Data Processing Acceleration Over OCP Based Solutions

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Cloud and NFV Market Trends

- 25GbE deployed today, ensure easy transition to 400GbE
- 5G drives more bandwidth demand
- Software Defined Everything
- Virtualized environments Containers & VMs
- High scale
- Secure
The Software Defined Data Center

- Resource virtualization & disaggregation
- Efficient services
- Tenant isolation & security
- Visibility and telemetry

- vMem
- vCPU
- vAccelerator
- vStor (SDS)
- vNetwork (SDN)
The Virtualized Data Center

Network & Storage Baseline Services

- Software Defined
- Scalable
- Secure
- Efficiency & Performance

VM/Container

Hypervisor

Network Virtualization

Storage Virtualization

OCP NIC Hardware

Open. Together.
Bare Metal Platforms Emerging in the Cloud

Driving Forces
- Performance
- Security and Isolation

Trust shifts into the Smart NIC
Packets Processing @200GbE is Challenging
Packet Processing Requires Accelerator

1518B Packet
- 16M packets per second
- 62ns/packet

64B Packet
- 298M packets per second
- 3.3ns/packet

L3 cache
Spin lock/unlock
Syscall
Memory access

Single 1518B Packet Software Budget

Single 64B Packet Software Budget
SDN and NFV Data Path Needs

NFV

- VNF Logic
- VNF
- VNF Logic
- VNF Send Receive

SDN Dataplane

- Hypervisor
- vSwitch
- vSwitch Packet Processing
- Hypervisor Send/Receive

- Encap/Decap
- vSwitch
- vRouter
- Crypto/Security
- Firewall NAT

- 10X PPS @ 0% CPU
- 5x BW @ 80% lower CPU%
OVS over DPDK VS. OVS Offload

<table>
<thead>
<tr>
<th>Test</th>
<th>ASAP2</th>
<th>OVS DPDK</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Flow VXLAN</td>
<td>66M PPS</td>
<td>7.6M PPS (VLAN)</td>
<td>8.6X</td>
</tr>
<tr>
<td>60K flows VXLAN</td>
<td>19.8M PPS</td>
<td>1.9M PPS</td>
<td>10.4X</td>
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</tbody>
</table>

Significant Performance Boost @ Zero CPU resources
Security Must Be Accelerated

Denial of Service and Firewalls

- SW protection can’t scale
- HW acceleration to the rescue

Application throughput during DoS attack
6.5Mpps attack

- Attack 1: No DoS Mitigation
- Attack 2: SW DoS Mitigation
- Attack 3: HW DoS Mitigation

Application performance total collapse during attack
Software mitigation is worthless

Application performance unaffected during attack
HW mitigation solution
Infrastructure Ecosystem

- Orchestration and Management
  - Kubernetes
  - OpenStack
  - OpenBMC
  - Docker

- Software Defined Infrastructure
  - libvirt
  - ceph
  - DPDK
  - nvm

- Multi Vendor OCP Hardware

- OS
  - Linux

* Partial list
Multi-Vendor Collaboration is Critical

Build an ecosystem together!
- OCP hardware support
- Hardware independent API
- Open software
- Define use cases and needs
- Make it standard
Smart NIC Hardware Interface

OCP NIC 3.0 addresses all Smart NIC HW needs

New interfaces
- UART
- USB

Make sure they are connected!
Open APIs

- Network, Storage, Security Enablement SDK
- Opensource - Linux, DPDK, SPDK
- Acceleration APIs - extend existing frameworks
- Control plane - offload and isolation
- Management integration
Network Virtualization using NIC ASAP²
Accelerated Switching & Packet Processing

ASAP² Benefits
- Uncompromised performance
- CPU savings
- Full isolation
- Same solution for VM and BM
- OS/HV agnostic
- Security extensions

Opensource standard APIs
- Linux Kernel TC
- DPDK rte_flow

VM/Container
- Hypervisor
  - SDN SW
  - Drivers

Bare Metal Server
- OCP Smart NIC HW
  - SDN SW
  - Drivers

OCP NIC Hardware
- e-switch

Accelerated Switching & Packet Processing

Open. Together.
Storage Virtualization using NIC NVMe SNAP

Software-defined NIC for Accelerated Processing

NVMe SNAP Benefits
- Uncompromised performance
- CPU savings
- Full isolation
- OS/HV agnostic

Opensource standard APIs
- SPDK
- Includes storage toolkit rich feature
- Kernel infrastructure can be used
Call to Action

OCP to support a standard open API for packet acceleration that will maximize data center efficiency

- Agree on what to accelerate & roadmap
- Agree on what APIs
- Add it to OCP NG.0
Mellanox OCP NIC 3.0 and Switches

www.mellanox.com/ocp/

ConnectX®-4 Lx
OCP 3.0 25GbE Dual-port Adapter

ConnectX®-5
OCP 3.0 25GbE Dual-port Adapter

ConnectX®-5
OCP 3.0 100GbE Dual-port Adapter

SN2700 Open Ethernet Switch