PLiOPS

EXTREME DATA PROCESSOR

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PLiOPS XDP-RAIDplus: Introducing the Best Data Protection Solution for NVMe/NVMe-oF Environments

January 31, 2023

Webinar Agenda

10:00-10:02	Ground Rules and Webinar Topic Introduction (G2M Research)
10:03-10:05	Introduction – Why is Accelerated Data Protection Important? (Mike Heumann, G2M Research)
10:06-10:20	Introducing the Best Data Protection Solution – ***Pliops XDP-RAIDplus*** (Tony Afshary, Pliops)
10:21-10:21	Audience Survey #1
10:22-10:31	A Customer Use Case – Cloud Computing (Tom Sanfilippo, Paperspace)
10:32-10:41	Partner Use Case – Protecting NVMe SSDs (Yuyang Sun, Solidigm)
10:42-10:42	Audience Survey #2
10:43-10:54	Panel Discussion – Accelerating Data Protection
10:55-11:00	Q&A / Wrap-Up

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Introduction and Ground Rules

G2M Webinar Ground Rules

G2M Research will record this webinar

➔ We will send a link to the recording and a PDF of the slides for the webinar to all registrants approximately 2 days after webinar

You are strongly encouraged to ask questions

➔ Please use the Zoom Q&A feature to submit your questions; we will go through all questions at the end of the session

We will conduct some audience surveys during the webinar

➔ Please answer using the Zoom survey tool (and all answers are anonymous, so no one will know how you answered)

Thanks!

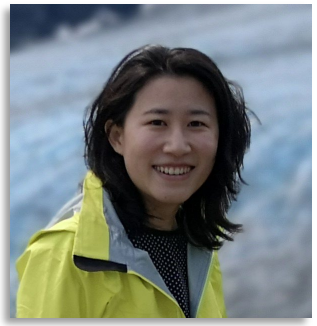
Why is Hardware RAID Protection is Important Today for Data Resiliency?

- 15 years ago, datacenters were limited by the efficiency of CPUs and their operating systems
  - VMware, machine virtualization changed this
- Next, storage media created the bottleneck
  - NVMe and NVMe-oF changed this
- Today the bottleneck is high-level data processing
  - Specifically, rebuild of today's ultra-dense SSDs can cripple data resiliency
- This is why RAID acceleration has exploded across our industry
  - Hyperscalers are heavily investing in this technology
- How can non-hyperscale companies get the same benefits?

Panelists

Tony Afshary
Vice President
Products and Marketing
www.pliops.com

Tom Sanfilippo
Chief Technical Officer
www.paperspace.com



Yuyang Sun
Product Marketing Manager
www.solidigm.com

Mike Heumann
Principal Analyst
www.g2minc.com

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Tony Afshary
Vice President
Products and Marketing
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Pliops XDP-RAIDplus

G2M Research Webinar – Jan 31st, 2023

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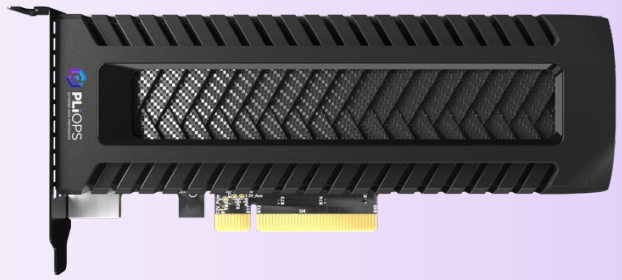
Pliops Extreme Data Process (XDP)



