MAPS™ 5G N11 Interface Emulator

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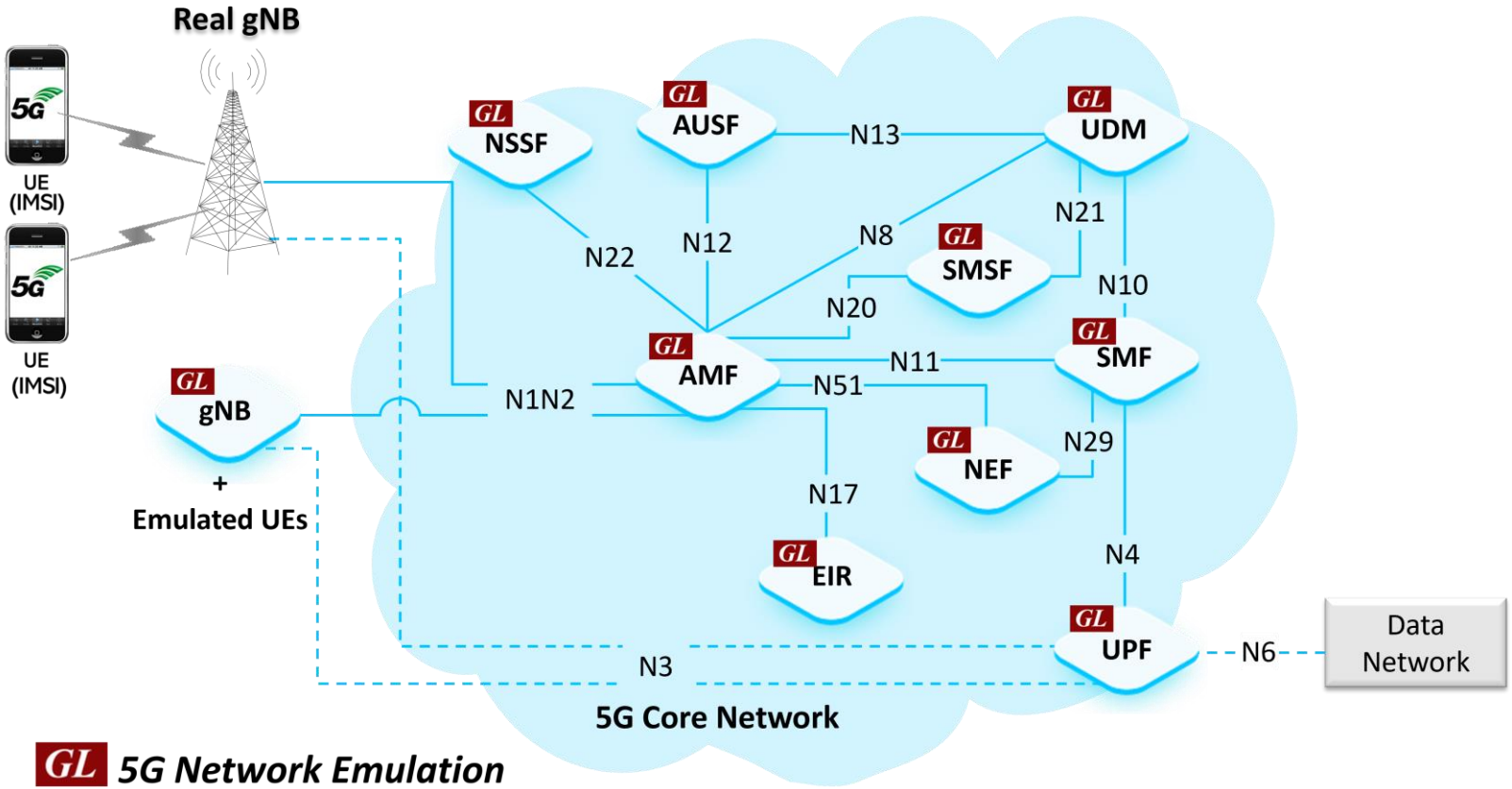
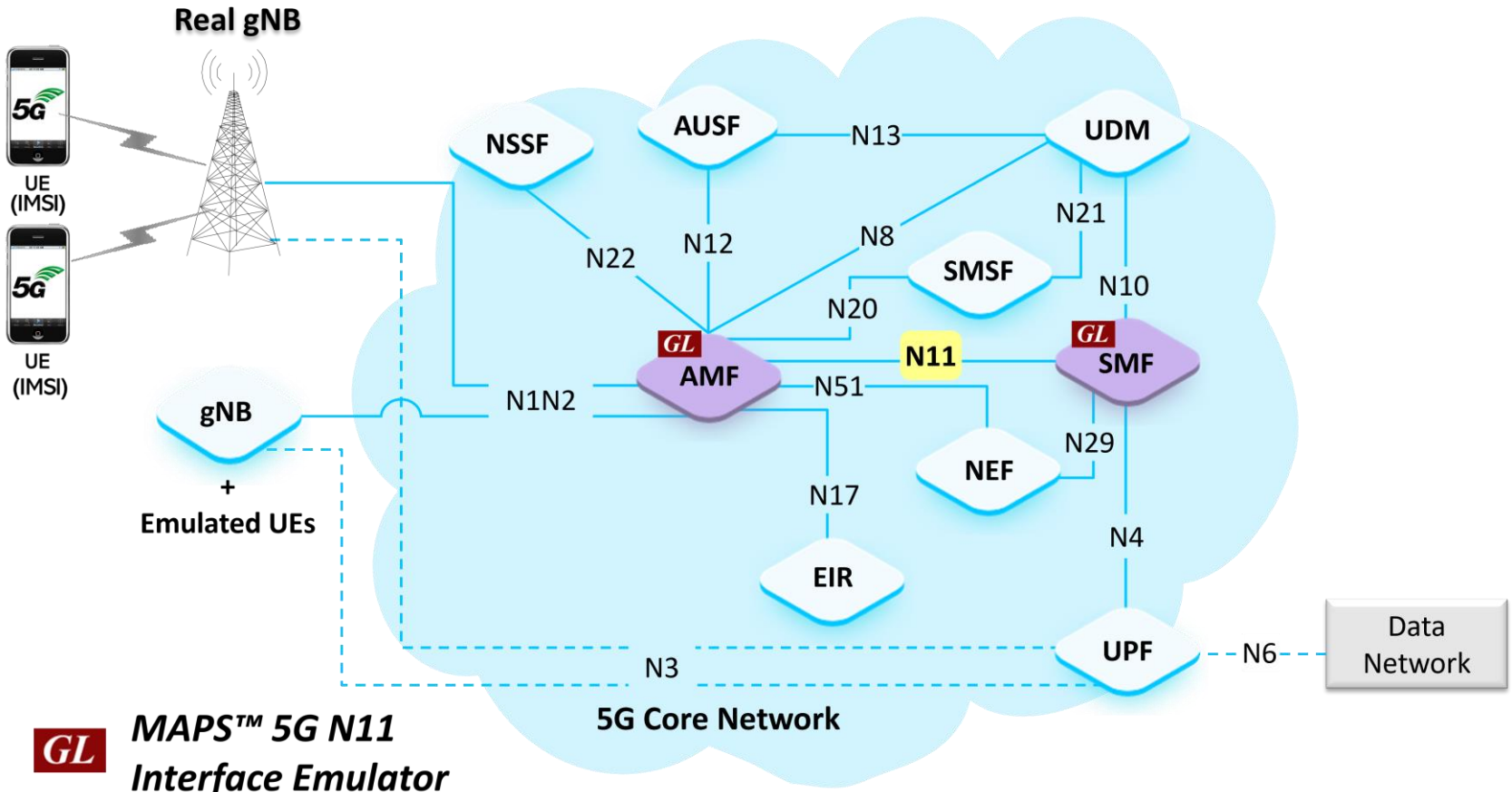
5G Network Diagram



