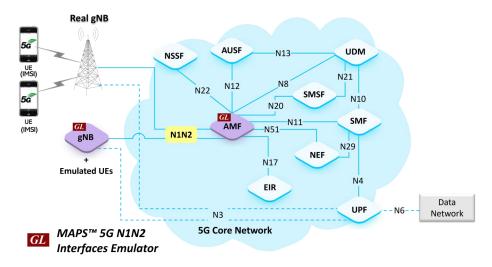
MAPS[™] 5G N1N2 (NGAP) Emulator



Overview

GL's **Message Automation & Protocol Simulation (MAPS™)** is enhanced to test 5G N1N2 interface that can emulate gNodeB (gNB), and AMF (Access and Mobility Management Function) according to 3GPP standards (Release 17).

It supports Non-Access-Stratum (NAS) signaling on N1N2 interface between UE and AMF. It also supports NGAP to emulate signaling services between NG-RAN and AMF.

MAPS[™] N1N2 Interface emulator supported procedures include - NG Reset, NG Setup, Initial Context Setup, UE Context Release, Registration, De-registration, Primary authentication and key agreement procedure, Security mode control, Identification and PDU session management and SMS over NAS. The application gives the users an unlimited ability to edit NGAP/NAS message and call scenarios (message sequences).

In addition to control plane emulation the application supports generation and verification of traffic, including VoNR (Voice) calls with SIP signaling and RTP Traffic generation. It also emulates mobile traffic such as HTTP, FTP, Video by playing back real capture stateful over established TCP connection with additional licenses - Mobile Traffic Core – GTP (ETH101) and Mobile Traffic Core – Gateway (ETH102).

GL MAPS[™] is not only used for protocol validation but also for performance and capacity by emulating tens of thousands of 5G subscribers.

MAPS[™] 5G NGAP emulator supports utilities like Message Editor, Script Editor, and Profile Editor which allows new scenarios to be created or modified using 5G NGAP/N1N2 messages and parameters.

For more information, refer to <u>MAPS[™] 5G N1N2 Interface Emulator</u> webpage.

Main Features

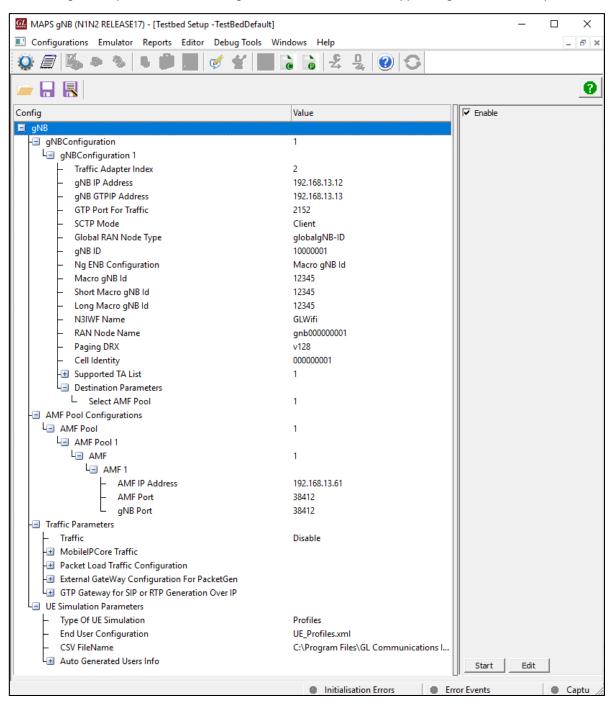
- MAPS[™] 5G N1N2 interface emulates gNodeB and AMF
- Application supports 5G Control Plane and User Plane
- Supported traffic types includes mobile data traffic such as HTTP and VoNR
- Generates and processes NGAP/NAS (valid and invalid) messages
- Includes gateway functionality to forward mobile traffic over GTP to and from external IP network
- · Customization of call flow and message templates using Script and Message Editor
- Ready-to-use scripts for quick testing
- Supports scripted call generation and automated call reception
- Provides detailed Statistics and Events Status
- Emulates tens of thousands of 5G subscribers
- Supports Command Line Interface (CLI) via Python APIs
- Automation, Remote access, and Schedulers to run tests 24/7

🔊 GL Communications Inc.

818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A (Web) <u>www.gl.com</u> - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) <u>info@gl.com</u>

Testbed Configuration

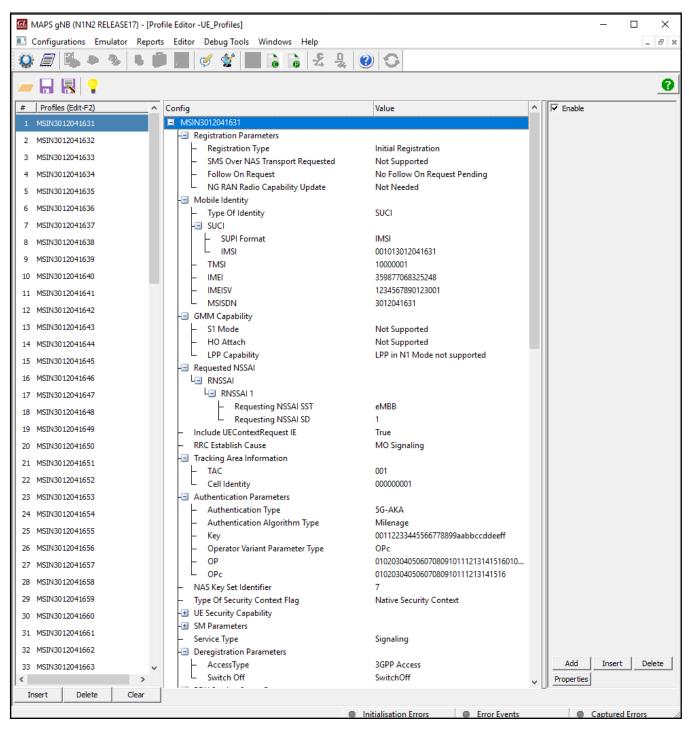
The testbed setup window allows users to setup the required test environment with SCTP configuration in N1N2 interface. SCTP configuration parameters consist of Source/Destination IP addresses, and Port numbers to configure MAPS[™] to emulate gNodeB and AMF entities in N1N2 interface. MAPS[™] can then generate and receive NGAP/NAS messages to/from valid IP address in the 5G network. End user configuration profile is used to configure MAPS[™] 5G N1N2 with supported gNodeB and AMF parameters.





