

## Chia: Plotting on Client SSDs



### What is Chia?

Cryptocurrency, that is digital or virtual currency that leverages cryptography to track and safeguard monetary transfers, has been all the rage in the last decade since the introduction of Bitcoin (BTC) in early 2009. Behind the technology is the so-called blockchain which is effectively a digital ledger that verifies and records transactions. Cryptocurrency exists parallel to traditional “fiat” currencies with the benefit of using encryption

concepts to secure transactions and protect user privacy. On the surface, this appears to be a novel way of doing business but the technology is constantly being iterated and with growth the need for regulation increases. Potential security issues aside, cryptocurrency is often used for nefarious deeds and can also fall prey to bad actors.

Cryptocurrency's drawbacks are the reason developers have been seeking to improve the system with their own "forks" and currencies. For example, cryptocurrency is notoriously volatile, which is troublesome for exchange rates. Yet the advantages make the investment worthwhile as such a currency can be portable, easy-to-use with proper implementation, and the decentralized nature ensures some sense of user security. As such, cryptocurrencies need a way to form a consensus on transfers and this requires some sort of "effort" from users that must be proven. While Bitcoin, for example, uses proof of work (PoW) – the effort that must be proven, by challenge or puzzle, is computational in nature – other cryptocurrencies can utilize a different basis.

Chia, for its part, relies on a combination of proof of space – that is, utilizing space as effort – and proof of time, the retention of this space, in a combination known as proof of space-time (PoST). The developers of Chia believe this is "greener" with lower energy consumption, hence "Chia," and use terms like "seed," "plot," and "farming" to distinguish it from the more well-known "mining." This also relies on blockchain and the developers seek to produce a decentralized, secure, usable, and well-planned cryptocurrency, backed by a strategic reserve. Their goal is to make a functional, safe, and fast currency that can be utilized by anyone. Of course, Chia must be backed by storage, and solid state drives (SSDs) are convenient, but there is the question of endurance.

## SSD Endurance

Chia plotting by its nature is space- and write-intensive, requiring around 256GiB of temporary space for each 101GiB completed plot with a total write count around 1.3TiB. As stated by Chia, "plotting is a write-intensive process due to creating random data, sorting, and compression." Typical solid state drives rely on a block-based system whereby data must be consolidated and blocks freed for future writes, as flash must be erased before it can be rewritten. As such, certain processes may incur more wear than others, a concept known as

write amplification (WA). Random writes, for example, tend to have higher write amplification, which means the flash is worn faster. Therefore, it is unsurprising that solid state drive endurance is a significant factor with Chia, even as SSDs are desirable over hard drives (HDDs) due to their performance characteristics.

Flash is an imperfect memory and will suffer errors, increasingly over time with wear. Typically, this is measured by the raw bit error rate (RBER) which to some extent can be mitigated with error correction code (ECC) such as with low-density parity-check (LDPC), a redundant array of memory (RAID), and spare blocks, with an attempt to wear the flash cells evenly through wear-leveling. Write amplification can be reduced by having more spare blocks available for future writes through overprovisioning, with writes and amplification tracked by self-monitoring, analysis, and reporting technology (SMART). Drives will typically have a warranted write target, known as total bytes written (TBW), which when factored with capacity and warranty period gives a drive writes per day (DWPD) value. This can be based on the amount of program/erase cycles (PEC) the flash is guaranteed to withstand or be arbitrarily assigned, although there is still an error threshold.

Many aspects of the SSD and flash can influence endurance. The presence of local/dedicated dynamic random access memory (DRAM) for metadata, or the host memory buffer (HMB) function for non-volatile memory express (NVMe™) drives, can reduce write amplification. Likewise, triple-level cell (TLC) flash has higher general endurance than quad-level cell (QLC) flash. Consumer drives, in particular, can be troublesome with Chia because they often rely on large, dynamic SLC caches, which have worse sustained performance and the cache may introduce additive wear. The TRIM ATA command and garbage collection (GC) mechanisms of the drive may also influence performance and endurance.

## Other SSD Factors

Consumer drives also tend to be read-focused while enterprise drives are write-focused, the latter closer to Chia's needs; client drives, for their part, tend to be more conservatively designed than consumer drives, with a focus on reliability and consistency of performance. Nevertheless, Chia farmers tend to look at performance, such as IOPS, to mitigate potential system bottlenecks. Drive choice may also include form factor – M.2, U.2 – as well as interface, such as SATA vs PCIe®, and protocol, AHCI vs. NVMe™. NVMe™ drives offer the most flexibility and performance but may not be the most cost-effective from a capacity

standpoint. Farmers may also want extra features found in firmware, power loss protection (PLP), or may want to RAID drives together, although these factors are not directly related to the plotting process.

## Summary

Cryptocurrency has a lot to offer for the future of finance and the technology is improving every day. Chia, along with its Chialisp programming language, offers an innovative way to leverage storage to allow for secure, reliable payments. Based on PoST, this technology is portable but performs best with flash memory – and of course, this means SSDs. Flash by its very nature has endurance limits that must be taken into consideration as a trade-off when plotting Chia. Consumer and retail drives are not ideal, while enterprise and client may be more useful, when giving consideration to features, warranty, and design.

\*All product and company names may be trademarks or registered trademarks of their respective holders.

## Our SSD Solutions



### CA6 Series | PCIe™ Gen 4

- Slim form factor— M.2 2280
- Random read/write up to 1000K/1000K IOPS
- Low latency
- LDPC technology



### CL4 Series | PCIe™ Gen 4

- Slim form factor— M.2 2230/2242/2280
- Random read/write up to 450K/400K IOPS
- Low latency
- 256GB - 1TB

Please contact our [Solid State Storage Technology Corp. expert](#) for more information.

\*Specifications and features are subject to change without prior notice. Images are samples only, not actual products.

**Request Full Specs Sheets**



## ABOUT US

A subsidiary of KIOXIA Corporation, **Solid State Storage Technology Corporation** is a global leader in the design, development, and manufacturing of digital storage solutions. We offer a comprehensive lineup of high-performance customizable SSDs for the Enterprise, Industrial, and Business Client markets. With various form factors and interfaces, our SSD solutions help businesses simplify their storage infrastructures accelerating variable workloads, improving efficiency, and reducing total cost of ownership.

© 2021 Solid State Storage Technology Corporation. All rights reserved.

**Learn more at [www.ssstc.com](http://www.ssstc.com)**

[Report abuse](#)

Created with  **mailchimp**