MAPS™ 5G N1N2 Interface Emulator

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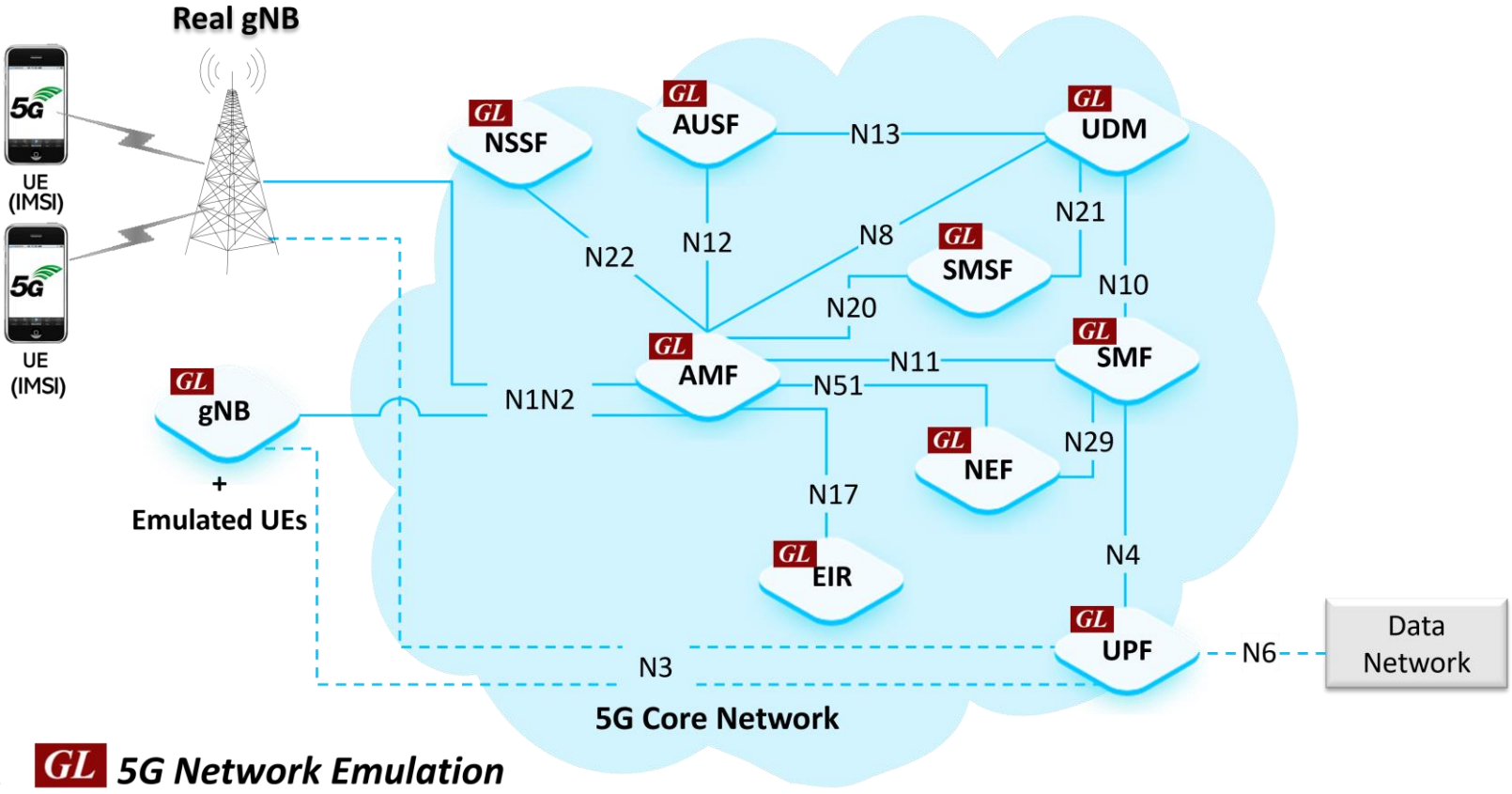
5G Network Diagram



GL 5G Network Emulation

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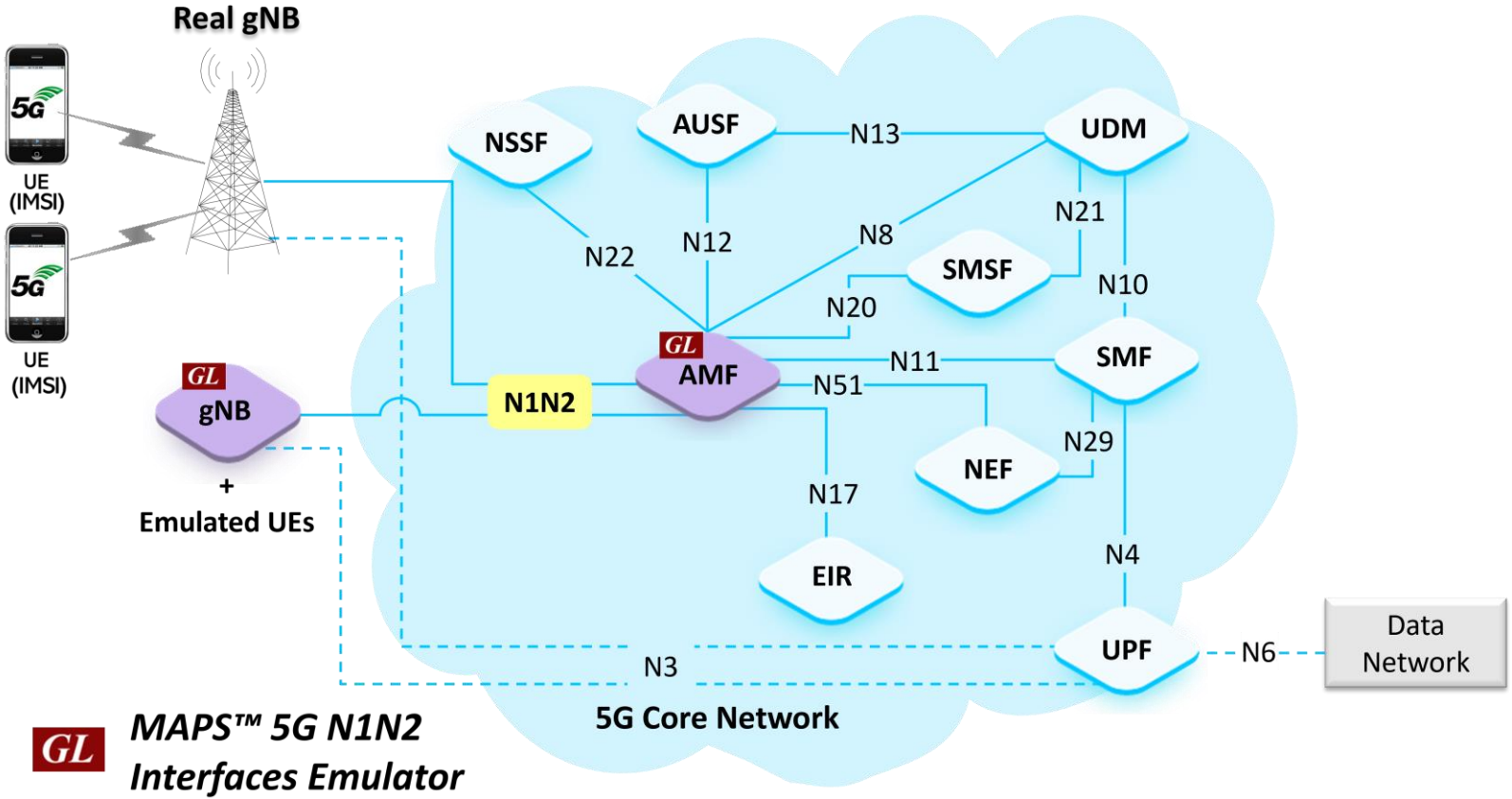
MAPS™ 5G N1N2 Interface Network Architecture



