



# DATA CENTRIC BUSINESS UPDATE

## MEDIA BRIEFING

**Lisa Spelman**

VICE PRESIDENT & GENERAL MANAGER  
INTEL® XEON® PRODUCTS AND DATA CENTER MARKETING

# TODAY'S NEWS

**NEW:** CASCADE LAKE ADVANCED PERFORMANCE

**NEW:** XEON E PROCESSOR – ENTRY 1S SERVER SOLUTION

**NEW:** OPTANE DC PERSISTENT MEMORY UPDATE

# DATA DEFINES THE FUTURE


**The Economist**

Obama the warrior  
Misgoverning Argentina  
The economic shift from West to East  
Genetically modified crops blossom  
The right to eat cats and dogs

FEBRUARY 27/11 - MARCH 5/11 2010

## The data deluge

AND HOW TO HANDLE IT: A 14-PAGE SPECIAL REPORT



The cover features a man in a dark suit and white gloves holding a large green umbrella. Below him, a small plant with a single orange flower grows from a stream of data points. The background is a dense grid of binary code.

**The Economist**

Crunch time in France  
Ten years on: banking after the crisis  
South Korea's unfinished revolution  
Biology, but without the cells

MAY 6/11 - 12/11 2011

## The world's most valuable resource



Data and the new rules of competition

The cover shows a cityscape of skyscrapers built on a body of water. The buildings are labeled with logos for Amazon, Uber, Google, Facebook, and Tesla. The sky is blue and the water is dark.

**POPULAR SCIENCE**

THE FUTURE NOW

## THE CONTROL CENTERS

Using Data to Feed the World, Solve Cold Cases, Battle Malware, Predict Our Fate

**PLUS**  
Juan Enriquez Reprograms Life  
James Gleick Unspools the Bit  
AND Lawrence Weschler Questions the Cloud

**NEW WAYS OF SEEING**  
A Gallery of Extraordinary Infographics

**SPECIAL ISSUE**

## DATA IS POWER

HOW INFORMATION IS DRIVING THE FUTURE



The cover features a hand pointing upwards with a glowing light effect. The background is a dark blue with a grid pattern.

8-PAGE SPECIAL POSTGRADUATE SURVIVAL GUIDE 8<sup>TH</sup> BIRTHDAY ISSUE!

# COSMOS

THE SCIENCE OF EVERYTHING

THE END OF VIOLENCE  
Steven Pinker on the new peace

**DEFEATING POLIO**  
Will politics jeopardise a cure?

**FRAUDS AND FAKES**  
Science's biggest scams

**GENIUS OF DOGS**  
Inside the canine brain



## IS data THE NEW GOD?

How tracking your digital trail could predetermine your future – and why you'll benefit from today's data deluge.

Preventing cybercrime

GALAXIES AND NEBULAE ■ CANCER VACCINES ■ WHALES ■ FICTION ■ REVIEWS

ISSUE 33 JANUARY 2013  
\$5.99 \$25.90

The cover features a close-up of a human eye with digital elements overlaid. The eye is looking forward, and the background is a dark blue with a grid pattern.

# NEW ERA OF DATA-CENTRIC INNOVATION

## MOVE FASTER

intel SILICON PHOTONICS

intel OMNI-PATH FABRIC



intel ETHERNET

## STORE MORE

intel OPTANE™ DC   
SOLID STATE DRIVE

intel OPTANE™ DC   
PERSISTENT MEMORY

## PROCESS EVERYTHING



OVER 20 YEARS OF XEON PLATFORM LEADERSHIP



# PROCESS EVERYTHING DATA-CENTRIC MOMENTUM



**95** WORLD RECORDS  
AND COUNTING...

**8M**

IN Q3'18  
CPUS SHIPPED INTO  
A GROWING 30M UNIT TAM  
SPANNING SERVER, STORAGE, NETWORK

## INTEL® XEON® PROCESSOR AI WINS



KYOTO UNIVERSITY



Other names and brands may be claimed as the property of others.



