

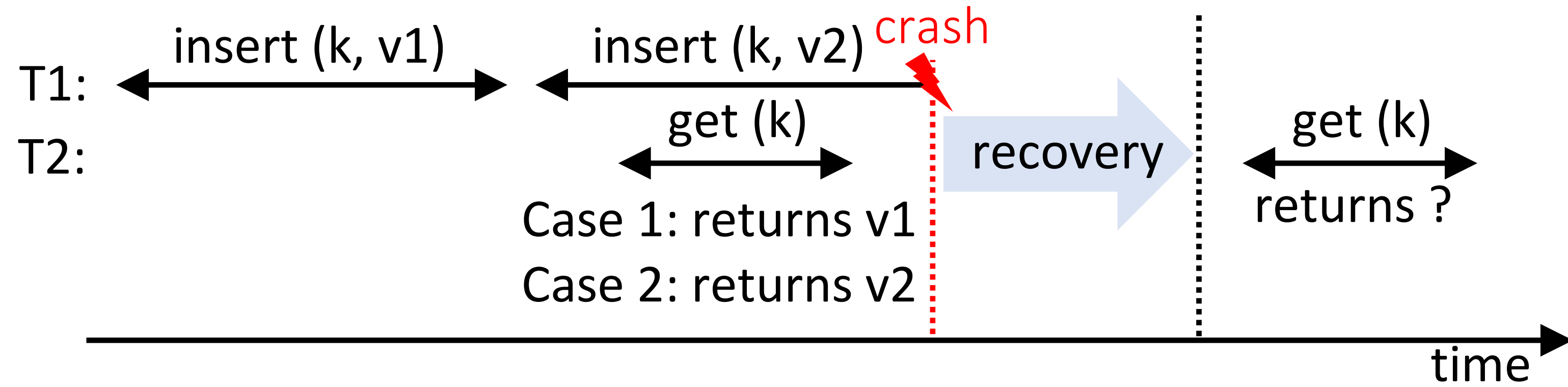
# Durinn: Adversarial Memory and Thread Interleaving for Detecting Durable Linearizability Bugs

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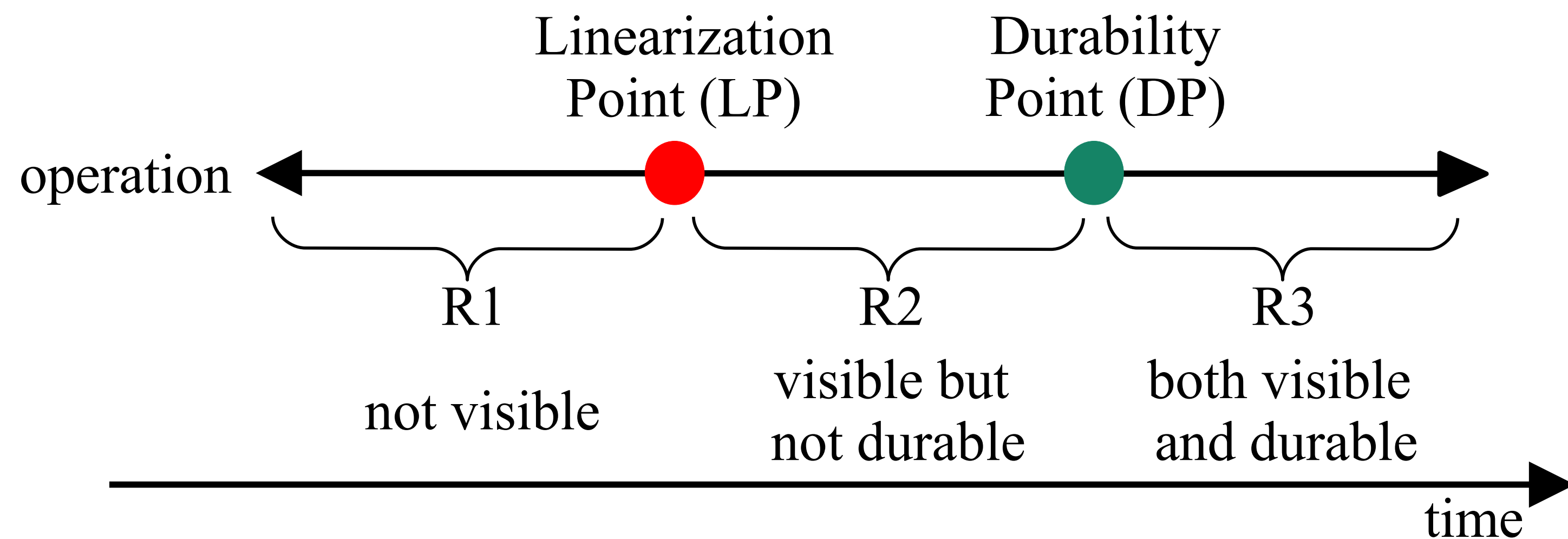


