

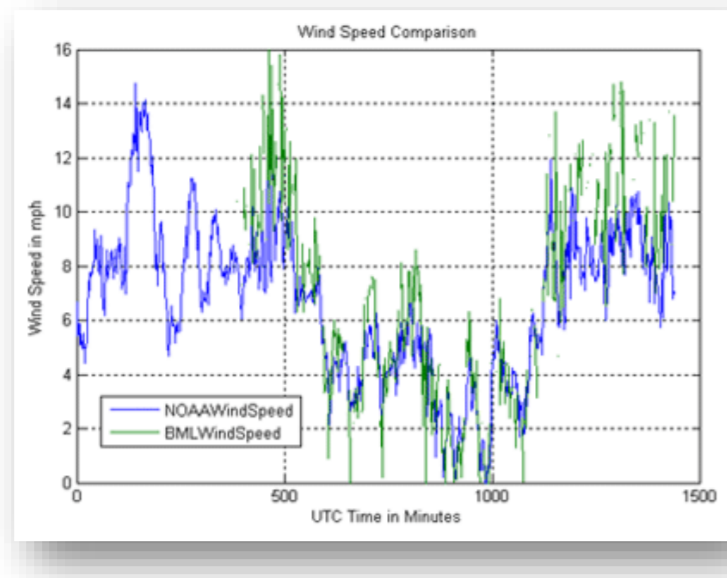
PFRESH: A persistent Lock Free Data Series Index

Georgios Paterakis, Panagiota Fatourou, Eleftherios Kosmas, Themis Palpanas

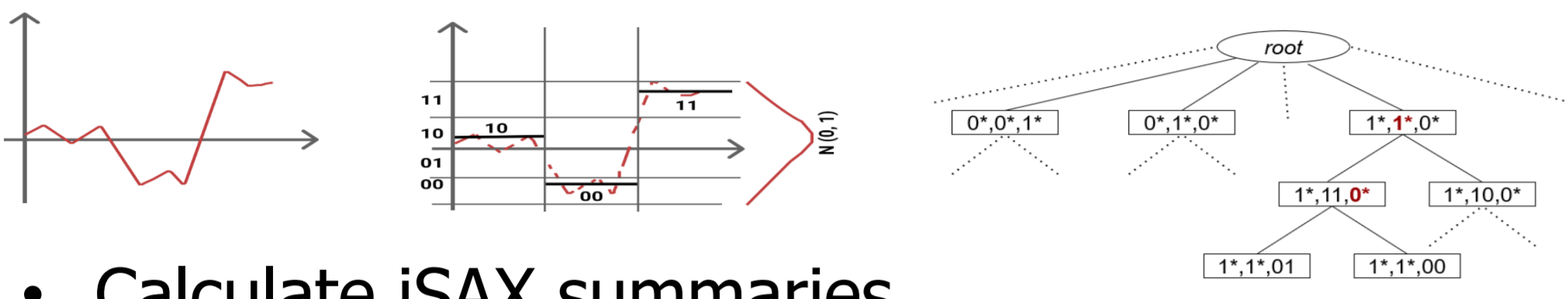
Motivation and Challenges

Data Series

- Many Applications
 - Seismology
 - Astrophysics
 - Neuroscience
 - Engineering etc.



