Containerized VNFs with Data Plane Acceleration On Arm platform

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Agenda

• Background
• Containerized VNFs on Arm
• Container networking acceleration with DPDK
• What we have done
• Next steps
Background

1. Infrastructure Layer
   • Use ARM64 Server

2. Data Plane Layer
   • Enable DPDK for Container

3. Compute Virtualization Layer
   • Enable Docker Container

4. Network Virtualization Layer
   • Enhance Kubernetes SRIOV-CNI for DPDK deployment

5. Virtualization Infrastructure Manager layer
   • Use Kubernetes instead of OpenStack

Source: https://www.opnfv.org/software
Containerized VNFs on Arm - with Data Plane Acceleration
Container Networking

• Current status
  • Linux bridge, veth pair, Network namespace, iptables ...
  • Docker native network drivers
    – Host, bridge, overlay and MACVLAN
  • Other container network solutions
    – flannel, calico, contiv ...

• But may not be good enough for NFV
  • Complicated logic costs more CPU cycles
  • Low throughput and high latency for some use cases
  • Handling networking outside kernel is more popular
Container Networking Acceleration with DPDK

- Data Plane Development Kit (DPDK)
  - Libraries and poll-mode drivers for fast packet processing
  - Kernel bypassing, core affinity, huge pages, lockless synchronization, polling, NUMA awareness ...
  - Multi-arch support – x86, ARM64 and PPC

- NIC passthrough and SR-IOV VF passthrough
  - Device assignment by VFIO/UIO
  - High throughput, low latency

- Virtio-user in container
  - Virtio-user as DPDK virtual device
  - Reuse existing vhost-user backend
L2FWD with DPDK in Container

- **Flannel/Calico**
- **10GbE**
- **Traffic In**
- **Traffic Out**
- **Traffic Generator**
- **DPDK**
- **VFIO**
- **Port1**
- **Port2**
- **L2 FORWARDING**

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L2FWD Performance

• Hardware
  • ARMv8 64-bit, 2.4Ghz
    – 2 cores dedicated
    – 1G Hugepage size
  • Intel 2-port 82599ES 10Gbe
  • IXIA traffic generator

• Software
  • Linaro ERP 17.08 (Debian based)
    – Kernel 4.12
  • DPDK 17.08
Enhance Kubernetes CNI with Data Plane Acceleration

- With SRIOV-CNI, each VF and PF can be treated as a separate NIC
- After adding SRIOV CNI patch using DPDK, K8s can assign VFIO/UIO device into a specific container
What We Have Done

• Enabled DPDK in container on ARM64 platform
• Enhanced SRIOV-CNI with DPDK acceleration
• Performance test with DPDK for container networking
• Enabled K8s as VIM on ARM64 platform
Next Steps

• Enable VPP-DPDK for OPNFV on Arm
• Enable VPP-ODP for OPNFV on Arm
• Performance tuning of DPDK in container on Arm
• Enable new features of high performance container networking in K8s on Arm
  • Resource allocation for DPDK in K8s: cpuset, NUMA, cache...