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Features

- End-to-End 5G Network Emulation
- Emulate UE+gNodeB and AMF nodes
- Supports Control plane signaling and User plane traffic
- Generate and process NGAP/NAS (valid and invalid) messages
- Insertion of impairments to create invalid messages
- Supports 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
- Emulate Massive UEs (up to 64,000) with Voice Traffic
- Emulate User-plane GTP traffic at high line rates (up to 40 Gbps)
- Provides Call Statistics and Events Status
- Supports Command Line Interface (CLI) using Python API Client

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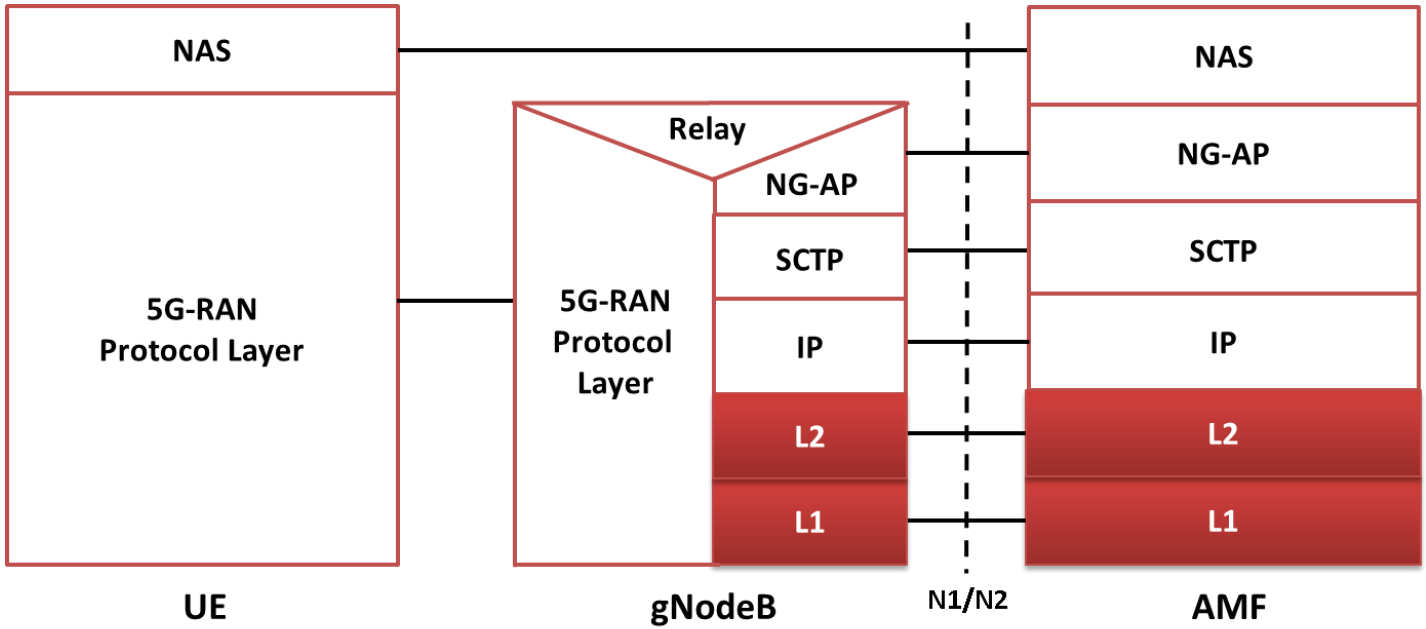
Protocol Stack Specification



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Protocol Stack Specification (Contd.)

Supported Protocols	Standard / Specification Used
N1N2 Interface (gNB - AMF)	TS24.501
NG-AP	3GPP TS 38.413 V0.7.0 (2018-03)
SCTP	RFC 4960
Non-Access-Stratum (NAS)	3GPP TS 24.501 V1.0.0 (2018-3)
NR and NG-RAN	3GPP TS 28.300 V2.0.0 (2017-12)

- NG Application Protocol (NGAP): Application Layer Protocol between the gNodeB and the AMF
- SCTP for the control plane (SCTP): This protocol guarantees delivery of signaling messages between AMF and gNodeB (N1N2). SCTP is defined in RFC 2960

MAPS™ 5G Call Scenarios

- UE Registration Signaling
  - Initial UE Message
  - Downlink NAS Transport
  - Uplink NAS Transport
  - Registration Procedure
  - Authentication Procedure
  - Security Mode Procedure
  - PDN Connectivity Request
  - Initial Context Setup Procedure
- Session Establishment Procedure
  - Session Establishment Request
  - Session Establishment Accept
- Session Release Procedure
  - Session Release Request
  - Session Release Command
  - Session Release Complete
- Deregistration procedures
  - Deregistration Request
  - Deregistration Accept
- UE Context Release Procedure
  - UE Context Release Command
  - UE Context Release Complete

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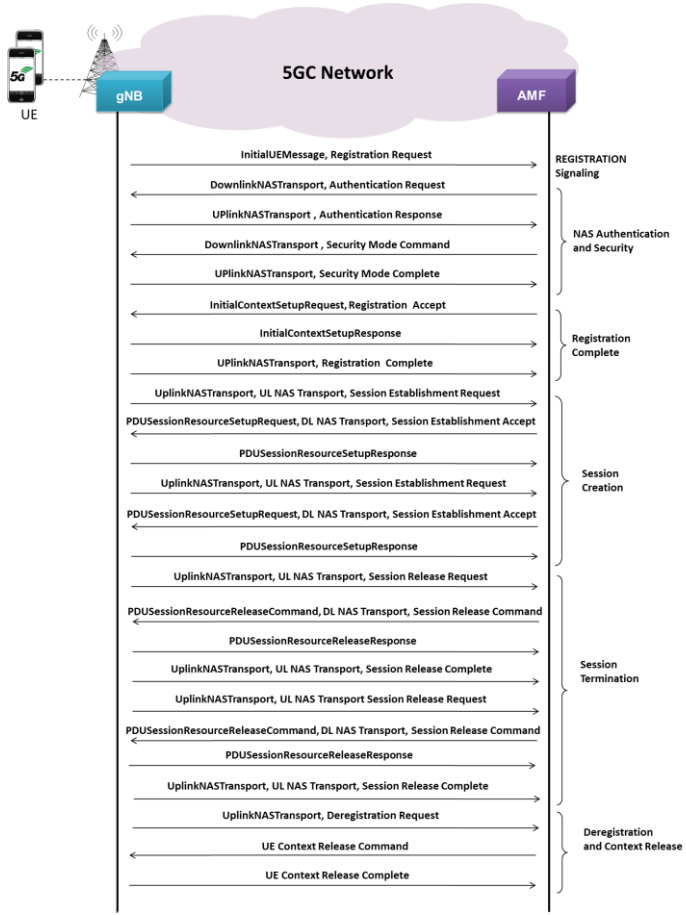
MAPS™ 5G N1N2 Call Scenario



