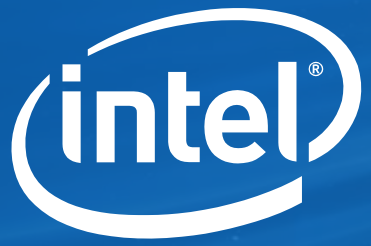

Re-architecting Communication Service Providers

Oren Benisty
Director, New Services
DCG sales, Communication Service Providers

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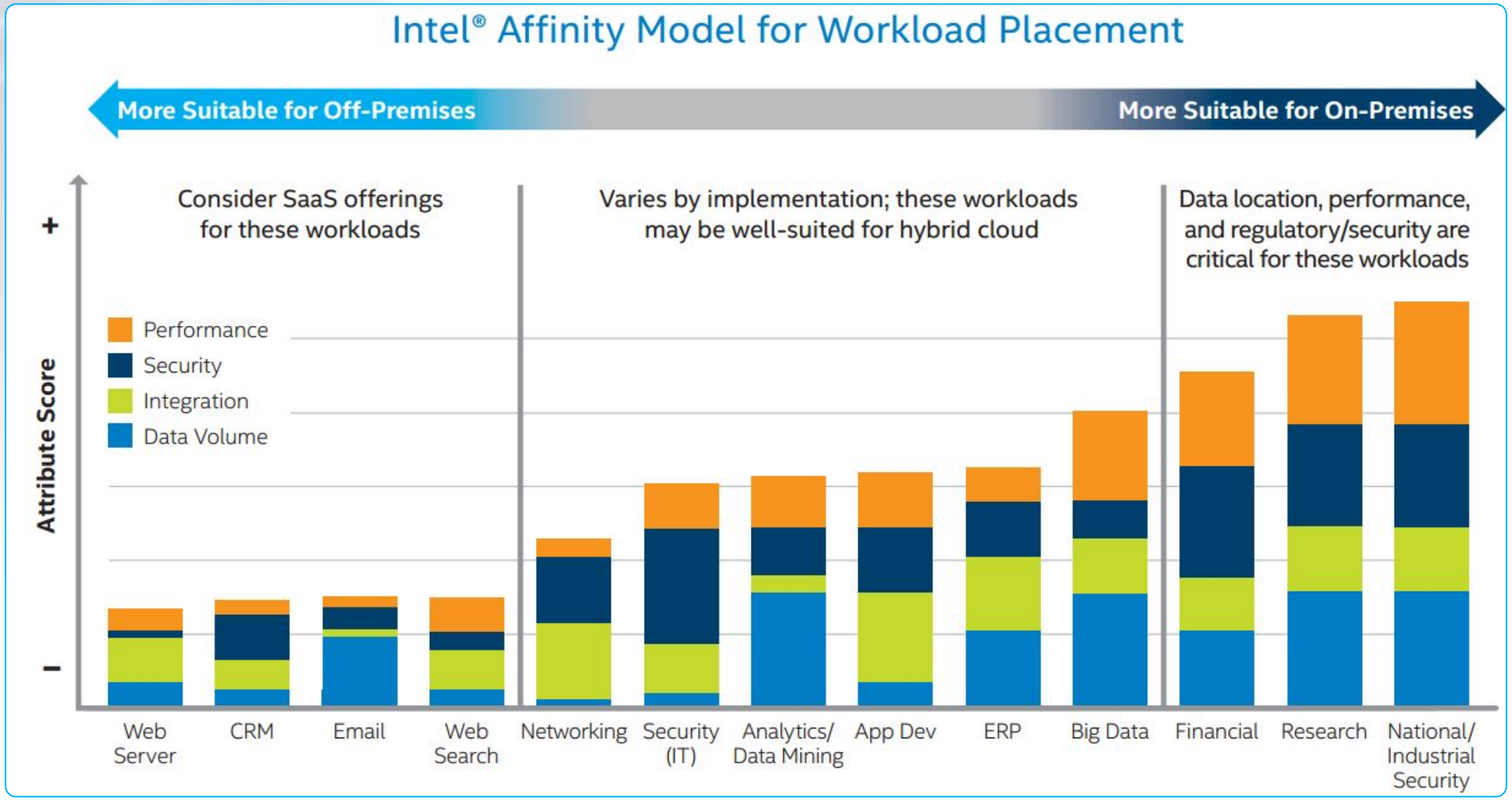
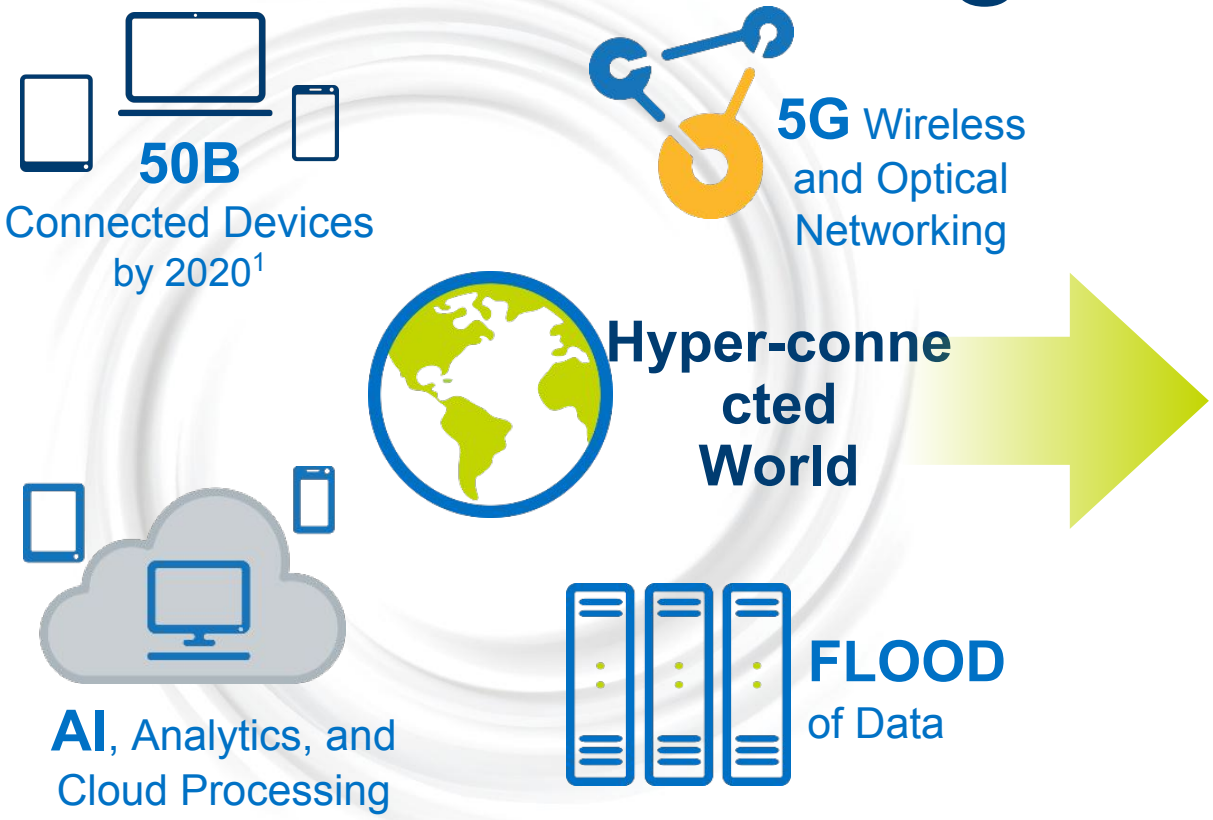
Software Defined infrastructure

