Solution Brief

Enterprise Storage
Intel® Xeon® 6 Processors

# Redefining Storage as a Workload: Intel Xeon 6 Processors Bring High-Density Efficiency to the Data Center

**Intel Xeon 6 processors deliver the storage capacity, efficiency, and performance enterprises need to keep pace with explosive data growth.**


**Intel Xeon 6 1S processors offer 6% more total PCIe I/O capacity than the competition.[1]**

**Industry-leading I/O capacity to scale without compromise**

With **136 PCIe 5.0 lanes** per socket, Intel Xeon 6 processors provide unmatched connectivity for NVMe storage and networking, which can help you boost server density and reduce costs.

Enterprise data centers face a critical need for flexible, efficient storage architectures capable of scaling with the rapid growth of data driven by AI, analytics, and large-scale database operations. Traditional storage architectures can't keep pace with these explosively growing data volumes, and in many cases can limit how many high-performance NVM Express (NVMe)-based drives can be connected. At the same time, many organizations are exploring one-socket solutions for select workloads to help reduce power, cooling, and total cost of ownership (TCO) while maintaining scalability. Critically, though, businesses are looking for systems that can provide adequate storage capacity with only a single CPU. Such systems require processors that deliver exceptional input/output (I/O) performance to efficiently support higher-density NVMe-based storage. And while hardware innovation sets the foundation, it's the software ecosystem, optimized for Intel Xeon 6 processors, that helps transform storage into a strategic advantage.

## Modern requirements for storage as a workload

A mismatch between storage capabilities and workload demands can create I/O bottlenecks. For example, training AI models can require lightning-fast I/O but lack it with traditional, low-PCIe storage infrastructure, which can't keep pace. Inefficiencies like this can add up over time, potentially slowing workloads and extending time to insight. Such inefficient storage infrastructures might require organizations to purchase more servers to achieve optimal storage capacity.

With these modern demands on storage, architects must think of storage as an active workload that requires performing compression, decompression, encryption, and data movement in real time at scale. These tasks consume compute and I/O resources and deny them to other tasks. Intel Xeon 6 processors meet these demands with high PCIe lane capacity and built-in acceleration to improve throughput and efficiency. This is crucial for organizations seeking efficient, scalable storage—and single-socket servers powered by Intel Xeon 6 processors can significantly expand storage capacity without expanding the data center footprint, thus reducing cost.

### 1S Intel Xeon 6700/6500-series processors with Performance-cores (P-cores)

Intel Xeon 6 processors are purpose-built for data-intensive storage workloads, and they bring a balance of high I/O bandwidth, compute efficiency, and architectural innovation that results in a variety of benefits for organizations seeking to scale enterprise storage.

### Dramatically improved I/O through an industry-leading 136 PCIe 5.0 lanes

Improved I/O in Intel Xeon 6 processors can support significantly more NVMe drives per socket (with up to 136 PCIe 5.0 lanes) compared to prior Intel Xeon processor generations and current-generation AMD EPYC processors (which have a maximum of 128 PCIe 5.0 lanes).[1] This improved I/O can allow for greater lane availability for high-speed storage devices, networking cards, and accelerators, supporting flexible rack configurations to achieve optimized density and energy efficiency. More sophisticated storage solutions like NVMe allow for greater diversification of storage workloads.

Independent testing of MLPerf Storage 2.0 workloads indicates that enhanced NVMe connectivity and expanded PCIe bandwidth, provided by the 136 PCIe 5.0 lanes in Intel Xeon 6 processors, can accelerate both traditional storage operations and AI training and inference pipelines.[2] These results show that storage is now an essential performance factor for modern data-intensive applications, and that single-socket Intel Xeon 6 platforms can deliver measurable throughput and latency advantages over competing architectures.

### Cost optimization

Storage workloads can be consolidated on a single-socket Intel Xeon 6 platform, rather than on dual-socket systems. This consolidation can reduce hardware footprint, power draw, and cooling requirements, which can lower both capital and operational costs. Enhanced I/O performance and efficient core utilization can contribute to reduced energy costs.

