Implementation of Solid State Drives to Enterprise Systems

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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

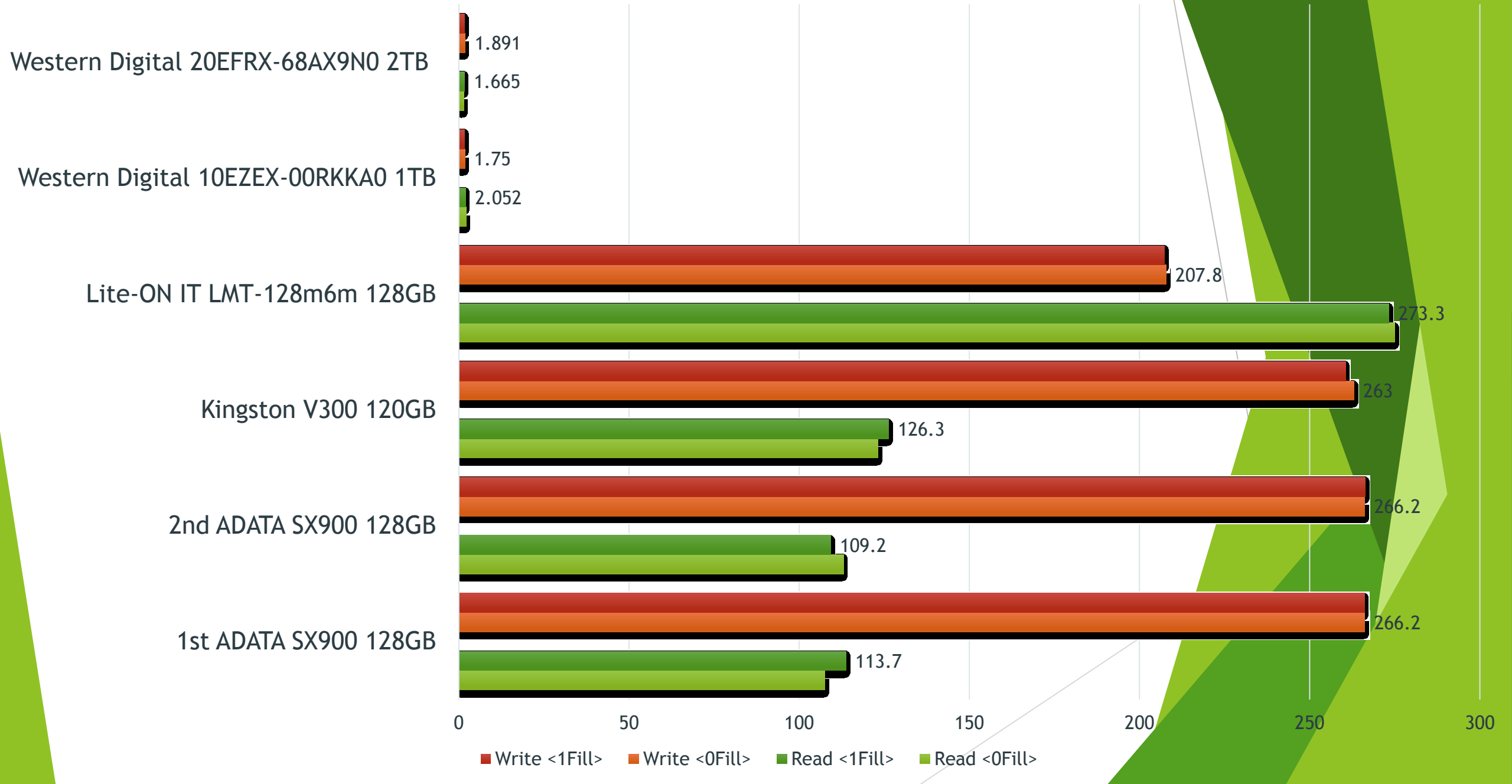
- Western Digital 10EZEX-00RKKA0 1TB
- Western Digital 20EFRX-68AX9N0 2TB

- 4x Patriot WARP 32GB (disqualified)