Pre-processing Tools

PROFILE EDITOR - This feature allows loading profile to edit the values of variables using GUI, replacing the original value of variables in the message template. An XML file defines a set of multiple profiles with varying parameter values which allows users to configure call instances in call generation to receive calls. The UE_Profiles includes 5G parameters, that is required to configure multiple UEs to emulate Signaling, Traffic, VoLTE calls. User can configure Mobile Traffic parameters, allowing emulation of offline HTTP Traffic using Mobile IP Core TCP Client Server connections.



GL Communications Inc.

Pre-processing Tools (Contd.)

SCRIPT EDITOR - The script editor allows user to create/edit scripts and access protocol fields as variables for the message template parameters. The script uses pre-defined message templates, to perform send and receive actions.

ScriptEditor - [E:\17-01-24\MA	PS5G-N	V1N2	-Verylate	\MAPS\N1N2\RELEASE17\gNB\Scripts\5GNGAP_gNB.gls]	- 🗆
File View Edit Shortcuts	Tools	н	alm		
The view Ear Shortead					
) 🗳 🔒 🗙 💥 🚦	₽₫	:	ୃତ 💡		
mand Window	1		5GNGA	gNB	Þ ×
ction		2	//UE_R	gistration Procedure//	^
Send				ates Registration procedure by sending Registration Request Me	
Recv		4			
- Decode		5	Parent:	criptId = "*";	
Bind		6	RANStat	="Null";	
Unbind		7	5GMMSul	State="5GMM-NULL";	
-Load Profile		8	5GMMSta	e = "RM-NULL";	
- Start Timer		9	RAN_UE	IGAPID=0;	
- Stop Timer	1	0	//RAN_I	_NGAPIDs="RAN";	
- Stop Retransmit Timer	1	1	//A110	JniqueId RAN_UE_NGAPIDs RAN_UE_NGAPID; //Signaling Binding Id	
Conditional & Flow Control				<pre>i=1;//It is required in case of multithreading as per develope;</pre>	cs.
'ariable				ationAttemptCounter = 0;	
laps CLI				trationAttemptCounter = 0;	
ogs / Comment				(binarystring)0x0000;	
nit			PTI = 0		
Child Script				ionId = 4;	
)ataBase			ULNasS		
end Report				ionSCNumberPlan=1;	
lesume leturn				<pre>cionSCNumberType=1;</pre>	
ndude				IndicatorDigit=(binarystring)0000; LonSchemeIdentifier=0;	
bit				vorkPublicKevId=0;	
Julity Functions				Setting=0; //Voice Centric	
raffic Commands				CtxtSetupRegWithRegAccept=0;	
				estAttempt=0;	
				Lization PDU Status Indicator(arrav) variable	
			i=0;	(
			PSI.Si:	=15;	
				(.Size)	
	3	1	PS:	[1]=0;	
	3	2	endloop		
	3	3			
	3	4	MsgHan	ler:"NGAPMessageHandler";	
	3	5	KIdDis	Strl="RAN_UE_NGAPID :";	
				Str2="AMF_UE_NGAPID :";	
				Str3="TMSI :";	
	3	8	KIdDis	Str4="IMSI :";	~
	<				>
	p –			Line Count - 257 Line : 1 Col : 1	NUM
Y				Line Count - 257 Line : 1 Col : 1	INUIVI

MESSAGE EDITOR - The message editor allows user to build a template for each protocol message type. The value for each field may be changed in the message template prior to testing. The protocol fields comprise of mandatory and optional parameters.

· View Direction Tools Help	
÷ 🖬 🔋 🗙	
- NAS	▲ Registration Request = 65
- Extended Protocol Discriminator	Registration Request = 65
Security Header Type MM Message Type InformationElements SGS Registration Type and NAS Key Set Identifier Registration Type Follow-On Reguest NAS Key Set Identifier Type of Security Context Flag (TSC) SGS Mobile Identity Length	Registration Accept = 66 Registration Complete = 67 Registration Request (UE originating) = 69 Deregistration Request (UE originating) = 70 Deregistration Accept (UE terminated) = 71 Deregistration Accept (UE terminated) = 72 Service Request = 76 Service Request = 76 Service Accept = 78 Configuration Update Command = 84 Configuration Update Command = 84
NGAP-PDU	= CHOICE
Extensibility Marker	= 0
Choice Index	= 0
ProcedureCode	= INTEGER
Contents	= 4 id-DownlinkNASTransport
procedureCriticality	= ENUMERATOR
Contents	= 0 reject(0)
Value	= Open Type
Length	= 29
Extensibility Marker	= 0
ProtocolIE-Container	= SEQUENCE OF
Iteration Count	= 3
ProtocolIE-Container	= Instance 0
ProtocolIE-ID	= INTEGER
Contents	= 10 id-AMF-UE-NGAP-ID
procedureCriticality	= ENUMERATOR
Contents	= 0 reject(0)
Value	= Open Type
Length	= 3
AMF-UE-NGAP-ID	= INTEGER

GL Communications Inc.

Call Generation and Call Reception

In call generation mode, MAPS[™] is configured for the outgoing messages, while in call receive mode, it is configured to respond to the incoming messages. Tests can be configured to run once, multiple iterations and continuously. Also, allows users to create multiple entries using quick configuration feature. The editor allows to run the added scripts sequentially (order in which the scripts are added in the window) or randomly (any script from the list of added script as per the call flow requirements). The test scripts are started manually at call generation, and at the call reception, the script is automatically triggered by incoming messages.

