Accelerate Nuage Networks Virtualized Services Platform (VSP) with the Intel® Ethernet Network Adapter XXV710

Solution Overview

- Agile, elastic and secure SDN deployment with unconstrained, deterministic cloud network performance (10, 25, and 40 Gb/s throughput to the server host)
- Enhanced cloud infrastructure efficiency and higher application workload density resulting from reduced CPU overhead associated with overlay virtual network processing.
- Integrated and tested solution ready for Software Defined Data Center (SDDC), Network Function Virtualization (NFV) and cloud deployments

Nuage Networks and Intel jointly provide highly efficient Software Defined Networking (SDN) solution that combines the agility, elasticity and automation of Nuage Networks Virtualized Service Platform (VSP) and the performance, reliability and efficiency of Intel interconnect, so you can deploy your cloud infrastructure with confidence.

Software-Defined Networking (SDN) is a revolutionary approach to designing, building and operating networks that delivers business agility in addition to lowering capital and operational costs through network abstraction, virtualization and orchestration.

Nuage Networks VSP is a non-disruptive overlay SDN platform that realizes secure network virtualization without requiring forklift hardware network upgrade. Virtual Routing and Switching (VRS) is the distributed forwarding module within VSP that serves as a virtual endpoint for network services. Through the VRS, changes in the compute environment are immediately detected, triggering instantaneous policy-based responses in network connectivity to ensure application performance.
VXLAN (Virtual Extensible LAN) Encapsulated Packet Format

| Outer Ethernet Header | Outer IP Header | Outer UDP Header | Outer VXAN Header | Inner Ethernet Header | Outer IP Header | Outer L4 Header* | Outer Data | Outer CRC |

As an overlay SDN solution, VSP uses tunneling protocol such as VXLAN to encapsulate the original payload. Tunneling protocols like VXLAN have challenged Ethernet network adapters because they need access to the encapsulated payload. To do so they need to be “VXLAN-aware,” that is, they know where to locate specific fields in the encapsulated payloads. The Intel® Ethernet Network Adapter XXV710 was the first from Intel designed with the VXLAN-awareness required to enable line-rate performance in SDN overlays.

VXLAN-awareness matters because all Ethernet network adapters at 10 Gbps or faster offload specific functions from the host CPU to enable line-rate performance. Two important Ethernet adapter offloads relate to segmentation, one on the send side and one on the receive side. An application can just send a large block of data for transmission to a 10GbE or faster Ethernet adapter that will in turn break up the large data block into smaller fragments. Furthermore, it will place these fragments into multiple frames with the correct headers and CRCs, ready for transmission. This is commonly called “TCP Segmentation Offload” (TSO) and is one of the most potent offloads in relieving the host CPU from excessive low-level formatting and bit-manipulation tasks.

Receive-side segmentation (RSS) is more complicated both because packets arrive asynchronously and also because the Ethernet adapter has to decide whether or not multiple incoming packets contain data from a common data block. Though the benefit of offloading receive-side segmentation is marginal at 10 Gbps, it becomes increasingly more important as the industry moves to 25 Gbps and higher speeds.

A first industry attempt in Linux to codify what is required for receive-side segmentation is known as “Large Receive Offload” (LRO). However, LRO has now been deprecated in Linux because of two key deficiencies of LRO. First, the LRO algorithm was too lax in its acceptance criteria for merging the data from multiple packets. This can result in an Ethernet adapter handing a block of data to an application that came from mixed sources, that is, including data not intended for that application. (Bad!) Second, LRO does not support TCP/IPv6, an increasingly important requirement for Ethernet networking.

In response, the Linux community has developed a successor, “Generic Receive Offload” (GRO), to address these problems. Intel has been an active contributor to the evolution of GRO, and now supports it for the Intel® Ethernet Network Adapter XXV710 [see test conditions for details].
About Intel
Intel has been driving continuous innovation of Ethernet products for more than 35 years, with products that deliver a reliable out-of-the-box experience, and proven interoperability for networking infrastructure. Intel® Ethernet 700 Series Network Adapters accelerate the delivery of new services and capabilities by increasing the speed and efficiency of network infrastructure through critical performance optimizations and increased agility for scalable packet processing.

About Nuage Networks
Nuage Networks strikes at the heart of the cloud networking challenge: Choreographing datacenter and wide-area networks to maximize responsiveness, utilization and visibility. Nuage Networks delivers a highly programmable infrastructure that bridges the gap between the application-centric view and the equally important network-centric view, realizing the full power of SDN. The Nuage Networks solution combines groundbreaking SDN and virtualization techniques with unmatched networking expertise to deliver a massively scalable solution that consistently spans datacenters and remote locations. Our solution enables enterprise IT to respond instantly and securely to the demands of users and applications anywhere.

Solution Features and Benefits

**SDN network performance**
As you can see below, with GRO enabled, the XXV710 achieves almost 22 Gbps performance within a single virtual machine (VM), which is approaching line-rate for that adapter (25Gbps)\(^1\). In contrast, without the GRO offload, the XXV710 doesn’t even reach 12 Gbps. It takes four VMs, each with restricted performance to fill the XXV710 pipeline.

![XXV710 VXLAN Throughput](image)

Enhanced infrastructure efficiency
By offloading virtual overlay network processing from the CPU to the NIC, CPU overhead is significantly reduced, empowering the infrastructure to support more application workload, thus improving cloud infrastructure efficiency.

![XXV710 VXLAN Offload Benefit](image)

Conclusion
To meet the performance requirements of SDN VXLAN overlays, such as Nuage Networks Virtualized Services Platform (VSP), use VXLAN-aware Ethernet adapters that support Generic Receive Offload (GRO) for encapsulated packets — like the Intel® Ethernet Network Adapter XXV710-DA2.

\(^1\) Test conditions: XXV710-DA2 [Firmware: 5.51 & Driver: 2.1.14-kl]. Nuage VSP 5.3.1. iperf v2.0.10 run with 12 threads per instance. CPU: Xeon Gold 6152 @ 2.1 GHz (88 cores).

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