Data Series Processing

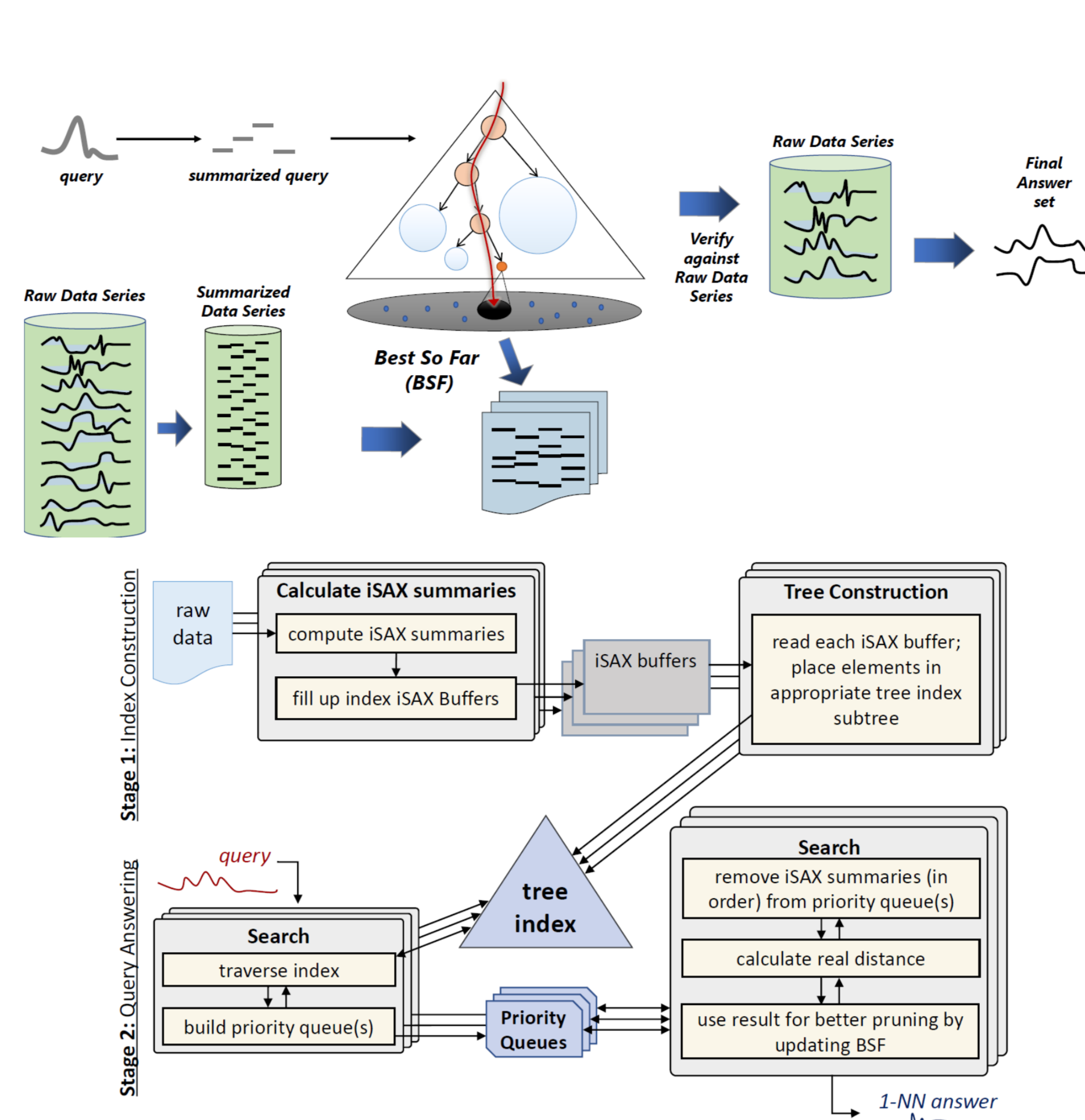


- Calculate iSAX summaries

Similarity Search

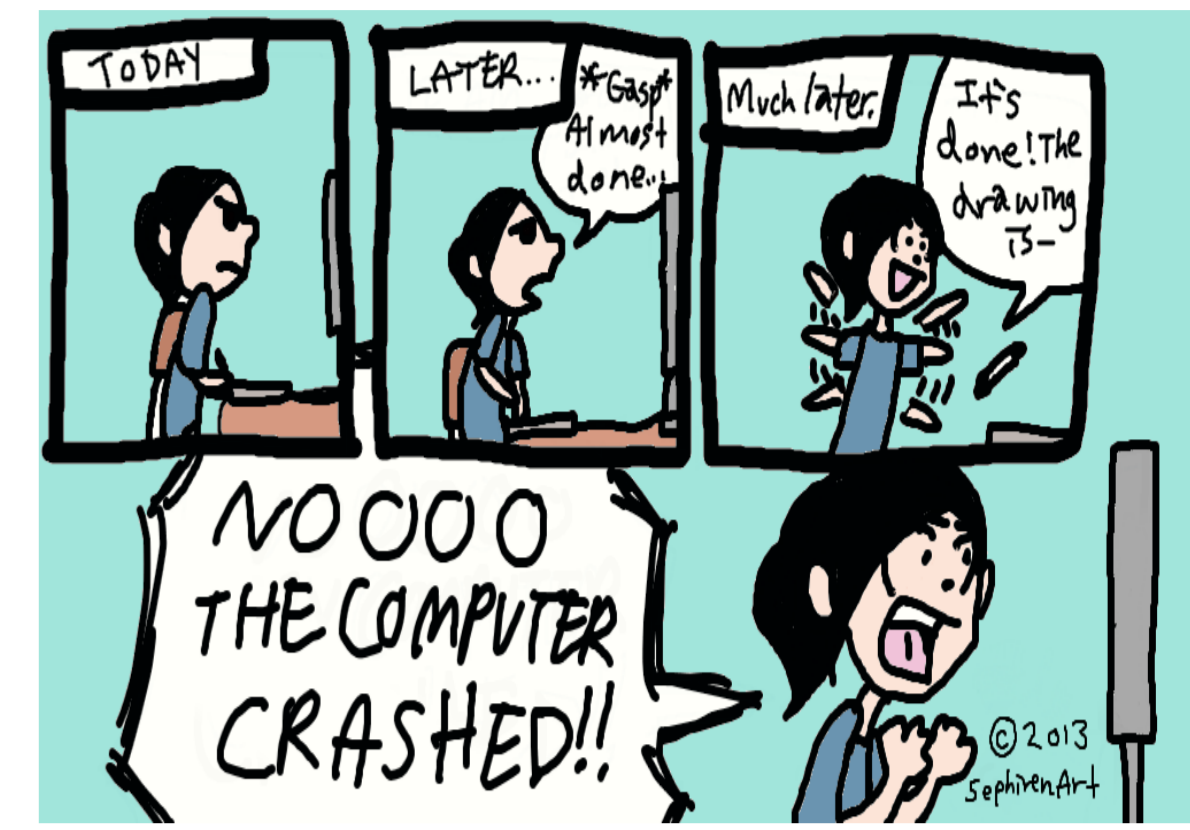
Find the most similar series of a collection to a query series

