

### Overview

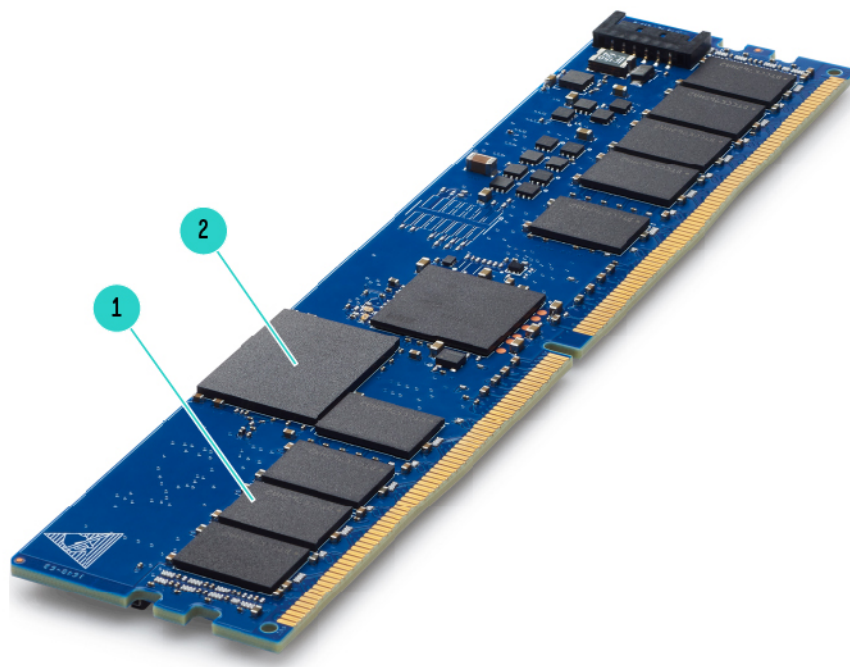
#### HPE NVDIMMs

Do you need to increase the performance of your data center database and analytics applications?

When you need to increase the performance of your database and analytics applications, look to HPE Persistent Memory. HPE has the broadest persistent memory portfolio in the market. We offer NVDIMMs that are right-sized to handle your constrained workloads, as well as terabyte capacity persistent memory, for larger bottlenecks. Now you can unlock new levels of performance, increase data resiliency and achieve faster business decisions in database management. HPE NVDIMMs are flash-backed DIMMs designed to eliminate smaller storage bottlenecks while delivering the performance of memory with the persistence of storage. Our NVDIMMs are also complemented by a robust software ecosystem that is designed around HPE servers and today's applications and workloads,

What's new:

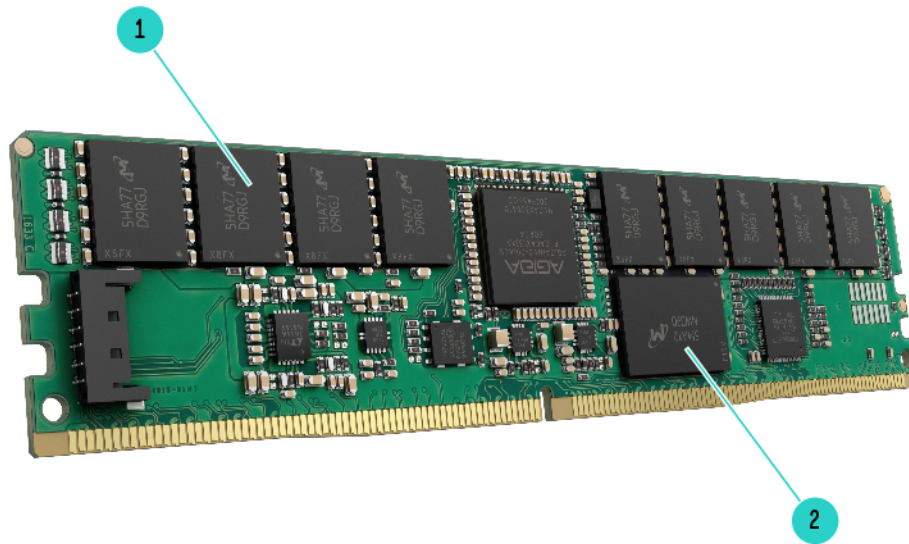
- New HPE 16GB NVDIMM for Gen10 Servers - 50% increase in capacity vs Gen9 Servers [5]
- 25% faster NVDIMMs in Gen10 Servers [6]
- Expanded server platform support with Gen10 Servers



#### HPE 16GB NVDIMM

1. DRAM: Application Acceleration.
2. NAND Flash: Persistent store for the NVDIMM.

## Overview



### HPE 8GB NVDIMM

1. DRAM: Application Acceleration.
2. NAND Flash: Persistent store for the NVDIMM.

## Models

HPE 16GB NVDIMM Single Rank x4 DDR4-2666 Module Kit

845264-B21

**NOTE:** Supported on select HPE ProLiant Gen10 servers (DL360, DL380, DL560, DL580), BL460c Gen10 and Synergy Gen10 Compute Modules (SY480 and SY660) - includes CTO support.

