

Implementation of Solid State Drives to Enterprise Systems

Bc. Matej Fuček

Objective of the work

- ▶ Is the SSD technology sufficient replacement for HDD in Enterprise Systems?
- ▶ Are SSDs fast enough?
- ▶ Can SSD unconditionally replace HDDs?

Experimental Performance Evaluation

- ▶ Performance of Single SSDs vs. single HDDs
- ▶ Performance of RAID 0 using only HDDs
- ▶ Performance of RAID 0 using only SSDs
- ▶ Performance of mixed RAID 0 (HDD + SSD)
- ▶ Performance of RAID 1 using only HDDs
- ▶ Performance of RAID 1 using only SSDs
- ▶ Performance of mixed RAID 1 (HDD + SSD)
- ▶ NTFS, FAT32 and exFAT performance

Environment

- ▶ Drives:
 - ▶ 2x ADATA SX900 128GB
 - ▶ 2x Kingston V300 120GB
 - ▶ Lite-ON IT LMT-128m6m 128GB

- ▶ Western Digital 10EZEX-00RKKA0 1TB
- ▶ Western Digital 20EFRX-68AX9N0 2TB

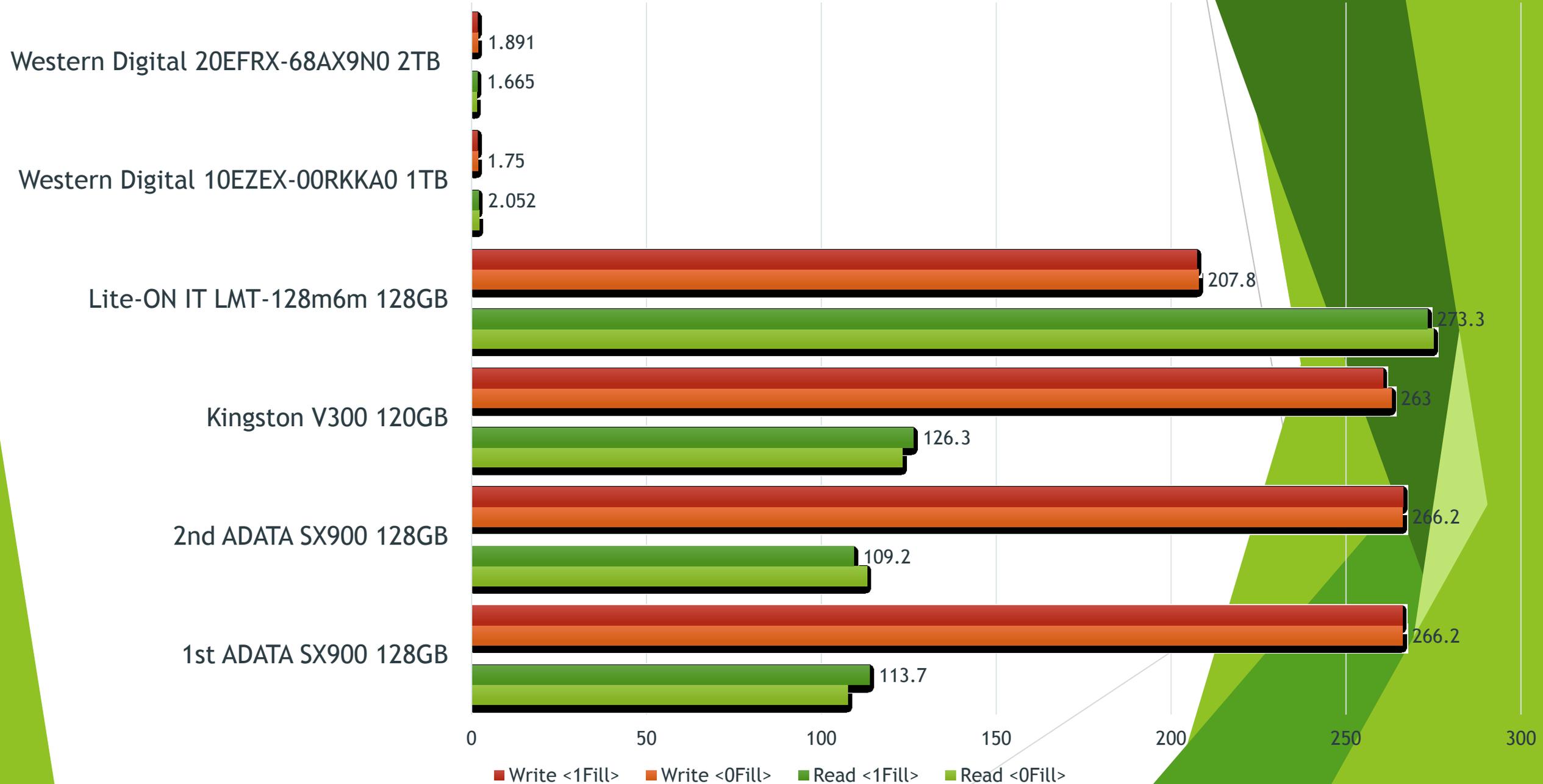
- ▶ 4x Patriot WARP 32GB (disqualified)

