Data Sheet

VIAVI
TeraVM
TeraVM Core Test for 5G SA

Overview

The VIAVI Core Test for 5G SA provides a full wrap-around test of a 5G Standalone Core Network.

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

TVM Core Test gives Core Network engineers a controllable and repeatable test environment that helps implement 3GPP standards rapidly. It also simplifies the development lifecycle of the 5G SA Core Network and the introduction of 5G services to the market.

TVM Core Test provides fully configurable emulation of thousands of base stations, millions of Ue's and user applications to create the most realistic 5G SA RAN environment to stress the core. Full support for 3GPP interfaces such as N1, N2, N3 and N6 enables the tester to accurately emulate UE applications and mobility behavior for inter-5G and inter-RAT scenarios.

TVM Core Test virtualized platform and SBA (service-based architecture) function emulation makes it an ideal solution for validating the 5G SBA virtual mobile core and it's components.
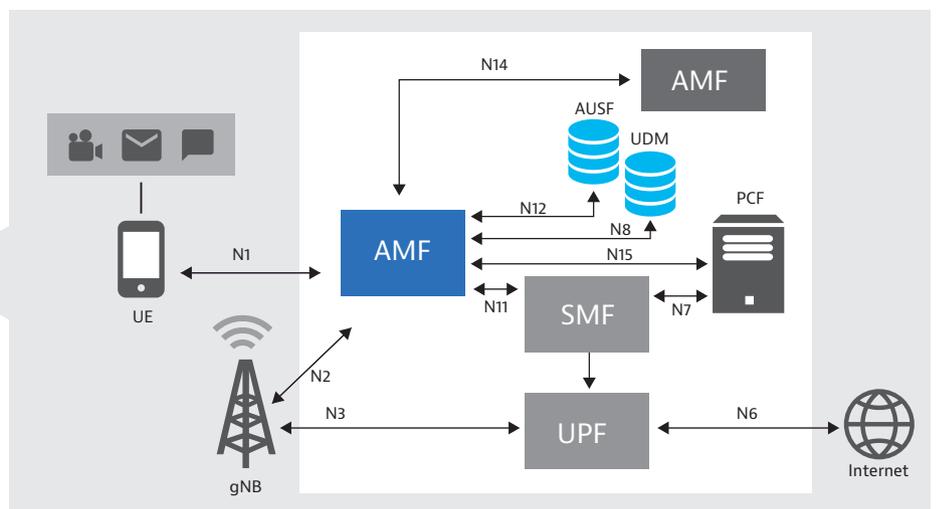
Features

- First to market alignment with 3GPP standards
- Runs in lightweight VM on standard x86 hardware
- CI/CD Automation Integration
- Supports Open Source automation tools such as Jenkins
- Automation and scripting tools
- Negative Testing via Error injection on N1/N2 interface
- Test physical or virtual 5G Core Networks
- One-stop test support

Benefits of Emulated RAN

- Fully virtual – runs on x86 OTS servers

- License sharing across geo-location

- Performs functional and load testing

- Create real life tests – subscriber profiles, mobility scenarios

- Mobility across RAT or inter-RAT

- Multiple use cases – Core Network validation, Core Network Node wraparound testing, SBA testing etc.

- Ease of access. Core engineers have access to an always available RAN test resource thereby boosting test productivity.

- RANtoCore – TVM Core Test can be used in conjunction with the TVM Core emulator (TVM4104), 5G SA individual node wrap around testing and 5G SBA function emulation:

  - TVM AMF wraparound Test (TVM3102),
  - TVM SMF wraparound Test (TVM3104),
  - TVM UPF wraparound test (TVM3105)
  - TVM NRF Emulation (TVM3117)
  - TVM EIR Emulation (TVM3118)

  - TVM NEF Emulation (TVM3121)
  - TVM NSSF Emulation (TVM3122)
  - TVM CHF Emulation (TVM3123)
  - TVM UDM Emulation (TVM3128)
  - TVM AUSF Emulation (TVM3129)

to provide the most comprehensive suite of 5G test capability on the market today.