Intel Affinity Model for Workload Placement

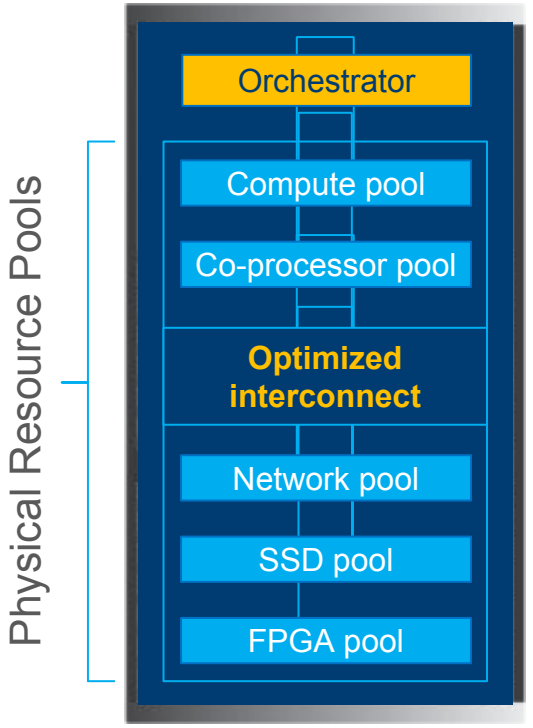


Source: Optimal Workload Placement for Public, Hybrid, and Private Clouds.
https://www.intel.com/content/www/us/en/cloud-computing/enterprise-cloud-computing/optimal-workload-placement-for-public-hybrid-and-private-clouds-white-paper.html

Digital Transformation IS Driving Data center "Re-design"