📃 🖏 🔌 💺 🏓 🍇 🗹 쑿 🔓 🔓 😤 💂 🥝	0									
🚈 🔒 🎅 💦 🔒 🛋										
o Script Name Profile Call Info		Script Execution	Status		Events	Result	Total Iterations	Completed Itera		
5GNGAP_UESessionControl.gls MSIN3012041631 TMSI_0x699A5B8E_IMSI_00101301 5GNGAP_UESessionControl.gls MSIN3012041632	12041631	Start Start	UE	CONTEXT RELEASE	None None	Pass Unknown	1	1 0		
Add Delete Insert Refresh Start Start All Stop 💌 Stop All 💌 Abort	Abort All									
Save Column Width Show Latest										
JNB 0	AMF 0		^		Find					
InitialUEMessage, Registration Request	16:39:1	15 425000		NGAP-PDU	== NGAP Layer :		= = Initiat:	.ngMessage		
DownlinkNASTransport, Authentication Request	10.33.1	13.433000		Initiat	ngMessage		=			
Bownink was transport, Admenication nequest	16:39:1	6:39:16.241000 ProcedureCode procedureCriticality					= 15 id-InitialUEMes = 0 reject(0)			
UplinkNASTransport, Authentication Response	16:39:1	16.244000		Value	=					
DownlinkNASTransport, Security Mode Command				InitialUEMessage = ProtocolIE-Container = 6 1						
	16:39:1	16.342000		Item	= 0					
UplinkNASTransport, Security Mode Complete		16.343000		ProtocolIE-Field ProtocolIE-ID				= = 85 id-RAN-UE-NGAP-		
InitialContextSetupRequest, Registration Accept				procedureCriticality = 0 re Value =				et (0)		
	16:39:1	16.456000			N-UE-NGAP-ID		= 2			
InitialContextSetupResponse		16.457000		Item	ocolIE-Field		= 1			
UplinkNASTransport, Registration Complete				Pro	tocolIE-ID		= 38 id-N	AS-PDU		
	16:39:1	16.458000		pro Val	cedureCritical:	ity	= 0 reje	et (0)		
UplinkNASTransport, UL NAS Transport, Session Establishment Request		16.493000		N	IS-PDU		=			
PDUSessionResourceSetupRequest, DL NAS Transport, Session Establishment Accept	16-29-1	16.542000		Item	IAS-PDU		= x7E0041' = 2	71000D0100E		
PDUSessionResourceSetupResponse	10.33.1	10.342000		ProtocolIE-Field =						
		16.546000		ProtocolIE-ID = 121 id-UserL procedureCriticality = 0 reject(0)						
UplinkNASTransport, UL NAS Transport, Session Establishment Request	16/39/1	16.550000		Value =						
PDUSessionResourceSetupRequest, DL NAS Transport, Session Establishment Accept	10.33.1	10.330000		UserLocationInformation = userLoca userLocationInformationNR =						
P D O Session mesour ce Secupine quest, D E NAS Transport, Session E stabilismient Accept	16:39:1	16.646000			nR-CGI		=			
PDUSessionResourceSetupResponse	16:39:1	16.648000		0042	pLMNIdentity MCC		= 001			
UplinkNASTransport, UL NAS Transport, Session Release Request			0043 MNC = 01			= 01				
	16:39:2	24.386000			nRCellIdentit; tAI	Z.	= 0000000	000		
PDUSessionResourceReleaseCommand, DL NAS Transport, Session Release Command	16:39:2	24.454000			pLMNIdentity		=			
■ PDUSessionResourceReleaseResponse				004A 004B	MCC MNC		= 001 = 01			
	16:39:2	24.456000			tAC		= x000001			
UplinkNASTransport, UL NAS Transport, Session Release Complete		24.457000		Item Pro:	ocolIE-Field		= 3			
UplinkNASTransport, UL NAS Transport, Session Release Request		1 150000		ProtocolIE-ID = 90 id-RRC						
	16:39:2	24.459000		pro Va		LEY	= 0 reje =	20(0)		
PDUSessionResourceReleaseCommand, DL NAS Transport, Session Release Command	16:39:2	24.553000		Ri	CEstablishment	Cause	= 3 mo-S:	ignalling(:		
PDUSessionResourceReleaseResponse	10,000	24 652000	~		ocolIE-Field		= 4	Act		
			>	<				co t		

Figure: Call Generation



Call Generation and Call Reception (Contd.)