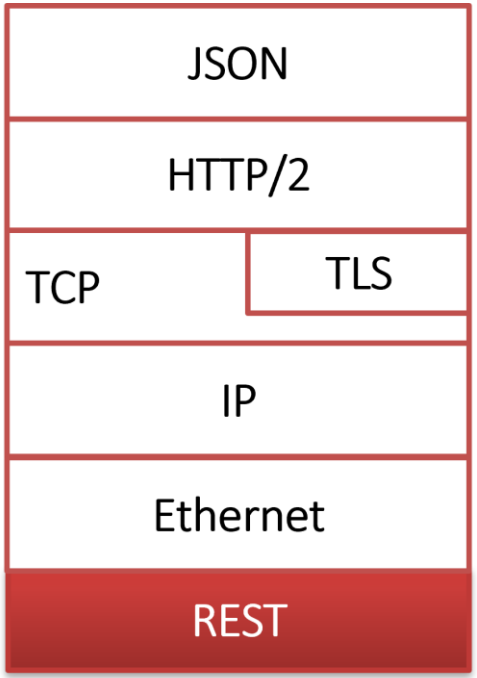
MAPS™ 5G N11 Interface



Main Features

- Emulate Session Management Function (SMF) and Access and Mobility Management Function(AMF) elements
- Supported Procedures are-
  - Nsmf_PDUSession Services
  - Namf_Communication Services
- Services use REST APIs based on HTTP and JSON data format
- Supports Command Line Interface (CLI) through a client-server model, enabling users to control all features via Python APIs
- Supports TLS and TCP transports
- Supports scripted call generation and automated call reception
- Supports customization of call flow and message templates using Script and JSON messages
- Ready-to-use scripts for quick testing
- Provides Call Statistics and Events Status
- Automation, Remote access, and Schedulers to run tests 24/7

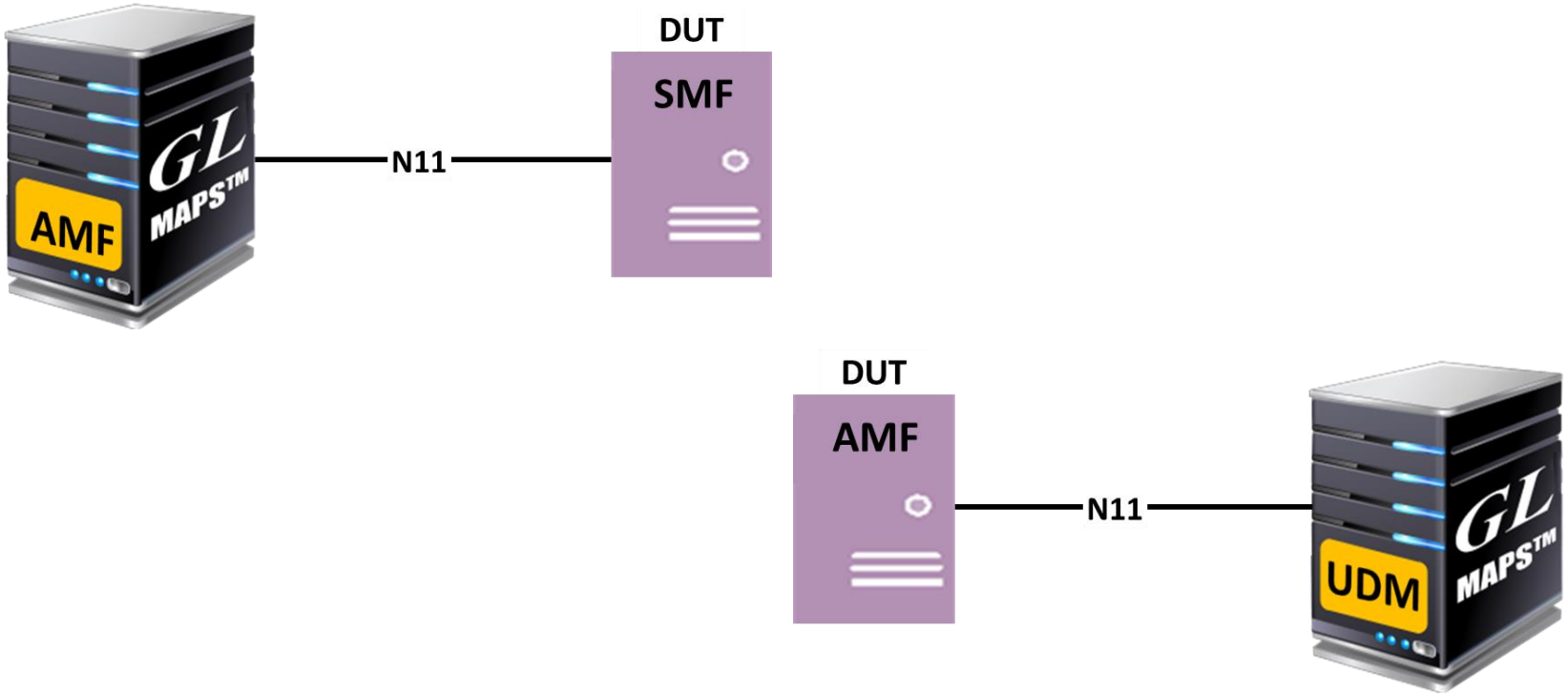
Protocol Stack Specification



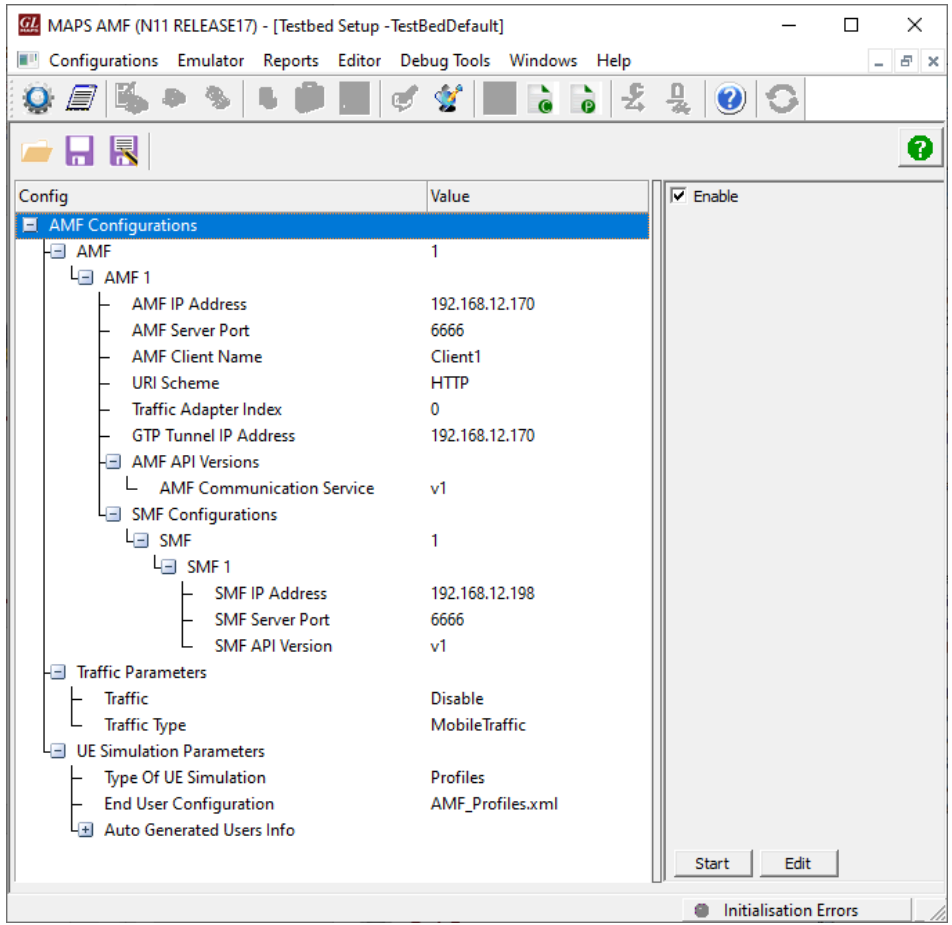
Supported Protocols	Standard / Specification Used
N11 Interface (SMF - AMF)	TS29.502
JavaScript Object Notation (JSON)	IETF RFC 8259
HTTP / 2 (Hypertext Transfer Protocol)	3GPP TR 21.905 IETF RFC 7540 IETF RFC 7232 IETF RFC 7234
TCP	IETF RFC 793
IPv4	IETF RFC 791 [5] IETF RFC 2460 [6]