HPE 8GB NVDIMM Single Rank x4 DDR4-2133 Module

782692-B21

**NOTE:** Supported on HPE ProLiant DL360 and DL380 Gen9 servers featuring E5-2600 v4 processors (includes CTO support).

**NOTE:** HPE ProLiant DL360 and DL380 Gen9 servers with NVDIMMs require BIOS version 2.31 located at <http://persistentmemory.hpe.com>.

## Standard Features

<b>Storage at the Speed of Memory</b>	<p>Select HPE Servers equipped with HPE 16GB NVDIMMs increase performance for write intensive workloads delivering up to 2x+ faster database logging performance. [1]</p> <p>Designed to speed customer applications workloads, delivering up to 4x faster and better CPU Utilization with byte addressable storage. [2]</p>
<b>Technology Designed to Make Your Business Data Resilient</b>	<p>The HPE 16GB NVDIMM Modules include a flash component for persistence and utilizes the HPE Smart Storage Battery that provides you with a persistent storage capability at memory speeds without the data volatility of memory. [4] Active data runs on DRAM component of NVDIMM which not only provides outstanding performance but also offers greater endurance than traditional storage media.</p>
<b>Solutions Designed Around Your Business Workloads</b>	<p>HPE Persistent Memory is designed around industry applications and workloads to deliver the performance of memory with the persistence of storage.</p> <p>Complete hardware and software ecosystem providing a comprehensive persistent memory solution for your business, delivering up to 50% reduction in core-based software licensing. [3]</p>
<b>Optimized for HPE servers, including select ProLiant and BladeSystem servers and Synergy Compute Modules.</b>	<p>The HPE 8GB NVDIMM is designed for HPE ProLiant DL360 and DL380 Gen9 servers featuring Intel® E5-2600 v4 processors.</p> <p>The HPE 16GB NVDIMM is supported on the following Gen10 servers:  ProLiant DL Gen10: DL360, DL380, DL560 and DL580  Synergy Gen10: SY480 and SY660  BladeSystem Gen10: BL460c</p>
<b>Ideal Workloads</b>	<p>Ideal for databases write caching use cases and write-intensive workloads constrained by smaller storage bottlenecks.</p> <p>Reducing database storage bottlenecks: Up to 4x faster and better CPU utilization with byte addressable storage features in Microsoft SQL Server 2016.</p> <p>Software licensing reduction: Up to 50% reduction in core-based software licensing using NVDIMMs with fewer server cores while still maintaining equivalent or better overall performance.</p> <p>Write caching: Up to 2x faster with NVDIMMs versus NVMe SSDs.</p>
<b>Operating Systems</b>	<p>Microsoft Windows Server 2012 R2 (HPE driver)  Microsoft Windows Server 2016  Red Hat Enterprise Linux 7.3 or newer  SUSE Linux Enterprise Server 12 SP2 or newer</p>
<b>Warranty</b>	<p>For details on HPE Server Options Limited Warranty visit:  <a href="http://h17007.www1.hpe.com/us/en/enterprise/servers/warranty">http://h17007.www1.hpe.com/us/en/enterprise/servers/warranty</a></p>
<b>Other Resources</b>	<p>For information regarding HPE Persistent Memory visit: <a href="http://www.hpe.com/info/persistentmemory">http://www.hpe.com/info/persistentmemory</a>  For the latest updates on HPE Server Options visit: <a href="http://www.hpe.com/info/serveroptions">http://www.hpe.com/info/serveroptions</a></p>

- [1] Internal HPE lab testing on an HPE ProLiant DL380 Gen9 E5 2600 v4 with HPE 8GB NVDIMM-N, December 2015.  
[2] Internal HPE lab testing on an HPE ProLiant DL380 Gen9 E5 2600 v4 with HPE 8GB NVDIMM-N, December 2015.  
[3] HPE Internal lab testing. Data gathered on pre-release hardware and software, final results may differ, March 31, 2017.  
[4] Based on the NVDIMM utilizing NAND Flash as a persistent store and the HPE Smart Storage Battery providing the backup power source to move data from DRAM to NAND Flash.  
[5] Comparing 8GB NVDIMM to 16GB NVDIMM equals 2X capacity increase, July 2017.  
[6] Comparing 8GB NVDIMM speed of 2133 in Gen9 to 16GB NVDIMM speed of 2666 in Gen10, July 2017.

