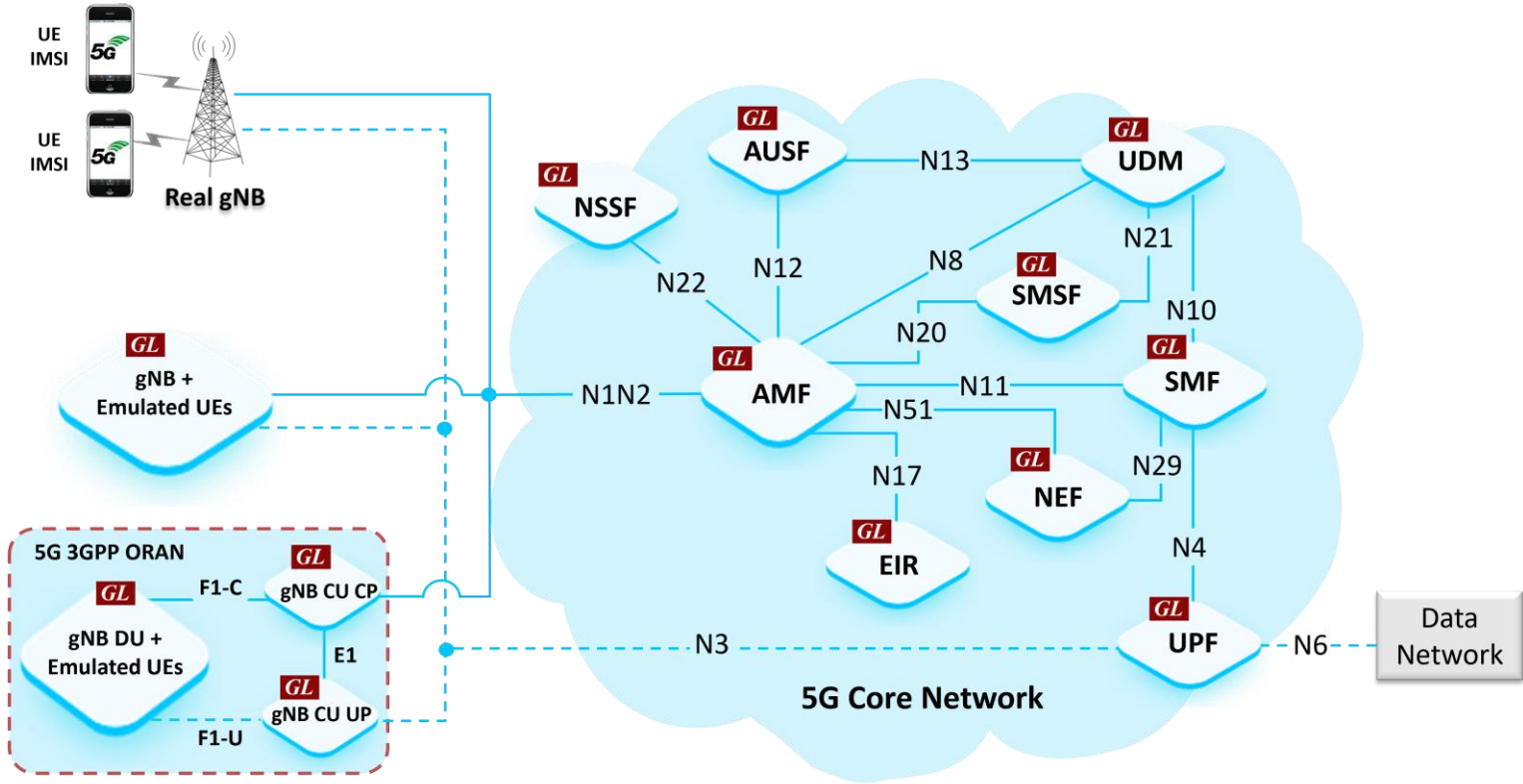

MAPS™ 5G E1AP Interface Emulator

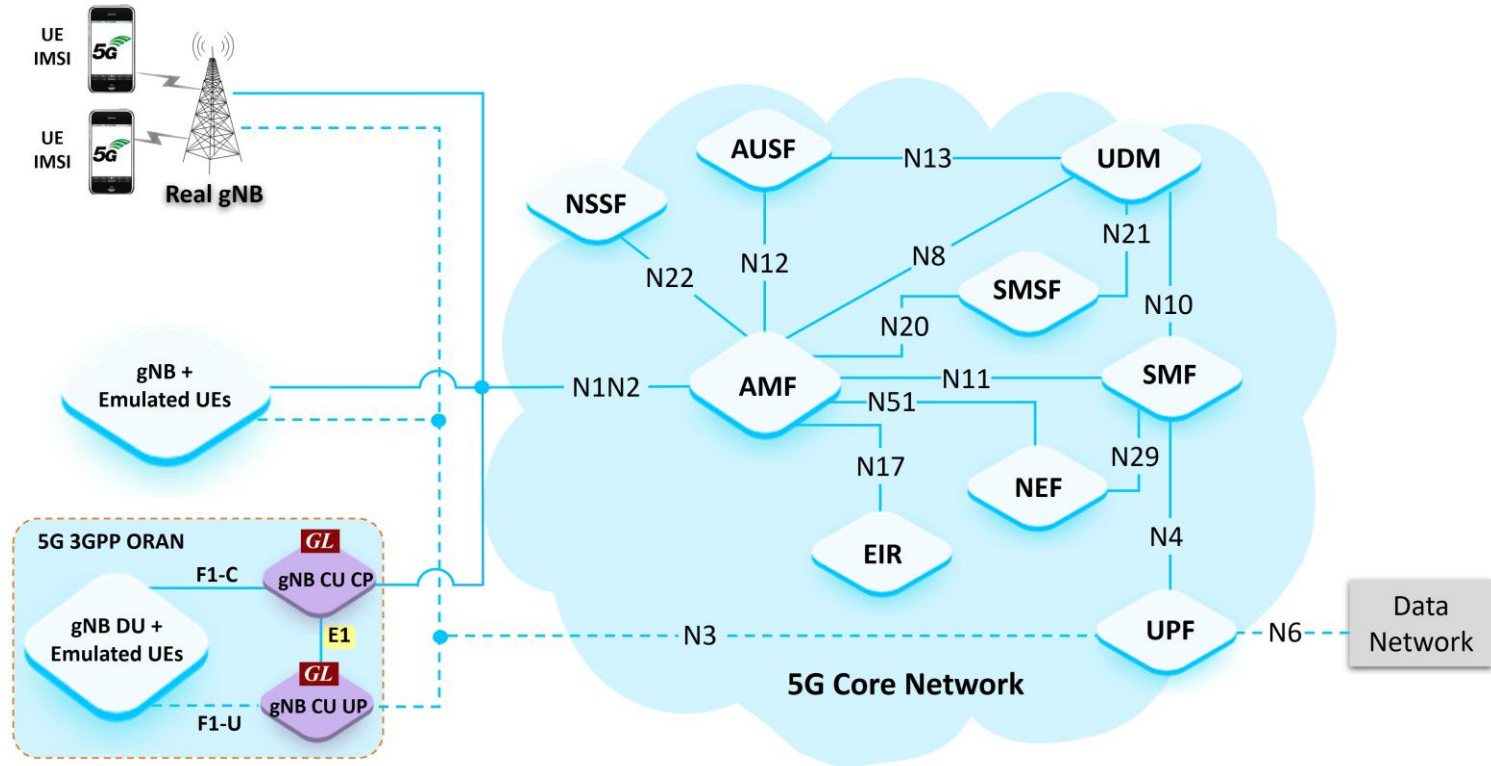


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Website: <https://www.gl.com>

