

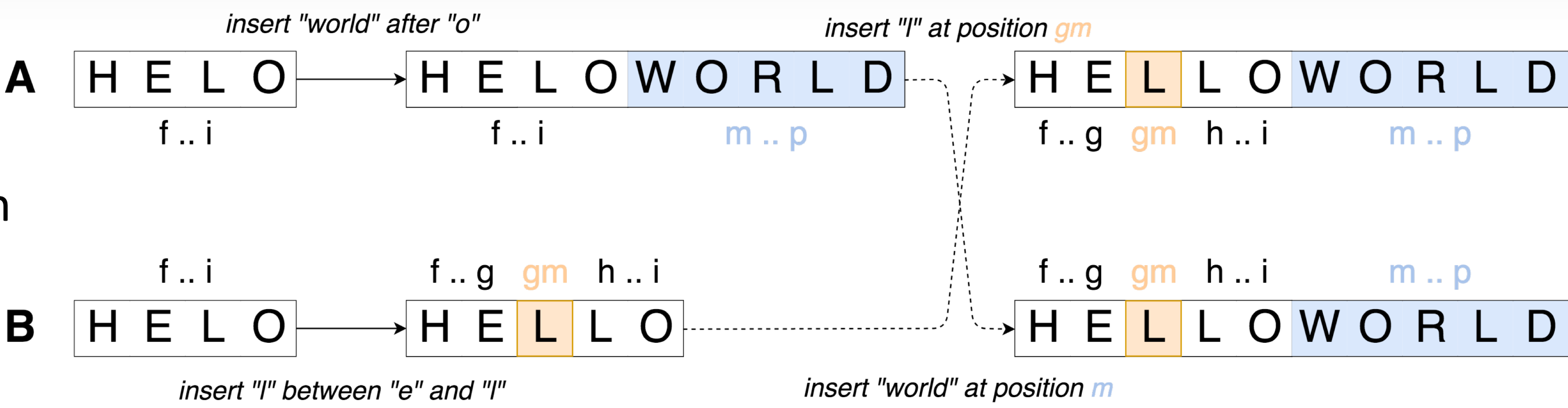
# Efficient Renaming in Conflict-Free Replicated Data Types (CRDTs)

## Case Study of a Sequence CRDT : LogootSplit

Matthieu Nicolas ([matthieu.nicolas@inria.fr](mailto:matthieu.nicolas@inria.fr)), G rald Oster, Olivier Perrin

### CRDTs [2]

- Replicated data structure
- Updates performed without coordination
- **Strong Eventual Consistency** [2]



### Limits

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

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l volution de la taille des  l ments  
et de la taille du CRDT  
en fonction du nombre d l ments ins r s

How to reduce the overhead introduced by the data structure ?

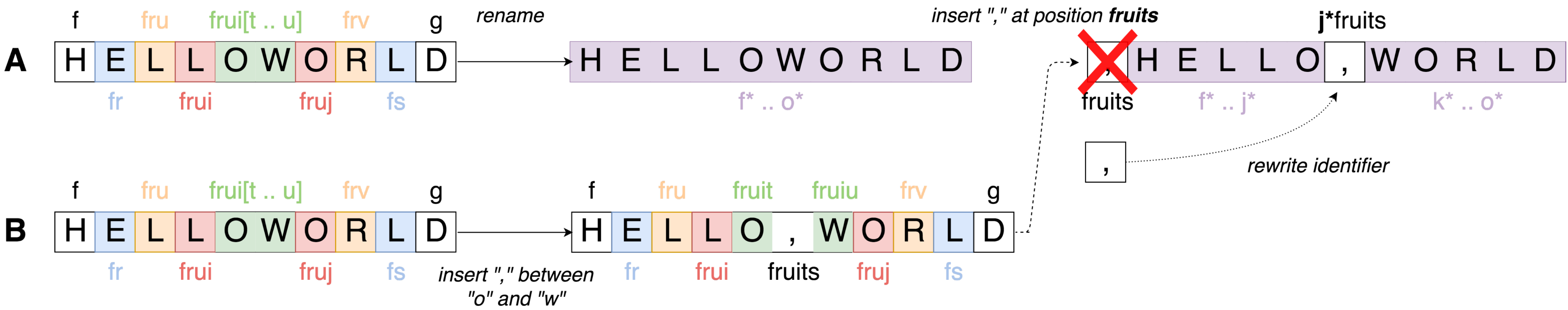
### Reassign shorter identifiers in a fully distributed manner

#### Rename operation

- Reassign shorter identifiers to whole current state

#### Rewriting rules

- Concurrent *insert* or *delete* can not be applied as such
- Define rewriting rules for concurrent updates



### Concurrent *rename* operations

- 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 [1]

- Designed the *rename* operation
- Defined rewriting rules to deal with concurrent updates
- **WIP:** Implementation in MUTE (<https://coedit.re/>)
- **WIP:** Design the strategy to trigger the renaming
- Prove formally its correctness
- Benchmark its performances

### Next Steps

- **Generalize the approach** to other CRDTs
  - To other Sequence CRDTs
  - To other types (Counter, Set, ...)

### References

[1] 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*.  
[2] 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*.