MAPS™5G N11 User Cases

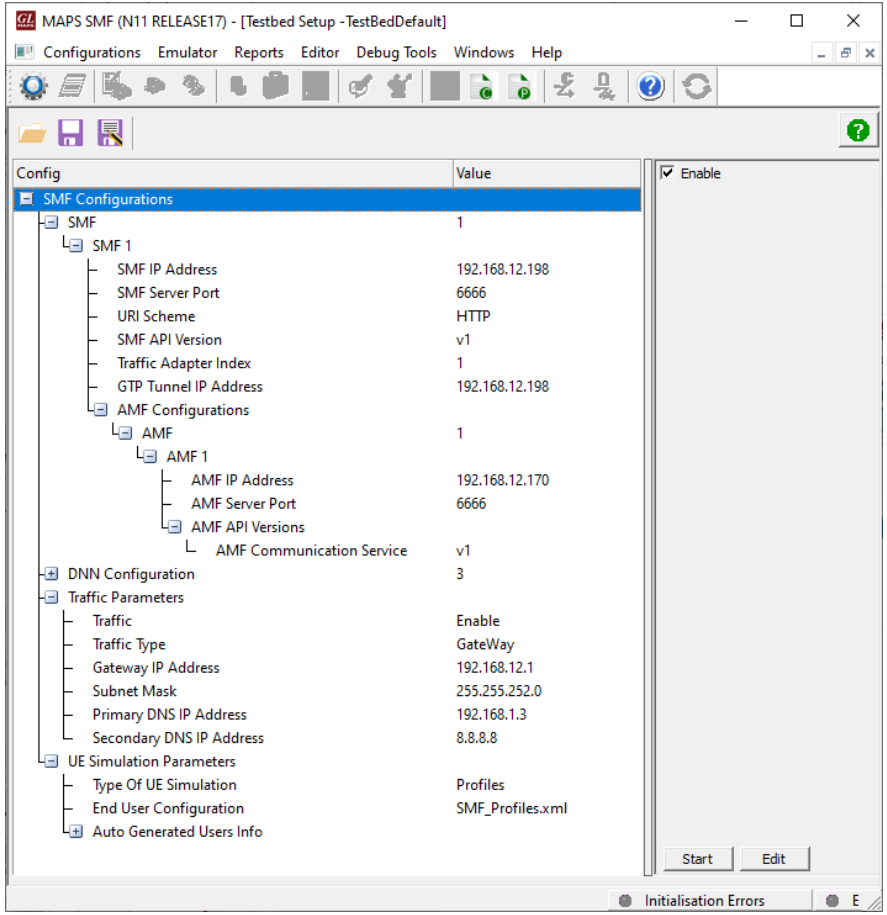
- MAPS™ can emulate any one node (AMF/SMF) or both AMF and SMF nodes



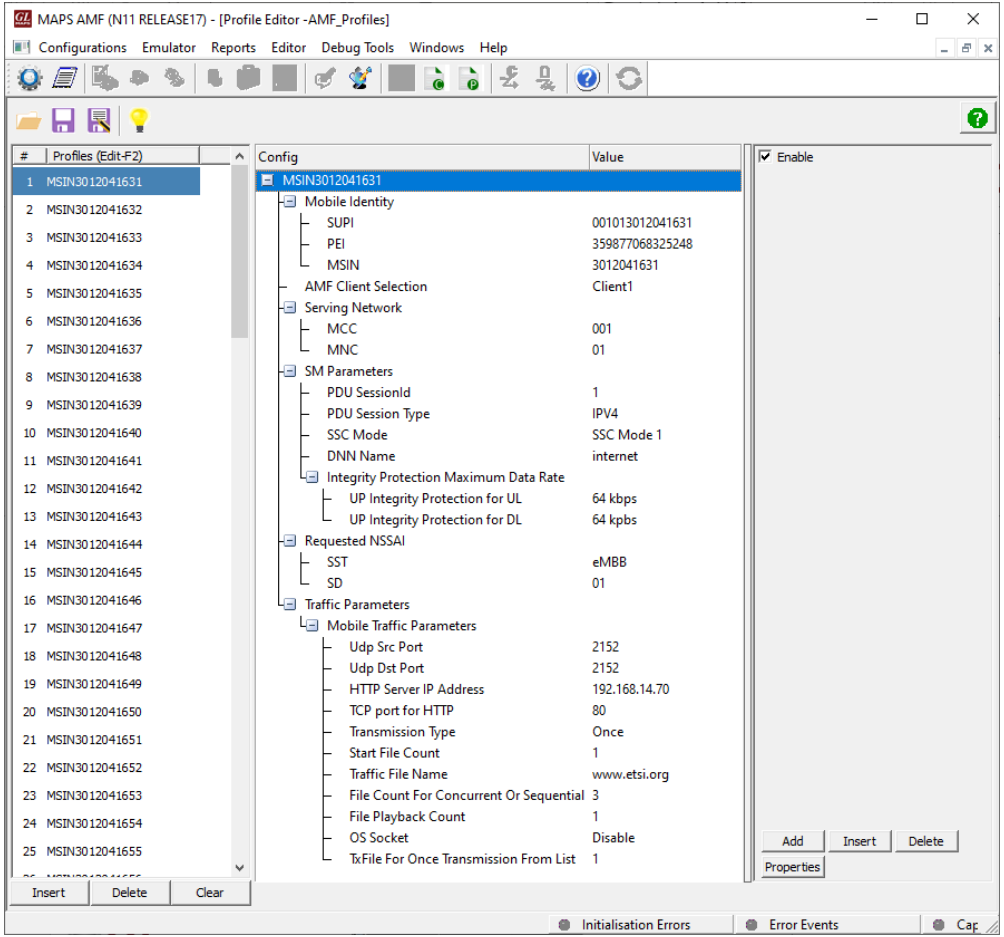
Testbed Setup (AMF)



