

VIAMI

TeraVM

5G Core AMF Wraparound Test

Overview

The VIAMI TeraVM AMF wraparound feature provides a comprehensive validation test suite for the most critical component of 5G Core Network, the Access and Mobility Management Function.

As with the 4G MME, the AMF is the nerve center of the 5G Core network where protocol interoperability and performance issues have the potential to cause network outages. Unlike 4G, the AMF will run in a network with multiple vendors, a variety of virtual environments, with CI/CD (Continuous Integration/Continuous Development) making releases in the network more frequent than ever before. VIAMI leadership in 5G has enabled a first-to-market AMF test that is designed to emulate a multiple-vendor environment with 3GPP conformant and non-conformant messages stressing the resilience of the Core at load. AMF software updates are tested automatically by integrating our tools with CI/CD environments.

The 5GCore Services layer introduces a new challenge for vendors and operators alike. Different vendors bring different functionality and a multitude of topologies. TeraVM emulates these service layers, exposing the REST APIs, thereby emulating the different environments customers require. This answers key questions about how the AMF operates, for example:

- How the AMF operate at scale when working with a third-party NEF to expose network events to operations
- How the AMF performs with the 5G-EIR that has blacklisted a portion of the subscriber population

Individually, these tests are trivial but the intricacy of the protocols, the non-standard nature of the schema (JSON) and the vast array of combinations increases the likelihood of errors and ultimately network outages.

Features

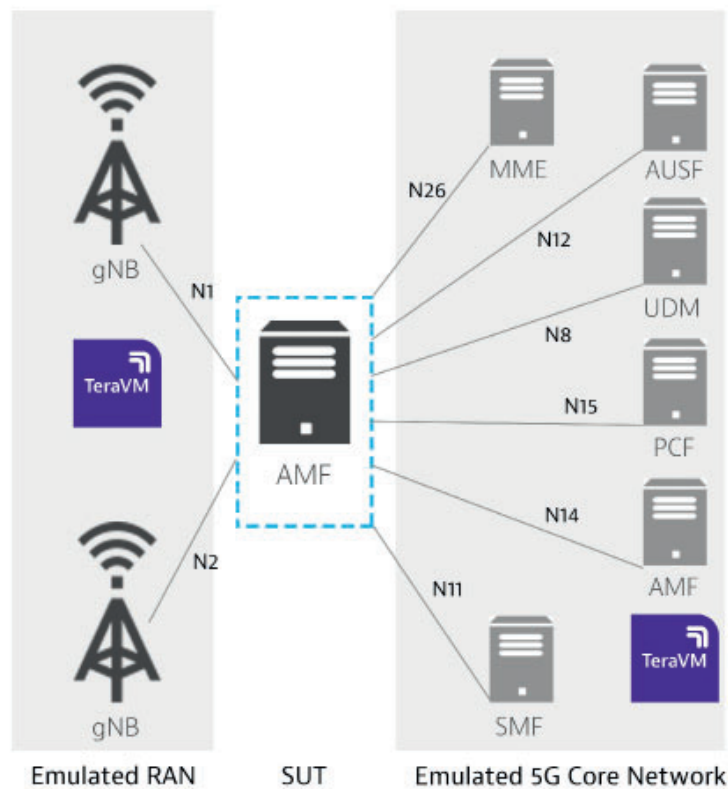
- First to market AMF wraparound test, compliant with Latest 3GPP standards
- Runs in lightweight VM on standard x86 hardware
- CI/CD Automation Integration
- Functional Testing
- Performance, Capacity Testing
- Negative Testing via Error insertion
- Flexible Impairment Generation
- Supports Open source automation tools such as Jenkins
- NFV MANO Ready
- Lab to Field – Same test tools used in the field

AMF Wraparound Testing

One of the biggest time-to-market challenges facing NEMs and mobile operators as they launch 5G services is developing products against constantly changing and maturing 3GPP specs.

Consequently, as AMF functions are developed the major obstacle to developers is readily available 5G compatible network elements to fully test the node. Not only are the other elements of the 5G standalone Core network required (SMF, UPF, PCF, AUSF, UDM) but a compatible 5G Radio Access network is required to test the N1, N2 interfaces.