How an iSAX data series index works



Blocking Implementations

- Use of locks
- Convoying
- Priority Inversion
- Restricted Parallelism
- Thread holding the lock fails



Transform to non-Blocking Implementations

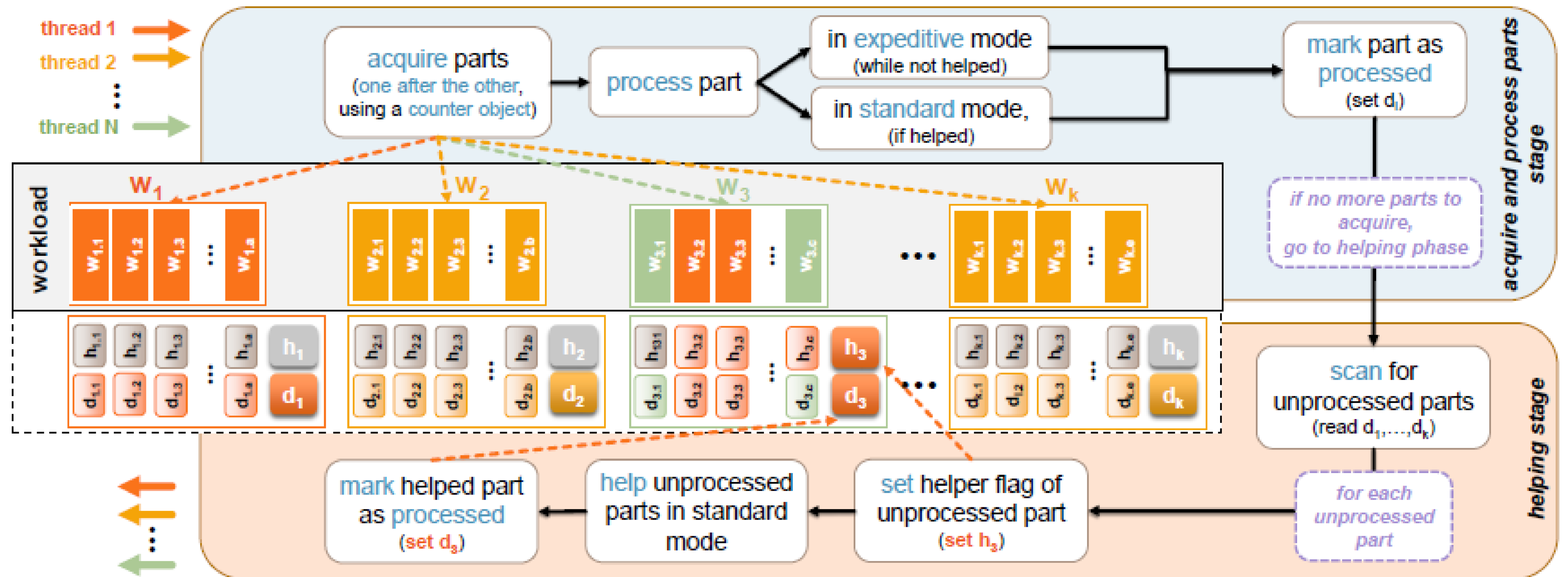
- Some sort of helping is needed.
 - Helping is costly
 - Adds complexity
 - It's not always easy to implement.