In addition, Intel Xeon 6 processors integrate Intel® QuickAssist Technology (Intel® QAT) to accelerate the compression, encryption, and deduplication workloads that commonly burden CPUs. Only Intel offers integrated Intel QAT acceleration for hardware-based compression. Compression and decompression tasks can consume valuable CPU cycles, and by offloading these data services to Intel QAT, Intel Xeon 6 processors improve I/O responsiveness and overall efficiency across software-defined storage and data-intensive environments. Intel QAT frees up CPU cores to handle other tasks simultaneously. And these hardware accelerators work in concert with ISV-optimized software stacks, ensuring that data services from compression to encryption run at peak efficiency.

**Table 1.** Workload versus benefit matrix showcasing the I/O and PCIe lane advantages of Intel Xeon 6 processors

| Workload/Use Case | Storage Needs | Intel Xeon 6 Processor Advantage | Performance Measurements |
|---|---|---|---|
| Storage/software-defined storage (SDS) | High throughput and high density | More NVMe storage capacity and Intel QAT | **Up to 8 more PCIe 5.0 lanes** per processor compared to AMD EPYC processors[1] |
| AI inference (ResNet-50) | Rapid offload and high bandwidth | PCIe 5.0, Intel® Advanced Matrix Extensions (Intel® AMX), and Intel QAT | **Up to 2.97x performance per dollar** for ResNet-50 compared to AMD EPYC processors[3] |
| Relational database management system (RDBMS) database workloads (MySQL) | High I/O and efficient query performance | More PCIe lanes and Intel QAT | **Up to 1.05x performance per dollar** for MySQL compared to AMD EPYC processors[4] |

## High-performance memory for high-performance processors

The advancements in performance and I/O capabilities in Intel Xeon 6 processors require concurrent enhancements in memory performance to help organizations get the most from their systems. Support for Multiplexed Rank DIMMs (MRDIMMs) expands memory capacity and bandwidth for metadata-intensive workloads, while Intel AMX enables inline analytics and AI-driven data classification directly within the storage path. The result is a platform purpose-built to handle the growing demand for real-time storage analytics, compression, and encryption without compromising throughput or energy efficiency.

## I/O and offload performance for consolidated storage

The 136 PCIe 5.0 lanes in Intel Xeon 6 processors enable organizations to meet I/O and storage needs for more NVMe drives with fewer single-socket servers than AMD processor–based options. This high I/O capacity can help increase storage density, simplify scaling, and reduce costs. Competitors point to core-count per socket as the sole measure of processor performance. However, Intel processors enable more NVMe connectivity and Intel QAT acceleration, which can result in better real workload efficiency.

Additionally, Intel QAT offloads compression and encryption, enhancing efficiency. Meanwhile, DDR5 and MRDIMM support in select SKUs further increases memory bandwidth for demanding workloads. Together, these features provide a strong foundation for improved efficiency and TCO in next-generation storage solutions.

**Table 2.** Intel Xeon 6700/6500-series processors are built to provide ideal performance for a wide range of use cases

| Series | Designed For |
|---|---|
| Intel Xeon 6700-series processors | Enhanced performance ideal for a wide array of data center and telecommunications environments |
| Intel Xeon 6500-series processors | Essential performance ideal for mainstream server and edge environments |

## Data center optimization

Intel Xeon 6700/6500-series processors with P-cores deliver flexible, high performance and efficient power usage, making them ideal for a wide range of workloads and driving significant TCO benefits for data centers. With a high PCIe lane count, the single-socket variants of these processors enable increased rack density, configuration flexibility (including 1U and 2U form factors from leading OEMs), and expanded storage capacity across a wide variety of workloads.

In addition, Intel Xeon 6700/6500-series processors with P-cores feature built-in reliability, availability, and serviceability (RAS) capabilities, such as error-detection, correction, and uptime safeguards that reduce downtime and risk. These capabilities give organizations greater confidence in mission-critical environments and help prevent costly interruptions. Intel Xeon 6700/6500-series processors with P-cores are supported by a broad ecosystem of storage partners and OEMs, including 1S options in 1U and 2U form factors from multiple OEMs. Beyond hardware, Intel Xeon 6 platforms are supported by a robust ISV ecosystem that delivers optimized software solutions for maximum performance on Intel Xeon 6. Leading partners including MinIO, NetApp with its AI Pod Mini, and Weka with Wekapod have tuned their offerings to work best on Intel Xeon 6 processors. This synergy between hardware and software accelerates deployment and unlocks the true value of enterprise storage, ensuring organizations can scale confidently with validated, widely supported solutions.

