intel®

Extending Intelligence to the Edge

intel XEON inside™

As communication service providers, enterprise IT, and cloud service providers seek to speed new service delivery and handle exponential growth in the number of users accessing their services, it is essential that they optimize infrastructure for density and cost, both in the data center and at the network edge.

Inefficient data center scaling drives up space and cost, and increases environmental impact, while fixed function, proprietary devices at the network edge hinder the ability of IT to rapidly deploy and manage new services. Intel® Xeon® D processors offer options for infrastructure optimization, by bringing the performance and advanced intelligence of Intel® Xeon® processors into dense, lower-power system-on-a-chip (SoC) designs.

They can be deployed for a variety of workloads—from the data center to the intelligent edge—in network solutions, wireless base stations, mid-range storage solutions, industrial Internet of Things (IoT), dynamic web serving, dense/rugged environments outside the data center, and more. And they can run the same instruction set as more robust Intel Xeon processors to provide software consistency from the data center to the network edge.
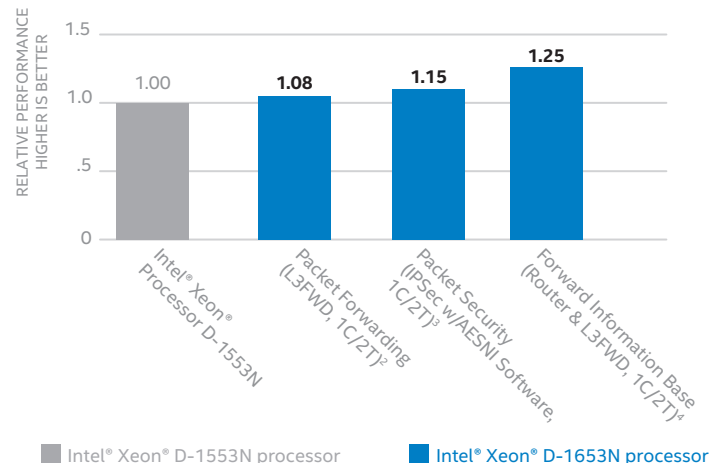
New Intel® Xeon® D-1600 Processors

Intel® Xeon® D-1600 processors offer new levels of workload-optimized support for both mid-range storage and network solutions. This customer-oriented design offers up to a 29% improvement in compute performance compared to the previous generation of Intel® Xeon® D-1500 processors, network series.[1]

Combined with the advanced capability integration of up to 40 Gbps with Intel® Ethernet and up to 30 Gbps of cryptography offload with Intel® QuickAssist (Intel® QAT) technology, the new Intel Xeon D-1600 processor delivers new levels of performance for dense computing environments. Featuring up to eight cores, new Intel Xeon D-1600 processors are ready to power the next generation of lower power designs where high per core performance is critical.

These new processors offer an effective upgrade path for solutions already using the Intel Xeon D-1500 processor - both the standard and network series. BGA package pin compatibility is shared across Intel Xeon D-1500 processors, network series, and Intel Xeon D-1600 processors.

Intel® Xeon® D-1600 Processor – Network Performance
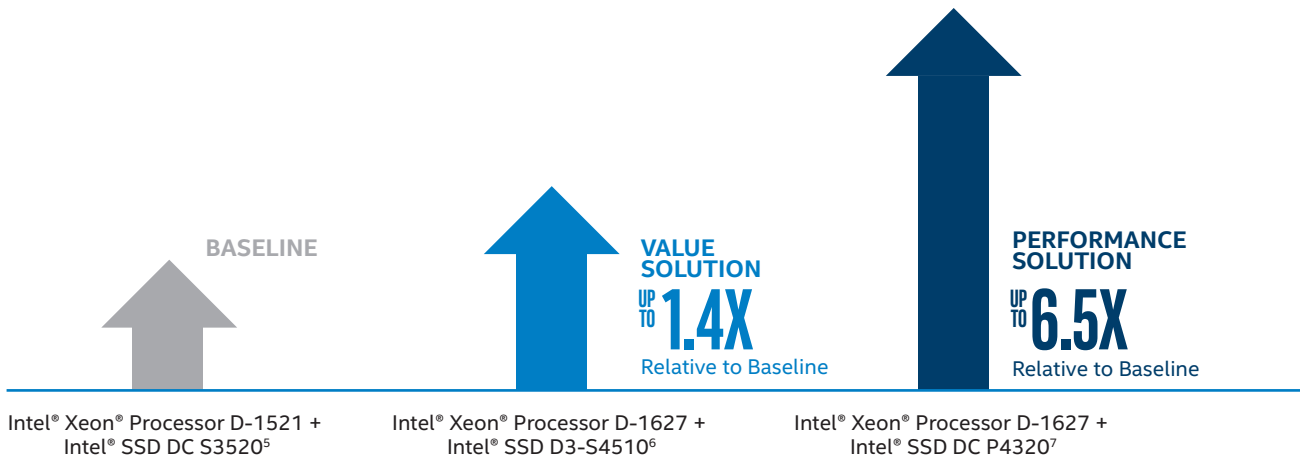Achieve higher performance per core for same TDP