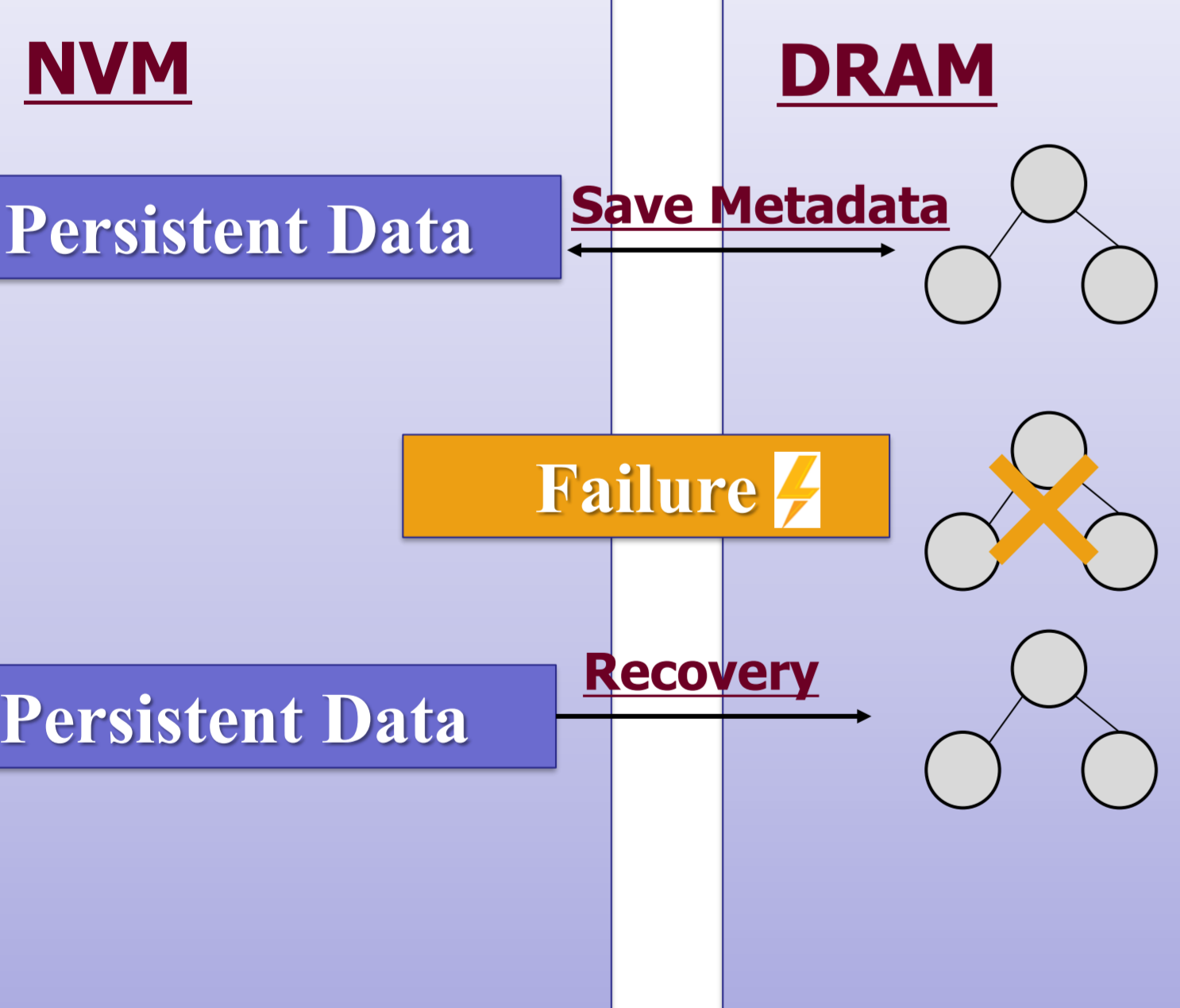
Refresh

Generic approach

- Applicable to any blocking locality-aware data series index
- Ensures Lock-Freedom



Non-Volatile Memory



NVM Properties

- Byte Addressable
- Large & Inexpensive
- Persistent

Data Series Indexes

- Data series indexes grow with dataset size
- Larger datasets slow down construction time
- Index failure requires full reconstruction

