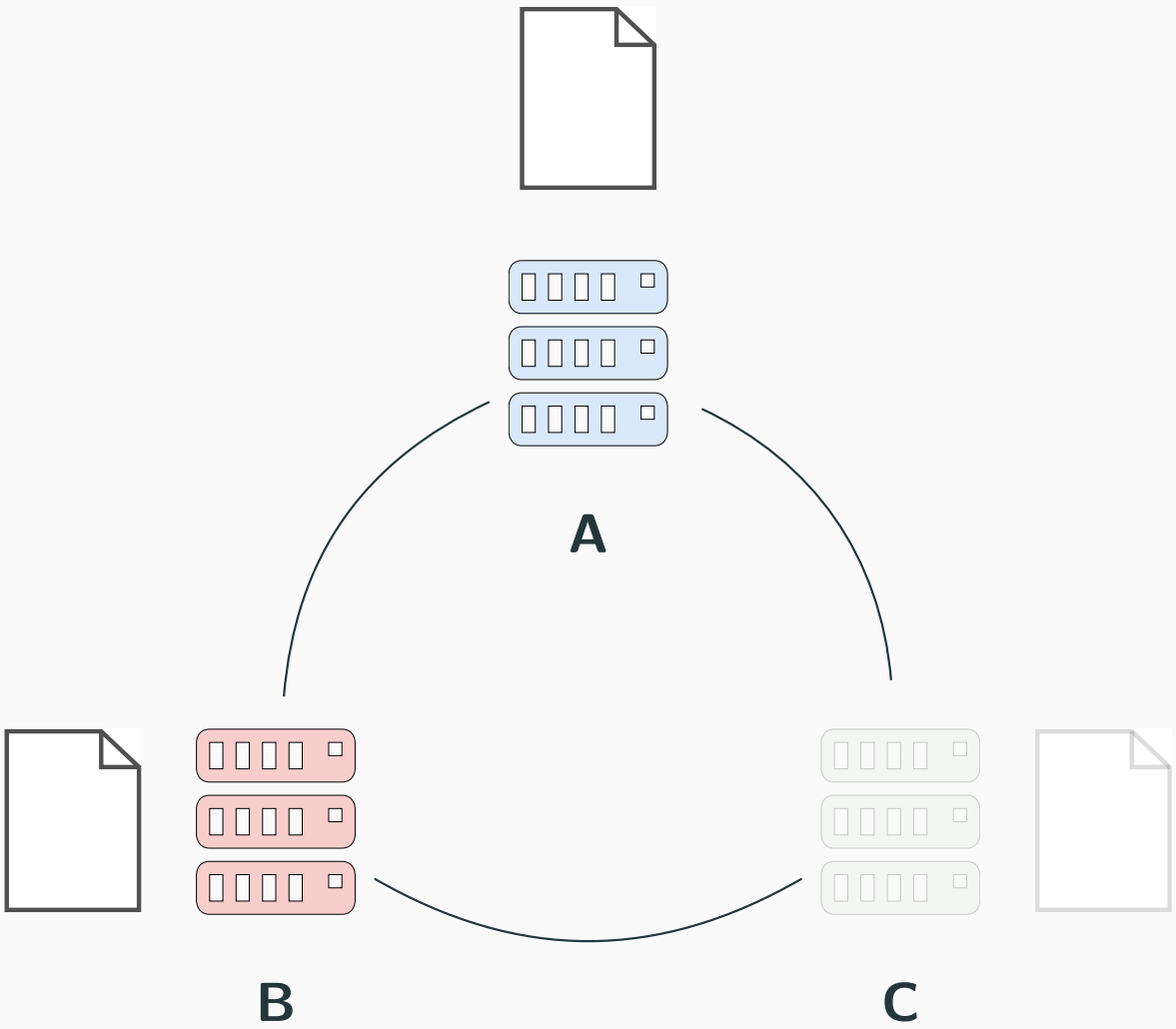
Efficient (re)naming in Conflict-free Replicated Data Types (CRDTs)

