TECHNOLOGY GUIDE

Intel Corporation

Open vSwitch – Optimized Deployment Benchmark

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1 Introduction

This benchmark report presents the throughput performance improvements achievable for various deployments and configurations of Open vSwitch (OVS) with the Data Plane Development Kit (DPDK) for a given use case.

The configuration and deployments demonstrate some of the latest Intel® architecture technology advancements, such as migration between 2nd and 3rd Gen Intel® Xeon® Scalable processors, which include additional CPU capabilities such as Intel® Speed Select Technology – Base Frequency (Intel® SST-BF), Intel® Advanced Vector Extensions 512 (Intel® AVX-512) software optimizations within both OVS and DPDK, as well as external software optimizations that impact OVS throughput performance, such as Virtual I/O Device (VIRTIO) version 1.1. In addition to the features mentioned, further upcoming Intel® AVX-512 optimizations are also demonstrated.

The performance improvements for these features are presented both individually as well as collectively. An outline of future performance enhancements in both hardware and software that are not yet merged as part of the OVS codebase are also discussed.

This guide is written for network administrators who want to use OVS DPDK with Intel® Architecture-based deployments, specifically to demonstrate the performance gains expected with the features highlighted. It is not intended as a user configuration guide.

This document is part of the Network Transformation Experience Kit, which is available at https://networkbuilders.intel.com/network-technologies/network-transformation-exp-kits.

NOTE: The general information contained within this document applies to both the 3rd Generation Intel® Xeon® Scalable processor and the Intel® Xeon® D processor. However, please note that the performance, configurations, and feature set in this document apply specifically to the 3rd Gen Intel® Xeon® Scalable processor and may vary for the Intel® Xeon® D processor.

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Document Revision History

REVISION	DATE	DESCRIPTION
001	April 2021	Initial release.
002	February 2022	Added a note regarding Intel® Xeon® D processor in the Introduction section.

1.1 Terminology

Table 1. Terminology

ABBREVIATION	DESCRIPTION
DPDK	Data Plane Development Kit (DPDK)
DPIF	DataPath InterFace, OVS datapath component that represents the software datapath as a whole
DPCLS	Datapath Classifier, OVS software datapath component that performs wildcard packet matching
EMC	Exact Match Cache, OVS software datapath component that performs exact packet matching
IA	Intel Architecture
IP	Internet Protocol
MFEX	Miniflow Extract
NIC	Network Interface Card
OVS	Open vSwitch
PMD	Poll Mode Driver
SMC	Signature Match Cache, OVS software datapath component that performs wildcard packet matching
SST	Intel® Speed Select Technology
SST-BF	Intel® Speed Select Technology – Base Frequency (Intel® SST-BF)
TEP	Tunnel Endpoint
VXLAN	Virtual Extensible LAN

1.2 Reference Documentation

Table 2. Reference Documents

REFERENCE	SOURCE
Applying SIMD Optimizations to the OVS Datapath Classifier (OVS Conference, 2018)	https://youtu.be/5-MDlpUIOBE
Next steps for higher performance of the software data plane in OVS (OVS Conference, 2019)	https://youtu.be/x0bOpojnpmU
Next steps for even higher performance of the SW Datapath in OVS (OVS Conference, 2020)	https://youtu.be/5dWyPxiXEhg
Intel® Xeon® Gold 6252N Processor	https://ark.intel.com/content/www/us/en/ark/products/193951/intel-xeon-gold-6252n-processor-35-75m-cache-2-30-ghz.html
3rd Generation Intel® Xeon® Scalable Processors	https://ark.intel.com/content/www/us/en/ark/products/series/204098/3rd-generation-intel-xeon-scalable-processors.html
Intel® Speed Select Technology – Base Frequency - Enhancing Performance Application Note	https://builders.intel.com/docs/networkbuilders/intel-speed-select-technology-base-frequency-enhancing-performance.pdf
Intel® Speed Select Technology – Base Frequency Priority CPU Management for Open vSwitch (OVS) Application Note	https://builders.intel.com/docs/networkbuilders/intel-speed-select-technology-base-frequency-priority-cpu-management-for-open-vswitch.pdf
What's new in VIRTIO 1.1	https://www.dpdk.org/wp-content/uploads/sites/35/2018/09/virtio-1.1_v4.pdf
Virtual I/O Device (VIRTIO) Version 1.1	https://docs.oasis-open.org/virtio/virtio/v1.1/csprd01/virtio-v1.1-csprd01.html
OVS Datapath Classifier Performance	https://docs.openvswitch.org/en/latest/topics/dpdk/bridge/#datapath-classifier-performance
OVS Enabling AVX-512	https://docs.openvswitch.org/en/latest/intro/install/dpdk/#possible-issues-when-enabling-avx512
ICE Vector PMD	https://doc.dpdk.org/guides-20.11/nics/ice.html#vector-pmd
Introducing the Intel® Data Streaming Accelerator (Intel® DSA)	https://01.org/blogs/2019/introducing-intel-data-streaming-accelerator
OVS-DPDK Datapath Classifier	https://software.intel.com/content/www/us/en/develop/articles/ovs-dpdk-datapath-classifier.html