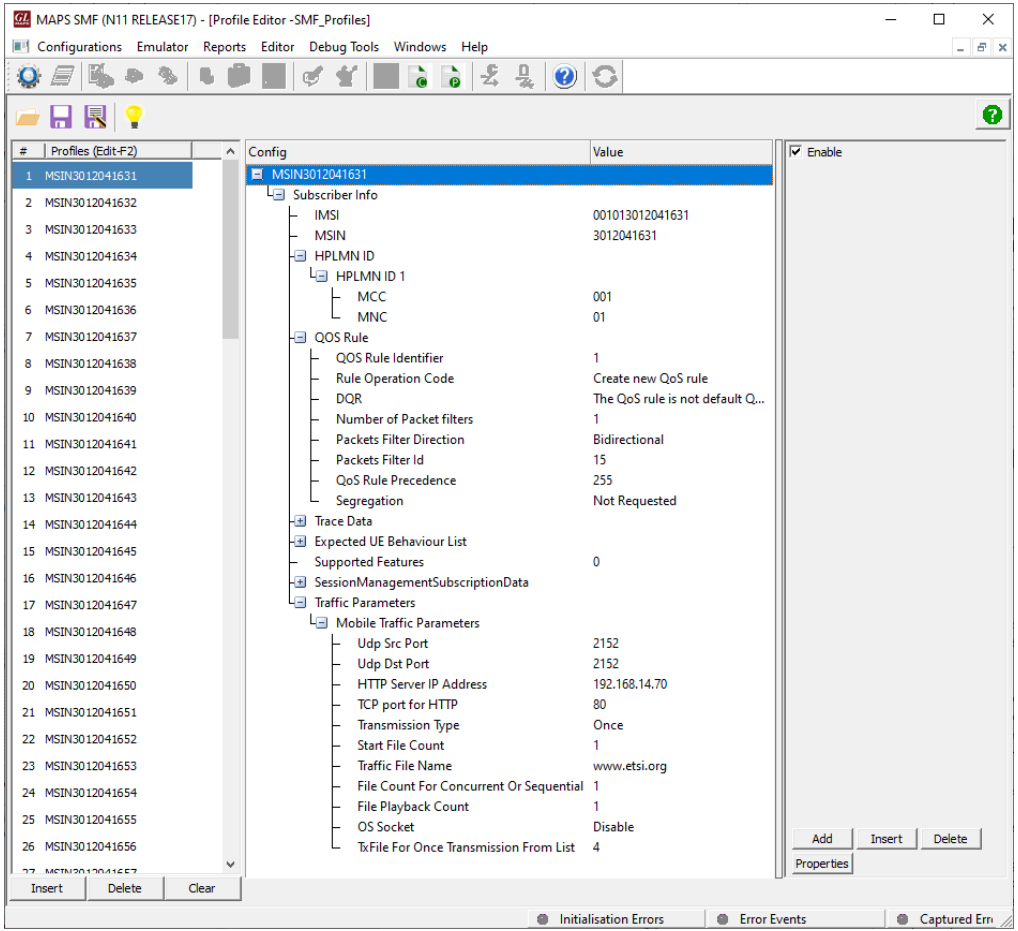
Testbed Setup (SMF)



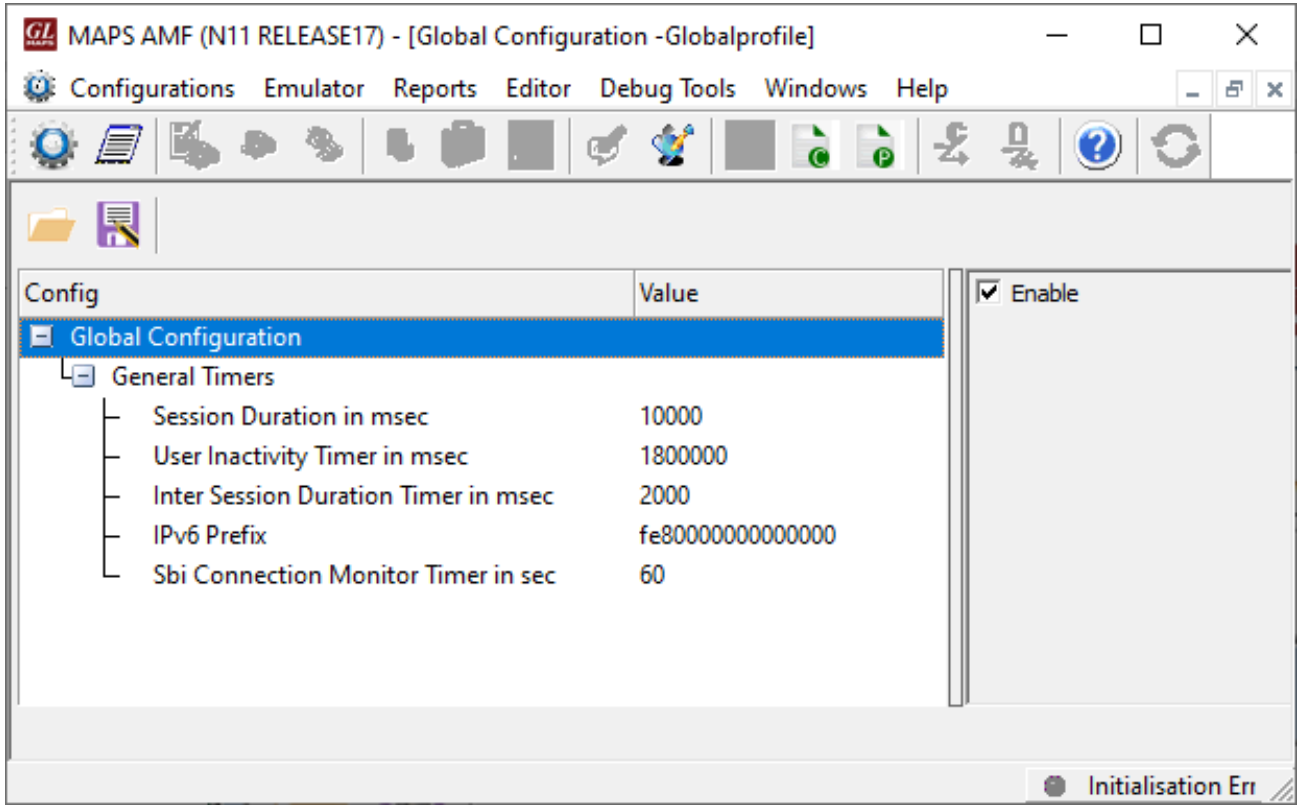
Profile Editor (AMF)



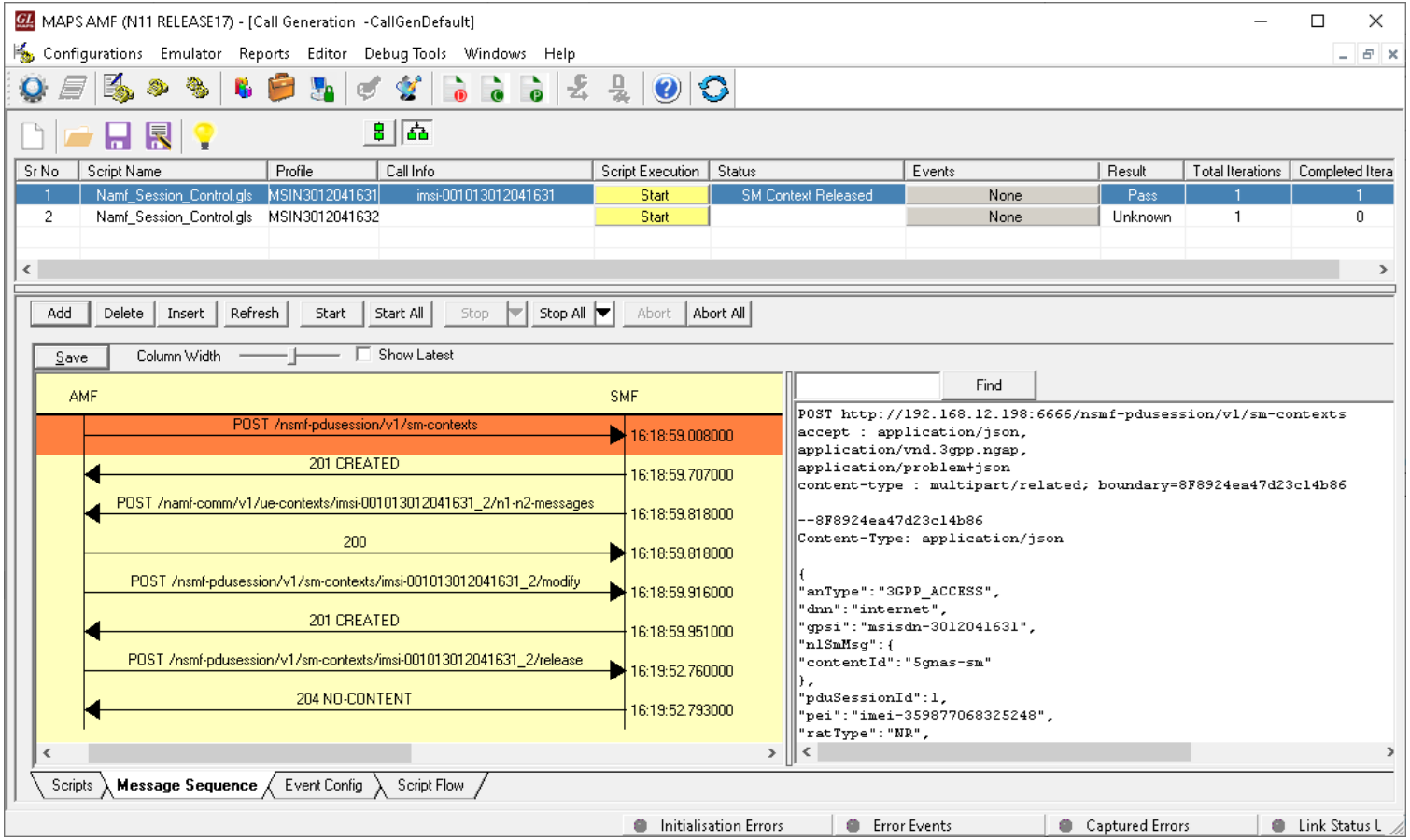
Profile Editor (SMF)



