Department of Computer Science

University of Kaiserslautern

Master Thesis

Offline caching in web applications for AntidoteDB

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Zusammenfassung

Zusammenfassung auf deutsch

Abstract

The goal of this thesis is to examine the possibilities of developing an offline web applicaiton, which would serve as a client for the AntidoteDB database. A prototype of the application is developed. The architecture of the application is designed in such a way that both offline and online functionality are possible. Conflict-free Replicated Data Types (CRDTs) are used for modeling the data to be stored offline in the local database of a web-browser. It lets to ease the task of merging the changes.

Apart from that, the client-server protocol was designed, in order to support the functionality of the application. The paper could be logically divided into two parts: firstly, the problem of designing mentioned solution is going to be discussed. Secondly, there is an implementation part and description how specific problems were tackled.

Ich versichere hiermit, dass ich die vorliegende Masterarbeit mit dem Thema „Offline caching in web applications for AntidoteDB“ selbstständig verfasst und keine anderen als die angegebenen Hilfsmittel benutzt habe.
Die Stellen, die anderen Werken dem Wortlaut oder dem Sinn nach entnommen wurden, habe ich durch die Angabe der Quelle kenntlich gemacht.

Kaiserslautern, den 15. December 2018 Server Khalilov

Contents

1 Introduction

In this chapter we are going to discuss the motivation, research questions and the scope of this thesis.

o Problem context (What is the broader context of this work?) o Problem description (What is the specific problem or challenge addressed by this work?) o Research question(s) (What are the actual questions that should be answered by this research? Why are they interesting? To whom? Why is there no obvious answer? If this is getting too much, then details of discussion can be deferred until later, e.g., to the methodology section.) o Summary of results and contributions (What is the outcome of this work in simple terms?) o Structure of the thesis (Introduce briefly the remaining chapters.)

1.1 Motivation

The motivation of this thesis is to explore the possibillities of implementing a web-client for the AntidoteDB with a support of caching and by utilizing the main features of the AntidoteDB.

1.2 Research questions

The following research questions are going to be addressed in this thesis:

- **RQ1.** How efficient is it to use a web-client with cache rather than without it?
- **RQ2.** What are the methods available to implement web-applications that would be able to work off-line and in the conditions of poor network connections?
- **RQ3.** What could be a scalable solution for transmitting CRDT data between a server and clients?

1.3 The structure

The structure of this thesis will be divided into the following subsections:

- Description of the main requirements of the application;
- Design of the architecture
- Description of the implementation phase
- Evaluation
- Conclusion

2 Background

2.1 Related Work

This chapter is needed, if the thesis is somewhat research-oriented. (This should be usually the case.) In some cases though, the thesis may also be more application- or implementation-oriented, in which case a designated related work chapter may not be necessary, but instead citations are just used appropriately throughout the thesis, but specifically in the chapters Introduction and Background. Literature search could be based on DBLP.

Maybe you can mention SwiftCloud here.
https://github.com/SyncFree/SwiftCloud

3 Problem Analysis

Might be not needed

3.1 Requirements

This chapter is needed specifically, if the work is meant to design or implement some sort of software system. In good alignment with basic software engineering practice, the requirements for this system have to be developed systematically. Each requirement should have a short name, a short description, and some illustration. Additional elements are priorities (must, should, can), pointers to related work, and a discussion of the challenges involved.

4 Design

This chapter is needed specifically, if the work is meant to design or implement some sort of software system. In good alignment with basic software engineering practice, the system's design is to be presented at a reasonable level of abstraction. Appropriate notations are to be identified, e.g., UML diagrams, pseudocode, formal specifications, or declarative programs may be appropriate.

4.1 Modern offline applications

5 Technologies

This chapter consists of detailed description of used technologies to accomplish thesis goal.

5.1 Service Workers

5.2 IndexDB database

6 Architecture

Architecture

6.1 General overview of the architecture

6.2 Communication protocol description

7 Implementation

Implementation

This chapter is needed specifically, if the work is meant to deliver an actual implementation of some software system. No low level details or extensive code fragments should be included, but non-trivial implementation issues are to be explained, if they could not be reasonable covered at the design level; see Chapter Design. Many thesis do not need an Implementation Chapter because implementation details can be deferred to software documentation or the appendix. Also, some illustrative details of implementation may be placed in other chapters.

8 Evaluation

Evaluation

This chapter is needed, when results from the previous chapters need to be systematically discussed. This is the case, when an implementation needs to be assessed, or the results of a case study or an experiment need to be interpreted.

9 Conclusion

Conclusion

This is always the first chapter of the thesis. The chapter should be short (up to 5 pages). The chapter should feature sections as follows (where applicable): o Summary (Summarize this work in an insightful manner, assuming that the reader has seen the rest.) o Limitations or threats to validity (Point out the limitations of this work. In the case of empirical research, discuss threats to validity in a systematic manner.) o Future work (Provide insightful advice on where this research should be taken next.)

9.1 Summary

9.2 Future Work

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