Performance	Reliability	Capacity	Efficiency
10x	5x	6x	80%

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Pliops XDP Data Services

RAIDplus

AccelDB

AccelKV

Pliops.com/Products

Free Trial @ phoenixNAP GLOBAL IT SERVICES

PLiOPS EXTREME DATA PROCESSOR

XDP-*RAIDplus*

Best-In-Class Data Integrity and RAID+ Solution for NVMe and NVMeoF

Full NVMe Performance

Ultra-Fast SSD Rebuild

DWPD

Enhanced SSD Endurance

Multiple Single Drive Failures

Fully PFAIL Protected

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EXTREME DATA PROCESSOR

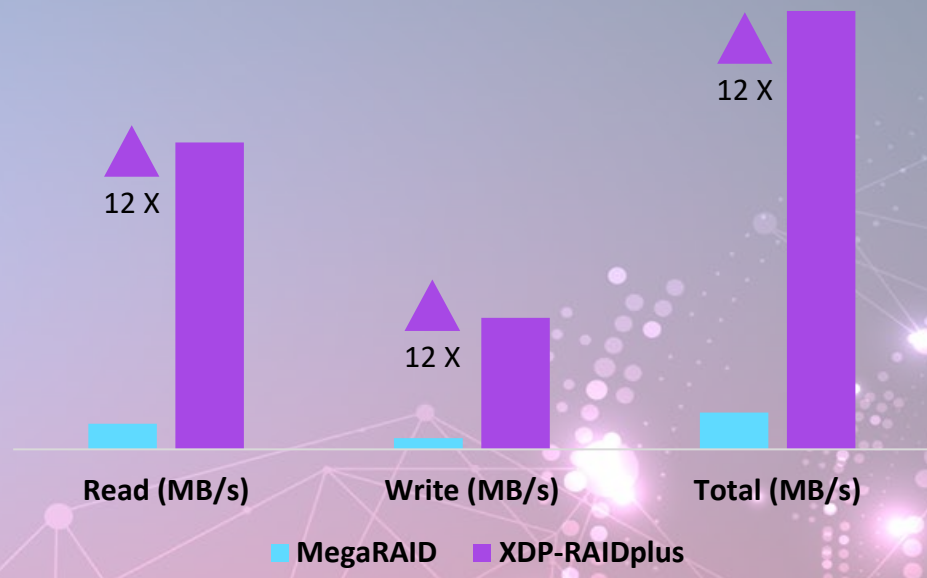
Fastest Performing Data Protection

12x

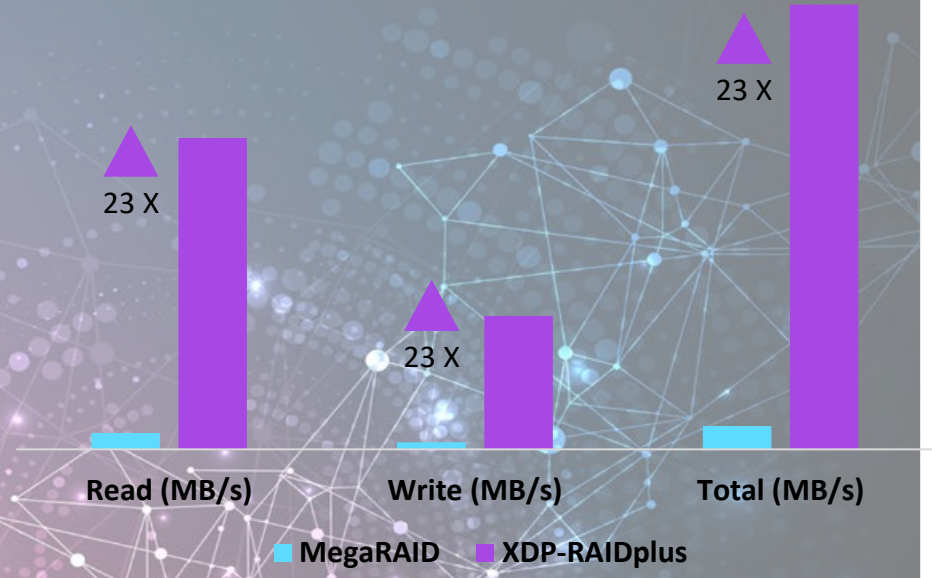
Faster

Full RAID Performance

Sustained Performance



Performance During Rebuild



Significant Performance Gains over HW RAID 5

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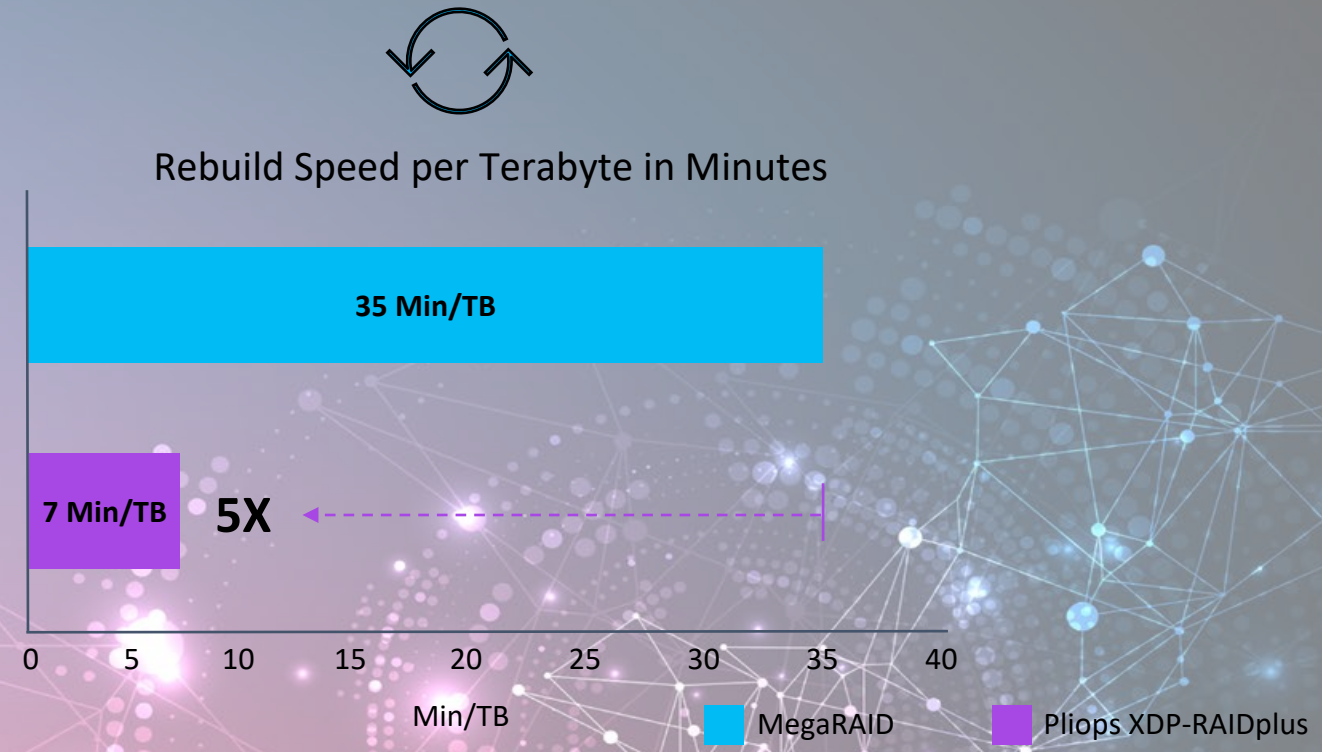
Fastest Rebuild Times

5x

Quicker

Shorten SSD Rebuild Times



Minimal Impact on QoS with Pliops During Rebuild
Enables High-Density Storage Due to Faster Rebuilds