## NVM Correctness Condition

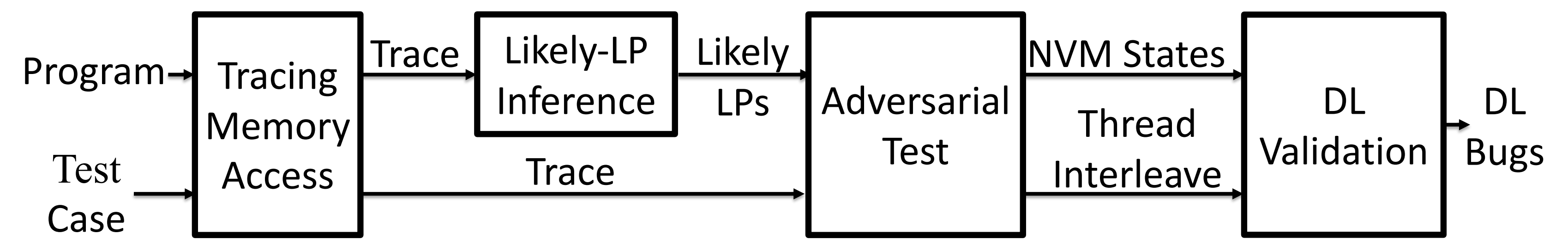
### Durable Linearizability Example



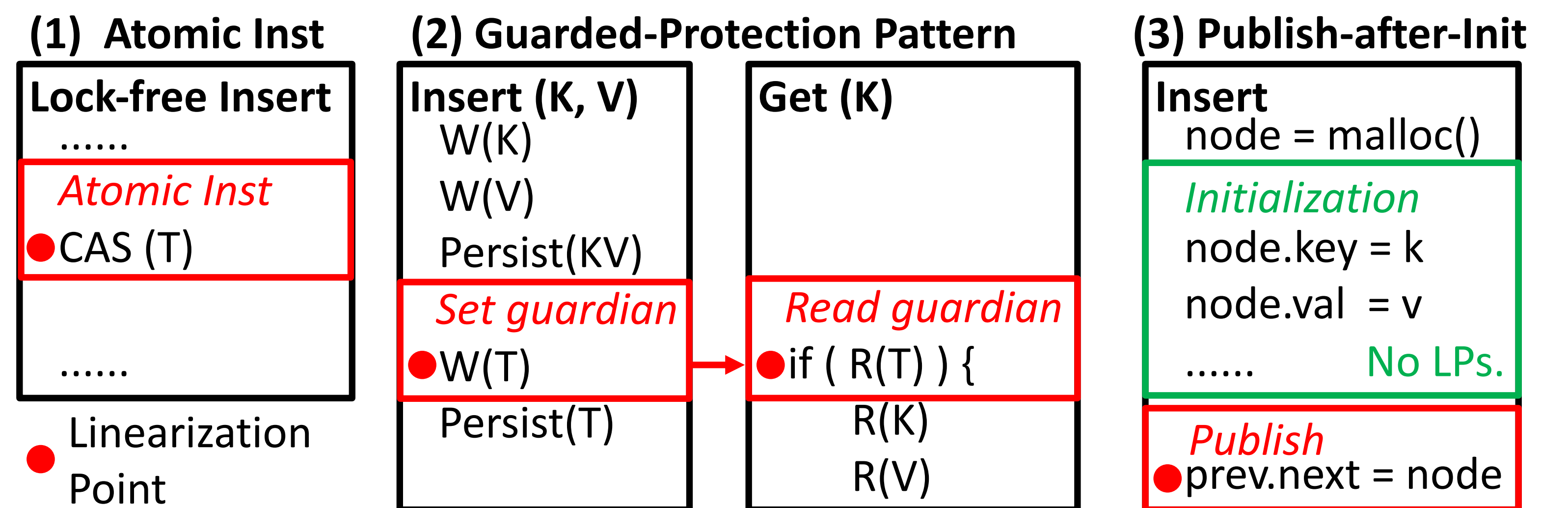
