12 million units by 2021

38% of Main Server Memory Non-Volatile in 2021

JEDEC Standard **NVDIMM**

What is NVDIMM?

A Non-Volatile Dual In-line Memory Module (NVDIMM) is a "persistent memory technology" that retains data in the event of a power loss or a system shut down.

So its a storage device? or DRAM?

Both! NVDIMM(s) come in various volatile and non-volatile media combinations that can be block and/or byte address-able. You can use it as memory that is persistent or the fastest storage device in your application.

A NEW STORAGE PYRAMID

CPU
DRAM **NVDIMM**
SSD (high-performance) PCIe, SAS
SSD (mainstream) SATA
HDD
CLOUD
TAPE

nanoseconds

LATENCY

milliseconds

NVDIMM - N

Memory mapped DRAM with no system access to flash.

Attributes:
JEDEC Standard
Low-Capacity (2GB - 32GB)
Very-low Latency (10s of nanoseconds)

NVDIMM - P

Memory mapped Flash and memory mapped DRAM with two access mechanisms: persistent DRAM (–N) and block-oriented drive access

Attributes:
High-Capacity (100GB - 1TB)
Low Latency (100s of nanoseconds)

"moving storage closer to the CPU"

ISV Supported { Windows Server 2016   CITRIX   Linux   ORACLE   SUSE A NOVELL BUSINESS   vmware }

The What(s) & Why(s) of NVDIMM Technology

NVDIMM-N

NVDIMM-P

- **A growing number of applications:**
  - Require frequent access to large data sets
  - Are sensitive to down time
  - Have performance limitations due to I/O bottlenecks

- **NVDIMM-N provides:**
  - Low latency, high performance and near infinite endurance of DRAM
  - The persistence of NVM

- **No impact to memory bus performance**

- **Fast recovery from system power loss**

- **Software overhead can be eliminated**

- **NVDIMM-P interface specification targeting persistent memories and high capacity DRAM memory on DDR4 and DDR5 channels**

- **It extends the DDR protocol to enable transactional access**
  - Host is decoupled from the media
  - Multiple media types supported

- **Supports any latency (ns ~ us)**

- **JEDEC specification publication in 2018**

10+ MEMBER Persistent Memory Special Interest Group (SIG)

Use Cases

In Memory Database	**Database & Big Data Analytics**
Traditional Database	**Virtualization**
Enterprise Storage	**Financial & Real-time Transaction**
Virtualization	**Image-editing Systems**
High-Performance Computing	**Movie Rendering**
NVRAM Replacement	**CAD Systems**
Financial & Real-time Transaction	**SAN appliances and Arrays**
Object Store	**Distributed Storage Systems**
Unstructured Data	**Distributed Cache**

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