VIAVI
TeraVM
TeraVM 5G SA Core Test for TVM-vRAN
UPF Wraparound Test

VIAVI

Overview

The VIAVI TeraVM UPF wraparound feature provides a comprehensive validation test suite for the User Plane Function (UPF).

The UPF is the interconnect point between the UE and the Data Network responsible for encapsulating and decapsulating GPRS Tunneling Protocol for the user plane.

UPF represents the Data plane of a CUPS (control and user plane separation) strategy allowing packet processing and traffic aggregation to be performed closer to the network edge.

UPF is the pressure point for user plane traffic and requires robust testing in a variety of traffic application profiles and handover mobility scenarios.

The UPF is completely controlled from the SMF using the N4 interface. The SMF uses the Packet Flow Control Protocol (PFCP) to define how the packets are identified, forwarded, processed, marked and reported by the UPF.
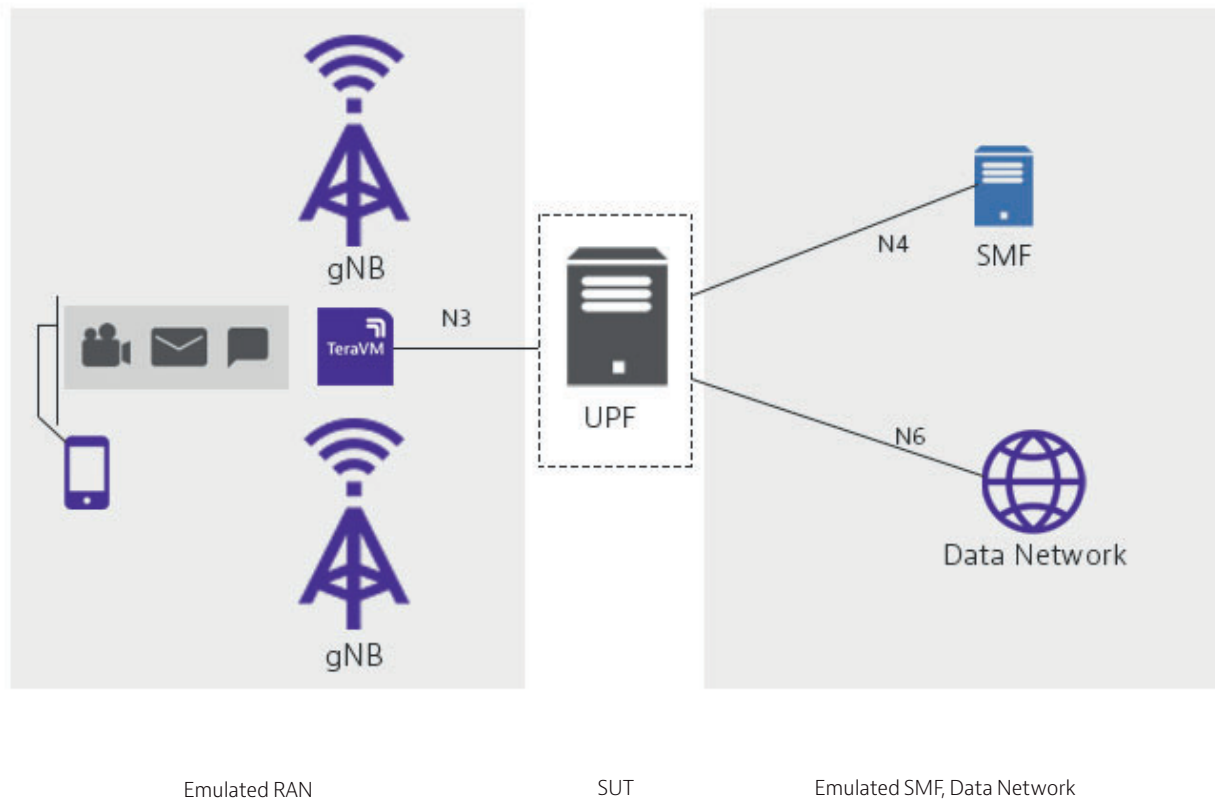
UPF Wraparound Testing

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 UPF functions are developed, the major obstacle to developers is readily available 5G compatible network elements to fully test the node. Not only are other elements of the 5G standalone Core network required (SMF) but a compatible 5G Radio Access network is required to test the N3 interfaces and a Data Network/Internet Emulator to test the N6 interface.

Features

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

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

| Emulated RAN | SUT | Emulated SMF, Data Network |

UPF Test Cases

Functional Test types available with UPF wraparound tester include:

• PFCP association setup/update/release procedure

• PDU session establishment procedure

• PDU session modification procedure

• PDU session release procedure

• Multiple PDU session

• IPv4 and IPv6 address assignment to UEs

• N4 report

• N4 session information

• PFD management procedure

• Heart beat procedure

• Load Control Information (LCI)

• Overload Control Information (OCI)

KPI's to Validate UPF

An extensive range of PFP KPIs and GTP-U KPIs are available for the 5G SA UPF tester including, but not limited to:

PFCP KPIs

- Active Association count
- Heartbeat count
- Create Session count
- Modify Session count
- Release Session count

- PFD Management count
- LCI
- LDI
- N4 Report
- N4 Session Information

GTP-U KPIs

- Bytes
- Tpdu
- Echo req
- Echo res
- Tpdu rate

- Rate (kbit/s)
- Rate (Mbit/s)
- Max Rate (kbit/s)
- Max rate (Mbit/s)
- Errorind

Benefits of TeraVM UPF Wraparound Feature

- Proven – Has tested leading vendor

- 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

Automation and Scripting

The TeraVM UPF 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.

UPF- wraparound shell:

- CLI (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, Core Network test. We work closely with our key customers to ensure that our roadmap is aligned to market needs and that we deliver test capability first.

Specification and Configuration

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

Network Functions

- vRAN Emulator (consisting of 5G gNB, UEs)

- SMF (Session Management Function)

Interfaces

- N3

- N4

- N6

The implemented features are according to the following 3GPP specifications. Subject to change (please contact VIAVI for the latest supported 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

UPF wraparound test is available with the following product codes:

Part Number	Description	Gbps	Support
48000/321	UPF Wraparound Test N3/N4/N6	100 Gbps	SA321
48000/317	Error Insertion N1/N2	100 Gbps	SA317