# Efficient Sanitization Design for LSM-based Key-Value Store over 3D NAND Flash



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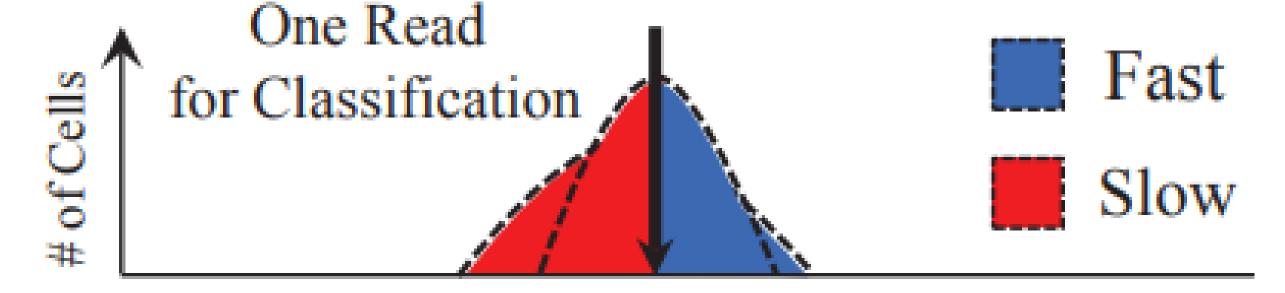
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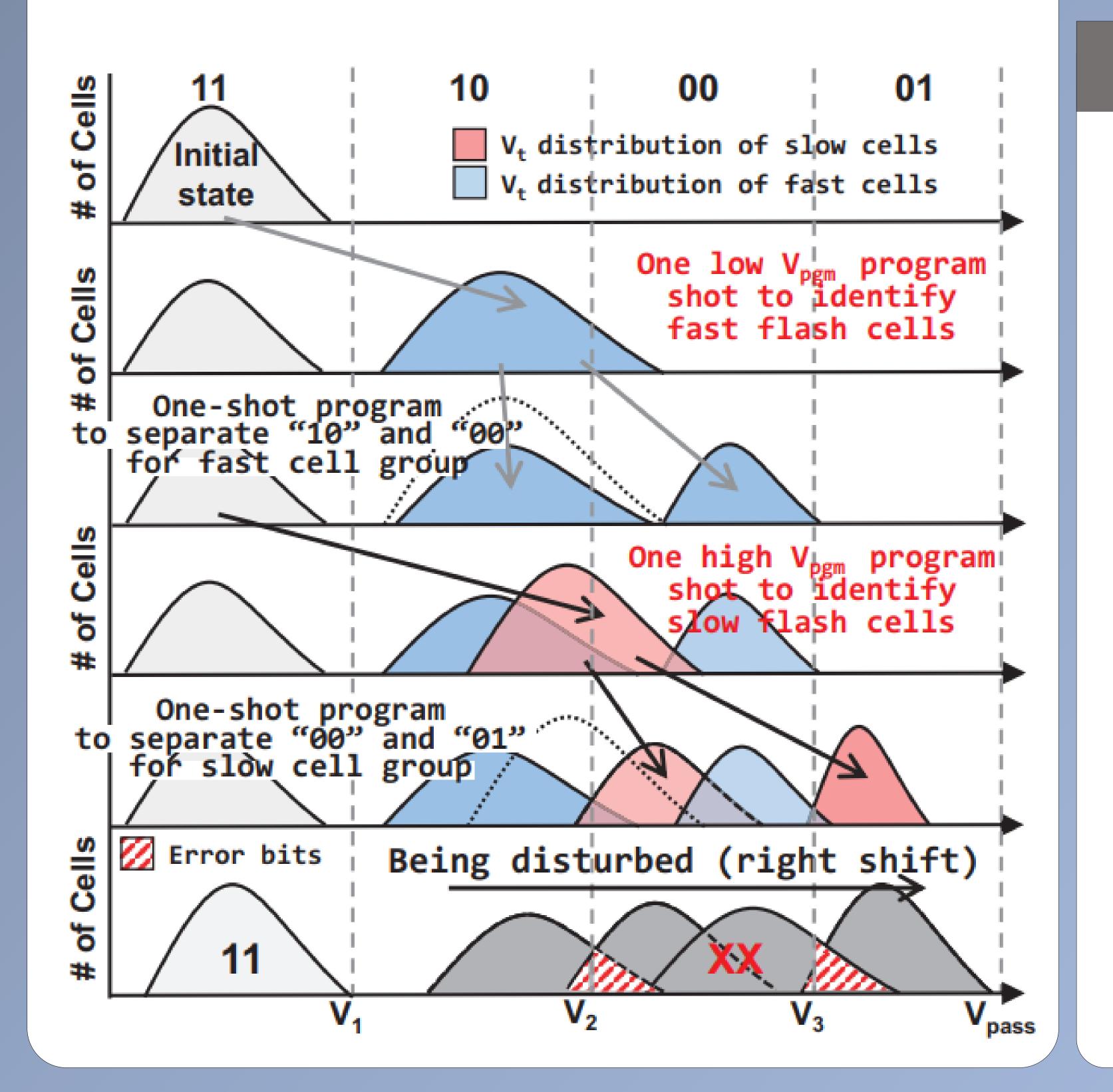
#### Instantaneous Sanitization ≈ zero overhead (fast) Directly adopting the instantaneous sanitization Only for SLC BLK #0 on MLC: Poor retention Space waste Error bits 0# **Error bits** WL 1 Sanitized page Page A1 is sanitized through Valid page WL 2 C1 being disturbed by writing Page A2 Error bits Free page WL 3 Retention issue (V<sub>t</sub> distribution left shift) of Cells WL 4 A5 ₩L1 More Error bits WL 2 C1 XX No usable Fails on ECC decoding B7 free page More error bits