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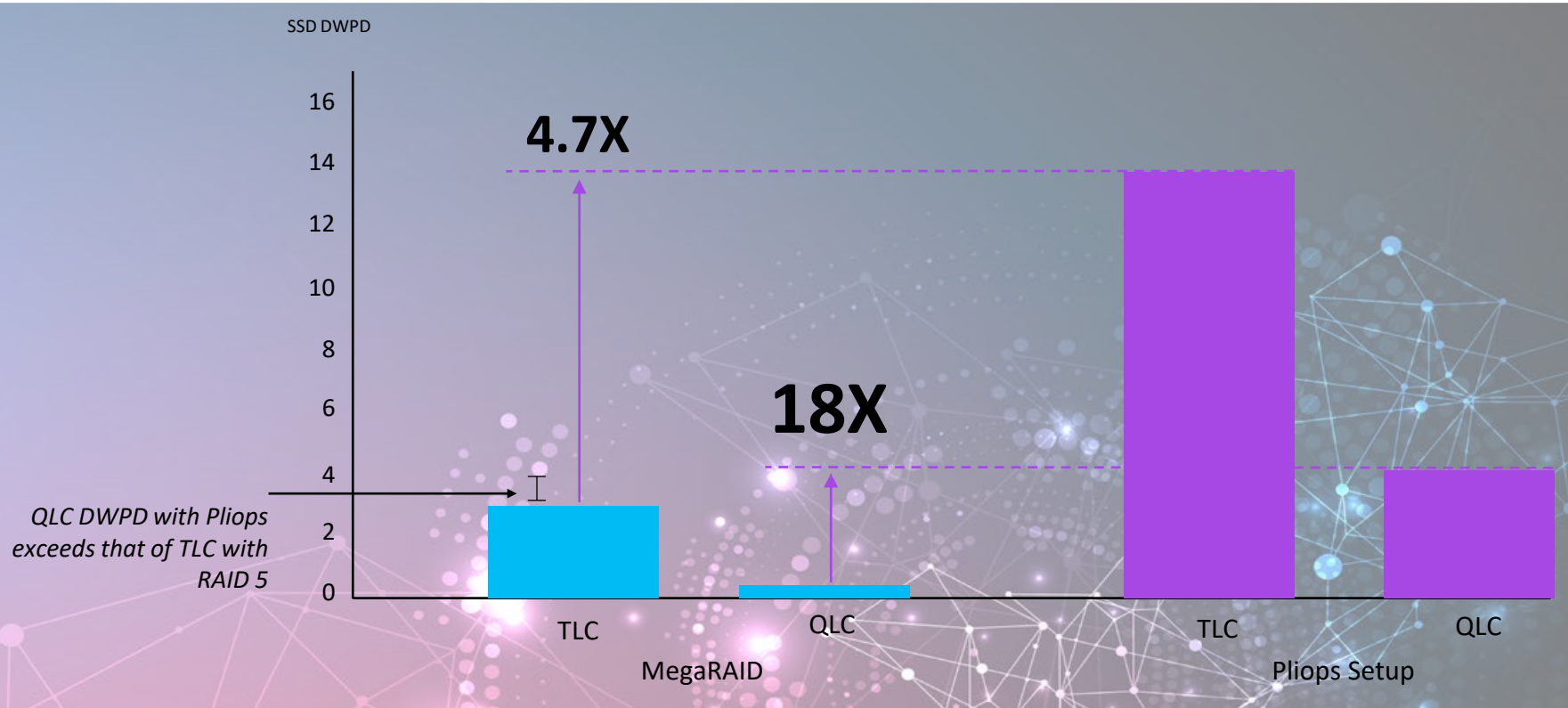
Longest SSD Drive Life

18x

Better

Enhanced SSD Endurance



XDP-RAIDplus Extends SSD Drive Life Beyond HW Refresh Cycle

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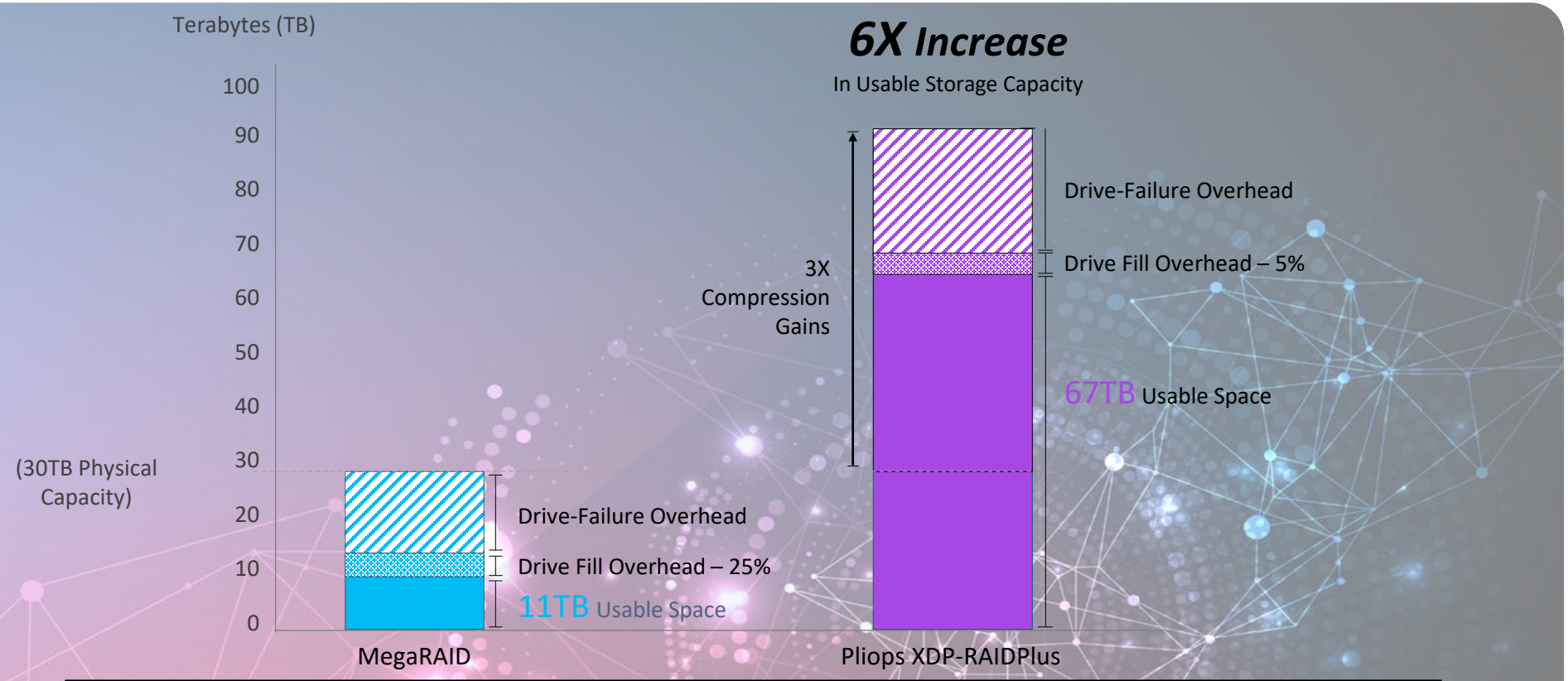
Most Optimized Capacity Usage & Savings