CPU	AMD A10-5700 Quad-core @3.7GHz with SilverStone Heligon HE02 cooler
RAM	16GB Corsair Vengeance Low Profile Black 16GB (4x4GB) DDR3 1600
MotherBoard	GigaByte GA-F2A85X-D3H rev 1.0 AMDK15 IMC, AMD A85X FCH Bios AM -F1
System drive	Kingston V300 120GB
GPU	AMD Radeon HD7600D
PSU	Seasonic X-750, 750W
Operating System	Windows 7 Ultimate x64 + updates till 24th August 2014
Drivers	AMD Chipset Driver (include chipset \ sata raid \ VGA \ USB driver) v. 13.25 AMD RAID Driver v3.3.1540.40
PC case	LIAN-LI PC-V2120B, with 3x40mm and 5x120mm fan
Benchmark software	HD-Tune v5.50 CrystalDiskMark 3.0.3 x64 ATTO Disk Benchmark v2.46

Performance SSD vs. HDD

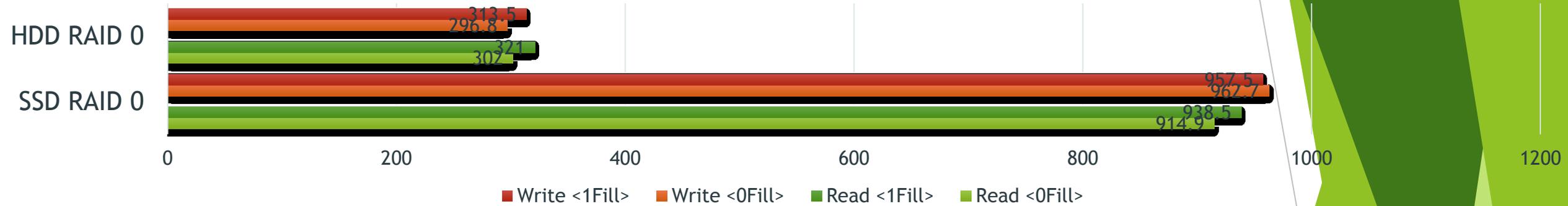
The slide features a white background with abstract, overlapping green geometric shapes on the right side. These shapes include various shades of green, from light to dark, forming a dynamic, modern design element.