NEXT GEN INTEL® XEON® SCALABLE PROCESSOR

# CASCADE LAKE

WITH INTEL® OPTANE™ DC PERSISTENT MEMORY

Leadership Performance

Optimized Cache Hierarchy

Higher Frequencies



Security Mitigations

Intel Deep Learning Boost (VNNI)

Optimized Frameworks & Libraries

BUILDING ON **20 YEARS** OF XEON INNOVATION



# ANNOUNCING CASCADE LAKE ADVANCED PERFORMANCE

NEW CLASS OF INTEL® XEON® SCALABLE PROCESSORS

## CASCADE LAKE ADVANCED PERFORMANCE 2-SOCKET SERVER



## PERFORMANCE LEADERSHIP

ARCHITECTED FOR  
DEMANDING HPC, AI  
& IAAS WORKLOADS

## UNPRECEDENTED MEMORY BANDWIDTH

MORE MEMORY  
CHANNELS THAN  
ANY OTHER CPU

## PERFORMANCE OPTIMIZED MULTI CHIP PACKAGE

HIGH  
SPEED  
INTERCONNECT

## PERFORMANCE LEADERSHIP

LINPACK

UP TO **3.4X**

STREAM TRIAD

UP TO **1.3X**

DL INFERENCE

UP TO **17X** IMAGES  
PER  
SECOND

vs AMD EPYC 7601

vs Intel® Xeon® Platinum  
Processor at launch

Performance Leadership: Based on our current understanding of the Linpack performance of general purpose processors commercially available in 2019. Unprecedented Memory Bandwidth: Native DDR memory bandwidth. 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](http://www.intel.com/benchmarks). Results have been estimated or simulated using internal Intel analysis or architecture simulation or modeling, and provided to you for informational purposes. Any differences in your system hardware, software or configuration may affect your actual performance.

Performance results are based on testing or projections as of 6/2017 to 10/3/2018 (Stream Triad), 7/31/2018 to 10/3/2018 (LINPACK) and 7/11/2017 to 10/7/2018 (DL Inference) and may not reflect all publicly available security updates. See configuration disclosure in backup for details. No product can be absolutely secure. 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). Other names and brands may be claimed as the property of others.



# NEW INTEL® XEON® E PROCESSOR

## ESSENTIAL PERFORMANCE FOR 1S ENTRY SERVER SOLUTIONS



UP TO **1.48X** PERFORMANCE IMPROVEMENT 4-YEAR REFRESH<sup>1</sup>

UP TO **1.39X** PERFORMANCE IMPROVEMENT GEN-ON-GEN<sup>2</sup>

UP TO **4.7** GHz WITH INTEL® TURBO BOOST TECHNOLOGY 2.0

UP TO **64GB → 128GB\*** DDR4 2666 MHz

UP TO **6 CORES**

ENHANCED INTEL® SOFTWARE GUARD EXTENSIONS DELIVERS ADVANCED SECURITY CAPABILITIES

**ESSENTIAL** PERFORMANCE AND VISUALS WITH EXPANDABILITY, RELIABILITY, SECURITY

AVAILABLE IN SINGLE-SOCKET CONFIGURATION ONLY

<sup>1</sup>Support for up to 128GB system memory capacity available in Q1 2019 through a BIOS Update. Please contact your hardware provider for availability and support. 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](http://www.intel.com/benchmarks). Performance results are based on testing as of 10/12/2018 and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure. Results have been estimated or simulated using internal Intel analysis or architecture simulation or modeling, and provided to you for informational purposes. Any differences in your system hardware, software or configuration may affect your actual performance. Please see Slide 17 for complete details on the performance claims and configurations.





# ENHANCING PROTECTION OF SENSITIVE DATA

## INTEL® SGX

INTEL® SOFTWARE GUARD EXTENSIONS



## INTEL® SGX ENCLAVES

PROVIDE A MORE SECURE PROCESSING ENVIRONMENT

## ENCLAVES PROTECT CODE AND DATA

EVEN IF ATTACKER HAS CONTROL OF THE PLATFORM



Fortanix provides Runtime Encryption® software to protect keys, data, and x86 applications



IBM Cloud Data Shield powered by Fortanix protects run time data at scale on Kubernetes Service



Azure Confidential Computing protects customer's most sensitive data while it's processed in the cloud



R3 Corda's approach to privacy and security shares data only with those who need to see it, enabling strict confidentiality for enterprise blockchain applications

