GoodNotes - Second Technical Challenge

This is a coding challenge to evaluate candidates interested in joining the team at GoodNotes. It is inspired by the existing problem you will face in GoodNotes.

Introduction

Conflict Free Replicated Data Types (CRDTs) are data structures that power real time collaborative applications in distributed systems. CRDTs can be replicated across systems, they can be updated independently and concurrently without coordination between the replicas, and it is always mathematically possible to resolve inconsistencies which might result.

Recommended Reading

- https://en.wikipedia.org/wiki/Conflict-free_replicated_data_type
- https://github.com/pfrazee/crdt_notes
- https://hal.inria.fr/inria-00555588/PDF/techreport.pdf

Deliverable

Study LWW-Element-Set, Graph and implement a state-based LWW-Element-Graph with test cases.
The graph must contain functionalities to add a vertex/edge, remove a vertex/edge, check if a vertex is in the graph, query for all vertices connected to a vertex, find any path between two vertices, and merge with concurrent changes from other graph/replica.
Test cases should be clearly written and document what aspect of CRDT they test.
We recommend you spend no more than 4 hours on this challenge. The provided readings should be sufficient to understand LWW-Element-Set, Graph and CRDT on a high level. You are welcome to dig deeper on those but we expect you to come up with the implementation yourself without any help from other open-sourced implementations.

Grading & Submission

You'll be graded based on code quality, test coverage, documentation, and you can use any language of choice.