Evaluation

Results

DRAM Configurations and Datasets

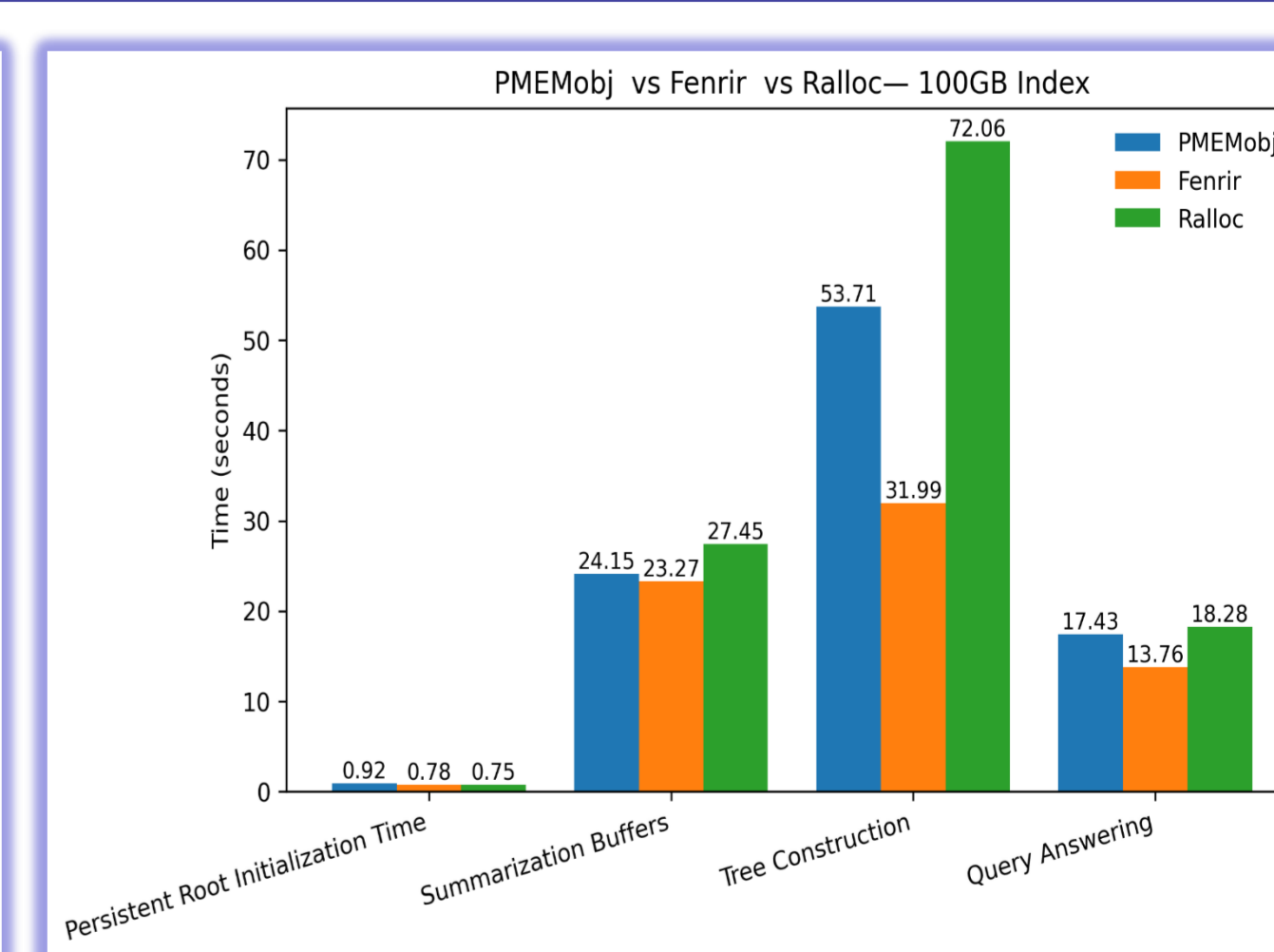
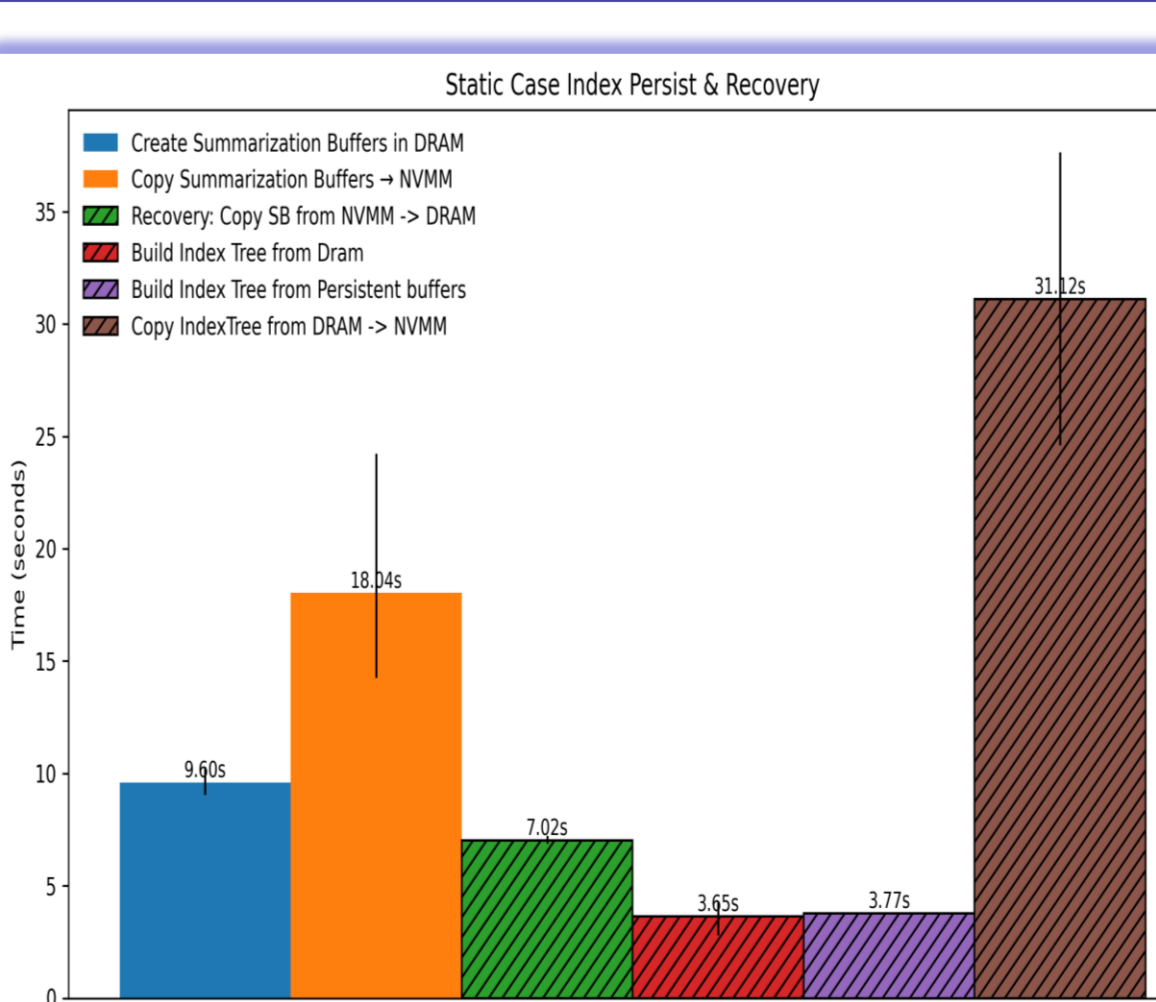
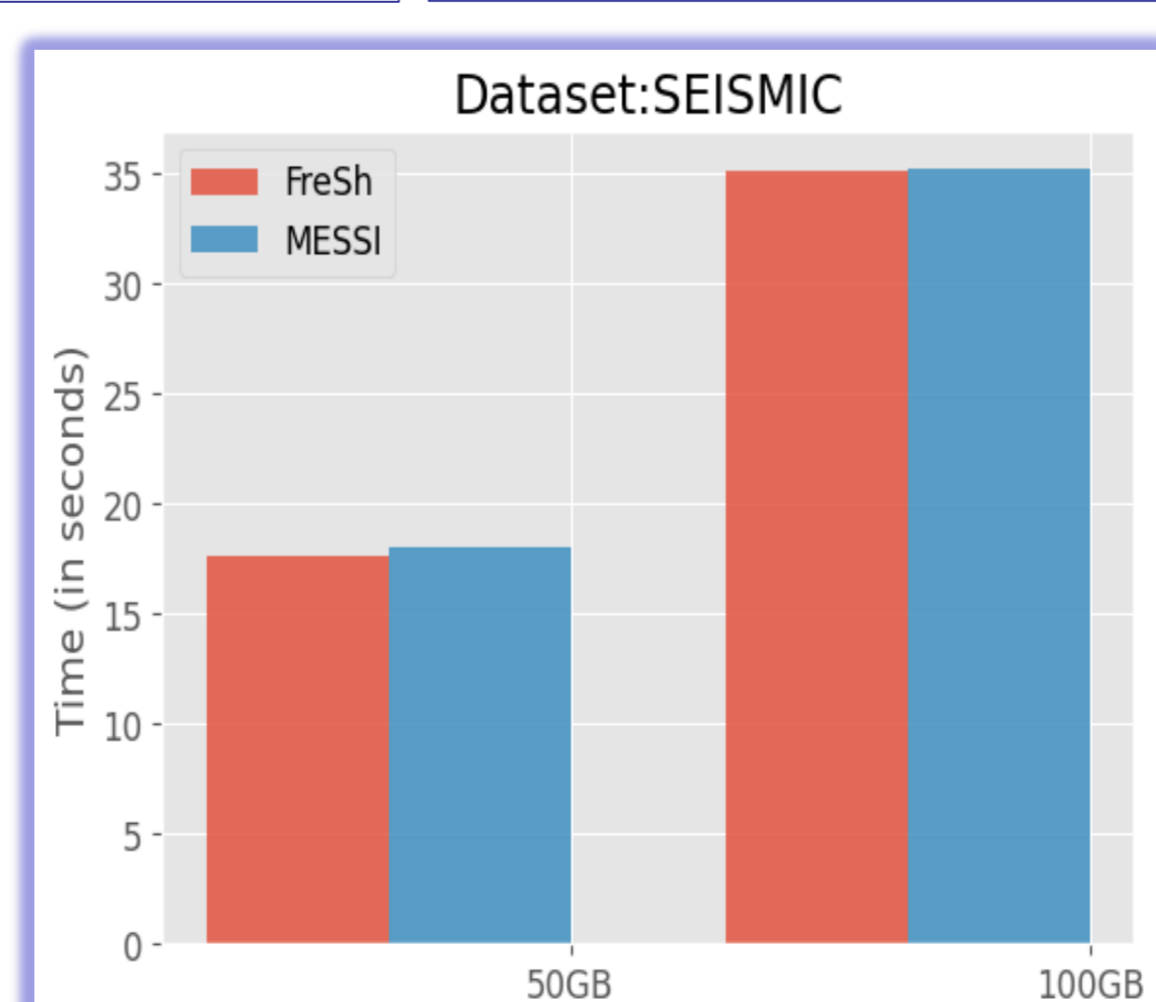
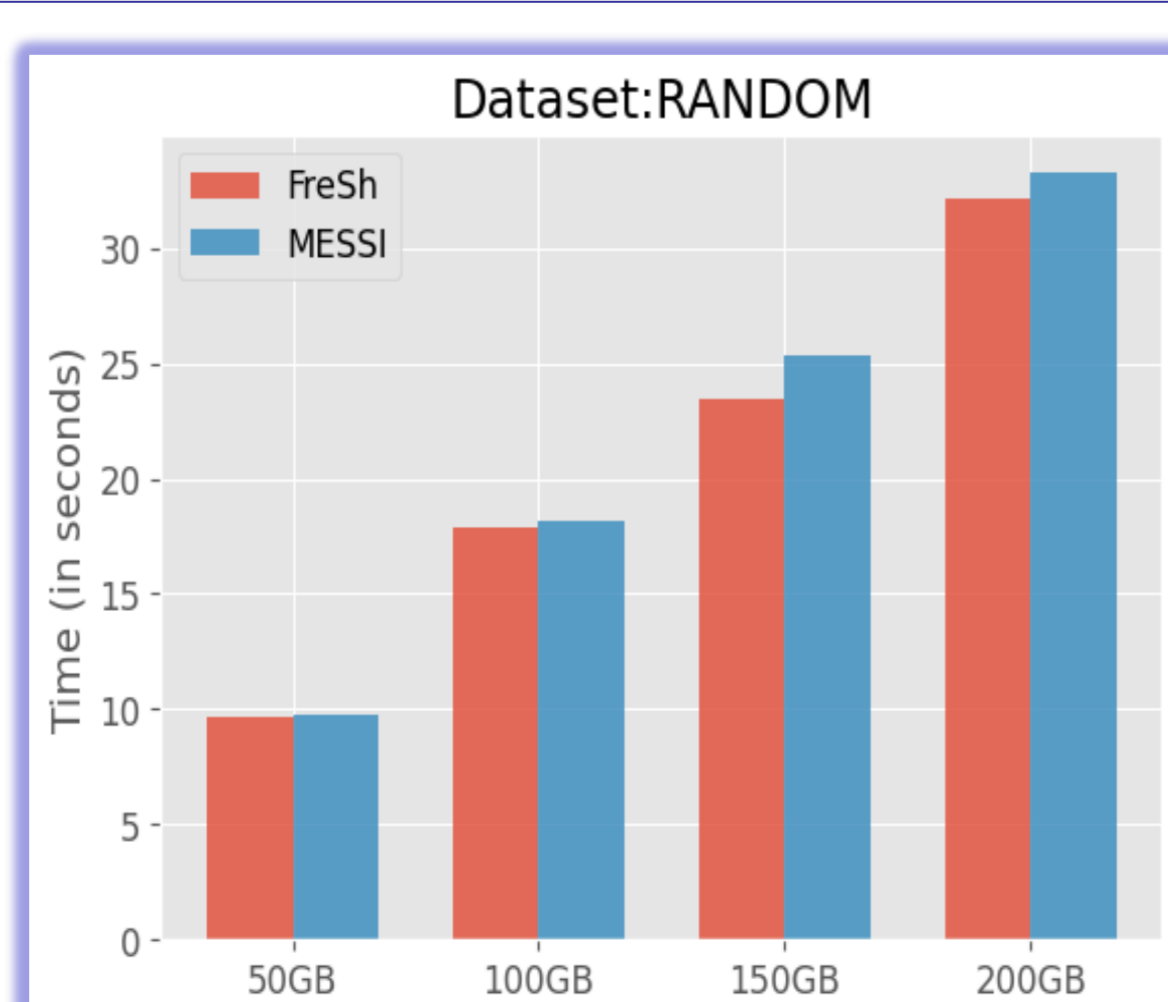
