

SwitchBox: Security, Energy, and Performance Tradeoffs Leveraging LFS Behavior in Stream Cipher Based Full Drive Encryption

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Abstract

Full-drive encryption (FDE) is a tier-one concern in modern systems increasingly backed by solid-state storage. By leveraging the proliferation of trusted hardware and the behavior of solid-state Flash Translation Layers (FTL)—which operate similarly to Log-structured File Systems (LFS)—we can improve I/O performance by as much as $2.36\times$ while offering stronger integrity guarantees than the state of the art. But this append-mostly overwrite-averse FTL/LFS behavior is further exploitable. By taking advantage of this behavior, we can trade off I/O performance or total filesystem energy use for stronger security guarantees without loss of generality.

In this paper, we demonstrate that this trade off space exists. We further characterize this space and provide a software mechanism to navigate it: the SwitchBox filesystem. We implement SwitchBox on an ARM big.LITTLE mobile processor and test its performance under the popular F2FS LFS. We find that SwitchBox is flexible enough to satisfy a wide range of performance and security constraints. [TODO: Perhaps a sentence-long general explanation of the use cases and the most interesting result(s) from them.]

1 Introduction

Todo!

2 Motivation

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3 SwitchBox System Design

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4 SwitchBox Implementation

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5 Evaluation

5.1 Experimental Setup

Todo!

5.2 Experimental Methodology

Todo!

6 Related Work

Todo!

7 Conclusion

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ASPLOS'19,

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