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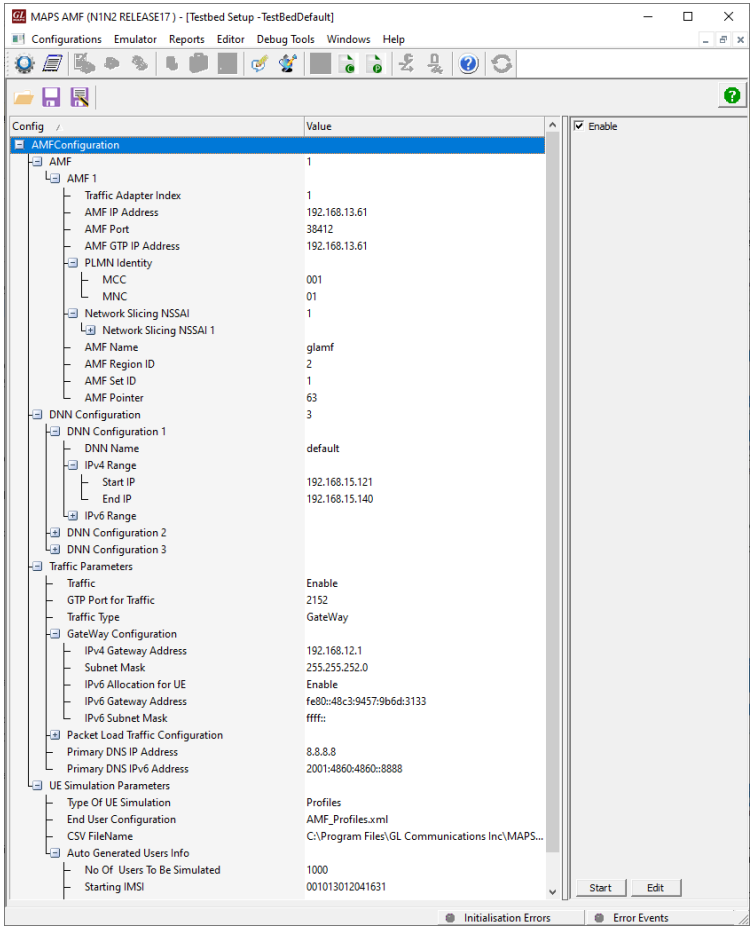
Testbed Configuration (AMF)



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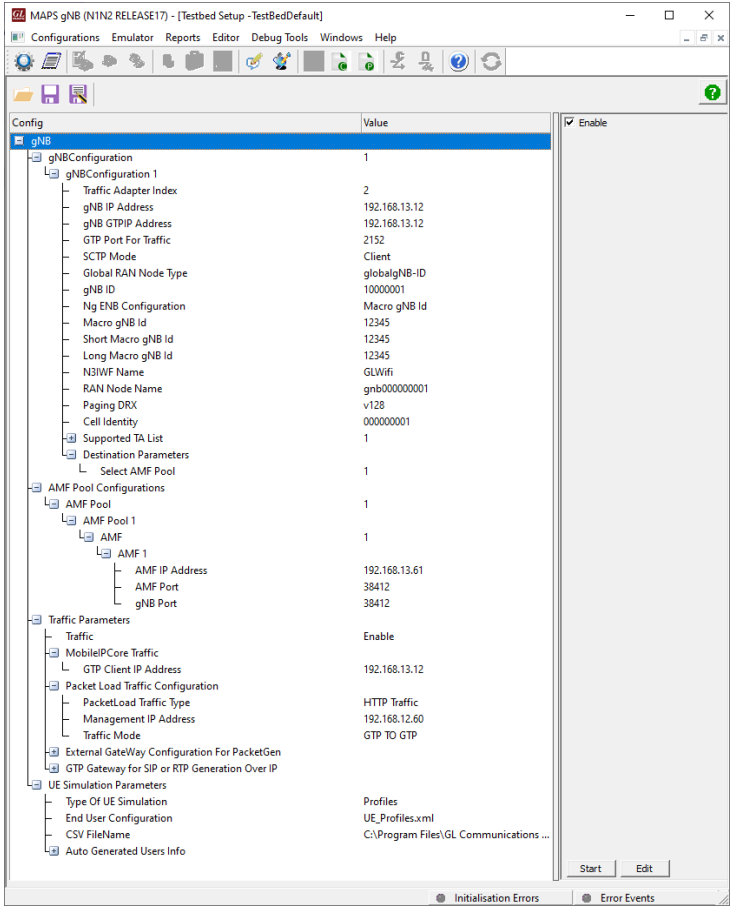
Testbed Configuration (gNB)