Bar chart — RELATIVE PERFORMANCE HIGHER IS BETTER (y-axis: 0 to 1.5):
- Intel® Xeon® Processor D-1553N: 1.00
- Packet Forwarding (L3FWD, 1C/2T)[2]: 1.08
- Packet Security (IPSec w/AESNI Software, 1C/2T)[3]: 1.15
- Forward Information Base (Router & L3FWD, 1C/2T)[4]: 1.25

■ Intel® Xeon® D-1553N processor   ■ Intel® Xeon® D-1653N processor

UPGRADE NETWORK EDGE INFRASTRUCTURE FOR IMPROVED THROUGHPUT WITH INTEL® XEON® D-1600 SERIES
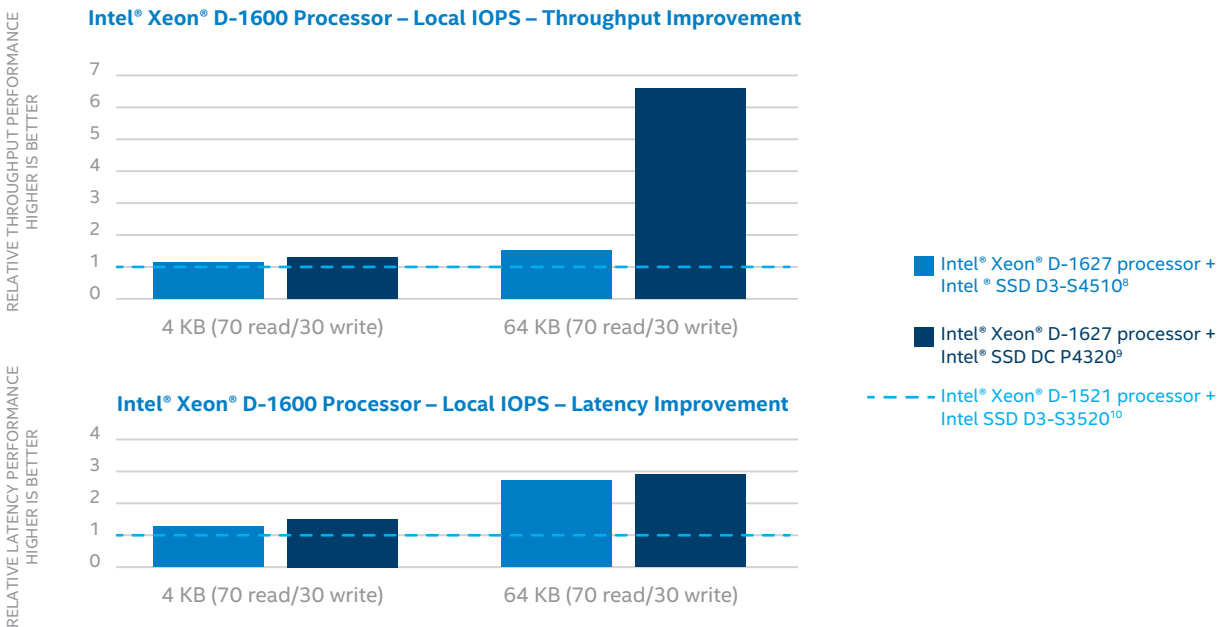
Mid-Range Storage for the Data Center and Beyond

