

## Accelerate Data Center Storage and Memory Performance

The next-generation Intel Optane SSD P5800X series provides the performance needed to support the most data-intensive workloads

### Intel Optane SSD P5800X series delivers high throughput and low latency

Intel Optane SSD P5800X series can accelerate access to the large and complex datasets that enterprises and cloud service providers (CSPs) need to run their high-demand workloads.

### Demanding workloads are held back by legacy storage

Today's data-intensive workloads demand low latency and high throughput to help drive predictive business decisions. IT organizations must try to meet those demands within ever-more-constrained budgets.

DRAM and NAND have historically acted as the performance buffer between compute and capacity storage, but they both leave an ever-widening gap for the modern, scaled-out data center. DRAM can be too expensive to scale, which means that density might fall further behind relative to the CPU-core growth rate. NAND offers capacity with lower cost and greater scalability, but even fast NAND solid state drives (SSDs) are no longer adequate for data-driven applications that need to predictively access and process data or act as a buffer to today's multi-gigabit Ethernet network connections.

### Closing the performance gap

The Intel Optane SSD P5800X series delivers low latency, high quality of service (QoS), fast throughput, and high endurance. These high-capacity SSDs fill the critical storage performance gap, making them ideal for caching or data tiering. Unlike NAND SSDs, Intel Optane SSDs use write-in-place technology, which enables them to read and write simultaneously without performance degradation.

