Specification and Implementation of Replicated List

— The Jupiter Protocol Revisited

(OPODIS'2018)

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The Main Contribution

The Jupiter protocol [Nichols et al., 1995][a] for replicated list satisfies the weak list specification [Attiya et al., 2016][b].

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[a] David A. Nichols et al. (1995). "High-latency, Low-bandwidth Windowing in the Jupiter Collaboration System". In: *Proceedings of the 8th Annual ACM Symposium on User Interface and Software Technology*. UIST '95. ACM, pp. 111–120.

[b] Hagit Attiya et al. (2016). "Specification and complexity of collaborative text editing". In: *Proceedings of the 2016 ACM Symposium on Principles of Distributed Computing*. PODC '16. ACM, pp. 259–268.

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This was proposed as a *conjecture* in a PODC paper [Attiya et al., 2016].

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4. What is the weak list specification?
5. How to prove that Jupiter satisfies the weak list specification?

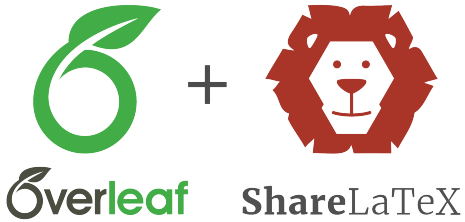
Replicated List

Replicated Collaborative Text Editing Systems

(a) Google Docs

(b) Apache Wave

(c) Wikipedia



(d) LaTeX Editor

replicated docs

Replicas are required to respond to user operations immediately.

Updates are propagated to other replicas asynchronously.

Replicated list object: to model the core functionality

$\textsc{Ins}(a, p)$: Insert a at position p.

$\textsc{Del}(p)$: Delete the element at position p.

$\textsc{Read}$: Return the list.

A Common Specification

Definition (Eventual Convergence [Ellis and Gibbs, 1989])

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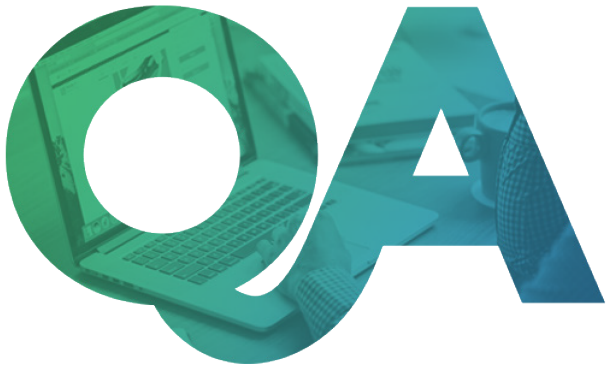
Specify little on *intermediate states* going through by replicas.

Thank You!



Attiya, Hagit et al. (2016). "Specification and complexity of collaborative text editing". In: *Proceedings of the 2016 ACM Symposium on Principles of Distributed Computing*. PODC '16. ACM, pp. 259–268.

Ellis, C. A. and S. J. Gibbs (1989). "Concurrency Control in Groupware Systems". In: *Proceedings of the 1989 ACM SIGMOD International Conference on Management of Data*. SIGMOD '89. ACM, pp. 399–407.

Nichols, David A. et al. (1995). "High-latency, Low-bandwidth Windowing in the Jupiter Collaboration System". In: *Proceedings of the 8th Annual ACM Symposium on User Interface and Software Technology*. UIST '95. ACM, pp. 111–120.

Shapiro, Marc et al. (2011). "Conflict-free Replicated Data Types". In: *Proceedings of the 13th International Conference on Stabilization, Safety, and Security of Distributed Systems*. SSS'11. Springer-Verlag, pp. 386–400.