

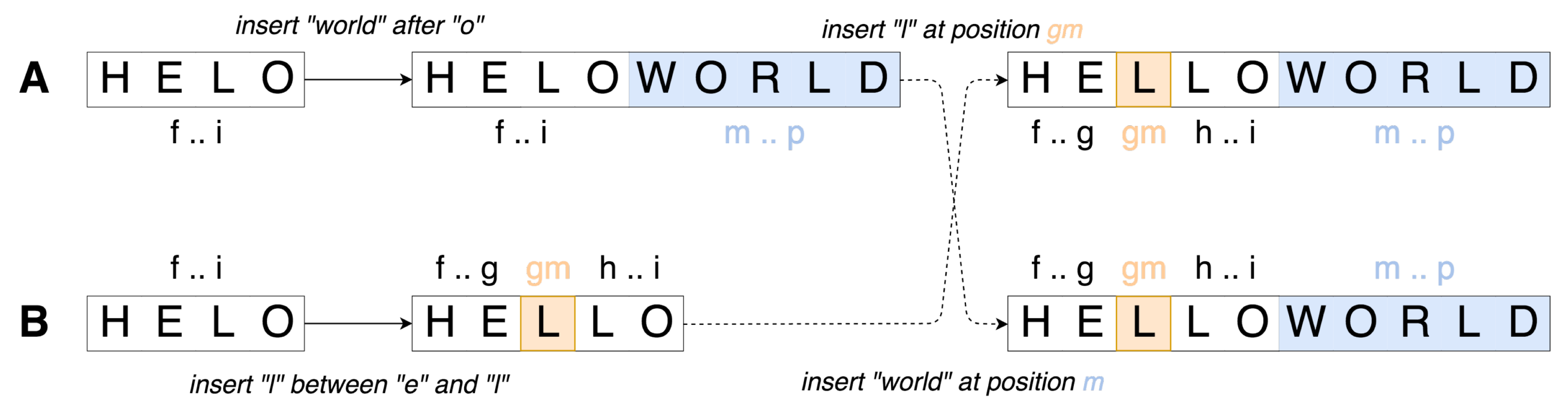
Efficient Renaming in Conflict-Free Replicated Data Types (CRDTs)

Case Study of a Sequence CRDT : LogootSplit

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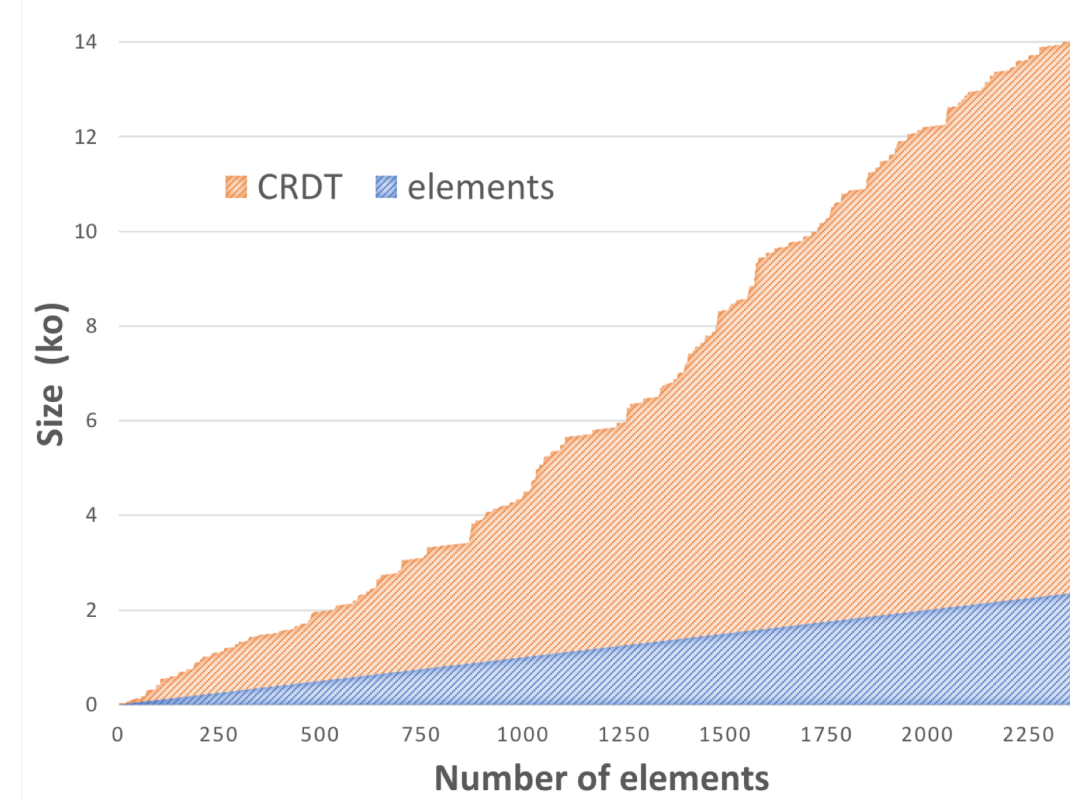
CRDTs [1]

- Replicated data structure
- Updates performed without coordination
- **Strong Eventual Consistency** [1]



