

Intel® Open Network Platform Release 2.0: Driving Network Transformation

This major release of the Intel® Open Network Platform (Intel® ONP) introduces new functionality, enhanced performance, and greater stability. Price-sensitive deployments, such as vE-CPE, will benefit from integration with the Intel® Xeon® processor D-1500 product family and the Intel® Atom™ processor C2000 product family of SoC. Support for the Community Enterprise Operating System (CentOS®) is now available with improved network interoperability through integration with the latest open-source ingredients. The Intel ONP reference architecture drives SDN/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 2.0 Improvements

One: Intel ONP 2.0 provides **complete integration with the first Intel® Xeon® processor-based SoC** designed for virtual environments. The Intel Xeon processor D-1500 product family delivers powerful performance enhancements, large memory capacity, and enhanced reliability, availability, and serviceability (RAS) features. The Intel Xeon Processor D-1500 is an ideal platform for SDN and NFV deployments.

Two: To expand commercial deployments and **encourage adoption of Intel ONP for commercial use**, this Intel ONP release includes an additional hardened OS, CentOS. CentOS corresponds to the major version of Red Hat Enterprise Linux® and is supported by Open Platform for NFV® (OPNFV®). Ongoing support for the Fedora® OS continues in this release.

Three: Stay current with **the latest SDN/NFV enabling open-source ingredients**. Intel ONP 2.0 supports the OpenStack® Liberty release (2015-10-15), which enables Enhanced Platform Awareness (EPA) features that improve network operation and management while exposing hardware and system capabilities.

Four: Intel ONP 2.0 supports the latest version of Data Plane Development Kit (DPDK), release 2.1.0, for high packet throughput on Intel® architecture-based platforms.

Five: With **improved integration of the latest open-source ingredients**, Intel ONP 2.0 enables excellent interoperability and reliability.

Intel Open Network Platform 2.0 Main Deliverables

Included among the deliverables bundled with Intel ONP 2.0 are:

Use Case Study: Service Function Chaining (SFC) is a vital requirement of NFV environments. SFC defines an ordered list of network services. The release 2.0 deliverables include a study of the SFC for a Gi-LAN use case with an analysis of industry status and open-source gaps to achieve market requirements.

Packet Processing Benchmark Report: The deliverables also include an extensive report detailing the packet processing benchmark results for Open vSwitch® (OVS) with DPDK on the newly introduced SoC, Intel® Xeon® Processor D-1540 (using eight cores). With this, Intel ONP users can make price and performance decisions by evaluating results from similar tests that have been performed using different 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 2.0 Ingredients

Intel ONP Release 2.0 introduces major feature enhancements and now delivers a fully integrated solution on the latest Intel® Xeon® processor D family, a 3rd-generation 64-bit System-on-a-Chip.

- OpenStack® Liberty release (2015-10-15)
- OpenDaylight® Lithium SR3 (2015-12-03)
- Open vSwitch® 2.4.9
- Data Plane Development Kit release 2.1.0
- Fedora® 22 release
- CentOS®-7.1
- Fedora 22 Real-Time Linux® Kernel, version: 3.18.24-rt22
- CentOS-7.1 Real-Time Kernel version 3.10.93-rt101-rebase
- Processors:
 - Intel® Xeon® processor D-1500 product family
 - Intel® Xeon® processor E5-2600 v3 product family
 - Intel® Atom™ processor C2000 product family
- Ethernet controllers:
 - Intel® Ethernet Controller X710-AM2 2x10 GbE
 - Intel® Ethernet Controller XL710-AM1 1x40 or 4x10 GbE ports

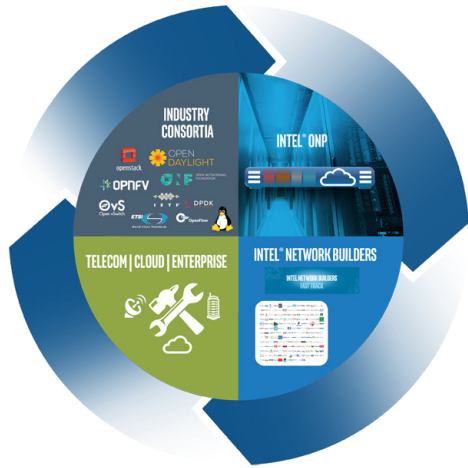


Figure 1. Market enablement with Intel® Open Network Platform.

