DPDK SUMMIT CHINA 2017
Accelerate VM IO via SPDK Vhost Solution

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Agenda

• Introduction
• SPDK Vhost Architecture
• Usage Cases
• Benchmarks
• Plans
The Opportunity: Use Intel software ingredients to unlock the potential of new media

<table>
<thead>
<tr>
<th>Technology</th>
<th>Latency</th>
<th>I/O Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDD</td>
<td>&gt;2ms</td>
<td>&lt;500 IO/s</td>
</tr>
<tr>
<td>SATA NAND SSD</td>
<td>&lt;100µs</td>
<td>&gt;25,000 IO/s</td>
</tr>
<tr>
<td>NVMe* NAND SSD</td>
<td>&lt;100µs</td>
<td>&gt;400,000 IO/s</td>
</tr>
<tr>
<td>Intel® Optane™ SSD</td>
<td>&lt;10µs</td>
<td>&gt;500,000 IO/s</td>
</tr>
</tbody>
</table>
SPDK VHOST Architecture

QEMU

Guest VM

virtio-scsi

vhost

eventfd

UNIX domain socket

SPDK vhost

virtio-scsi

vhost

DPDK vhost

virtqueue

Shared Guest VM Memory

Host Memory
VM Ephemeral Storage

- Improves Storage Virtualization
- Works with KVM/QEMU
- 6x efficiency vs. kernel vhost
- 10x efficiency vs. QEMU virtio
- Increased VM density
Enable disaggregation and migration of VMs using remote storage

Improves Storage Virtualization & Flexibility

Works with KVM/QEMU
Benchmarks

System configuration: 44x Intel(R) Xeon(R) CPU E5-2699 v4 @ 2.20GHz (HT off); Cores per socket: 22; 8x Samsung 8GB DDR4 @2400 12x Intel SSD DC P3700 Series 1,5T @ FW 8DV101H0 DPDK: 17.02; Host Dist/Kernel: Fedora 25/Kernel 4.8.15-300; Guest Dist/Kernel: Ubuntu 16.04/Kernel 4.4.0-59-generic, mq enabled; Fio ver: fio-2.2.10; Fio workload: blocksize=4k, iodepth=512, iodepth_batch=128, iodepth_low=256, ioengine=libaio, size=10G, ramp_time=10, group_reporting, thread, numjobs=1, direct=1, rw=randread
Plans

• VFIO Support
• Support for vhost-blk protocol
• Live migration
• Performance tuning, including
  - multiqueue
  - completion event coalescing
Accelerate Crypto Service by DPDK vhost

Xin Zeng, Intel
Agenda

- Virtio Crypto Device Introduction
- Boost SSL/TLS Service by virtio-crypto
- DPDK vhost-user for virtio-crypto
- Plans
- Summary
Virtio Crypto Device

- A virtual cryptography device under virtio device framework
- Provides an set of operation interfaces for different cryptography services
- Mainly contributed by Huawei & Intel in community
Boost SSL/TLS Service by virtio-crypto

- **Motivation**
  - Unified Driver in the Guest
  - Accelerator as a service for better performance
  - Friendly Cloud Characteristic

- **PoC Workload**
  - Nginx HTTPS Web Server
  - RSA2K session establishment

- **Ingredients**
  - virtio-crypto PMD
  - vhost-user for Crypto
  - Intel® QAT DH895XCC device driver in Linux

- **Performance**
  - ~4.5x throughput (TLS connection per second) compared to software solution
DPDK vhost-user for virtio-crypto

- virtio-crypto in VM
  - Crypto appliance
  - Under LKCF framework
  - virtio Crypto PMD
- New vhost proxy in QEMU
- virtio-crypto backend in Host
  - Build vhost user crypto target on top of DPDK generic vhost lib
  - Connect with DPDK crypto device
Intel® QAT Overview

- A hardware-based acceleration technology
- Accelerate compute-intensive security and compression operations
  - For more details of Intel® QAT, visit [here](#)
WIP and Plans

- New device type (virtio-crypto) proposal in virtio spec. v1.1
- Upstream vhost user for virtio-crypto in DPDK community
- Live migration support
- Multi-queue support
- Performance optimization
Acknowledgement

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Summary

- DPDK generic vhost user library is ready (available in DPDK 17.05)
- vhost user for SCSI and Crypto devices are ongoing.
- Benefits from DPDK vhost library
  - Why Reinvent Wheel?
  - General APIs to build vhost user application
  - Leverage fast I/O capacity by DPDK PMD
  - High Performance
- Welcome contributions!
Thanks!!

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Backup

- [http://spdk.io](http://spdk.io)
- Code available at [https://github.com/spdk/spdk](https://github.com/spdk/spdk)
- Submit your patch via [https://review.gerrithub.io/spdk/spdk](https://review.gerrithub.io/spdk/spdk)