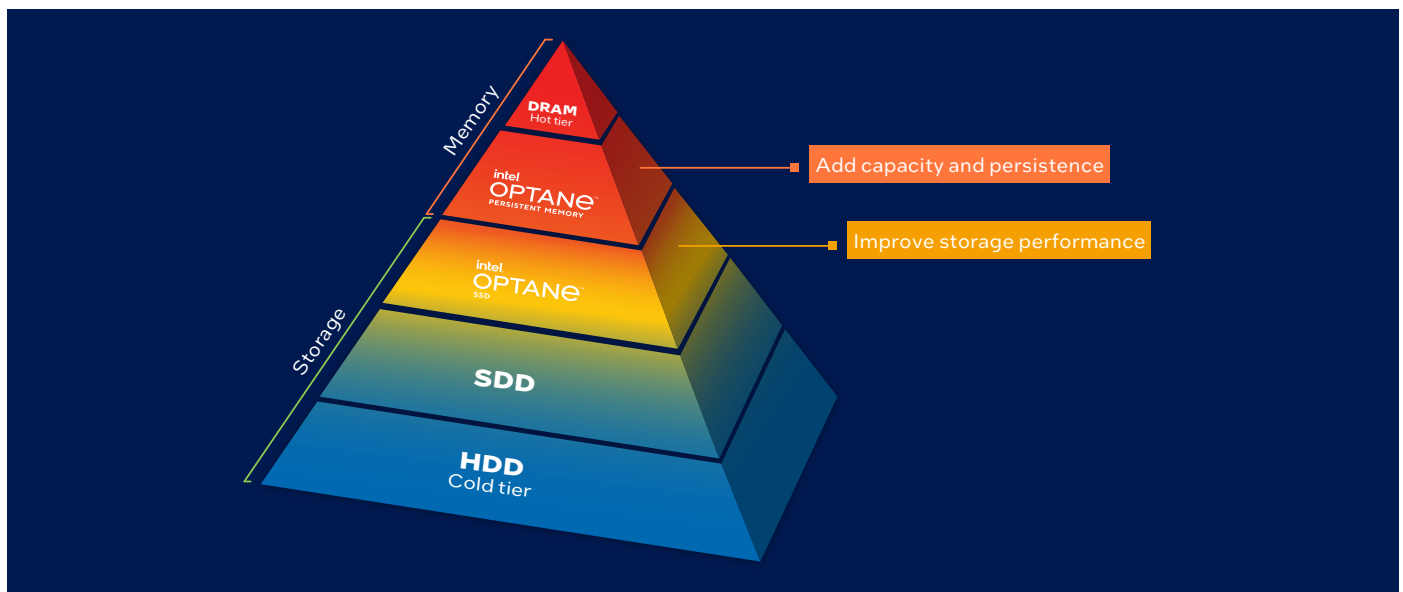
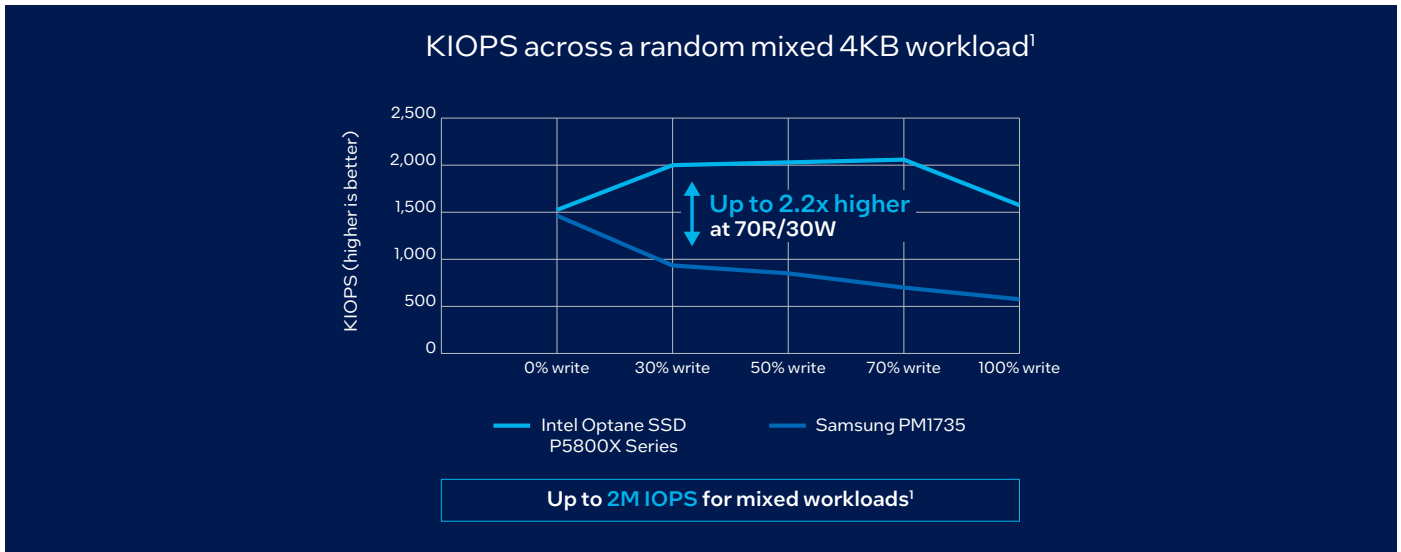


Figure 1. Intel Optane SSDs fill the storage gap between NAND SSDs and memory

## Blazing fast performance

The PCIe 4.0-compliant Intel Optane SSD P5800X series delivers consistent low-latency performance for applications that need to access and process data in real time. The drives can also act as buffers to fast Ethernet network interface card (NIC) connections.

The Intel Optane SSD P5800X series can reach up to 1.5M input/output operations per second (IOPS) of random read or random write performance at low queue depths (QDs). The PCIe bus is designed as a bidirectional bus, with both reads and writes. Because of this, the Intel Optane SSD P5800X series can achieve greater-than-specification-sheet performance—up to 2M IOPS—under 70/30 random mixed workloads (see Figure 2).<sup>1</sup> Compared to the Samsung PM1735 NVMe Express (NVMe) NAND SSD, the Intel Optane SSD P5800X series delivers up to 2.2x higher KIOPS at 70/30 random mixed workloads.<sup>1</sup>



**Figure 2.** The Intel Optane SSD P5800X series delivers better IOPS for more efficient network saturation<sup>1</sup>

The Intel Optane SSD P5800X series also has a unique 512B random read capability designed specifically for memory/DRAM offload of metadata use cases, and it is capable of reaching up to 5M IOPS, even in mixed-workload scenarios.

