

VIAVI TeraVM

Testing LTE/4G Evolved Packet Cores

TeraVM™ is used to emulate and analyze unique control plane and bearer sessions with mixed traffic running over bearers. TeraVM’s scalability enables efficient load testing of the EPC providing insight into utilization and optimization.

LTE/4G technologies are delivering a greater convergence of voice, video and data to subscribers on the move. Convergence coupled with the subscriber’s expectation for always on content, means greater speeds and throughput on a per handset basis. The challenge for service providers is how to scale the Evolved Packet Core (EPC) in order to achieve maximum equipment utilization and to optimize configurations so as to deliver the millions of unique subscriber flows with zero quality issues.

TeraVM is used for Evolved Packet Core (EPC) testing as it can efficiently and reliably scale to the level of load necessary to determine the capacity limitations of the EPC. A key reason to why TeraVM is chosen by many service providers is the ability to emulate stateful subscriber traffic on a granular basis; configure per UE, unique IMSI with multiple application traffic flow types. A significant advantage of stateful per UE emulation is the ability to isolate quickly any impairments based on EPC policy settings.

Features

- Emulate scaled subscriber traffic up to 1 Terabit per second (Tbps)
- Support for GTPv1-U and GTPv2-C
- Stateful UE emulation with configuration for unique IMSI, Bearer ID, TEID and gateway IP addresses
- Per emulated UE performance measurements, with unique performance metrics per application type IPv4 and/or IPv6 enabled traffic flows
- Multiple application types per emulated UE and GTP encapsulation
- Emulate multimedia sessions
- Support VoIP calling with AMR codecs

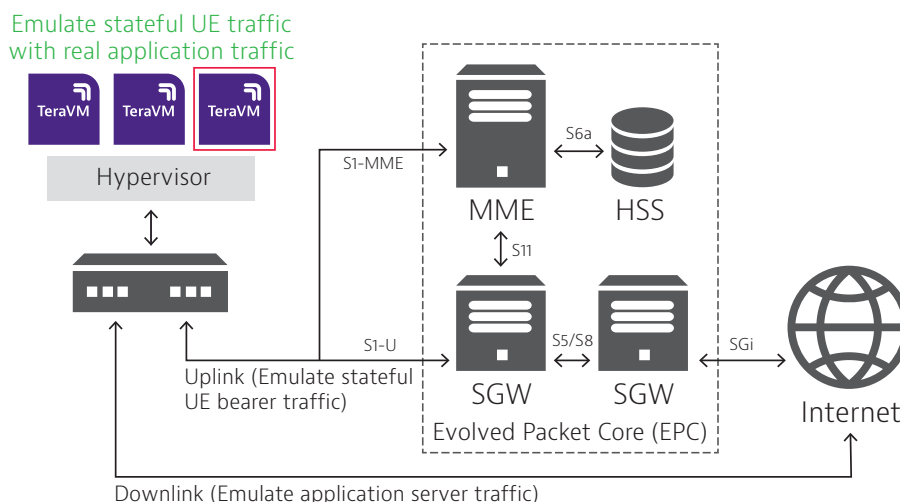


Figure 1: TeraVM testing EPC

Performance testing for the Evolved Packet Core (EPC)

TeraVM is used in two distinct ways to test the performance of the LTE EPC. The first is to generate the application traffic being encapsulated over existing GTP tunnels, in this mode TeraVM provides quality of experience analysis on a per application flow basis. The per flow granularity achieved by TeraVM is necessary to determine the impact any change or optimization of the settings of the EPC has on individual subscribers and application traffic.

A second important use of TeraVM in LTE EPC testing is the ability to load the EPC with a scaled volume of service requests, effectively emulating many eNodeBs worth of traffic. TeraVM is used to emulate load conditions on both the control plane and user plane.

TeraVM enables analysis of utilization performance through load testing on all the critical paths in the EPC, which include:

- eNodeB
- MME
- S11(to S/P-GW)
- S11(to S/P-GW)
- S1-U
- S11 (to S/P-GW)
- S5/S8 (to P-GW)

Functionality	
SGW/PDN GW	Emulate millions of network connection requests
	Scale test GTP tunnel capacity with millions of flows and IP packets
	Analyze heavy bandwidth usage flow profiles (users using multiple applications)
	Performance test latency with low latency dependent applications of voice and video
Application traffic (QoE testing)	Emulate multiple packet based application flows per GTP tunnel (voice, video and data)
	Test with the latest AMR codec and "OTT" multimedia services (RCS - messaging and video calling)
Device and Usage profiling	Emulate a profile of mixed traffic, emulate multiple application flows per endpoint
	Test with the latest traffic signatures, use packet replay to add the latest device and application traffic types

Comprehensive Test Capability

TeraVM provides the industry's most comprehensive test suite with over 3,000 unique metrics; ranging from application performance to protocol tunneling down to simple port enabled testing with throughput and latency metrics. A user defined threshold can be set on any of these metrics to easily pinpoint and isolate problem flows.

TeraVM provides detailed analysis on each and every emulated flow, the following highlighting some of those key metrics:

- Packets per second
- Dropped/Out of Sequence Packets
- Retransmitted Packets
- Jitter
- Latency
- TCP Connection Rate
- Application Goodput
- Unique Application timings
- Video/ Audio quality score

Features	
General	Real-time isolation of problem flows
Data	TCP / UDP, Teraflow, Ookla speed test
	HTTP (headers, substitution, attachments)
	SMTP / POP3 (incl. file attachments)
	FTP (Passive/Active), P2P applications, DNS
Address	MAC, VxLAN
	DHCP, PPPoE (IPv4 & IPv6)
	Dual Stack (6RD, DS Lite)
Ethernet switch	VLAN and double VLAN Tagging (Q-Q)
	ACL, 802.1p, DSCP
Replay	Replay large PCAP files - TCP, UDP and raw data playback
	Amplify and dynamically substitute data into PCAP files
Video	Multicast: IGMP v1/v2/v3 & MLD v1/v2
	Automatic Multicast Tunelling (AMT)
	Video on Demand (RTSP)
	Adaptive Bit Rate Video (HLS, HDS, Smooth)
	Video conferencing
Secure VPN	SSL/TLS/DTLS, IPsec (IKEv1/v2)
	Cisco AnyConnect SSL VPN Client, Cisco AnyConnect IPsec VPN Client
	Juniper Pulse, Juniper Network Connect
	802.1x EAP-MD5
Security attack mitigation	Spam / Viruses / DDoS
Voice	VoIP: SIP & RTP (secure & unsecure), H.323
	Dual Hosted UACs, SIP Trunking
	Voice & Video quality metric (MOS)
LTE/4G	GTP tunnel support
SLA	TWAMP
Automation	CLI, Perl, TCL, XML, Java API