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SOLID STATE DRIVE

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PERSISTENT MEMORY

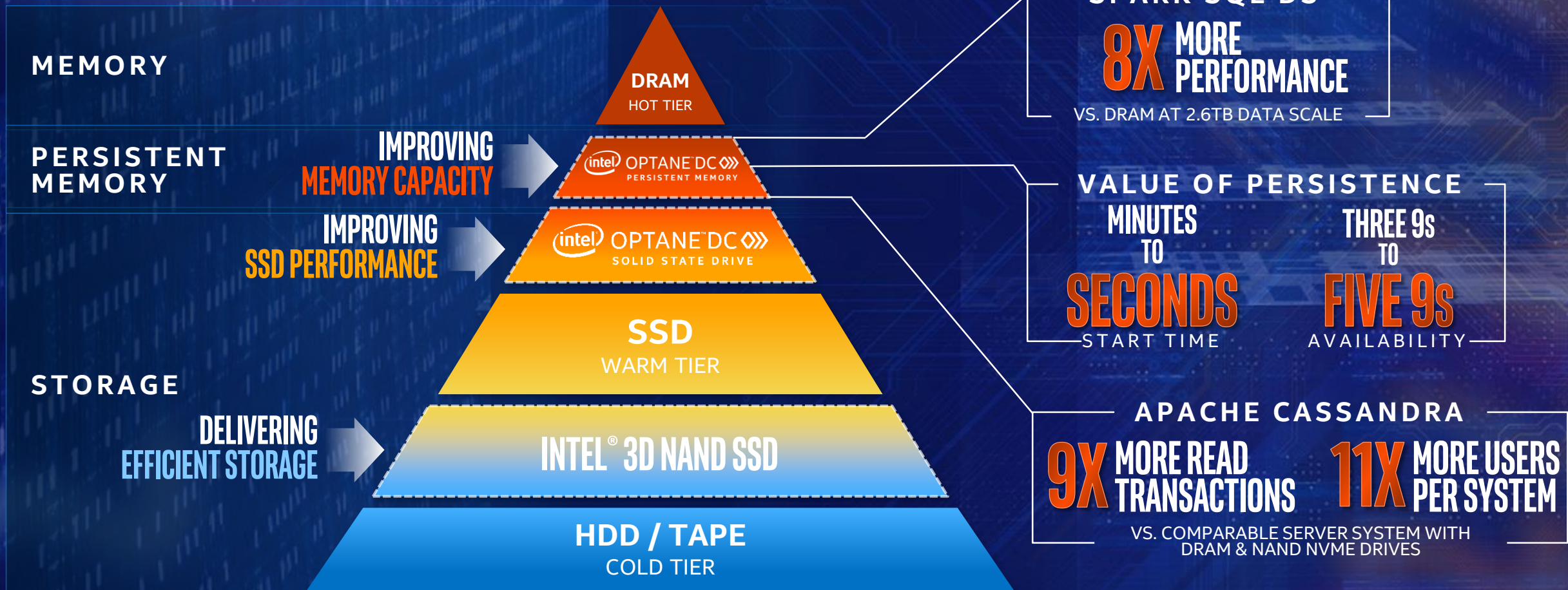
## PROCESS EVERYTHING



OVER 20 YEARS OF XEON PLATFORM LEADERSHIP



# RE-ARCHITECTING THE MEMORY / STORAGE HIERARCHY



Note: Performance results are based on testing: 8X (8/2/2018), 9X Reads/11X Users (5/24/2018), Minutes to Seconds (5/30/2018) and may not reflect all publicly available security updates. No product can be absolutely secure. See configuration disclosure for details. 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 information go to [www.intel.com/benchmarks](http://www.intel.com/benchmarks). Other names and brands may be claimed as the property of others.