Intel Open Network Platform Overview

The primary Intel ONP elements include the compute node, OpenDaylight* (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, the 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-standards projects. Contributions to projects and standards such as OVS, DPDK, OpenStack, and OpenDaylight have accelerated the development of Intel ONP; open-source code developed as part of the Intel ONP Server initiative is shared through the communities and 01.org.
- The Intel ONP reference architecture defines a test environment composed of the server, a control layer, and an OpenStack layer (see Figure 3). OpenStack and OpenDaylight 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 2.0 is delivered in these forms:

- **Release 2.0 Scripts.** Help quickly install the Intel ONP release 2.0 software stack based on open-source ingredients defined in Table 1 and Table 2.
- **Intel ONP Reference Architecture Guide Release.** Provides guidelines for configuring and installing the Intel ONP software stack and for validating the software in an SDN test environment. The software is running on a cost-effective SHVS based on Intel architecture.
- **Intel ONP Performance Benchmark Test Report.** Provides performance test results for Intel ONP 2.0 software on the Intel® Xeon® processor E5-2600 v3 product family and provides performance test results for the Intel ONP release 1.5 software on Intel® Xeon® processor D-1500 product family. Provides guidance for data plane characterization and performance measurements.

- **Intel ONP Dynamic Service Function Chaining (SFC) in Gi-LAN Study.** Provides a technology overview, industry status and gaps assessment, and complete technology evaluation when using the Intel ONP reference architecture.
- **Intel ONP vE-CPE Performance Test Report.** Provides vE-CPE guidelines for configuring systems and obtaining performance test results when testing the Intel ONP release 2.0 with Intel® Atom™ processor-based hardware platforms.
- **Intel® ONP Release Notes.** These notes detail the relevant technical information for each release.

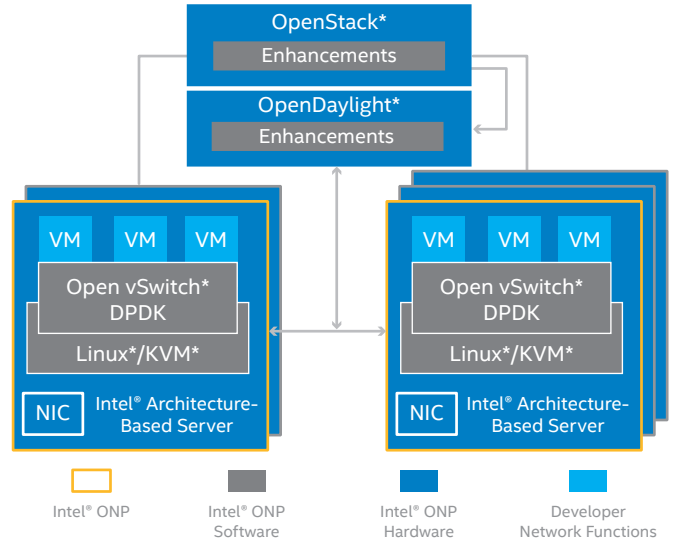


Figure 2. Key hardware and software ingredients in an Intel® Open Network Platform test environment.

Capitalizing on the Benefits of Intel Open Network Platform Server

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 and future open platforms.

Intel Open Network Platform Release 2.0 - Network Elements

Table 1. Compute Node software ingredients during testing of VNF components - vIPS and vBNG with OpenStack.

SOFTWARE COMPONENT	DESCRIPTION	VERSION/CONFIGURATION
Fedora* 22	Host operating system	Fedora 22 Server x86_64 Kernel version: 4.1.10-200.fc22.x86_64
CentOS*-7.1	Host operating system	CentOS-7 (1503) x86_64 DVD ISO Kernel version: 3.10.0-229.el7.x86_64
Real-Time Kernel	Addresses real-time requirements, such as low latency	Fedora 22 Real-Time Kernel version: 3.18.24-rt22 CentOS-7.1 Real-Time Kernel version: 3.10.93-rt101-rebase
QEMU-KVM*	Virtualization technology	QEMU-KVM version: 2.3.1-7.fc22.x86_64 libvirt version: 1.2.13.1-3.fc22.x86_64
Data Plane Development Kit (DPDK)	Network stack bypass and libraries for packet processing; includes user space vhost drivers	DPDK 2.1
Open vSwitch* (OVS)	Virtual switch	OVS 2.4.9

Table 2. Controller Node software ingredients used during testing of VNF components - vIPS and vBNG using OpenStack.