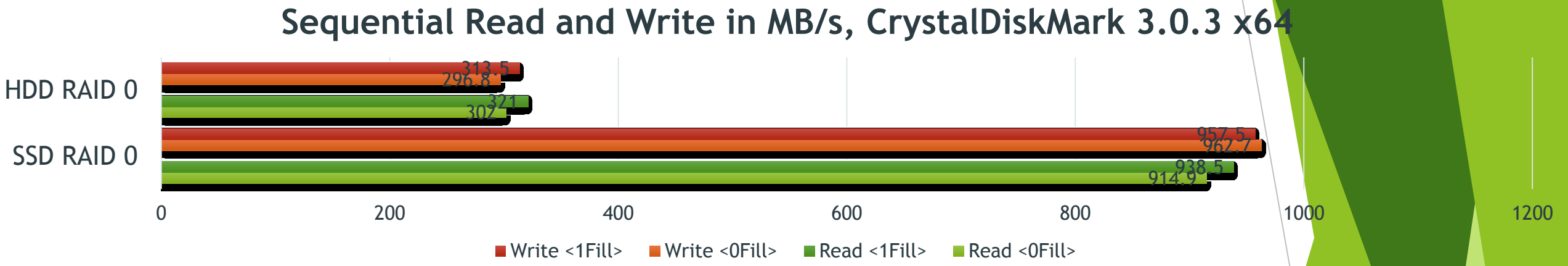
CPU	**AMD A10-5700 Quad-core @3.7GHz with SilverStone Heligon HE02 cooler**
RAM	16GB Corsair Vengeance Low Profile Black 16GB (4x4GB) DDR3 1600
MotherBoard	GigaByte GA-F2A85X-D3H rev 1.0 AMDK15 IMC, AMD A85X FCH Bios AM –F1
System drive	Kingston V300 120GB
GPU	AMD Radeon HD7600D
PSU	Seasonic X-750, 750W
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