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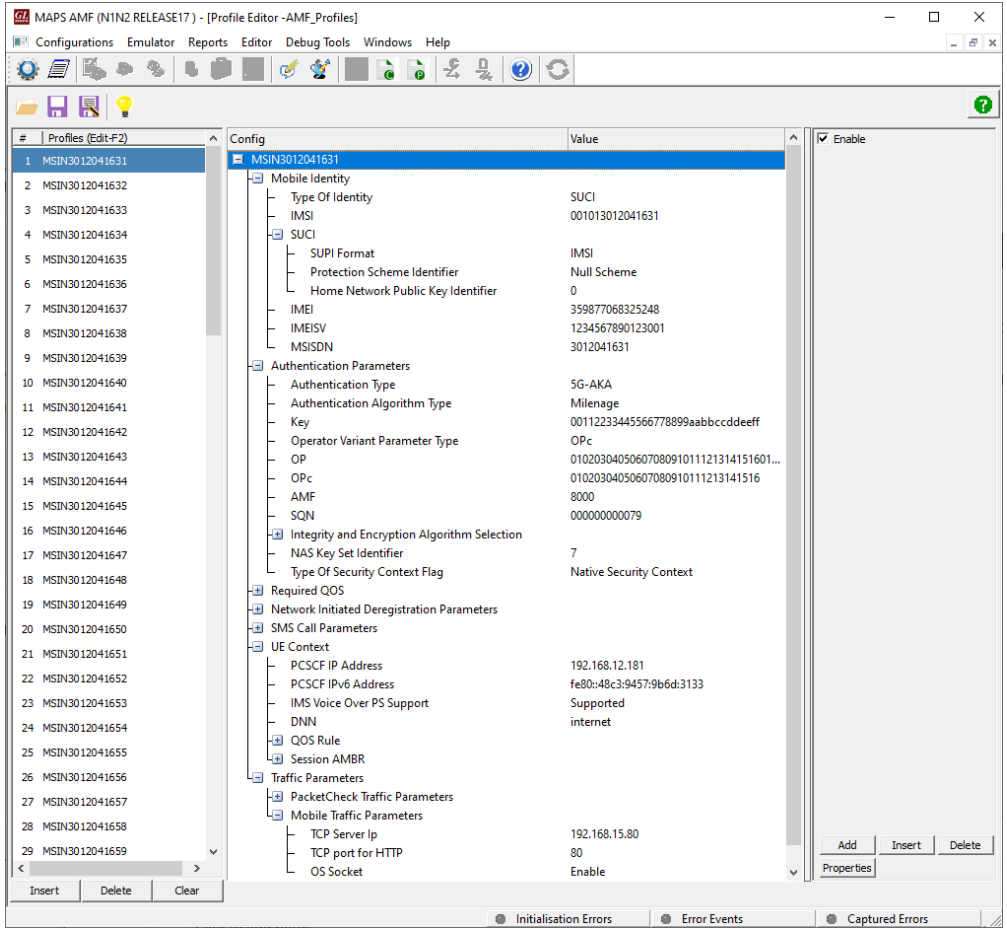
Profile Configuration (AMF)



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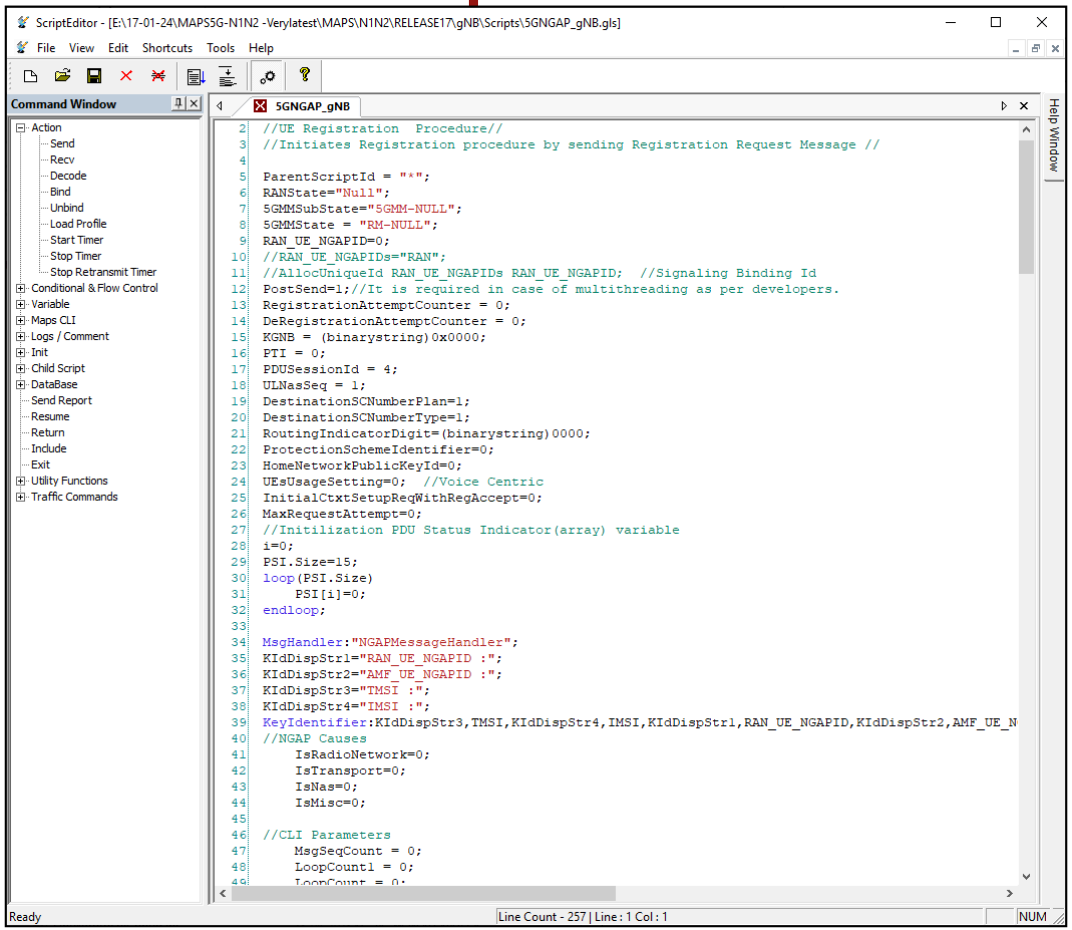
Script Editor



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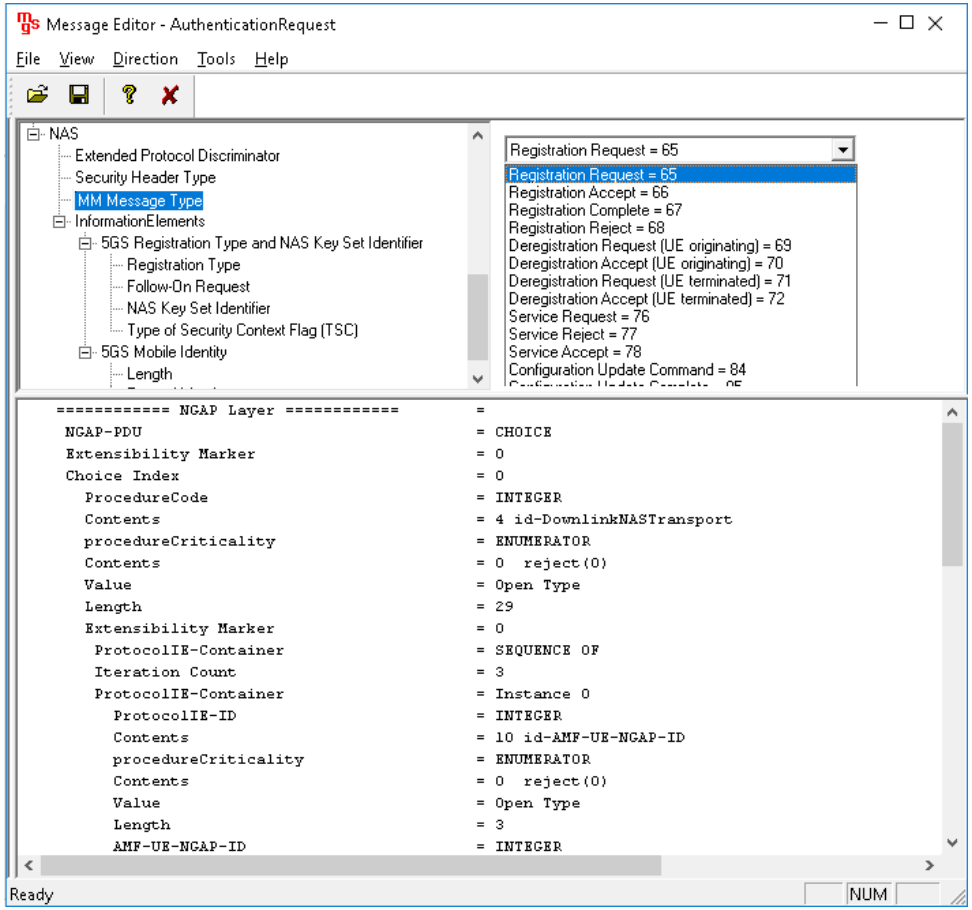
Message Editor