Random 4K QD32 Read and Write in MB/s, CrystalDiskMark 3.0.3 x64

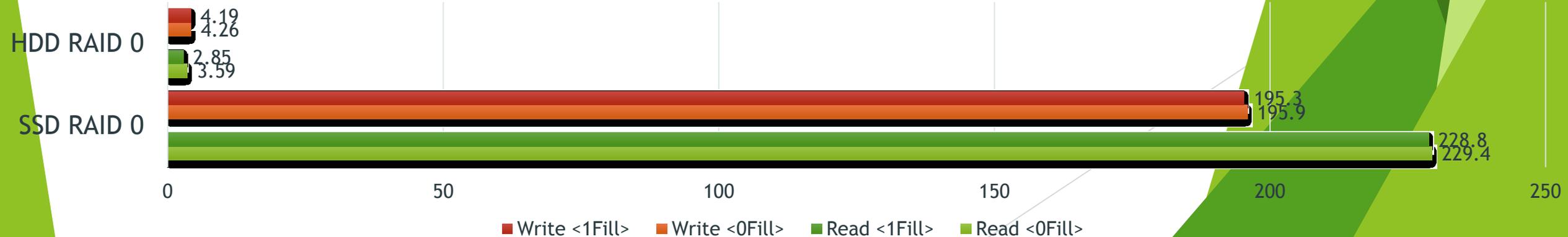


RAID0 performance

Sequential Read and Write in MB/s, CrystalDiskMark 3.0.3 x64

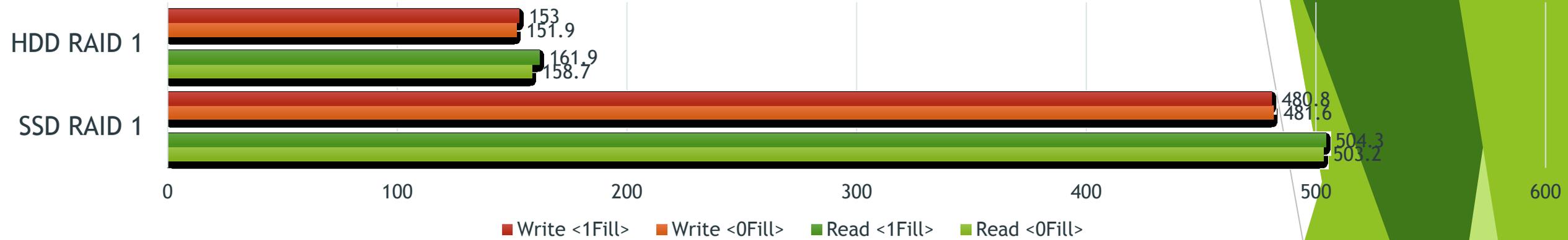


4KQD32 Read and Write in MB/s, CrystalDiskMark 3.0.3 x64

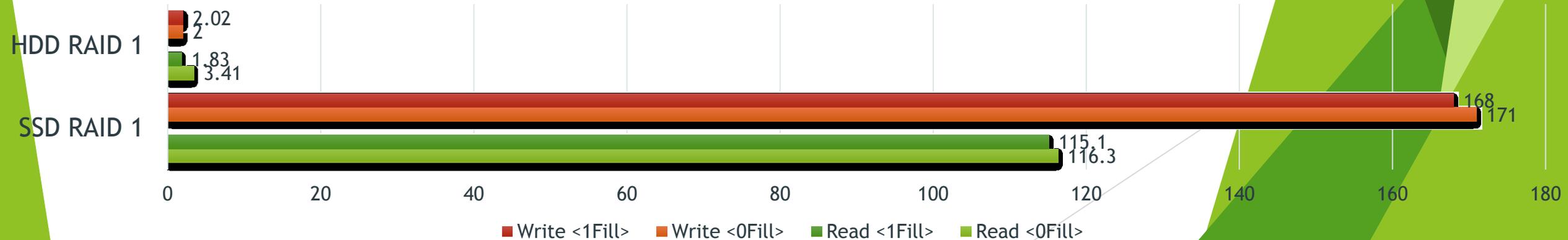


RAID1 Performance

Sequential Read and Write in MB/s, CrystalDiskMark 3.0.3 x64



Random 4K QD32 Read and Write in MB/s, CrystalDiskMark 3.0.3 x64



Enterprise Systems

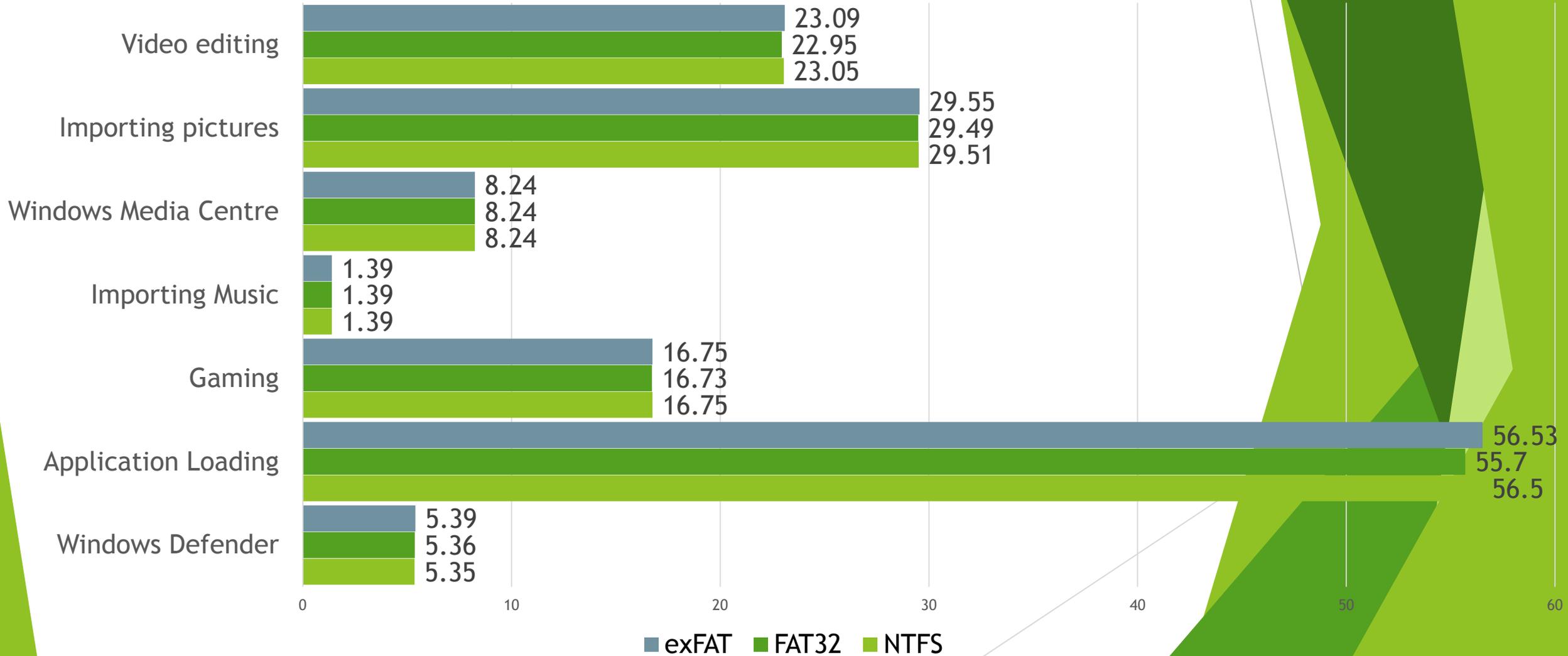
- ▶ Transactional Processing Server
- ▶ Video Server
- ▶ High Performance Computing Server
- ▶ Virtualization Server
- ▶ Internet/Network Server

Additional findings

- ▶ Old SSDs unsupported by systems
- ▶ Hardware RAID not optimized for SSDs
- ▶ Mixed SSD and HDD RAID are not as effective as expected
- ▶ Special hardware RAID needed for optimized performance of mixed HDD, SSD solutions
- ▶ RAID4, 5, 6 wear-leveling issue
- ▶ NTFS/FAT32 and exFAT performance

NTFS/FAT32 and exFAT performance

PCMark7 Storage tests in MB/s



Conclusions & Future Work

- ▶ SSDs are much faster
 - ▶ More reliable but wear faster
 - ▶ SSD RAIDs still lack desired performance
 - ▶ File systems have minimal impact on performance
 - ▶ SSD deployment is still limited
-
- ▶ Improve life expectancy of MTL and TLC by downgrading to SLC
 - ▶ Performance measurements of database systems -PostgreSQL
 - ▶ SSD RAID optimization

Thank you
for your attention

The right side of the slide features several overlapping, semi-transparent geometric shapes in various shades of green, ranging from a light lime green to a dark forest green. These shapes are primarily triangles and quadrilaterals, creating a modern, abstract design element.