## Influence-Conscious Programming

### The programmability classification



- Fast cells help sanitization
  - More errors to fail ECC (easily to interference )
- •Slow cells help improving reliability
  - No charge loss (easily to keep in the current Vt)

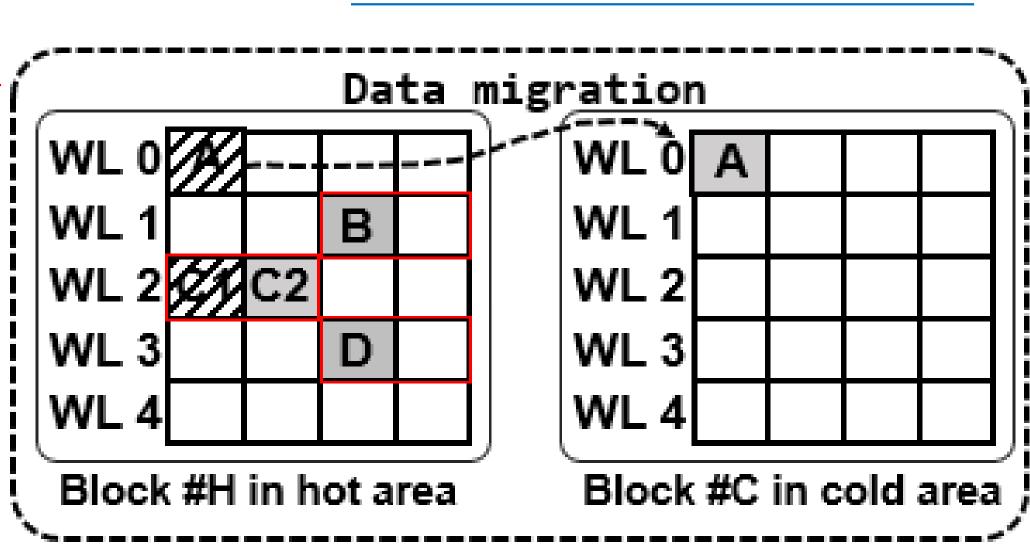


# Hot-Cold Separation Allocation Policy

Hot area:
Using ICP
(better sanitization
performance)

• Cold area:
Using scrubbing
(better space usage)

Cold data identifying is supported by compaction in LSM-tree



# **Experiment Result**

