

Case Study

# Testing the Performance and Functionality of a Cloud Deployment with OpenStack

OpenStack is a cloud operating system from which TeraVM can be provisioned and managed. TeraVM generates application traffic which is used to test the performance and functionality of a cloud deployment.

## Why TeraVM?

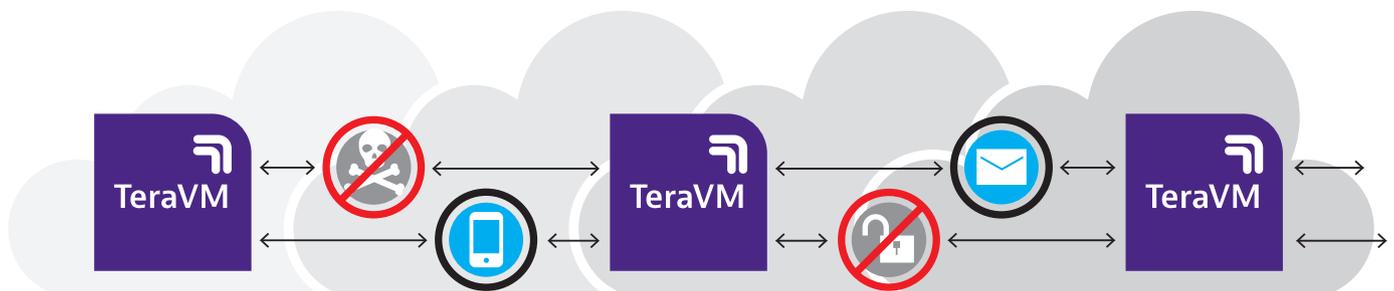
TeraVM is a real world IP traffic emulation solution used to validate the performance of network functions and application services. TeraVM provides comprehensive measurement and performance analysis on each and every application flow with the ability to easily pinpoint and isolate problem flows.

OpenStack is an open source cloud operating system, which provides the ability to build public or private clouds at scale. OpenStack enables the provisioning and management of the core cloud elements of compute, network and storage. As a virtualized IP test solution, TeraVM can be instantiated in OpenStack, providing a comprehensive suite of applications for performance testing OpenStack deployments consisting of compute instances and network configurations.

Once instantiated in OpenStack, TeraVM is used to emulate secure and/or unsecure application traffic flows. TeraVM's per flow performance measurements are used

## Features

- TeraVM is available as an image file (RAW) for import and use in OpenStack
- Provision and manage TeraVM using the Horizon dashboard or the Nova command line interface-
- Repeatable testing with a range of application traffic flows (https, email, voice, video, etc)
- Per flow performance analysis with problem flow isolation in real-time
- IPv4 and/or IPv6 enabled traffic flows
- Support for VXLAN



to assess the performance and functionality of the application traffic within the cloud and also the performance of the application traffic traversing a hybrid (public/private cloud) deployment. In addition, TeraVM enables testing of cloud scaling technologies such as Virtual eXtensible LAN (VXLAN). TeraVM is used to emulate VXLAN termination endpoints (VTEP) encapsulating secure and/or unsecure application flows. TeraVM's dedicated performance analysis is used to determine the reliability of the tunneling technology.