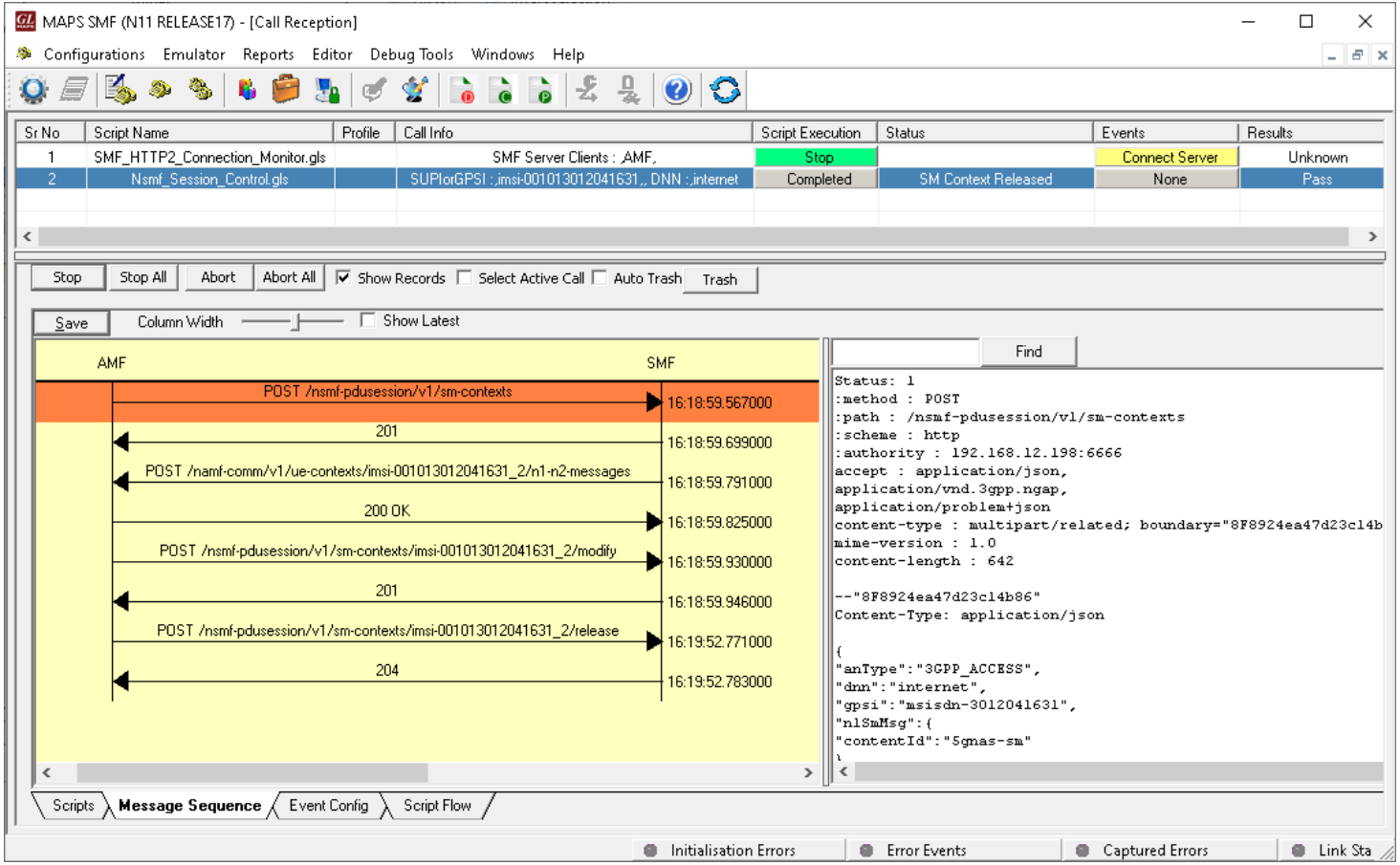
Global Configuration



Call Generation



Call Reception



MAPS™5G N11 Interface Procedures

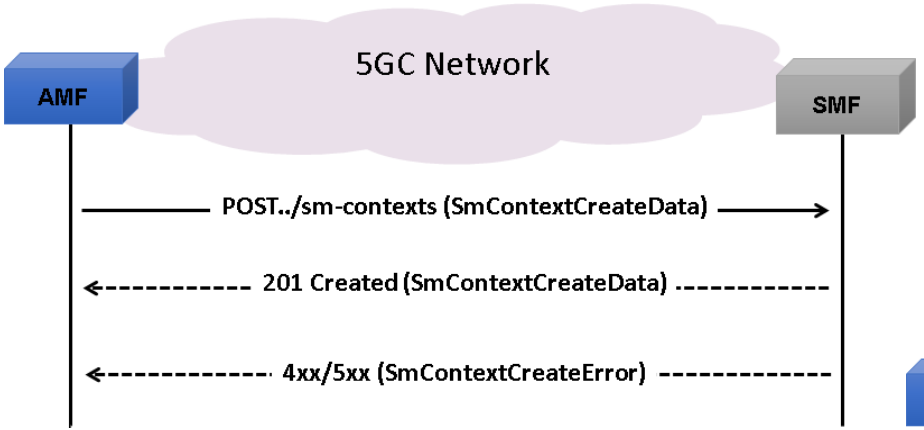
- Nsmf_PDUSession Services
  - Create SM Context Service Operation
  - Update SM Context Service Operation
  - Release SM Context Service Operation
  - Notify SM Context Status Service Operation
  - Retrieve SM Context Service Operation

- Nudm_UEContextManagement Service
  - Network triggered Service Request
  - PDU Session establishment
  - PDU Session modification
  - PDU Session release
  - Session continuity, service continuity and UP path management
  - Inter NG-RAN node N2 based handover
  - SMS over NAS procedures
  - UE assisted and UE based positioning procedure
  - Network assisted positioning procedure
  - UE configuration update procedure for transparent UE policy delivery