5G Network Diagram



MAPS™ 5G E1AP Interface Network Architecture

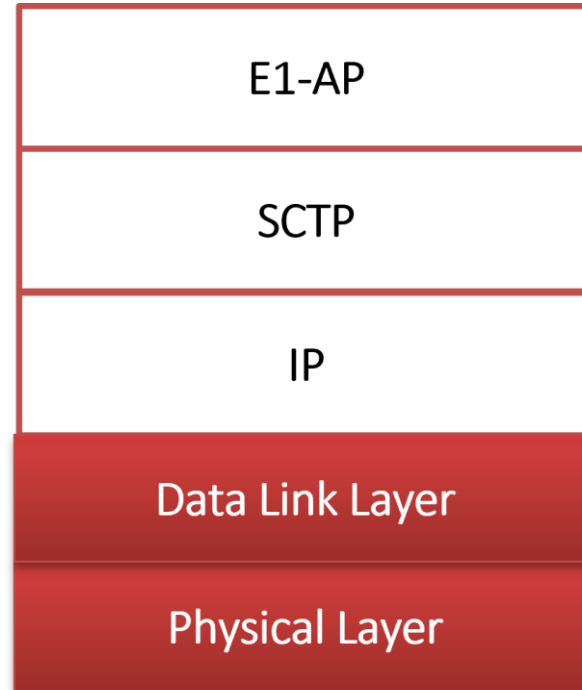


GL MAPS™ 5G E1AP Interface Emulator

Features

- MAPS™ 5G ORAN E1AP interface emulates gNB-CU-CP and gNB-CU-UP functions as per 3GPP standards
- Supports 5G Control and User Plane Separation (CUPS) procedures
- Simulates and processes E1AP signaling messages (valid and invalid)
- Provides fault insertion and impairments to create abnormal/negative test conditions
- Supports UE Context Setup, Modification, Release, Bearer Management, and QoS procedures
- Ready-to-use scripts and call flows for quick functional and regression testing
- Allows customization of call flow scenarios and message templates using Script and Message Editor
- Supports scripted call generation and automated call reception
- Provides performance testing with high call density for validating scalability
- Provides detailed call statistics, KPIs, and event logs for troubleshooting and analysis
- Supports remote access, automation, and scheduling for 24/7 unattended regression testing

Protocol Stack Specification

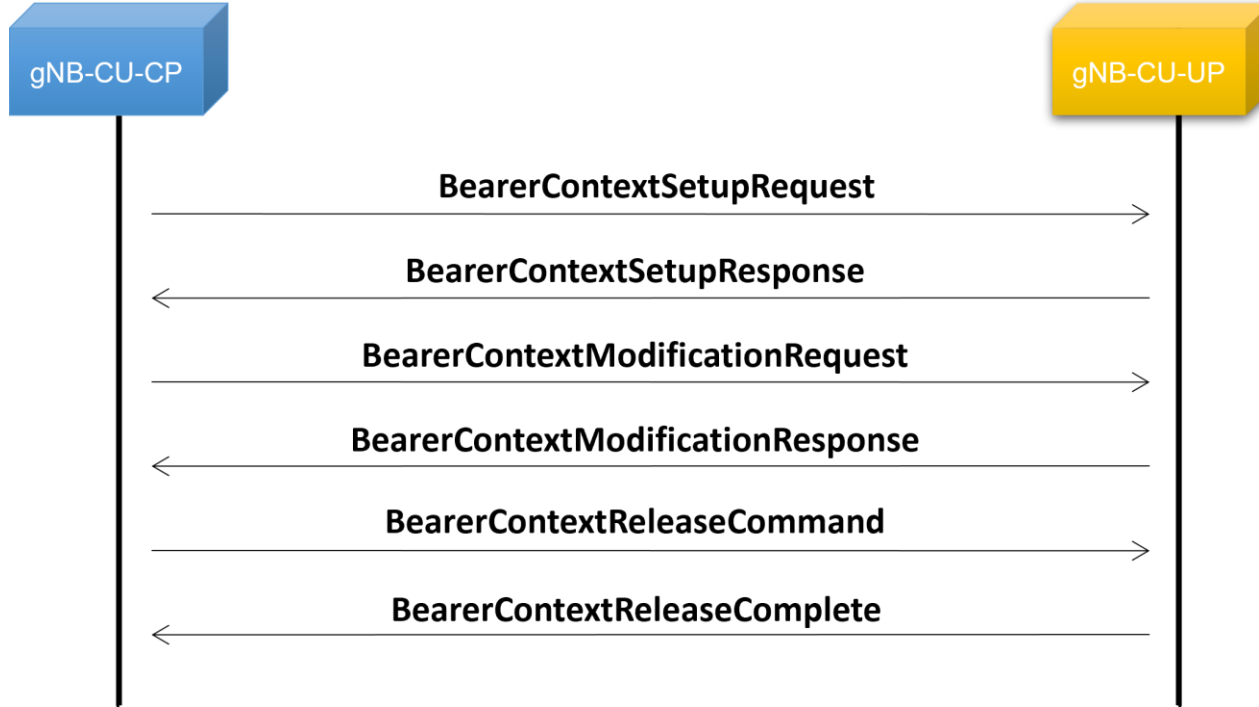


Protocol Stack Specification (Contd.)