Matthieu Nicolas
COAST team
Supervised by Gérald Oster and Olivier Perrin

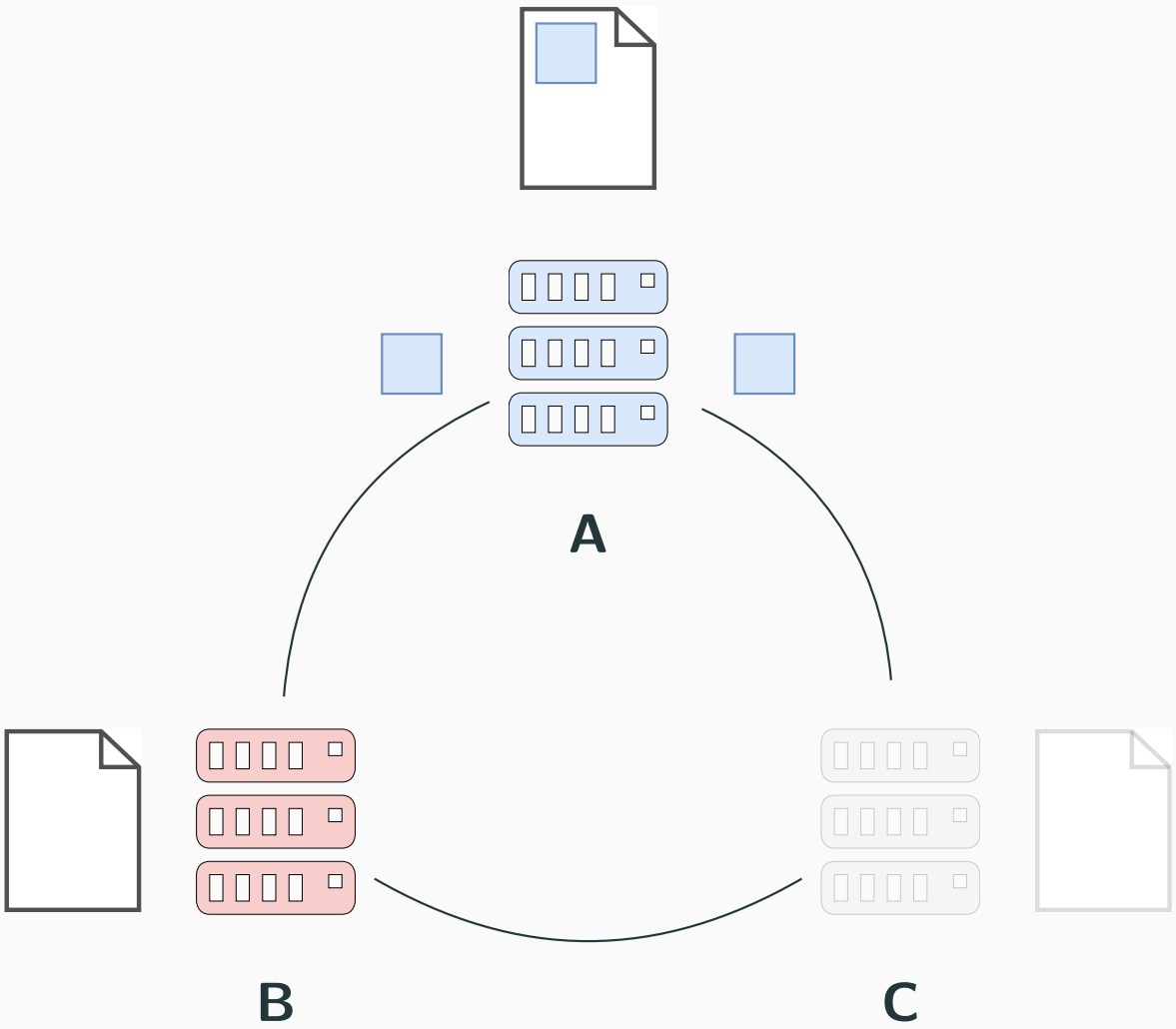
December 5, 2017

Conflict-free Replicated Data Types (CRDTs)[2]



