Case Study

TeraVM

Cisco Nexus 1000V – SAVBU uses TeraVM for performance and functional testing

Cisco was faced with the difficult challenge of how to test the performance and functionality of thousands of virtual interfaces on their highly scalable Nexus 1000V virtual switch. Furthermore the virtual interfaces (vNICs) or ports were only accessible from a virtual machine, which implied the test solution had to be virtualized as well. Also the solution had to be reliable with repeatable test configurations that enabled a consistent set of measurements throughout the software release life cycle. Prior to TeraVM, Cisco was using Iperf but it was inadequate because it lacked detailed per flow metrics/reporting and was difficult to deploy at scale.

The Nexus 1000V has two major components: the Virtual Ethernet Module (VEM), which runs inside a hypervisor, and the external Virtual Supervisor Module (VSM), which manages the VEMs (see figure 1).

Configuration is performed through the VSM and is automatically propagated to all the VEMs. The VSM can manage up to 64 VEMs each running on a unique host.
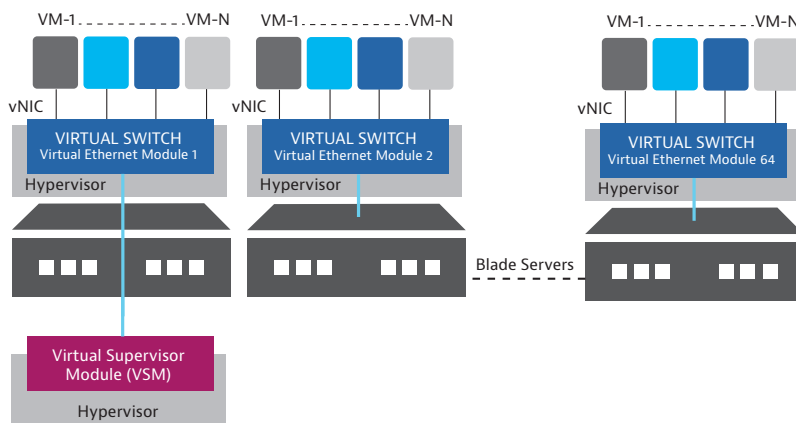
Overview
• Performance verification of the Nexus 1000V virtual switch (vSwitch)

Key Challenges
• Finding a replacement for Iperf
• Scale and distribute a virtual test solution to 64 unique hosts
• Test performance and functionality of 2,000 ports or vNICs
• Isolate virtual interfaces (vNICs) experiencing poor performance

Why TeraVM?
• Easily distributed to each of the 64 hosts in the Nexus 1000V deployment
• A single solution for concurrent testing of thousands of vNICs (ports)
• Supports all major hypervisors: VMware ESXi, Microsoft Hyper-V, Citrix XenServer and KVM

Emulated Traffic
• VLAN, ACL, 802.1p
• TCP/UDP
• Multicast

Figure 1: Nexus 1000v architecture

Technical Challenge

After evaluating all available test solutions on the market, Cisco recognized that a physical test chassis was not an option because all interfaces are virtual and only active when a VM is deployed. The major selection criteria was as follows:

- A virtualized test solution which could span across 64 or more unique hosts

- Ability to test on all major hypervisors because the VEM can be deployed on a variety of hypervisor types

- Concurrent and scalable testing of 2,000 vNICs or ports today. Scaling to 32,000 or more in the future.

- Repeatable test scenarios to reliably test each new release of the vSwitch software.

- A solution that can be quickly and reliably orchestrated across a large number of hosts.

- A feature rich solution that can test switch functionality such as VLANs, access control lists (ACL), and QoS settings as well as TCP, UDP, and multicast traffic. In addition, the solution had to offer layer L4-L7 application support for future test needs.

Test Requirements

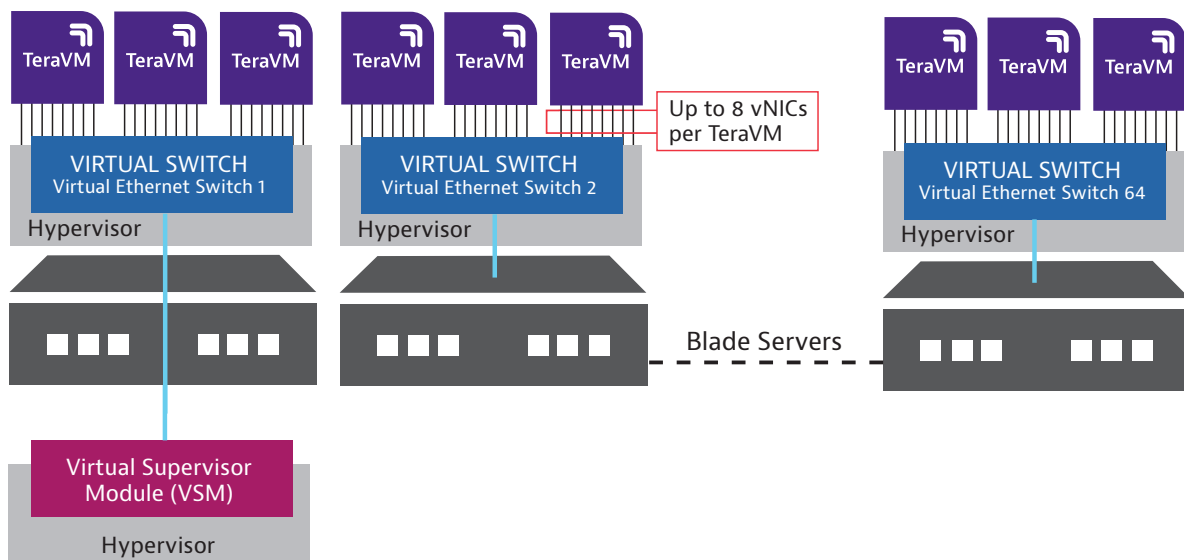Why was TeraVM chosen for testing the Nexus 1000V?

Figure 2: Nexus 1000V architecture with TeraVM emulating

Vendor Requirement	Why TeraVM?
Virtualized test solution (Physical proprietary chassis was not an option)	• Packaged as a virtual appliance with up to 8 virtual interfaces per TeraVM • Deploy on any industry-standard hardware (e.g. Cisco UCS) • Centralized control point to define, manage and execute test cases • Comprehensive test suite with over 3,000 unique metrics
Test on all major hypervisors (VEMs are available on different hypervisor types)	• Supports all major hypervisors: VMware ESXi, Microsoft Hyper-V, Citrix XenServer and KVM • Scales to hundreds of hosts, well beyond the current 64 host requirement
Concurrent VEM testing (Prove each and every virtual interface is active)	• Stateful endpoint and application flow emulation • Easily test integrity of each and every virtual interface • Pre-configured throughput and latency tests • Per flow analysis at a virtual interface, endpoint and application level
Repeatable test scenarios (Easily perform regression testing)	• Reliable and repeatable test scenarios • Easily access historical test cases for regression testing • Easily pinpoint and isolate problem interfaces

Conclusion

Cisco had a requirement to test performance and functionality on 2,000 virtual interfaces (vNICs) or ports on their highly scalable Nexus 1000V virtual switch. Cisco had been using Iperf but realized that it would not be sufficient for the required scale testing. With TeraVM, Cisco was able to reliably test virtual interfaces (vNICs) across different hosts using a mix of emulated traffic including TCP/UDP and multicast as well as common Ethernet switch functionality such as VLAN tags, access control lists and QoS settings. TeraVM enabled testing across different hypervisor types (e.g. ESXi, Hyper-V) and proved indispensable for regression testing as new features and functionality were introduced in the vSwitch.