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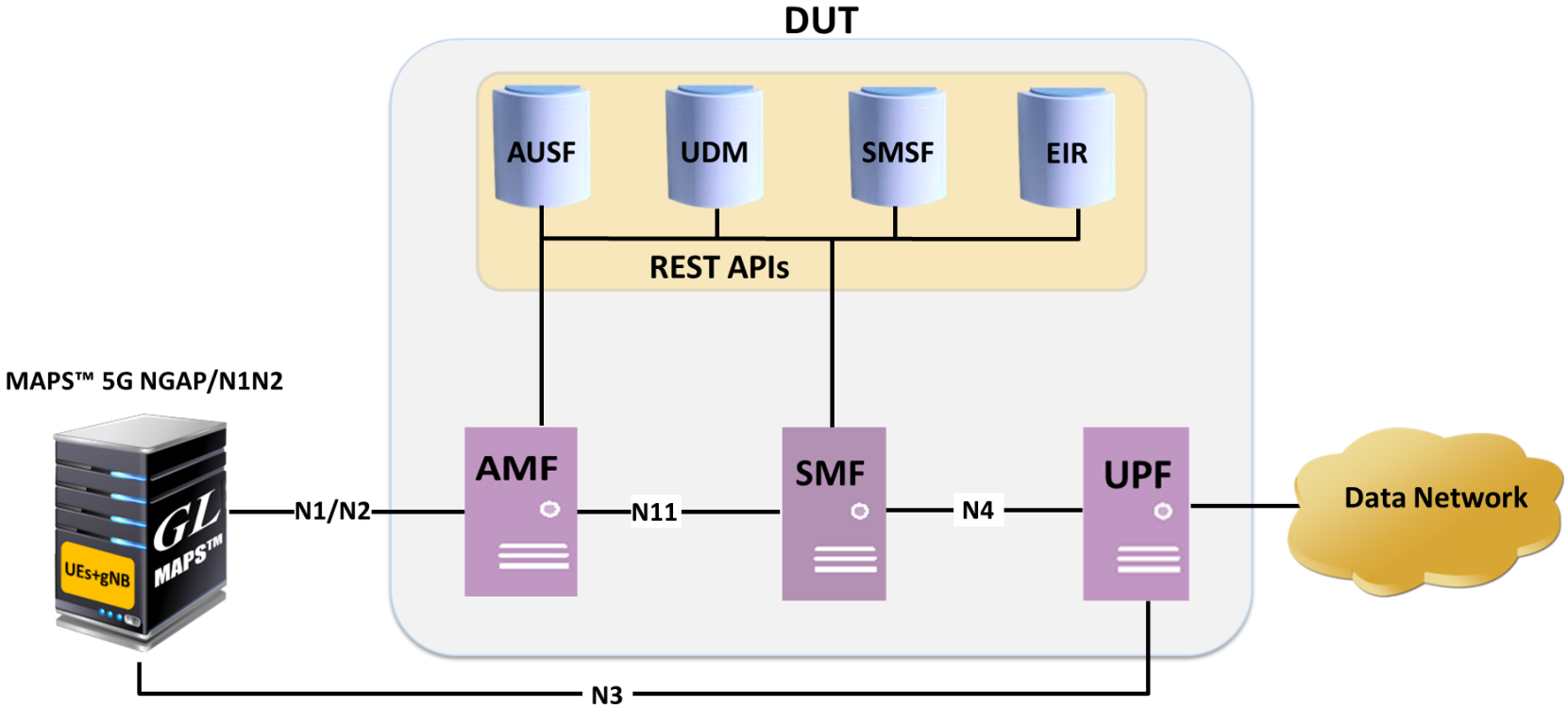
MAPS™ gNB Emulator testing 5G Core Network



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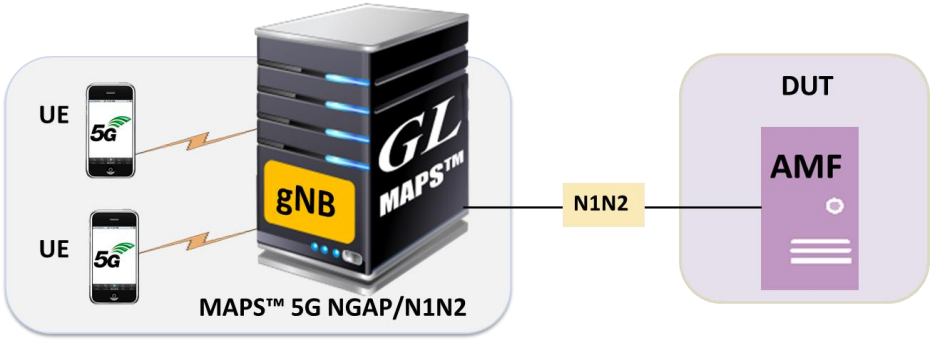
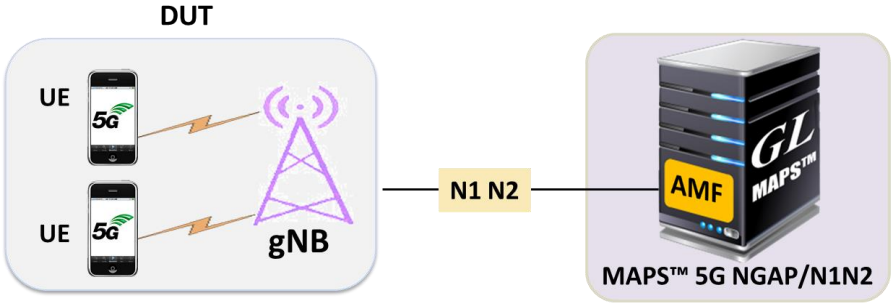
MAPS™ 5G N1N2 Use Cases

MAPS™ N1N2 configured as AMF to test gNB (DUT)



MAPS™ N1N2 configured as gNB to test AMF (DUT)



