Web-based Collaborative Editing for Linked Data

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Feature Hightlights

Collaborative editing of RDF triple stores in real-time

Work offline, auto-sync when you are online
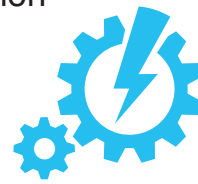

Linearly scalable server cluster

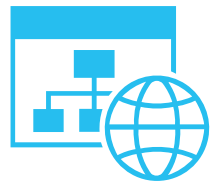Role-based access control

Overview

With the growing popularity of work that requires collaboration and knowledge sharing, traditional knowledge bases can no longer fulfil the business needs. A knowledge base that supports real-time collaborative editing would provide huge benefits.

This project proposes Collawork, a web-based collaborative editing framework for linked data that allows different real-time web applications to be run on top of it and access a shared real-time distributed datastore for linked data. We have also developed a demo application "MindGraph", which is a collaborative mind mapping tool, to showcase our framework.

In order to meet the challenges, we have designed a distributed data structure - Conflict-free Replicated TripleStore (CRTS), which allows concurrent editing and synchronization of RDF triples without the need of conflict resolution. We also propose the Reactive Model-driven View approach for developing user interfaces of collaborative apps.

Framework   **Demo Application**

Objective

5 goals we want to achieve

SCALABLE

Able to host multiple applications and handle a growing number of users.

EASY TO USE

Easy to set up and integrate with existing apps; simple API frees developers from implementation concerns.

FLEXIBLE

Support synchronziation of a flexible data model that is suitable for any web application.
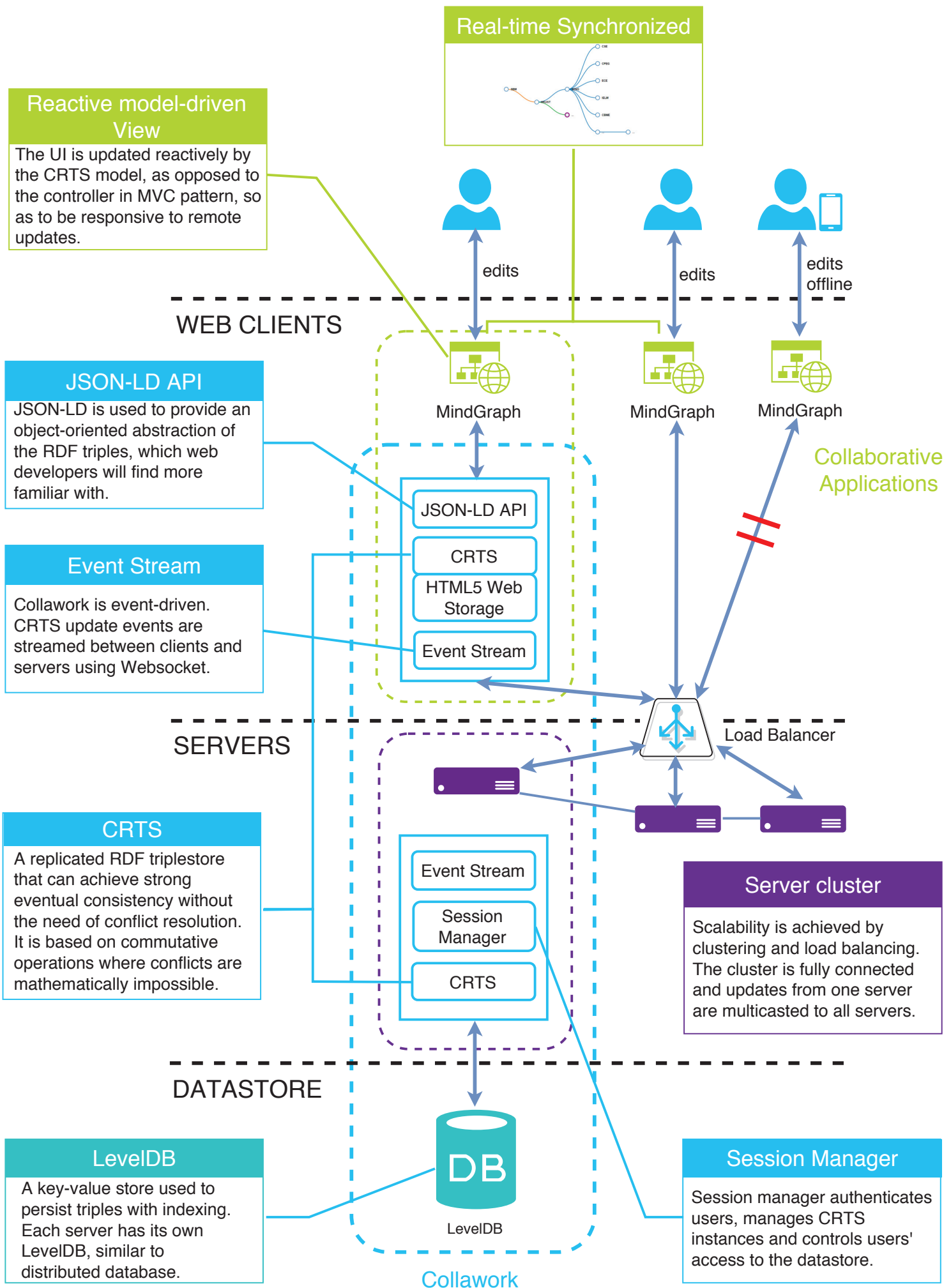
WEB STANDARDS-BASED