Intel® Rack Scale Design



Benefits

Standards Based

Modular Upgrade

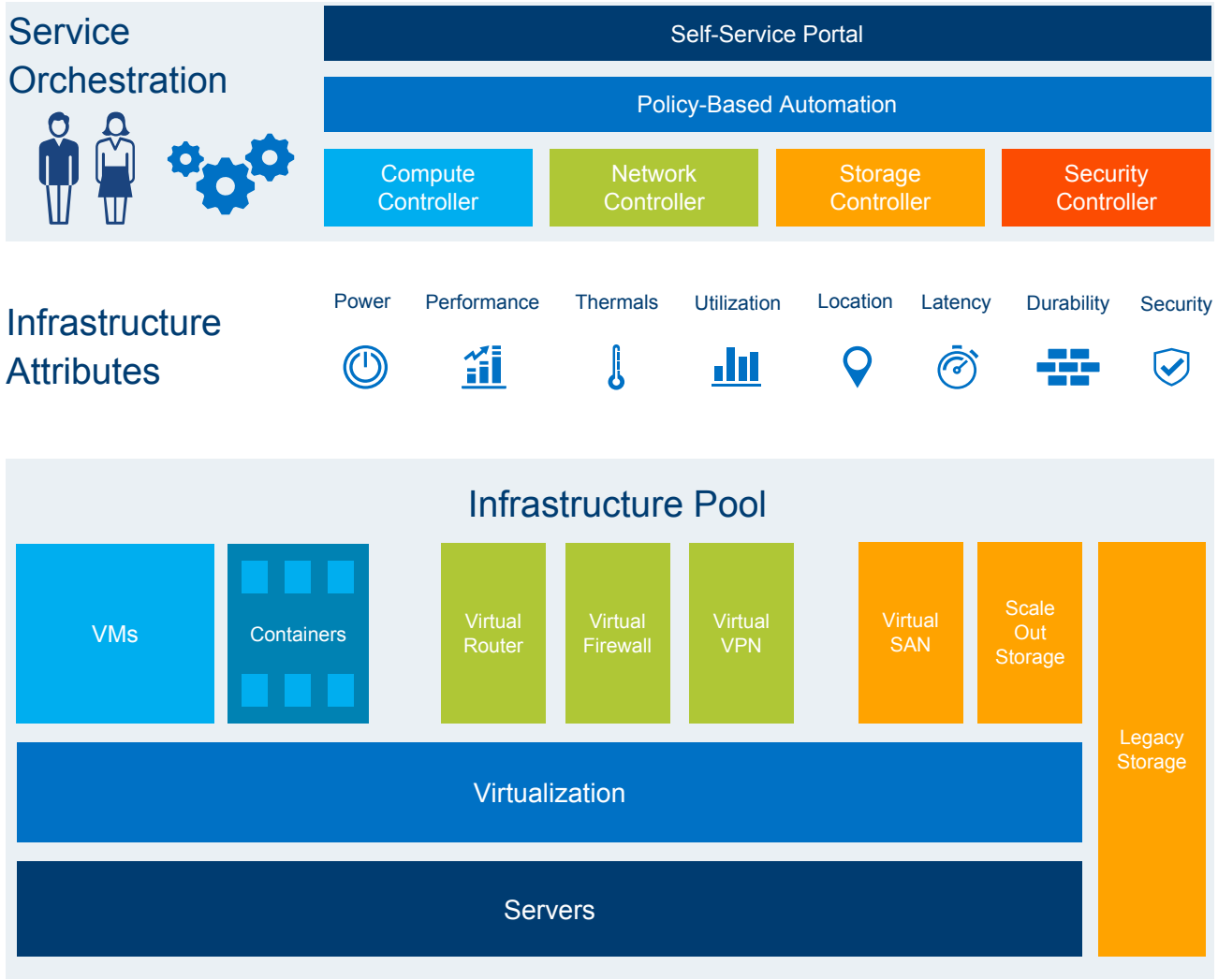
Higher Utilization

Better Performance

"A revolutionary, new architecture that fundamentally changes the way a data center ***is built, managed, and expanded over time****"*

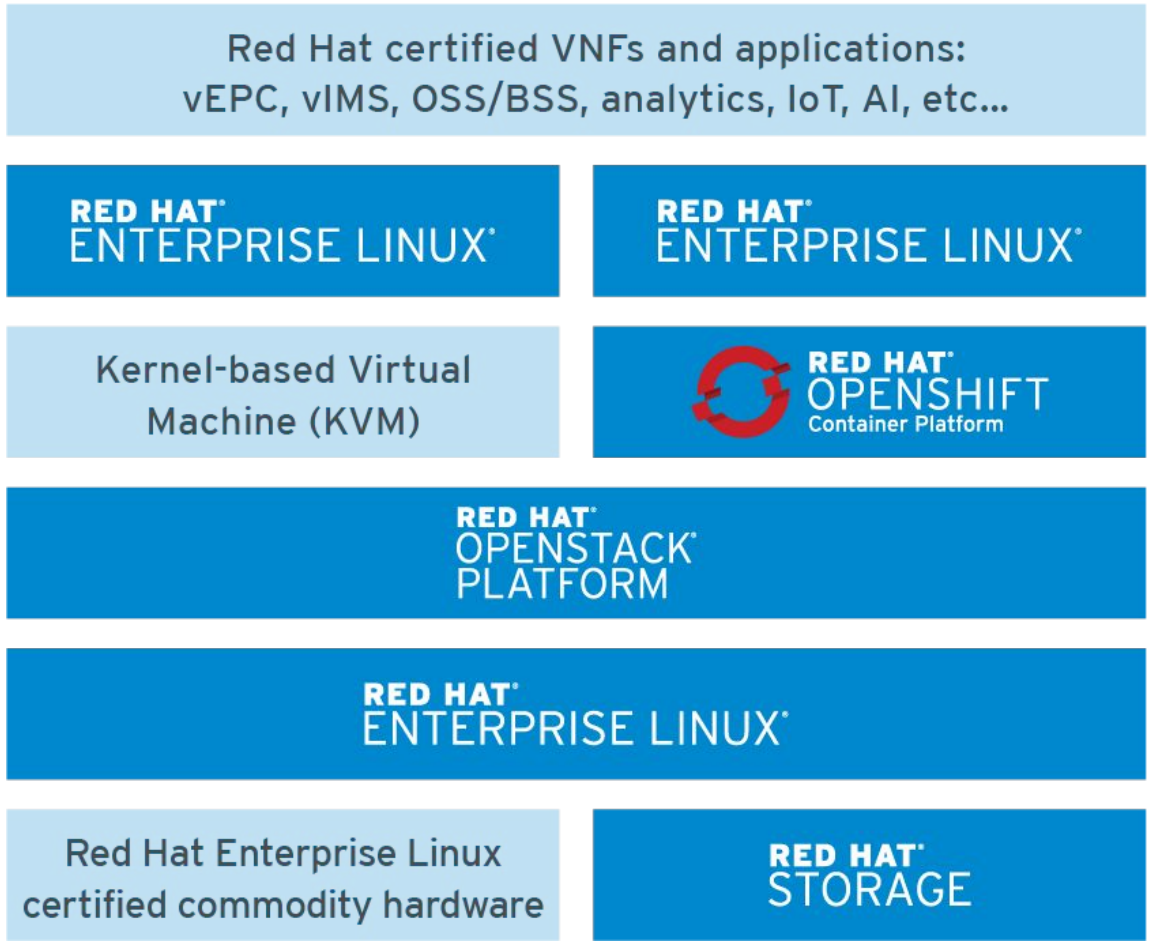
Deploy Software-Defined Infrastructure

- Centralized and Automated
- Platform Capability Aware
- Pooled, Virtualized Resources
- Readily Available Server-based Platforms
- Accommodates Legacy



Red Hat Telco Cloud / NFV Infrastructure

OpenStack IaaS with OpenShift Container PaaS



Common Infrastructure for all workloads:

- Supports VNFs and applications on Virtual Machines or containers
- Scales by adding x86 servers and commodity switches
- Red Hat certification of stack from application through hardware ensures full stack supportability
- Management and automation with CloudForms and Ansible

Applications are rapidly migrating from VMs to containers, and VNFs are expected to follow

