Performance Considerations When Deploying Open Source NFV Networking Myths Debunked

Open Networking Summit
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Eric Carmès, Founder and CEO

*SPEED MATTERS*
6WIND: Performance Software Experts

- Headquartered in France with a global presence in the US, China, Korea and Japan
- Primary business is infrastructure software for networking
- Combines software expertise with historical experience in telecom
- Products are used both by Network Operators and OEM vendors
- VC-backed company with Cisco as an investor

High Performance Software For Cost-Effective Virtual Networking
Performance Enables a Cost-Effective Transition to NFV

High Performance
Specialized Hardware

Deliver Required Performance
to Standard Servers

Bring Performance To
Virtual Networking
Open Source NFV: Virtual Networking Performance Problems

- **Application Throughput**
  - Standard OS Virtio driver bottlenecks
  - Legacy networking software doesn’t scale on standard servers

- **Hypervisor Scaling**
  - 10/40/100 Gig Ethernet
  - Virtual switch bottleneck
Standard Linux: Pros and Cons

**Pros: Features and Compatibility**
- Includes all virtual switching and networking features on heterogeneous NICs
- Supported by OpenStack, OpenDaylight, etc.

**Cons: Throughput / Performance**
- Linux networking performance doesn’t scale (Virtual Switch and Application)
- Host / Guest communication bottleneck
SR-IOV Breaks Virtualization

**Pros: Throughput**
- Bypasses hypervisor, curing throughput bottlenecks

**Cons: Lose all hypervisor features**
- Hardware dependent
  - Virtualization is broken
  - VNF migration?
- Only fixes performance at the hypervisor level
Data Plane Development Kit (DPDK): Preserve Performance And Hardware Compatibility

DPDK is:
- Set of libraries and drivers for high performance packet processing in Linux user space
- Low overhead, run-to-completion model
- Can be used in the hypervisor domain and for applications
- Built with open standards in mind, compatible with all major hardware vendors

DPDK is not:
- DPDK is not a networking stack
- DPDK does not provide functions such as Layer 3 forwarding, IPsec, firewalling, etc.
Data Plane Libraries and Optimized NIC Drivers in Linux User Space

DPDK Libraries
- Buffer Mgmt
- Queue/Ring Functions
- Packet Flow Classification
- NIC Poll Mode Drivers
- Etc.

User Space

App

Environment Abstraction Layer

Linux Kernel
dpdk.org: Knowledge Base and Online Community For DPDK Applications

- Open source project launched by 6WIND in April 2013; BSD licensed project

- THE open source framework for high performance packet processing
  - Initially for x86 CPU and Intel NICs
  - Now available for IBM Power 8, EZchip TILE-Gx and ARM CPUs
  - And for Cesnet, Chelsio, Emulex, Cisco, Mellanox, Netronome, QLogic, (Amazon soon) NICs

- A vibrant community
  - More than 3 million page visits since the project launch
  - More than 30,000 visitors per month, growing

- More than 20 projects use dpdk.org including OpenDayLight, OPNFV, OVS-DPDK, FD.io / VPP, Rump, dpdk-nginx…
Open Source Networking Stacks That Use DPDK: Two Examples
DPDK

- A high performance data plane stack is additional software separated from the Linux networking stack
- Interface to control plane has to be adapted and validated
- DPDK stack including configuration has to be integrated with network management

Linux

- Control Plane uses Linux stack APIs
- Management tools including OpenStack, SDN Controller, SNMP… integrate Linux stack management

How to benefit from DPDK performance without impacting system integration?
Linux Synchronization Architecture

Linux Networking Stack
- iproute2
- iptables
- Linux Kernel
- Data Plane Configuration
- Data Plane Statistics

Data Plane Modules
- Protocol Tables
- Shared Memory
- Statistics

Data Plane

Operating Systems
- Debian
- Fedora
- Red Hat
- Ubuntu

OpenStack
Quagga
OpenFlow
Haproxy
NGINX
Libvirt

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Use Case: Scalable IPsec Aggregation for Remote Users

Leverage NFV Infrastructure

Eliminate The Performance Gap From Commodity Hardware To Reap Cost Benefits

IPsec traffic

Clear traffic

Private Cloud

10/40 GE

IPsec Aggregator
Solution: Accelerating IPsec Software on COTS Servers

DPDK-based
High performance data plane stack (IPsec): Bare Metal or VM
Synchronized with Linux for reusing StrongSwan (IKE) control plane

DPDK-based (physical NIC)
Dedicated high performance data plane stack (OVS)
Synchronized with Linux for OpenStack
Scalable Virtual IPsec Aggregation

Save Costs
- Ownership costs drastically lowered
- Improved ROI on infrastructure costs

Use spare cores
- To serve more users with more bandwidth
- To integrate IPsec with added value services on the same server

Scenario 1
- Linux IPsec
- 2 Gbps <500 Kbps per user
- No spare cores

Scenario 2
- Linux OVS
- 6 Gbps 1.2 Mbps per user
- No spare cores

Scenario 3
- Linux OVS
- 10 Gbps 2 Mbps per user
- 8 spare cores out of 12

10G Wirespeed

Encrypted Traffic @ 10 Gbps

5,000 IPsec Tunnels
Fast, Open, Unlocked NFV Architecture

DPDK-based (virtual NIC)
High performance data plane stack
Synchronized with Linux for reusing control plane and management

DPDK-based (physical NIC)
High performance data plane stack (OVS + L3...)
Virtualization friendly
Synchronized with Linux for OpenStack, SDN controller...
DPDK Meetup

- Thursday, March 17
  6:00 pm

- Cypress Room

- Register:
  Meetup.com/DPDK_org/