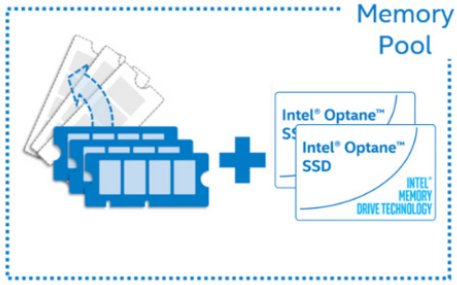
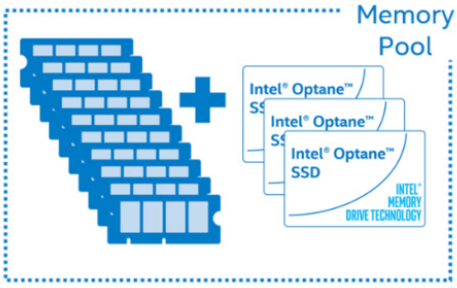
PRODUCT BRIEF

Intel® Optane™ SSD DC P4800X Series with Intel® Memory Drive Technology
Industry: Data Center

Enabling Bigger, More Affordable Memory Solutions

Intel® Memory Drive Technology transparently integrates Intel® Optane™ SSDs into the memory subsystem.





Intel® Memory Drive Technology can revolutionize your data center memory architecture. When combined with Intel® Optane™ SSDs, Intel® Memory Drive Technology transparently integrates the drive into the memory subsystem and makes it appear like DRAM to the operating system and applications. This can increase memory capacity beyond DRAM limitations, with no change required to the OS or applications.

Intel® Memory Drive Technology is highly beneficial in two primary IT scenarios:

- Displace a portion of more expensive DRAM to reduce overall memory cost
- Grow the memory pool beyond DRAM capacities to access or enable much larger memory datasets

Displace Costly DRAM for More Affordable Memory

Intel® Memory Drive Technology enables data centers to deliver more affordable memory pools by displacing a portion of higher cost, higher power DRAM. By pairing a reduced amount of DRAM and replacing that capacity with the high-performing non-volatile memory of the Intel® Optane™ SSD DC P4800X, data centers can more cost-effectively execute memory-intensive workloads with much lower DRAM capacity installed, saving on both hardware procurement and operations cost.

Extend Memory for a Bigger Memory Footprint

Intel® Memory Drive Technology enables data centers to grow the memory footprint beyond DRAM-only capacity. Together, DRAM and Intel® Optane™ SSDs with Intel® Memory Drive Technology emulate a single volatile memory pool. Additionally, Intel® Memory Drive Technology intelligently determines where data should be located within the pool to maximize speed, enabling servers to deliver performance across many workloads—even when DRAM is only supplying one-third to one-eighth of the memory pool capacity.

Enable New Possibilities for the Enterprise

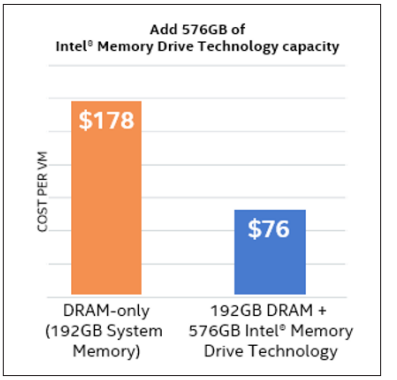
The combination of cost-efficiency and increased capacity means enterprises can break through today's memory limits, enabling new possibilities—like accessing higher-capacity, in-memory datasets to deliver better, faster analytics insight. As an example, cloud providers can reduce capital cost for memory when enabled to oversubscribe workloads with greater overall capacity. Or, high-performance computing centers can increase large memory datasets to improve research and scientific results, and test new simulations quickly and cost-efficiently.

Cost Efficiency and Overall Savings

Intel® Memory Drive Technology allows data centers to implement the same amount of memory for a significantly lower cost compared to all-DRAM installations, or alternatively, achieve much larger amounts of memory than the practical limitations of a given server DRAM-only capacity.