Intel select solutions

Introducing: Intel Select Solutions

intel select solution

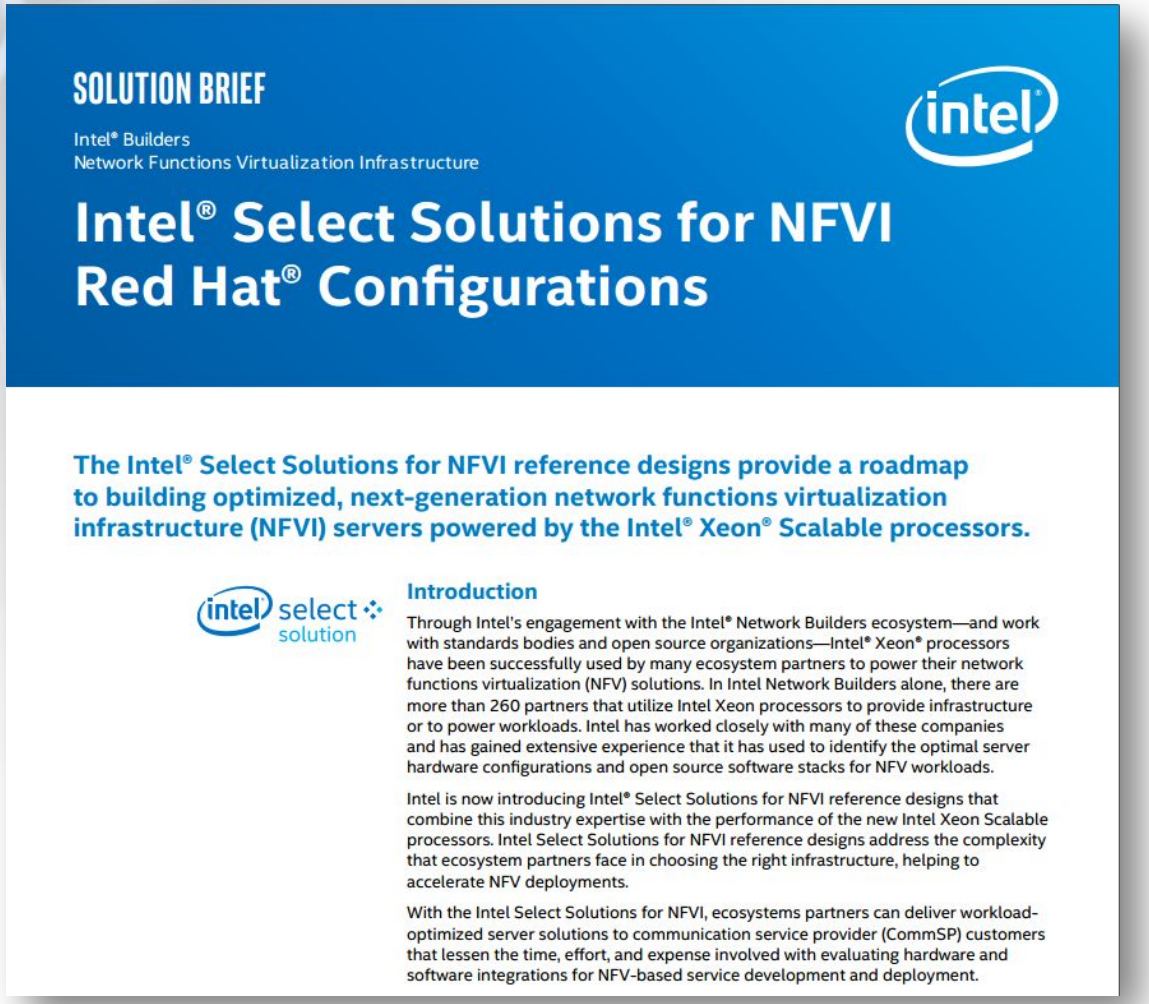
Simplified evaluatio — Tightly-specified HW and SW components, eliminating guesswork

Fast and easy — Pre-defined settings and system-wide tuning, enabling smooth deployment

Workload Optimize d — Designed and benchmarked to perform optimally for specific workloads

All Intel® Select Solution configurations and benchmark results are verified by Intel

Intel Select solution for NFVi



SOLUTION BRIEF

Intel® Builders
Network Functions Virtualization Infrastructure

Intel® Select Solutions for NFVI Red Hat® Configurations

The Intel® Select Solutions for NFVI reference designs provide a roadmap to building optimized, next-generation network functions virtualization infrastructure (NFVI) servers powered by the Intel® Xeon® Scalable processors.

Introduction

Through Intel's engagement with the Intel® Network Builders ecosystem—and work with standards bodies and open source organizations—Intel® Xeon® processors have been successfully used by many ecosystem partners to power their network functions virtualization (NFV) solutions. In Intel Network Builders alone, there are more than 260 partners that utilize Intel Xeon processors to provide infrastructure or to power workloads. Intel has worked closely with many of these companies and has gained extensive experience that it has used to identify the optimal server hardware configurations and open source software stacks for NFV workloads.

Intel is now introducing Intel® Select Solutions for NFVI reference designs that combine this industry expertise with the performance of the new Intel Xeon Scalable processors. Intel Select Solutions for NFVI reference designs address the complexity that ecosystem partners face in choosing the right infrastructure, helping to accelerate NFV deployments.

With the Intel Select Solutions for NFVI, ecosystems partners can deliver workload-optimized server solutions to communication service provider (CommSP) customers that lessen the time, effort, and expense involved with evaluating hardware and software integrations for NFV-based service development and deployment.

intel select solution

What are Intel® Select Solutions?

Intel® Select Solutions are verified hardware and software stacks that are optimized for specific software workloads across compute, storage, and network. The solutions are developed from deep Intel experience with ISV and OEM/ODM industry partners, as well as extensive collaboration with the world's leading data center and service providers.

To qualify as an Intel Select Solution, solution providers must:

1. Follow the software and hardware stack requirements outlined by Intel
2. Replicate or exceed Intel's reference benchmark-performance threshold
3. Publish a detailed implementation guide to facilitate customer deployment

Solution providers can develop their own optimizations to add further value to the solutions.

