

5th Gen Intel® Xeon® Scalable Processors Include Built-In Accelerators for Encryption, Compression and Data Movement



5th Gen Intel® Xeon® Scalable processors have built-in accelerators that allow the CPU to offload key storage tasks like encryption, compression, data movement and transformation. These Intel® Storage Engines improve performance for specific workloads and free up CPU cores for business-critical applications.

Storage workloads are critical and growing exponentially

Data is arguably one of the most important assets of any business — if you can capture, analyze and act on it. The more data you collect, the more potential insights you can extract. Of course, collecting more data means building out more storage, more bandwidth and more processing power to encrypt, compress, move and transform it. As data warehouses grow into petabytes and beyond, data storage and management are consuming more and more computing power.

Intel Storage Engines on 5th Gen Intel Xeon Scalable processors bring the offload performance of external accelerators onto the processor itself. Building these accelerators into the CPU overcomes the bottlenecks and latencies that occur when a system shuttles data to external devices; it also reduces overall complexity and costs.

Storage, security and data movement put constant demands on CPUs

Storing, moving and transforming data are never-ending tasks for data centers, web servers and networks. Offloading specific tasks to dedicated accelerator engines is a proven strategy for increasing overall capacity and performance.

- **Compression/decompression:** Compressing data so that it takes up less storage space and requires less bandwidth is a fundamental performance and capacity strategy. Today, compression/decompression is an intensive task for data center storage, enterprise databases, content delivery networks and networking.
- **Encryption/decryption:** Protecting data at rest, in motion and during processing requires encryption at every step. Files must be encrypted before they are written to disk and decrypted when accessed. Servers must encrypt and authenticate every read and write of data to storage. Encrypting and hashing are nonstop, processor-intensive tasks.
- **Data plane:** Simply put, the data plane or data path refers to moving data around the network and across the core, cloud and edge. In 5G networks, data rates are growing from tens of gigabits to hundreds. In data centers, the data rates are pushing into terabit territory.
- **Data movement:** Moving data from storage to memory, memory to CPU, and node to node around the network are major workloads. Integrity checks, removing duplicates, and other transformation processes also consume significant CPU resources. As organizations seek to analyze and quickly derive insights from more and more data, data sets have become larger and larger, increasing demand for processing, storage capacity and network bandwidth.
- **Improved manageability and reliability:** Today's data centers are diverse and complex, driven by the rapid growth of data, evolving technologies, and the need for efficient and reliable storage management. Storage systems require the ability to add or remove a storage device without powering down the system, as well as LED management to ensure that data center administrators and users can quickly assess the health and performance of the data storage devices.

Intel Storage Engines: Built-in accelerators for storage-specific workloads

Integrating workload accelerator engines into the CPU has three major benefits. First, built-in accelerators resolve the I/O bottlenecks and latency inherent in drop-in accelerator cards and external appliances. Second, they process their specific workloads faster than a CPU alone. Third, they allow the CPU to offload tasks and preserve headroom for the workloads that need higher-performance computing resources.

Enhanced storage performance with 5th Gen Intel Xeon Scalable processors



Fewer cores, faster compression and encryption

Intel® QuickAssist Technology (Intel® QAT) ›

Up to

2.17x higher NGINX TLS handshake

performance per core than the OOB software using Intel QAT¹



More efficient data movement and transformation operations

Intel® Data Streaming Accelerator (Intel® DSA) ›

Up to

2.45x higher IOPs

and

59% lower latency

on small packet random reads using Intel DSA over 3rd Gen Xeon²

5th Gen Intel Xeon Scalable processors can offload the bulk of compression, encryption and data transport to Intel Storage Accelerator Engines that take performance beyond the capabilities of the CPU alone. Implementation of these accelerators is largely built into the processor's Instruction Set Architecture (ISA). Shifting workloads involves making relatively simple code changes, enabling drivers and configuring BIOS settings.

Intel QuickAssist Technology: Encryption and compression offload engine

Previously available as an external accelerator, Intel QAT is a built-in accelerator in the 5th Gen Intel Xeon Scalable processor that reduces latency versus prior generations. The CPU offloads encryption, compression and public key exchange workloads to Intel QAT, freeing up clock cycles for other workloads. On-the-fly compression shrinks storage footprints and reduces network traffic. QAT also enables efficient encryption without the typical CPU performance penalty.