- 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

Supported Features

Functional Test types available with 5G SA Core Test include:

- NG Setup/Reset between gNB and AMF

- UE Registration w/o initial context

- Identity procedure

- Authentication procedure (5G AKA)

- Security Procedure (null, Snow3G, AES)

- Scale up number of registered UEs

- PDU Sessions establishment/Release

- Multiple PDU sessions per UE

- IPv4 and IPv6 address assignment to UEs

- Service Request Procedure

- Paging Procedure

- Location Reporting procedure

- Xn Based HO and Path Switch procedure

- N2 HO AMF anchored

- N26 based mobility

KPI's to validate performance

An extensive range of counters are available for the TVM Core Test including, but not limited to:

- Active Users

- UE Registrations/Deregistrations

- PDU Session Establishments/Modifications/Releases

- Authentication Request/Result/Fail/Reject

- Security Mode Command/Complete//Reject

- TAU Request/Accept/Complete/Reject

- Service Request/Reject

Error insertion via N1/N2 interface

Use TVM Core Test to introduce errors via the N1/N2 interface and observe how the Core Network reacts. All protocol layers from IP over SCTP to NG-AP and NAS can be emulated. Modification of messages and/or parameters on any protocol layer can be achieved using the TVM Core Test built-in error generation.

The following emulated error states are supported:

- Semantic Error

- Message Duplication

- Syntax Error

- Message Rejection

- Discard Silently

- Superfluous Messages

- Response Delay

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

"Pay as you grow" architecture

TeraVM was designed from the start as a virtualized solution that runs on industry-standard servers. Virtualization gives customers the flexibility to scale TeraVM's performance to suit specific needs.

Starting from an entry level of 10 Gbps capacity suitable for a new project start up or small cell supplier.

Automation and scripting

TVM Core Test comes with build-in management options, shell or a web client and provides APIs to control and operate the tester from external applications.

TVM Core Test shell:

• CLI (Command Line Interface) with readline support

• Fully scriptable

• Jenkins/Robot integration

First to market 3GPP standards test alignment

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

SBA Emulation

TeraVM emulates SBA functions such that the SA Core Network can be more comprehensively tested, by offering functional, interoperable and stress tests of the SBA bus and its interaction with the AMF and SMF Core Elements.
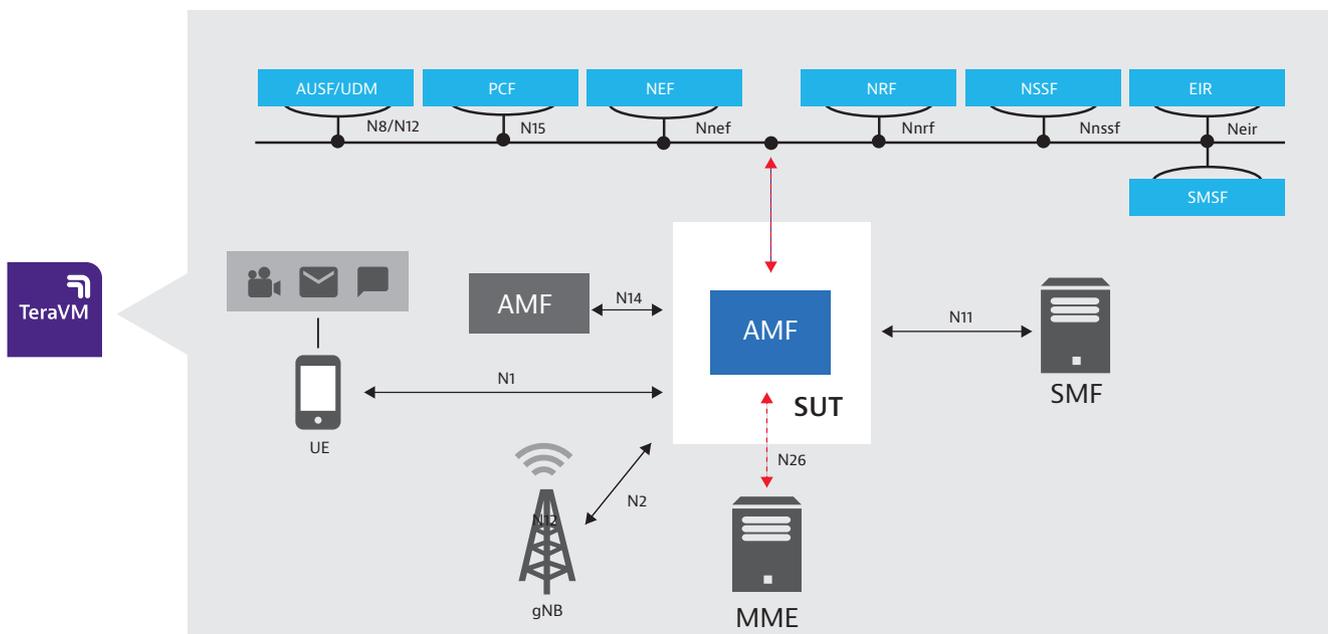
NSSF – Network Slicing Selection Function

Network Slicing is one of the most eagerly anticipated applications of 5G. It will allow different classes of subscribers a different path through the network to match the requirements of the service (e.g. latency, throughput etc). This SLA type service Operators agree with their subscribers renders testing of Network Slicing vitally important.