Script Name Profile Call Info		Script Execution	Status	Events	Events Profile Resu
NGAPManagementHandler.gls RANName:,gnb000000001, gNBId:,0x1000000	1, ConnectionId:,1001	Stop	NG Setup Successful	SendAMFConfigurationUpdate	
AMFSessionControl.gls MSIN; 3012041631		Completed	UE-CONTEXT RELEASED	None	
p Stop All Abort Abort All 🔽 Show Records 🗌 Select Active Call 🗌 Auto Trash	Trash Show H	iidden Calls			
ve 🔤 Column Width ———— 📄 Show Latest					
gNB 0	AMF	<u>^</u>	Find		
InitialUEMessage, Registration Request	000		NGAP Layer		
			.P-PDU itiatingMessage	= Initiating	gMessage (0)
DownlinkNASTransport, Authentication Request	10:20:10:140000		rocedureCode	- = 15 id-Init	tialUEMessage
	16:39:16.146000	p	rocedureCriticality	= 0 reject	
UplinkNASTransport, Authentication Response	16:39:16.310000		'alue InitialUEMessage	=	
DownlinkNASTransport, Security Mode Command			ProtocolIE-Container	= 6 Items	
	16:39:16.312000		Item ProtocolIE-Field	= 0	
UplinkNASTransport, Security Mode Complete	16:39:16.410000		ProtocolIE-ID	= 85 id-RAN	-UE-NGAP-ID
InitialContextSetupRequest, Registration Accept			procedureCriticality Value	= 0 reject	(0)
	16:39:16.418000		RAN-UE-NGAP-ID	= 2	
InitialContextSetupResponse	16:39:16.511000		Item	= 1	
UplinkNASTransport, Registration Complete			ProtocolIE-Field ProtocolIE-ID	= = 38 id-NAS-	- PDU
Opiniki MAS Hansport, negisiration Complete			procedureCriticality	= 0 reject	
UplinkNASTransport, UL NAS Transport, Session Establishment Request	16:39:16.512000		Value NAS-PDU	=	
	16:33:16:512000		NAS-PDU NAS-PDU	= = x7E0041710	000D0100F11000000
PDUSessionResourceSetupRequest, DL NAS Transport, Session Establishment Accept	16:39:16.516000		Item	= 2	
PDUSessionResourceSetupResponse			ProtocolIE-Field ProtocolIE-ID	= = 121 id-Use	erLocationInforma
	16:39:16.611000		procedureCriticality	= 0 reject	
UplinkNASTransport, UL NAS Transport, Session Establishment Request	16:39:16.612000		Value UserLocationInformat	ion = userLocati	ionInformationNR
PDUSessionResourceSetupRequest, DL NAS Transport, Session Establishment Accept			userLocationInforma		
	16:39:16.614000		nR-CGI	-	
PDUSessionResourceSetupResponse	16:39:16.713000	0042	pLMNIdentity MCC	= 001	
UplinkNASTransport, UL NAS Transport, Session Release Request		0043	MNC	= 01	_
	16:39:24.424000		nRCellIdentity tAI	= 000000000	v
PDUSessionResourceReleaseCommand, DL NAS Transport, Session Release Command	16:39:24.426000		pLMNIdentity	=	
PDUSessionResourceReleaseResponse		004A 004B	MCC	= 001 = 01	
	16:39:24.527000		tAC	= x000001	
UplinkNASTransport, UL NAS Transport, Session Release Complete	16:39:24.528000		Item ProtocolIE-Field	= 3	
UnlinkWACTronsport ULINAS Tronsport Consign Belgers Descript	10.00.24.020000		ProtocolIE-ID	= = 90 id-RRC	EstablishmentCaus
UplinkNASTransport, UL NAS Transport, Session Release Request	16:39:24.529000		procedureCriticality	= 0 reject	(0)
PDUSessionResourceReleaseCommand, DL NAS Transport, Session Release Command	10:20:24 520000		Value RRCEstablishmentCaus	= = 3 mo-Sign	nalling(3)
	16:39:24.529000		Item	= 4	
PDUSessionResourceReleaseResponse	16:39:24.626000		ProtocolIE-Field ProtocolIE-ID	= = 3 id-AMFS	etTD
UplinkNASTransport, UL NAS Transport, Session Release Complete			procedureCriticality	= 3 1d-Anrs. = 0 reject	
	16:39:24.626000	× 1	Value	= '	
		> <			>

Figure: Call Reception



Emulation of 5G N1N2 Signaling Procedure

The below 5G N1N2 signaling procedure indicates the messages flow between gNodeB (gNB) and AMF, which are emulated using MAPS[™] application.

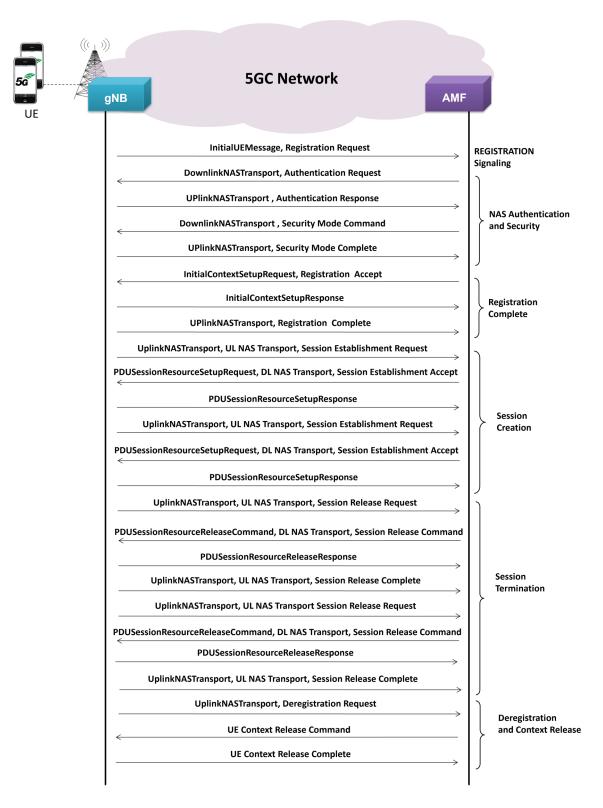
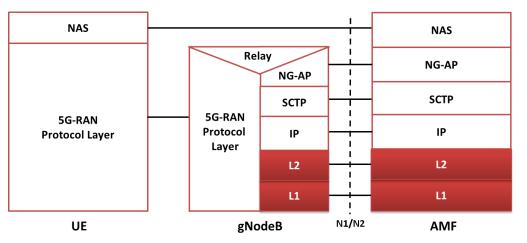


Figure: 5G N1N2 Signaling Procedure

🌑 GL Communications Inc.

Supported Protocols and Specifications



Supported Protocols	Standard / Specification
N1N2 Interface (gNB - AMF)	TS24.501 (Release 17)
System Architecture for the 5G	3GPP TS 23.501 (Release 17)
Non-Access-Stratum (NAS)	3GPP TS 24.501 (Release 17)
NG Application Protocol (NGAP)	3GPP TS 38.413 (Release 17)
SCTP	RFC 4960
GPRS Tunneling Protocol for User Plane (GTP-U)	3GPP TS 29.281 (Release 17)



Command Line Interface (CLI)

MAPS[™] can be configured as server-side application, to enable remote controlling of the application through multiple command-line based clients. Supported clients include Python.

Clients can remotely perform all functions such as start testbed setup, load scripts, and profiles, apply user events such as send digits/ file/tones, detect digits/file/tones, dial, originate call, terminate call, start and stop traffic. Users can also generate and receive calls through commands. This client application is distributed along with MAPS[™] Server application.