### The Gap between LP and DP



## Durinn Overall Architecture

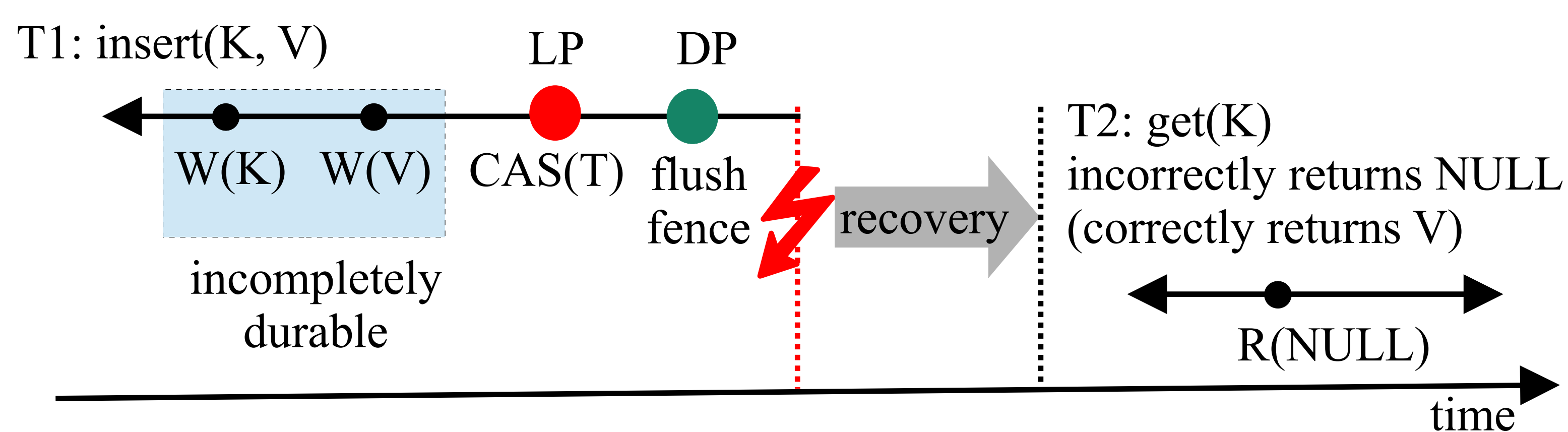


## Likely-Linearization Point Inference