- https://builders.intel.com/docs/networkbuilders/intel-select-solutions-for-nfvi-red-hat-configurations.pdf
- https://builders.intel.com/blog/accelerating-nfvi-with-one-size-fits-most-configurations/

Intel® Select Solutions for NFVI Red Hat® Configurations

Solution Brief | Intel® Select Solutions for NFVI Red Hat® Configurations

	INGREDIENT	SW NAME AND VERSION DETAILS	
FIRMWARE		BIOS	SE5C620.86B.0X.01.0038
		BMC	1.22.e97391bd
		Firmware for Intel® Ethernet Controller XXV710	47059_5p41
		Firmware for Intel® Ethernet Server Adapter X520-DA	E68793-005_rev1_0
HOST	Development Kit	DPDK	16.11
	OS	RHEL®	RHEL 7.3 (kernel 3.10.0-514)
	Hypervisor	KVM/QEMU*	1.5.3
	Libvirt	Libvirt*	2.0.0
	Drivers	Intel® QAT	1.7-L.1.0.3-42
		i40e	2.1.26
		ixgbe	5.0.4
GUEST	Development Kit	DPDK	16.11
		CentOS*	CentOS 7.2 (kernel 3.10.0-327.1.el7)
		RHEL®	RHEL 7.2 (kernel 3.10.0-327.1.el7)
	Drivers	i40evf	3.0.8
		ixgbevf	4.0.3

Table 2. An example software stack for the initial Intel Select Solutions for NFVI. (With ongoing testing and optimization collaboration, version levels and components are subject to change over time.)

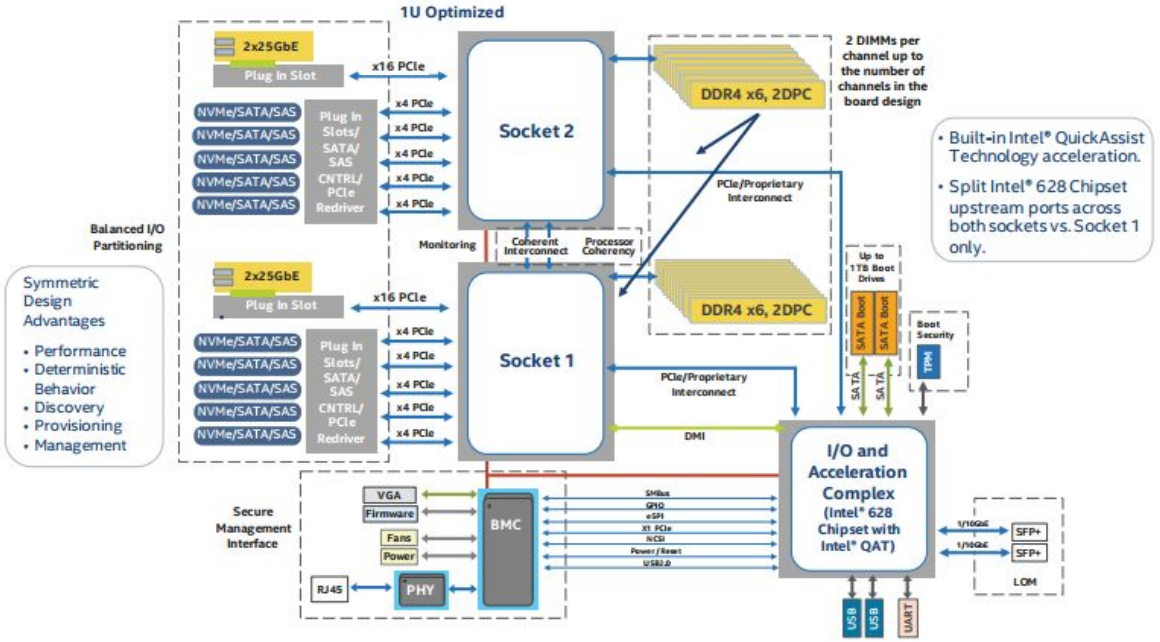


Figure 1. An example hardware design of an Intel Select Solution for NFVI shows symmetric design advantages and dual-CPU socket access to Intel QuickAssist Technology (Intel QAT) resources.

Why Xeon Scalable Platform

A Glimpse Inside the Intel® Xeon® Scalable platform

Workload optimized frameworks & telemetry
(e.g. Caffe*, Intel® DAAL, Intel® MKL, DPDK, SNAP*, SPDK)

performa security Agility

Advancing virtually every aspect: Brand New core,
cache, on-die interconnects, memory controller & more