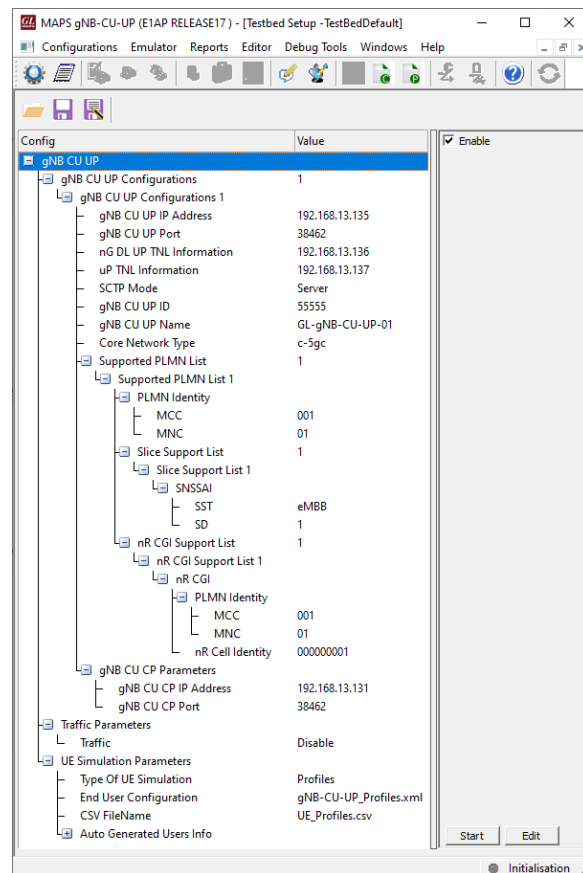
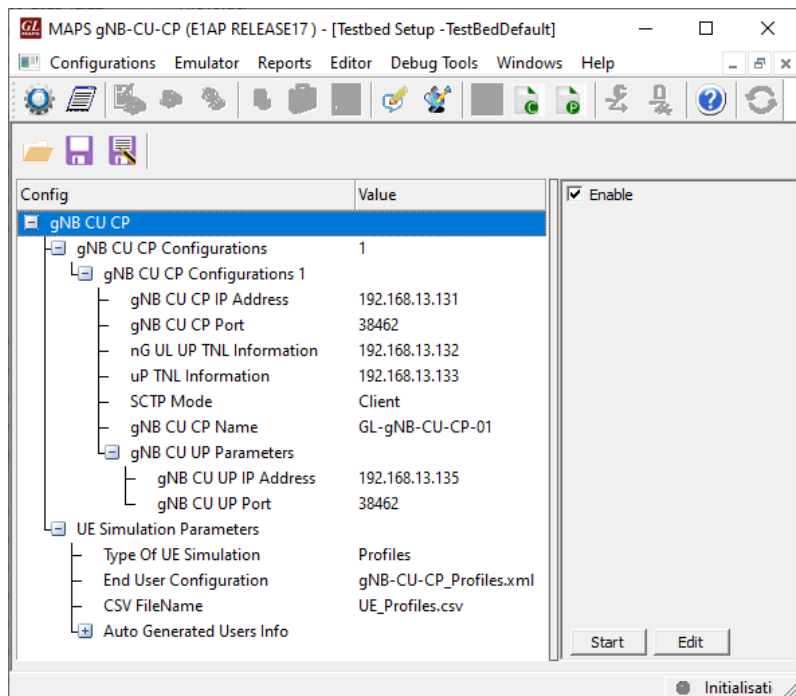
Supported Protocols	Standard / Specification Used
E1AP Interface	TS38.463
SCTP	RFC 4960

- E1 Application Protocol (E1AP): Application Layer Protocol between the gNB CU CP and the gNB CU UP Sctp for the control plane (Sctp): This protocol guarantees delivery of signaling messages between gNB CU CP and gNB CU UP (E1AP). Sctp is defined in RFC 4960

MAPS™ 5G E1AP Call Scenario



Testbed Configuration (gNB CU CP and gNB CU UP)



Profile Configuration (gNB CU CP)

GL MAPS gNB-CU-CP (E1AP RELEASE17) - [Profile Editor - gNB-CU-CP_Profiles]

