DATA SHEET

Intel® Open Network Platform Release 2.1: Driving Network Transformation

This new release of the Intel® Open Network Platform (Intel® ONP) introduces added functionality, enhanced performance, and greater stability. The major improvements in Intel ONP 2.1 include support for the Intel® Xeon® processor E5-2600 v4, Platform QoS, and the OPNFV KVM4NFV project. The Intel ONP reference architecture drives software-defined networking (SDN) and network functions virtualization (NFV) network transformation by addressing the commercial needs of diverse industry sectors.

What is the Intel® Open Network Platform?

The Intel ONP reference architecture provides engineering guidance and ecosystem support to enable widespread adoption of software-defined networking (SDN) and network functions virtualization (NFV) solutions across the telecommunications, cloud, and enterprise sectors. The reference architecture is based on a standard high-volume server (SHVS) and on an Intel ONP open-source software stack. Intel ONP software includes contributions made by Intel and extensive work done in many open-source community projects.

Key Release 2.1 Improvements

One: Intel ONP 2.1 provides integration with the **Intel Xeon processor E5-2600 v4.** This new server processor increases the core count to 22 cores per processor and up to 88 threads per dual processor platform.

Two: To continue to improve the latency for VM-VM communication in the networked environment, Intel ONP 2.1 supports the **Intel® Resource Director Technology (Intel® RDT)** on the Intel Xeon processor E5-2600 v4. Intel RDT gives additional controls to optimize memory utilization of the Last Level Cache (L3) on the processor and the main DDR memory.

Three: Stay current with **the latest SDN/NFV enabling open-source ingredients**. Intel ONP 2.1 supports the OpenDaylight* (ODL) Beryllium release. And, **KVM4NFV** minimizes VNF data plane latency. **Open vSwitch* (OVS) 2.5** supports management of Jumbo Frame packets.

Four: **Intel ONP 2.1 supports the latest version of Data Plane Development Kit (DPDK)**, release 2.2.0, for high packet throughput on Intel® architecture-based platforms.

Five: Support for the latest Linux* kernel versions in **Fedora 23** and **CentOS*-7.2** (1511).

Intel Open Network Platform 2.1 Main Deliverables

Included among the deliverables bundled with Intel ONP 2.1 are:

Packet Processing Benchmark Report: This deliverable includes an extensive report detailing the packet processing benchmark results for Open vSwitch (OVS) with DPDK on the newly introduced Intel Xeon processor E5-2600 v4. Intel ONP users can more easily compare performance between generations of Intel® Xeon® processors.

Intel and the Intel® Network Builders community of partners collaborate on trial deployments and solution implementations (see Figure 1 on the following page).

Highlights of Intel® Open Network Platform (Intel® ONP) Release 2.1 Ingredients

Intel ONP Release 2.1 introduces major feature enhancements and now delivers a fully integrated solution on the latest Intel® Xeon® processor E5-2600 v4 family.

- OpenStack* Liberty release
- OpenDaylight* Beryllium
- Open vSwitch* 2.5
- Data Plane Development Kit release 2.2
- Fedora* 23
- CentOS*-7.2
- Fedora 23 Real-Time Linux* Kernel, version: 4.3.3-300.fc23.x86_64
- CentOS-7.2 Real-Time Kernel version 3.10.0-327.el7.x86_64
- Processors:
  - Intel® Xeon® Processor D-1500 product family
  - Intel® Xeon® Processor E5-2600 v3 product family
  - Intel® Xeon® Processor E5-2600 v4 product family
- Ethernet controllers:
  - Intel® Ethernet Controller XL710-AM2 2x40 GbE or 4x10 GbE
  - Intel® Ethernet Controller XL710-AM1 1x40 GbE or 4x10 GbE ports

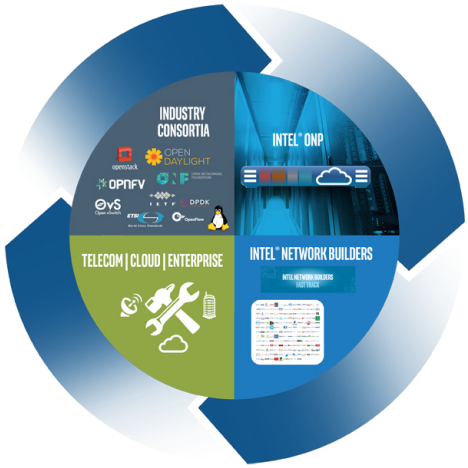

Figure 1. Market enablement with Intel® Open Network Platform.

