A Deeper Look into RowHammer’s Sensitivities

Experimental Analysis of Real DRAM Chips and Implications on Future Attacks and Defenses

Lois Orosa  Abdullah Giray Yağlıkçı
Haocong Luo  Ataberk Olgun  Jisung Park
Hasan Hassan  Minesh Patel  Jeremie S. Kim  Onur Mutlu

SAFARI

ETHzürich

TOBB ETÜ
University of Economics & Technology
Executive Summary

- **Motivation**: RowHammer is a worsening DRAM reliability and security problem
- **Problem**: Unfortunately, it is unclear, but critical to understand, how the RowHammer vulnerability varies under different conditions
- **Goal**: Provide insights into **three fundamental properties** of RowHammer that are 1) not yet rigorously studied 2) but can be leveraged to design more effective and efficient attacks and defenses
- **Experimental study**:  
  - 1) DRAM chip **temperature**, 2) aggressor row **active time**, and 3) victim DRAM cell’s **physical location**  
  - 272 DRAM chips of DDR3 and DDR4 modules from **four major manufacturers**
- **Analysis**: We make 16 novel observations, among which we highlight that
  A RowHammer bit flip is **more likely to occur**  
  1) in a **bounded range of temperature**  
  2) if the **aggressor row is active** for **longer time**  
  3) in **certain physical regions** of the DRAM module under attack
- **Implications**: We describe and analyze three **future RowHammer attack** and **five defense improvements**
- **Conclusion**: Our novel observations can be leveraged to **make an attack more effective**, and design **more effective and efficient defenses**
A Deeper Look into RowHammer’s Sensitivities

Experimental Analysis of Real DRAM Chips and Implications on Future Attacks and Defenses

MICRO’21 Session 10A: Security and Privacy III
Day 3: Thursday, October 21 – 3:00 PM (EDT/New York), 22:00 (EEST/Athens)

Lois Orosa  Abdullah Giray Yağlıkçı
Haocong Luo  Ataberk Olgun  Jisung Park
Hasan Hassan  Minesh Patel  Jeremie S. Kim  Onur Mutlu

SAFARI

ETH zürich

TOBB ETÜ
University of Economics & Technology