

KIOXIA Software-Enabled Flash™ Technology: Why Use Open Source Software to Unlock the Full Potential of Flash Memory?

KIOXIA recently introduced its innovative [Software-Enabled Flash technology](#) - a flash memory-based storage platform driven by software. It utilizes a software application programming interface (API) that abstracts flash-based functions, and enables direct access and host/application-level control over SSD behaviors (Figure 1). These capabilities help to unlock the full potential of flash memory and can include latency management, data placement, tenant isolation, garbage collection, endurance, and Quality of Service (QoS). The API is open-sourced and defines the commands and capabilities of the storage hardware for use by host applications.

Software-Enabled Flash technology is planning to use a neutral third-party, open source software host to emphasize innovation and open collaboration.

Software-Enabled Flash technology provides data center developers and architects, as well as cloud software developers and innovators, with access to the shared developments of multiple suppliers and vendors who are working together to develop and evolve flash-based capabilities. The software provides the flexibility of adapting, developing, customizing and tuning flash memory to applications and storage needs through the open source API, with the end goal of maximizing flash storage capabilities so flash memory can reach its full potential.

One major challenge is flash memory characteristics evolve and change with each new generation, along with the differences in implementations from vendor to vendor. This creates problems for the storage developer having to continuously update their hosts and applications across multiple vendors and flash generations. Also, since many flash-based storage products are built for wide market acceptance and general-purpose use, they present further challenges to very specific hyperscale applications that require direct access and host control of their flash storage devices.

Software-Enabled Flash Technology Overview

Software-Enabled Flash technology has been released to the open source software (OSS) community in 2020 with the API definition and specification document available and downloadable from the [KIOXIA repositories on the GitHub® site](#)¹. The site provides solutions to a wide community of developers, architects and end users that can help to solve their unique flash storage challenges. In addition, the KIOXIA Software-Enabled Flash technology [home page](#) includes white papers, presentations and demonstrations.

An OSS community project is being established that will enable vendors and suppliers to collaborate with each other in an open and neutral manner. Joint industry collaboration will help to evolve solutions further and faster, as well as unlock the full potential of flash memory.

A Software-Enabled Flash technology software development kit (SDK) is expected by mid-2021. The open source software model allows multiple supply sources and multi-vendor compatibility that will help customers future-proof their solutions. Several companies, and their associated skill sets, are cooperating on this technology project with the goal of creating a wide range of available, open-sourced solutions. The objective is to create Software-Enabled Flash standards supported by storage industry leaders. As it evolves, it should include several levels of engagement, such as product development, marketing communications, and legal compliance and conformance.

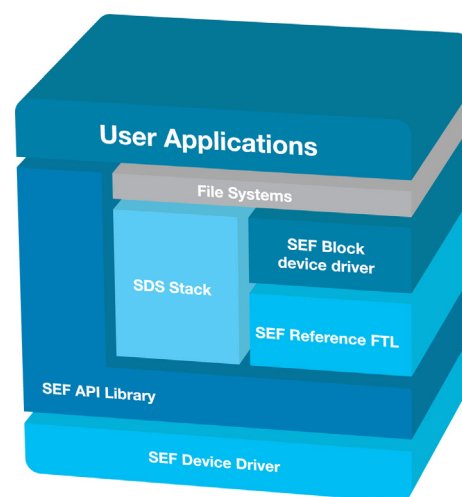


Figure 1: Software-Enabled Flash host software block diagram

Summary

The open-source API provides options for host software control over flash storage hardware. This control extends all the way down to individual flash dies and provides hyperscale users with the ability to control any aspect of latency management, data placement, tenant isolation, garbage collection, endurance, QoS, etc. These capabilities do not interfere with I/O access responses, as the API can coexist with multiple protocols simultaneously. With Software-Enabled Flash technology, the host can deliver applications and storage customizations for different tenants and workloads without noisy neighbor² issues. Hyperscale developers and architects are provided with the tools they need to optimize their use of solid-state storage.

Software-Enabled Flash technology is designed to adapt to current and new generations of flash memory rapidly, cost-effectively and efficiently in hyperscale environments. It makes flash memory easier for cloud software and hyperscale developers to manipulate and use, enabling them to implement the functions and capabilities they want, with solutions that can look, act and perform like an SSD, but enabled, defined and managed through a software API.

The future of flash storage is software-enabled.

For more technology information, visit <https://softwareenabledflash.com>.

¹ The GitHub branch platform includes a website and cloud-based service that stores and manages the code that a company develops, and tracks and controls any changes to their code. GitHub is an exclusive trademark registered in the United States by GitHub, Inc.

² A noisy neighbor is a hyperscale co-tenant that monopolizes bandwidth, SSD I/O, CPU and other resources, and can negatively affect other co-tenants' performance.

GitHub is a registered trademark of GitHub, Inc. All other trademarks or registered trademarks are the property of their respective owners.

© 2021 KIOXIA America, Inc. All rights reserved. Information in this tech brief, including product specifications, tested content, and assessments are current and believed to be accurate as of the date that the document was published, but is subject to change without prior notice. Technical and application information contained here is subject to the most recent applicable KIOXIA product specifications.