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### Title

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# The Harey Tortoise: Managing Heterogeneous Write Performance in SSDs

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## Abstract

Recent years have witnessed significant gains in the adoption of flash technology due to increases in chip bit density, enabling higher capacities and lower prices. Unfortunately, these improvements come at a significant cost to performance with trends pointing toward worst-case flash program latencies on par with disk writes.

We extend a conventional flash translation layer to schedule flash program operations to flash pages based on the operations' performance needs and the pages' performance characteristics. We then develop policies to improve in two scenarios: First, we improve peak performance for latency-critical operations of short bursts of intensive activity by 36%. Second, we realize steady-state bandwidth improvements of up to 95% by rate-matching garbage collection performance and external access performance.

A copy of this technical report can be obtained by sending a request to [swanson@cs.ucsd.edu](mailto:swanson@cs.ucsd.edu)