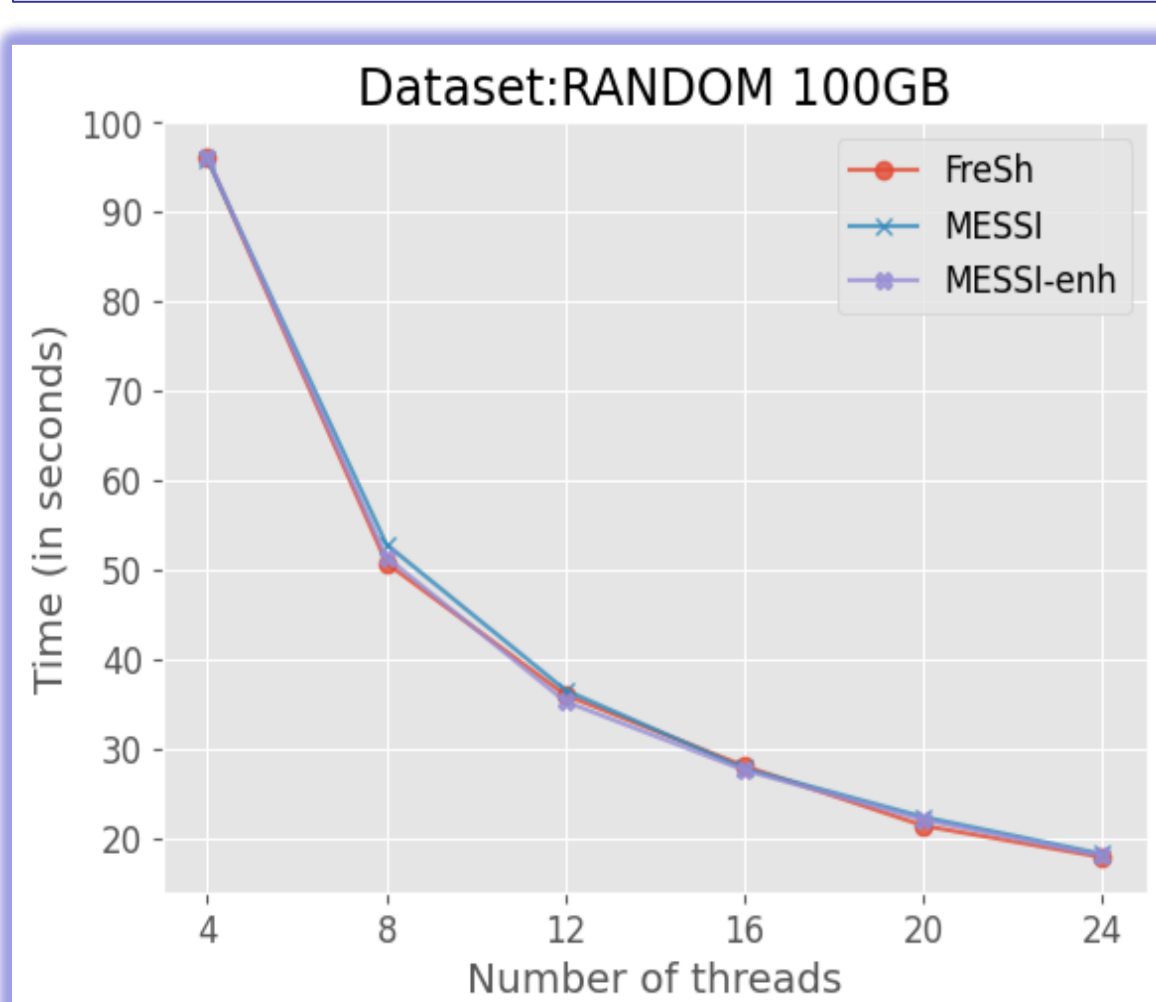
- Compared with optimized SOTA MESSI index.
- Use both synthetic and real datasets.

DRAM Experimental Findings

- FreSh performs as good as the SOTA blocking index.
- No penalty for providing lock-freedom.
- FreSh outperforms by far several lock-free baselines we have designed.
- In case of delays achieves better performance.

Non-Volatile Configurations

- Measure the persistent and recovery cost of each stage of PFrSh.
- Compared the implementation using three Persistent Allocators.



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