## Service and Support

<b>Service and Support</b>	<p><b>HPE Technology Services for ProLiant Servers</b></p> <p>HPE Technology Services delivers confidence, reduces risk and helps customers realize agility and stability. Connect to Hewlett Packard Enterprise to help prevent problems and solve issues faster. Our support technology lets you to tap into the knowledge of millions of devices and thousands of experts to stay informed and in control, anywhere, any time.</p> <p><b>Protect your business beyond warranty with HPE Support Services</b></p> <p>HPE Support Services enable you to order the right service level, length of coverage and response time as you purchase your new server, giving you full entitlement for the selected support.</p> <p><b>NOTE:</b> This option is covered under the HPE Support Service(s) applied to the compute module. No separate HPE Support Service(s) need to be purchased.</p>
<b>HPE Support Center</b>	<p>Personalized online support portal with access to information, tools and experts to support Hewlett Packard Enterprise business products. Submit support cases online, chat with Hewlett Packard Enterprise experts, access support resources or collaborate with peers. Learn more at <a href="https://www.hpe.com/us/en/support.html">https://www.hpe.com/us/en/support.html</a></p> <p>The HPE Support Center Mobile App* allows you to resolve issues yourself or quickly connect to an agent for live support. Now, you can get access to personalize IT support anywhere, anytime. HPE Insight Remote Support and HPE Support Center are available at no additional cost with a Hewlett Packard Enterprise warranty, HPE Support Service or Hewlett Packard Enterprise contractual support agreement.</p> <p><b>NOTE:</b> *HPE Support Center Mobile App is subject to local availability.</p>
<b>Parts and materials</b>	<p>Hewlett Packard Enterprise will provide HPE-supported replacement parts and materials necessary to maintain the covered hardware product in operating condition, including parts and materials for available and recommended engineering improvements.</p> <p>Parts and components that have reached their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual, product quick-specs, or the technical product data sheet will not be provided, repaired, or replaced as part of these services.</p> <p>The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by Hewlett Packard Enterprise due to malfunction.</p>
<b>Warranty / Service Coverage</b>	<p>For ProLiant servers and storage systems, this service covers Hewlett Packard Enterprise-branded hardware options qualified for the server, purchased at the same time or afterward, internal to the enclosure, as well as external monitors up to 22" and tower UPS products; these items will be covered at the same service level and for the same coverage period as the server unless the maximum supported lifetime and/or the maximum usage limitation has been exceeded. Coverage of the UPS battery is not included; standard warranty terms and conditions apply.</p> <p>The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by Hewlett Packard Enterprise due to malfunction. It does not apply to any exchange of Disk or SSD/Flash Drives that have not failed. SSD/Flash Drives that are specified by Hewlett Packard Enterprise as consumable parts and/or that have exceeded maximum supported lifetime and/or the maximum usage limit as set forth in the manufacturer's operating manual or the technical data sheet are not eligible for the defective media retention service feature option.</p>
<b>For more information</b>	<p>To learn more on services for HPE ESSN Options, please contact your Hewlett Packard Enterprise sales representative or Hewlett Packard Enterprise Authorized Channel Partner. Or visit: <a href="http://www.hpe.com/services/proliant">http://www.hpe.com/services/proliant</a></p>

## Technical Specifications

For details on the HPE Server Memory Options Population Rules, visit:

<http://www.hpe.com/docs/memory-population-rules>

### General Server Memory and NVDIMM Population Rules and Guidelines for Gen10:

- Install DIMMs only if the corresponding processor is installed.
- If only one processor is installed in a two-processor system, only half of the DIMM slots are available.
- To maximize performance, it is recommended to balance the total memory capacity between all installed processors.
- When two processors are installed, balance the DIMMs across the two processors.
- White DIMM slots denote the first slot to be populated in a channel.
- Mixing of DIMM types (UDIMM, RDIMM, and LRDIMM) is not supported.
- The maximum memory speed is a function of the memory type, memory configuration, and processor model.
- The maximum memory capacity is a function of the number of DIMM slots on the platform, the largest DIMM capacity qualified on the platform, and the number and model of installed processors qualified on the platform.

### HPE 16GB NVDIMM for Gen10 Servers - Population Rules and Guidelines:

- Maximum of (12) 16GB NVDIMMs for 2 socket servers and (24) 16GB NVDIMMs for 4 socket servers.
- If NVDIMM-N interleaving is disabled, then any number of NVDIMM-Ns may be used, and the NVDIMM-Ns should be populated in this order:
  - Choose a CPU with open slots (based on NUMA proximity), if any.
  - Pick a channel with two open slots, if any. This keeps the NVDIMM-N from sharing bandwidth with regular memory. Populate the white slot.
  - Pick a channel with an open slot that already has an NVDIMM-N rather than a regular DIMM, if any. This slot must be a black slot. Keep NVDIMM-N traffic away from regular DIMM traffic.
- If NVDIMM-N interleaving is enabled, then the same interleaving balance restrictions that applied to regular DIMMs also apply to the NVDIMM-Ns using the remaining open slots. When assigning the NVDIMM-Ns to those open channels per the regular DIMM placement rules:
  - It's important to keep the same number of DIMMs on the same memory controller.
  - Choose the number of NVDIMM-Ns per CPU based on desired block device size and NUMA locality.
  - Pick a memory controller with a channel with two open slots, if any.
  - Pick a channel with two open slots, if any. This keeps the NVDIMM-N from sharing bandwidth with regular memory. Populate the white slot.
- Please visit the [HPE Server Memory Options Population Rules](#) for detailed configuration rules and best practices.