	I		-)
<u>File E</u> dit She <u>l</u> l <u>C</u>	ebug <u>O</u> ptio	ons <u>Window</u> <u>H</u> elp			
Type "help", "		7.5:5c02a39a0b, Oct 15 2019, 00:11:34) [MSC v.1916 64 bit (AMD64)] on win32 ", "oredits" or "license()" for more information.			
>>>	Drogram I	Files/GL Communications Inc/MAPS5G-N1N2/MAPSCLI/PythonClient/examples/gNB/N1N	12 D1 -		
efault.py	FIOGIAM P	TIES (GE COMMUNICATIONS THE (MAPSOE ATM2 (MAPSOET (Pythonorient (PAAmples (GMD (MIN	*2_F14	Lecall	-"
N1N2 Server Co	nnection.	True			
N1N2 Testbed S					
True					
N1N2 Profile L	oading	True			
Check NGAP Lin	k Status.	True			
N1N2 Call Init					
Call Status					
Call Status	REGISTRA	ATION-COMPLETED			
PDU Session In	itiate fo	or Dnn ims True			
PDU Session Es	tablished	1			
PDU Session In	itiate fo	or Dnn internet True			
PDU Session Es					
De-register In	itiated	True			
Total Signalli					
N1N2 Call's La					
	Route				
		UEContextReleaseCommand, , ,			
***** N1N2 Cal CLI(gNB)					
CLI (GNB)	<>	DOI (ARE)			
Time Stamp					
12:11:10.624		InitialUEMessage, Registration Request			
12:11:11.537		DownlinkNASTransport, Authentication Request, ,			
12:11:11.552		UplinkNASTransport, Authentication Response			
12:11:11.637	<-	DownlinkNASTransport, Security Mode Command, ,			
12:11:11.650		UplinkNASTransport, Security Mode Complete			
		InitialContextSetupRequest, Registration Accept, , InitialContextSetupResponse			
		UplinkNASTransport, Registration Complete			
		UplinkNASIransport, Registration Complete UplinkNASTransport, UL NAS Transport, Session Establishment Request			
12:11:12.046					
12:11:12.046 12:11:12.244	<-	PDUSessionResourceSetupRequest, DL NAS Transport, , Session Establishment &	Accept		
12:11:12.046 12:11:12.244 12:11:12.324	<- ->	PDUSessionResourceSetupRequest, DL NAS Transport, , Session Establishment # PDU Session Resource Setup Response	Accept		
12:11:12.046 12:11:12.244 12:11:12.324 12:11:12.464	<- -> ->	PDUSessionResourceSetupRequest, DL NAS Transport, , Session Establishment & PDU Session Resource Setup Response UplinkNASTransport, UL NAS Transport, Session Establishment Request			
12:11:12.046 12:11:12.244 12:11:12.324 12:11:12.464 12:11:12.639	<- -> -> <-	PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment # PUD Session Resource Setup Response OplinkNASTransport, UL NAS Transport, Session Establishment Request PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment #			
12:11:12.046 12:11:12.244 12:11:12.324 12:11:12.464 12:11:12.639 12:11:12.707	<- -> -> ->	PDUSessionResourceSetupRequest, DL NAS Transport, , Session Establishment 3 PDU Session Resource Setup Response UplinkMASTransport, UL NAS Transport, Session Establishment Request PDUSessionResourceSetupRequest, DL NAS Transport, , Session Establishment 3 PDU Session Resource Setup Response			
12:11:12.046 12:11:12.244 12:11:12.324 12:11:12.464 12:11:12.639 12:11:12.707 12:11:22.859	<	PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment # PUD Session Resource Setup Response OplinkNASTransport, UL NAS Transport, Session Establishment Request PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment #	Accept		
12:11:12.046 12:11:12.244 12:11:12.324 12:11:12.664 12:11:12.609 12:11:12.707 12:11:22.859 12:11:23.046		PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment J PUD Session Resource Setup Response UplinkNASTransport, UL NAS Transport, Session Establishment Request PUDSessionResource Setup Response UplinkNASTransport, UL NAS Transport, Session Release Request	Accept		
12:11:12.046 12:11:12.244 12:11:12.324 12:11:12.464 12:11:12.639 12:11:12.707 12:11:23.059 12:11:23.059 12:11:23.069	< ^ ^ < ^ ^ < ^ ^	PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment 2 PDD Session Resource Setup Response UplinkMASTransport, UL NAS Transport, Session Establishment Request PDU Session Resource Setup Response UplinkMASTransport, UL NAS Transport, Session Release Request PDUSessionResource Release Response DDUSession Resource Release Response DDIIskMASTransport, UL NAS Transport, Session Release Comman PDU Session Resource Release Response	Accept		
12:11:12.046 12:11:12.244 12:11:12.324 12:11:12.464 12:11:12.639 12:11:12.707 12:11:22.859 12:11:23.046 12:11:23.069 12:11:23.083	5 ° ° 5 ° ° ° ° °	PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment 3 PUD Session Resource Setup Response UplinkNASTransport, UL NAS Transport, Session Establishment Request PUDSessionResourceSetupReguest, DL NAS Transport, Session Establishment 3 PUD SessionResourceSetupResponse UplinkNASTransport, UL NAS Transport, Session Release Request PUD SessionResourceReleaseCommand, DL NAS Transport, , Session Release Comme PUD SessionResourceReleaseCommand, DL NAS Transport, Session Release UplinkNASTransport, UL NAS Transport, Session Release Complete UplinkNASTransport, UL NAS Transport, Session Release Request	Accept		
