SOLUTION BRIEF

Cloud-Native NFV Acceleration at Scale

Network Function Virtualization (NFV) enables agile service delivery and seamless scalability

Executive Summary

Network Function Virtualization (NFV) offers a change in the platform used to deliver telecommunication networking functions. Rather than employing proprietary tightly-coupled dedicated hardware and software, which tend to be static and difficult to scale, are replaced with virtual machines running on commercial off-the-shelf (COTS) servers. By leveraging virtualization and cloud technologies telco service provides can better achieve agile service delivery and efficient scalability. In order to properly support this without compromising the reliability and performance of the dedicated hardware, an advanced network infrastructure must be used to support higher rates of packet processing and the resulting increase in east-west traffic. For these reasons choosing the right networking hardware becomes critical to achieving a cloud-native NFV solution that is agile, reliable, fast and efficient.

Addressing Performance

Telco service provider applications are rarely “best-effort” services. Voice and video application are particularly sensitive to delays. Often requiring less than 100ms of latency to perform accurately. The process of virtualization cause numerous interrupts, I/O movement traverses from kernel to user space. This storage-and-forward mechanism eats up CPU cycles and decreases pack performance. Adding in encapsulation checksum and CRC calculations and performance degrades significantly.

HIGHLIGHTS

- Support for DPDK, which enables NFV solution to provide over 139Mpps
- Optimization of OpenStack through software accelerators and hardware offloads including:
  - DPDK
  - ASAP²
  - SRV-IO
  - RDMA/RoCE
  - Overlay Network Offloads
- Over a decade of market leadership in High performance networking
- Depth of engineering expertise in efficient server virtualization
- Out-of-Box NFV functionality with not complicated configuration
- Hardware-based NFV capabilities without hidden license fees

Accelerate Your VNFs with DPDK and Mellanox ASAP²

NFV

Network Function Virtualization

DPDK

DATA PLANE DEVELOPMENT KIT

ASAP²

Accelerated Switching & Packet Processing

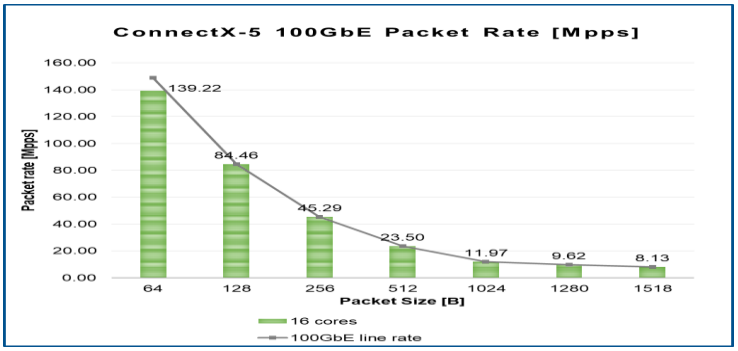

Fig 1. Highest Packet Rate for Baremetal DPDK VNFs

Mellanox delivers the best DPDK performance in the industry and supports over 139Mpps. To improve upon this, Mellanox offers ASAP² technology which dramatically increases packets-per-second by accelerating packet switching in hardware. The ASAP² accelerates OVS using an embedded network switch to process millions of more packets than DPDK and with nearly zero CPU overhead. This results in the most efficient NFV and SDN solutions.

DPDK

- Highest Packet Rate
- 50% CapEx Savings
- 66% Lower Latency
- Best in Class Security

ASAP²

- 8X-10X Better DPDK
- Zero CPU Utilization
- Line Rate Performance
- Broadly Integrated

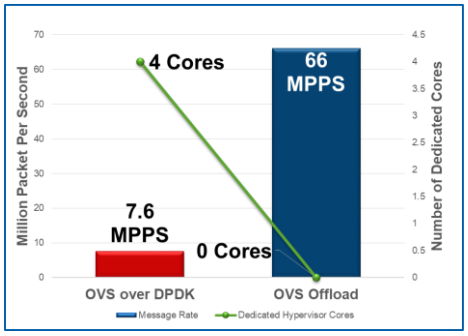

Fig 2. OVS Offload (ASAP²)

The need to service tens of millions of customers further challenges the ability to provide proper performance. To address this Mellanox delivers multiple options to overcome performance penalties; software accelerators, overlay networks and hardware offloads.

