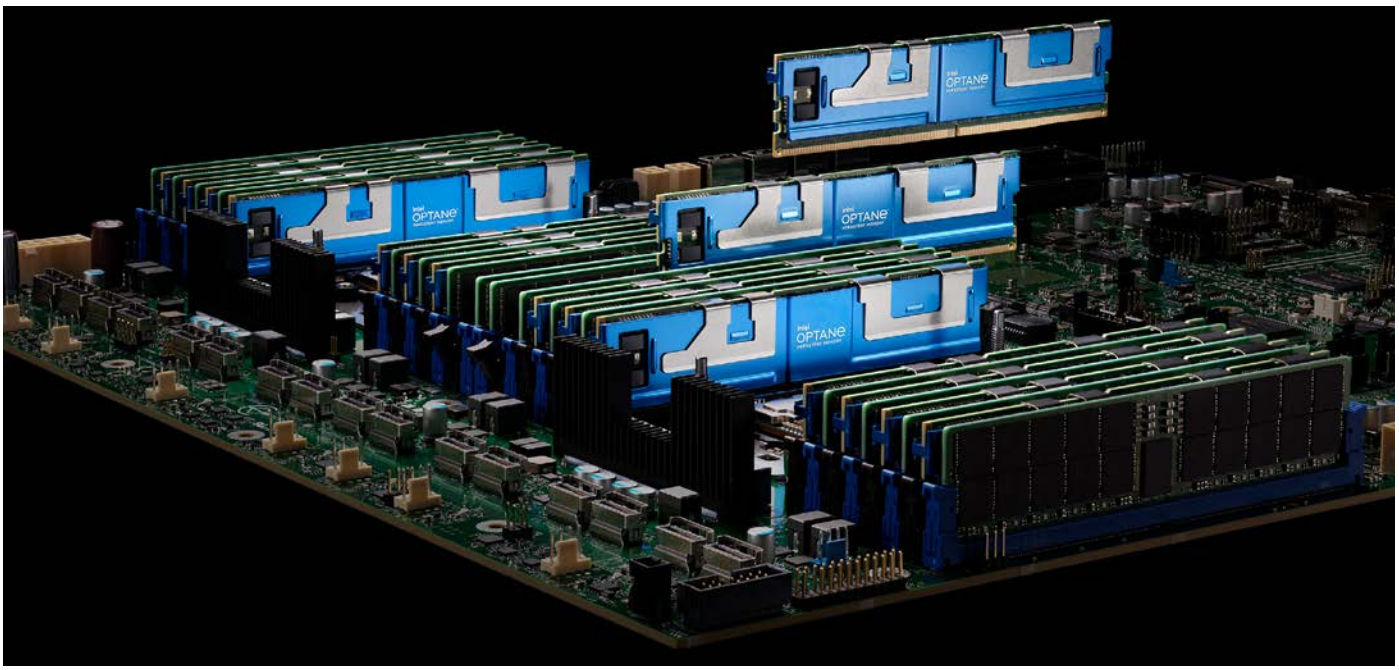
Product Brief

Enterprise
Intel® Optane™ Persistent Memory 300 Series

Propel Your Digital Transformation with Intel Optane Persistent Memory 300 Series

Intel Optane persistent memory 300 series enables fast tiered memory for large datasets, with an average of 56 percent more bandwidth for sequential workloads and an average of 214 percent more bandwidth for random workloads on 4th Gen Intel® Xeon® Scalable processors, compared to the previous generation.[1]



Memory technology has not kept up with the innovations made in CPU and solid state drive (SSD) technologies, which limits what enterprises can achieve with ever-increasing dataset sizes using their current data center and cloud infrastructures. These datasets are highly valuable to organizations undergoing digital transformation and seeking to build better customer experiences, increase operational efficiency, create new business models, and innovate in a rapidly changing world.

Keeping large pools of data on DRAM can help accelerate computing workloads, but DRAM is expensive, volatile, and limited in capacity. And while SSDs are less expensive than DRAM and able to store large amounts of data, they are slower to send and receive data from the CPU.