Built-in Intel Ethernet eliminates the need for PCI Express* (PCIe) connected Ethernet devices in storage solutions, while integrated Intel® QAT offloads compute-intensive algorithms, freeing up more compute cycles for software-defined storage, SAN and NAS workloads. And, with Intel® Platform Storage Extensions, Intel Xeon D processors offer intelligence for dense, low-power storage solutions deployed in or out of the data center for workloads including cloud backup, video on demand, virtualized storage, and more.

Intel Platform Storage Extensions enable valuable optimizations for storage workloads. Non-Transparent Bridging (NTB) enables high-speed connectivity among Intel® Xeon® processor-based platforms for failover support, while Asynchronous DRAM Self- Refresh (ADR) helps to protect data in the event of a power outage. To deliver data to two PCI Express* (PCIe) devices simultaneously, PCIe Dual Cast is available. And, for fast data movement with low processor overhead, Intel® QuickData Technology offloads memory accesses to Intel Xeon D processors.

Intel® Xeon® D-1600 Processor – Storage Performance

BASELINE

VALUE SOLUTION
UP TO **1.4X**
Relative to Baseline

PERFORMANCE SOLUTION
UP TO **6.5X**
Relative to Baseline

Intel® Xeon® Processor D-1521 + Intel® SSD DC S3520[5]

Intel® Xeon® Processor D-1627 + Intel® SSD D3-S4510[6]

Intel® Xeon® Processor D-1627 + Intel® SSD DC P4320[7]

ENHANCE READ & WRITE IOPS THROUGHPUT PERFORMANCE OF DISTRIBUTED OBJECT INFRASTRUCTURE WITH INTEL® XEON® D-1600 PROCESSORS + INTEL® SSD DATA CENTER SERIES

Intel® Xeon® D-1600 Processor – Local IOPS – Throughput Improvement

RELATIVE THROUGHPUT PERFORMANCE
HIGHER IS BETTER

4 KB (70 read/30 write)   64 KB (70 read/30 write)

■ Intel® Xeon® D-1627 processor + Intel ® SSD D3-S4510[8]

■ Intel® Xeon® D-1627 processor + Intel® SSD DC P4320[9]

- - - Intel® Xeon® D-1521 processor + Intel SSD D3-S3520[10]

Intel® Xeon® D-1600 Processor – Local IOPS – Latency Improvement

RELATIVE LATENCY PERFORMANCE
HIGHER IS BETTER

4 KB (70 read/30 write)   64 KB (70 read/30 write)

UPGRADE YOUR STORAGE HARDWARE TO THE LATEST INTEL® XEON® D-1600 PROCESSORS WITH INTEL® SSD DATA CENTER SERIES TO BOOST STORAGE PERFORMANCE

Intel® Xeon® D-1500 Processors

Intel Xeon D-1500 processors—both standard and network series—address other low-power, high-density infrastructure needs, including those with higher floating point performance workload requirements, while offering additional product options with industrial extended temperature support. Available with up to 16 cores and 128 GB of addressable memory, Intel Xeon D-1500 processors have an integrated platform controller hub (PCH), integrated I/O, integrated 10 Gigabit Intel Ethernet ports, and a thermal design point (TDP) of 20 watts to 65 watts.

Ideal for Lightweight Hyperscale Workloads

Intel Xeon D-1500 processors provide excellent performance and software compatibility in a low-power SoC, for microservers that can efficiently process lightweight, hyperscale workloads in cloud service provider data centers and in dedicated hosting company data centers.

These SoCs offer exceptional node performance, up to 12 MB of last level cache, and support for up to 128 Gigabytes of high-speed DDR4 memory, and are ideal for emerging lightweight hyper-scale workloads, including memory caching, dynamic web serving, and dedicated hosting.

