

Product Brief

Intel® Xeon® 6+ processor

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More cores, less power: redefining data center efficiency

The Intel® Xeon® 6+ processor helps organizations cut costs by consolidating servers for scale-out workloads and high-density compute needs while improving performance per watt and security.

At a glance:

Intel Xeon 6+ processor enables:

- **Up to 30% greater performance per thread, compared to competitive processor.¹**
- **Up to 48% higher performance per watt, compared to previous Efficient core processor.²**
- **Up to 9:1 server consolidation for 5-year refresh, delivering significant gains in total cost of ownership.⁵**

The need for core density

Mobile network operators and digital service providers—such as social networks, streaming platforms, and e-commerce sites—must support rapidly growing traffic and data volumes. Yet most data centers are constrained by fixed floor space, rack footprints, and limited power and cooling capacity. Higher server and rack density helps these organizations deliver more compute per square foot and per kilowatt. This reduces the need for costly expansions and, in many regions, offsets rising electricity prices.

Many of the workloads use scale-out architectures built on microservices, containers, and distributed databases. To run more services in parallel and maintain performance at scale, providers increasingly rely on processors with higher core counts and platforms that can pack more compute into each system and rack. The challenge is doing so efficiently: density targets must be balanced against power draw, heat removal, and energy use to achieve optimal operating costs and sustainability goals.

Introducing the Intel® Xeon® 6+ processor

Intel® Xeon® 6+ is the first data center processor to be delivered on the Intel 18A manufacturing process, which includes PowerVia backside power delivery and RibbonFET gate-all-around transistors to improve power efficiency. The processor's packaging uses Foveros Direct 3D to enable ultra-low-latency data access.

The Intel Xeon 6+ processor has been engineered for power efficiency and core density and offers up to 288 Efficient cores (E-cores) per processor. The processor is available in one-socket and two-socket versions, with up to 576 cores per two-socket server. The new processor offers up to 30% higher performance per thread than the competition.¹

Intel Xeon 6+ doubles the core count from the Intel® Xeon® 6700E processor, our first with E-cores, and offers significant improvements in performance, power efficiency, and memory speeds (see Figure 1).

Performance per watt is up to 48% higher than our previous Efficient core processor², which helps data center operators to cut energy costs and work within their existing infrastructure's power footprint more effectively.

Intel® Xeon® 6700E processor	Improvement	Intel® Xeon® 6+ processor
144 E-cores	2x core count	Up to 288 E-cores
Crestmont cores	+17% instructions per cycle per core	Darkmont cores
108MBs	>5x last-level cache	576MBs
8 channels	+4 memory channels	12 channels
Up to 4 UPI 2.0 links	+2 UPI links	6 UPI 2.0 links
Up to 6400MT/s DDR5	25% faster memory speed	Up to 8000MT/s DDR5

Figure 1. The Intel® Xeon® 6+ processor embodies significant architectural advances over our previous Efficient core processor.

Total memory bandwidth is nearly double through the combination of speed and channel increases, and total memory capacity scales to 3TB, while last-level cache is 5x bigger to support the large number of cores.

To help accelerate a range of common workloads, Intel Xeon 6+ includes more instances of built-in accelerators than our previous Efficient core processor. Intel Xeon 6+ has up to four instances of each Accelerator. The accelerators are:

- **Intel® QuickAssist Technology (Intel® QAT)** accelerates encryption, decryption, and data compression, offloading these tasks from the processor core to help reduce system resource consumption.
- **Intel® Dynamic Load Balancer (Intel® DLB)** provides efficient hardware-based load balancing by dynamically distributing network data across multiple CPU cores as the system load varies.
- **Intel® Data Streaming Accelerator (Intel® DSA)** drives high performance for storage, networking, and data-intensive workloads by improving streaming data movement and transformation operations.

- **Intel® In-Memory Analytics Accelerator (Intel® IAA)** improves analytics performance while offloading tasks from CPU cores to accelerate database query throughput and other workloads.

The processor also supports Intel® Advanced Vector Extensions 2 (Intel® AVX2), which uses parallel data processing to accelerate applications such as video encoding, image processing, and data analysis. It enables 8-bit integer data processing (INT8) and vector neural network instructions (VNNI).

The processor has a maximum platform thermal design power (TDP) of up to 450W per CPU.

For connectivity, there are up to 96 lanes of Peripheral Component Interconnect Express (PCIe) 5.0 and up to 64 lanes of Compute Express Link (CXL) 2.0.

The new Intel® Ethernet E835 Controllers and Network Adapters are designed to improve the bandwidth-per-core ratio of high-core-count Intel Xeon 6+ platforms, providing the performance, scalability and flexibility to handle diverse workloads ranging from cloud to edge.

Optimizing energy consumption

Intel® Application Energy Telemetry (Intel® AET), new on Intel® Xeon® 6+, enables you to directly monitor workload-level power consumption at runtime. Workloads spanning multiple servers can be aggregated into dashboards, allowing power, energy, and cost metrics to be compared across workload deployment options.

