

MAKING THE MOST OUT OF YOUR HYBRID CLOUD INFRASTRUCTURE

BOB CHAFFARI

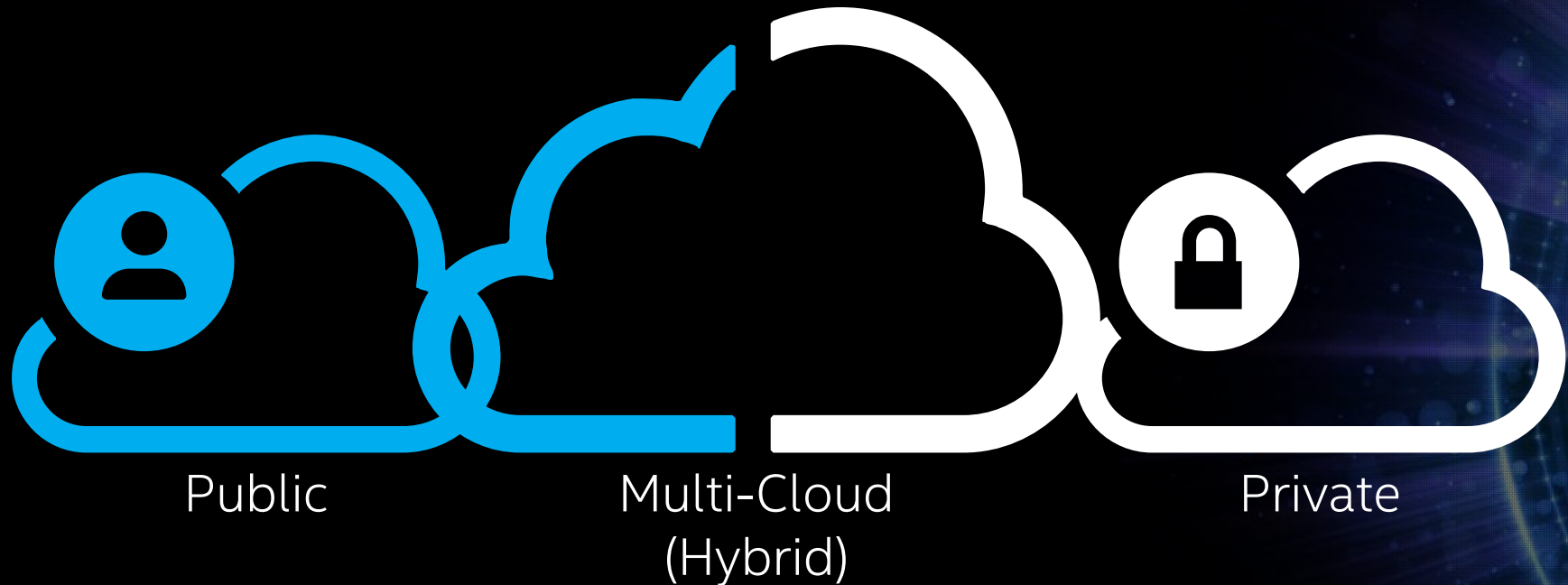
GENERAL MANAGER, ENTERPRISE & CLOUD NETWORKING, INTEL

GEORGE DRAPEAU

DIRECTOR, PARTNER SOLUTIONS AND TECHNOLOGY, RED HAT

MAY 7, 2019

MULTIPLE CLOUDS DRIVE BUSINESS SUCCESS



CLOUD ARCHITECTURE IS THE MOST EFFICIENT AND AGILE COMPUTING SOLUTION, REGARDLESS OF WHERE IT IS DEPLOYED.

TODAY'S DATA CENTERS MUST...