Intel Open Network Platform Overview

The primary Intel ONP elements include the compute node, ODL controller, and OpenStack* platform. Aligned with the architecture defined by the European Telecommunications Standards Institute (ETSI) for NFV and with the goals of the OPNFV project, Intel ONP has these characteristics:

- Based on Intel architecture, the design uses industry-standard servers. Advances in Intel® processors—including new microarchitectures and smaller-scale process technologies—enable Intel ONP to keep pace with the emerging platform technologies and deliver optimal performance and energy efficiency in SDN and NFV network implementations.
- The Intel ONP software stack includes only open-source software from open-community projects. Contributions to projects and standards such as OVS, DPDK, OpenStack, and ODL have accelerated the development of Intel ONP; open-source code developed as part of the Intel ONP initiative is up-streamed through the individual communities and uploaded on 01.org.
- The Intel ONP reference architecture defines a test environment composed of the server, a control layer, and an OpenStack layer (see Figure 2). OpenStack and ODL provide the management and controller platforms. The compute nodes consist of network interface controller cards, the Open vSwitch functionality, DPDK, and supplier-specific applications executing in virtual machines.

Intel Open Network Platform Release Deliverables

Intel ONP is released quarterly through 01.org. Intel ONP release 2.1 is delivered in these forms:

- **Release 2.1 Scripts**. Help quickly install the Intel ONP release 2.1 software stack based on open-source ingredients as defined in Table 1 and Table 2.
- **Intel ONP Reference Architecture Guide Release**. Provides guidelines for configuring and installing the Intel ONP software stack. The software is running on a cost-effective SVHS based on Intel architecture.
- **Intel ONP Performance Test Report**. Provides packet processing performance test results for Intel ONP 2.1 software on the Intel Xeon processor E5-2600 v4 product family. Provides guidance for data plane characterization and performance measurements.
- **Intel ONP Release Notes.** These notes detail the relevant technical information for each release.

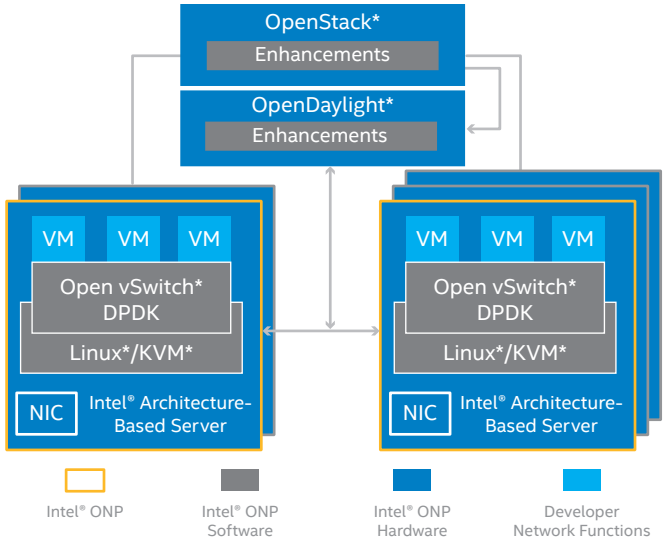

Figure 2. Intel® Open Network Platform test and validation environment.

Capitalizing on the Benefits of Intel Open Network Platform

Intel ONP offers these distinct benefits:

- **Service providers**, data center operators, and enterprises can use Intel ONP during a technology proof-of-concept process to validate performance and operational objectives, collaboratively define industry standards, and test equipment and software prior to commercial deployment.
- **Hardware producers**, including telecommunications equipment manufacturers and original equipment manufacturers, gain an edge in the market by being able to accelerate development projects and take advantage of Intel contributions to open-source software projects and the manner in which Intel has addressed the software ingredients.
- **Software producers**, including independent software vendors and operating-system vendors, can capitalize on optimized, integrated, pre-validated, released open-source software that provides access to the latest Intel processor-based server platforms.