Network Slicing is an end to end application where many elements including the UE, gNB and Core Network functions are involved in defining the path through the network. While networks are being tested in the lab VIAVI can emulate the NSSF to ensure all other aspects of Network slicing are working as planned.

NSSF redirects the traffic to a specific network slice based on the information supplied by the UE. NSSF performs the following functions:

• Select the Network Slice instance to serve the UE

• Determine the allowed NSSAI

• Determine the AMF set to be used to best serve the UE

NRF – Network Repository Function

The NRF maintains a record of available NF instances and their supported services. It allows other NF instances to subscribe and be notified of registrations from NF instances of a given type. NRF is one of the basic building blocks of the SBA Core Network allowing Network Functions discover other NFs and build associations with them.

NEF – Network Exposure Function

All service-based interfaces are encrypted limiting operator visibility into UE state and key network events. The NEF supports secure exposure of network capability and monitoring events. The monitoring capability tracks UE status and specific network events in a secure fashion for operators.

The NEF function will challenge the Core by placing extra processing requirements by reporting UE events leading to a tradeoff for Operators between visibility of events and a responsive core network.

EIR – Equipment Identity Register Function

EIR manages authentication of mobiles (including IOT devices) on a mobile network by checking the status of Equipment's identity (e.g. to check that it has not been blacklisted). The EIR supports Blacklist, Whitelist, Greylist and Unknown lists of UEs.

CHF – Charging Function

The Charging function supports Charging Data requests and response primitives.

It reports on the volume of data produced by each UE.

UDM – Unified Data Management

The UDM is responsible for generating authentication credentials for UEs, authorizing access based on subscription data, Lawful intercept and subscription management.

AUSF – Authentication Server Function

The AUSF is used to facilitate 5G security processes by making the decision on UE authentication based on inputs (keys, UE data) from other SBA functions.

SEPP – Security Edge Protection Proxy

The SEPP is used to ensure secure interconnect between home and roaming networks when validating roaming subscriber's credentials.

Specification and configuration

TeraVM Core Tester supports the following interfaces:

Interfaces

- N1
- N2
- N3
- N6
- N9
- N11
- N14
- N26

The implemented features are according to the following specifications:
(Subject to change, please contact VIAVI for latest supported specifications)

- 3GPP TS 23.501: System Architecture for the 5G System
- 3GPP TS 23.502: Procedures for the 5G System
- 3GPP TS 24.501: Non-Access-Stratum (NAS) protocol for 5GS
- 3GPP TS 38.300: NR and NG-RAN Overall Description
- 3GPP TS 38.413: NG Application Protocol (NGAP)
- 3GPP TS 38.420: NG-RAN; Xn general aspects and principles
- 3GPP TS 38.423: NG-RAN; Xn application protocol (XnAP)
- 3GPP TR 38.801: Study on New Radio Access Technology; Radio Access Architecture and Interfaces
- 3GPP TR 38.401: NG-RAN Architecture Description
- 3GPP TR 38.410: NG-U, Userplane interface (gNB – UPF)

Order Codes

TVM Core Test is available with the following product codes:

Part Number	Description	Capacity	Support
TVM3000	Dell Server for Core Test	—	HWSUP PPG15
TVM3106	5GC Wraparound Test – N1/N2/N3/N6 10 Gbps	10 Gbps	SA341
TVM3101	vRAN Emulation Error Insertion N1/N2	—	SA317
TVM3103	TVM AMF Mobility Test – N14/26 10k TPS	10k TPS	SA338
TVM3113	4G 5G RAN iRAT Mobility Extension	—	SA349
TVM3117	TVM 5G SBA-NRF Emulator	1 Instance	SA326
TVM3118	TVM 5G SBA-EIR Emulator	1 Instance	SA327
TVM3121	TVM 5G SBA-NEF Emulator	1 Instance	SA330
TVM3122	TVM 5G SBA-NSSF Emulator	1 Instance	SA332
TVM3123	TVM 5G SBA-CHF Emulator	1 Instance	SA333
TVM3128	TVM 5G SBA-UDM Emulator	1 Instance	SA358
TVM3129	TVM 5G SBA-AUSF Emulator	1 Instance	SA359

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