Configurations Emulator Reports Editor Debug Tools Windows Help

Profiles (Edit-F2)

#	Profiles (Edit-F2)
1	Profile0001
2	Profile0002
3	Profile0003
4	Profile0004
5	Profile0005
6	Profile0006
7	Profile0007
8	Profile0008
9	Profile0009
10	Profile0010

Config Value

Profile0001

- gNB CU CP Name GL-gNB-CU-CP-01
- Security Information
 - Security Algorithm
 - ciphering Algorithm nEA0
 - integrity Protection Algorithm nIA0
 - uP Security Key
 - encryption Key 680AEEF62DB29CC8435F0A...
 - integrity Protection Key 00
 - UE DL Aggregate Maximum Bit Rate 100000000
- Serving PLMN
 - MCC 001
 - MNC 01
- Activity Notification Level ue
- UE Inactivity Timer 1000
- PDU Session Resource To Setup List 1
 - PDU Session Resource To Setup List 1
 - PDU SessionId 1
 - pDU Session Type ipv4
 - sNSSAI
 - sST eMBB
 - SD 1
 - Security Indication
 - Integrity Protection Indication required
 - Confidentiality Protection Indication required
 - PDU Session Resource DL AMBR 10000000
 - dRB To SetupList NG RAN 1

Enable

Add Insert Delete

Properties

Insert Delete Clear

Initialisation Errors Error Events Captured E

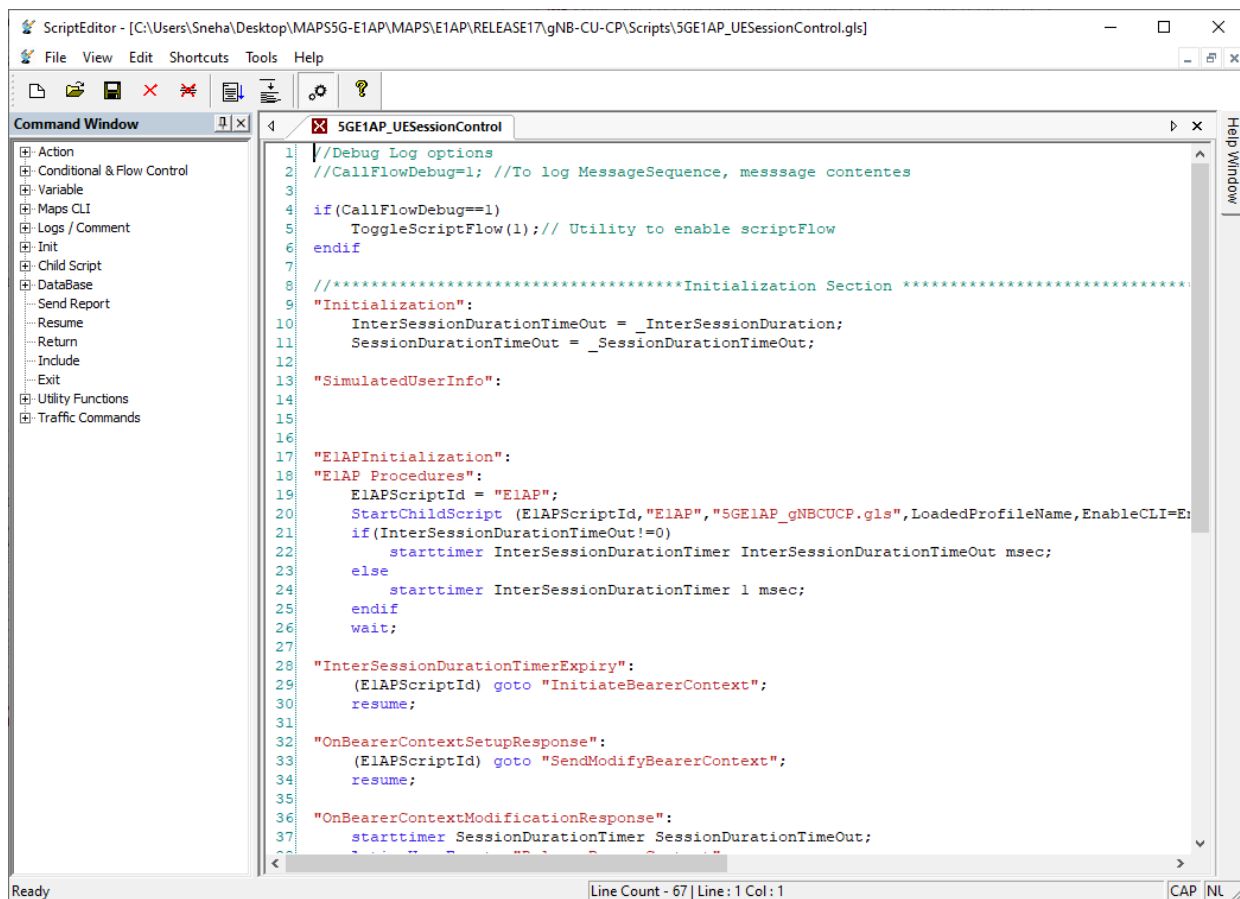
Profile Configuration (gNB CU UP)