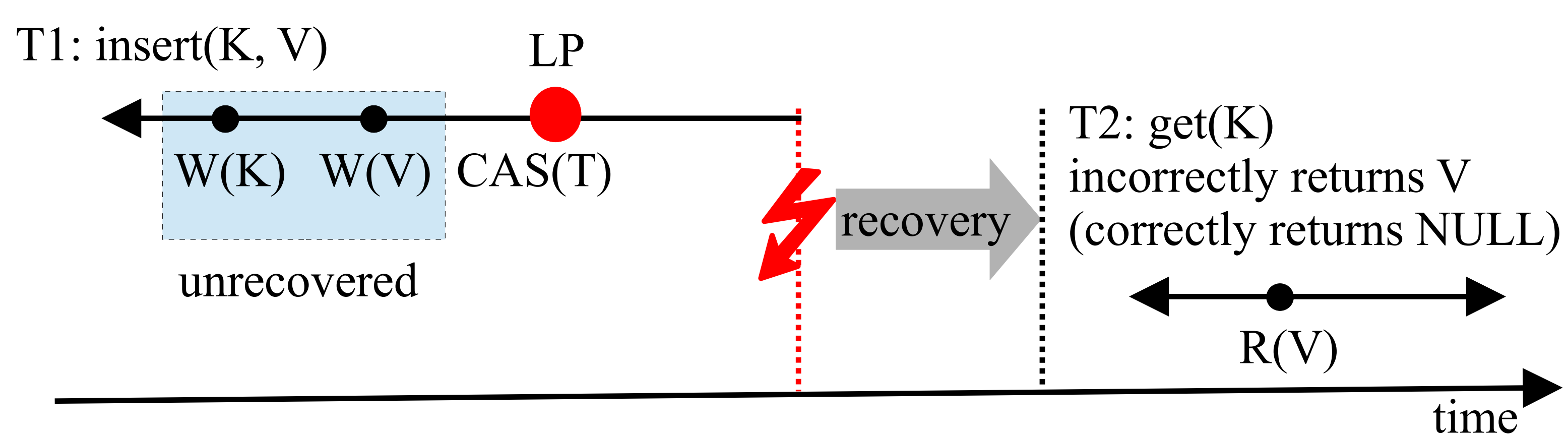


## Durable Linearizability Bugs

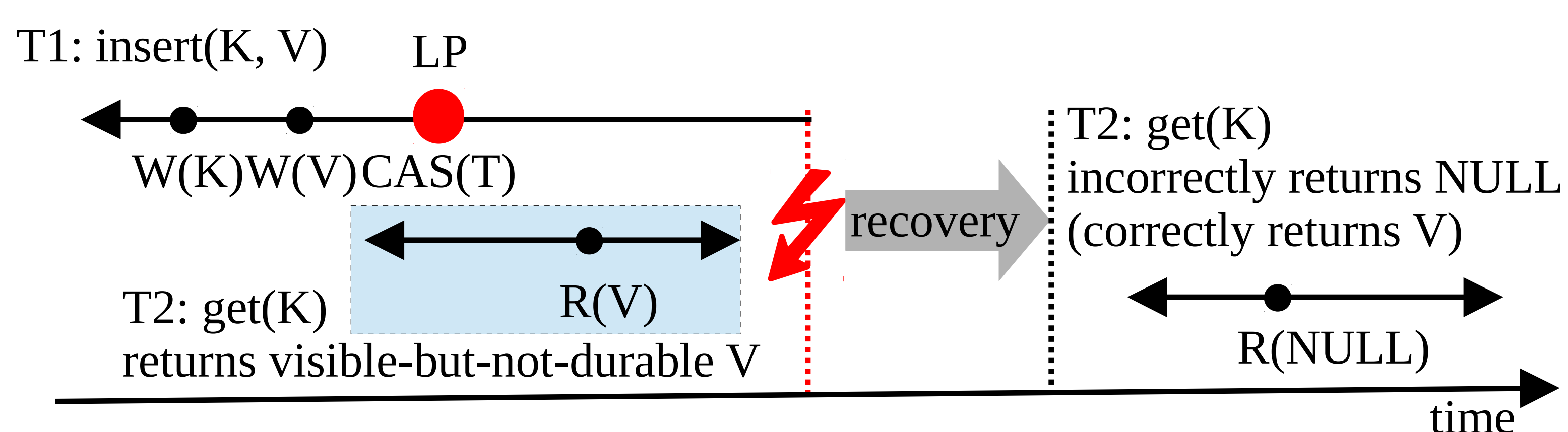
### DL1 Bug: An Incompletely-Durable Bug