TeraVM vRAN 5G Emulator emulates 5G gNBs according to 3GPP Rel 15 while TeraVM 5G Core Emulator emulates all functions of the 5G Standalone Core Network allowing the interfaces to the AMF be exposed and the AMF under test be bracket tested.



AMF Test Cases

Functional Test types available with AMF wraparound tester include:

- NG Setup between gNB and AMF
- UE registration
- Identity Procedure
- Authentication procedure
- Security Procedure
- AMF Register
- Scale up number of registered UEs

- PDU Sessions establishment/Release
- AMF Deregister
- Scale up number of UEs with PDU session
- Multiple PDU sessions per UE
- Service Request Procedure
- Paging Procedure

Benefits of TeraVM AMF Wraparound Feature

- Proven – Has tested leading vendor
- Robust Testing – The TeraVM AMF tester allows engineers to insert errors on the N1 and N2 interface to check the robustness of the AMF design
- Portability – 1U Server based system, easy to transport and setup (Lab/Field)
- Lightweight – Deploy and configure in real-time
- Deterministic Performance – Outcome is always consistent
- Time to Market – Frequent updates to most recent 3GPP Specifications

Error Insertion via N1, N2 Interface (Optional)

Use TeraVM AMF Wraparound Test to introduce errors via the N1 and N2 interface and observe how the AMF reacts. The following emulated error cases can be supported:

- Wrong PLMN, wrong TAI
- NG Reset with wrong NGAP ID list
- UE Registration with wrong UE identity, unsupported security capability
- Wrong K value for Authentication procedure
- Configure High RAMP rate to flood AMF with Register requests
- Different DNN names from DNNs configured in SMF
- Incorrect PDU session ID
- Erroneous PDU sessions modification request for UE and Network initiated
- Erroneous Service Request
- Paging Request with non-existing PDU session ID
- HO AMF anchored with wrong target ID

The above flexibility allows the customer to decide which impairments they would like emulated and tested.

N26 Interface Testing (Optional)

Handover between 5G and 4G is carried out by signaling between the AMF and MME over the N26 interface. Mobility scenarios can be tested with the AMF wraparound test using an emulated MME in both directions (hand in and hand out)

Automation and Scripting

The TeraVM AMF wraparound tester comes with build-in management options, shell or a web client and provides APIs to control and operate the tester from external applications.

AMF wraparound shell

- Command Line Interface with readline/auto-completion support
- Fully scriptable

First to Market 3GPP Standards Test Alignment

VIAVI has the largest dedicated 4G and 5G R&D team of any test company focusing on gNB, Core Network test. We work closely with our key customers to ensure that our road map is aligned to market needs and that we deliver test capability first.

Specification and Configuration

The TeraVM AMF wraparound test consists of the following virtual network function and interfaces:

Network Functions

- vRAN Emulator (consisting of 5G gNB, UEs)
- AUSF (Authentication Server Function)
- UDM (User Data Management)
- SMFs (Session Management Function)
- PCF (Policy Control Function)
- AMF (Access and Mobility Functions)
- MME (Mobile Management Entity)

Interfaces

- N1/N2
- N12
- N8
- N11
- N15
- N14
- N26

The implemented features are according to the following 3GPP specifications:

- System Architecture for the 5G System
- Procedures for the 5G System
- Non-Access-Stratum (NAS) protocol for 5GS
- NR and NG-RAN Overall Description
- NG Application Protocol (NGAP)
- Study on New Radio Access Technology; Radio Access Architecture and Interfaces
- NG-RAN Architecture Description
- NG-U, Userplane interface (gNB – UPF)

Order Codes

AMF wraparound test is available with the following product codes:

Part Number	Description	Gbps	Support
48000/319	AMF Wraparound Test N1/2/8/11/12/14	100,000 TPS	SA319
48000/317	Error Insertion N1/N2/-100K TPS	100,000 TPS	SA317
48000/318	AMF Mobility Test N26 (Requires 48000/319)	100,000 TPS	SA318



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