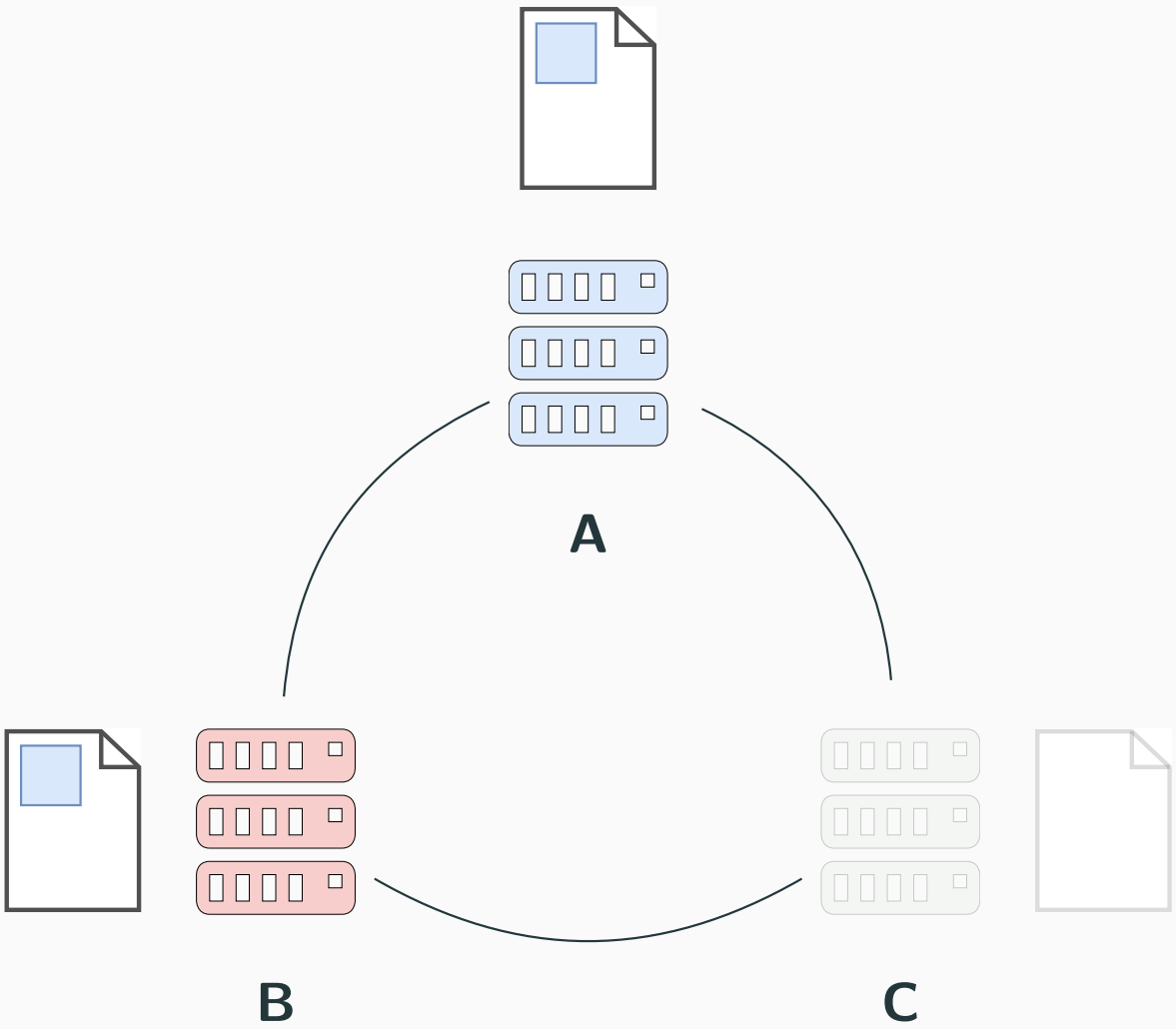
- Replicated data structure

Conflict-free Replicated Data Types (CRDTs)[2]