12:11:12.046 12:11:12.244 12:11:12.324 12:11:12.464 12:11:12.639 12:11:12.707 12:11:12.859 12:11:23.046 12:11:23.058 12:11:23.063 12:11:23.245	4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment 2 PUD Session Resource Setup Response UplinkMASTransport, UL NAS Transport, Session Establishment Request PUDSessionResourceSetupRequest, DL NAS Transport, Session Establishment J PUD Session Resource Setup Response UplinkMASTransport, UL NAS Transport, Session Release Request PUDSessionResourceRelease Command, DL NAS Transport, Session Release Comma PUD Session Resource Release Response UplinkMASTransport, UL NAS Transport, Session Release Complete UplinkMASTransport, UL NAS Transport, Session Release Complete UplishMASTensport, UL NAS Transport, Session Release Complete UDSessionResourceReleaseCommand, DL NAS Transport, Session Release Complete	Accept		
12:11:12.046 12:11:12.244 12:11:12.324 12:11:12.464 12:11:12.639 12:11:22.859 12:11:23.046 12:11:23.069 12:11:23.069 12:11:23.083 12:11:23.255	\$? ? \$? ? \$? ? \$? \$	PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment & PUD Session Resource Setup Response UplinkNASTransport, UL NAS Transport, Session Establishment Request PUDSessionResourceSetupResponse UplinkNASTransport, UL NAS Transport, Session Release Request PUD SessionResourceReleaseCommand, DL NAS Transport, , Session Release Comme PUD SessionResourceReleaseCommand, DL NAS Transport, , Session Release Comme PUD SessionResourceReleaseCommand, DL NAS Transport, , Session Release UplinkNASTransport, UL NAS Transport, Session Release Complete UplinkNASTransport, UL NAS Transport, Session Release Complete PUDIsessionResourceReleaseCommand, DL NAS Transport, , Session Release Request PUD Session Resource Release Command, DL NAS Transport, , Session Release Request PUD Session ResourceReleaseCommand, DL NAS Transport, , Session Release Comme PUD Session ResourceReleaseCommand, DL NAS Transport, , Session Release Request	Accept		
12:11:12.046 12:11:12.244 12:11:12.324 12:11:12.464 12:11:12.463 12:11:12.707 12:11:22.859 12:11:23.058 12:11:23.068 12:11:23.083 12:11:23.262	\$? \$? ? ? \$? ? ? ? ? ?	PU05essionResourceSetupRequest, DL NAS Transport, , Session Establishment # PU0 Session ResourceS etup Response UplinkMASTransport, UL NAS Transport, Session Establishment Request PU05essionResourceSetupReguest, DL NAS Transport, , Session Retablishment # PU0 SessionResourceSetupResponse UplinkMASTransport, UL NAS Transport, Session Release Request PU05essionResourceRelaseScommand, DL NAS Transport, , Session Release Comman UplinkMASTransport, UL NAS Transport, Session Release Complet UplinkMASTransport, UL NAS Transport, Session Release Complet UplishMASTransport, UL NAS Transport, Session Release Complet PU05essionResourceRelaseCommand, DL NAS Transport, Session Release Complet PU05essionResource Release Request PU05ession Resource Release Request PU05ession Resource Release Request PU05essionResource Release Request	Accept		
12:11:12.046 12:11:12.324 12:11:12.324 12:11:12.464 12:11:12.639 12:11:12.058 12:11:23.046 12:11:23.046 12:11:23.046 12:11:23.049 12:11:23.049 12:11:23.245 12:11:23.262 12:11:23.262	4 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment & PUD Session Resource Setup Response UplinkNASTransport, UL NAS Transport, Session Establishment Request PUDSessionResourceSetupReguest, DL NAS Transport, Session Establishment & PUD SessionResourceSetupResponse UplinkNASTransport, UL NAS Transport, Session Release Request PUD SessionResourceReleaseCommand, DL NAS Transport, , Session Release Comme PUD SessionResourceReleaseCommand, DL NAS Transport, , Session Release Comme UplinkNASTransport, UL NAS Transport, Session Release Complete UplinkNASTransport, UL NAS Transport, Session Release Request PUDSessionResourceReleaseCommand, DL NAS Transport, , Session Release Comme PUD Session Resource Release Response UplinkNASTransport, UL NAS Transport, Session Release Comme UplinkNASTransport, UL NAS Transport, Session Release Comme UplinkNASTransport, UL NAS Transport, Session Release Complete UplinkNASTransport, UL NASTRANSPORT, Session Release Complete UplinkNASTRANSPORT, UL NASTRANSPORT, Session Release Complete UplinkNASTRANSPORT, Session Release Response	Accept		
12:11:12.046 12:11:12.244 12:11:12.324 12:11:12.464 12:11:12.463 12:11:12.639 12:11:12.639 12:11:23.046 12:11:23.046 12:11:23.068 12:11:23.265 12:11:23.255 12:11:23.253 12:11:23.263	\$ ^ ^ \$ ^ \$ ^ \$ ^ \$ ^ \$ ^ \$ ^ \$ ^ \$ ^ \$	PU05essionResourceSetupRequest, DL NAS Transport, , Session Establishment # PU05 session ResourceS etup Response UplinkMASTransport, UL NAS Transport, Session Establishment Request PU05essionResourceSetupReguest, DL NAS Transport, , Session Retablishment # PU05essionResourceSetupResponse UplinkMASTransport, UL NAS Transport, , Session Release Commande FU05essionResourceReleaseCommand, DL NAS Transport, , Session Release Commande FU05essionResourceReleaseCommand, DL NAS Transport, , Session Release Commande FU05essionResourceReleaseCommand, DL NAS Transport, , Session Release Commune UplinkMASTransport, UL NAS Transport, Session Release Compute UD05essionResourceReleaseCommand, DL NAS Transport, , Session Release Commune FU05essionResourceReleaseCommand, DL NAS Transport, , Session Release Complete UplinkMASTransport, Deregistration Request UEContextReleaseCommand, JL	Accept		