Industry-wide, Intel ONP is enabling wide-scale network transformation—using SDN and NFV simply and cost-effectively on Intel architecture. The flexible reference architecture helps organizations accelerate their network virtualization initiatives, harnessing the rich functionality of current open platforms.

Intel Open Network Platform Release 2.1 - Network Elements

Table 1. Compute Node software ingredients during testing of VNF components.

SOFTWARE COMPONENT	DESCRIPTION	VERSION/CONFIGURATION
Fedora* 23	Host OS	Fedora 23 Server x86_64 Kernel version: 4.3.3-300.fc23.x86_64
gemu-kvm version: 2.4.1-7.fc23x86_64	Host OS	CentOS*-7.2 (1511) x86_64 DVD ISO Kernel version: 3.10.0-327.el7.x86_64
KVM4NFV Real-Time Kernel	Targeted toward low latency Telco environment	KVM4NFV Real-TIme Kernel version: 4.1.10-rt10
QEMU*-KVM	Virtualization technology	Fedora 23 gemu-kvm version: 2.4.1-7.fc23.x86_64 libvirt version: 1.2.18.2-2.fc23.x86_64 CentOS-7.2 gemu-kvm version: 1.5.3-105.el7_2.3x86_64 libvirt version: 1.2.17-13.el7.x86_64
Data Plane Development Kit (DPDK)	Network stack bypass and libraries for packet processing; includes user space vhost drivers	DPDK 2.2
Open vSwitch* (OVS)	Virtual switch	OVS 2.5

Table 2. Controller Node software ingredients used during testing of VNF components.

SOFTWARE COMPONENT	DESCRIPTION	VERSION/CONFIGURATION
Fedora* 23	Host OS	Fedora 23 Server x86_64 Kernel version: 4.3.3-300.fc23.x86_64
gemu-kvm version 2.4.1-7.fc23.x86_64	Host OS	CentOS*-7.2 (1511) x86_64 DVD ISO Kernel version: 3.10.0-327.el7.x86_64
KVM4NFV Real-Time Kernel	Targeted towards low latency Telco environment	KVM4NFV Real-Time Kernel version: 4.1.10-rt10
QEMU*-KVM	Virtualization technology	Fedora 23 gemu-kvm version: 2.4.1-7.fc23.x86_64 libvirt version: 1.2.18.2-2.fc23.x86_64 CentOS-7.2 gemu-kvm version: 1.5.3-105.el7_2.3x86_64 libvirt version: 1.2.17-13.el7.x86_64
Open vSwitch* (OVS)	Virtual switch	OVS 2.5
OpenStack*	Software-defined networking (SDN) orchestrator	OpenStack Liberty Release
OpenDaylight* (ODL)	SDN controller	ODL Beryllium

Table 3. Platform based on a dual Intel® Xeon® processor E5-2600 v3 and v4 configuration - hardware ingredients.