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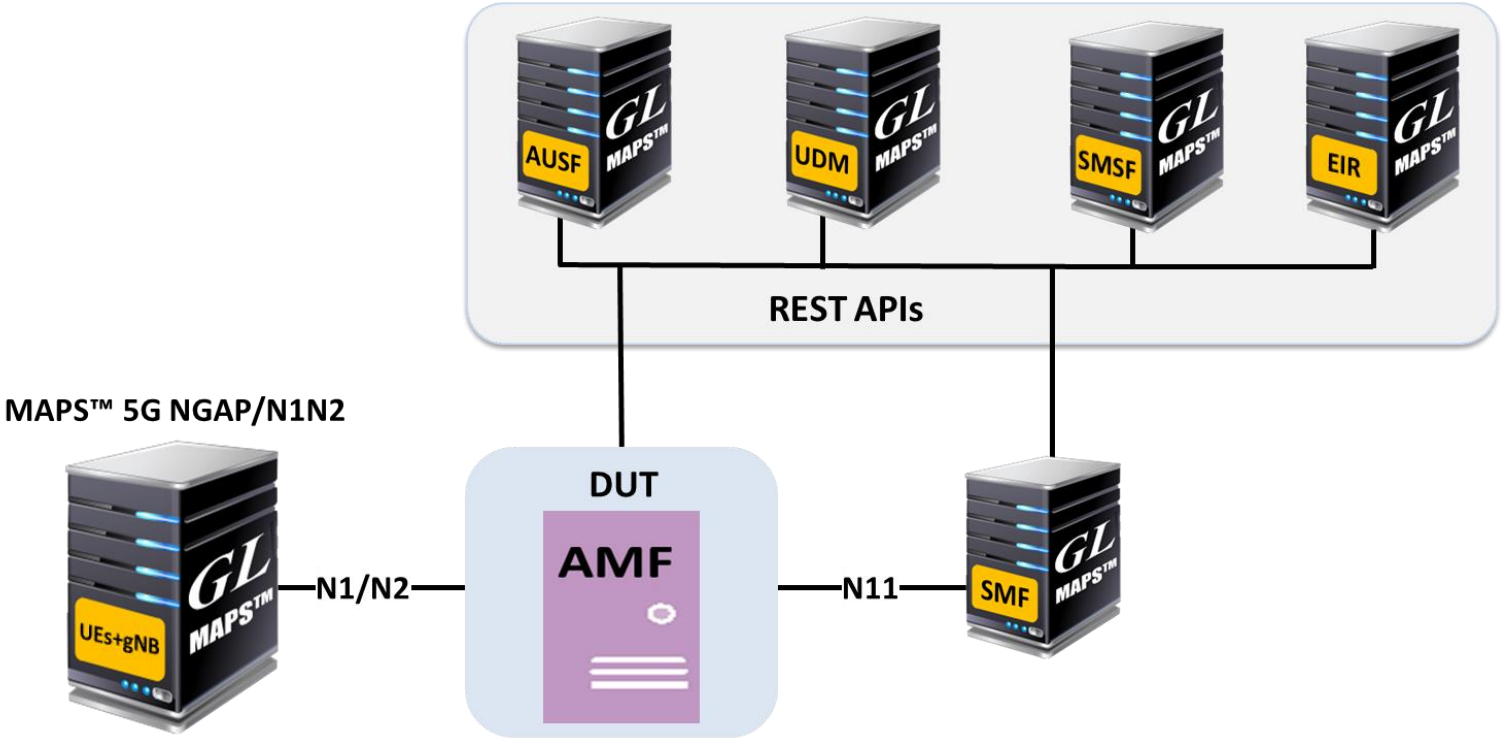
MAPS™ 5G N1N2 Use Cases (Contd.)

Wrap Around Testing of AMF



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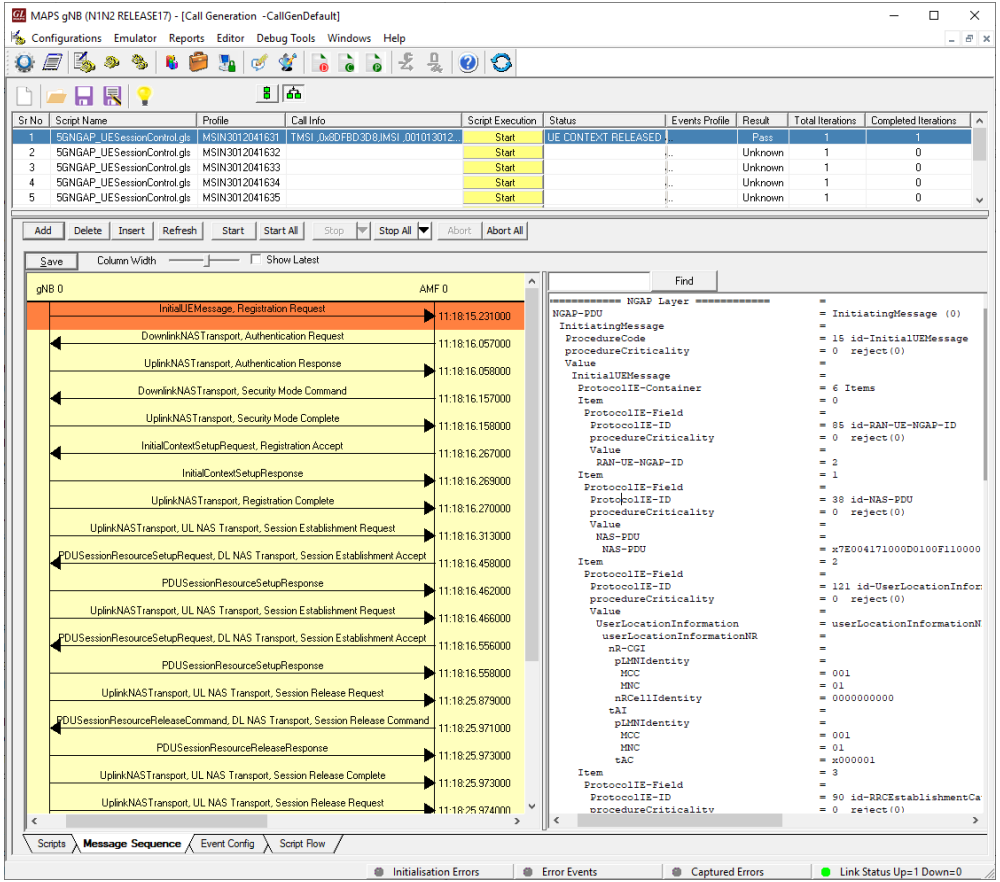
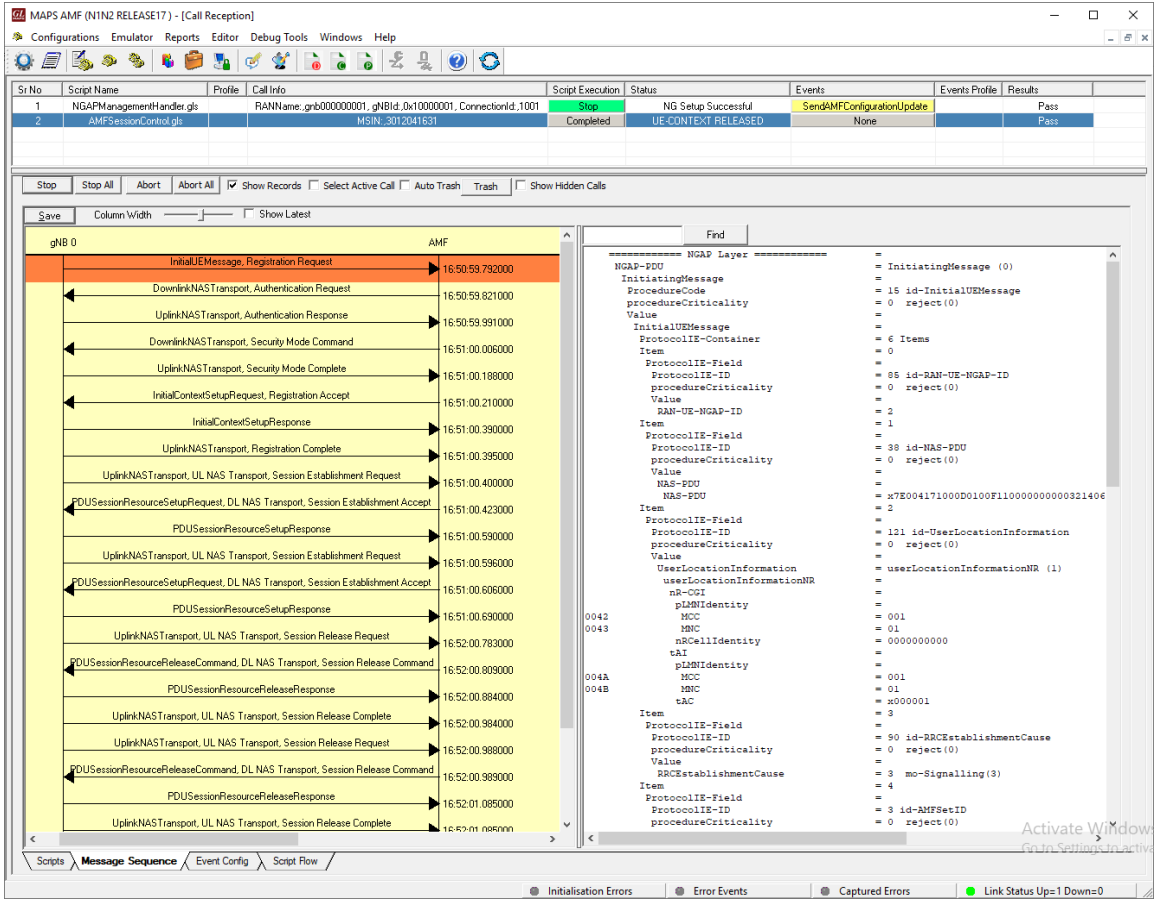
MAPS™ 5G N1N2 Interface – Call Generation