...manage an increasingly complex range of mission-critical workloads



...make difficult decisions about workload placement



...quickly deploy optimal infrastructure

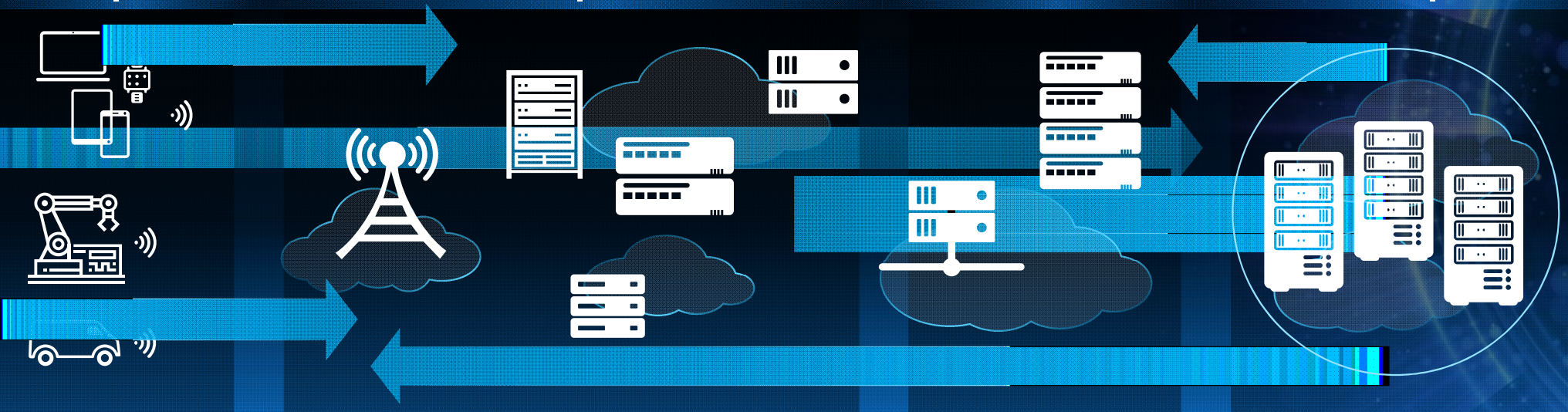
NETWORK KEY FROM EDGE TO CLOUD

DEVICES | THINGS

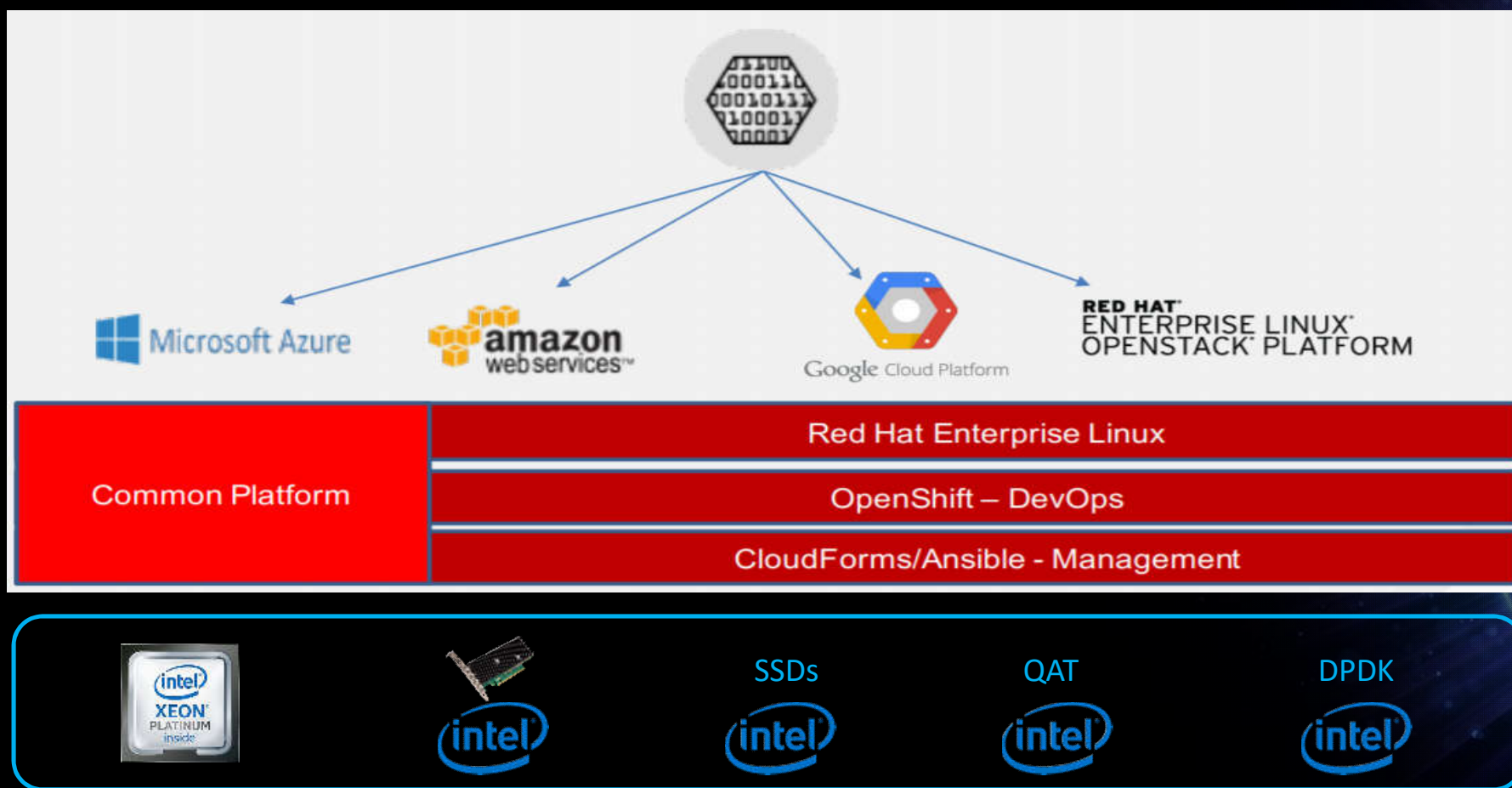
ACCESS | EDGE

CORE

DATA CENTER | CLOUD

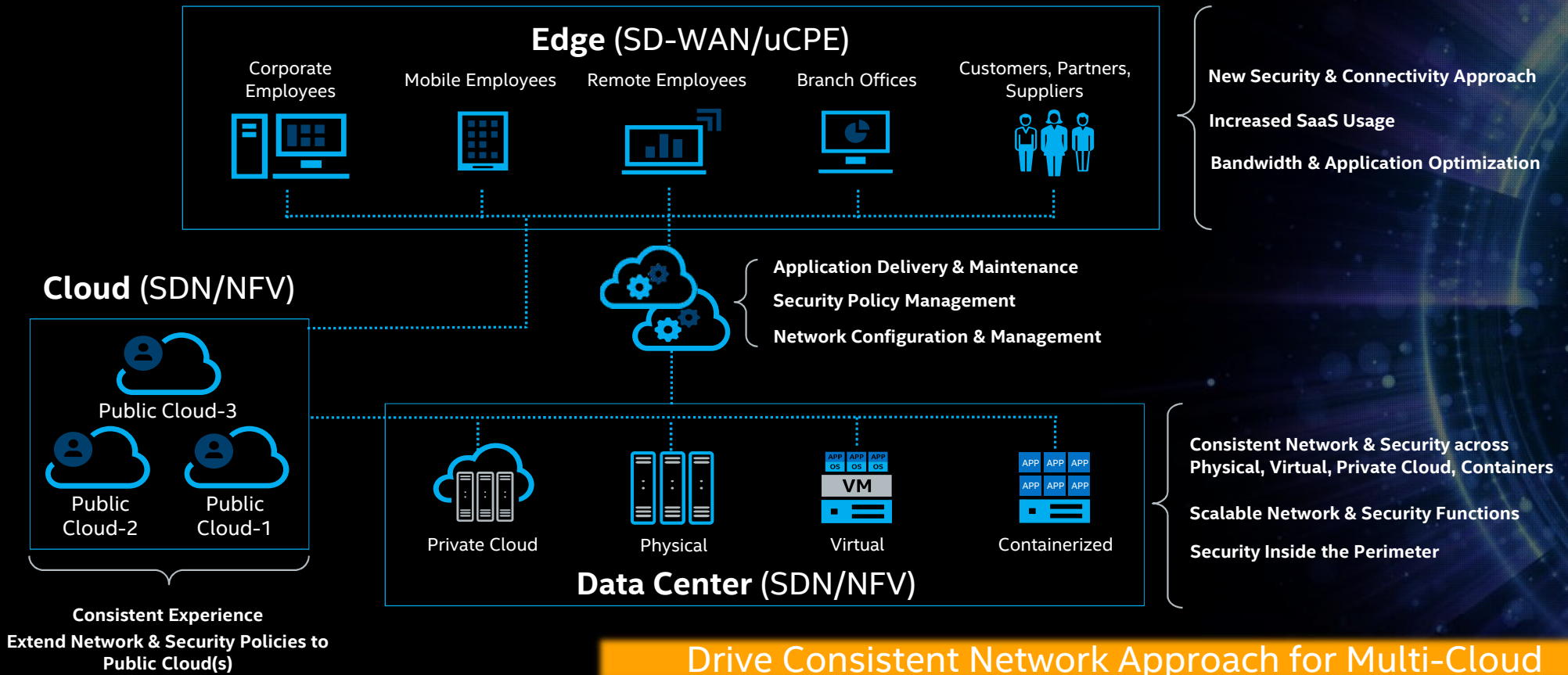


ARCHITECTING EDGE TO CLOUD FOR NETWORKING



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NETWORK TRANSFORMATION: EDGE TO CLOUD



