

WALDIO mode to improve smartphone life explained at USENIX

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Credit: Peter Griffin/Public Domain

Researchers from South Korea's Hanyang University and the Ulsan National Institute of Science and Technology (UNIST) have got together to resolve the journaling of journal anomaly in the Android IO stack. Translation: They have worked out a way to improve life with a smartphone.



They presented their work at this year's USENIX technical conference in Santa Clara, California, which took place from July 8 to 10. Their paper is titled "WALDIO: Eliminating the Filesystem Journaling in Resolving the Journaling of Journal Anomaly." They said they successfully eliminated the root cause for journaling of journal <u>anomaly</u>, the filesystem journaling.

The authors believe that the <u>performance</u> of the <u>smartphone</u> is governed by the performance of the storage device, not by the performance of the airlinks. "In Android, it is reported that more than 70% page writes generated by the <u>smartphone application</u> are for filesystem journal and dominant fraction of which are generated by SQLite DBMS."

SQLite is a serverless embedded DBMS and is the way of maintaining records in smartphone platforms. They overhauled the interaction between SQLite and EXT4.

The authors wrote: "In the smartphone, the storage subsystem is arguably the main governing factor for performance. Android IO stack suffers from the excessive IO behavior. Sending two character message, 'Hi', through the text messaging application yields at least 48 KByte of writes to the storage device. This anomalous amplification is due to the uncoordinated interaction between SQLite and EXT4 filesystem."

They proposed to use direct IO based write operation for committing logs to the SQLite journal file so that the logs are directly written to the storage and the activity of committing the logs does not accompany any updates in the page cache entries; neither the data block nor the metadata. "With this approach," they said, "the synchronization activity of SQLite, e.g. fdatasync(), does not trigger any filesystem journaling related IO."

The authors raised points about NAND Flash endurance. They believe



that "via decreasing the IO volume generated by SQLite to 1/6, WALDIO can make the TLC NAND Flash not an infeasible choice for <u>storage device</u> in Android platform. Adoption of TLC NAND Flash in Android device can significantly reduce the cost of the smartphone and can make it available to wider community in the world."

Rob Triggs, writing in *Android Authority*, summed up the significance of their research—technology that could slow down the rate of decay, boost performance and increase smartphone battery <u>life</u>.

WALDIO stands for Write Ahead Logging Direct IO.

Won You-jip, professor of the Department of Computer Science and Engineering at Hanyang University, led the research team. Cho Jinyoung in *BusinessKorea*, said "Professor Won confirmed that the phenomenon that the longer smartphones are used, the slower they become is real. He said that it is attributable to worsening product performance stemming from repeated data storage and deletion in <u>flash</u> <u>memory</u>." Professor Won said in the article, "This tech will make it possible to use low-priced flash memory for a long time, like expensive flash <u>memory</u>."

More information: <u>www.usenix.org/conference/atc1</u> ... <u>sentation/lee_wongun</u>

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