### What it means

<p><b>Up to 2.2x greater<sup>1</sup></b></p>	<p><b>Up to 2.7x higher<sup>2</sup></b></p>	<p><b>Up to 3.2x greater<sup>3</sup></b></p>	<p><b>Up to 5.1x greater<sup>3</sup></b></p>
<p>4 KB block bandwidth with bi-directional read/write capability versus a Samsung PM1735 NVMe NAND SSD</p>	<p>IOPS at low QDs, compared to a Samsung PM1735 NVMe NAND SSD</p>	<p>performance per watt in a 70 percent read/30 percent write workload versus a Samsung PM1735 NAND SSD</p>	<p>performance per watt in a 30 percent read/70 percent write workload versus a Samsung PM1735 NVMe NAND SSD</p>

### Why it matters

It's all about getting more for less. The Intel Optane SSD P5800X series delivers the performance density needed to achieve desired storage performance levels with fewer storage devices. This approach potentially saves money or precious slots in disaggregated storage architecture. If you're looking to expand your host memory capability, Intel Optane technology's small-block random read performance and low latency also enable greater memory expansion using the PCIe bus with sparse datasets in artificial intelligence (AI) training and inferencing use cases. If you compare how many SSDs are needed to saturate 100 GbE network, you can realize 3x to 6x more efficient saturation with the Intel® Optane™ SSD P5800X series.<sup>4</sup> This has the added benefit of freeing up PCIe slots, which can enable data center footprint reduction, or capacity expansion within the node.

**Table 1.** Number of SSDs to saturate a 100 GbE network

	Intel Optane SSD P5800X series (1.6 TB)	Samsung PM1735 (3.2 TB)
100% random read	Two SSDs (3.2 TB)	Three SSDs (9.6 TB)
100% random write	Two SSDs (3.2 TB)	Six SSDs (19.2 TB)
70/30 mixed read/write	Two SSDs (3.2 TB)	Four SSDs (12.8 TB)

Using the Intel Optane SSD P5800X series for caching or tiering dramatically reduces I/O bottlenecks. The Intel Optane 5800X Series delivers up to 5.1x greater performance per watt in a 30 percent read/70 percent write workload as compared to a Samsung PM1735 NVME NAND SSD.<sup>3</sup> The ability to greatly improve write-intensive workload performance helps to save power and reduce operating expense (OPEX).

### Unrivaled low random read latency

The low-latency Intel Optane SSD P5800X series delivers near-nanosecond response times under any workload, maintaining consistent read response times, regardless of the write throughput.

Near-nanosecond latency means improved application response times. With its bidirectional capability, the low latency of the Intel Optane SSD P5800X series remains consistent until saturation. Latency is improved even more by being able to read smaller 512B data chunks.

For industries like financial services, this capability means businesses can get faster time to insight for fraud detection, analytics, compliance, market modeling, and securities market transactions.

### Consistent, predictable quality of service (QoS)

In an environment of fast-growing data and demanding customer requirements, data centers need predictable application performance.

#### What it means

<div style="background-color: #002060; color: white; padding: 10px; margin-bottom: 5px;"> <p>Up to <b>21x better<sup>5</sup></b></p> </div> <p>five-nines response times, compared to a Samsung PM1735 NVMe NAND SSD</p>	<div style="background-color: #002060; color: white; padding: 10px; margin-bottom: 5px;"> <p>Up to <b>93% lower<sup>6</sup></b></p> </div> <p>latency on a 4K random read workload, compared to a Samsung PM1735 NVMe NAND SSD</p>	<div style="background-color: #002060; color: white; padding: 10px; margin-bottom: 5px;"> <p>Up to <b>147x lower<sup>7</sup></b></p> </div> <p>read response time under an increasing write workload, compared to a Samsung PM1735 NVMe NAND SSD</p>	<div style="background-color: #002060; color: white; padding: 10px; margin-bottom: 5px;"> <p>Up to <b>8.8x higher<sup>8</sup></b></p> </div> <p>throughput on a mixed 70 percent read/30 percent write workload, compared to a Samsung PM1735 NVMe NAND SSD</p>	<div style="background-color: #002060; color: white; padding: 10px; margin-bottom: 5px;"> <p>Up to <b>95% lower<sup>9</sup></b></p> </div> <p>latency at 600K IOPS, compared to a Samsung PM1735 NVMe NAND SSD</p>
--	--	--	---	--