ITEM	DESCRIPTION	NOTES
Platform	Intel® Server Board S2600WTT	Intel® Xeon® processor-based dual-processor (DP) server; 2x10 GbE integrated LAN ports based on Intel® Ethernet Controller X-540
	Intel® Server Board S2600WT2	Intel® Xeon® processor-based DP server; 2x1 GbE integrated LAN ports based on Intel® Ethernet Controller I350-AM2
Processors	Dual Intel® Xeon® processor E5-2658 v3	12 cores, 24 threads; 2.2 GHz, 105 W, 30 MB Intel® Smart Cache per processor; 9.6 GT/s Intel® Quick Path Interconnect (Intel® QPI); DDR4-1600/1866/2133; 24 hyper-threaded cores per CPU for 48 total cores. Supports Cache Allocation Technology and Cache Monitoring Technology
	Dual Intel® Xeon® processor E5-2697 v3	14 cores, 28 threads; 2.6 GHz, 145 W, 35 MB total cache per processor; 9.6 GT/s Intel QPI; DDR4-1600/1866/2133; 28 hyper-threaded cores per CPU for 56 total cores.
	Dual Intel® Xeon® processor E5-2699 v3	18 cores, 36 threads; 2.3 GHz, 145 W, 45 MB total cache per processor; 9.6 GT/s Intel QPI; DDR4-1600/1866/2133; 36 hyper-threaded cores per CPU for 72 total cores.
	Dual Intel® Xeon® processor E5-2699 v4	22 cores, 44 threads; 2.2 GHz, 145 W, 55 MB total cache per processor; 9.6 GT/s Intel QPI; DDR4-1600/1866/2133/2400; 44 hyper-threaded cores per CPU for 88 total cores. Supports Cache Allocation Technology and Cache Monitoring Technology
Memory	64 GB total Crucial CT8G4RFS4213	8x DDR4 RDIMM 2133 MHz, 8 GB
	64 GB total Kingston KVR21R15S4/8	8x DDR4 RDIMM 2133 MHz, 8 GB
Intel® QuickAssist Technology	Intel® QuickAssist Adapter 8950	Provides IPSec, SSL Acceleration and Compression services Support for SR-IOV PCIe Gen 3 (8 GT/s)
NICs	Intel® Ethernet Converged Network Adapter X710-DA4	Intel® Ethernet Controller XL710-AM1; 4x10 GbE ports; Firmware version 4.53; Tested with Intel® FTLX8571D3BCV-IT and Intel® AFBR 703sDZ IN2 transceivers
	Intel® Ethernet Converged Network Adapter XL710-QDA2	Intel® Ethernet Controller XL710-AM2; 2x40 GbE ports; Firmware version 4.53; Tested with Intel® E40QSFPSR transceiver
Local Storage	Intel® Solid-State Drive Data Center S3500 Series	SSDSC2BB120G4 120 GB SSD 2.5-inch SATA 6 GB/s
BIOS	Servers with Intel® Xeon® processor E5 2600 v3 product family: SE5C610.86B.01.01.0009.060120151350 Release date: 06/01/2015 SE5C610.86B.01.01.0011.081020151200 Release date: 08/10/2015 Servers with Intel® Xeon® processor E5 2600 v4 product family: GRRFCRB1.86B.0267.R00.1509110656 RC revision 2.4.0 Release date: 09/11/2015	Hyper-Threading enabled Intel® Virtualization Technology (Intel® VT) for IA-32, Intel® 64 and Intel® Architecture (Intel® VT-x) enabled Intel® VT for Directed I/O (Intel® VT-d) enabled Turbo Boost enabled.

Table 4. System based on the Intel® Xeon® processor D-1500 product family - hardware ingredients.

ITEM	DESCRIPTION	NOTES
Platform	SuperMicro SuperServer* 5018D-FN4T	Intel® Xeon® processor-based system-on-a-chip (SoC) server motherboard: SuperMicro X10SDV-8C-TLN4F Dual LAN via Intel® i350-AM2 Gigabit Ethernet Dual LAN via SoC 10GBase-T
Processors	Intel® Xeon® processor D-1540	8 cores, 16 threads, 2.00 GHz, 12 MB cache Single Socket FCBGA 1667 supported; CPU TDP 45 W SoC
	Intel® Xeon® processor D-1520	4 cores, 8 threads, 2.20 GHz, 6 MB cache Single-socket FCBGA 1667 CPU TDP 45W SoC
Memory	32 GB toal Kingston KVR21R15S4/8	4x DDR4 RDIMM 2133 MHz, 8 GB
Local Storage	Seagate Barracuda ST500DM002	500 GB HDD 3.5-inch SATA 6 GB/s 7200 RPM 16 MB
BIOS	AMIBIOS* Version: 1.0a Release Date: 05/27/2015	Hyper-Threading enabled; Intel® Virtualization Technology (Intel® VT) for IA-32, Intel® 64 and Intel® Architecture (Intel® VT-x) enabled Intel® VT for Directed I/O (Intel® VT-d) enabled.
Intel® QuickAssist Technology	Intel® QuickAssist Adapter 8950	Provides IPSec, SSL Acceleration and Compression services Support for SR-IOV PCIe* Gen 3 (8 GT/s)

Learn more about the Intel Open Network Platform: **www.intel.com/ONP**

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