NETWORK TRANSFORMATION ENABLES BUSINESS TRANSFORMATION

Customers want to virtualize the network to gain...



Various NFVi workloads to meet objectives and gain advantages

OBJECTIVES

Cloud Native and DevOps for Core to Edge

Digital Transformation of Networks

Scale Up and Down Rapidly

ADVANTAGES

High Resilience and Availability

Enable New Revenue Streams

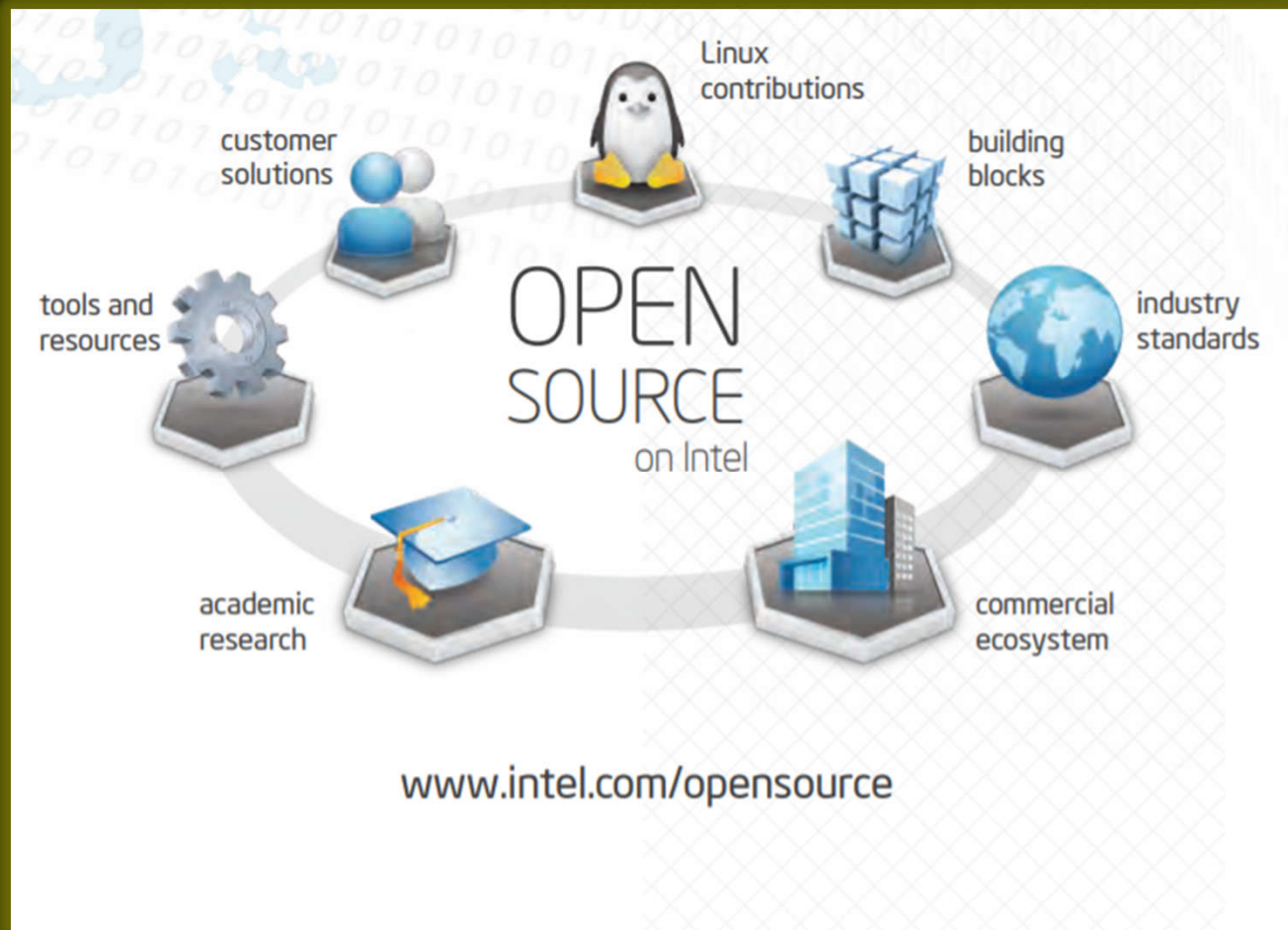
Rapid Innovation & Improved Customer Experiences

