

The Reach Profiler (REAPER):

Enabling the Mitigation of DRAM Retention Failures
via Profiling at Aggressive Conditions

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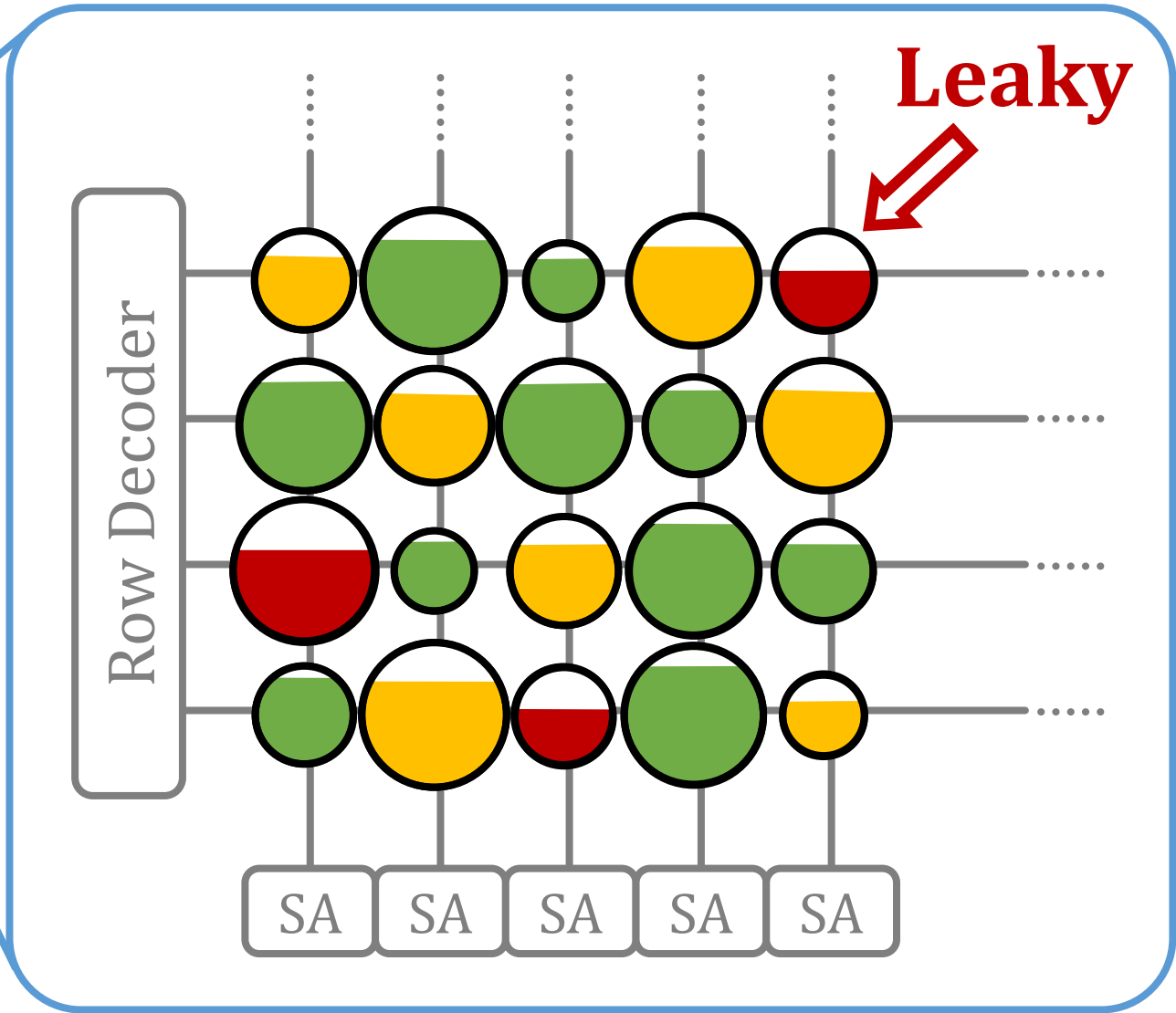
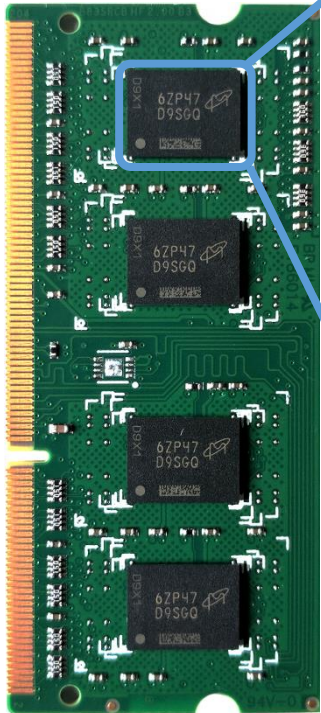