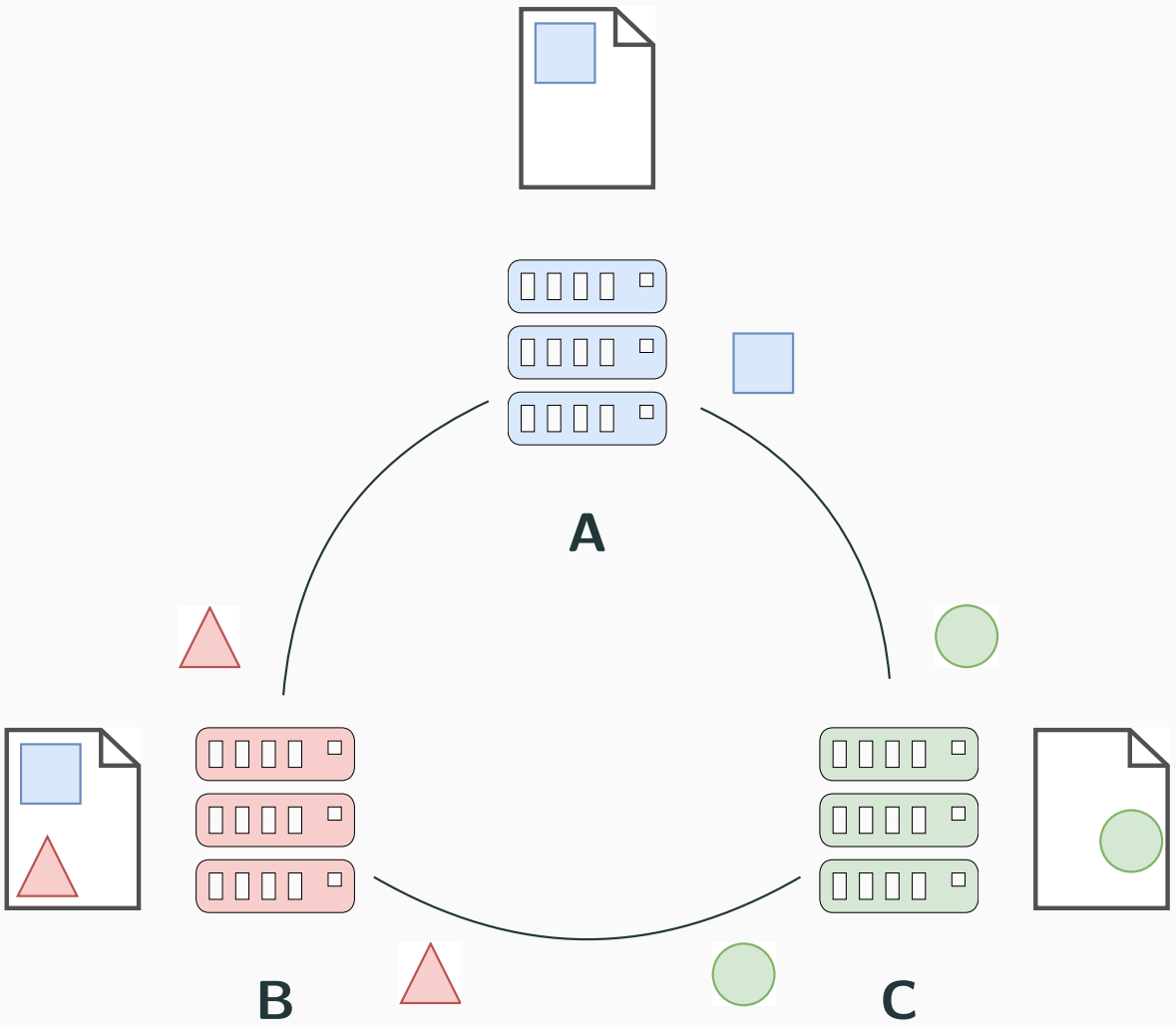
- Replicated data structure
- Updates performed without coordination

Conflict-free Replicated Data Types (CRDTs)[2]