6x

More

Capacity Expansion

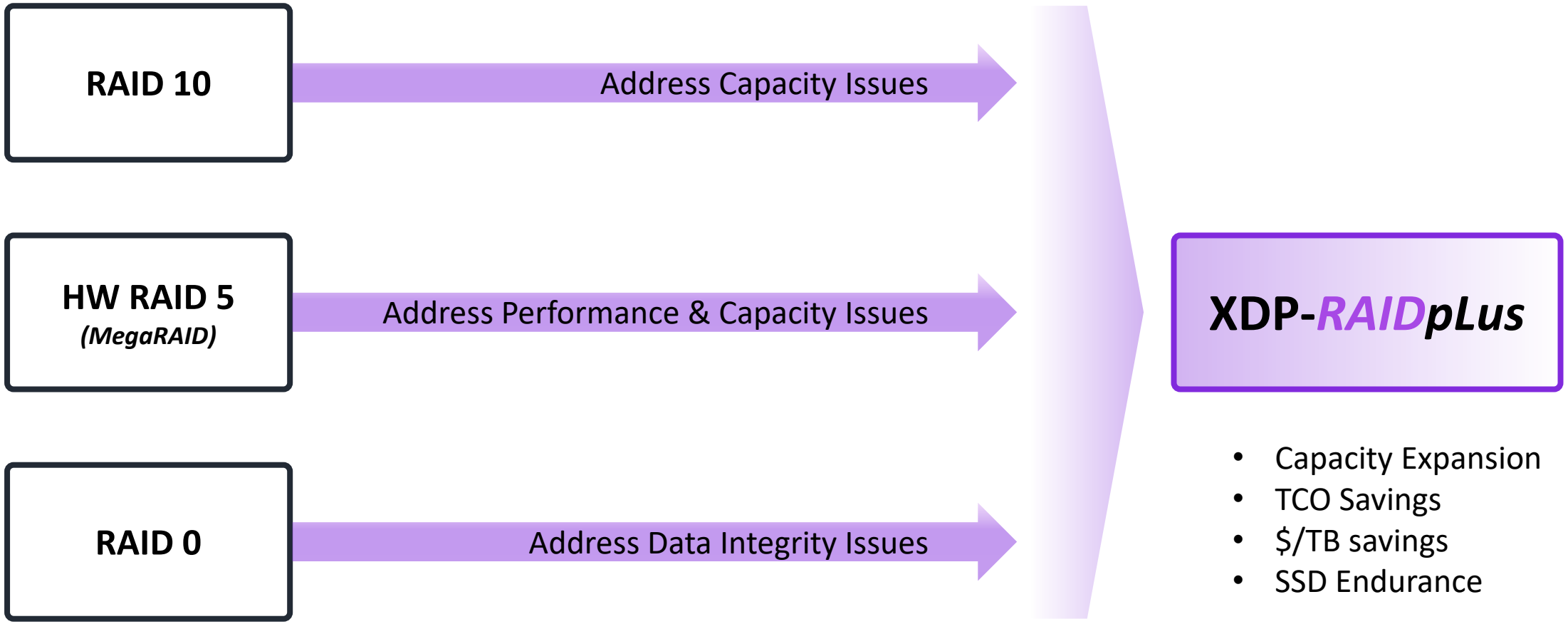


XDP-RAIDplus Enables a Substantial Reduction in Cost/Terabyte

The Best RAID / Reliability Solution

	Status Quo with Software	RAID Controllers	*Pliops XDP-RAIDplus*
Performance Acceleration	☒	☑	☑
Data Protection	☑	☑	☑
SSD Endurance	☒	☒	☑
Capacity Expansion & TCO Benefits	☒	☒	☑
Legacy & Modern Application Support	☑	☒	☑
Ultra Fast Rebuilds	☒	☒	☑

Why Customers are Migrating to XDP-RAIDplus



Audience Survey Question #1

How critical is it to address drive failure/rebuild for your business operation (select one answer)?

- Critical – It is essential to our business model: 29%
- Very Important – We need it to scale our business: 12%
- Important – It provides a competitive edge for us: 24%
- Nice-to-Have: 12%
- Not that important: 0%
- Don’t know/no opinion: 24%

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Paperspace

Tom Sanfilippo
Chief Technology Officer
www.paperspace.com

Paperspace - A GPU Cloud Service Provider

- All Flash storage for Virtual Machine: 3.5PB and growing
  - Older generation:
    - 90 NFS-based SSD NAS hosts, 22 x 2TB SSDs each, 40Gbe, 2U chassis
    - Broadcom/Megatrends hardware RAID (availability constrained)
    - Drive failures weekly; recovery times as long as 5hrs
    - Low throughput bandwidth (under 250MB/s)
    - Need to add multiple NAS hosts per region every month (4 at a time)
  - Needs:
    - Bigger storage increments
    - Faster throughput - NVMe speeds
    - Faster recovery times
    - Higher density
    - Non-goal: cheaper

Paperspace - PLiOPS NVMe NAS

- Solution:
  - PLiOPS card, 8 x 15TB Solidigm QLC U.2 NVMe drives, 40Gbe + 100Gbe, 1U
    - 128TB/NAS
  - 8x storage density improvement
  - 2x recovery time improvement
  - Up to 5x throughput improvement (network limited now)
  - BONUS:
    - Cost per TB is 33% less than our older solution
    - PLiOPS technical support has been outstanding
  - Quote from storage engineers: "Performance is incredible!"