SAFARI

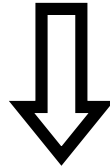
ETH zürich

Carnegie Mellon

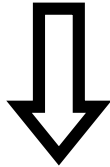
DRAM



Leaky Cells

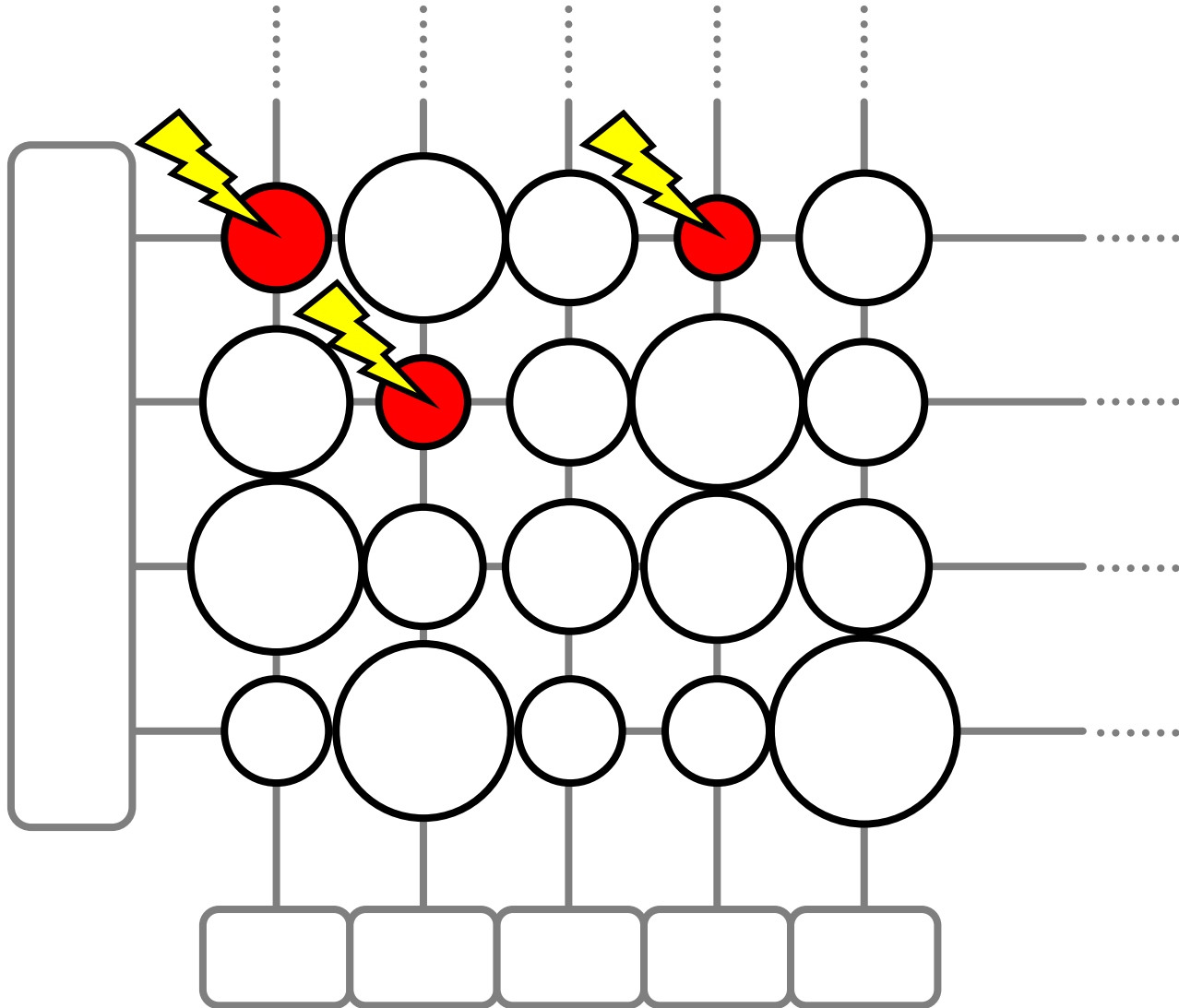


Periodic DRAM Refresh



Performance + Energy Overhead

Goal: find *all* retention failures for a refresh interval $T >$ default (64ms)