**intel** OPTANE™ DC   
PERSISTENT MEMORY

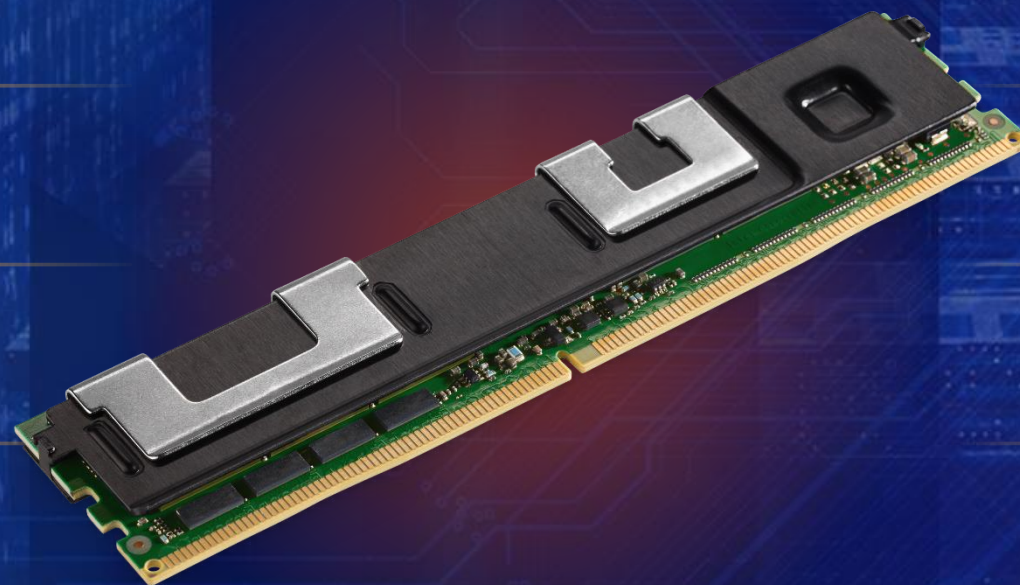


**BIG AND AFFORDABLE MEMORY**

**HIGH PERFORMANCE STORAGE**

**DIRECT LOAD/STORE ACCESS**

**NATIVE PERSISTENCE**



**128, 256, 512GB**

**DDR4 PIN COMPATIBLE**

**HARDWARE ENCRYPTION**

**HIGH RELIABILITY**

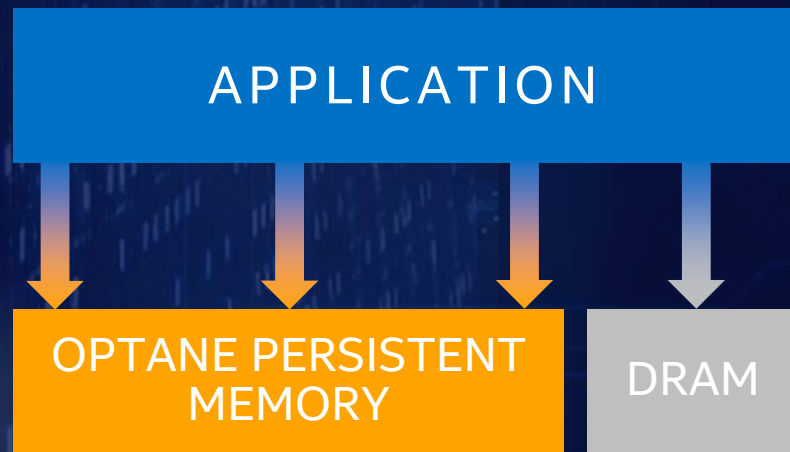
**SHIPPING FOR REVENUE SINCE AUG. 8**



# SUPPORT FOR BREADTH OF APPLICATIONS

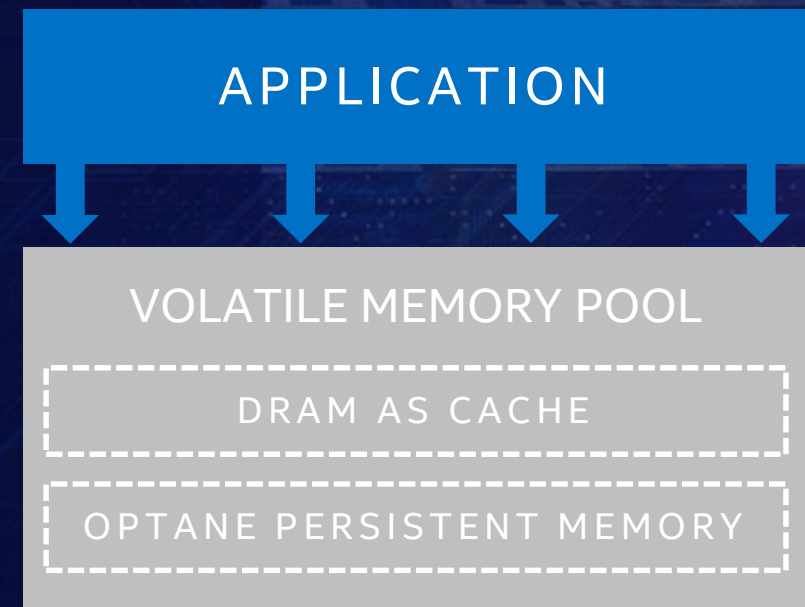