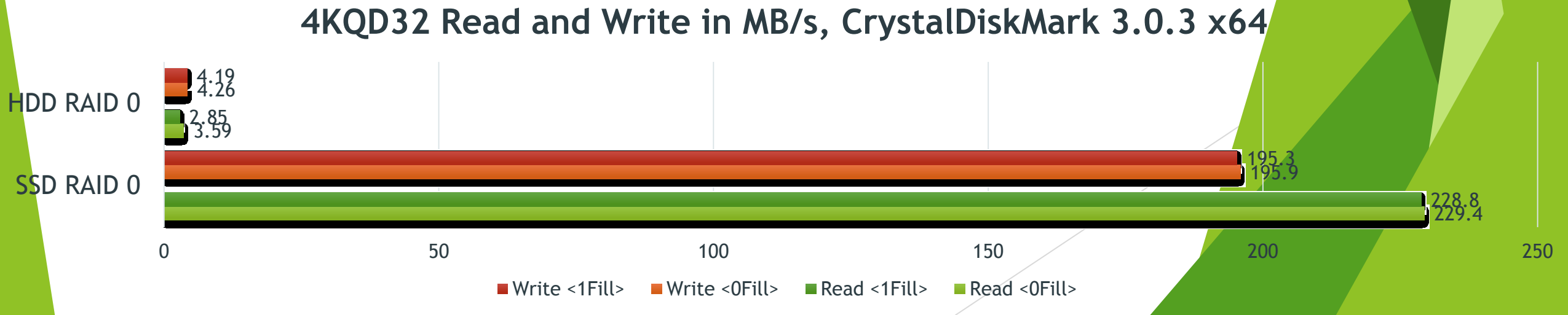
Performance SSD vs. HDD

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

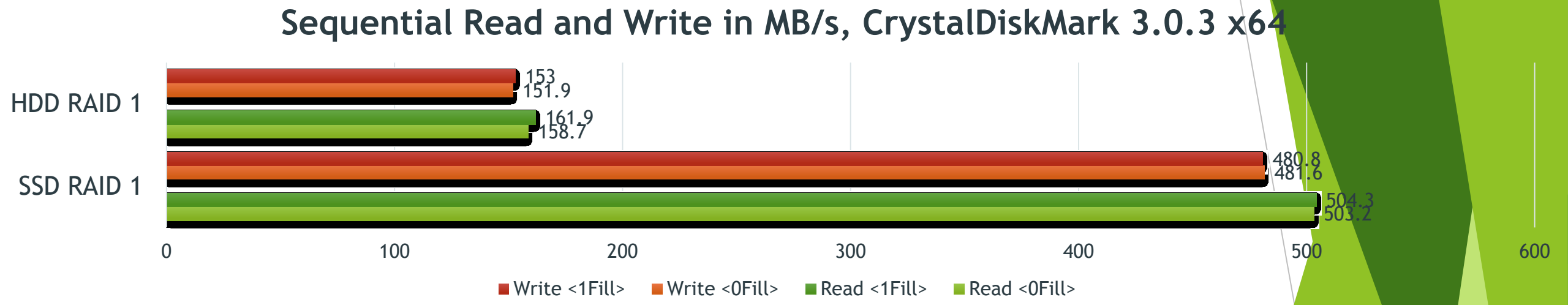


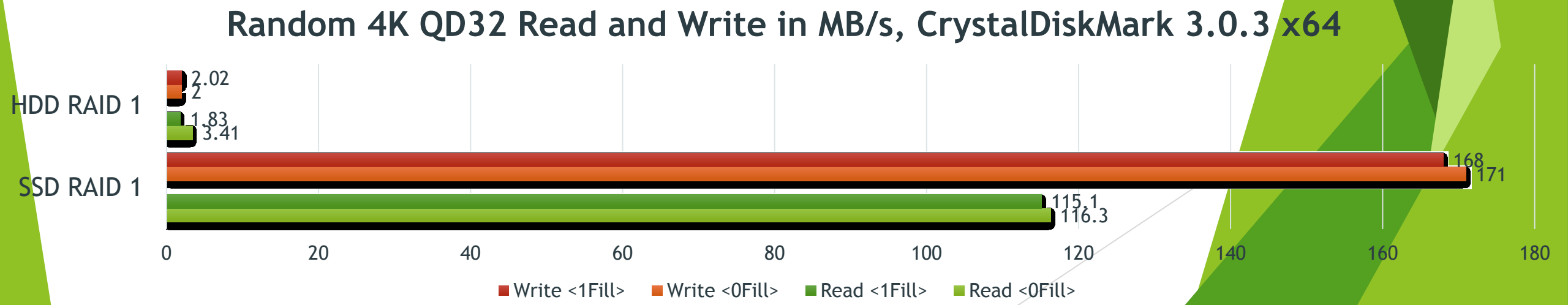
RAID0 performance





RAID1 Performance





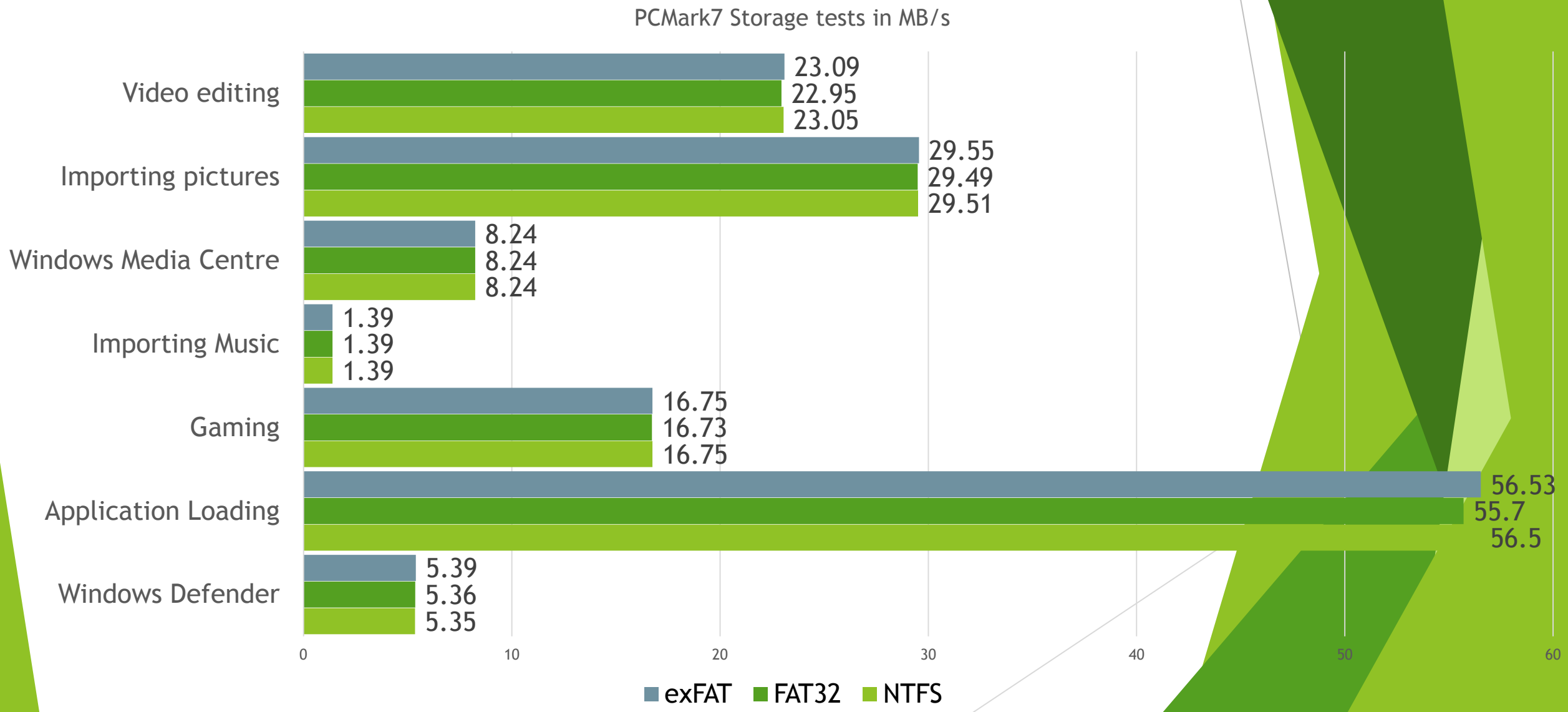
Enterprise Systems

- 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



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