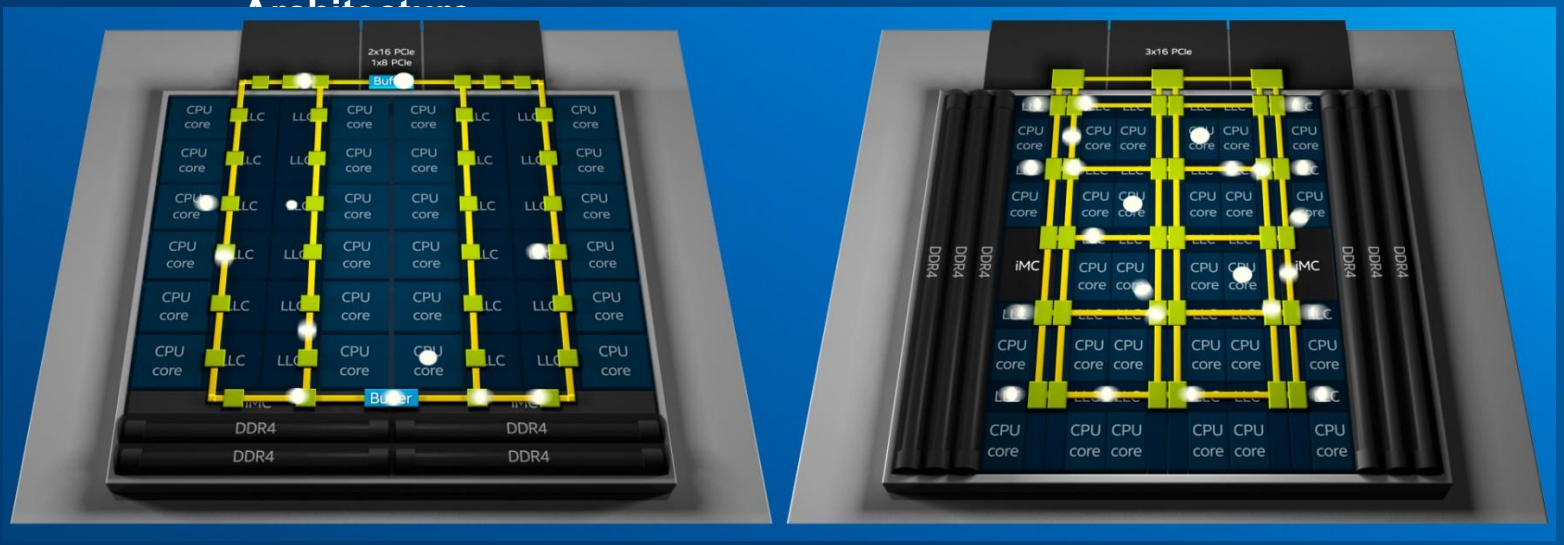
Intel® Advanced Vector Extensions 512 (Intel® AVX-512)
Intel® Volume Management Device (Intel® VMD)
Intel® Data Analytics Acceleration Library (Intel® DAAL)

Intel® Math Kernel Library (Intel® MKL)
Storage Performance Development Kit (SPDK)

Breakthrough CPU Design: Intel® Mesh Architecture

Ring

Mesh



2009-2017+

New in 2017

- ✓ **Maximizes performance**
- ✓ **Enables consistent, low latencies**
- ✓ **Optimized for data** sharing and memory access between all CPU cores/threads for ideal memory bandwidth and capacity
- ✓ **Data flows scale efficiently** for 2, 4 & 8+ socket configurations
  - ✓ Designed for modern virtualized and hybrid cloud implementations

Designed for next-generation Data Centers

intel

INTEL® XEON® SCALABLE processors

The Foundation for Agile, Secure, Workload-Optimized Hybrid Cloud

Best

UP TO 28 CORES

UP TO 2, 4 & 8 SOCKET

UP TO 3 UPI LINKS

UP TO 2666 MHz

UP TO 1.5 TB

TOPLINE CHANNEL MEMORY BANDWIDTH

ACCELERATION

HIGHEST MAINSTREAM

great

UP TO 22 CORES

2 & 4 SOCKET

UP TO 3 UPI LINKS

RELIABILITY, AVAILABILITY SERVICEABILITY

ADVANCED

Good

SCALABLE PERFORMANCE

STANDARD POWER

RAS

MODERATE

INTEL® TURBO BOOST TECHNOLOGY

INTEL® HYPER-THREADING TECHNOLOGY

Efficient

ENTRY

SCALABLE PERFORMANCE

STANDARD RAS

Light TASKS

ENTRY PERFORMANCE, INCREASING

ENTRY

Delivering Performance Beyond Benchmarks

Cloud	Baidu 百度 SEARCH	HUAWEI FUSIONSPHERE	KINGSOFT MYSQL CLOUD SERVICE	Neusoft ACLOME	Tencent 腾讯 CLOUD
	1.74X CLICK-THROUGH-RATE[1]	1.62X ENTERPRISE CLOUD APPLICATIONS[2]	1.63X OLTP DATABASE[3]	1.5X CLOUD MONITORING[4]	1.72X VIDEO STITCHING[5]
AI & Analytics	IBM DB2	IHS Markit ANALYTICS RISK ENGINE	LAMMPS	SAP HANA	sas
	1.47X IN-MEMORY ANALYTICS[6]	1.68X ENTERPRISE RISK MANAGEMENT[7]	1.72X MOLECULAR DYNAMICS[8]	1.59X DATABASE TRANSACTIONS[9]	2X BUSINESS ANALYTICS[10]
Network	AsiaInfo VERIS	eBrisk EBLIVE	ERICSSON MEDIAFIRST	sandvine VIRTUAL SERIES	Telefónica VIRTUAL BNG
	2.21X BUSINESS SUPPORT SYSTEM[11]	1.9X HEVC VIDEO ENCODING[12]	1.5X VIDEO TRANSCODING[13]	1.64X PACKET INSPECTION[14]	1.67X ROUTING[15]