BALANCING ACT

Intel Solves



INTEL LEADING OPEN SOURCE INNOVATIONS



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OPEN SOURCE LEADERSHIP WITH NETWORKING

RAN



Edge



Security



Storage

Storage Performance Development Kit SPDK



Data Plane



Networking



Orchestration & Automation

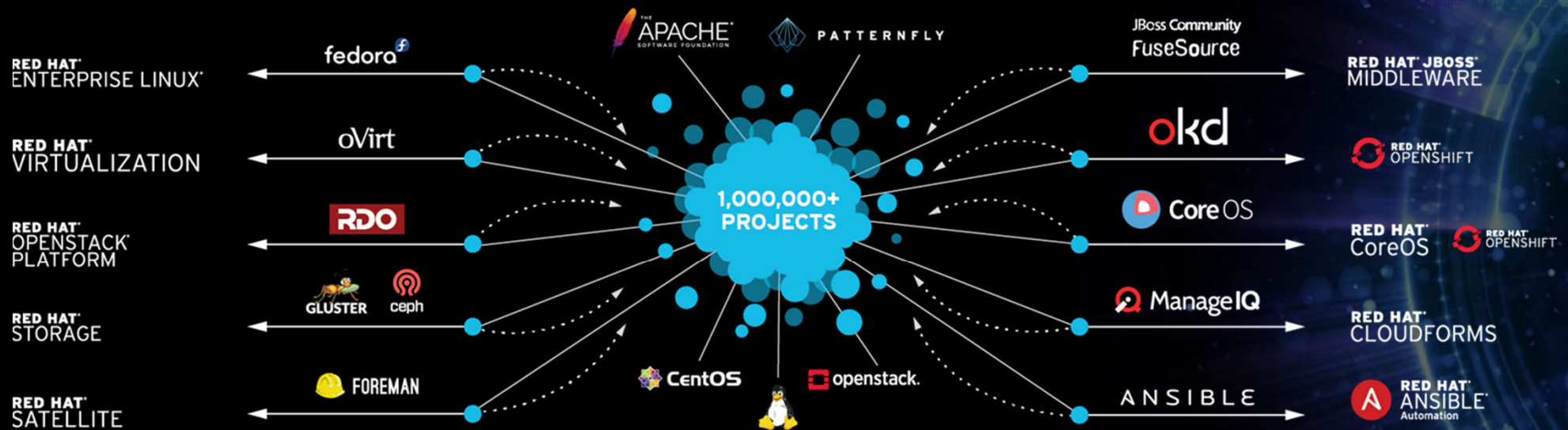


Core



- Contributions
- Convergence
- Commercial

FROM COMMUNITY TO ENTERPRISE

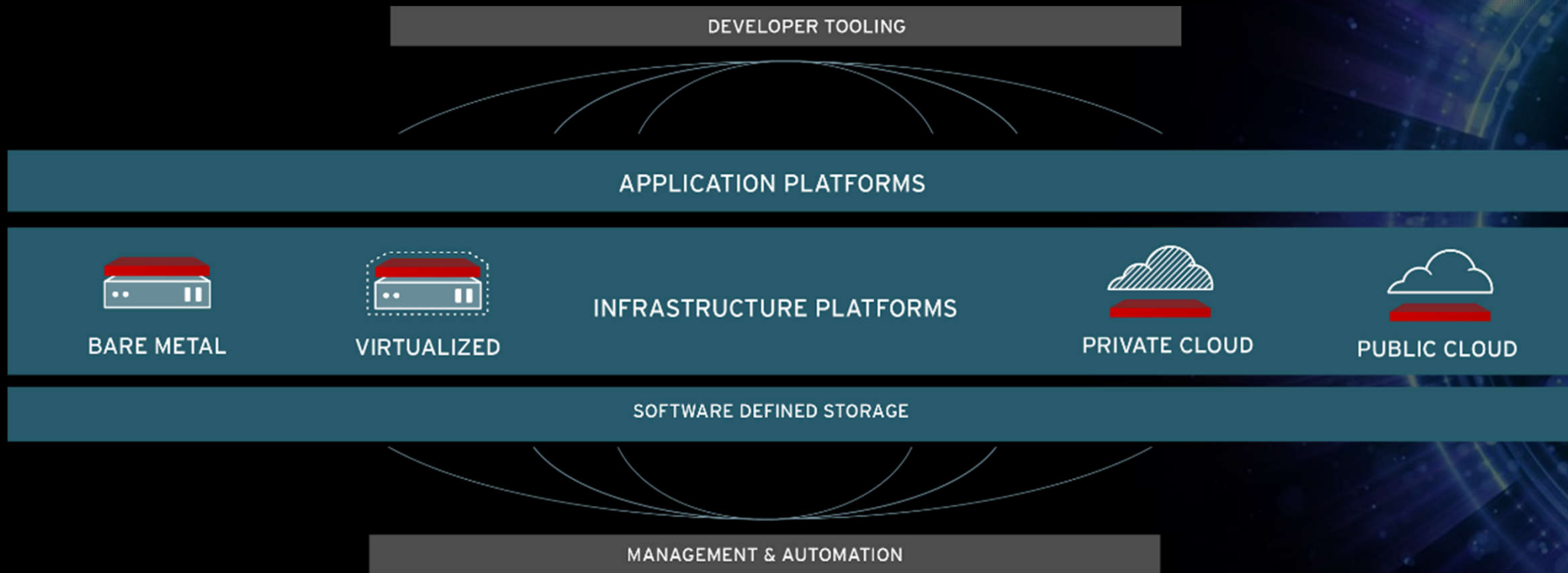


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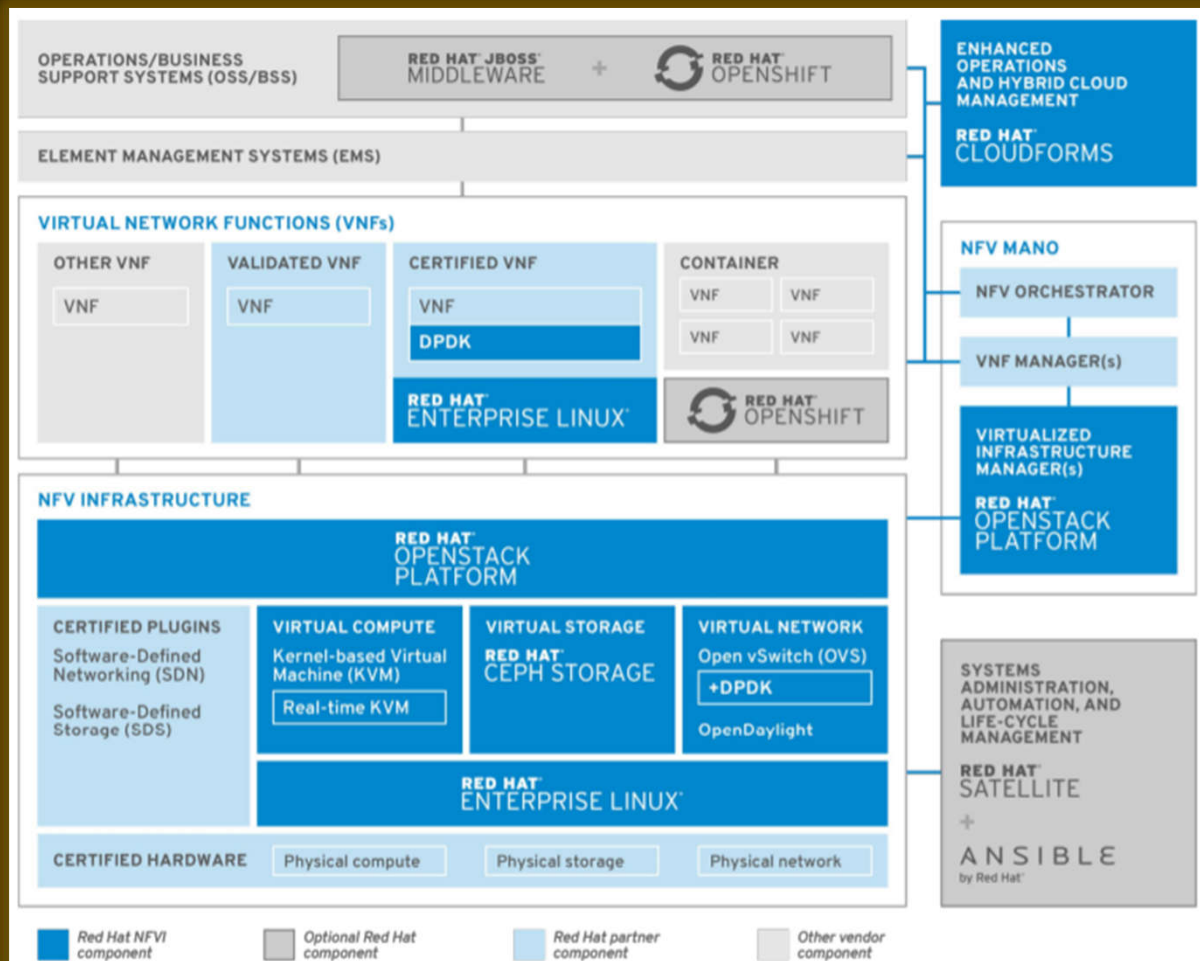
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RED HAT'S VISION: OPEN HYBRID CLOUD



RED HAT NFVI INFRASTRUCTURE AND PARTNER ECOSYSTEM



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RED HAT NFV PLATFORM, POWERED BY INTEL® XEON® SCALABLE PROCESSORS

Access the latest open source software and hardware technologies that have been optimized to work together to deliver:



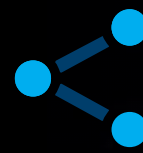
Optimized
performance



Advanced
security features



Improved
server uptime



Reduced
service disruptions



Simple
scalability

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark* and MobileMark*, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit [intel.com/performance](https://www.intel.com/performance).