PROCESSOR OVERVIEW FOR INTEL® XEON® D-1600 PROCESSORS AND INTEL® XEON® D-1500 PROCESSORS

Intel® Xeon® Processor Intelligence in a Low-Power SoC	Includes 2-16 cores, multiple integrated ports of Gigabit Intel® Ethernet, plus support for up to 128 GB of memory. Also includes L1 cache (32K data, 32K instructions per core), L2 cache (256K per core), LLC cache (1.5 MB per core), Intel® Turbo Boost Technology,[11] and Intel® Hyper-Threading Technology.[11]
System-on-a-Chip	Enables dense, low power system designs with thermal design points ranging from about 20W to 65W.
Intel® QuickAssist Technology (Intel® QAT)	Hardware acceleration for compute-intensive workloads, such as cryptography and data compression, by offloading the functions to a specialized logic engine (integrated into the chipset), freeing the processor to focus on other workload operations.
Built-In Intel® Virtualization Technology	Delivers near-native compute and I/O performance in virtualized data centers, network infrastructure, and cloud computing, with advanced monitoring of cache and memory bandwidth for better service level and infrastructure management.
Server-Class Reliability, Availability, and Serviceability (RAS)	Provides high system reliability and data integrity with support for error correction code (ECC) memory, single device data correction (SDDC), memory demand and patrol scrubbing, and much more.
Hardware-Enhanced Security and Compliance	Intel Advanced Encryption Standard New Instructions (Intel AES-NI) provide integrated support for fast, low-overhead encryption and Intel® Trusted Execution Technology (Intel® TXT) provides platform verification (through authenticated boot) to enable strong security with reduced performance impact.
Server-Class Manageability	Includes Intel® Node Manager (Intel® NM) Base for adaptive power management.
Intel® Platform Storage Extensions	Enables fast data movement and high availability through integrated support for non-transparent bridging (NTB), asynchronous DRAM self-refresh (ADR), and Intel® QuickData Technology, which provides a direct memory access (DMA) engine within the SoC.
Intel x86 64-bit Software Support	Helps to ensure broad and scalable application compatibility across infrastructure.

SKU LIST FOR INTEL® XEON® D-1600 PROCESSORS AND INTEL® XEON® D-1500 PROCESSORS

Processor Name	CPU Cores	Memory Speed	Base CPU Speed	Max. DRAM Capacity	Intel® Ethernet	Thermal Design Power	Integrated Intel® QAT Support
Network and Storage Workloads							
Intel® Xeon® D-1653N processor	8	DDR4-2400 MT/s	2.8 GHz	128 GB	4 x 10 GbE	65W	Up to 30 Gbps
Intel® Xeon® D-1649N processor	8	DDR4-2133 MT/s	2.3 GHz	128 GB	4 x 10 GbE	45W	Up to 20 Gbps
Intel® Xeon® D-1633N processor	6	DDR4-2133 MT/s	2.5 GHz	128 GB	4 x 10 GbE	45W	Up to 10 Gbps
Intel® Xeon® D-1637 processor	6	DDR4-2400 MT/s	2.9 GHz	128 GB	4 x 10 GbE	55W	-
Intel® Xeon® D-1623N processor	4	DDR4-1866 MT/s	2.4 GHz	128 GB	4 x 10 GbE	35W	Up to 10 Gbps
Intel® Xeon® D-1627 processor	4	DDR4-2133 MT/s	2.9 GHz	128 GB	4 x 10 GbE	45W	-
Intel® Xeon® D-1622 processor	4	DDR4-2133 MT/s	2.6 GHz	128 GB	-	40W	-
Intel® Xeon® D-1602 processor	2	DDR4-1866 MT/s	2.5 GHz	128 GB	-	27W	-