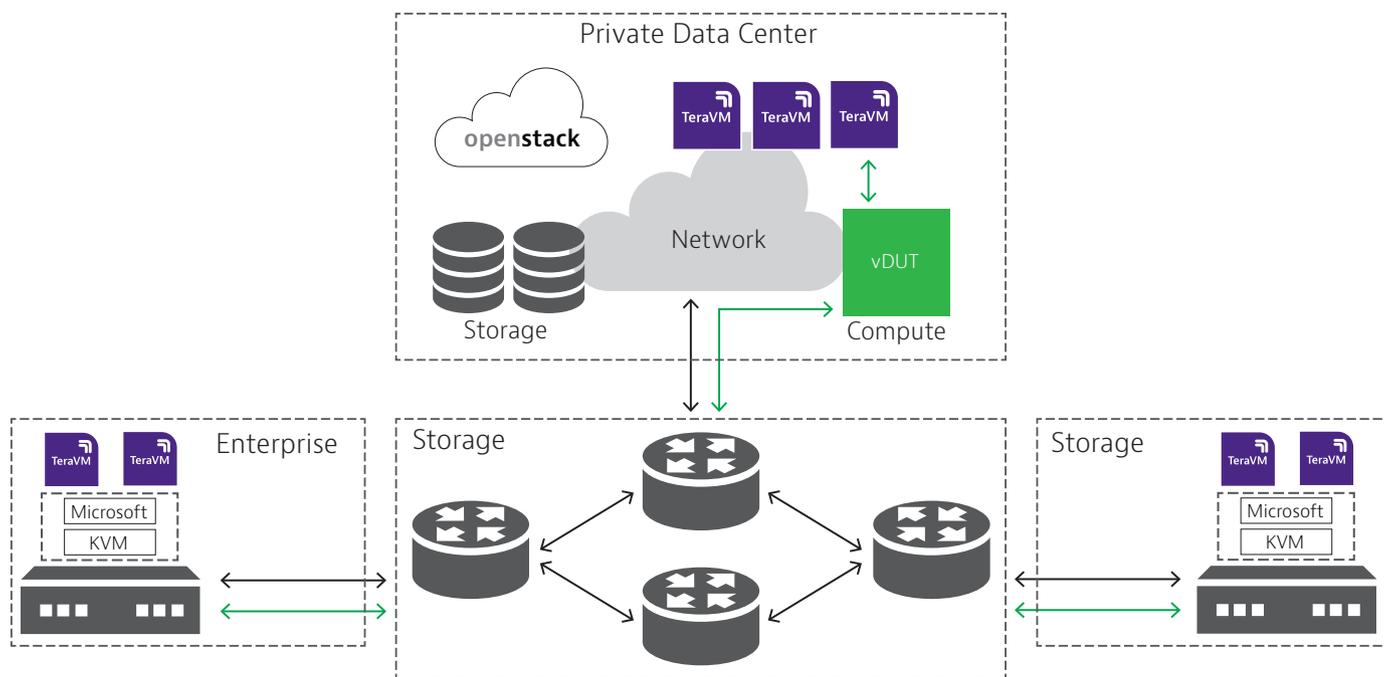


Figure 1: TeraVM used to test application performance of OpenStack cloud

## Testing OpenStack VXLAN performance with stateful flows

OpenStack's network service module Neutron supports the use of VXLAN. The first technical decision associated with using VXLAN is to decide where the VXLAN Tunnel Endpoint (VTEP) resides, for example in the virtual switch or in a physical switch. The location decision must ensure that a high level of quality is maintained and that the stateful application passing through the encapsulation path is not impacted in any way.

As a stateful traffic emulator, TeraVM removes the guess work associated with deciding where the VXLAN VTEP is to be located. By instantiating TeraVM in OpenStack users can quickly determine if the vSwitch is the right place to associate the VTEP. In addition, TeraVM also enables testing at scale with many VTEPs, in this instance the decision could be to associate the VTEP on a physical switch. With TeraVM:

- Emulate a scaled number of VXLAN VTEP/VNI in the OpenStack cloud
- Performance test VXLAN tunnels with secure and unsecure application flows
- Test with highly scaled bandwidth throughput

## Functionality

Use Case	Description
<b>Cloud Scalability</b>	Performance test OpenStack cloud robustness; emulate thousands of virtual machines and stateful application flows
	Determine the capacity of OpenStack networking services; emulate scaled throughput of millions of flows and IP packets
	Performance test dedicated compute instances such as vload Balancer, vDPI, vSwitch, etc
<b>Cloud Application Performance</b>	Emulate and measure performance of secure and unsecure application flows, for example, HTTP vs HTTPS) on/off the cloud
	Performance test cloud interconnects using tunneling ( VXLAN) with real application flows
	Assess SLAs of cloud only or hybrid deployments
<b>Cloud Security</b>	Emulate profiles of mixed tenant traffic; test and ensure only dedicated user traffic arriving to each tenant
	Performance test security configurations; access lists, illegal file transfers, flow behavior models, etc

## 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

## Applications Supported

<b>General</b>	Real-time isolation of problem flows
<b>Data</b>	TCP / UDP
	HTTP (headers, substitution, attachments)
	SMTP / POP3 (incl. file attachments)
	FTP (Passive/Active), P2P applications, DNS
<b>Address</b>	MAC, VxLAN
	DHCP, PPPoE (IPv4 & IPv6)
	Dual Stack (6RD, DS Lite)
<b>Ethernet Switch</b>	VLAN and Double VLAN Tagging (Q-Q)
	ACL, 802.1p, DSCP
<b>Replay</b>	Replay large PCAP files - TCP, UDP and raw data playback
	Amplify and dynamically substitute data into PCAP files
<b>Video</b>	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
<b>Secure VPN</b>	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
<b>Security Attack Mitigation</b>	Spam / Viruses / DDOS
<b>Voice</b>	VoIP: SIP & RTP (secure & unsecure), H.323
	Dual Hosted UACs, SIP Trunking
	Voice & Video quality metric (MOS)
<b>LTE/4G</b>	GTP tunnel support
<b>SLA</b>	TWAMP
<b>Automation</b>	CLI, Perl, TCL, XML, Java API