The screenshot displays the 'Profile Editor - gNB-CU-UP_Profiles' window. On the left, a list of profiles is shown, with 'MSIN3012041631' selected. The main area shows the configuration for this profile, organized into a tree structure. The configuration includes:

- Registration Parameters**
 - Registration Type: Initial Registration
 - SMS Over NAS Transport Requested: Not Supported
 - Follow On Request: Follow On Request Pending
 - NG RAN Radio Capability Update: Not Needed
- Mobile Identity**
 - Type Of Identity: SUCI
 - SUPI Format: IMSI
 - IMSI: 001013012041631
 - TMSI: 10000001
 - IMEI: 359877068325248
 - IMEISV: 1234567890123001
 - MSISDN: 3012041631
- GMM Capability**
 - S1 Mode: Not Supported
 - HO Attach: Not Supported
 - LPP Capability: LPP in N1 Mode not supported
- Requested NSSAI**
 - RNSSAI
 - RNSSAI 1
 - Requesting NSSAI SST: eMBB
 - Requesting NSSAI SD: 1
 - Include UEContextRequest IE: True
 - RRC Establish Cause: MO Signaling
- Tracking Area Information**
 - TAC: 001
 - Cell Identity: 000000001
- Authentication Parameters**
 - Authentication Type: 5G-AKA
 - Authentication Algorithm Type: Milenage
 - Key: 00112233445566778899aabbccddeeff
 - Operator Variant Parameter Type: OPc

At the bottom right, there are buttons for 'Add', 'Insert', 'Delete', and 'Properties'. The status bar at the bottom shows 'Initialisation Errors', 'Error Events', and 'Captured'.

Script Editor



Message Editor

Message Editor - BearerContextModificationRequest

File View Direction Tools Help

Frame No 1

E1AP

- E1AP-PDU
 - InitiatingMessage
 - ProcedureCode
 - Criticality
 - ProtocolIE-Container
 - ProtocolIE-Field
 - ProtocolIE-ID
 - Criticality
 - gNB-CU-CP-UE-E1AP-ID
 - ProtocolIE-Field

