NVM Express® (NVMe®) Innovations in Windows

Sponsored by NVM Express organization, the owner of the NVMe® Specifications

Speakers

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Microsoft

Agenda

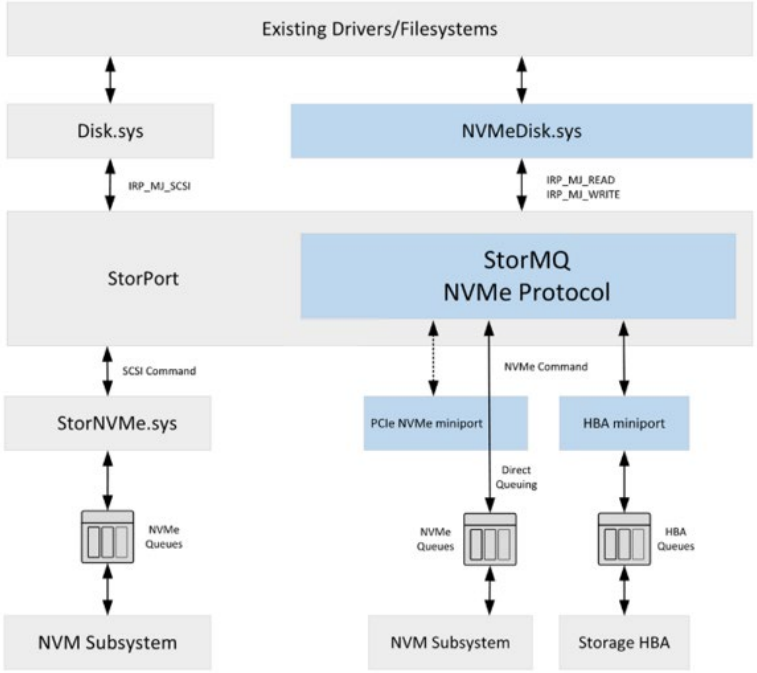
- Updates in Windows 11 24H2
- Modernizing NVMe® Technology Support in Windows Update
- Upcoming Features

Updates in Windows 11 24H2

Dynamic Link Rate Management (DLRM)

- New feature available in Windows 11 24H2 starting early 2025
- Power saving feature to increase system battery life by adjusting the PCIe® link speed used by NVMe® devices
- Windows NVMe driver has different policies for the PCIe link speed
  - Default balanced power mode – monitor for link speed usage and adjust PCIe link speed to match throughput usage
  - Best performance power mode – link speed set to max generation supported by device
  - Best power efficiency power mode – link speed set to PCIe 3.0 technology
- For link speed changes, using a heuristic that is aggressive in increasing link speed and conservative in decreasing link speed
- DLRM requires a system opt-in through ACPI _DSM method (https://learn.microsoft.com/en-us/windows-hardware/drivers/pci/nvme-dynamic-link-rate-management)

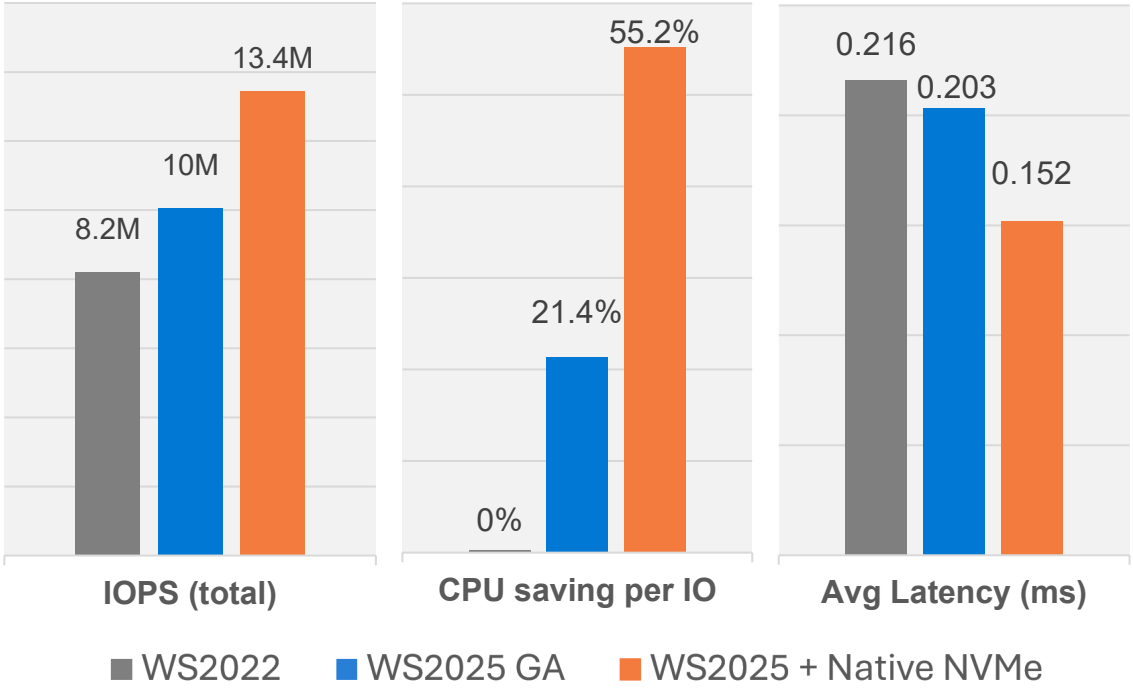
Modernizing NVMe® Technology Support in Windows Update



- Native NVMe technology – Redesign of the Windows lower storage stack to optimize for high performance multi-queue storage hardware using NVMe technology concepts and features
- New architecture provides significant improvements in CPU usage, performance and multi-device performance scalability compared with existing stack
- Windows NVMe driver support available in public preview on Windows Server 2025 through Windows Insider program

Perf Results – 16 Threads; 4 Disks

Diskspd 4K random read test



Configuration

Disks – 4x Solidigm D7-PS1010

Host – Intel Dual Socket Emerald Rapids, 208LPs, 128GB RAM

Diskspd 2.2.1

>diskspd -b4k -r -Su –t16 -L -o32 -W10 -d30 #2

Modernizing NVMe® Technology Support in Windows Futures

- Native NVMe Technology Futures
  - Working on supporting for Windows client OS
  - Partnering with early adopters for other Storport miniports
- NVMe® over Fabrics (NVMe-oF™) Technology
  - Windows TCP and RDMA initiator available in Windows Server Preview builds
  - Targeting minimum of NVMe 2.0 specification compliance

Upcoming Features

- Dataset Management (DSM) Hints
  - Windows NVMe driver has been updated to pass DSM hints for some reads and writes commands
  - Support available in Windows client preview builds available through Windows Insiders program or Collaborate if you are part of a Windows ecosystem partner program
  - Seeking feedback on the usefulness of these DSM hints. Will add more if it is useful
  - Believe this will help devices improve IO responsiveness and device lifetime
- Boot Partition
  - Adding new IOCTLs to expose boot partition feature

Questions?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