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INTRODUCING INTEL® XEON® SCALABLE PROCESSORS

INTEL® XEON® PLATINUM 9200 PROCESSORS



A NEW CLASS OF
ADVANCED
PERFORMANCE

INTEL® XEON® PLATINUM 8200 PROCESSORS



INTEL® XEON® GOLD 6200 PROCESSORS



INTEL® XEON® GOLD 5200 PROCESSORS



INTEL® XEON® SILVER 4200 PROCESSORS



INTEL® XEON® BRONZE 3200 PROCESSORS



**BUILT-IN
VALUE**

LEADERSHIP WORKLOAD
PERFORMANCE

GROUNDBREAKING
MEMORY INNOVATION

EMBEDDED
ARTIFICIAL INTELLIGENCE
ACCELERATION

HARDWARE ENHANCED
SECURITY

ENHANCED
AGILITY & UTILIZATION



INTEL SECOND GENERATION XEON SCALABLE: GREAT FOR NETWORKING TOO!

PERFORMANCE LEADERSHIP

With up to 48 cores and 12 Memory Channels on Advanced Performance

WORKLOAD SPECIALIZED

DL Boost, Speed Select

NATIVE PERSISTENCE

Support for Optane DC
Persistent Memory



DL INFERENCE

UP
TO
17X

IMAGES PER SECOND vs Intel® Xeon® Platinum Processor (48 cores)

UP
TO
1.5X

SPECIALIZED NFV SKUS

NETWORK
FUNCTION
SPEEDUP

vs Intel® Xeon® Gold Processor (48 cores)

32%

VISUAL CLOUD SOLUTIONS

LOWER COST vs DRAM-based solutions with same capacity and performance

INTEL® XEON® SCALABLE PLATFORM: THE FOUNDATION AND CATALYST FOR HYBRID CLOUD

Performance results are based on estimates as of 12/11/2018 and may not reflect all publicly available security updates. Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit <http://www.intel.com/performance>.



WORLD'S FIRST XEON SCALABLE PROCESSORS SPECIALIZED FOR NETWORKING/NFV






UP
TO **1.23-1.58X** NFV WORKLOAD²⁻⁸
PERFORMANCE IMPROVEMENT

ADDITIONAL PROCESSING HEADROOM DELIVERS
ENHANCED VM/NFV CAPACITY AND DENSITY

HANDLE MORE SUBSCRIBER CAPACITY
AND MOBILE SERVICES

REDUCED BOTTLENECKS FOR
FIXED AND MOBILE 5G NETWORKS

NETWORKING SPECIALIZED "N" PROCESSORS

	6552N	24	2.3GHZ	150W	
	6230N	20	2.3GHZ	125W	
	5218N	16	2.3GHZ	105W	

FEATURING
INTEL® SPEED SELECT TECHNOLOGY
WITH PRIORITIZED BASE FREQUENCY (INTEL® SST-BF)

NEW IN 2019
"N"-BASED NFV
SOLUTIONS



Performance results are based on testing as of dates shown in configuration and may not reflect all publicly available security updates. See configuration disclosure for details. No product or component can be absolutely secure. Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more complete information visit www.intel.com/benchmarks. Configurations – see backup

VM: VIRTUAL MACHINE
NFV: NETWORK FUNCTION VIRTUALIZATION

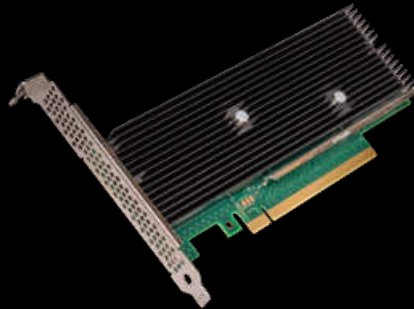


F5 NETWORKS* BIG-IP WITH SECOND GENERATION INTEL® XEON® SCALABLE PROCESSORS AND INTEL® QUICKASSIST® TECHNOLOGY

✓ Platform



+



=

Second Generation Intel®
Xeon Scalable Platform:
“N” Processors

Intel® QuickAssist
(QAT) Acceleration
Adapter 8970

✓ Network Functions W/Acceleration

F5 BIG-IP
Optimized !



F5 NETWORKS* BIG-IP WITH SECOND GENERATION INTEL® XEON® SCALABLE PROCESSORS AND INTEL® QUICKASSIST® TECHNOLOGY¹

F5 Networks*

Virtual Firewall (TLS)

2.4x

Throughput 6230N+QAT vs
6230N

F5 Networks*

Virtual Firewall (TLS)

6.4x

TPS 6230N+QAT vs 6230N



More Throughput, More TPS

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INTEL AND RED HAT*: BETTER TOGETHER

BETTER TOGETHER

- Have co-developed deployable architecture solutions for 20+ years
- Jointly collaborate upstream to help enable the availability of innovative open technologies
- Share a vision to accelerate, simplify, and improve Red Hat OpenShift*
- Help organizations navigate digital transformation with solutions that deliver choice, flexibility, and innovation

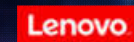
INNOVATION AND PERFORMANCE

Majority of Fortune 500 companies
use Red Hat Enterprise Linux*¹

The majority of the world's clouds
are powered by Intel® Xeon® processors²

CHOICE, WITHOUT VENDOR LOCK-IN

OEMs certified for Red Hat solutions
choose Intel® processors³



On-premises and cloud

¹ Source: Red Hat. "Meet Business Goals with Intel and Red Hat." 2016. redhat.com/en/files/resources/pa-intel-business-goals-brochure-inc0345277mm-201601-en.pdf.

