SUSTAINABLE PERFORMANCE IN THE DATACENTER

HOW SOLIDIGM DELIVERS BOTH PERFORMANCE AND SUSTAINABILITY IN THE AI ERA

SUMMARY

There is tension between a business's need to maximize the value of AI across the organization and its need to drive down its energy consumption. On one side is the need for performance—powerful (and power-hungry) GPUs attached to highly performant storage. On the other side is a power budget that is expensive—in terms of carbon and datacenter footprint. Both sides contribute to significant financial costs.

While many datacenter professionals look to GPUs and CPUs as the key contributors, they often overlook the role of storage in this power consumption equation. This Moor Insights & Strategy (MI&S) pulse brief will explore this power challenge and how Solidigm's new D5-P5336 SSD with a capacity of 122.88 TB helps datacenter operators solve for both performance and power consumption.

SIZING THE SUSTAINABILITY CHALLENGE

Sustainability is a real issue. According to the International Energy Agency, datacenters consumed 460 TWh of power in 2022. This accounts for 2% to 3% of all power consumed, or roughly the amount consumed by the country of Australia. In 2026, this number is expected to rise to upwards of 1000 TWh. That's the equivalent of Australia plus Sweden.

The largest contributor to this power crisis is the United States, home to 33% of the world's datacenters. In 2022, datacenters in the U.S. consumed 220 TWh of energy—or 6% of the country's total power footprint. By 2026, that number is expected to rise to 260 TWh.

There are no detailed estimates for power consumption at the datacenter level. However, based on rough estimates, MI&S sees the following breakdown for the datacenter power footprint:

- Compute: 40%
- Environmental control (cooling): 30%

- Networking: 15%
- Storage: 15%

As stated, these numbers are rough estimates. Further, storage in particular can be difficult to estimate because the types of storage used in the datacenter vary so much. However, using 15% as a baseline, a large-scale datacenter consuming 50 MW would be using 7.5 MW of power on storage. This is the equivalent of powering 7,500 homes in the U.S. annually.

Besides the environmental cost of datacenter (and storage) energy consumption, there is a financial cost as well—one that is perhaps even more pressing for enterprise datacenters. Recent studies indicate that the typical datacenter spends about 40% of its budget on electricity—or $7.4 million annually.

Considering the example above, a 50 MW datacenter with an electricity price of $.05/KWh (an extremely low estimate) would cost $2,500 per hour, or $21.9 million annually. The cost of powering storage alone would be roughly $3.3 million annually.

THE STORAGE PERFORMANCE TAX

While the environmental and financial costs of the datacenter present obvious concerns for business and IT leaders, there is yet a third vector to consider—performance. Even setting aside concerns around power, AI's increasing permeation of every business process mandates a highly performant storage infrastructure.

Many enterprise IT organizations undertaking modernization and AI projects fail to recognize the performance tax associated with older, smaller-capacity storage. The drag on AI and high-performance workloads created by this older storage can be high in terms of opportunity lost. For example, a high-frequency financial trading workload that executes a trade milliseconds slower due to the performance of storage media could cost a financial institution millions of dollars.

It is not an exaggeration to say that this performance tax can be more costly to enterprise organizations than any other factor.

SOLIDIGM DRIVES SUSTAINABLE PERFORMANCE AND CAPACITY

Because storage contributes so significantly to a datacenter's costs—both directly and indirectly—MI&S recommends that IT organizations regularly assess their storage environments. Within a storage environment, media matters. HDDs—or spinning media—consume significantly more power than SSDs when considering fully deployed solutions. The value of SSDs is dependent on factors such as the type of NAND employed. Quad-level cell (QLC) NAND, where four bits of data are stored in each cell, can generally deliver the highest storage density.

Storage pioneer Solidigm recently announced the highest-capacity SSD commercially available in the market, the D5-P5336, to address these performance and power concerns. In fact, the company claims that in a network-attached storage environment, this new drive can deliver a 4:1 footprint reduction when comparing against HDD and triple-level cell (TLC) storage media. This translates into an 84% power reduction.

This efficiency also translates into a direct performance gain for data-intensive workloads such as AI and HPC. While specific measurements are not yet available, having data on fewer drives can clearly deliver greater performance when feeding models being trained.

The D5-P5336 will ship in three form factors: U.2 (15mm—traditional SSD), E1.L (9.5mm—sled), and E3.S (7.5mm—mini). It's important to note that the E3.S form factor will only support up to 30.72 TB.

To tie this all together, Solidigm and its storage partners (such as Dell Technologies) are delivering an AI- and data-intensive platform that delivers better performance while simultaneously freeing up more power and space for the specialized infrastructure required to operationalize AI across the enterprise.

CALL TO ACTION

The need to consume less power and pursue aggressive sustainability goals in the enterprise conflicts with the need to operationalize AI to achieve greater business efficiencies. One of the significant contributors to power consumption in the datacenter is storage, with estimates ranging from 10% to 20% of the datacenter total. In addition to the sustainability and fiscal costs, storage can also levy a performance tax on high-performance workloads, with examples ranging from high-frequency trading to electronic design to genomics. The performance tax can lead to significant costs—both direct and indirect.

Solidigm's new high-density QLC SSD enables enterprise IT organizations to make real progress toward sustainability goals while delivering greater storage performance for these business-critical workloads. Because of this, MI&S expects the D5-P5336 122 TB SSD to populate many enterprise and hyperscale datacenters.

IT modernization efforts and data-intensive workloads such as AI require a full solution stack designed and tuned for performance and efficiency. At the foundation of that solution stack is storage, and at the foundation of storage is the SSD. Because of this, MI&S recommends that IT organizations evaluate Solidigm-based storage solutions from Dell Technologies, HPE, and Lenovo.

IMPORTANT INFORMATION ABOUT THIS PAPER

CONTRIBUTOR
Matt Kimball, Principal Analyst at Moor Insights & Strategy

PUBLISHER
Patrick Moorhead, Founder, President, & Principal Analyst at Moor Insights & Strategy

INQUIRIES
Contact us if you would like to discuss this report, and Moor Insights & Strategy will respond promptly.

CITATIONS
Accredited press and analysts can cite this paper, but it must be cited in context, displaying the author's name, title, and "Moor Insights & Strategy." Non-press and non-analysts must receive prior written permission from Moor Insights & Strategy for any citations.

LICENSING

DISCLOSURES
This paper was commissioned by Solidigm. Moor Insights & Strategy provides research, analysis, advising, and consulting to many high-tech companies mentioned in this paper. No employees at the firm hold any equity positions with any companies cited in this document.

DISCLAIMER
The information presented in this document is for informational purposes only and may contain technical inaccuracies, omissions, and typographical errors. Moor Insights & Strategy disclaims all warranties as to the accuracy, completeness, or adequacy of such information and shall have no liability for errors, omissions, or inadequacies in such information. This document consists of the opinions of Moor Insights & Strategy and should not be construed as statements of fact. The opinions expressed herein are subject to change without notice.

Moor Insights & Strategy provides forecasts and forward-looking statements as directional indicators and not as precise predictions of future events. While our forecasts and forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could cause actual results to differ materially. You are cautioned not to place undue reliance on these forecasts and forward-looking statements, which reflect our opinions only as of the date of publication for this document. Please keep in mind that we are not obligating ourselves to revise or publicly release the results of any revision to these forecasts and forward-looking statements in light of new information or future events.