id-bearerContextModification = 9

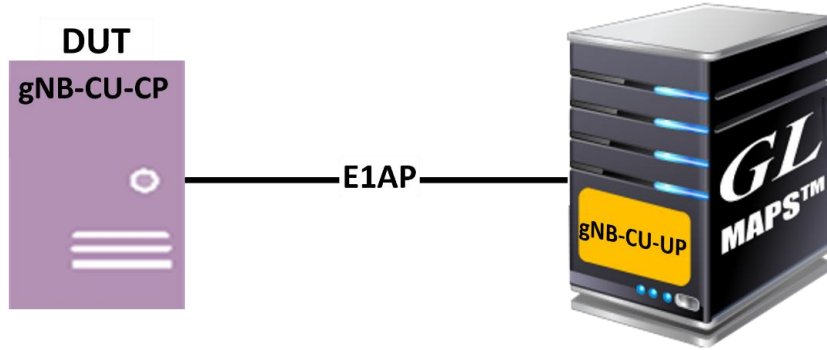
===== E1AP Layer =====

0000	E1AP-PDU	= CHOICE
0000	Extensibility Marker	= 0
0000	Choice Index	= 0
0000	InitiatingMessage	= SEQUENCE
0001	ProcedureCode	= INTEGER
0001	Contents	= 9 id-bearerContextModification
0002	Criticality	= ENUMERATOR
0002	Contents	= 0 reject(0)
0003	Length	= 79
0004	Value	= Open Type
0004	BearerContextModificationRequestIEs	= SEQUENCE
0004	Extensibility Marker	= 0
0004	ProtocolIE-Container	= SEQUENCE OF
0005	Iteration Count	= 3
0007	ProtocolIE-Container	= Item 0
0007	ProtocolIE-Field	= SEQUENCE
0007	ProtocolIE-ID	= INTEGER
0007	Contents	= 2 id-gNB-CU-CP-UE-E1AP-ID
0009	Criticality	= ENUMERATOR
0009	Contents	= 0 reject(0)
000A	Length	= 2
000B	Value	= Open Type
000B	gNB-CU-CP-UE-E1AP-ID	= INTEGER
000B	Length Determinant	= 1
000C	Contents	= 0

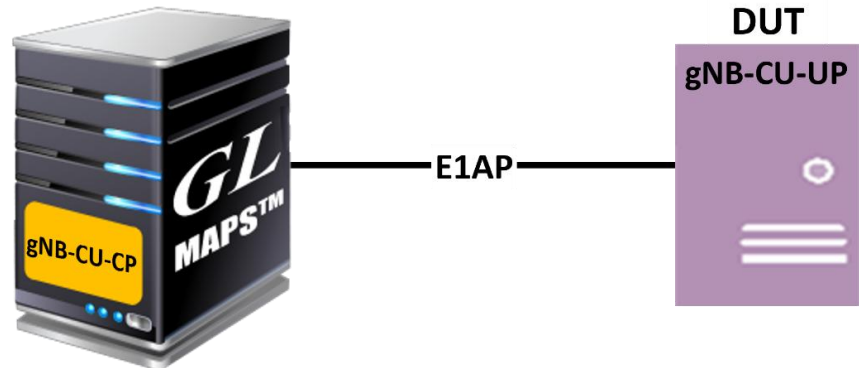
Ready CAP NUM

MAPS™ 5G E1AP Use Cases

MAPS™ E1AP configured as gNB CU UP to
test gNB CU CP (DUT)



MAPS™ E1AP configured as gNB CU CP to
test gNB CU UP (DUT)



MAPS™ 5G E1AP Interface – Call Generation

GL MAPS gNB-CU-CP (E1AP RELEASE17) - [Call Generation - CallGenDefault]

Configurations Emulator Reports Editor Debug Tools Windows Help

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Events Pr...	Result	Total Iteratio...	Completed Iteratio...
1	5GE1AP_UESessionControl.gls	Profile0001	GNBCUCP_UE_E1APID::2.GNBC...	Start	Bearer context Release complete Received	None		Pass	1	1
2	5GE1AP_UESessionControl.gls	Profile0002		Start		None		Unknown	1	0
3	5GE1AP_UESessionControl.gls	Profile0003		Start		None		Unknown	1	0
4	5GE1AP_UESessionControl.gls	Profile0004		Start		None		Unknown	1	0
5	5GE1AP_UESessionControl.gls	Profile0005		Start		None		Unknown	1	0

Add Delete Insert Refresh Start Start All Stop Stop All Abort Abort All

Save Column Width Show Latest

gNB-CU-CP-0 gNB-CU-UP

BearerContextSetupRequest 12:27:50.440000

BearerContextSetupResponse 12:27:50.725000

BearerContextModificationRequest 12:27:50.752000

BearerContextModificationResponse 12:27:50.949000

BearerContextReleaseCommand 12:27:55.060000

BearerContextReleaseComplete 12:27:55.190000

Find

===== E1AP Layer =====

```
0000 E1AP-PDU =  
0000 Extensibility Marker = CHOICE  
0000 Choice Index = 0  
0000 InitiatingMessage = SEQUENCE  
0001 ProcedureCode = INTEGER  
0001 Contents = 8 id-bearerContextSetup  
0002 Criticality = ENUMERATOR  
0002 Contents = 0 reject(0)  
0003 Length = 108  
0004 Value = Open Type  
0004 BearerContextSetupRequestIEs = SEQUENCE  
0004 Extensibility Marker = 0  
0004 ProtocolIE-Container = SEQUENCE OF  
0005 Iteration Count = 7  
0007 ProtocolIE-Container = Item 0  
0007 ProtocolIE-Field = SEQUENCE
```