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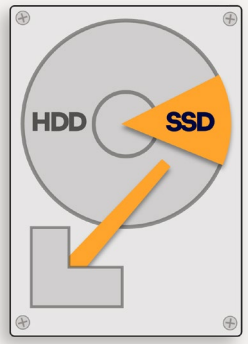
Yuyang Sun
Product Marketing Manager
www.solidigm.com

Storage Pain Point Drivers

1 Aging gear

85-90% of all datacenter data still stored on HDDs[1]

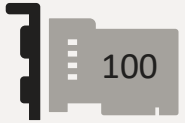


Scalability challenges from core → mid-tier → edge

2 Lack of capacity

Data-rich services

High-speed networks



AI/ML

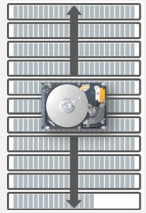
Big Data

Data-intensive workloads

3 High costs

SSD spending growing 4.5x faster than compute[2]

Legacy storage drives higher TCO



Power and sustainability concerns

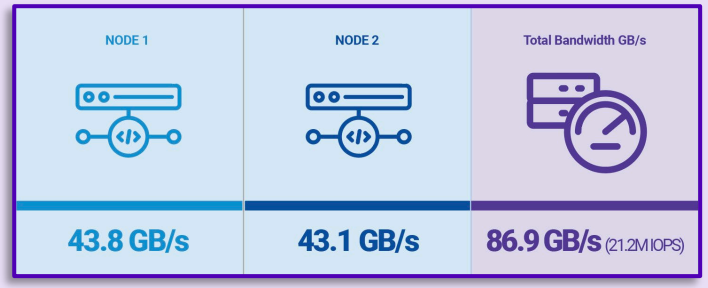
Solidigm™ QLC NAND SSDs Address Key Storage Pain Points

Rapidly access | **More data** | **More efficiently**

1. Source - Solidigm internal analysis and consensus of industry analyst estimates.
2. Source – World Bank and Gaertner, Q2 2022.

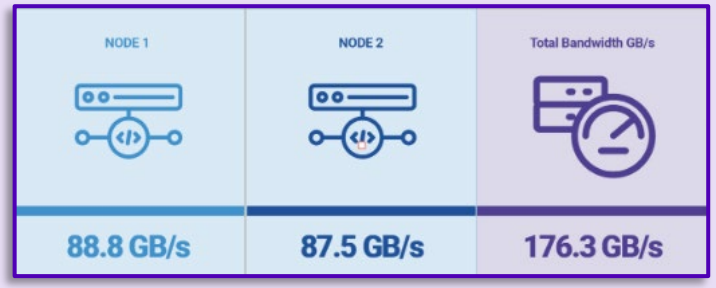
Rapidly access More Data More Efficiently with QLC

4K Random Read Throughput[1]



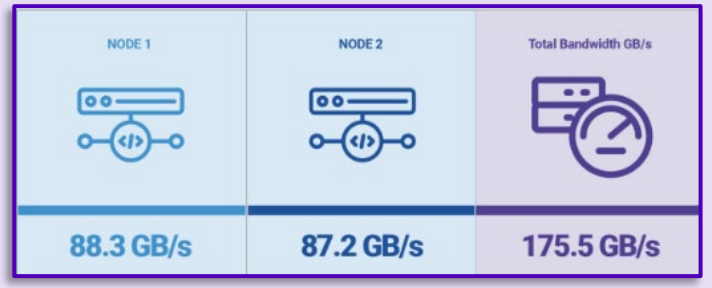
"In 4K random read, we measured nearly 87GB/s of 4K traffic or 21.2 million IOPS. That is an impressive stat, aligning closely with TLC SSD offerings in the market."

64K Random Read Throughput[1]



"…64K random working set, which put the QLC SSDs into one of their most stressful situations. Read traffic saw its highest bandwidth, with an insane 176.3GB/s of traffic."

1M Sequential Read Throughput[1]

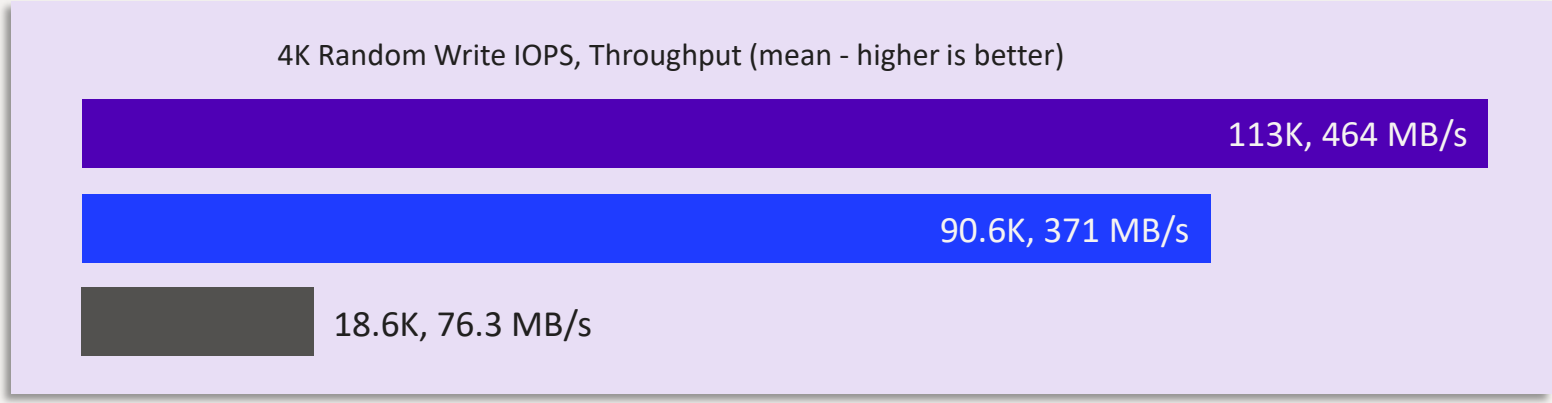


"…with a 1MB sequential transfer size, we measured an incredible 175.5GB/s of bandwidth across 24 of the P5316 SSDs….just over 7.3GB/s per SSD on the front end."