This technology can unlock new opportunities for energy-efficient computing, lower energy bills, enable power balancing, and potentially reduce carbon footprints, thereby improving operational efficiency.

Intel AET enables resource monitoring for each application thread at the CPU core level, reported through the Intel® Platform Monitoring Technology (Intel® PMT) interface.

Intel® Infrastructure Power Manager is a software solution that complements Intel® Xeon® 6+. It dynamically applies power-saving features when it identifies idle cores and adjusts core frequencies based on true workload intensity in packet-processing workloads.

On a non-polling workload, where the system isn't constantly polling for new data, Intel Infrastructure Power Manager delivered an average power saving of 34% with a peak saving of up to 42% in a non-busy hour.³ On a packet-processing workload, the savings were 38.3% on average over 24 hours and a peak saving of 41% at idle. Both results were achieved while maintaining performance.⁴

Driving data center modernization

Digital service providers and network operators are under constant pressure to deliver more performance per rack and per data center. With its outstanding core count and performance per watt, Intel Xeon 6+ plays a central role in data center modernization. The processor enables data centers to increase their compute capacity without using more power or physical space.

Data centers currently using 2nd Gen Intel® Xeon® Scalable processors can consolidate their servers at an up to 9:1 ratio using the new processor. This delivers significant savings in total cost of ownership, reducing energy costs and freeing up space in the data center for innovative new services.

Figure 2 models the impact of consolidation across a data center. 960 servers based on 2nd Gen Intel Xeon Scalable processors can be consolidated into 100 servers. Across the fleet, that enables a 79% reduction in space and 23.1 GWh of power savings.

Improving data center security

Security matters because modern data centers run business-critical and often regulated workloads, frequently in shared or multi-tenant environments. A single weakness can expose sensitive customer data, disrupt services, damage trust, and create significant financial and compliance risk. The Intel Xeon 6+ processor helps provide a trusted foundation for the data center with built-in technologies that support confidential computing:

- [Intel® Software Guard Extensions \(Intel® SGX\)](#) enables applications to be partitioned into hardened enclaves, helping protect selected code and data from modification or disclosure.
- [Intel® Trust Domain Extensions \(Intel® TDX\)](#) enables hardware-isolated virtual machines, helping protect sensitive data and applications from unauthorized access.
- [Intel® QuickAssist Technology \(Intel® QAT\)](#) offloads cryptography and compression workloads from the CPU, helping improve performance while protecting data at rest, in transit, and in use.

