TEAM W11

COLLABORATIVE PLAIN TEXT EDITOR

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Weak Points at Large Scale:

1)Partial Interleaving Resolution

Although your modified GRA implementation tolerates some interleaving, it doesn't resolve all cases. This could lead to inconsistencies or confusing behavior in highly concurrent editing scenarios.

2)Scalability of Metadata Overhead

Introducing metadata (inspired by Treedoc/WOOT) helps with ordering but adds overhead per operation. As the number of operations or users grows, this metadata could accumulate and affect performance and memory usage.

3)No Full Conflict-Free Guarantees

Unlike CRDTs like WOOT or Automerge, which are formally proven to be Conflict-Free Replicated Data Types (CRDTs), your hybrid approach may lack formal guarantees of convergence under all conditions, especially in edge cases.

4)Linear or Centralized Data Structures

If the implementation uses centralized buffers or linear data structures (e.g., arrays or lists without chunking/tree optimizations), this will become a bottleneck in large documents or high-frequency edits.

5)Lack of Garbage Collection for Metadata

Metadata from GRA, Treedoc, or WOOT can grow indefinitely unless you implement compaction or garbage collection. Without it, memory usage can balloon in long editing sessions.

6)Latency in Synchronization Across Nodes

Without a highly optimized sync mechanism (like vector clocks, tombstone removal, or peer-to-peer anti-entropy protocols), sync between users could suffer in terms of speed and reliability.

7)Limited Fault Tolerance or Recovery Mechanisms

If the algorithm doesn't handle late joiners, disconnections, or rollback scenarios well, it may not be robust enough for real-time collaborative editing in unreliable network conditions.

8)No Formal Testing Against Complex Merge Scenarios

If the implementation hasn't been validated against complex concurrent editing scenarios (e.g., simultaneous insert/delete at same positions), unexpected bugs or merge failures might occur in production.