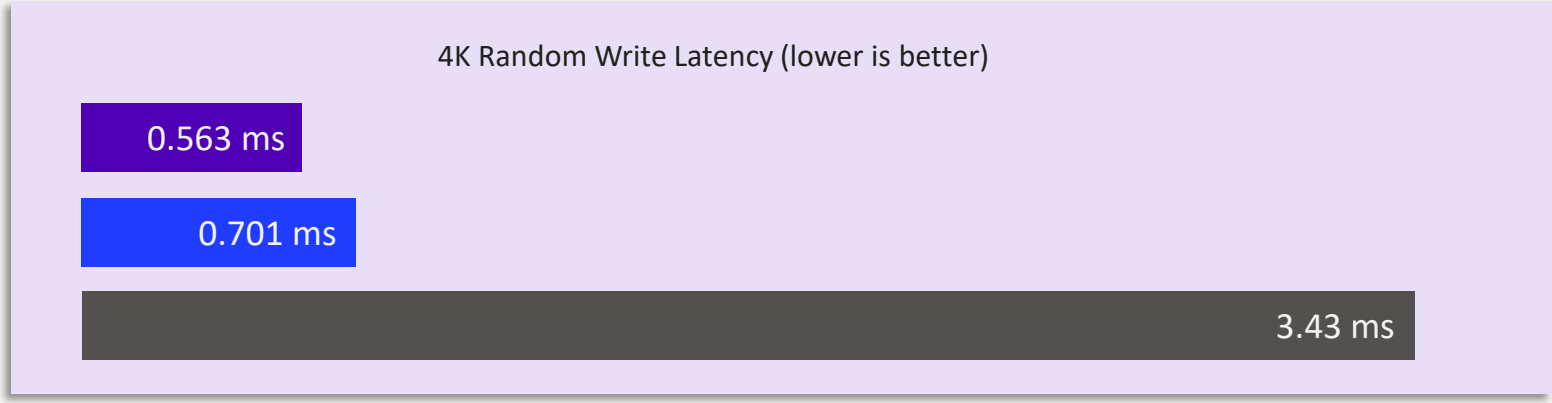
1. Source – StorageReview.com. "*QLC SSDs Deliver 175GB/s in 2U Storage Server*", https://www.storagereview.com/review/qlc-ssds-deliver-175gb-s-in-2u-storage-server

4th gen PCIe QLC 4KB RW Performance Preview

future product



vs Comp TLC	vs Comp QLC
24% higher	6x higher



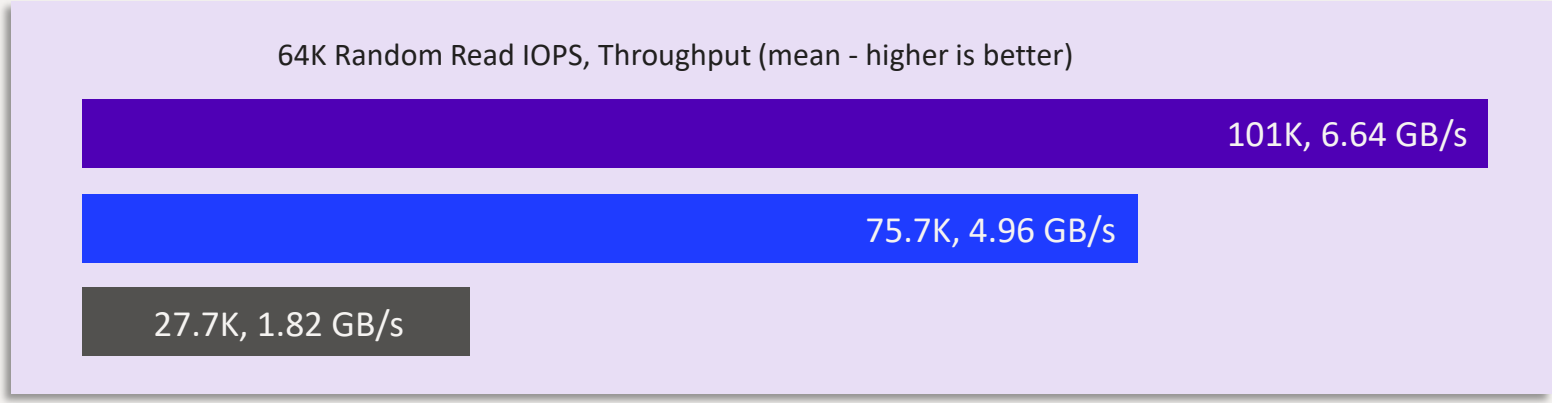
vs Comp TLC	vs Comp QLC
20% better	84% better

4th Gen QLC - 7.68TB | Comp-K TLC - 7.68TB | Comp-S QLC - 15TB

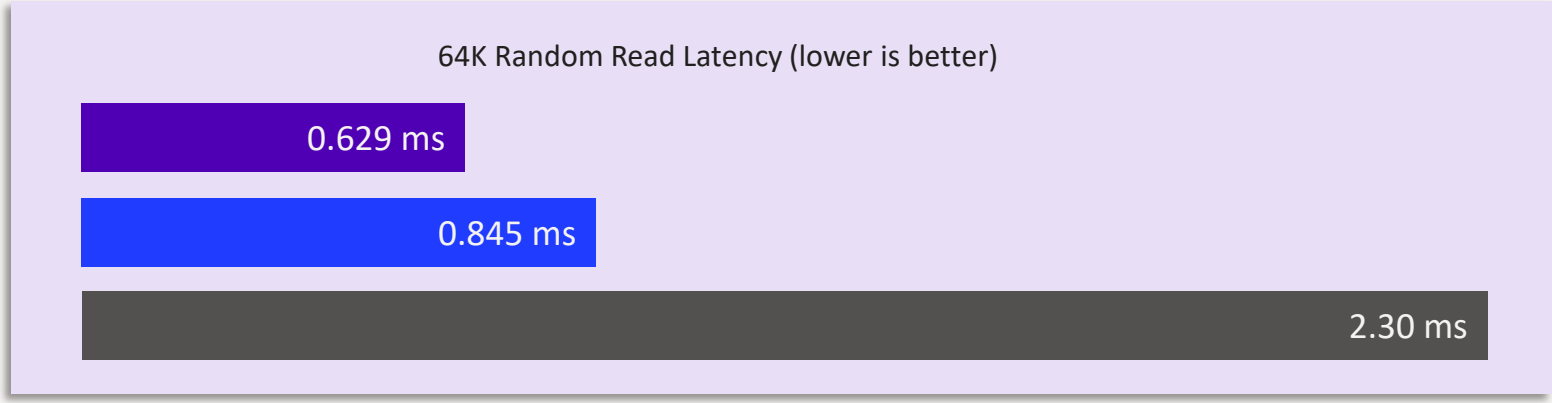
See Appendix B for test configuration details. Results may vary.