Intel Optane persistent memory (PMem) bridges the gap in memory technology as an innovative new tier. It offers the best of both DRAM and SSDs in the memory-storage hierarchy to provide a unique combination of affordable, high-capacity memory and data persistence. Intel Optane PMem helps deliver fast insights from large datasets by maintaining larger amounts of data closer to the processor, while reducing the higher latency of fetching data from system storage.

Get actionable insights faster

Now in its third generation, Intel Optane PMem offers more innovations to extract actionable insights from data. Available in 128, 256, and 512 GB DIMM modules, Intel Optane PMem 300 series delivers up to 4 TB of memory per socket, enabling up to 6 TB of total memory per socket on Intel Xeon Scalable processor–based server platforms.

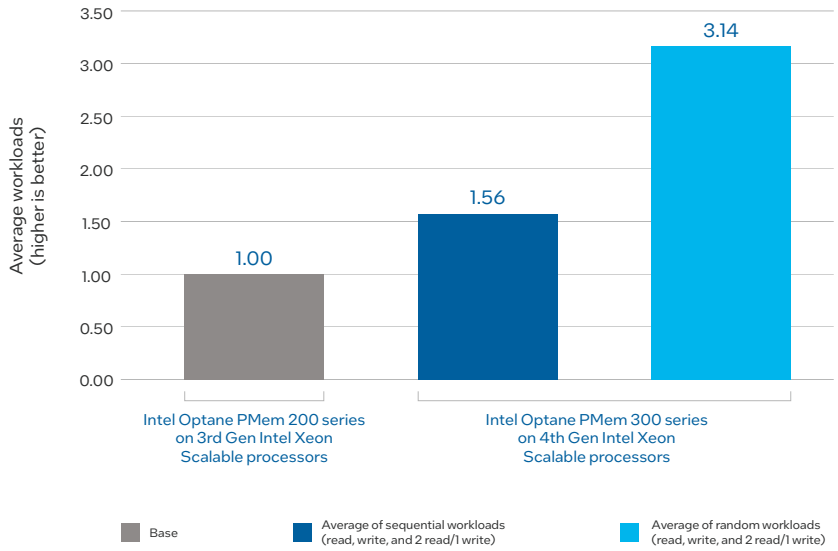


Figure 1. How workload bandwidth has improved on Intel Optane PMem 300 series, compared to the previous generation[1]

Intel Optane PMem 300 series and the latest Intel Xeon Scalable processors work together to deliver:

- **More bandwidth in general.** Improve performance significantly, with an average of 56 percent more bandwidth for sequential workloads and an average of 214 percent more bandwidth for random workloads on 4th Gen Intel Xeon Scalable processors, compared to the previous generation.[1]
- **Even more bandwidth when your apps need it.** Temporarily boost bandwidth by powering above the normal 12 to 15 W with the included Intel® Memory Bandwidth Boost feature. Intel Memory Bandwidth Boost increases bandwidth performance while staying within safe temperature and power limits. It's a feature that is already enabled by default on 4th Gen Intel Xeon Scalable processors, with no configuration necessary.
- **Increased frequency.** To achieve faster data transfers, Intel Optane PMem 300 series supports DDR-T2 speeds of up to 4,400 megatransfers per second (MT/s), compared to 3,200 MT/s in the previous generation.[2]
- **Data protection with hardware-based encryption.** Intel Optane PMem 300 series helps protect data at rest with AES-XTS-256-bit hardware-based encryption, and it is certified as Federal Information Processing Standard (FIPS) 140-3 Level 2 compliant.[3] These protections allow users to move sensitive workloads where they need them. No code rewriting is required for applications to take advantage of strong security capabilities.

Tiered memory

Enterprises can also use Intel Optane PMem to implement a tiered memory approach in the data center. In a tiered memory scenario, Intel Optane PMem is used as the large capacity tier, while a relatively small amount of DRAM serves as a memory cache tier to maintain high speed and low latency. The ratio of DRAM to Intel Optane PMem can be configured to support application and workload demands. IT can right-size DRAM investments and expand total memory per server, accommodate much larger workloads, increase VM density, and dramatically improve resource utilization.