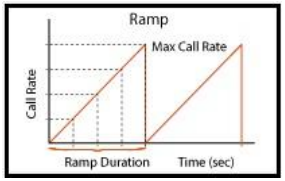


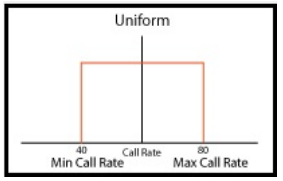
MAPS™ 5G N1N2 Interface – Call Reception

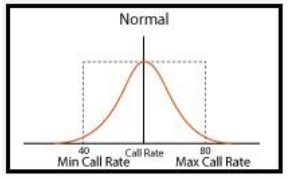


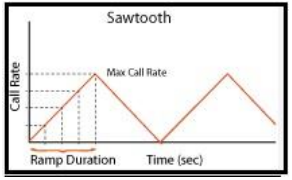
Load Generation

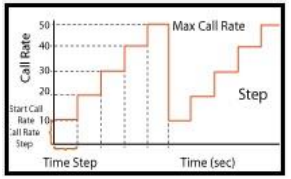
- Stability/Stress and Performance testing using Load Generation
- Different types of Load patterns to distribute load
- User can load multiple patterns for selected script
- User configurable Test Duration, CPS, Maximum and Minimum Call Rate etc.