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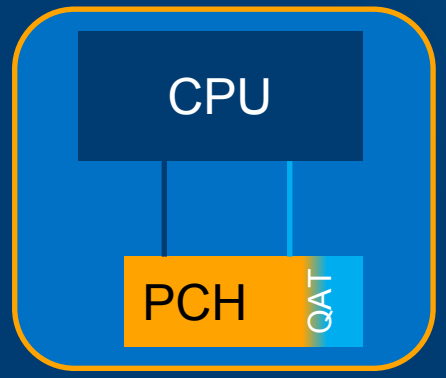
1. Baidu Search Click-Through-Rate (CTR) : OS: CentOS Linux release 7.3.1611. Testing by Intel June 2017. 2S Intel® Xeon® processor E5-2699 v4 vs 2S Intel® Xeon® Platinum processor 8180.
2. Huawei FusionSphere virtualized cloud Platform: OS: RHEL 7.2. Testing by Intel May 2017. 2S Intel® Xeon® processor E5-2699 v4 vs 2S Intel® Xeon® Platinum processor 8180.
3. Kingsoft Cloud Image Processing and MySQL Cloud Service: OS: CentOS 7.3.1611. Testing by Intel May 2017. 2S Intel® Xeon® processor E5-2699 v4 vs 2S Intel® Xeon® Platinum processor 8180.
4. Neusoft SaCa Aclome: SaCa Aclome workload (for general performance) and compressing/decompressing workload (for QAT). OS: CentOS 7.3.1611. Testing by Intel and Neusoft May 2017. 2S Intel® Xeon® processor E5-2699 v4 vs 2S Intel® Xeon® Platinum processor 8180.
5. Tencent Business Analytics: Video Stitching workload. OS: CentOS 7.3.1611 Linux kernel 4.9.8. Testing by Intel April 2017. 2S Intel® Xeon® processor E5-2699 v4 vs 2S Intel® Xeon® Platinum processor 8180.
6. IBM DB2: DB2 v11.1.1.1. The IBM Big Data Insights Internal Heavy Multiuser Workload (BDInsights) is a multi-user data warehousing workload based on a retail environment. Testing by Intel and IBM April/May 2017. 4S Intel® Xeon® processor E7-8890 v4 vs 4S Intel® Xeon® Platinum processor 8180.
7. IHS Markit Analytics Risk Engine: internal synthetic portfolio. OS: Windows server 2016. Testing by Intel and IHS Markit May 2017. 2S Intel® Xeon® processor E5-2699 v4 vs 2S Intel® Xeon® Platinum processor 8168.
8. LAMMPS: Testing by Intel June 2017. 2S Intel® Xeon® processor E5-2697 v4 vs 2S Intel® Xeon® Platinum processor 8168.
9. SAP HANA: TBD.
10. SAS Business Analytics: SAS 9.4 m4 application running the 30 session SAS Mixed Analytics workload. OS: CentOS 7.2 kernel 3.10.0. Testing by Intel and SAS May 2017. 2S Intel® Xeon® processor E5-2699 v4 vs 2S Intel® Xeon® Platinum processor 8180.
11. AsiaInfo Telco BSS: AsiaInfo Telco BSS workload. OS: RHEL 7.3. Testing by Intel & AsiaInfo May 2017. 4S Intel® Xeon® processor E7-8890 v4 vs 4S Intel® Xeon® Platinum processor 8180.
12. eBrisk: OS: Windows Server 2012 R2 Standard Build 9600. Test clips: https://media.xiph.org/video/derf/ . Testing by Intel May 2017. 2S Intel® Xeon® processor E5-2699 v4 vs 2S Intel® Xeon® Platinum processor 8180.
13. Ericsson MediaFirst Video Processing UHD HEVC transcoding workload. OS: CentOS Linux* 7.2 kernel 3.10.0. Testing by Ericsson in May 2017. 2S Intel® Xeon® processor E5-2699 v4 vs 2S Intel® Xeon® Platinum processor 8168.
14. Sandvine Virtual Series OS: CentOS Linux release 7.3.1611 Kernal: Linux 3.10.0-514.6.2.el7.x86_64 Hypervisor: qemu-kvm-1.5.3-126.el7_3.3.x86_64 VNF sizing: 3vCPU (6 pCPU threads), 128 GB RAM Testing by Sandvine, June 2017. 2S Intel® Xeon® processor E5-2699 v3 vs 2S Intel® Xeon® Gold processor 6150.
15. Telefonica: Testing by Telefonica. 2S Intel® Xeon® processor E5-2600 v4 vs 2S Intel® Xeon® Platinum processor 8168.