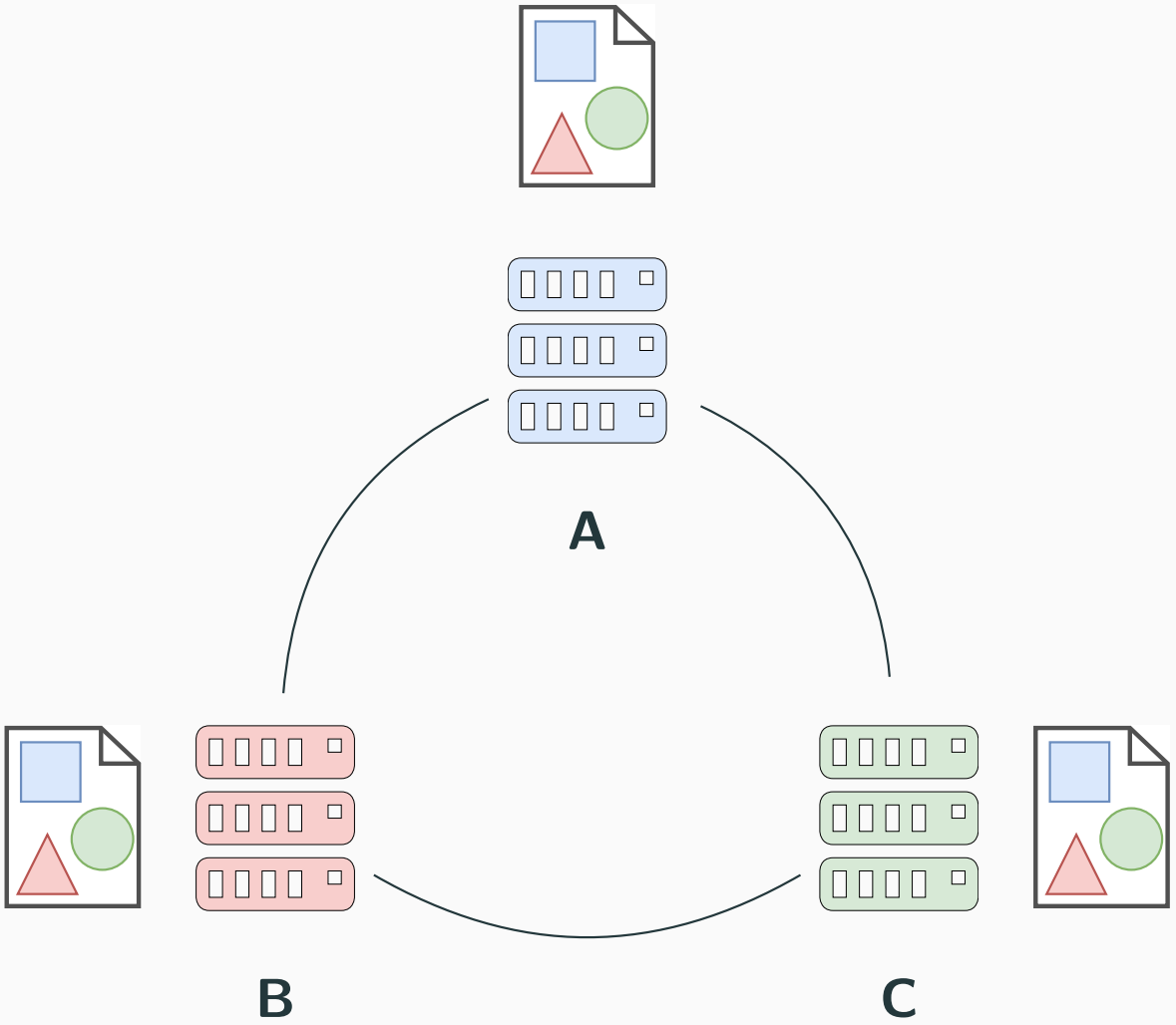
- Replicated data structure
- Updates performed without coordination

Conflict-free Replicated Data Types (CRDTs)[2]