Intel Data-Streaming Accelerator: Faster data movement within and beyond the CPU

Intel DSA is a direct memory access (DMA) engine. It delivers significant throughput improvements by accelerating data movement and transformation operations such as data integrity checks and deduplication. Intel DSA works on the CPU — between memory, caches and processor cores — and beyond the CPU to attached memory, storage and networked resources. The impact on performance yields high efficiency for I/O, data transfers and packet processing.

Intel Volume Management Device: Improved manageability & reliability

Intel VMD improves the manageability and serviceability of storage devices in a system, helping system administrators identify devices that need repair or replacement. Intel VMD is useful wherever PCIe or NVMe-based storage devices are utilized and enables direct control and management of NVMe SSDs from the PCIe bus without additional hardware adapters. This robust NVMe SSD functionality allows a seamless transition to NVMe storage while limiting the downtime of critical infrastructure. Intel VMD brings enterprise reliability, availability and serviceability (RAS) features to NVMe SSDs, enabling the deployment of next-generation storage. Intel VMD is ideal for data center and enterprise environments, where efficient storage management, high availability, and reliability are critical.

Intel VMD provides the following benefits:

- **Isolation of Drives:** Intel VMD helps isolate and manage individual drives, which can be especially useful in environments where multiple drives are connected. This isolation can help prevent drive failures from affecting other drives and improve overall system stability.
- **Hot-Plug Capabilities:** With Intel VMD, drives can be hot-plugged — connected or disconnected — while the system is running for increased safety and efficiency. This is important for minimizing downtime and maximizing system availability.
- **Drive Management:** Intel VMD provides enhanced drive management features, allowing administrators to monitor and control the status of individual drives. This can help identify issues early and improve maintenance processes.
- **Compatibility and Interoperability:** Intel VMD is designed to work with various types of storage devices, especially NVMe-based SSDs (Solid State Drives). It provides a standardized way of managing different storage devices, improving compatibility and interoperability while reducing TCO.
- **RAID Support:** Intel VMD can be used in conjunction with Intel® Virtual RAID (Redundant Array of Independent Disks) on Chip (Intel VROC) configurations to enhance data protection and performance, and beginning with 5th Gen Intel Xeon processors, Intel VROC will be available for activation through Intel® On Demand.

Conclusion: Intel Storage Engines amplify performance and value

Building storage accelerators into 5th Gen Intel Xeon Scalable processors adds significant performance improvements and capabilities that create business value. Anyone who builds, uses and optimizes data-intensive services will benefit. This ranges from system builders and enterprises to cloud service providers, architects and developers.

Intel Storage Engines — Performance beyond the CPU



Intel Storage Engines — Performance beyond the CPU

Workload

Compression/decompression:

Reduces storage footprints, shrinks files before transport

Encryption/decryption:

Ubiquitous, CPU-intensive task that secures data at rest and in motion

Data movement/transformation:

Common storage functions and operations such as data integrity checks and deduplication

Improved manageability and reliability:

NVMe storage devices

Accelerator

Intel QuickAssist Technology:

Accelerates on-the-fly compression, frees up CPU cores

Intel QuickAssist Technology:

Accelerates encryption and authentication, frees up CPU cores

Intel Data-Streaming Accelerator:

Moves more data faster² through the data path, accelerating reads, writes and replication while freeing CPU cores

Intel Volume Management Device:

Helps system administrators identify devices that need repair or replacement

Learn more

See how built-in accelerators can help improve the performance of your fastest-growing workloads: [Accelerator Engine Overview](#).

Explore how to get the most out of Intel Xeon Scalable processors with built-in accelerators at intel.com/xeonscalable.

Learn more about Intel Storage Accelerator Engines:

[Intel QuickAssist Technology](#) >

[Intel Data Streaming Accelerator](#) >

[Intel Volume Management Device](#) >



¹See [N15] at intel.com/processorclaims: 5th Gen Intel Xeon Scalable processors. Results may vary.

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Notices and disclaimers

Availability of accelerators varies depending on SKU. Visit the [Intel Product Specifications](#) page for additional product details.

Performance and power vary by use, configuration, and other factors. Learn more at intel.com/PerformanceIndex.

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details.

Intel® technologies may require enabled hardware, software, or service activation.

No product or component can be absolutely secure.

Your costs and results may vary.

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