VIAVI Solutions

Case Study

TeraVM

Testing Cisco ASR 5000

The Cisco ASR 5000 Series addresses the high performance requirements that the next generation of mobile Internet brings. The ASR contains real-time integrated, session-state intelligence enabling it to effectively manage IP based flows on a per session basis.

The challenge Cisco faced was how to efficiently test the stateful reliability of the ASR's enhanced charging service function, which is part of the packet data network gateway (PGW), at a highly scaled level of network traffic load.

Technical Challenge

The ASR's enhanced charging service (ECS) function is designed to identify and manage traffic on a per session basis. The ECS function helps develop tiered and detailed billing schemes based on how mobile subscribers use their devices. The challenge Cisco faced was how to efficiently and reliably test the ECS function with an array of traffic types.

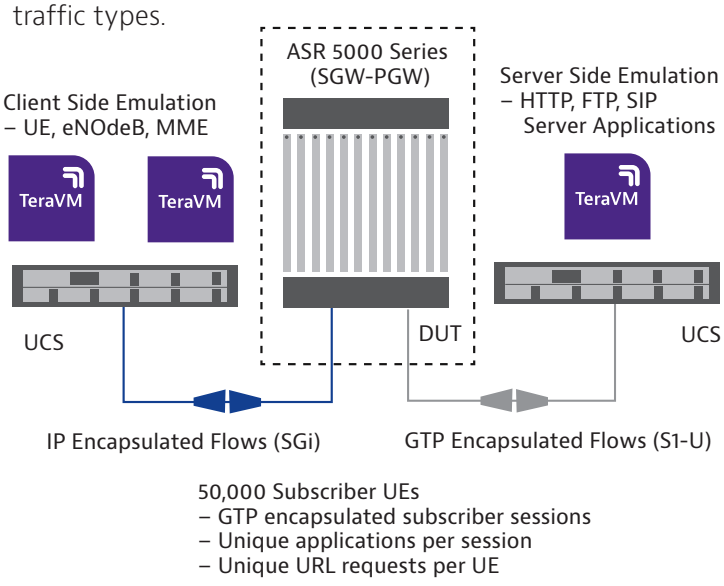

Figure 1: Test Configuration

Overview

- Benchmark the performance of the enhanced charging service function of the Cisco ASR 5000 Series.

Key Challenges

- Emulate 50,000 subscriber UEs
- Statefully emulate GTP encapsulated traffic flows:
  - Non-encrypted (FTP, HTTP, VoIP, OTT Video)
  - Encrypted flows (HTTPS)
- Emulate a range of packet based application servers

Why TeraVM?

- Emulate GTP encapsulated flows at scale
- Stateful application flows including HTTPS in GTP tunnel encapsulations
- Statefully emulates multiple server side applications
- A highly scalable virtualized IP test solution
- Runs on Cisco UCS hardware

Emulated Traffic

- GTP v1, v2
- HTTP, FTP, and VoIP (client and server)

The ECS is part of the LTE PGW which adds an additional complexity to the challenge of testing; requiring that the IP application flows be delivered in GTP encapsulated tunnels. As the ECS is designed to inspect each and every flow, a key challenge of proving reliability is to emulate real subscriber application flows on a granular basis at the scale necessary to effectively exercise the flow inspection algorithms.

Cisco applied the following selection criteria when choosing the test solution to benchmark the ASR 5000 enhanced charging service function of the PGW:

- Scalable virtualized test solution
- Emulate a highly scaled number of unique subscriber UEs
- Statefully emulate on a per GTP per flow basis, encapsulated subscriber sessions of:
  - Non-encrypted applications – HTTP, FTP, VoIP, OTT Video
  - Encrypted applications – HTTPS (TLS)
- Emulate and dynamically control multiple server side application types
- Ability to performance test the ECS capacity limitations and to determine the accuracy of the subscriber flow inspection algorithms using a range of application types

Test Bed Overview

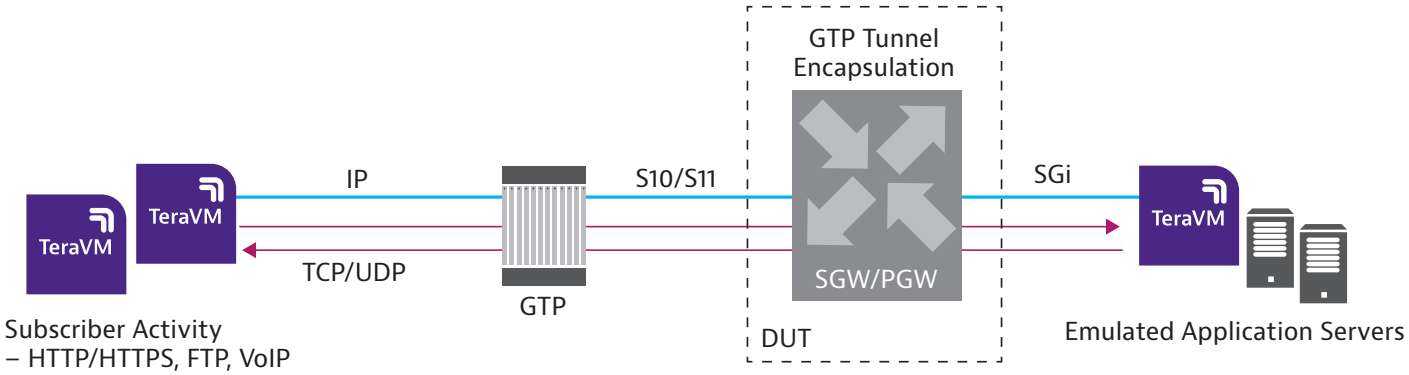

Figure 2: TeraVM is used to test the ASR's enhanced charging service (ECS) function

Functionality

- UE – enodeB: TeraVM is used to emulate the subscriber flows at scale, each UE having a unique IMSI identification. TeraVM's per flow architecture enables users to apply unique application flows per UE.
- MME: TeraVM is used to emulate the MME enabling the EPC to manage the user plane traffic. The GTP encapsulated flows on the user plane contain fully stateful application traffic.
- Application Servers: TeraVM is used to emulate multiple application servers such as web (HTTP & HTTPS), email, voice and video. The emulated UE and application flows are fully stateful and can connect to emulated and/or third party application servers.
- Per flow QoE metrics: TeraVM delivers performance analysis in real time on a per emulated subscriber basis, this is used to quickly identify if the ASR ECS is mishandling any of the flows.

Performance Results

- Cisco uses TeraVM's per flow performance measurements to determine the reliability and accuracy of the ECS on a per subscriber basis. Using
- TeraVM Cisco can define a range of measurements in both the uplink and downlink channels. An example performance test is to define throughput with the enhanced charging service function operational for both encrypted and un-encrypted flows.
- Per Subscriber Downlink Throughput (un-encrypted): 90Mbps
- Per Subscriber Downlink Throughput (encrypted): 70Mbps

Conclusion

Cisco uses TeraVM to test the reliability of the enhanced charging service function of the ASR 5000 Series. TeraVM enables Cisco to emulate flows on a granular basis; on a per unique subscriber UE and application flow basis. This is critical to prove that the ASR is identifying each subscriber flow correctly. In addition, TeraVM enables the stateful emulation of multiple application types. Cisco conducted their tests using Cisco UCS hardware and without the need for any proprietary test hardware. TeraVM as a virtualized solution ensures Cisco can continue to meet their test needs for the ASR 5000 Series well into the future.

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