# Simplify infrastructure and scale storage performance with Intel Xeon 6 processors

Intel Xeon 6 processors transform enterprise storage by making storage a true workload priority. With up to 136 PCIe 5.0 lanes, Intel Xeon 6 processors deliver exceptional I/O density for more NVMe drives per server. Integrated Intel QAT accelerates data services, while single-socket efficiency enables faster, lower-cost data movement and protection. Together and in concert with ISV-optimized software stacks, these innovations help organizations consolidate infrastructure, reduce costs, and scale confidently to meet modern data demands.

## Next Steps

Explore validated single-socket reference architectures that demonstrate how Intel Xeon 6 processors can help simplify infrastructure and scale storage performance for future growth. Ask your IT advisor today about Intel Xeon 6 processors.

[1] Intel Xeon 6 processors can support up to 136 PCIe 5.0 lanes per socket, whereas AMD EPYC processors have a maximum of 128 PCIe 5.0 lanes.

[2] Matthew Fletcher. "Redefining AI Storage Economics: A Deep Dive into Single-Node Performance and System-Level Optimization." *FarmGPU*. August 2025.

[3] Up to 297 percent higher performance per dollar with an Intel Xeon 6741P processor, compared to an AMD EPYC 9455 processor, when running ResNet-50 v1.5 inference with the OpenVINO™ 2024.4.0-16554-9c9778aba39-luocheng/mha_fusion_bhls, ww45 container, Python 3.8.20, INT8, multi-instance, and batched. Performance per dollar calculated using CPU recommended customer pricing (RCP) and memory pricing as of June 2025. **Intel**: 1-node, 1 x Intel Xeon 6741P processor, 48 cores, 300 W Thermal Design Power (TDP), Intel® Hyper-Threading Technology (Intel® HT Technology) on, Intel® Turbo Boost Technology on, 512 GB total memory (8 x 64 GB DDR5 6,400 megatransfers per second [MT/s]), BIOS 3A08.QCT001, microcode 0x11000311, 2 x Broadcom NetXtreme E-Series BCM57416 dual-media 10G Remote Direct Memory Access (RDMA) Ethernet controller, 1 x 3.5 TB Samsung MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Tested by Intel as of June 2025. **AMD**: 1-node, 1 x AMD EPYC 9455 processor, 48 cores, Simultaneous Multithreading (SMT) on, boost on, 768 GB total memory (12 x 64 GB DDR5 6,400 MT/s [6,000 MT/s]), BIOS 3.2, microcode 0xb00211a, 2 x Mellanox Technologies MT2910 family, 2 x Broadcom NetXtreme E-Series BCM57416 dual-media 10G RDMA Ethernet controller, 1 x 3.5 TB Samsung MZWLJ3T8HBLS-00007, 1 x 447.1 GB Micron_7450_MTFDKBA480TFR, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Tested by Intel as of June 2025.

[4] Up to 5 percent higher performance per dollar with an Intel Xeon 6741P processor, compared to an AMD EPYC 9455 processor, when running HammerDB 4.7 and TPROC-C on MySQL 8.0.33 multi-instance. Performance per dollar calculated using CPU RCP and memory pricing as of June 2025. **Intel**: 1-node, 1 x Intel Xeon 6741P processor, 48 cores, 300 W TDP, Intel HT Technology on, Intel Turbo Boost Technology on, 512 GB total memory (8 x 64 GB DDR5 6,400 MT/s), BIOS 3A08.QCT001, microcode 0x11000311, 2 x Broadcom NetXtreme E-Series BCM57416 dual-media 10G RDMA Ethernet controller, 1 x 3.5 TB Samsung MZWLJ3T8HBLS-00007, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Tested by Intel as of June 2025. **AMD**: 1-node, 1 x AMD EPYC 9455 processor, 48 cores, SMT on, boost on, 768 GB total memory (12 x 64 GB DDR5 6,400 MT/s [6,000 MT/s]), BIOS 3.2, microcode 0xb00211a, 2 x Mellanox Technologies MT2910 family, 2 x Broadcom NetXtreme E-Series BCM57416 dual-media 10G RDMA Ethernet controller, 1 x 3.5 TB Samsung MZWLJ3T8HBLS-00007, 1 x 447.1G Micron_7450_MTFDKBA480TFR, Ubuntu 24.04.1 LTS, 6.8.0-47-generic. Tested by Intel as of June 2025.



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