4th gen PCIe QLC 64KB RR Performance Preview

future product



vs Comp TLC	vs Comp QLC
33% higher	2.7x higher

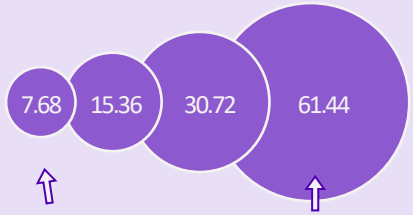
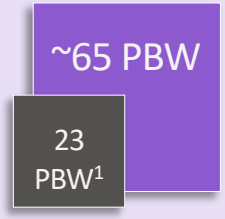
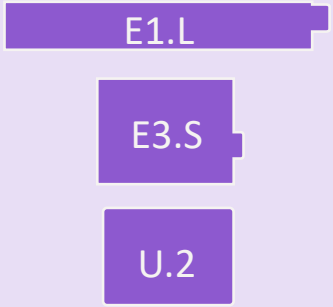


vs Comp TLC	vs Comp QLC
26% better	72% better

4th Gen QLC - 7.68TB | Comp-K TLC - 7.68TB | Comp-S QLC - 15TB

See Appendix B for test configuration details. Results may vary.

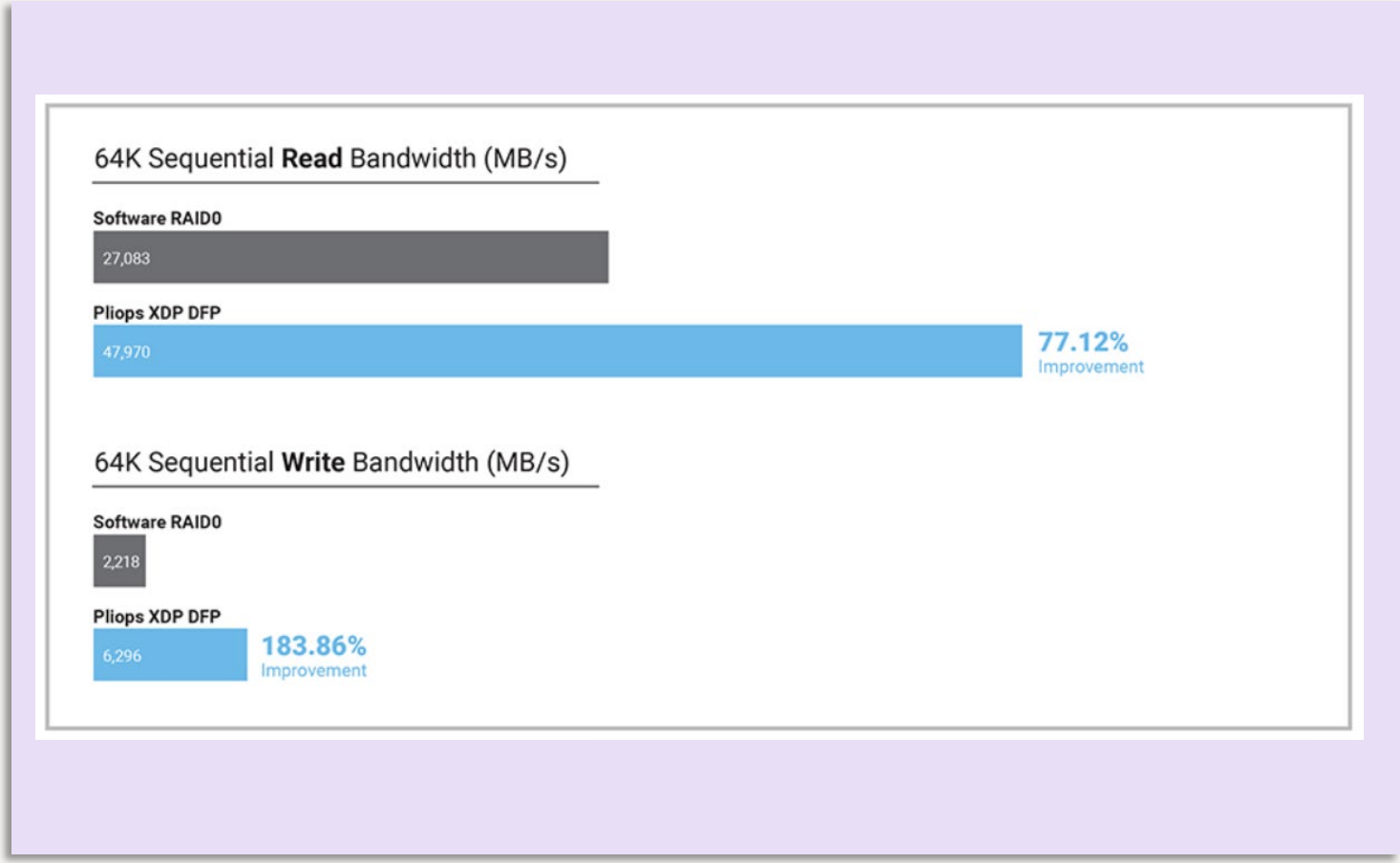
4th Gen Solidigm™ PCIe QLC SSD Portfolio

	Write Alignment/Block Size	Capacity (TB)	Max PBW	Form Factors
4th Gen 192-L QLC Essential Endurance	 Majority drop-in 4KB aligned	 Smaller min cap. 4x Higher max cap.	 8KB random endurance	
4th Gen 192-L QLC Value Endurance	 Light write or majority ≥16KB aligned	 Smaller min cap. 2x Higher max cap.	 16KB random endurance	

Learn more about Solidigm Data Center SSDs

[1] Refers to previous generation Solidigm™ D5-P5316 30.72TB Random 64KB (IU-aligned) Write endurance.