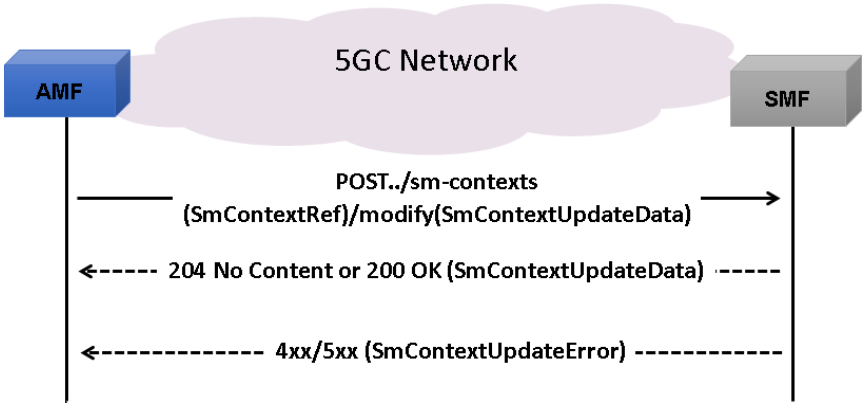
MAPS™5G N11 Interface Procedures

Nsmf_PDUSession Service

Create SM Context Service Operation



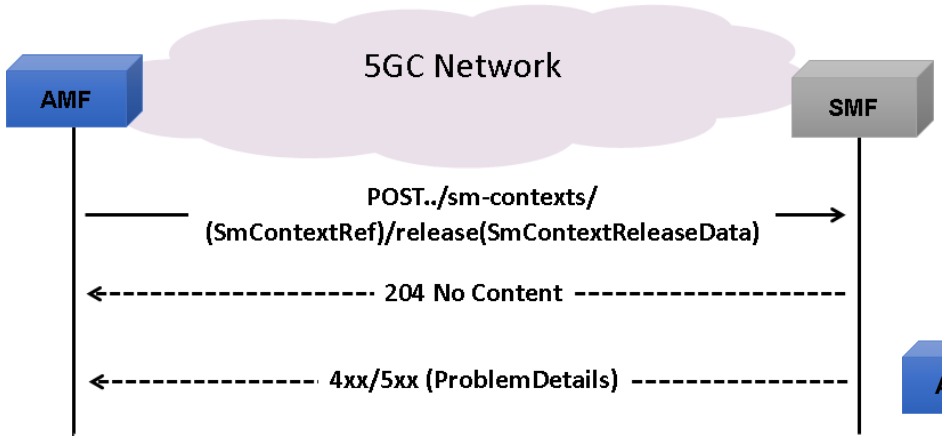
Update SM Context Service Operation



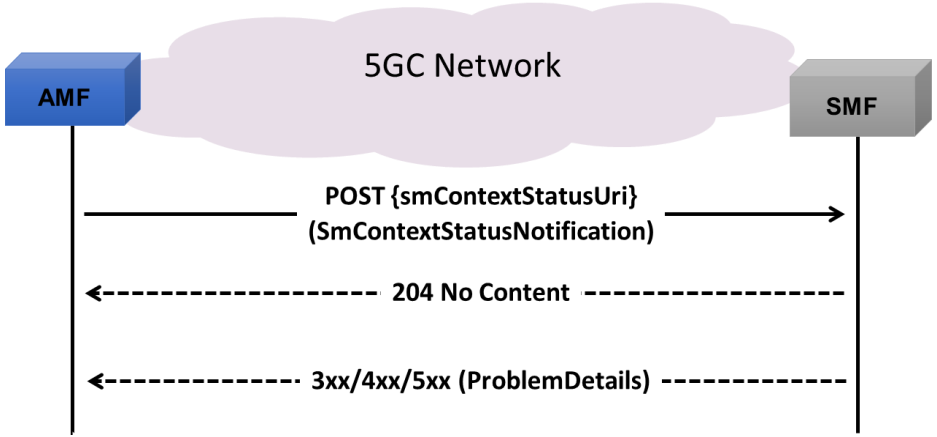
MAPS™5G N11 Interface Procedures

Nsmf_PDUSession Service (*Contd.*)

Release SM Context Service Operation



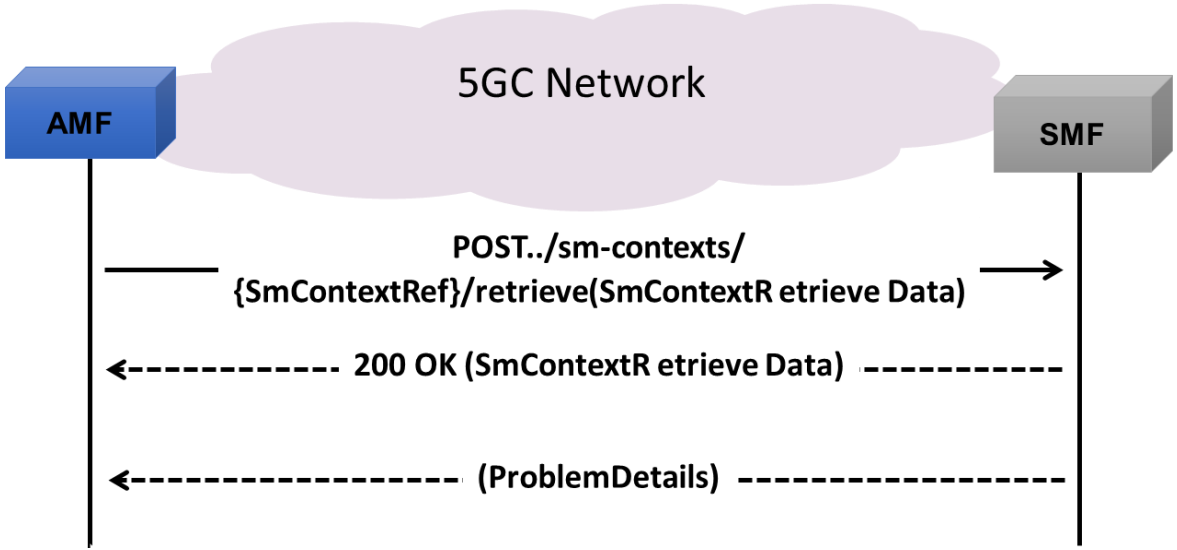
Notify SM Context Status Service Operation



MAPS™5G N11 Interface Procedures

Nsmf_PDUSession Service (*Contd.*)