Scripts Message Sequence Event Config Script Flow

Initialisation Errors Error Events Captured Errors Link Status Up=1 Down=0

MAPS™ 5G E1AP Interface – Call Reception

GL MAPS gNB-CU-UP (E1AP RELEASE17) - [Call Reception]

Configurations Emulator Reports Editor Debug Tools Windows Help

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Results
1	E1APManagementHandler.gls		GNB-CU-UP-id:55555, GNB-CU-UP-name:GL-gNB-CU-UP-01, GNB...	Stop	E1AP-LINK-UP	SendGNBCUUPConfiguration...	Pass
2	5GE1AP_UESessionControl.gls		GNBCUUP_UE_E1APID :2,GNBCUUP_UE_E1APID :2	Completed	Bearer Context Release Complete Sent	None	Pass

Stop Stop All Abort Abort All ☒ Show Records ☐ Select Active Call ☐ Auto Trash Trash

Save Column Width ☐ Show Latest

gNB-CU-CP gNB-CU-UP-0

Message	Time
BearerContextSetupRequest	12:27:50.621000
BearerContextSetupResponse	12:27:50.640000
BearerContextModificationRequest	12:27:50.810000
BearerContextModificationResponse	12:27:50.833000
BearerContextReleaseCommand	12:27:55.124000
BearerContextReleaseComplete	12:27:55.147000

Find

===== E1AP Layer =====

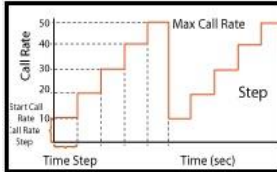
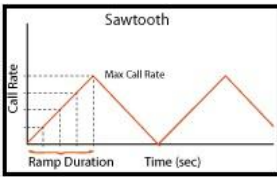
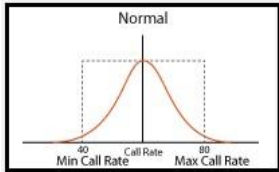
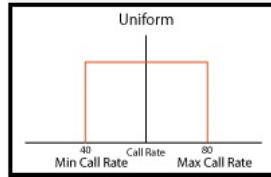
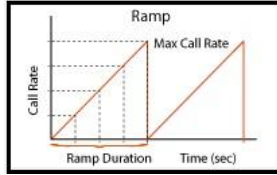
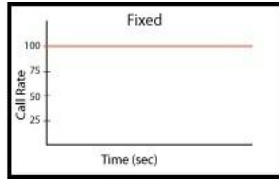
```
0000 E1AP-PDU = CHOICE
0000 Extensibility Marker = 0
0000 Choice Index = 0
0000 InitiatingMessage = SEQUENCE
0001 ProcedureCode = INTEGER
0001 Contents = 8 id-bearerContextSet
0002 Criticality = ENUMERATOR
0002 Contents = 0 reject(0)
0003 Length = 108
0004 Value = Open Type
0004 BearerContextSetupRequestIEs = SEQUENCE
0004 Extensibility Marker = 0
0004 ProtocolIE-Container = SEQUENCE OF
0005 Iteration Count = 7
```

Scripts **Message Sequence** Event Config Script Flow

● Initialisation Errors ● Error Events ● Captured Errors ● Link Status Up=1 Down=0

Load Generation

- Stability/Stress and Performance testing using Load Generation
- Different types of Load patterns to distribute load
- User can load multiple patterns for selected script
- User configurable Test Duration, CPS, Maximum and Minimum Call Rate etc.



The screenshot shows the MAPS gNB-CU-CP (E1AP RELEASE17) - [Load Generation - LoadGendefault] interface. The main configuration area includes:

- Total Calls To Generate:** * (* indicates no limit)
- Max Active Calls:** 200
- Unique Distributions Per Script:** ☐
- Multi Distributions:** ☐
- Statistical Distribution:** Fixed
- Call Rate:** 100

The **Scripts** section lists:

Scripts	Profile
SGE IAP UESessionControl	Profile0001
	Profile0002
	Profile0003
	Profile0004
	Profile0005
	Profile0006
	Profile0007
	Profile0008
	Profile0009
	Profile0010

Buttons: Add, Delete, Add, Delete.

Stop Time: Days 0, Hours 0, Minutes 0. **Start Time:** 00:00:00.000. **End Time:** 00:00:00.000. Buttons: Pause, Start.

Initialisation Errors

Thank you