² Wired. "Intel Can't Win Mobile, but It Owns the Cloud—For Now." April 2016. [wired.com/2016/04/intel-smart-declare-cloud-company-now/](https://www.wired.com/2016/04/intel-smart-declare-cloud-company-now/).

³ Red Hat. "Red Hat Certification: Get Certified. Hire Certified." redhat.com/en/services/certification.

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CALL TO ACTION

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Visit the Intel Booth # 515

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CONFIGURATION—APPLICATION PERFORMANCE SECOND GENERATION INTEL® XEON® GOLD PROCESSORS WITH INTEL® QUICKASSIST® TECHNOLOGY

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1. F5 Networks* Gi-Lan: Configuration #1: 2x Intel® Xeon® Gold E5-6230N Processor on Neon City Platform with 192 GB total memory (12 slots / 16GB / DDR4 2667MHz), ucode 0x4000019, Bios: PLYXCRB1.86B.0568.D10.1901032132, uCode: 0x4000019 on CentOS 7.5 with Kernel 3.10.0-862, KVM Hypervisor; 1 x Intel® QuickAssist Adapter 8970, TLS1.2: AES128-GCM-SHA256 2K key with 3x QAT Physical Functions (End-Point); 1 x Dual Port 40GbE Intel® Ethernet Network Adapter XL710; Application: BIG-IP Virtual Edition (VE) v14.1 (BETA Version with QAT Enabled); Configuration #2: 2x Intel® Xeon® Gold E5-6230 Processor on Neon City Platform with 192 GB total memory (12 slots / 16GB / DDR4 2667MHz), ucode 0x4000019, Bios: PLYXCRB1.86B.0568.D10.1901032132, uCode: 0x4000019 on CentOS 7.5 with Kernel 3.10.0-862, KVM Hypervisor; 1 x Dual Port 40GbE Intel® Ethernet Network Adapter XL710; Application: BIG-IP Virtual Edition (VE) v14.1 (BETA Version with no QAT); Results recorded by F5 on 3/27/2018.
2. Up to 1.25 to 1.58X NVF Workload Performance Improvement comparing Intel® Xeon® Gold 6230N processor to Intel® Xeon® Gold 6130 processor.
3. VPP IP Security: Tested by Intel on 1/17/2019 1-Node, 2x Intel® Xeon® Gold 6130 Processor on Neon City platform with 12x 16GB DDR4 2666MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 6x Intel XXV710-DA2, Bios: PLYDCRB1.86B.0155.R08.1806130538, ucode: 0x200004d (HT= ON, Turbo= OFF), OS: Ubuntu* 18.04 with kernel: 4.15.0-42-generic, Benchmark: VPP IPsec w/AESNI (AES-GCM-128) (Max Gbits/s (1420B)), Workload version: VPP v17.10, Compiler: gcc7.3.0, Results: 179. Tested by Intel on 1/17/2019 1-Node, 2x Intel® Xeon® Gold 6230N Processor on Neon City platform with 12x 16GB DDR4 2999MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 6x Intel XXV710-DA2, Bios: PLYXCRB1.PFT.0569.D08.1901141837, ucode: 0x4000019 (HT= ON, Turbo= OFF), OS: Ubuntu* 18.04 with kernel: 4.20.0-042000rc6-generic, Benchmark: VPP IPsec w/AESNI (AES-GCM-128) (Max Gbits/s (1420B)), Workload version: VPP v17.10, Compiler: gcc7.3.0, Results: 225
4. VPP FIB: Tested by Intel on 1/17/2019 1-Node, 2x Intel® Xeon® Gold 6130 Processor on Neon City platform with 12x 16GB DDR4 2666MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 6x Intel XXV710-DA2, Bios: PLYDCRB1.86B.0155.R08.1806130538, ucode: 0x200004d (HT= ON, Turbo= OFF), OS: Ubuntu* 18.04 with kernel: 4.15.0-42-generic, Benchmark: VPP FIB (Max Mpackets/s (64B)), Workload version: VPP v17.10 in ipv4fib configuration, Compiler: gcc7.3.0, Results: 160. Tested by Intel on 1/17/2019 1-Node, 2x Intel® Xeon® Gold 6230N Processor on Neon City platform with 12x 16GB DDR4 2999MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 6x Intel XXV710-DA2, Bios: PLYXCRB1.PFT.0569.D08.1901141837, ucode: 0x4000019 (HT= ON, Turbo= OFF), OS: Ubuntu* 18.04 with kernel: 4.20.0-042000rc6-generic, Benchmark: VPP FIB (Max Mpackets/s (64B)), Workload version: VPP v17.10 in ipv4fib configuration, Compiler: gcc7.3.0, Results: 212.9
