TeraVM™ - Testing LTE/4G Evolved Packet Cores

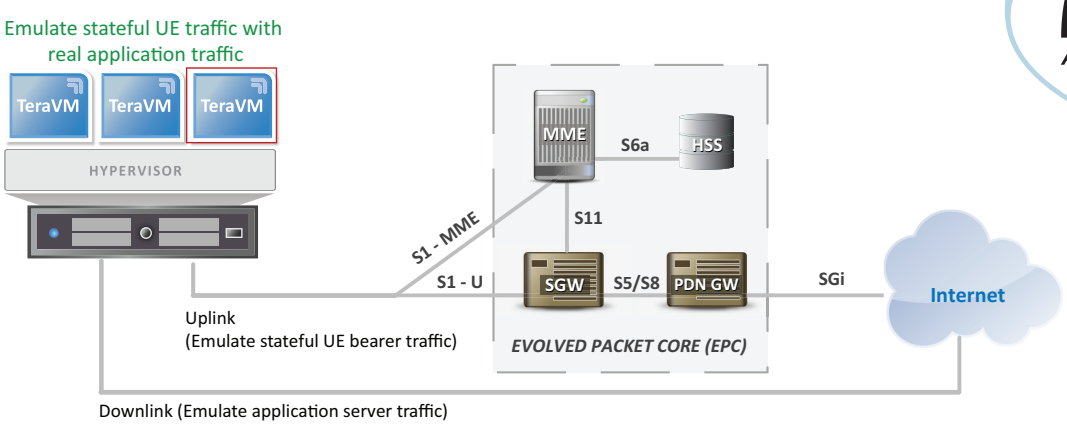

Figure 1: TeraVM testing EPC

Overview

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.

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

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.

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

FUNCTIONALITY

Use Case	Description
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
- 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 (IKE v1/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

CHINA Beijing
Tel: [+86] (10) 6539 1166
Fax: [+86] (10) 6539 1778

CHINA Shanghai
Tel: [+86] 21 2028 3588
Fax: [+86] 21 2028 3558

CHINA Shenzhen
Tel: [+86] (755) 3301 9358
Fax: [+86] (755) 3301 9356

FINLAND
Tel: [+358] (9) 2709 5541
Fax: [+358] (9) 804 2441

FRANCE
Tel: [+33] 1 60 79 96 00
Fax: [+33] 1 60 77 69 22

GERMANY
Tel: [+49] 89 99641 0
Fax: [+49] 89 99641 160

INDIA
Tel: [+91] 80 [4] 115 4501
Fax: [+91] 80 [4] 115 4502

IRELAND
Tel: [+353] 1 236 7002

JAPAN
Tel: [+81] (3) 3500 5591
Fax: [+81] (3) 3500 5592

KOREA
Tel: [+82] (2) 3424 2719
Fax: [+82] (2) 3424 8620

SCANDINAVIA
Tel: [+45] 9614 0045
Fax: [+45] 9614 0047

SINGAPORE
Tel: [+65] 6873 0991
Fax: [+65] 6873 0992

TAIWAN
Tel: [+886] 3 5500 338
Fax: [+886] 3 5502 065

UK Stevenage
Tel: [+44] (0) 1438 742200
Fax: [+44] (0) 1438 727601
Freephone: 0800 282388

USA
Tel: [+1] (408) 385 7630

www.aeroflex.com

info-test@aeroflex.com

AEROFLEX
A passion for performance.

Our passion for performance is defined by three attributes represented by the icons pictured above: solution-minded, performance-driven and customer-focused.

Part No. 46900/044, Issue 1, 6/14