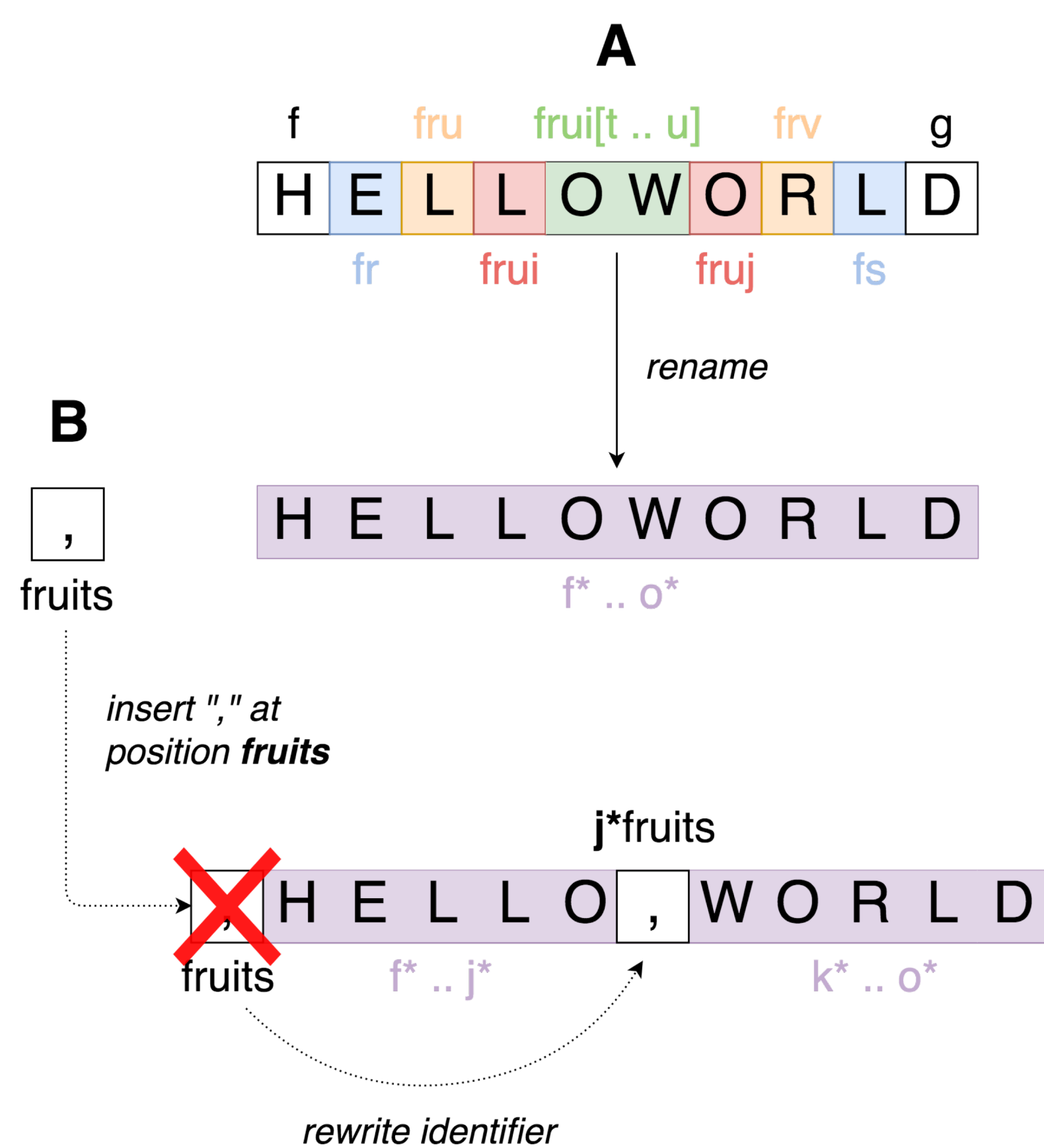
Limits

- Attach an identifier to each element
- Size of identifiers **not bounded**
- **Overhead** of the data structure **increasing over time**



How to reduce the overhead introduced by the data structure ?

Reassign shorter identifiers in a fully distributed manner



Rename operation

- Reassign shorter identifiers to whole current state
- Can be performed without coordination

Rewriting rules

- Can not apply concurrent *insert* or *delete* as such
- Define rewriting rules to handle concurrent updates

Concurrent *rename* operations

- Proposed *rename* operation not commutative
- Define a total order on *rename* operations
- Pick a “winner” operation between concurrent *renames*
- Add rewriting rules to *undo* effects of “losing” ones

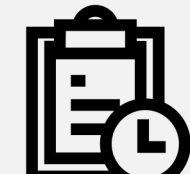
Propose a fully distributed renaming mechanism for *LogootSplit* [2]



- Designed the *rename* operation
- Defined rewriting rules to deal with concurrent updates



- Implementing in MUTE (<https://coedit.re/>)
- Designing the strategy to trigger the renaming



- Prove formally the correctness of the renaming mechanism
- Benchmark its performances (Memory, CPU, Bandwidth, ...)

[1] M. Shapiro, N. M. Pregui a, C. Baquero, and M. Zawirski. *Conflict-free replicated data types*. In *Proceedings of the 13th International Symposium on Stabilization, Safety, and Security of Distributed Systems, SSS 2011*.

[2] L. Andr , S. Martin, G. Oster, and C.-L. Ignat. *Supporting adaptable granularity of changes for massive-scale collaborative editing*. In *International Conference on Collaborative Computing: Networking, Applications and Worksharing - CollaborateCom 2013*.