5. Virtual Firewall: Tested by Intel on 10/26/2018 1-Node, 2x Intel® Xeon® Gold 6130 Processor on Neon City platform with 12x 16GB DDR4 2666MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 4x Intel X710-DA4, Bios: PLYDCRB1.86B.0155.R08.1806130538, ucode: 0x200004d (HT= ON, Turbo= OFF), OS: Ubuntu* 18.04 with kernel: 4.15.0-42-generic, Benchmark: Virtual Firewall (64B Mpps), Workload version: opnfv 6.2.0, Compiler: gcc7.3.0, Results: 38.9. Tested by Intel on 2/04/2019 1-Node, 2x Intel® Xeon® Gold 6230N Processor on Neon City platform with 12x 16GB DDR4 2999MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 6x Intel XXV710-DA2, Bios: PLYXCRB1.PFT.0569.D08.1901141837, ucode: 0x4000019 (HT= ON, Turbo= OFF), OS: Ubuntu* 18.04 with kernel: 4.20.0-042000rc6-generic, Benchmark: Virtual Firewall (64B Mpps), Workload version: opnfv 6.2.0, Compiler: gcc7.3.0, Results: 52.3
6. Virtual Broadband Network Gateway: Tested by Intel on 11/06/2018 1-Node, 2x Intel® Xeon® Gold 6130 Processor on Neon City platform with 12x 16GB DDR4 2666MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 6x Intel XXV710-DA2, Bios: PLYDCRB1.86B.0155.R08.1806130538, ucode: 0x200004d (HT= ON, Turbo= OFF), OS: Ubuntu* 18.04 with kernel: 4.15.0-42-generic, Benchmark: Virtual Broadband Network Gateway (88B Mpps), Workload version: DPDK v18.08 ip_pipeline application, Compiler: gcc7.3.0, Results: 56.5. Tested by Intel on 1/2/2019 1-Node, 2x Intel® Xeon® Gold 6230N Processor on Neon City platform with 12x 16GB DDR4 2999MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 6x Intel XXV710-DA2, Bios: PLYXCRB1.PFT.0569.D08.1901141837, ucode: 0x4000019 (HT= ON, Turbo= OFF), OS: Ubuntu* 18.04 with kernel: 4.20.0-042000rc6-generic, Benchmark: Virtual Broadband Network Gateway (88B Mpps), Workload version: DPDK v18.08 ip_pipeline application, Compiler: gcc7.3.0, Results: 78.7
7. VCMTS: Tested by Intel on 1/22/2019 1-Node, 2x Intel® Xeon® Gold 6130 Processor on Supermicro*-X11DPH-Tq platform with 12x 16GB DDR4 2666MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 4x Intel XXV710-DA2, Bios: American Megatrends Inc.* version: '2.1', ucode: 0x200004d (HT= ON, Turbo= OFF), OS: Ubuntu* 18.04 with kernel: 4.20.0-042000rc6-generic, Benchmark: Virtual Converged Cable Access Platform (iMIX Gbps), Workload version: vcmts 18.10, Compiler: gcc7.3.0, Other software: Kubernetes* 1.11, Docker* 18.06, DPDK 18.11, Results: 54.8. Tested by Intel on 1/22/2019 1-Node, 2x Intel® Xeon® Gold 6230N Processor on Neon City platform with 12x 16GB DDR4 2999MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 6x Intel XXV710-DA2, Bios: PLYXCRB1.PFT.0569.D08.1901141837, ucode: 0x4000019 (HT= ON, Turbo= OFF), OS: Ubuntu* 18.04 with kernel: 4.20.0-042000rc6-generic, Benchmark: Virtual Converged Cable Access Platform (iMIX Gbps), Workload version: vcmts 18.10, Compiler: gcc7.3.0, Other software: Kubernetes* 1.11, Docker* 18.06, DPDK 18.11, Results: 83.7
8. OVS DPDK: Tested by Intel on 1/21/2019 1-Node, 2x Intel® Xeon® Gold 6130 Processor on Neon City platform with 12x 16GB DDR4 2666MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 4x Intel XXV710-DA2, Bios: PLYXCRB1.86B.0568.D10.1901032132, ucode: 0x4000019 (HT= ON, Turbo= OFF), OS: Ubuntu* 18.04 with kernel: 4.15.0-42-generic, Benchmark: Open Virtual Switch (on 4C/4P/8T 64B Mpacket/s), Workload version: OVS 2.10.1, DPDK-17.11.4, Compiler: gcc7.3.0, Other software: QEMU-2.12.1, VPP v18.10, Results: 9.6. Tested by Intel on 1/18/2019 1-Node, 2x Intel® Xeon® Gold 6230N Processor on Neon City platform with 12x 16GB DDR4 2999MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 6x Intel XXV710-DA2, Bios: PLYXCRB1.86B.0568.D10.1901032132, ucode: 0x4000019 (HT= ON, Turbo= OFF), OS: Ubuntu* 18.04 with kernel: 4.20.0-042000rc6-generic, Benchmark: Open Virtual Switch (on 6P/6C/12T 64B Mpacket/s), Workload version: OVS 2.10.1, DPDK-17.11.4, Compiler: gcc7.3.0, Other software: QEMU-2.12.1, VPP v18.10, Results: 15.2. Tested by Intel on 1/18/2019 1-Node, 2x Intel® Xeon® Gold 6230N Processor with SST-BF enabled on Neon City platform with 12x 16GB DDR4 2999MHz (384GB total memory), Storage: 1x Intel® 240GB SSD, Network: 6x Intel XXV710-DA2, Bios: PLYXCRB1.86B.0568.D10.1901032132, ucode: 0x4000019 (HT= ON, Turbo= ON (SST-BF)), OS: Ubuntu* 18.04 with kernel: 4.20.0-042000rc6-generic, Benchmark: Open Virtual Switch (on 6P/6C/12T 64B Mpacket/s), Workload version: OVS 2.10.1, DPDK-17.11.4, Compiler: gcc7.3.0, Other software: QEMU-2.12.1, VPP v18.10, Results: 16.9