#### Why it matters

The Intel Optane SSD P5800X series delivers predictable low latency and consistent input/output (I/O) command completion times, resulting in dependable QoS.

These SSDs are ideal for critical applications with demanding latency requirements or for customers with strict service-level agreements (SLAs).

## High endurance for lower storage costs and less downtime

Greater endurance means longer life for storage media. By using Intel Optane SSDs as a caching or tiering layer for write-heavy workloads, the life of lower-cost NAND storage media can be extended, and costs can be reduced through less maintenance and downtime.

### What it means

Up to  
**67%  
higher<sup>10</sup>**

endurance versus  
the Intel Optane SSD  
DC P4800X NVMe  
NAND SSD

Up to  
**20x  
better<sup>11</sup>**

extended life for  
NAND capacity  
storage drives

### Why it matters

Intel Optane SSDs are designed for mixed workload environments, and they can withstand the kind of intense traffic typically demanded of memory. Their extremely high endurance makes them ideal for write-intensive applications or as a tiering layer in storage architecture.

The Intel Optane SSD P5800X series overcomes legacy storage performance shortfalls in today's increasingly intensive workloads:



#### Hyperconverged infrastructure (HCI)

Increase performance  
without added nodes



#### Artificial intelligence (AI)

Overcome  
IOPS limitations



#### High-performance computing (HPC)

Eliminate write-bandwidth  
I/O bottlenecks



#### Database

Maintain fast, reliable  
Microsoft SQL Server  
performance

## The Intel Optane SSD P5800X series delivers incredible versatility

Choose the Intel Optane SSD P5800X series as a caching or high-performance tiering layer, as extended memory to augment host memory in AI use cases, or to store large files locally for higher performance in electronic design automation (EDA) use cases. Intel Optane SSDs can help you achieve a scalable data center with cost-effective, performance-dense solutions that include the following benefits:

- **Extended memory:** 512B read capability enables using a PCIe storage device as extended memory for metadata or sparse data in large datasets.
- **Fast caching (temporarily copy or hold the hottest data):** The write buffer accelerates time-to-durability, and the read cache accelerates application performance.
- **Intelligent tiering (data placement):** Intelligent data placement enables you to deploy multiple tiers for cost optimization.

## Intel Optane SSD P5800X series specifications

Feature	Specification
Capacity	400 GB/800 GB
Interface	PCIe 4.0
Drive writes per day (DWPD)	100
Throughput:	Throughput:
<ul style="list-style-type: none"> <li>▪ Sequential read</li> <li>▪ Sequential write</li> <li>▪ Random 4K read (IOPS)</li> <li>▪ Random 4K write (IOPS)</li> <li>▪ Random 4K 70/30 read/write (IOPS)</li> <li>▪ Random 512B read (IOPS for metadata)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Up to 7.2 GB/second</li> <li>▪ Up to 6.0 GB/second</li> <li>▪ Up to 1.5M</li> <li>▪ Up to 1.5M</li> <li>▪ Up to 1.8M</li> <li>▪ Up to 5.0M</li> </ul>
QoS:	QoS:
<ul style="list-style-type: none"> <li>▪ 4KRR, QD=1, 99%</li> <li>▪ 4KRR, read/Write, mixed QD=1, 99.999%</li> </ul>	<ul style="list-style-type: none"> <li>▪ Less than 5 μs</li> <li>▪ Less than 66 μs</li> </ul>

Learn more at [intel.com/optanessd](https://intel.com/optanessd).