With this approach, data-intensive and compute-intensive workloads, including databases, in-memory analytics, content delivery networks (CDNs), and more, can take advantage of large-scale and persistent memory. Enabling large memory pools helps speed time to insights that inform business decisions, cost efficiencies, and new revenue streams.

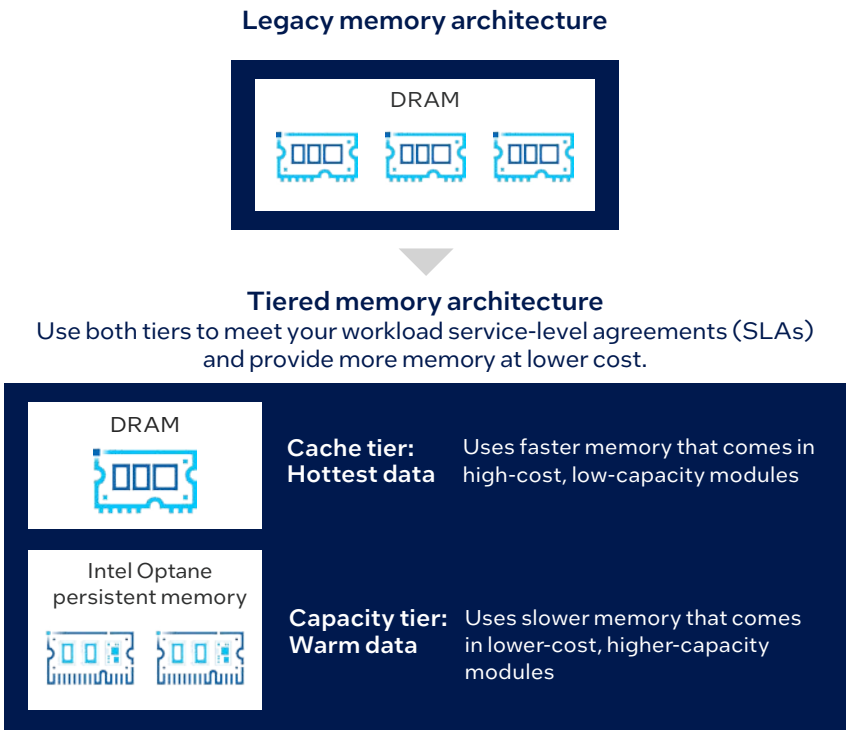


Figure 2. A tiered memory approach helps reduce total cost of ownership (TCO) by making memory more affordable

Lower overall TCO

With the greater capacity of Intel Optane PMem, infrastructure architects can lower overall memory costs because Intel Optane PMem modules cost less than DRAM. And because data can be retained on an Intel Optane PMem module, IT administrators can avoid time-consuming data reloads or data loss during an unexpected outage or a planned restart. This means less downtime, fewer data losses from system outages, and increased operational efficiency.

In addition, by providing large capacity memory at the same cost as DRAM, Intel Optane PMem can help decrease the amount of physical data center space required. With a smaller data center footprint, attendant costs such as power and cooling, networking and storage, software licensing, and system administration are also reduced.

Grow and innovate on a trusted platform

With Intel Optane PMem 300 series, enterprises can better deploy innovative services and products that require high-performance data analytics using an established, trusted technology supported by advanced hardware-based security and a five-year product warranty.