## APP DIRECT MODE

PERSISTENT PERFORMANCE  
& MAXIMUM CAPACITY



## MEMORY MODE

AFFORDABLE MEMORY CAPACITY  
FOR MANY APPLICATIONS



# BROAD ECOSYSTEM SUPPORT

## BETA PARTNERS



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## STORE MORE

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SOLID STATE DRIVE

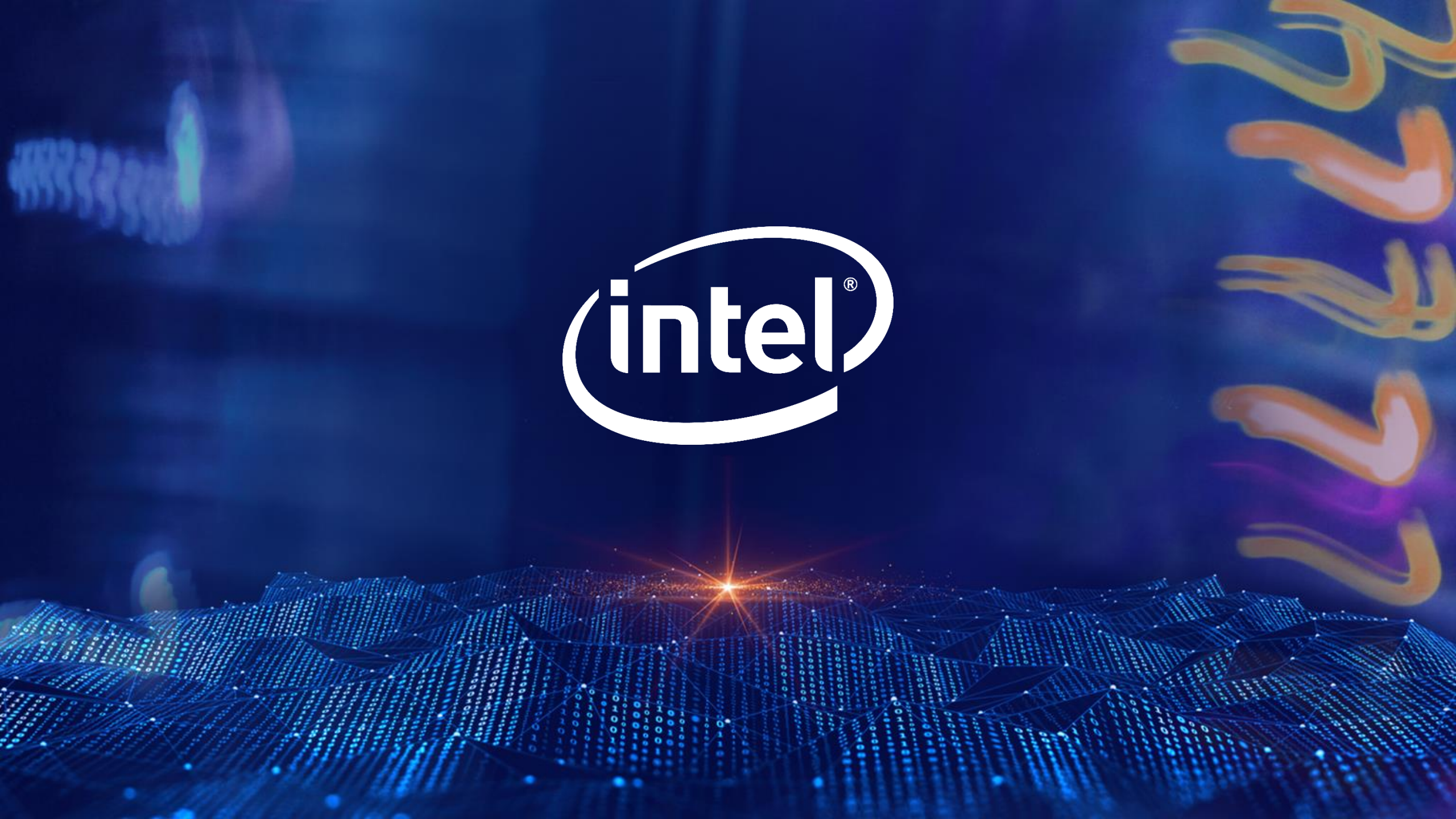
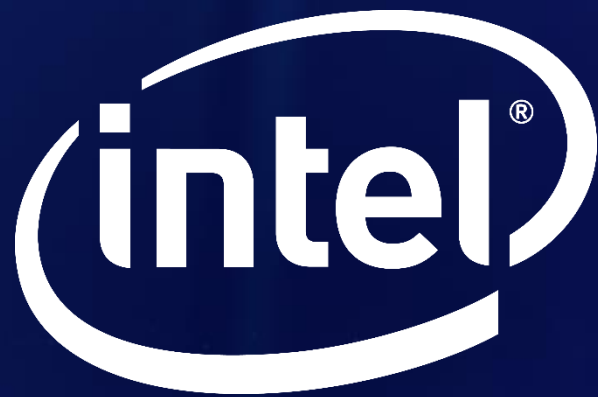
 OPTANE™ DC   
PERSISTENT MEMORY