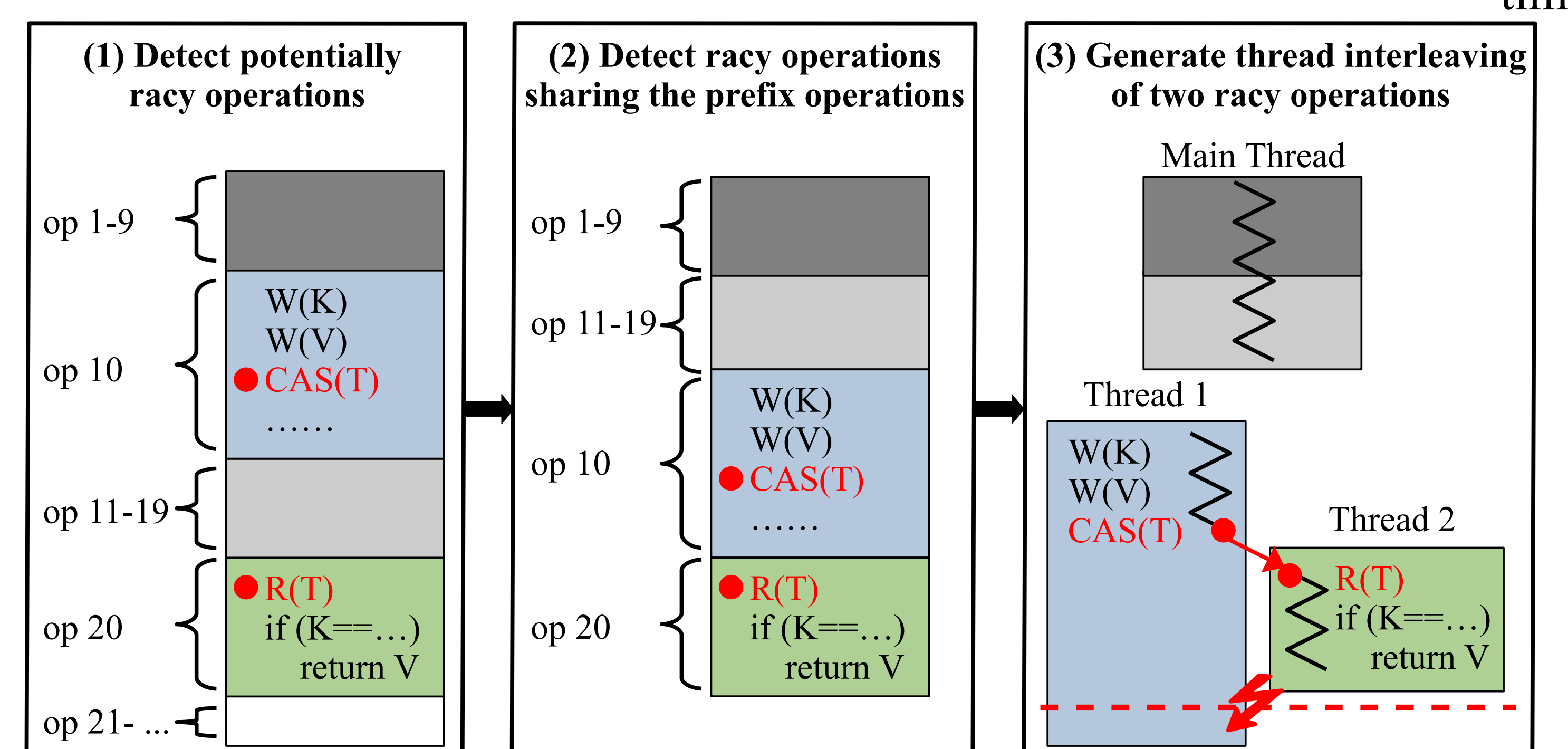
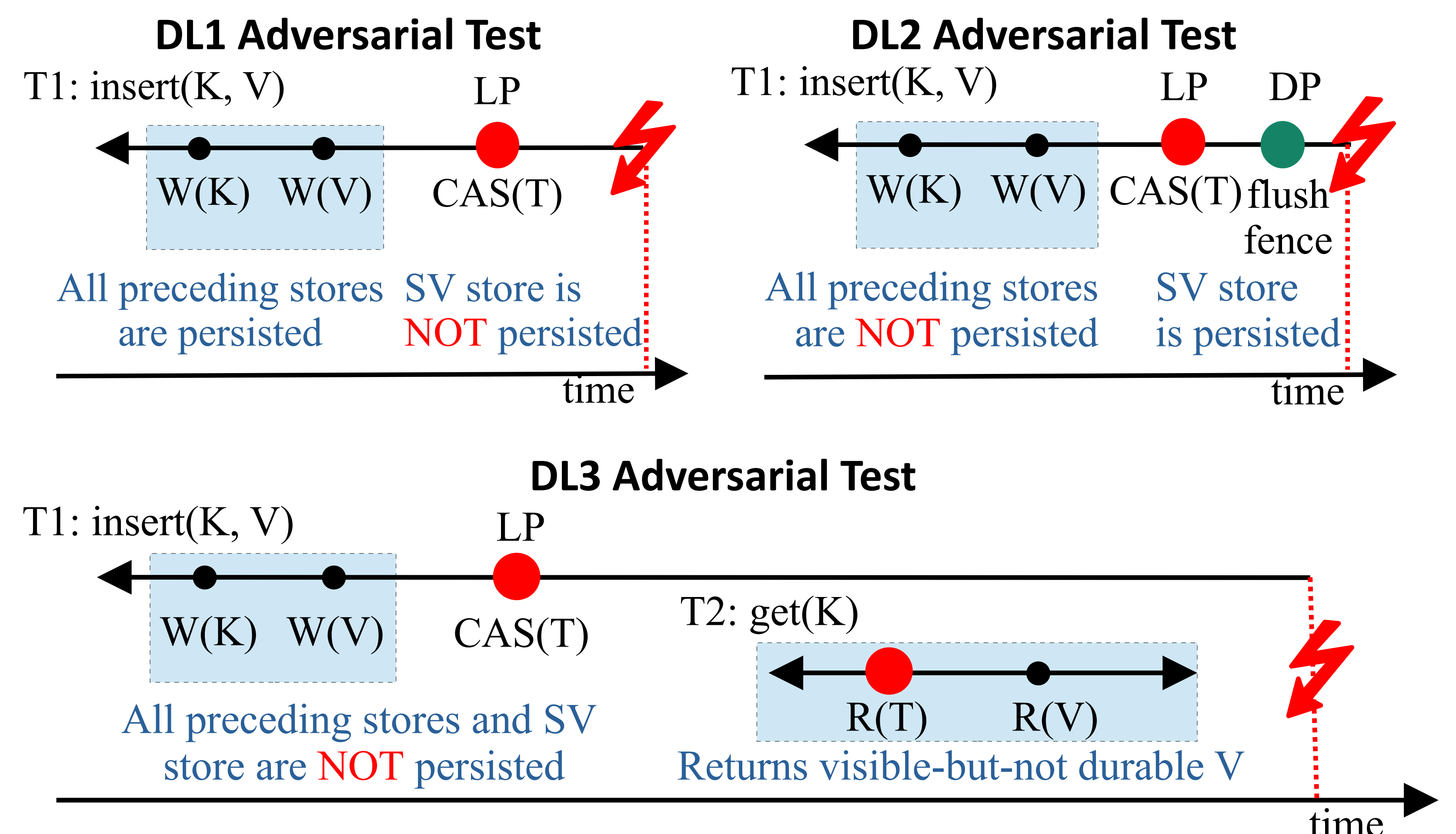
### DL2 Bug: An Unrecovered-Durable Bug