Processor Name	CPU Cores	Memory Speed	Base CPU Speed	Max. DRAM Capacity	Intel® Ethernet	Thermal Design Power	Integrated Intel® QAT Support
SKU LIST FOR INTEL® XEON® D-1600 PROCESSORS AND INTEL® XEON® D-1500 PROCESSORS							
Network, Cloud, and Storage Workloads							
Intel® Xeon® D-1587 processor	16	DDR4-2133 MT/s	1.70 GHz	128 GB	2 x 10 GbE	65 W	–
Intel® Xeon® D-1581 processor	16	DDR4-2133 MT/s	1.80 GHz	128 GB	2 x 10 GbE	65 W	–
Intel® Xeon® D-1577 processor	16	DDR4-2400 MT/s	1.30 GHz	128 GB	2 x 10 GbE	45 W	–
Intel® Xeon® D-1571 processor	16	DDR4-2400 MT/s	1.30 GHz	128 GB	2 x 10 GbE	45 W	–
Intel® Xeon® D-1567 processor	12	DDR4-2133 MT/s	2.10 GHz	128 GB	2 x 10 GbE	65 W	–
Intel® Xeon® D-1559 processor	12	DDR4-2133 MT/s	1.50 GHz	128 GB	2 x 10 GbE	45 W	–
Intel® Xeon® D-1557 processor	12	DDR4-2133 MT/s	1.50 GHz	128 GB	2 x 10 GbE	45 W	–
Intel® Xeon® D-1553N processor	8	DDR4-2400 MT/s	2.30 GHz	128 GB	4 x 10 GbE	65 W	Up to 40 Gbps
Intel® Xeon® D-1548 processor	8	DDR4-2400 MT/s	2.00 GHz	128 GB	2 x 10 GbE	45 W	–
Intel® Xeon® D-1543N processor	8	DDR4-2400 MT/s	1.90 GHz	128 GB	2 x 10 GbE	45 W	Up to 20 Gbps
Intel® Xeon® D-1541 processor	8	DDR4-2400 MT/s	2.10 GHz	128 GB	2 x 10 GbE	45 W	–
Intel® Xeon® D-1539 processor	8	DDR4-2133 MT/s	1.60 GHz	128 GB	2 x 10 GbE	35 W	–
Intel® Xeon® D-1537 processor	8	DDR4-2133 MT/s	1.70 GHz	128 GB	2 x 10 GbE	35 W	–
Intel® Xeon® D-1533N processor	6	DDR4-2133 MT/s	2.10 GHz	128 GB	4 x 10 GbE	45 W	Up to 30 Gbps
Intel® Xeon® D-1533 processor	8	DDR4-2133 MT/s	2.10 GHz	128 GB	2 x 10 GbE	45 W	–
Intel® Xeon® D-1531 processor	6	DDR4-2133 MT/s	2.20 GHz	128 GB	2 x 10 GbE	45 W	–
Intel® Xeon® D-1530 processor	4	DDR4-2133 MT/s	2.40 GHz	128 GB	2 x 10 GbE	45 W	–
Intel® Xeon® D-1529 processor	4	DDR4-1600 MT/s	1.30 GHz	128 GB	2 x 10 GbE	20 W	–
Intel® Xeon® D-1528 processor	6	DDR4-2133 MT/s	1.90 GHz	128 GB	2 x 10 GbE	35 W	–
Intel® Xeon® D-1527 processor	4	DDR4-2133 MT/s	2.20 GHz	128 GB	2 x 10 GbE	35 W	–
Intel® Xeon® D-1526 processor	4	DDR4-2133 MT/s	1.80 GHz	128 GB	2 x 10 GbE	35 W	–
Intel® Xeon® D-1523N processor	4	DDR4-1866 MT/s	2.00 GHz	128 GB	2 x 10 GbE	45 W	Up to 20 Gbps
Intel® Xeon® D-1521 processor	4	DDR4-2133 MT/s	2.40 GHz	128 GB	2 x 10 GbE	45 W	–
Intel® Xeon® D-1518 processor	4	DDR4-2133 MT/s	2.20 GHz	128 GB	2 x 10 GbE	35 W	–
Intel® Xeon® D-1513N processor	4	DDR4-1866 MT/s	1.60 GHz	128 GB	2 x 10 GbE	35 W	Up to 10 Gbps

MORE INFORMATION

On Intel® Xeon® processor available at:
www.intel.com/xeond.