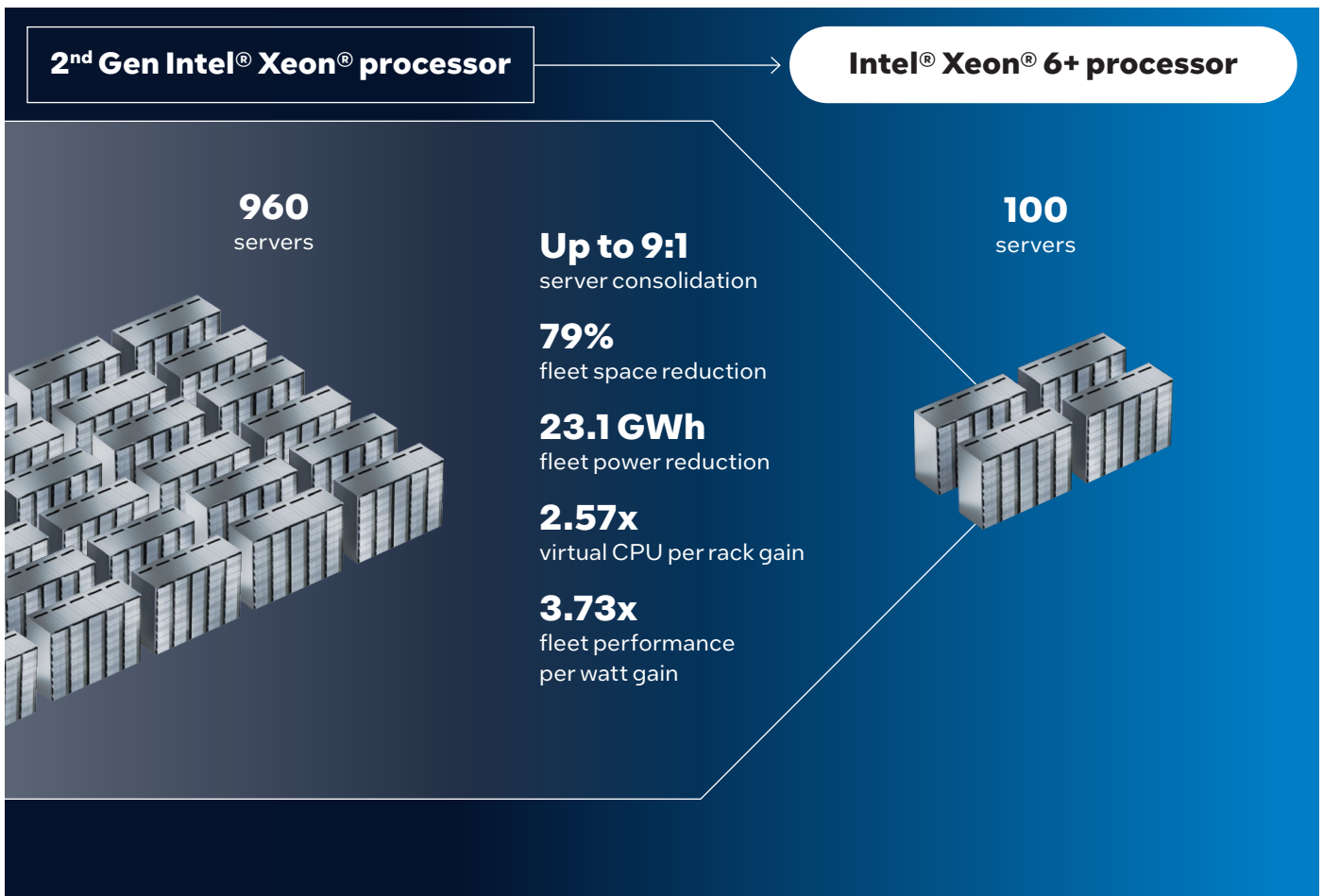


Figure 2. Modeling data center consolidation with Intel® Xeon® 6+ processors.⁵

Solution benefits

- **Increased core density.** Intel® Xeon® 6+ has 2x the core density of the previous Efficient core Intel Xeon processor, improving data center core and rack density.
- **Improved energy efficiency.** With up to 48% higher performance per watt compared to the previous Efficient core processor², Intel Xeon 6+ drives down energy costs and increases compute capacity within power-constrained data centers.
- **Improved security.** With the latest confidential computing features, including Intel® Software Guard Extensions and Intel® Trust Domain Extensions, Intel Xeon 6+ improves workload and data security when migrating from earlier processor generations.

Additionally, enterprises can harness mixed-system development with the high performance of different Intel® Xeon® processors to mix, orchestrate, and load balance across systems that are available today—not promised in the future – with full support for the data center software ecosystem already built on x86. The result is fully optimized, agentic AI systems—built on a trusted infrastructure that enterprises already know how to deploy, operate and scale. Enterprises can move from less secure, under-utilized agents to fully optimized, safer agent deployments, all on a long-standing, trusted infrastructure that they already know how to build and support.

Summary

By adopting Intel Xeon 6+, service providers will significantly improve core density, energy efficiency and security for scale-out workloads. This helps them to grow in response to customer demand and frees up rack space and budget for innovative new applications.

Improving efficiency for agentic AI

Enterprises are increasingly deploying agentic. AI GPUs are used for inference or generative AI and CPUs orchestrate AI workloads and agent-based tasks.

Insufficient CPU core density limits GPU utilization. Intel Xeon 6+ helps eliminate this bottleneck with ultra-high-density cores optimized for orchestration.

Intel® TDX provides a protected execution environment for enterprise agentic AI. Credentials are protected, data remains within the enterprise boundary, and security policies are enforced during execution – not retroactively.

Learn more

- [Intel® Xeon® 6+ processor](#)
- [Intel® Infrastructure Power Manager](#)
- [Intel® Ethernet E835](#)

Find the solution that is right for your organization.
Contact your Intel representative or visit intel.com/cloud.



¹ See [9D220] at intel.com/processorclaims: Intel® Xeon® 6+. Results may vary.

² See [9T020] at intel.com/processorclaims: Intel® Xeon® 6+. Results may vary.

³ Configuration: Dual 3rd Gen Intel® Xeon® Gold 6338 processors (32 cores at 2 GHz), 512 GB total memory, Intel® Ethernet Network Adapter E810-CQDA2 (qty=2). For full details see: [Dynamic power savings in cloud-native 5G wireless infrastructure network functions](#).

⁴ Configuration: Test by Intel as of 11/21/2024. 1-node, 2x Intel® Xeon® 6780E processor, 144 cores, 320W TDP, HT N/A, Turbo On, Total Memory 1024GB (16x64 GB DDR5 6400 MT/s [6400 MT/s]), BIOS 1.0.1, microcode 0x30001b3, 10 x Ethernet Controller E810-C for QSFP, 1x 28.6G SanDisk 3.2Gen1, 1x 894.2G Dell BOSS-N1, 4x 1.7T Dell NVMe PM1743 RI E3.S 1.92TB, Red Hat Enterprise Linux CoreOS 416.94.202408132101-0, 5.14.0-427.31.1.el9_4.x86_64. For more details, see [Intel-Dell verified reference configuration for 5G core on Red Hat OCP](#).

⁵ See [9W20] at intel.com/processorclaims: Intel® Xeon® 6+. Results may vary. 5-year refresh. Comparing to 2nd Gen Intel® Xeon® Processors.

Performance varies by use, configuration, and other factors. Learn more on the [Performance Index site](#).

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. No product or component can be absolutely secure.

Your costs and results may vary.

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

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