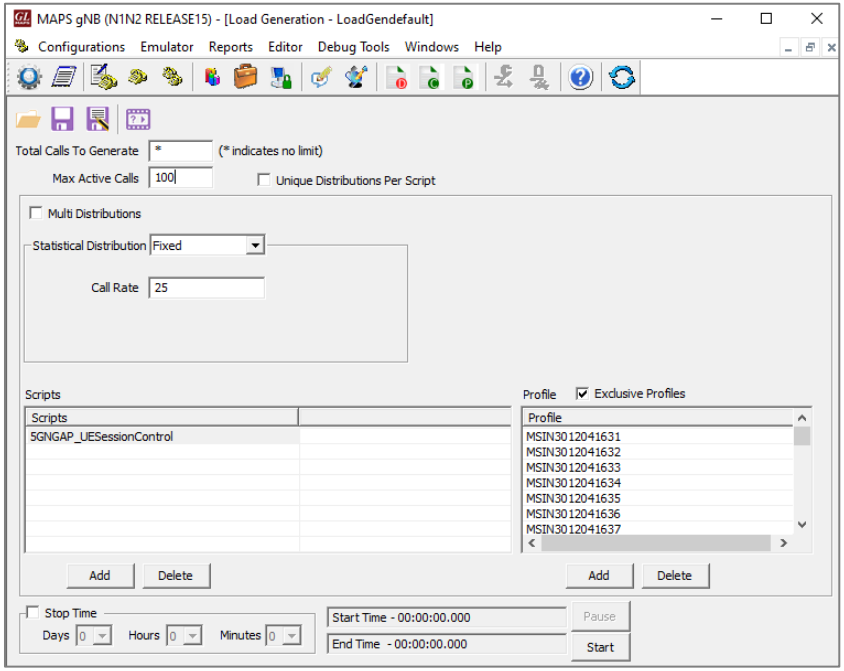












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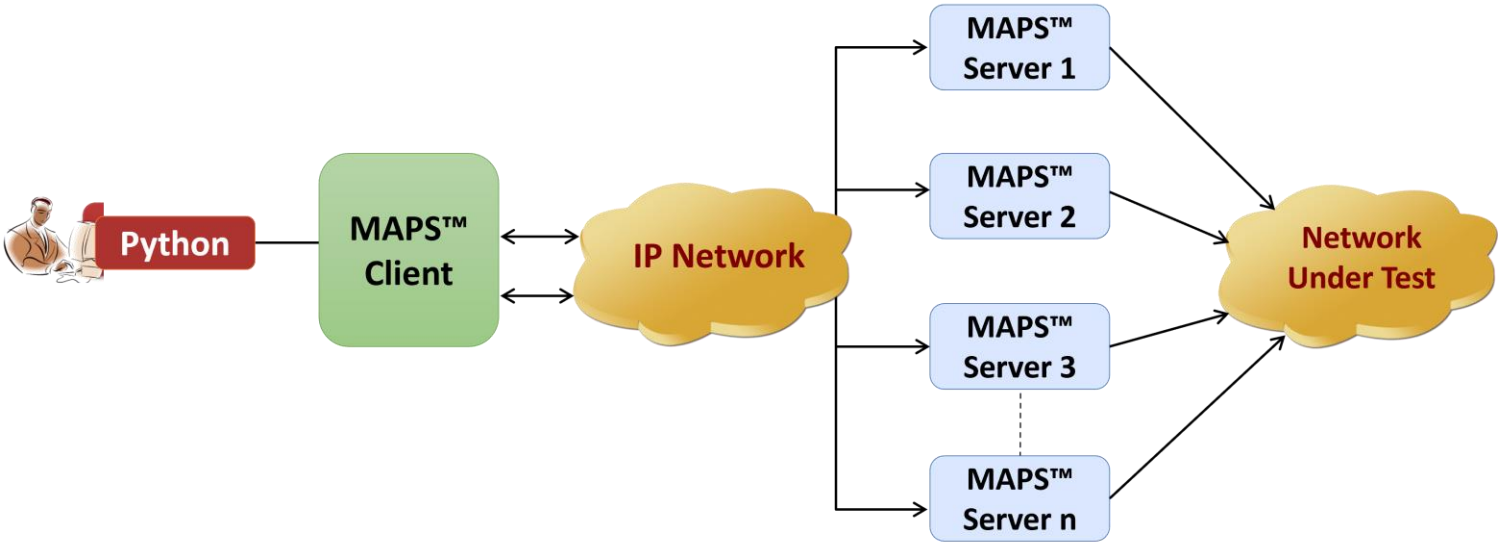
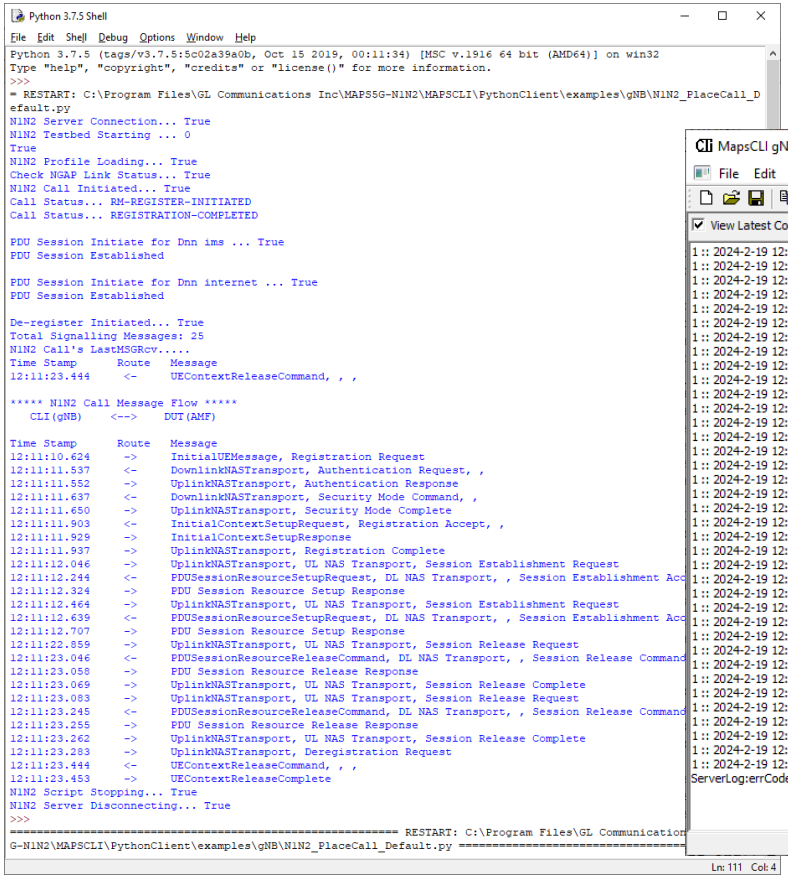
MAPS™ API Architecture



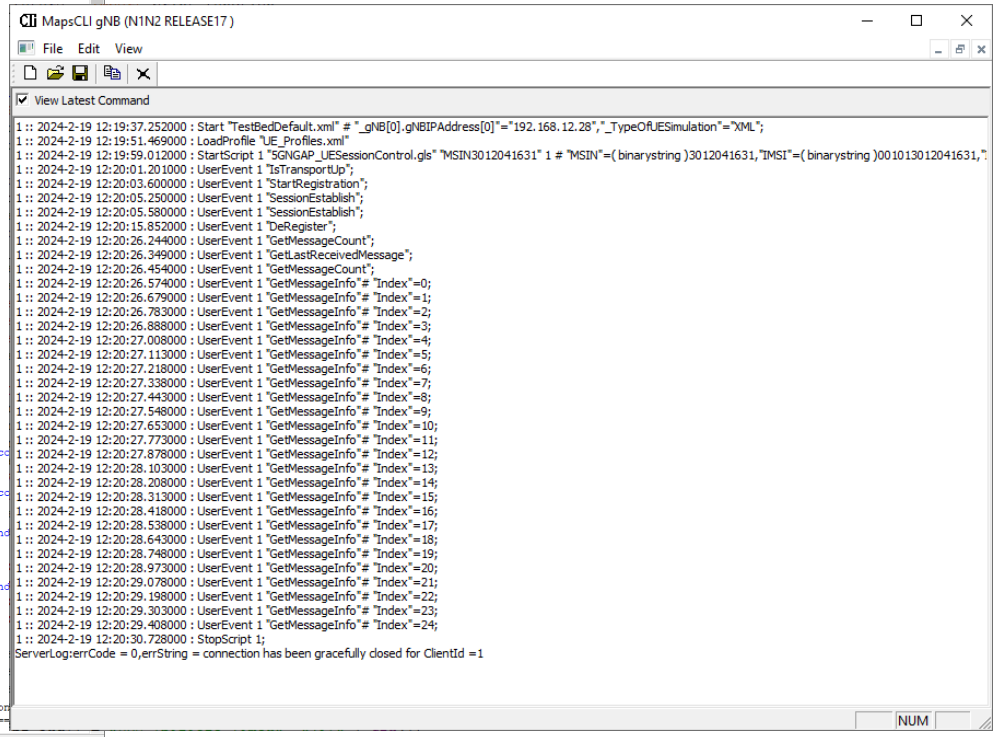
- API wraps our proprietary scripting language in standard languages familiar to the user:
  - Python
- Clients and Servers support a “Many-to-Many” relationship, making it very easy for users to develop complex test cases involving multiple signaling protocols

CLI/API Support

Python Client



MAPS™ CLI Server



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Thank you