### DL3 Bug: A Visible-But-Not-Durable Bug



## Adversarial Test



## Evaluation

### Tested Applications:

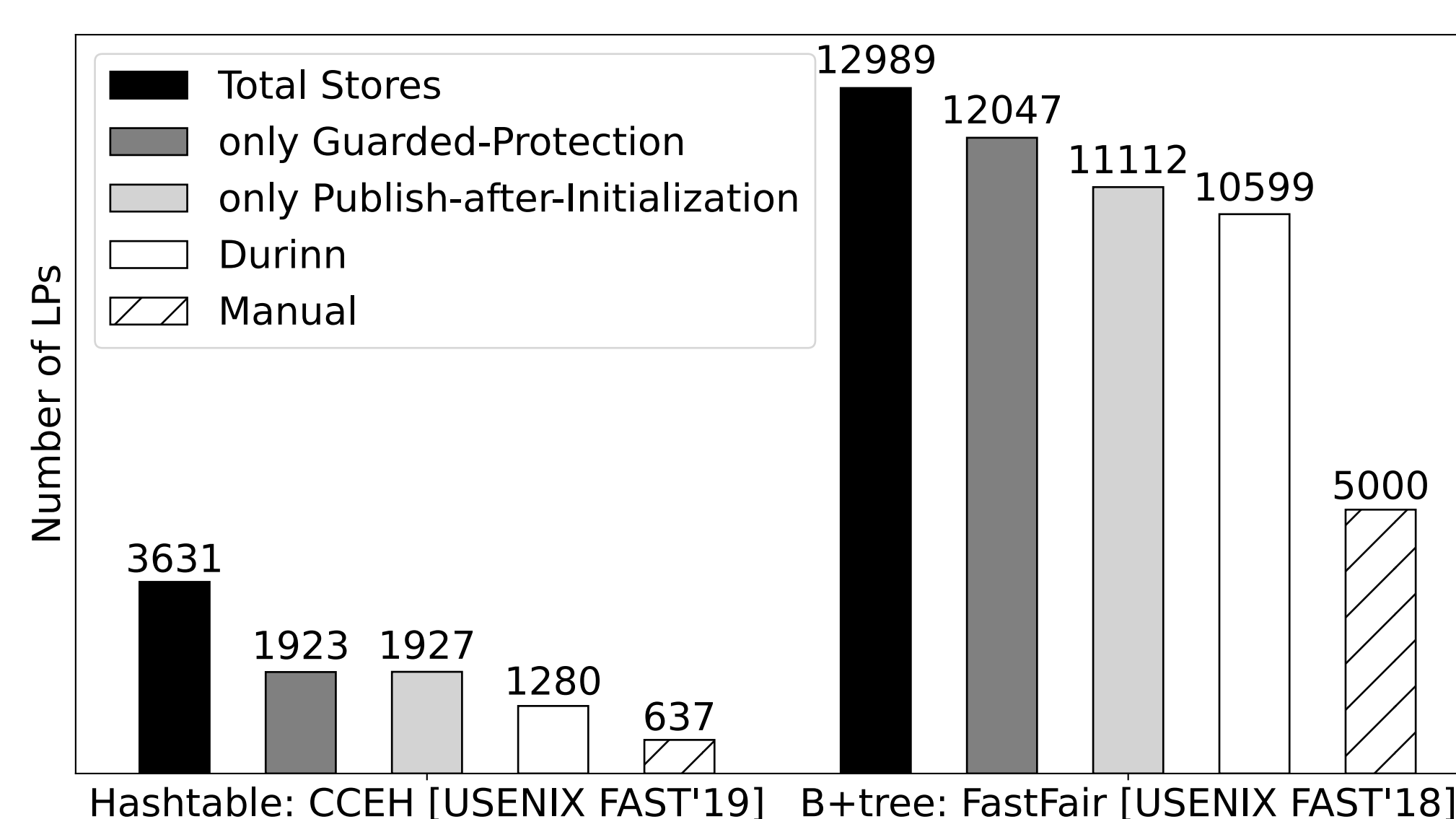
- 13 concurrent NVM data structures
- Low-level and high-level persistency
- Lock-based and lock-free
- 1000 ops generated by AFL++ Fuzzer

### Bug Detection:

- Detected 27 bugs from 12 data structures
- 15 new bugs and 7 are confirmed
- 10 DL1 bugs, 7 DL2 bugs, and 10 DL3 bugs.

### Likely-LP Inference Effective and Sound

- Durinn only tested 35% and 82% of Total Stores
- Durinn did not miss true Linearization points



### Comparison against Witcher