[1] Compute (SPECrate*2017): 1x Intel® Xeon® D-1623N processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Red Hat 7.6 with Kernel: 3.10.0-957.5.1.el7.x86_64, Bios: GNVDTRL1.86B.0010.D75.1902060802, uCode: 0xe00000c, Benchmark: SPECrate*2017_int_base (Estimated), Compiler: ICC 19.0.1.144, Storage: Intel® SSD D3-S4510 Series 1.92TB, Score: 19.7 (Estimated) compared to 1x Intel® Xeon® D-1513N processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Red Hat 7.6 with Kernel: 3.10.0-957.5.1.el7.x86_64, Bios: GNVDTRL1.86B.0010.D75.1902060802, uCode: 0xe00000c, Benchmark: SPECrate*2017_int_base (Estimated), Compiler: ICC 19.0.1.144, Storage: Intel® SSD D3-S4510 Series 1.92TB, Score: 15.2 (Estimated)

[2] Packet Forwarding (L3FWD): 1x Intel® Xeon® D-1653N processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Ubuntu 18.04 LTS with Kernel: 4.15.0-42-generic x86_64, Bios: GNVDTRL1.86B.0010.D52.1708180300, uCode: 0xE00000A, Benchmark: IPV4 L3FWD, Compiler: DPDK 18.11, Network: 2x Intel® Ethernet Controller X552 (4x 10G ports), Storage: Intel® SSD D3-S4510 Series 240GB, Score: 33.5 (1Core/2T Mpackets/s (64B)) compared to 1x Intel® Xeon® D-1553N processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Ubuntu 18.04 LTS with Kernel: 4.15.0-42-generic x86_64, Bios: GNVDTRL1.86B.0010.D52.1708180300, uCode: 0xE00000A, Benchmark: IPV4 L3FWD, Compiler: DPDK 18.11, Network: 2x Intel® Ethernet Controller X552 (4x 10G ports), Storage: Intel® SSD D3-S4510 Series 240GB, Score: 30.9 (1Core/2T Mpackets/s (64B))

[3] Forward Information Base (Router & L3FWD): 1x Intel® Xeon® D-1653N processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Ubuntu 18.04 LTS with Kernel: 4.15.0-42-generic x86_64, Bios: GNVDTRL1.86B.0010.D52.1708180300, uCode: 0xE00000A, Benchmark: VPP 18.10 IPV4 FIB, Compiler: DPDK 18.08, Network: 2x Intel® Ethernet Controller X552 (4x 10G ports), Storage: Intel® SSD D3-S4510 Series 240GB, Score: 17.3 (1Core/2T Mpackets/s (64B)) compared to 1x Intel® Xeon® D-1553N processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Ubuntu 18.04 LTS with Kernel: 4.15.0-42-generic x86_64, Bios: GNVDTRL1.86B.0010.D52.1708180300, uCode: 0xE00000A, Benchmark: VPP 18.10 IPV4 FIB, Compiler: DPDK 18.08, Network: 2x Intel® Ethernet Controller X552 (4x 10G ports), Storage: Intel® SSD D3-S4510 Series 240GB, Score: 13.8 (1Core/2T Mpackets/s (64B))

[4] Packet Security (IPSec w/AESNI software): 1x Intel® Xeon® D-1653N processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Ubuntu 18.04 LTS with Kernel: 4.15.0-42-generic x86_64, Bios: GNVDTRL1.86B.0010.D52.1708180300, uCode: 0xE00000A, Benchmark: VPP IPSec 18.10 (AES128-CBC-HMAC-SHA1), Compiler: DPDK 18.08, Network: 2x Intel® Ethernet Controller X552 (4x 10G ports), Storage: SSD S4510 Series 250GB, Score: 2.3 (1Core/2T Mpackets/s (64B)) compared to 1x Intel® Xeon® D-1553N processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Ubuntu 18.04 LTS with Kernel: 4.15.0-42-generic x86_64, Bios: GNVDTRL1.86B.0010.D52.1708180300, uCode: 0xE00000A, Benchmark: VPP IPSec 18.10 (AES128-CBC-HMAC-SHA1), Compiler: DPDK 18.08, Network: 2x Intel® Ethernet Controller X552 (4x 10G ports), Storage: SSD S4510 Series 250GB, Score: 2 (1Core/2T Mpackets/s (64B))

