

# VIAVI

## TeraVM

### TeraVM 5G SA Core Emulator

#### Overview

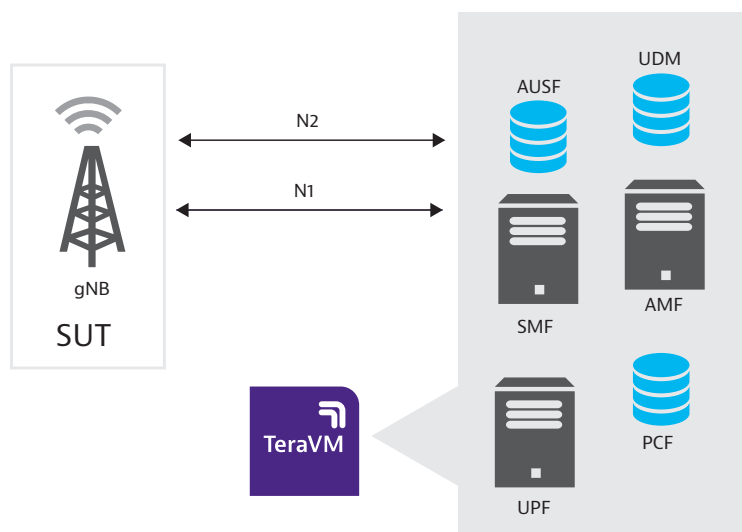
The VIAVI TeraVM Core Emulator adds to the capabilities of industry- standard TM500 test mobile to provide a full wrap-around test of a 5G gNB for 5G standalone (SA) mode.

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

TeraVM Core Emulator can remove the pain of Core Network dependencies by giving RAN engineers a controllable and repeatable test environment that helps implement 3GPP standards rapidly and simplify the development lifecycle of 5G gNBs and the introduction of 5G services to the market.

#### Features

- First to market alignment with 3GPP standards
- Runs in lightweight VM on standard x86 hardware
- Automation and scripting tools
- Negative testing via error generation N2 interface.
- Alignment and compatibility with TM500 test mobile
- One-stop test support for TM500 and TeraVM
- View all Core Network KPIs on one GUI



## Testing throughout the gNB lifecycle

The TM500 is already extensively used throughout the R&D lifecycle for functional, system integration, capacity and regression testing. It is also used by network operators for debugging networks or evaluating network performance prior to launch of new services. Control of the gNB under test can be done by connecting it to a real or test Core Network though increasingly engineers prefer to use a core emulator to implement standards rapidly as it makes it less problematic. A real or test Core Network can prove expensive and requires dedicated engineers to manage it. As a result, RAN engineers prefer an emulated core where they maintain control of their own test resource.

## Benefits of Emulated Core Network

- Time to Market – Alignment and compatibility with TM500 and gNB 3GPP specifications, making it easier to identify and pinpoint issues
- Agile Releases – Releases made bi-weekly with common configuration with TM500
- Remote software upgrades
- Ease of access. RAN engineers have access to an always available Core Network test resource thereby boosting test productivity.
- Controllable: a single shared Core may not be set up in line with a particular set of RAN test requirements.
- The TeraVM 5G Core Emulator can be configured to match specific RAN test needs.
- Repeatable: engineers managing a real/test Core need to make constant changes and updates to keep it up to date. But when debugging a gNB problem or trying to optimize performance, a constant/repeatable environment is required.
- Robust Testing: the TeraVM 5G Core Emulator allows engineers to insert errors on the N2 interface to check the robustness of the gNB design.
- KPI overview – view KPIs from all Core Network functions on 1 GUI screen
- 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

	5G-SA procedures
1	NGAP Setup/Reset Procedure
2	NGAP InitialContextSetup Procedure
3	RAB-Setup Procedure
4	Modify RAB procedure
5	Mobility from NSA coverage to 4G coverage
6	UE Context Release (AMF-initiated)
7	UE Context Release Request (NG-RAN initiated):
8	RRC Inactive Transition Report
9	PDU Session Resource setup
10	PDU Session Resource Release
11	PDU Session Resource Notify
12	Initial UE
13	Downlink NAS Transport
14	Uplink NAS Transport
15	Paging: available but untested
16	ERROR indication
17	UE Radio Capability Info Indication
18	Support of essential NAS procedure
19	Support of essential 5G QoS model
20	Support of essential 5G security function

## Error Generation via N2 interface

Use TeraVM 5G Core Network Emulator to generate errors via the N2 interface and observe how the gNB reacts. All protocol layers from IP over SCTP to NG-AP and NAS can be emulated. Modification of messages and/or parameter on any protocol layer can be done using the TeraVM Core Emulator built-in error generation.

The following emulated error states are supported:

- Message Rejection
- Discard Silently
- Response Delay

The above flexibility allows the customer to decide which impairments they would like emulated and tested. VIAVI works with its customers to regularly update new error insertion scenarios.

## **“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 1 Gbps capacity suitable for a new project start up or small cell supplier.

## **Automation and scripting**

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

Core Emulator shell

- Command Line Interface with readline/autocompletion 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/eNB 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. The TeraVM Core Emulator and TM500 test mobile follow a common 3GPP baseline to ensure that both deliver functionality early and that will work together smoothly.

## **One stop shop for support**

VIAVI TeraVM has a world class support team located close to customers that speaks the same language as them and is exceptionally highly trained. The same support team handle both TM500 and TeraVM products eliminating the frustrations one vendor product blaming the other.

## **Specification and configuration**

The TeraVM 5G Core Emulator consists of the following subcomponents and interfaces:

### **Subcomponents**

- AMFs (Access & Mobility Function)
- SMFs (Session Management Function)
- UPFs (User Plane Function)
- AUSF (Authentication Server Function)
- UDM (User Data Management)
- PCF (Policy Control Function)

### **Interfaces**

- N1/N2
- N3
- N6

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: Userplane interface (gNB – UPF)

## Order Codes

TeraVM 5G Core Emulator is available with the following product codes:

Part Number	Description	Gbps	Support
TVM4000	Dell Server for Core Emulator	—	HWSUP PPG15
TVM4104	5GC Core EM Base	Up to 10 Gbps	SA308
TVM4105	5GC Core EM 2.5 Gbps	2.5 Gbps step for 5G Core Em	SA309
TVM3101	Error Insertion N1/N2-100K TPS	100 Gbps	SA317

For further details please visit: <https://www.viavisolutions.com/en-us/products/teravm-5g-core-emulator>

Also available as part of the TeraVM family of products is the 5G NSA and 4G core emulator package:

<https://www.viavisolutions.com/en-us/solutions/wireless/rantocore#tabs-network-application-traffic-emulation>



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