<sup>1</sup> As measured by fio version 3.33 testing on February 10, 2023, of the Intel Optane SSD P5800X series versus the Samsung PM1735 PCIe Gen4 SSD. For full workloads and configuration details, visit <https://edc.intel.com/content/www/us/en/products/performance/benchmarks/overview/> (Intel Optane SSD P5800X series, claim 4). Results may vary.

<sup>2</sup> As measured by fio version 3.33 testing on February 10, 2023, of the Intel Optane SSD P5800X series versus the Samsung PM1735 PCIe Gen4 SSD. For full workloads and configuration details, visit <https://edc.intel.com/content/www/us/en/products/performance/benchmarks/overview/> (Intel Optane SSD P5800X series, claim 6). Results may vary.

<sup>3</sup> As measured by fio version 3.33 testing on February 10, 2023, of the Intel Optane SSD P5800X series versus the Samsung PM1735 PCIe Gen4 SSD. For full workloads and configuration details, visit <https://edc.intel.com/content/www/us/en/products/performance/benchmarks/overview/> (Intel Optane SSD P5800X series, claim 16). Results may vary.

<sup>4</sup> As measured by fio version 3.33 testing on February 10, 2023, of the Intel Optane SSD P5800X series versus the Samsung PM1735 PCIe Gen4 SSD. For full workloads and configuration details, visit <https://edc.intel.com/content/www/us/en/products/performance/benchmarks/overview/> (Intel Optane SSD P5800X series, claim 19). Results may vary.

<sup>5</sup> As measured by fio version 3.33 testing on February 10, 2023, of the Intel Optane SSD P5800X series, versus the Samsung PM1735 PCIe Gen4 SSD. For full workloads and configuration details, visit <https://edc.intel.com/content/www/us/en/products/performance/benchmarks/overview/> (Intel Optane SSD P5800X series, claim 8). Results may vary.

<sup>6</sup> As measured by fio version 3.33 testing on February 10, 2023, of the Intel Optane SSD P5800X series versus the Samsung PM1735 PCIe Gen4 SSD. For full workloads and configuration details, visit <https://edc.intel.com/content/www/us/en/products/performance/benchmarks/overview/> (Intel Optane SSD P5800X series, claim 17). Results may vary.

<sup>7</sup> As measured by fio version 3.33 testing on February 10, 2023, of the Intel Optane SSD P5800X series versus the Samsung PM1735 PCIe Gen4 SSD. For full workloads and configuration details, visit <https://edc.intel.com/content/www/us/en/products/performance/benchmarks/overview/> (Intel Optane SSD P5800X series, claim 7). Results may vary.

<sup>8</sup> As measured by fio version 3.33 testing on February 10, 2023, of the Intel Optane SSD P5800X series versus the Samsung PM1735 PCIe Gen4 SSD. For full workloads and configuration details, visit <https://edc.intel.com/content/www/us/en/products/performance/benchmarks/overview/> (Intel Optane SSD P5800X series, claim 2). Results may vary.

<sup>9</sup> As measured by fio version 3.33 testing on February 10, 2023, of the Intel Optane SSD P5800X series versus the Intel Optane SSD DC P4800X series. For full workloads and configuration details, visit <https://edc.intel.com/content/www/us/en/products/performance/benchmarks/overview/> (Intel Optane SSD P5800X series, claim 5). Results may vary.

<sup>10</sup> As measured by fio version 3.33 testing on February 10, 2023, of the Intel Optane SSD P5800X series versus the Intel Optane SSD DC P4800X series. For full workloads and configuration details, visit <https://edc.intel.com/content/www/us/en/products/performance/benchmarks/overview/> (Intel Optane SSD P5800X series, claim 1). Results may vary.

Performance varies by use, configuration and other factors. Learn more at [www.intel.com/PerformanceIndex](https://www.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. No product or component can be absolutely secure.

Your costs and results may vary.

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

© Intel Corporation. Intel, the Intel logo, and other Intel marks are trademarks of Intel Corporation or its subsidiaries. Other names and brands may be claimed as the property of others.