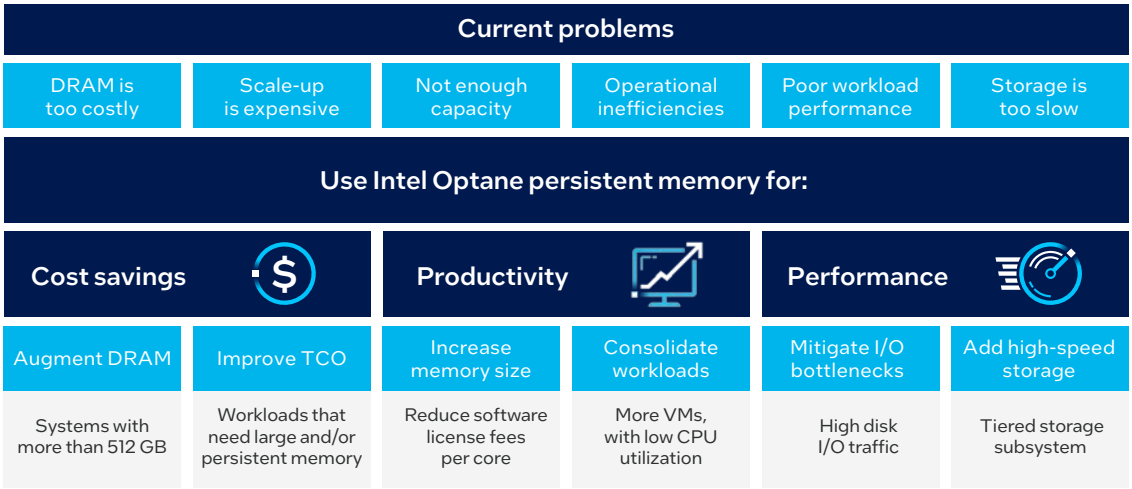


Figure 3. Intel Optane PMem addresses problems in the data center and cloud so companies can grow and innovate

Intel Optane PMem has been deployed in 1,000+ customer success stories across many workloads and verticals.

Top workloads

- Virtual infrastructure
- Databases
- Analytics and artificial intelligence (AI)
- High-performance computing (HPC)
- Cloud and custom workloads

Top verticals

- Cloud service providers (CSPs)
- Financial services
- Communications service providers (CoSPs)
- Manufacturing/industrial
- Government and education
- Health and life sciences
- Energy

Operating modes: More flexibility for business needs

Intel Optane PMem 200 series offers multiple operating modes:

- **App Direct Mode: Drive application innovation.** In App Direct Mode, Intel Optane PMem enables applications to access DRAM and persistent memory in a byte-addressable way, directing where data is placed for each workload. Data structures can be made persistent even though they live in memory, which can help reduce reboot times and enables multi-terabyte capacity for large datasets. App Direct Mode has been in use on Windows and Linux operating systems and hypervisors for several years.
- **Memory Mode: Increase memory capacity at a lower cost.** In Memory Mode, Intel Optane PMem is used solely as volatile memory, effectively expanding the capacity of memory available to the system at a lower cost than that of DRAM. Apps and workloads have direct access to high-speed, high-capacity memory. Memory Mode use does not require any changes to the operating system or applications—it transparently provides larger memory capacity. Memory Mode also allows existing DRAM to be used as cache for even more performance benefits.

Table 1. Intel Optane persistent memory 200 series data sheet

Product family	Intel Optane PMem 200 series		
Compatible processor	3rd Gen Intel Xeon Scalable processors		
Form factor	Persistent memory module		
SKU	128 GB	256 GB	512 GB
User capacity	[illegible]	[illegible]	[illegible]
MOQ	4	4	4
MM#	[illegible]	[illegible]	[illegible]
Product code	[illegible]	[illegible]	[illegible]
Model string	[illegible]	[illegible]	[illegible]
Technology	Intel Optane technology		
Limited warranty	5 years		
Annualized failure rate (AFR)	[illegible]		
Endurance at 100% write, 15 W, 128 B	[illegible]	[illegible]	[illegible]
Endurance at 67% read, 33% write, 15 W, 128 B	[illegible]	[illegible]	[illegible]
Endurance at 100% write, 15 W, 64 B	[illegible]	[illegible]	[illegible]
Endurance at 67% read, 33% write, 15 W, 64 B	[illegible]	[illegible]	[illegible]