Process, voltage, temperature

Variable retention time

Data pattern dependence

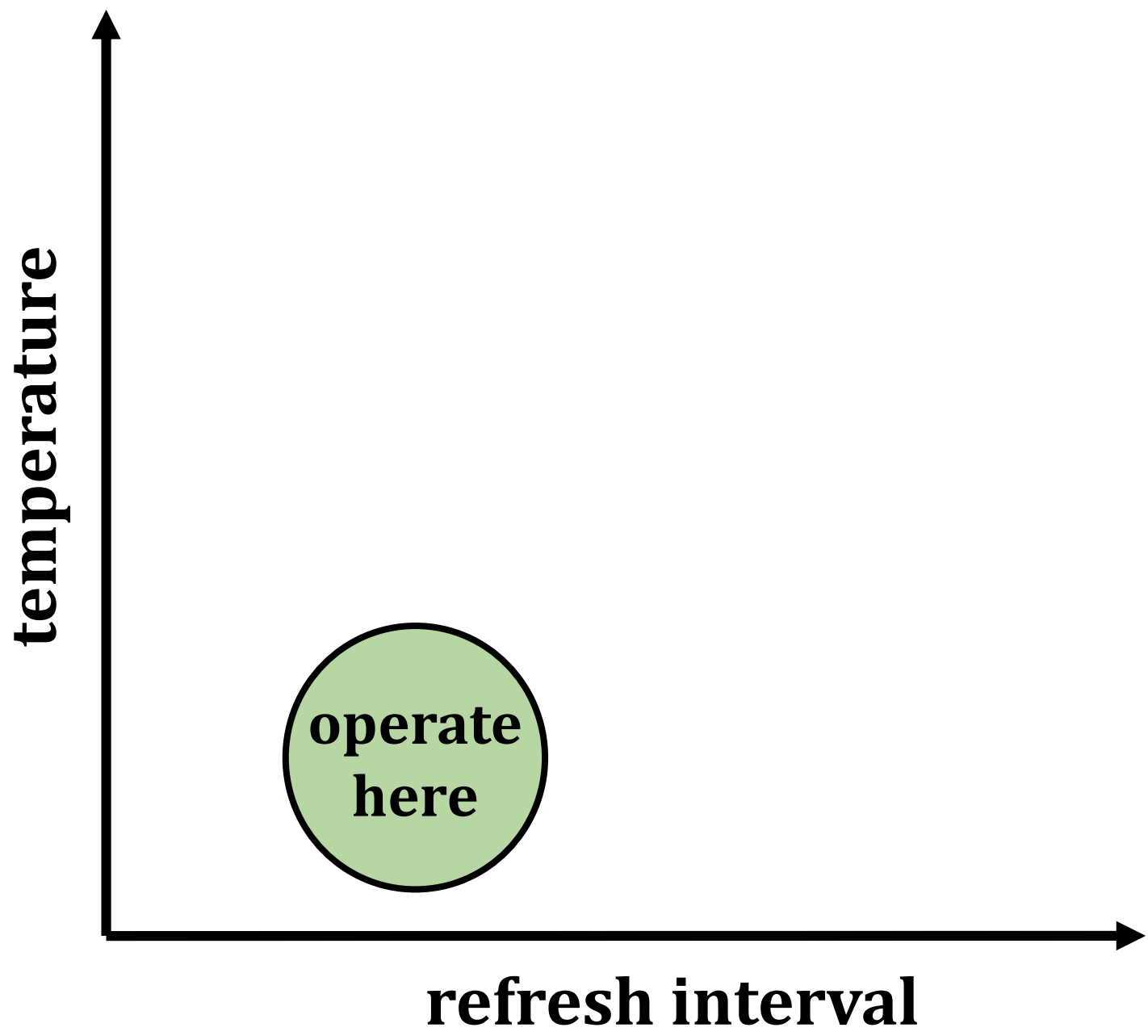
Characterization of 368 LPDDR4 DRAM Chips