Converged "highly integrated" Platform for the network

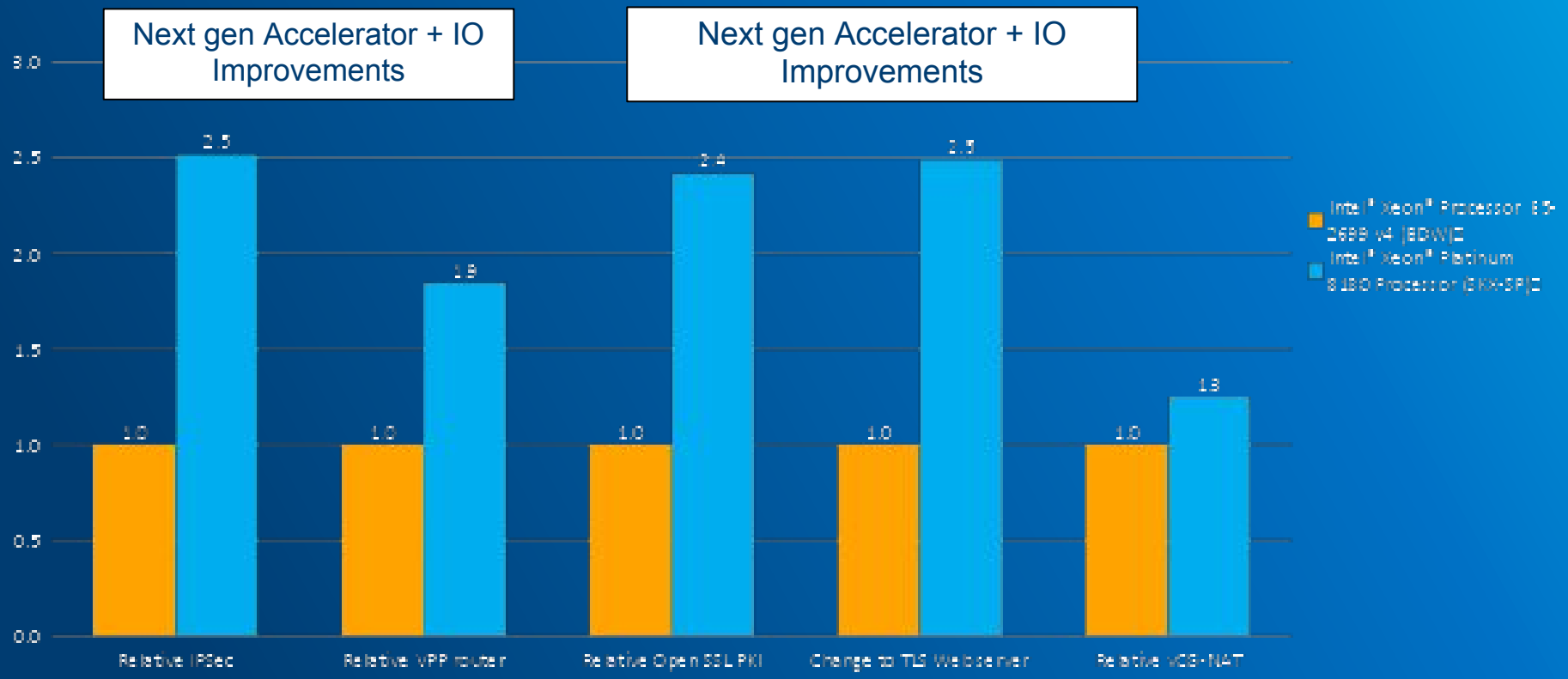


Intel® Xeon® Scalable processor with Server PCH + QAT

comms

Cloud

Enterprise



Application & Architectural Level Performance Comparison

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Intel® Xeon® Scalable processors

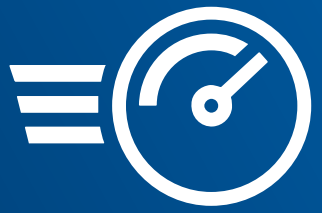
Scalable performance for widest variety of AI & other datacenter workloads – including deep learning

for AI

Most agile AI platform

Built-in ROI

Begin your AI journey today using existing, familiar infrastructure



Potent performance

*Train in ~~days~~ HOURS with up to **113X[2] perf vs. Intel Xeon E5 v3** (2.2x excluding optimized SW[1])*

Production-ready

Robust support for full range of AI deployments

[1,2]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 Source: Intel measured as of November 2016. Optimization Notice: Intel's compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel microprocessors. These optimizations include SSE2, SSE3, and SSSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel. Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors. Certain optimizations not specific to Intel microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered by this notice. Notice Revision #20110804. See slide 15 for configuration details.

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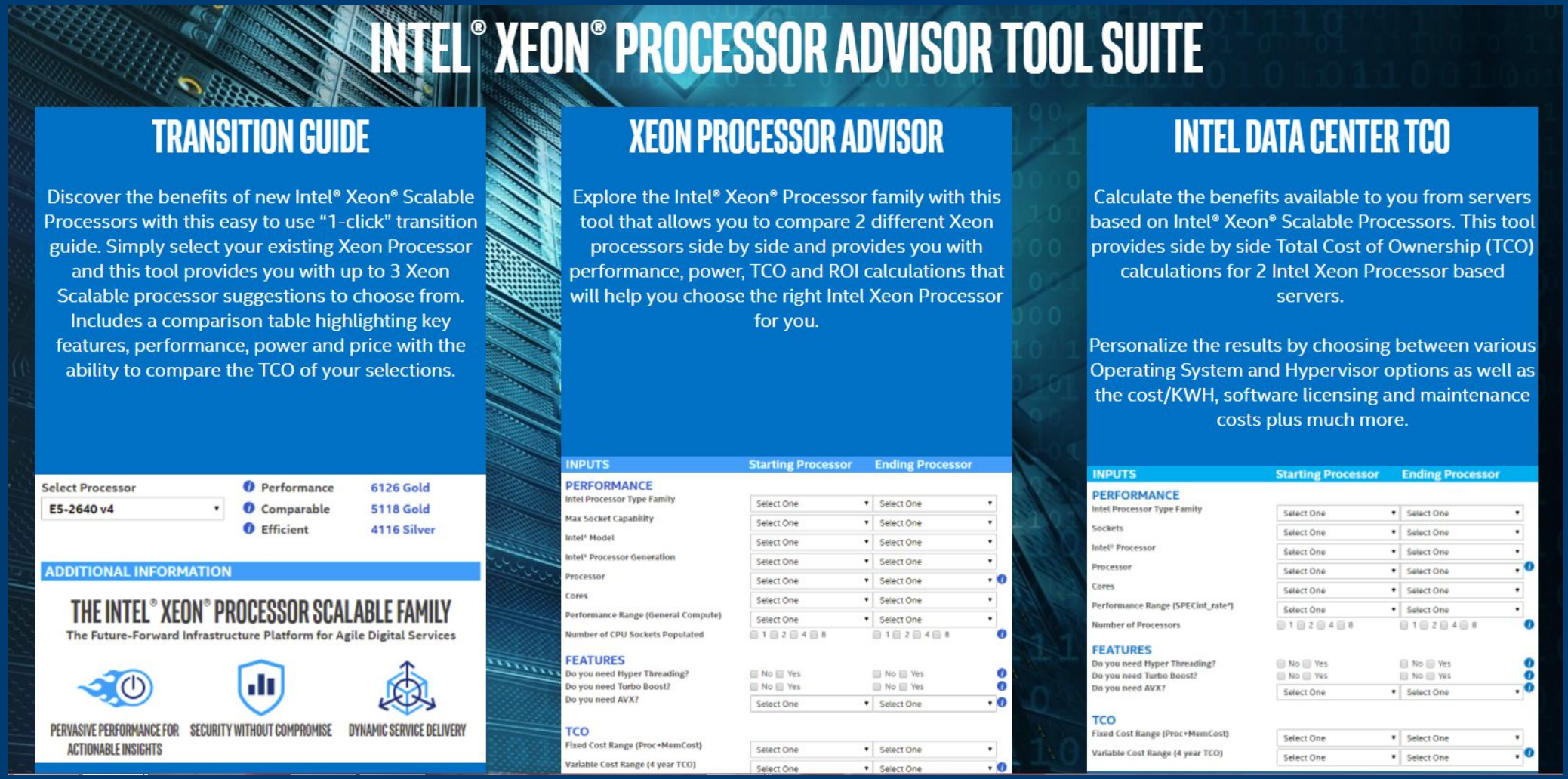
Intel® XEON® Processor Advisor Tool Suite



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Intel is Investing to Lead the Transformation


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experience
what's inside™