Bandwidth at 100% read, 15 W, 128 B	10.55 GB/s	10.55 GB/s	8.96 GB/s
Bandwidth at 67% read, 33% write, 15 W, 128 B	6.06 GB/s	6.06 GB/s	5.12 GB/s
Bandwidth at 100% write, 15 W, 128 B	3.25 GB/s	3.25 GB/s	2.77 GB/s
Bandwidth at 100% read, 15 W, 64 B	5.28 GB/s	5.28 GB/s	4.48 GB/s
Bandwidth at 67% read, 33% write, 15 W, 64 B	3.03 GB/s	3.03 GB/s	2.56 GB/s
Bandwidth at 100% write, 15 W, 64 B	1.63 GB/s	1.63 GB/s	1.39 GB/s
DDR frequency	4,400 MT/s		
Max thermal design power (TDP)	15 W		
Temperature (Tjmax)	≤83°C Bu (85°C shutdown, 83°C default) media temperature		
Temperature (Tambient)	48°C at 2.4 m/s for 12 W		
Temperature (Tambient)	43°C at 2.7 m/s for 15 W		

Notes: Bandwidths are +/– 3 percent; GiB = 2^{30}; GB = 10^{9}.

Advance to innovative memory technology today

Intel Optane PMem 300 series is the next step in groundbreaking memory technology to help enterprises achieve more with their data. Deployed on 4th Gen Intel Xeon Scalable processors, this technology can transform critical data workloads to enable enterprises to gain faster insights and lower costs, and to design and innovate confidently on a trusted platform.

[1] Intel Optane PMem 300 series on 4th Gen Intel Xeon Scalable processors can provide an average of 56 percent more bandwidth for sequential workloads and an average of 214 percent more bandwidth for random workloads compared to the previous generation; average of read, write, 2 read/1 write workloads (compared to Intel Optane PMem 200 series on 3rd Gen Intel Xeon Scalable processors). **Baseline:** Tested by Intel as of 09/27/22. 1-node, 1 x Intel Xeon Platinum 8380 processor, 40 cores, Intel® Hyper-Threading Technology (Intel® HT Technology) on, Intel® Turbo Boost Technology on, 256 GB total DRAM (8 slots/32 GB/3,200 MT/s), 1,024 GB total Intel Optane PMem (8 slots/128 GB/3,200 MT/s, App Direct non-interleaved), WLYDCRB1.E9I.0027.P61.2209071746 (ucode 0xd000363), CentOS Stream 8, kernel 5.15.0-spr.bkc.pc.10.4.11.x86_64, gcc (GCC) 8.5.0 20210514 (Red Hat Enterprise Linux 8.5.0-10), MLC v3.9a-RC2-internal, single Intel Optane PMem module under test through FSDAX interface, stride length 128 B for random tests to force a non-sequential data pattern at the DIMM. **New:** Tested by Intel as of 09/27/22. 1-node, 1 x Intel Xeon Platinum 8480+ processor, 56 cores, Intel HT Technology on, Intel Turbo Boost Technology on, 512 GB total DRAM (8 slots/64 GB/4,800 MT/s at 4,400 MT/s), 1,024 GB total Intel Optane PMem (8 slots/128 GB/4,400 MT/s, App Direct non-interleaved), EGSDCRB1.E9I.0087.D13.2209212048 (ucode 0x2b000070), CentOS Stream 8, kernel 5.15.0-spr.bkc.pc.10.4.11.x86_64, gcc (GCC) 8.5.0 20210514 (Red Hat Enterprise Linux 8.5.0-10), MLC v3.9a-RC2-internal, single Intel Optane PMem module under test through FSDAX interface, stride length 256 B for random tests to force a non-sequential data pattern at the DIMM.

[2] Intel Optane PMem 300 series supports DDR-T2 up to 4,400 MT/s (1DPC and 2DPC) with 4th Gen Intel Xeon Scalable processors.

[3] FIPS 140-3 Level 2 certification is pending National Institute of Standards and Technology (NIST) approval.

[4] Memory Mode will be supported after launch. Check with your solution provider for availability.

Performance varies by use, configuration and other factors.
Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See configuration disclosure for additional 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.
All product plans and roadmaps are subject to change without notice.

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