12:11:12.046 12:11:12.244 12:11:12.347 12:11:12.463 12:11:12.639 12:11:12.639 12:11:12.639 12:11:23.059 12:11:23.069 12:11:23.069 12:11:23.069 12:11:23.245 12:11:23.245 12:11:23.443	4444444444444444444	PU05essionResourceSetupRequest, DL NAS Transport, , Session Establishment & PU05 session Resource Setup Response UplinkNASTransport, UL NAS Transport, Session Establishment Request PU05essionResourceSetupResponse UplinkNASTransport, UL NAS Transport, Session Release Request PU05essionResourceReleaseCommand, DL NAS Transport, , Session Release Comme PU05essionResourceReleaseCommand, DL NAS Transport, , Session Release Comme PU05essionResourceReleaseCommand, DL NAS Transport, , Session Release Comme UplinkNASTransport, UL NAS Transport, Session Release Request PU05essionResourceReleaseCommand, DL NAS Transport, , Session Release Comme PU05essionResourceReleaseCommand, DL NAS Transport, , Session Release Comme PU05essionResourceReleaseCommand, DL NAS Transport, , Session Release Comme UplinkNASTransport, UL NAS Transport, Session Release Complete UplinkNASTransport, UL NAS Transport, Session Release Complete UplinkNASTensport, UL NAS Transport, Session Release Complete UplinkNASTensport, UL NAS Transport, Session Release Complete UplinkNASTensport, UL NAS Transport, Session Release Complete UU5contextReleaseCommand, , , UEContextReleaseCommand, , ,	Accept		
12:11:12.046 12:11:12.244 12:11:12.444 12:11:12.639 12:11:12.639 12:11:12.659 12:11:23.058 12:11:23.058 12:11:23.058 12:11:23.058 12:11:23.058 12:11:23.255 12:11:23.255 12:11:23.262 12:11:23.444 12:11:23.444 12:11:23.444	<- -> -> -> -> -> -> -> -> -> -> -> -> ->	PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment # PUD Session ResourceS etup Response UplinkNASTransport, UL NAS Transport, Session Establishment Request PUDSessionResourceSetupReguest, DL NAS Transport, , Session Retablishment # PUD Session Resource Setup Response UplinkNASTransport, UL NAS Transport, , Session Release Commune PUD Session Resource RelaxeR Response UplinkNASTransport, UL NAS Transport, Session Release Compute UplinkNASTransport, UL NAS Transport, Session Release Request UplinkNASTransport, UL NAS Transport, Session Release Request UplinkNASTransport, UL NAS Transport, Session Release Request UDISsessionResource Release Response PUDSsessionResource Release Response UplinkNASTransport, Deregistration Request UEContextReleaseCommund, DL UEContextReleaseComplete True	Accept		
12:11:2.044 12:11:2.244 12:11:2.464 12:11:2.464 12:11:2.464 12:11:2.698 12:11:2.698 12:11:2.698 12:11:2.088 12:11:2.088 12:11:2.088 12:11:2.2.688 12:11:2.2.681 12:11:2.2.483 12:11:2.443 NINZ Script 35	<- -> -> -> -> -> -> -> -> -> -> -> -> ->	PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment # PUD Session ResourceS etup Response UplinkNASTransport, UL NAS Transport, Session Establishment Request PUDSessionResourceSetupReguest, DL NAS Transport, , Session Retablishment # PUD Session Resource Setup Response UplinkNASTransport, UL NAS Transport, , Session Release Commune PUD Session Resource RelaxeR Response UplinkNASTransport, UL NAS Transport, Session Release Compute UplinkNASTransport, UL NAS Transport, Session Release Request UplinkNASTransport, UL NAS Transport, Session Release Request UplinkNASTransport, UL NAS Transport, Session Release Request UDISsessionResource Release Response PUDSsessionResource Release Response UplinkNASTransport, Deregistration Request UEContextReleaseCommund, DL UEContextReleaseComplete True	Accept		
12:11:12.046 12:11:12.244 12:11:12.464 12:11:12.639 12:11:12.659 12:11:12.659 12:11:12.059 12:11:23.065 12:11:23.065 12:11:23.063 12:11:23.063 12:11:23.063 12:11:23.255 12:11:23.55 1	<	PUOSessionResourceSetupRequest, DL NAS Transport, , Session Establishment & PUOS ession Resource Setup Response UplinkhSiTansport, UL NAS Transport, Session Establishment Request PUOSessionResourceSetupRequest, DL NAS Transport, , Session Establishment & PUO SessionResourceSetupResponse UplinkhSiTansport, UL NAS Transport, , Session Release Request PUOSessionResourceReleaseCommand, DL NAS Transport, , Session Release Compare UplinkhSiTansport, UL NAS Transport, Session Release Request UplinkhSiTansport, UL NAS Transport, Session Release Request UplinkhSiTansport, UL NAS Transport, Session Release Request UplinkhSiTansport, UL NAS Transport, Session Release Complete UplinkhSiTansport, Detection, End, NAS Transport, Session Release Complete UplinkhSiTansport, Detection Request UPContextReleaseComplete True Section ReleaseComplete	and		que
12:11:2.044 12:11:2.244 12:11:2.444 12:11:2.444 12:11:2.454 12:11:2.454 12:11:2.659 12:11:22.059 12:11:23.045 12:11:23.045 12:11:23.245 12:11:23.245 12:11:23.453 NINZ Server D	<	PUDSessionResourceSetupRequest, DL NAS Transport, , Session Establishment # PUD Session ResourceS etup Response UplinkNASTransport, UL NAS Transport, Session Establishment Request PUDSessionResourceSetupReguest, DL NAS Transport, , Session Retablishment # PUD Session Resource Setup Response UplinkNASTransport, UL NAS Transport, , Session Release Commune PUD Session Resource RelaxeR Response UplinkNASTransport, UL NAS Transport, Session Release Compute UplinkNASTransport, UL NAS Transport, Session Release Request UplinkNASTransport, UL NAS Transport, Session Release Request UplinkNASTransport, UL NAS Transport, Session Release Request UDISsessionResource Release Response PUDSsessionResource Release Response UplinkNASTransport, Deregistration Request UEContextReleaseCommund, DL UEContextReleaseComplete True	Accept and and ions In		

