

Title:**NFV & Data Plane Optimizations – Tools and Tips****Abstract:**

This tutorial will dive into the problem of fast packet processing on standard x86 based servers and the current state of the art using software and hardware acceleration capabilities. The session will start with the basic motivation and design of Data Plane Development Kit (a.k.a. DPDK) and how it accelerates SDN/NFV components such as FD.io, Open vSwitch (OVS), BESS, and integrates with hardware solutions, for example SR-IOV. Hands on sessions follow the overview and introduction and focus on Open vSwitch with DPDK and SR-IOV to achieve near bare metal performance. The tutorial ends with tips and techniques for performance optimization on modern multi core CPUs with some performance benchmark measurements.

Description:

Session 1: DPDK overview APIs and Virtualization in NFV using virtio, fd.io and TLDK

Speaker: Keith Wiles

In this session we cover the design of DPDK and how it is used in many different applications within a VNF/NFV solution to accelerate the performance of throughput demanding applications. We begin with an overview of DPDK as used in NFV, VPP [FD.io](http://fd.io) and the new TLDK (Transport Layer Development Kit). Turning to a case study we then show how DPDK is used to accelerate Cisco's routing software. We continue in this session with an introduction to Virtio and how it is used with DPDK in a VNF/NFV workloads. A simple example of how to use Virtio APIs is given. We will end with how these layers of software components within VNF/NFV combine into a workload solution.

Session 2: Soft-switches Open vSwitch and BESS

Speaker: Irene Liew

There are many different virtual switching solutions. Many target specific requirements and use cases. Open vSwitch (OVS) is a production quality, multilayer virtual switch licensed under the open source Apache 2.0 license. It is fully featured and supports SDN control semantics via the Open Flow protocol and its OVSDB management interface. The native OVS forwarding plane runs in kernel space. The OVS kernel datapath gives adequate performance in many cloud and enterprise use cases. However, the performance is not sufficient to support the Communication Service Provider NFV use cases. Therefore, DPDK is integrated into native OVS to boost the performance. In this session we will cover how OVS multilevel table support, vhost multi-queue feature etc can be used with DPDK to achieve maximum performance.

This session will also introduce BESS, an extensible platform for rapid development of software switches which allows the user to implement a fully customizable packet processing data path by combining small "modules".

The session will end with benchmark results on both OVS and BESS for some commonly used use cases.

Session 3: Demo How to set up virtualization in VMs using Open vSwitch and SR-IOV

Speaker: Clayne Robison

This is a DPDK Open vSwitch and SRIOV hands-on session. In the first part the participant will be guided in the set-up of two VMs, OVS is used to connect the two. Traffic is generated to flowing between the

two VMs. The second part allows the participants to learn how to create Virtual Functions (VF) off a physical port using SRIOV and passing through that VF to a virtual machine (VM). Users run a DPDK packet generator app called pkt-gen on a physical port which is looped back into the earlier SRIOV PF port. DPDK is then installed inside the VM and run an example application called L2 forward. This application simply forwards the packets received back to DPDK pkt-gen. This can be confirmed by looking at the statistics provided by pkt-gen.

Session 4: Vtune & Performance Optimizations

Speaker: Muthurajan JayaKumar

This a session covers performance optimization Best Practices and VTune demo with do yourself cookbook at:

<https://software.intel.com/en-us/articles/profile-dpdk-code-with-intel-vtune-amplifier>.

The session has role play sessions with attendees acting as various building blocks of a CPU pipeline. It emphasizes thought process – best algorithm gives more mileage followed by mapping application to the underlying architecture – be NUMA, affinity and then the microarchitecture optimizations with VTune. Finally the session wraps up with the reference to the above cookbook link and how the attendee can replicate the demo with VTune profiling DPDK microbenchmarks and identifying hotspots in their own applications. Performance figures on network forwarding applications are presented.

Keith Wiles

Intel Corporation

Principle Engineer

Keith Wiles is a Principle Engineer at Intel Corporation working with DPDK and NFV acceleration technologies for accelerated networking performance. Keith is a contributing member of the DPACC Data Plane Acceleration group within OPNFV. Keith is also the author of Pktgen-DPDK a network traffic generator running on DPDK. He wrote Pktgen-DPDK while working at Wind River to understand DPDK and introduce DPDK as part of the network acceleration platform products within Wind River. He worked at Wind River for 16 years while enhancing VxWorks Real Time networking stack. Keith designed and wrote the CertStack a DO-178B certified TCP/IPv4 network stack used in the MILS and AIRINC platforms. Keith was also a founding member, CTO and CFO of XAct Inc before Wind River acquired the company producing software and hardware for Ethernet managed and unmanaged switch designs.

Irene Liew

Intel Corporation

Performance Engineer:

Irene Liew is a Performance Engineer who focused on virtualization performance analysis and in network virtualization. She defines test methodologies and conduct tuning/optimizations on platform and software stacks. She currently works on Open vSwitch with DPDK, and other virtual switches. She has been with Intel for 11 years working on performance analysis.

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Intel

M Jay works with DPDK team from 2009 onwards. M Jay joined Intel in 1991 and has been in various roles and divisions with Intel – 64 bit CPU front side bus architect, 64 bit HAL developer to mention a few before DPDK team. M Jay holds 21 US Patents, both individually and jointly, all issued while working in Intel.

Jay

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Robison, Clayne B

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Clayne has been at Intel since 2000, working most of that time consulting with software companies on technology ranging from InfiniBand, Itanium, Xeon, Centrino, Moblin/MeeGo, Android, RealSense and SDN/NFV.