scarded Reordeed I	Packet Count Duplicate Packe
	2024-03-	14 17:14:35.2	61 SIP	1026	192.168.15.14	192.168.15.34	INVITE						
	2024-03-	14 17:14:35.6	02 SIP	406	192.168.15.34	192,168,15,14	100 Trying						
	2024-03-	14 17:14:35.7	21 SIP	963	192,168,15,34	192.168.15.14	200 OK						
	2024-03-	14 17:14:35.7	49 SIP	483	192.168.15.14	192.168.15.34	ACK						
	2024-03-	14 17:14:41.7	63				Squelch ON		0	0	0	0	0
	2024-03-	14 17:14:50.7	73				Squelch OFF		4.2	0	0	0	0
	2024-03-	14 17:14:51,4	76 SIP	487	192,168,15,14	192.168.15.34	BYE						
	2024-03-	14 17:14:51.4	85 SIP	466	192.168.15.34	192.168.15.14	200 OK						

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Communications

NetSurveyorWeb™ – **Reports and Graphs**





GL's Critical Delay and Voice Quality Measurement in Air Traffic Management (ED-138)



Critical Time Delay Measurements





Critical Time Delay Measurements (ED-138) - Overview



Communications

Important Events to Measure in ATM Network

- PTT
- PTT confirmation
- PTT release
- PTT release confirmation
- Squelch on
- Squelch off
- End-to-end voice delay for PTT
- End-to-end voice delay for Squelch
- Main/Standby Tx/Rx transfer
- Main/Standby Tx/Rx transfer confirmation
- Remote Receiver Mute
- Remote Receiver Mute Confirmation
- Remote Receiver Unmute
- Remote Receiver Unmute Confirmation





GL meets all critical specifications for ATM Delay and Voice Quality measurements



Voice Quality Measurements in ATM



Voice Quality measurement can be across IP to IP, IP to Analog and Analog to Analog networks







Packet Analyzer + MAPS™ ED137 Radio



Audio Analyzer



Discrete Signal Logger

Deployment Architecture Elements

MAPS[™] Administrator

- Client application that controls all the components of TM ATM suite and runs the tests to perform measurements
- Calculate the time difference between posted events from the Discrete Signal Logger and Packet Analyzer and reports precise measured delay at different points in the network

Packet Analyzer

- Filter packets of interest on multiple ports with 120 byte depth filters. Define what byte(s) of interest to be filtered at hardware-level
- Capable of routing filtered packet with GPS time stamp or generate TTL triggers (1 Microsecond pulse) for each filter passed

MAPS[™] ED-137 Radio

- Simulates CWP and GRS to emulate hundreds of Air-to-Ground calls
- Key PTT/Squelch, send and record audio

Audio Analyzer

- Emulate Controller (PTT and Audio); Generates TTL triggers based on PTT On, PTT Off, Audio Start and Audio Detect (On or Off)
- Inject and record analog signals at the CWP, Radio and VoIP gateway interfaces

Discrete Signal Logger

The Discrete Signal Logger monitors the TTL output from the Audio Analyzer and generates a corresponding IP packet indicating a certain event has occurred. The packets generated by the Discrete Signal Logger are named as discrete events and posted to the Event Data Logger

ATM Solution for Portable Field Testing





Thank you