XDP Data Protection at High Performance and High Capacity

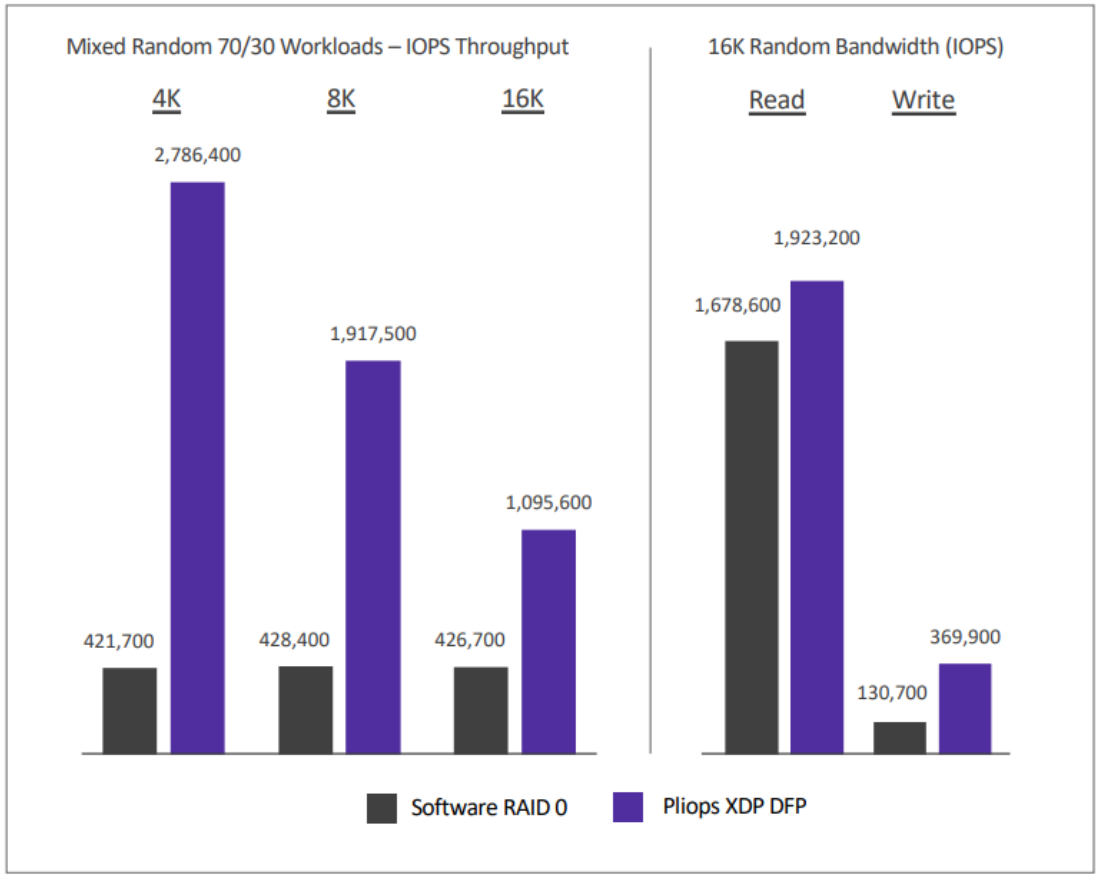


Learn more about
Solidigm Data Center SSDs

Learn more about
Solidigm Data Center QLC SSDs
with Pliops XDP

[1] Test result based on 3rd Gen Solidigm™ D5-P5316 30.72TB QLC SSDs

XDP Data Protection at High Performance and High Capacity



Learn more about
Solidigm Data Center SSDs

Learn more about
Solidigm Data Center QLC SSDs
with Pliops XDP

[1] Test result based on 3rd Gen Solidigm™ D5-P5316 30.72TB QLC SSDs

Panel Discussion

Audience Survey Question #2

How critical is it to address “blast radius” concerns when deploying SSDs that are greater than 8TB of capacity (select ALL that apply):

- We won’t deploy SSDs >8TB today due to the blast radius concern: 9%
- We are very concerned with deploying capacity >8TB in our systems, but we will for specific use cases: 18%
- We believe software defined storage protection alone is not enough to address the blast radius problem: 36%
- We experience a QoS impact when rebuilding a volume/node (east-west traffic, data access slowdown, etc.): 18%
- Don’t know/no opinion: 45%

Panel Question #1

The “blast radius” problem for high-capacity SSDs is still a concern for many companies. Is the “blast radius” problem a “capacity issue”, a “rebuild time issue”, a “wear issue”, or something else?

- Yuyang Sun (Solidigm)
- Tom Sanfilippo (Paperspace)
- Tony Afshary (Pliops)

Audience Survey Question #3

What are your thoughts on deploying a data-protection solution that maintains or increases workload performance, extends SSD endurance, and eliminates large drive rebuild pain (select ALL that apply):

- I would only deploy high capacity SSDs with this type of data protection solution: 36%
- I would deploy QLC or ZNS drives with this type of data protection solution into use cases where I would have previously used TLC drives: 18%
- I have no concerns with wear on my SSDs since I generally do not use the capacity optimally: 18%
- Don’t know/no opinion: 45%

Panel Question #2

With “software-defined” everything being the rage these days, it would seem that the role for hardware solutions is shrinking in importance, yet a number of companies are developing hardware solutions. What makes hardware acceleration critical for so many applications?

- Tom Sanfilippo (Paperspace)
- Yuyang Sun (Solidigm)
- Tony Afshary (Pliops)

Audience Q&A

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Effective Marketing & Communications with Quantifiable Results