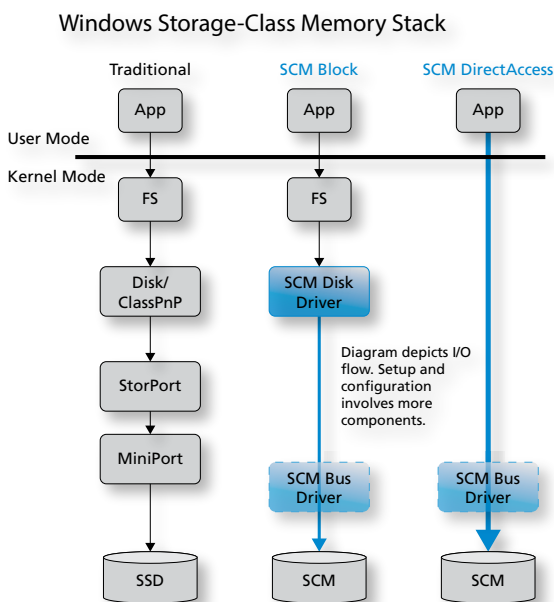




Windows Server 2016 Shows 75X IOPS Gain With NVDIMM-N

Microsoft's Build Conference 2016 (San Francisco) was the first public demonstration of Windows Server 2016's performance using DirectAccess (DAX) capabilities. This demonstration highlighted the differences between high-performance NVMe SSD and NVDIMMs configured for block and direct access modes.

The data illustrates the dramatic differences created by Windows Server 2016's native support for persistent memory (which they call storage-class memory, or SCM). Clearly, HPE Persistent Memory can offer unprecedented levels of performance and data resiliency for databases and analytic workloads.



HPE, Windows Server 2016 and Micron NVDIMM

Unparalleled Performance

NVDIMM-N (DAX)

- 1,112,006 IOPS
- 0.8µs

NVDIMM-N (Block)

- 148,566 IOPS
- 6.4µs

NVMe SSD

- 14,553 IOPS
- 66.6µs

Simple Deployment

Windows Server 2016 adds support for JEDEC-compliant NVDIMM-N products via a set of inbox drivers, simplifying customer deployments with next-generation HPE ProLiant Gen9 servers.

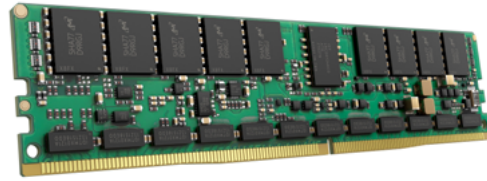
Speed With Persistence

For applications that require the highest levels of performance to enable frequent access to data sets, NVDIMMs combine the speed of DRAM and the persistence of NAND into a single memory subsystem that delivers increased system performance and reliability.

Bridge the DRAM-to-Storage Gap

Persistent memory bridges the gap between DRAM and storage, allowing greater flexibility in data management by providing nonvolatile, low-latency memory closer to the processor. Because it resides on the DRAM bus, persistent memory can provide ultra-fast, DRAM-like access to critical data. Combining the data reliability of traditional storage with ultra-low latency and high bandwidth, persistent memory opens up capabilities for optimizing systems and managing data like never before.

HPE, Micron® and Microsoft® Windows® Server 2016/NVDIMM-N Solution



HPE ProLiant Gen9 Server With NVDIMM-N

The Configuration

The demonstration platform was an HPE ProLiant DL380 Gen9 server with one NVMe SSD and two Micron 8GB DDR4 NVDIMM-Ns (1 used in block mode, 1 used in DAX mode), which provide the highest performance and flexibility for performance- and latency-sensitive applications.

Measured Performance and Latency*

Storage	IOPS	Delta (vs SSD)	MB/s	Latency (ns)
NVMe SSD	14,553	Baseline	56.85	66,632
Block NVDIMM-N	148,566	10.2X	580.34	6,418
DAX NVDIMM-N	1,112,006	76.4X	4343.78	828

In a 7-second test window, each tested device achieved the results shown in the table above (1 thread, 1 outstanding I/O).

Performance and Value

Windows Server 2016, with its native support for JEDEC-compliant NVDIMM-N devices, unlocks the potential for applications to modify critical data sets at memory speeds. It provides a platform for application developers to begin experimenting, readying and deploying their apps to take full advantage of persistent memory solutions — resulting in massive improvements in application performance.

HPE next-generation servers are designed to reduce costs and complexity, leveraging the latest Intel® processors and DDR4 memory. Offering 12 Gb/s SAS and 40Gb NICs with broad range compute options, these platforms enable fast processing and transaction times.

The Bottom Line

HPE Persistent Memory, the world's first NVDIMM optimized on ProLiant, can offer unprecedented levels of performance for databases and analytic workloads. Spanning the most basic to the most mission critical applications, these new platforms can be deployed with confidence. NVDIMM-N persistent memory support in Windows Server 2016 provides nonvolatile storage at the speed of memory.

Resource Links

- [HPE ProLiant Gen9 servers](#)
- [Micron NVDIMM-N](#)
- [Microsoft Windows Server 2016](#)

- Microsoft Channel 9 NVDIMM-N videos
- [Block](#)
 - [DAX](#)

**Prerelease software and hardware were used in this demonstration. Final, shipping products tested similarly will vary from these results.*



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