Retrieve SM Context Service Operation



MAPS™5G N11 Interface Procedures

Namf_Communication Service

- Network triggered Service Request
- PDU Session establishment
- PDU Session modification
- PDU Session release
- Session continuity, service continuity and UP path management
- Inter NG-RAN node N2 based handover
- SMS over NAS procedures
- UE assisted and UE based positioning procedure
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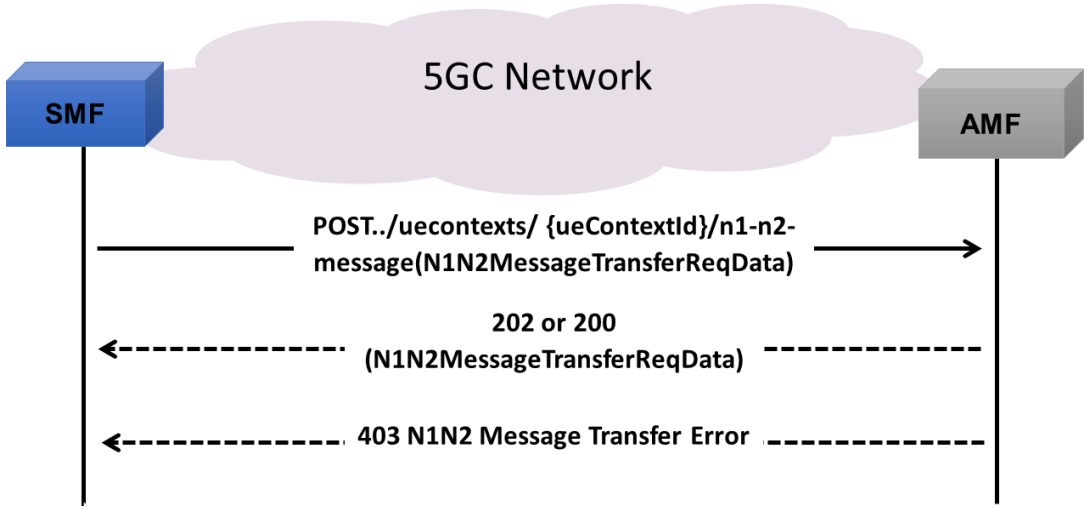
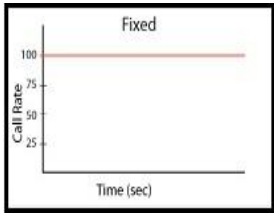
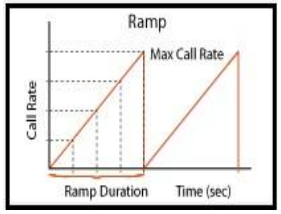
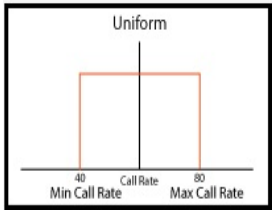
- UE configuration update procedure for transparent UE policy delivery