[5] Baseline: 1x Intel® Xeon® D-1521 processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Red Hat 7.6 with Kernel: 3.10.0-957.5.1.el7.x86_64, Bios: GNVDTRL1.86B.0010.D75.1902060802, uCode: 0xe00000c, Benchmark: Local IOPS (FIO 3.1) Compiler: Red Hat 4.8.5-36-GCC, Q-depth=32, Storage: Intel® SSD D3-S4510 1.92TB (boot), 3x Intel® SSD DC S3520 800GB (Application), Score: 16421.33 (IOPS) for Sequential 64K 70Read/30Write

[6] Value: 1x Intel® Xeon® D-1627 processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Red Hat 7.6 with Kernel: 3.10.0-957.5.1.el7.x86_64, Bios: GNVDTRL1.86B.0010.D75.1902060802, uCode: 0xe00000c, Benchmark: Local IOPS (FIO 3.1) Compiler: Red Hat 4.8.5-36-GCC, Q-depth=32, Storage: Intel® SSD D3-S4510 1.92TB (boot), 3x Intel® SSD D3-S4510 1.92TB (Application), Score: 23834.66 (IOPS) for Sequential 64K 70Read/30Write

[7] Performance: 1x Intel® Xeon® D-1627 processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Red Hat 7.6 with Kernel: 3.10.0-957.5.1.el7.x86_64, Bios: GNVDTRL1.86B.0010.D75.1902060802, uCode: 0xe00000c, Benchmark: Local IOPS (FIO 3.1) Compiler: Red Hat 4.8.5-36-GCC, Q-depth=32, Storage: Intel® SSD D3-S4510 1.92TB (boot), 3x Intel® SSD D5-P4320 7.68TB (Application), Score: 107818.66 (IOPS) for Sequential 64K 70Read/30Write

[8] S4510 + Xeon® D-1627: 1x Intel® Xeon® D-1627 processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Red Hat 7.6 with Kernel: 3.10.0-957.5.1.el7.x86_64, Bios: GNVDTRL1.86B.0010.D75.1902060802, uCode: 0xe00000c, Benchmark: Local IOPS (FIO 3.1) Compiler: Red Hat 4.8.5-36-GCC, Q-depth=32, Storage: Intel® SSD D3-S4510 1.92TB (boot), 3x Intel® SSD D3-S4510 1.92TB (Application), Score: 162645.33(IOPS) & 2351.66us (99th Latency) for Random 4K 70Read/30Write and 23834.66 (IOPS) & 9962.44us (99th Latency) for Sequential 64K 70Read/30Write

[9] P4320 + Intel® Xeon® D-1627: 1x Intel® Xeon® D-1627 processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Red Hat 7.6 with Kernel: 3.10.0-957.5.1.el7.x86_64, Bios: GNVDTRL1.86B.0010.D75.1902060802, uCode: 0xe00000c, Benchmark: Local IOPS (FIO 3.1) Compiler: Red Hat 4.8.5-36-GCC, Q-depth=32, Storage: Intel® SSD D3-S4510 1.92TB (boot), 3x Intel® SSD D5-P4320 7.68TB (Application), Score: 190208(IOPS) & 2112.55us (99th Latency) for Random 4K 70Read/30Write and 107818.66 (IOPS) & 9329.66us (99th Latency) for Sequential 64K 70Read/30Write

[10] S3520 + Xeon® D-1521: 1x Intel® Xeon® D-1521 processor, Platform: Echo Canyon, 2 x 32GB DDR4 2400 ECC(64GB Total Memory) ,OS: Red Hat 7.6 with Kernel: 3.10.0-957.5.1.el7.x86_64, Bios: GNVDTRL1.86B.0010.D75.1902060802, uCode: 0xe00000c, Benchmark: Local IOPS (FIO 3.1) Compiler: Red Hat 4.8.5-36-GCC, Q-depth=32, Storage: Intel® SSD D3-S4510 1.92TB (boot), 3x Intel® SSD DC S3520 800GB (Application), Score: 151296(IOPS) & 3148.11us (99th Latency) for Random 4K 70Read/30Write and 16421.33 (IOPS) & 27493.44us (99th Latency) for Sequential 64K 70Read/30Write

[11] Intel technologies may require enabled hardware, specific software, or services activation. Check with your system manufacturer or retailer.

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