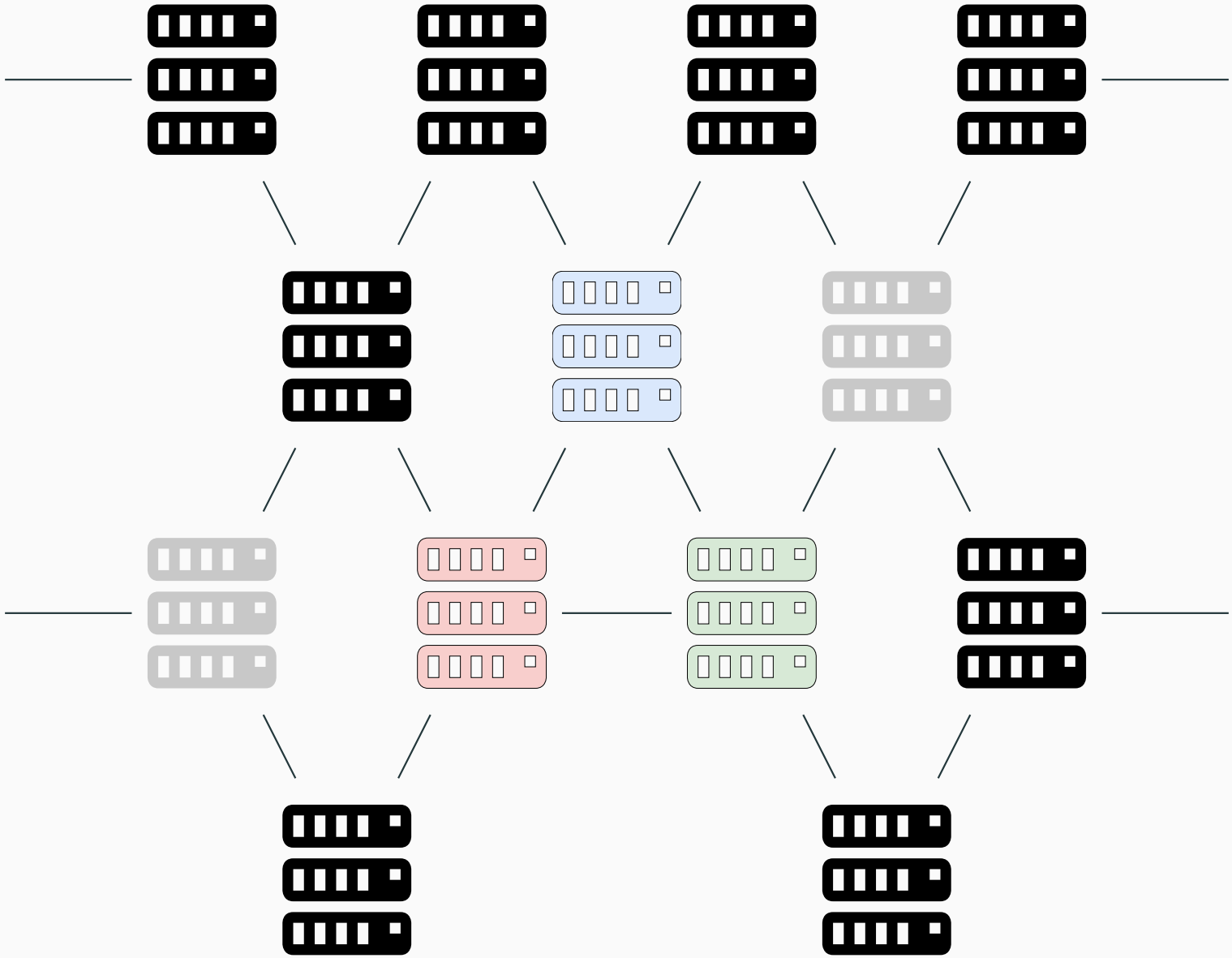
- Replicated data structure
- Updates performed without coordination

Conflict-free Replicated Data Types (CRDTs)[2]



- Replicated data structure
- Updates performed without coordination
- Eventual consistency

Large-scale system



Identifier-based CRDTs

Identifiers

- Attached to elements and updates
- Have to comply to several constraints
  - Unique
  - Immutable
  - Order relation
  - Many others
- Achieve transaction-less and commutative updates

Identifier-based CRDTs

Identifiers

- Attached to elements and updates
- Have to comply to several constraints
  - Unique
  - Immutable
  - Order relation
  - Many others
- Achieve transaction-less and commutative updates

Limits

- Unbounded size of identifiers
- Efficiency decreasing over time

Research problem

Reduce size of identifiers

- Renaming problem[1]

Research problem

Reduce size of identifiers

- Renaming problem[1]

Make identifiers mutable again

- Trade-off mutability/immutability

Thanks for your attention, any questions?

References i

D. Alistarh, J. Aspnes, S. Gilbert, and R. Guerraoui.
The complexity of renaming.
In *Fifty-Second Annual IEEE Symposium on Foundations of Computer Science*, pages 718–727, Oct. 2011.

M. Shapiro, N. Preguiça, C. Baquero, and M. Zawirski.
Conflict-free Replicated Data Types.
In *International Symposium on Stabilization, Safety, and Security of Distributed Systems - SSS 2011*, pages 386–400, Grenoble, France, Oct. 2011. Springer.