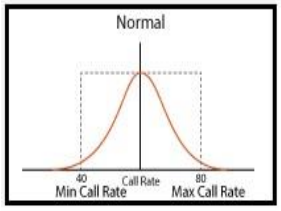


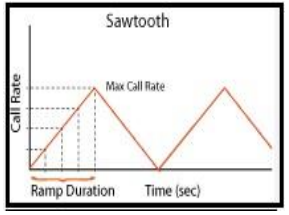
Load Generation

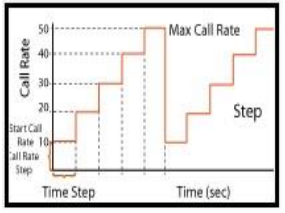




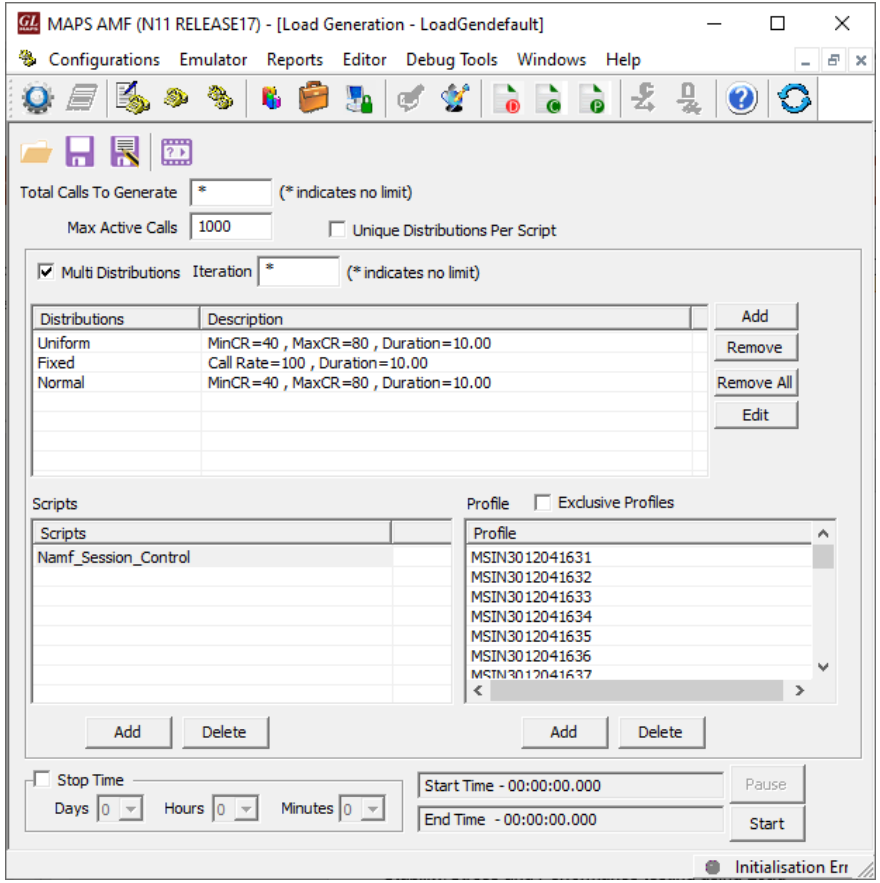




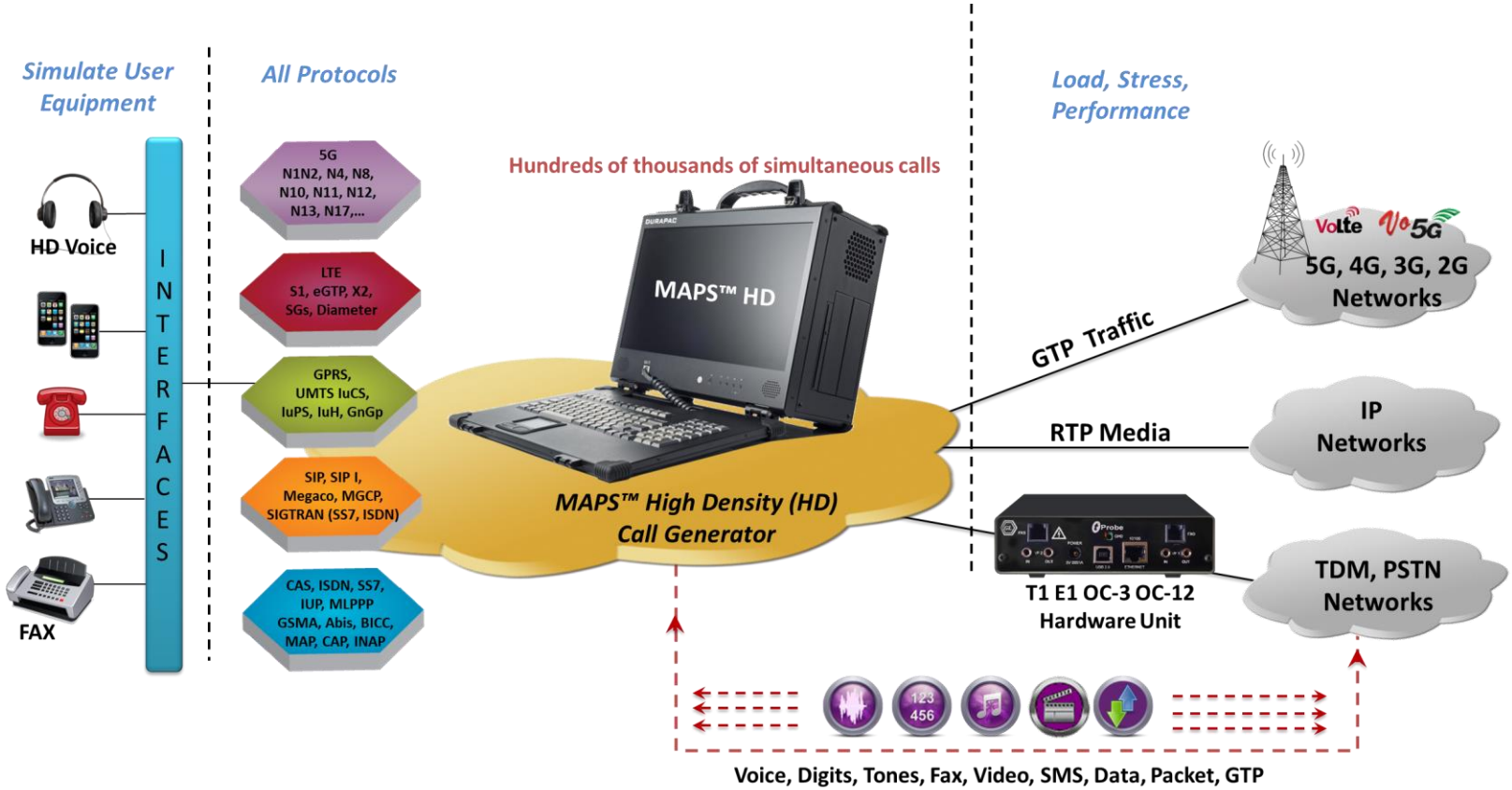




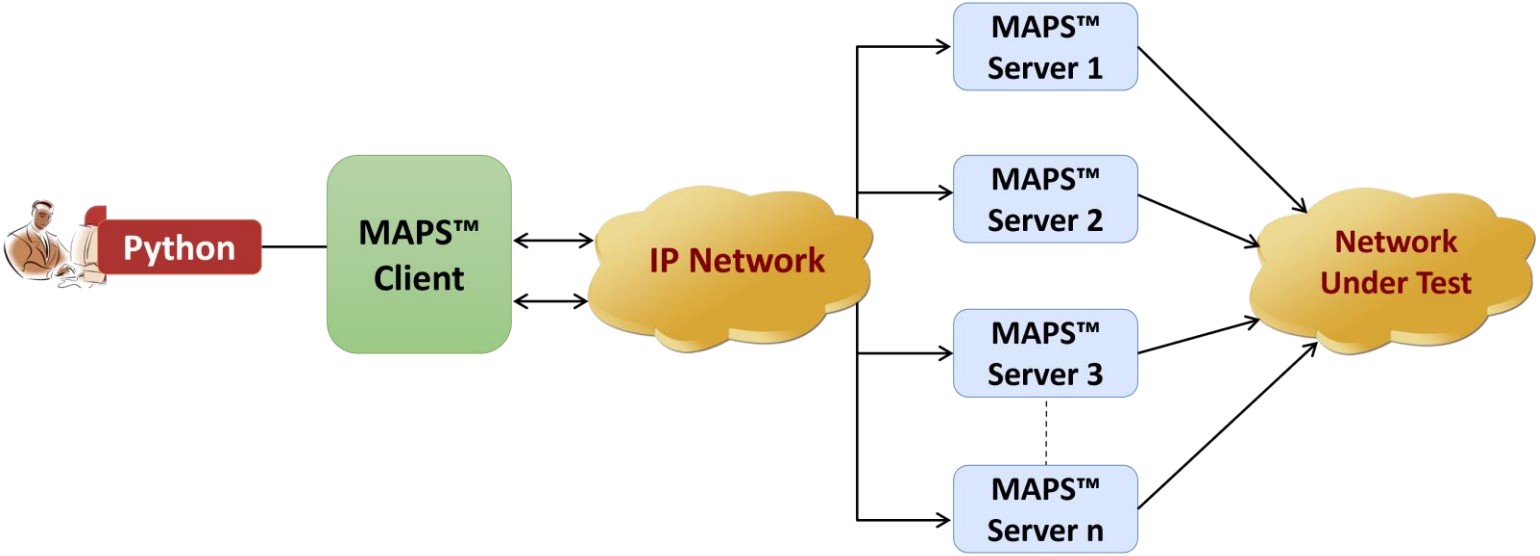
- Stability/Stress and Performance testing using Load Generation
- Different types of Load patterns to distribute load
- User can load multiple patterns for selected script
- User configurable Test Duration, CPS, Maximum and Minimum Call Rate etc.



Traffic Emulation

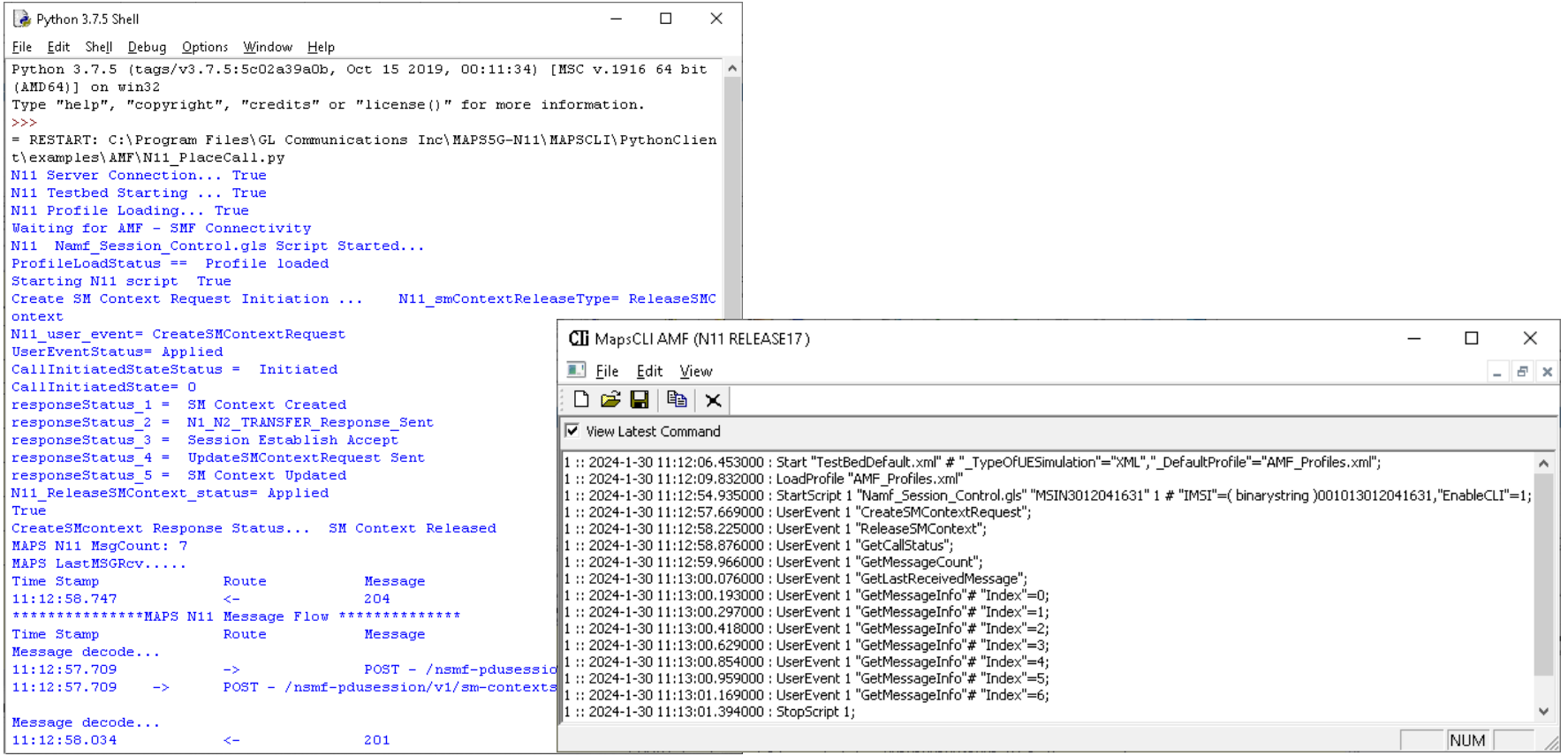


MAPS™ API Architecture



- 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

Python Client and MAPS™ CLI Server



Thank you