## PROCESS EVERYTHING



OVER 20 YEARS OF XEON PLATFORM LEADERSHIP







# CONFIGURATION DETAILS

LINPACK: AMD EPYC 7601: Supermicro AS-2023US-TR4 with 2 AMD EPYC 7601 (2.2GHz, 32 core) processors, SMT OFF, Turbo ON, BIOS ver 1.1a, 4/26/2018, microcode: 0x8001227, 16x32GB DDR4-2666, 1 SSD, Ubuntu 18.04.1 LTS (4.17.0-041700-generic Retpoline), High Performance Linpack v2.2, compiled with Intel(R) Parallel Studio XE 2018 for Linux, Intel MPI version 18.0.0.128, AMD BLIS ver 0.4.0, Benchmark Config: Nb=232, N=168960, P=4, Q=4, Score = 1095GFs, tested by Intel as of July 31, 2018. compared to 1-node, 2-socket 48-core Cascade Lake Advanced Performance processor projections by Intel as of 10/3/2018.

Stream Triad: 1-node, 2-socket AMD EPYC 7601, <http://www.amd.com/system/files/2017-06/AMD-EPYC-SoC-Delivers-Exceptional-Results.pdf> tested by AMD as of June 2017 compared to 1-node, 2-socket 48-core Cascade Lake Advanced Performance processor projections by Intel as of 10/3/2018.

DL Inference: Platform: 2S Intel® Xeon® Platinum 8180 CPU @ 2.50GHz (28 cores), HT disabled, turbo disabled, scaling governor set to "performance" via intel\_pstate driver, 384GB DDR4-2666 ECC RAM. CentOS Linux release 7.3.1611 (Core), Linux kernel 3.10.0-514.10.2.el7.x86\_64. SSD: Intel® SSD DC S3700 Series (800GB, 2.5in SATA 6Gb/s, 25nm, MLC). Performance measured with: Environment variables: KMP\_AFFINITY='granularity=fine, compact', OMP\_NUM\_THREADS=56, CPU Freq set with cpupower frequency-set -d 2.5G -u 3.8G -g performance. Caffe: (<http://github.com/intel/caffe/>), revision f96b759f71b2281835f690af267158b82b150b5c. Inference measured with "caffe time --forward\_only" command, training measured with "caffe time" command. For "ConvNet" topologies, dummy dataset was used. For other topologies, data was stored on local storage and cached in memory before training. Topology specs from [https://github.com/intel/caffe/tree/master/models/intel\\_optimized\\_models](https://github.com/intel/caffe/tree/master/models/intel_optimized_models) (ResNet-50), and [https://github.com/soumith/convnet-benchmarks/tree/master/caffe/imagenet\\_winners](https://github.com/soumith/convnet-benchmarks/tree/master/caffe/imagenet_winners) (ConvNet benchmarks; files were updated to use newer Caffe prototxt format but are functionally equivalent). Intel C++ compiler ver. 17.0.2 20170213, Intel MKL small libraries version 2018.0.20170425. Caffe run with "numactl -l". Tested by Intel as of July 11th 2017 -. compared to 1-node, 2-socket 48-core Cascade Lake Advanced Performance processor projections by Intel as of 10/7/2018.