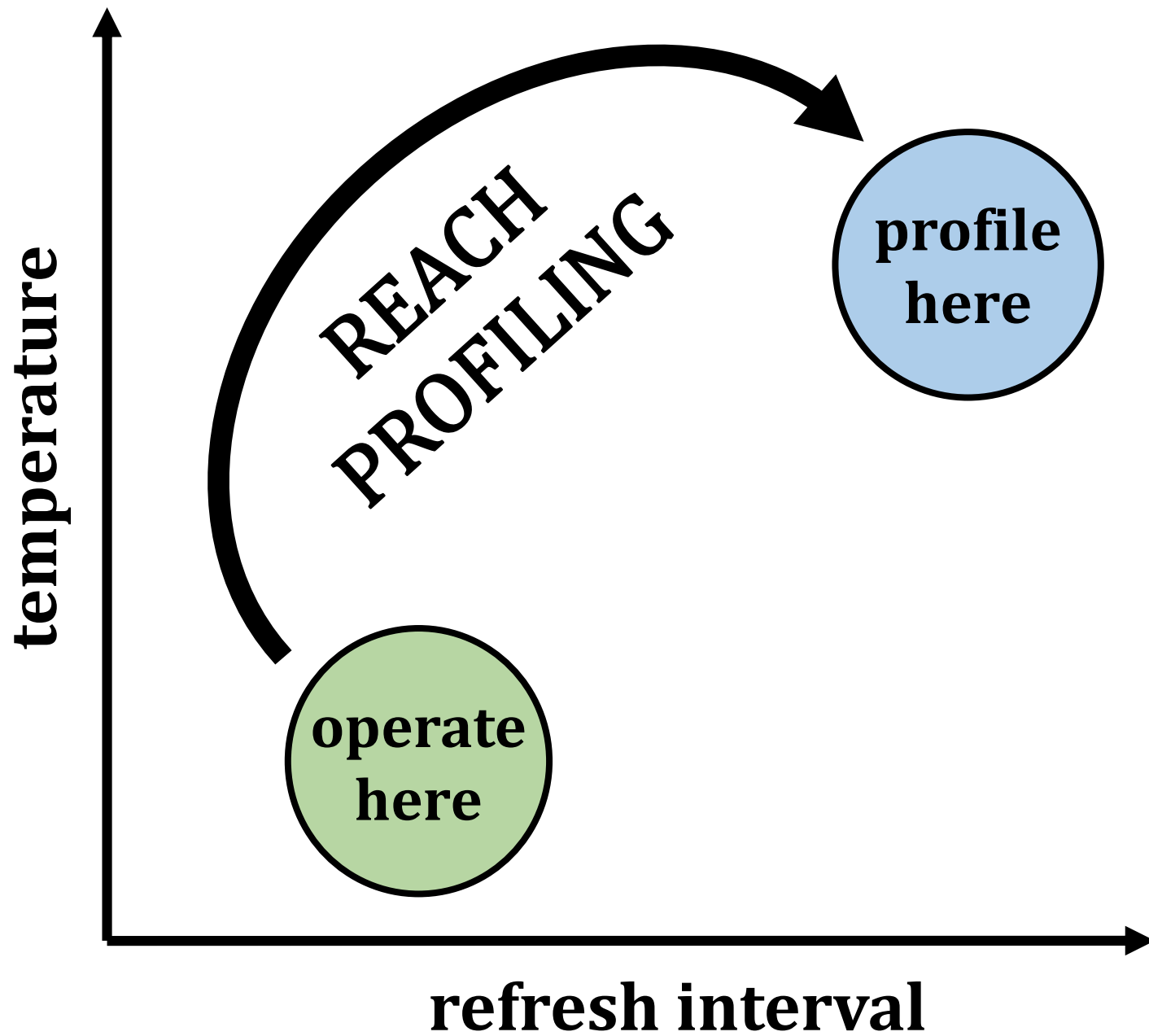
①

Cells are **more likely to fail** at an **increased (refresh interval | temperature)**

②

Complex tradeoff space between profiling
(speed & coverage & false positives)





Reach Profiling

A new DRAM retention failure profiling methodology

- + **Faster** and **more reliable** than current approaches
- + Enables **longer refresh intervals**

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Session 4A, 4-5:40pm

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