### General Server Memory and NVDIMM Population Rules and Guidelines for Gen9:

- Install DIMMs only if the corresponding processor is installed.
- If only one processor is installed in a two processor system, only half of the DIMM slots are available.
- To maximize performance, it is recommended to balance the total memory capacity between all installed processors and load the channels similarly whenever possible.
- When two processors are installed, balance the DIMMs across the two processors.
- White DIMM slots denote the first slot to be populated in a channel.
- Place the DIMMs with the highest number of ranks in the white slot when mixing DIMMs of different ranks on the same channel.
- Do not mix UDIMMs, RDIMMs or LRDIMMs. RDIMMs can be mixed with NVDIMMs only.
- Quad rank RDIMMs are not supported in HPE ProLiant Gen8 servers.
- Quad rank LRDIMMs are capable of up to three DIMMs per channel.
- RDIMMs operating at either 1.35V or 1.5V may be mixed in any order, but the system will power them at the higher

## Technical Specifications

voltage.

- DIMMs of different speeds may be mixed in any order; the server will select a common optimal speed.
- The maximum memory speed is a function of the memory type, memory configuration, and processor model.
- The maximum memory capacity is a function of the memory type and number of installed processors.

### HPE 8GB NVDIMM Population Rules and Guidelines:

- NVDIMMs follow the general memory population rules & guidance (*above*)
- Can be mixed with RDIMMs only. [No mixing with LRDIMM or UDIMM]
- When installing NVDIMM(s) on the same memory channel as RDIMM(s), populate the RDIMM(s) first / farthest from the processor, then populate the NVDIMM(s) last / closer to the processor.
- When NVDIMMs exist in the system, there must be a minimum of one (1) RDIMM installed in any DIMM slot in the first CPU socket.
- Maximum NVDIMM by Server:
  - DL360/DL380 Gen9 servers = 16
- One processor may have more than 8 NVDIMMs, but the total number of NVDIMMs among the two processors may not exceed 16. Balanced memory configuration between the two processors and between memory channels is still recommended to maximize performance.
- The HPE Smart Storage Battery provides the battery backup source for NVDIMMs. NVDIMMs can only be installed in servers supporting the HPE Smart Storage Battery.
- Supported only on HPE ProLiant DL360 Gen9 and HPE ProLiant DL380 Gen9 servers featuring Intel® E5-2600 v4 processors.

**NVDIMM Type:** NVDIMM-N

**NVDIMM Rank:** Single Rank

**NVDIMM Capacity:** 8GB or 16 GB

**Native Speed (MT/s):** 2,133 (8GB) or 2,666 (16GB)

**Non-volatile media:** NAND Flash

**Backup power source:** HPE Smart Storage Battery

**Max number of NVDIMMs:** 16 (Gen9) or **Gen10:** 2s (12) and 4s (24)

**Max NVDIMM capacity (single server):** 8GB: (128GB) or 16GB: 192GB (2s) and 384GB (4s)

**Compatible DIMM Types:** RDIMMs only

**What's included in kit:** HPE 16GB NVDIMM for Gen10 or HPE 8GB NVDIMM for Gen9

**Imperial Dimensions (W x D x H):** 5.25 in x .25 in x 1.23 in

**Metric Dimensions (W x D x H):** 2.54 cm x .64 cm x 3.12 cm

**Imperial Weight:** .5 lbs

**Metric Weight:** .24kg

### Environment-friendly Products and Approach- End-of-life Management and Recycling

Hewlett Packard Enterprise offers **end-of-life product return, trade-in, and recycling programs** in many geographic areas, for our products. Products returned to Hewlett Packard Enterprise will be recycled, recovered or disposed of in a responsible manner.

The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard Enterprise web site. These instructions may be used by recyclers and other WEEE treatment facilities as well as Hewlett Packard Enterprise OEM customers who integrate and re-sell Hewlett Packard Enterprise equipment.

Summary of Changes

Date	Version History	Action	Description of Change
12-Feb-2018	Version 2	Changed	Parts and Materials & Persistent Memory URL were updated
04-Dec-2017	Version 1	New	New QuickSpecs



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