Software Accelerators

Software accelerators can be utilized to eliminate overhead and processes that slow down central processing. One of these is Data Plane Development Kit (DPDK) which reduces overhead caused by interrupts that are sent each time a new packet arrives for processing. DPDK implements a polling process for new packets and the key benefits of significantly improving processing performance while eliminating PCI overhead and maintaining hardware independence.

Mellanox has an alternative, and better way, to solve the NFV packet performance challenge. It's called Accelerated Switching and Packet Processing (ASAP²). ASAP² combines the performance and efficiency of server/storage networking hardware, the NIC (Network Interface Card), along with the flexibility of virtual switching, resulting in the highest infrastructure efficiency, and performance. SR-IOV can also be used to enable application direct access to memory to gain further efficiencies as well as moving virtual switching out of kernel space and into user space, accelerating the process while eliminating the CPU from the task.

By using software accelerators, I/O performance can be significantly improved, allowing Virtual Network Functions to run closer to native software performance.

Overlay Networks

Overlay networks, such as VXLAN, and NVGRE require an additional header and CRC to accompany the encapsulated data. This results in even more stress being placed on CPU recourses as it must process the additional data. However, Mellanox offers overlay offload capabilities to handle the checksum and CRC calculations on the adapter hardware. This results in significant throughput enhancements that closely match bare-metal performance while reducing burden on the CPU. The results is an increase in server efficiency and more deterministic latency.

Hardware Offloads

The processing of communications protocols places a significant burden on the CPU. With hardware offloads such as RDMA, efficiency can be gained to further improve performance. RDMA allows network adapters direct access to application buffers, bypassing the kernel, CPU and protocol stack so the CPU can perform more useful tasks while I/O transfers are taking place. This increases efficiency of the server by allowing application workloads to efficiently scale in high-bandwidth networks.

Out-of-Box NFV Features

The advanced NFV features of the Mellanox ConnectX family of adapters are designed into the silicon and are fully functional out-of-box with no special configuration necessary. Other vendors require software development teams with advance knowledge to integrate NFV best practices into actual solutions, increasing expenses and adding costs. Mellanox solutions are also designed for and test to work with each standard Linux distributions (Red Hat/Ubuntu). Offering NFV support out-of-the box simplifies integration, deployment and support.

Further Mellanox Advantages

Mellanox is a long time leader in high-performance networks and now brings our maturity, breadth and expertise to the telco market. Mellanox chip architecture and software drivers are based off the same core fundamentals and continue to deliver the stability and advanced functionality that have made them the industry leader in 25G and higher speeds. It is also because of these reasons that industry leading telco and Cloud service provides choose Mellanox when looking for a NFV platform they can trust.

Conclusion

The telco industry is undergoing a major transformation to increase agility and efficiency by introducing virtual networking devices. Carriers networks need to be much more responsive and offer agility to rapidly deploy network services. They must architect their network data centers to enable the nimbleness necessary for growing demands all while conserving capital expenditure, reduce operating expenses, and accelerate time to delivery. They are finding Mellanox 25GbE, 50GbE and 100GbE technologies offer the best performance and the robustness they demand when deploying network function virtualization (NFV). While DPDK and Mellanox ASAP^2 address key scalability concerns for communications and networking workloads. Whether deploying on OpenStack or KVM using Red Hat or Ubuntu Linux-based virtual devices, Mellanox offers a compelling solutions to address your ever need.

Expansive NFV Partner Ecosystem

Mellanox integrates with leading solutions and applications to deliver innovative functionality and efficiency. Key NFV partners include:

OPEN Compute Project, TensorFlow, openstack, nvm EXPRESS Over Fabrics, OvS Open vSwitch, CORD, switchdev, SONiC SAI, APACHE Spark, DPDK DATA PLANE DEVELOPMENT KIT, ceph, P4.org