Support and leverage latest web standards to simplify development and be future proof.

MOBILE FRIENDLY

Support mobile devices, provide good user experience under unstable network that mobile devices may face.

System Design

Real-time Synchronized

Reactive model-driven View

The UI is updated reactively by the CRTS model, as opposed to the controller in MVC pattern, so as to be responsive to remote updates.

WEB CLIENTS

MindGraph   MindGraph   MindGraph

edits   edits   edits offline

Collaborative Applications

JSON-LD API

JSON-LD is used to provide an object-oriented abstraction of the RDF triples, which web developers will find more familiar with.

JSON-LD API

CRTS

HTML5 Web Storage

Event Stream

Event Stream

Collawork is event-driven. CRTS update events are streamed between clients and servers using Websocket.

SERVERS

Load Balancer

CRTS

A replicated RDF triplestore that can achieve strong eventual consistency without the need of conflict resolution. It is based on commutative operations where conflicts are mathematically impossible.

Event Stream

Session Manager

CRTS

Server cluster

Scalability is achieved by clustering and load balancing. The cluster is fully connected and updates from one server are multicasted to all servers.

DATASTORE

DB

LevelDB

LevelDB

A key-value store used to persist triples with indexing. Each server has its own LevelDB, similar to distributed database.

Session Manager

Session manager authenticates users, manages CRTS instances and controls users' access to the datastore.

Collawork

Use Cases

ONLINE EDUCATION

Collawork can be applied to distant learning to allow students to work on exercises together online, while teachers can keep track of students' progress and assist them in real-time.

CROWDSOURCING PLATFROM

For crowdsourcing platforms, Collawork can be used to effectively coordinate people worldwide, allowing them to work together to solve a big problem.
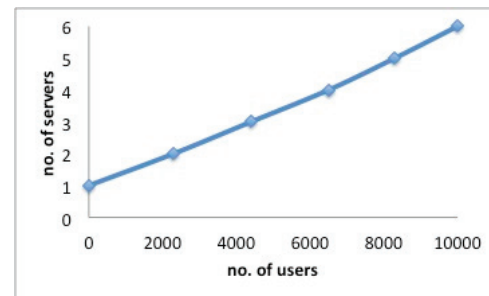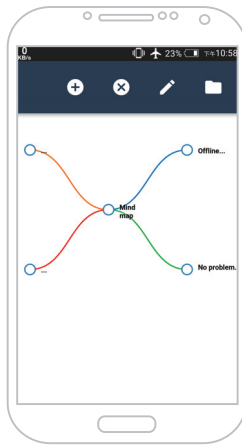
TEAM COLLABORATION

Applications like MindGraph use Collawork to provide collaboration features that facilitate idea sharing and business communication, within a team or across teams.

Results

All objectives have been achieved

Collaborate on mobile anytime, anywhere - with offline editing and auto-synchronization support

Horizontally scalable, suitable for cloud computing platforms

Able to handle hundreds of users in one session

3 future improvements

- Provide SPARQL endpoint for linked data querying
- Integrate with semantic search engines, eg. Google Custom Search
- Prepare detailed API Documentation for developers

1 Run Collawork Node.js Server

2 Include Collawork in your app

3 Design web UI

4 Release your app

Getting Started

or

```
<link rel="import" href="./components/crts-model.html">
<crts-model id="model" graph-id="12345"></crts-model>
```

Try out MindGraph