Figure: Sample Python Client

File Edit View Image: Second	_ & X
✓ View Latest Command 1:: 2024-2-19 12:19:37.252000 : Start "TestBedDefault.xml" # "_gNB[0].gNBIPAddress[0]"="192.168.12.28"," TypeOftJESimulation"="XML"; 1:: 2024-2-19 12:19:59.012000 : Start Sint 1: SintAp-UEsessionControl.gis" MSIN3012041631" 1 # "MSIN"=(binarystring)3012041631, "IMSI"=(binarystring) 1:: 2024-2-19 12:20:01.20100 : UserEvent 1: "Stransportup"; 1:: 2024-2-19 12:20:01.20100 : UserEvent 1: "Stransportup"; 1:: 2024-2-19 12:20:05.520000 : UserEvent 1: "Stransportup"; 1:: 2024-2-19 12:20:05.520000 : UserEvent 1: "SessionEstablish"; 1:: 2024-2-19 12:20:05.5320000 : UserEvent 1: "SessionEstablish"; 1:: 2024-2-19 12:20:05.5320000 : UserEvent 1: "DeRegister"; 1:: 2024-2-19 12:20:20:26.244000 : UserEvent 1: "DeRegister"; 1:: 2024-2-19 12:20:20:26.244000 : UserEvent 1: "DeRegister"; 1:: 2024-2-19 12:20:20:5.532000 : UserEvent 1: "DeRegister"; 1:: 2024-2-19 12:20:20:5.424000 : UserEvent 1: "DeRegister"; 1:: 2024-2-19 12:20:20:26.244000 : UserEvent 1: "DeRegister"; 1:: 2024-2-19 12:20:20:5.532000 : UserEvent 1: "DeRegister";	001013012041631,"
1: 2024-2-19 12:19:37.252000 : Start "TestBedDefault.xml" # "_gNB[0].gNBIPAddress[0]"="192.168.12.28","_TypeOfLESimulation"="XML"; 1: 2024-2-19 12:19:51.469000 : LoadProfile 'UE_Profiles.xml" 1: 2024-2-19 12:19:59.012000 : StartSript 1: "SGNAP_UEBessionControl.gis" MSIN3012041631" 1 # "MSIN"=(binarystring)3012041631, "IMSI"=(binarystring) 1: 2024-2-19 12:2003.600000 : UserEvent 1: "TarAngeptrub"; 1: 2024-2-19 12:2003.500000 : UserEvent 1: "SessionEstablish"; 1: 2024-2-19 12:2005.50000 : UserEvent 1: "SessionEstablish"; 1: 2024-2-19 12:2005.582000 : UserEvent 1: "DeRegister"; 1: 2024-2-19 12:2005.582000 : UserEvent 1: "DeRegister"; 1: 2024-2-19 12:2005.582000 : UserEvent 1: "DeRegister"; 1: 2024-2-19 12:2005.582000 : UserEvent 1: "DeRegister";	001013012041631,"
1:: 2024-2:912:19:51.469000 :LoadProfile 'UE_Profiles.xml' 1:: 2024-2:912:19:59.012000 :StartScript 1:?SiGNAP_UESessionControl.gb' "MSIN3012041631" 1 # "MSIN"=(binarystring)3012041631, TMSI"=(binarystring) 1:: 2024-2:912:2003.600000 :UserEvent 1:TarAnsportUp'; 1:: 2024-2:912:2005.520000 :UserEvent 1:SessionEstableh'; 1:: 2024-2:912:2005.520000 :UserEvent 1:SessionEstableh'; 1:: 2024-2:912:2005.520000 :UserEvent 1:SessionEstableh'; 1:: 2024-2:912:2005.582000 :UserEvent 1:DeRegister'; 1:: 2024-2:912:2005.582000 :UserEvent 1:DeRegister'; 1:: 2024-2:912:2005.582000 :UserEvent 1:DeRegister';	001013012041631,"
1: 2024-219 2:2022.45.490.00 Liber:Vert 1 'GetHessapeCourts' Track '=0; 1: 2024-219 2:2026.45.490.00 Liber:Vert 1 'GetHessapeCourts' Track '=0; 1: 2024-219 2:2026.55.490.00 Liber:Vert 1 'GetHessapeCourts' Track '=0; 1: 2024-219 2:2027.25.490.00 Liber:Vert 1 'GetHessapeCourts' Track '=1; 1: 2024-219 2:2027.25.490.000 Liber:Vert 1 'GetHessapeCourts' Track '=1; 1: 2024-219 2:2027.25.490.000 Liber:Vert 1 'GetHessapeCourts' Track '=2;	
	NUM

Figure: MAPS[™] CLI Server

GL Communications Inc.

Buyer's Guide

ltem No	Product Description
<u>PKS500</u>	MAPS™ 5G N1N2 Interface Emulator
<u>ETH101</u>	Mobile Traffic Core - GTP
ETH102	Mobile Traffic Core - Gateway
Item No	Related Software
<u>PKS305</u>	MAPS™ 5G Multi-Interface Emulation
<u>PKS501</u>	MAPS™ 5G N4 Interface Emulator
<u>PKS502</u>	MAPS™ 5G N17 Interface Emulator
<u>PKS503</u>	MAPS [™] 5G N8 Interface Emulator (Requires PKS502)
<u>PKS504</u>	MAPS™ 5G N10 Interface Emulator (Requires PKS502)
<u>PKS505</u>	MAPS [™] 5G N11 Interface Emulator (Requires PKS502)
<u>PKS506</u>	MAPS™ 5G N12 Interface Emulator (Requires PKS502)
<u>PKS507</u>	MAPS [™] 5G N13 Interface Emulator (Requires PKS502)
<u>PKS508</u>	MAPS™ 5G N20 Interface Emulator (Requires PKS502)
<u>PKS509</u>	MAPS [™] 5G N21 Interface Emulator (Requires PKS502)
<u>PKS510</u>	MAPS™ 5G N22 Interface Emulator (Requires PKS502)
<u>PKS511</u>	MAPS™ 5G N29 and N51 Interface Emulator (Requires PKS502)
<u>PKS170</u>	CLI Support for MAPS™

For complete list of MAPS[™] products, refer to <u>Message Automation & Protocol Simulation (MAPS[™])</u> webpage.

For more details on supported MAPS[™] 5G interfaces, refer to <u>5G Core (5GC) Network Test Solution</u> webpage.



818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A (Web) <u>www.gl.com</u> - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) <u>info@gl.com</u>