SOFTWARE COMPONENT	DESCRIPTION	VERSION/CONFIGURATION
Fedora* 22	Host operating system	Fedora 22 Server x86_64 Kernel version: 4.1.10-200.fc22.x86_64
CentOS*-7.1	Host operating system	CentOS-7 (1503) x86_64 DVD ISO Kernel version: 3.10.0-229.el7.x86_64
Real-Time Kernel	Addresses real-time requirements, such as low latency	Fedora 22 Real-Time Kernel version: 3.18.24-rt22 CentOS-7.1 Real-Time Kernel version: 3.10.93-rt101-rebase
Open vSwitch	Virtual switch	OVS 2.4.9
OpenStack*	Software-defined networking (SDN) orchestrator	OpenStack Liberty Release (2015-10-15)
OpenDaylight* (ODL)	SDN controller	OpenDaylight Lithium-SR3 (2015-12-03)

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

ITEM	DESCRIPTION	NOTES
Platform	Intel® Server Board S2600WTT	Intel® Xeon® processor-based DP server (with dual processors); 2x10 GbE integrated LAN ports; 120 GB SSD 2.5-inch SATA 6 GB/s; SSDSC2BB120G4; Supports SR-IOV
Processors	Dual Intel® Xeon® processor E5-2697 v3	14 cores, 28 threads; 2.6 - 3.6 GHz, 145 W, 35 MB total cache per processor; 9.6 GT/s Intel® Quick Path Interconnect (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 - 3.6 GHz, 145 W, 45 MB total cache per processor; 9.6 GT/s
Memory	64 GB DDR4 RDIMM Crucial CT8G4RFS423	24 memory sockets support LR/U/R/NV-DIMMs Supports up to 1.5 TB total memory.
NICs	Intel® Ethernet Converged Network Adapter X710-DA4	Intel® Ethernet Controller XL710-AM1; 4x10 GbE ports; Firmware version f4.33 a1.2 n04.42; 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 f4.33 a1.2 n04.42; Tested with Intel® E40QSFPSR transceiver
BIOS	SE5C610.8.01.01.0008.031920151331; Release date: 03/19/2015	Hyper-Threading enabled; Intel® Virtualization Technology (Intel® VT-x) enabled; Intel® Virtualization Technology 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

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

ITEM	DESCRIPTION	NOTES
Platform	SuperMicro SuperServer* 5018D-FN4T	Intel® Xeon® processor-based SoC server; Motherboard: SuperMicro X10SDV-8C-TLN4F; Dual LAN via Intel® i350-AM2 Gigabit Ethernet; Dual LAN via SoC 10GbBase-T; 500 GB HDD 3.5-in SATA 6 GB/s 7200 RPM 16 MB Seagate Barracuda ST500DM002
Processors	Intel® Xeon® Processor D-1540	8 cores, 16 threads, 2-2.6 GHz, 12 MB cache; Single Socket FCBGA 1667 supported; CPU TDP 45 W; System-on-a-Chip
	Intel® Xeon® processor D-1520	4 cores, 8 threads, 2.2-2.6 GHz, 6 MB cache; Single Socket FCBGA 1667; CPU TDP 45W; System-on-a-Chip
Memory	32 GB DDR4 2133 Reg ECC 1.2 V Kingston KVR21R15S4/8 Single Rank	4x DDR4 DIMM sockets; Supports up to 128 GB DDR4 ECC RDIMM; Supports up to 64 GB DDR4 ECC/non-ECC
BIOS	AMIBIOS Version: 1.0a; Release Date: 05/27/2015	Hyper-Threading enabled; Intel® Virtualization Technology (Intel® VT-x) enabled Intel® Virtualization Technology 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

Table 5. Platform based on the Intel® Atom™ processor C2758 used for benchmark testing the virtual CPE use case - hardware ingredients.

ITEM	DESCRIPTION	NOTES
Platform	SuperMicro SuperServer 5018A-FTN4	Intel® Atom™ processor-based server; Motherboard: SuperMicro A1Sri-2758F; 4x1 GbE integrated Intel® Ethernet C2000 SoC; i354 Quad GbE LAN ports; 120 GB SSD 2.5-inch SATA 6 GB/s; SSDSC2BB120G4
Processors	Intel® Atom™ processor C2758	8 cores, 8 threads, 2.4 GHz, 4 MB cache; CPU TDP 20W (8 core); FCBGA 1283; System-on-a-Chip
Memory	32 GB 1600MHZ DDR3L ECC CL11 SODIMM 1.35 V	4x 204-pin DDR3 SO-DIMM slots; Supports up to 64 GB DDR3 ECC memory
BIOS	AMIBIOS Version: 1.1; Release Date: 01/09/2015	Hyper-Threading not applicable Intel® Virtualization Technology (Intel® VT-x) enabled

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

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