The chart on the right compares the cost per KVM* + Redis* Virtual Machine (VM) structure of:

- A DRAM-only dual-processor server with 192GB of memory
- The same dual-processor server configuration with 192GB DRAM complemented by Intel® Memory Drive Technology to expand overall system memory pool to 768GB total[1]
- With otherwise identical server configurations, expanding the overall system memory footprint with additional Intel® Memory Drive Technology capacity decreases the cost per VM by greater than 50%[1] when compared to the smaller all-DRAM set.



About Intel® Optane™ Technology

Intel® Optane™ technology is a unique combination of Intel® 3D XPoint™ memory media with Intel's advanced system memory controller, interface hardware and software IP. This revolutionary technology is offered in several form factors to unleash vast system performance in a range of products.

HARDWARE REQUIREMENTS	
Intel® Optane™ SSD DC P4800X	375GB, 750GB, 1.5TB[2,3]
Supported Processors	Intel® Xeon® Scalable, Intel® Xeon® E5-x6xx v2 or later, E7-x8xx v2 or later
Maximum Processor Sockets	8
Operating Systems	RHEL* / Centos* 6.5, 6.6, 6.7, 6.8 ,7.0, 7.1, 7.2, 7.3, 7.4, 7.5 SLES* 11 SP4, 12, 12 SP1, 12 SP2 Ubuntu 16.04-17.10 Intel® Memory Drive Technology Software[4] requires a bootable media[5] Supported protocols: IDE, UHCI, EHCI
SOFTWARE FEATURE	**SPECIFICATIONS**
Memory Capacity	320GB, 640GB, 1.28TB[2,3]
Maximum Software-defined Memory	64TB[2]
Recommended DRAM Expansion	Up to 8x[6]
Memory Media Mode	Volatile (non-persistent)

For more information, visit intel.com/ssd

1. System configuration: Source – Intel: Server model: 2x Intel® Xeon® Gold 6154 @ 3.0 GHz, 72 hyper threaded cores, Intel system board S2600WF, 192GB installed DDR4 @ 2400Mhz, 2x Intel® Optane™ SSD DC 375GB; CentOS 7.5.1804 (kernel 4.15.12-1.el7.elrepo.x86_64 upgraded) , Redis version 4.02 (benchmark and server) in-memory instances given 5.7GB , 3.3 million key pairs at 1024b). The benchmark results may need to be revised as additional testing is conducted. Implementation details: System BIOS: 00.01.0013; Kernel 4.15.12; Mitigation was validated for variants 1 through 3 using a checker script, accessed June 20, 2018). Cost advantages derived from memory cost only – DDR4 2400 Server memory @ $11.72/GB (https://www.newegg.com/Product/Product.aspx?Item=9SIA7S67E57702&cm_re=32GB_Samsung_Server_DDR4-_-20-147-572-_-Product) versus bundle channel price of an Intel Memory Drive (any density) of $4.22/GB as of June 25, 2018. (https://www.amazon.com/Intel-Xpoint-P4800X-PCIe3-0-SSDPED1K375GA01/dp/B076TCZ3CM), $3.09 for SSD, $1.13 for Software license.
2. GB = 1,073,741,824 bytes, TB = 1,099,511,627,776 bytes
3. Total physical capacity is 375GB, 750GB, and 1500GB. Total usable capacity towards Intel® Memory Drive Technology is 320 GB. 640GB, 1280GB
4. Technology licensed from ScaleMP*
5. Software boots from USB media, network image (PXE boot) or directly from Optane SSD in UEFI mode.
6. For example: 128GB DRAM can be expanded up to 1024GB based on the capacity of the non-volatile memory media installed. Higher expansion ratios may be supported, with possibly suboptimal performance.

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software or service activation. Performance varies depending on system configuration. No computer system can be absolutely secure. Check with your system manufacturer or retailer or learn more at intel.com.

Performance results are based on testing as of July 5, 2018 and may not reflect all publicly available security updates. See configuration disclosure for details. No product can be absolutely secure.

Tests document performance of components on a particular test, in specific systems. Differences in hardware, software, or configuration will affect actual performance. Consult other sources of information to evaluate performance as you consider your purchase. For more complete information about performance and benchmark results, visit www.intel.com/benchmarks.

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