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Bachelor's thesis

StudyPad - Android Client

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Declaration

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Abstrakt

StudyPad je kombinace služby pro porižovaní poznámek a socíální sítě s cílem pomoci studentum zapamatovat si ruzné informace. Cílem práce je vyvinout aplikaci pro OS Android, která bude sloužit jako klient. Tento text uznává stávající řešení, obsahuje analýzu domén a požadavku, popis a výběr architektury aplikace a její implementace

Klíčová slova Android, Kotlin, MVVM

Abstract

StudyPad is a combination of note-taking service and a social network, aimed to help students to memorise different pieces of information. The goal of this thesis is to develop an application for Android OS which will serve as client. This text acknowledges existing solutions, contains domain and requirements analysis, description and choise of application's architecture and it's implementation

Keywords Android, Kotlin, MVVM

Contents

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Introduction

Each year, our smartphones get smarter and mobile applications - more advanced. Arrival of smartphones and mobile applications completely changed our way. of life, made it easier and it is hard to come up with the single aspect of it, which was not improved by some or the a other application. They are everywhere: helping us to navigate in our neighbourhood, keeping up to date with latest news, helping us to stay in touch with our loved ones, stay fit and healthy and more. And some of the most popular applications tend to teach us something new.

Educational apps are one of the most popular apps on both mobile platforms (iOS and Android). Many of them use the so-called flash card system in the study process - displaying small pieces of information one after another so the user could memorise it more easily. However, most of these services are fairly limited in terms of what the are trying to teach and some of the greatest features are scattered across different applications. StudyPad wants to give its users freedom in what they want to learn and deliver convenient environment to make study process even more easier

StudyPad service

StudyPad is a combination of a note taking service and a social network. This service is focused primarily on students and it aims to get rid of the boundaries of what it can teach - because users will be able to create teaching materials themselves and share it with each other.

The basis of StudyPad is such concepts as Notebook. Notebook is simply a collection of notes united by one theme. This may be a subject in school, a language that you would like to learn, or a set of questions that you can hear at the job interview. Note, in turn, is a part of the notebook and represents a single piece information that has a name and content. Note can be interpreted as a question and answer, or a term and its definition.

Each user has his own space where he can create, store and edit his note-

books (Further Library) and then use as a basis for various tests and exercises to quickly memorise information from a notebook using the familiar flash card system

StudyPad also allows users to easily share these notebooks with each other. Each notebook can be published, thereby making it available for viewing and downloading to other users. The publication process is to provide additional information about the notebook, including its name, optional description, topic and optional tags that serve to narrow the topic. All this data, including the author's school, will then be used in the process of searching and filtering - which will facilitate the search for the necessary materials. There is also the ability to quickly send a notebook using the links. In this case, if the notepad has not yet been published, its published version will be created with a minimum of details and excluded from the search results, making it accessible only using link until all details nedeed are provided, link to the Published version will be sent otherwise

The author of the notebook reserves the right to edit the notebook located in the common space by editing the local notebook. Other users (hereinafter subscribers) in turn can save the published notebook to their library, discuss this notebook with other users, or suggest the author changes to improve the content inside. Having saved the notebook to his library, the subscriber will be able to make any local changes as he sees fit and use it in tests. Subscribers will be notified about the information in the notepad so that they can update their notepads locally using the latest version of the published notepad, any local changes will be canceled. The author of the notebook, in turn, will be notified of such activities as: suggestion or correction of content and new comments.

Chapter 1

Analysis

This chapter contains StudyPad application analysis with the goal to identify requirements and how it is compared with its rivals

// TODO Component diagram

1.1 System description

StudyPad system follows client-server software architecture. Server part is presented by REST API thats is developed using Spring framework. Client part consists of client applications for several platforms: Android, iOS and Web. Main task of this thesis is to deliver an Android application. iOS application is developed as a part subject called BI-IOS and hence, has some limitations in its implementation. Web client is being developed alongside the Android one is serves as Admin Panel for the server which allows to modify certain data without dealing with the server directly.

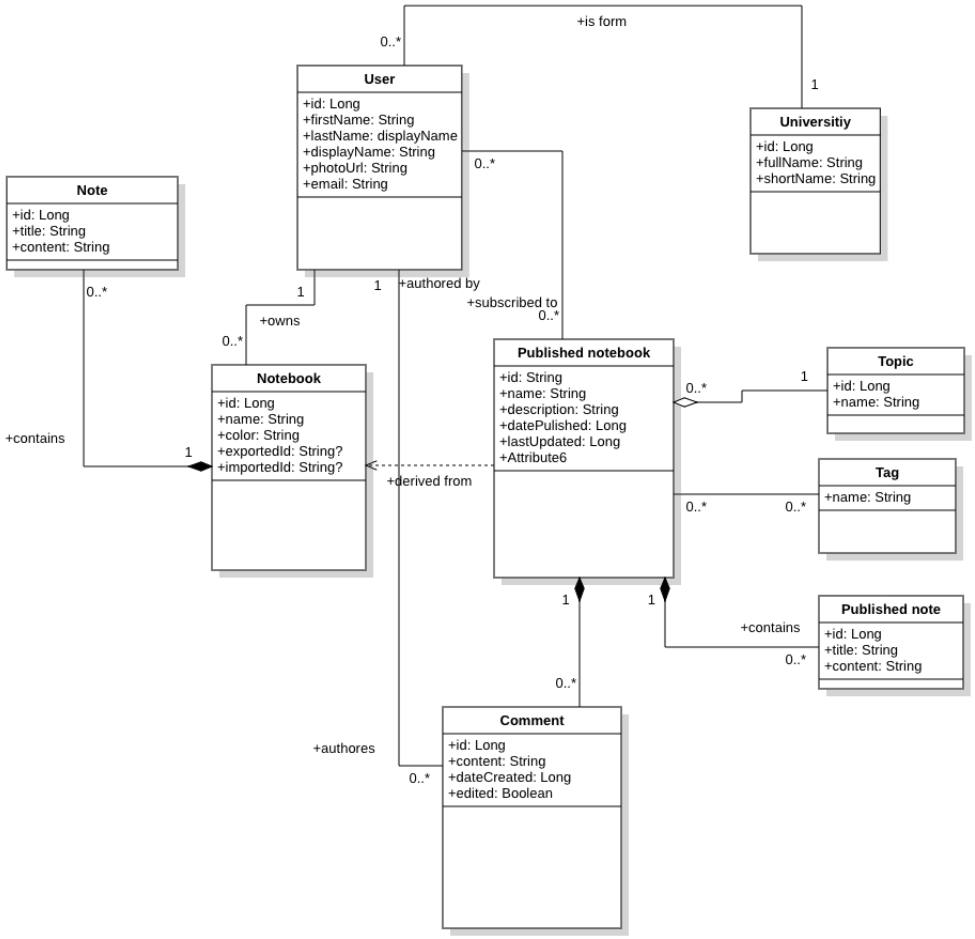
The detailed structure of the Android client structure and its connection with other components are presented in the component diagram bellow. It will be connected with Facebook SDK and Google Auth SDK to provide options for user to login and some minimal setup of Firebase SDK to enable analytics and crash reporting functionality

1.2 Domain Description

Class diagram bellow represents Domain Model of the application, it provides visual representation of Entities and relations between them. Design is based on the entities used on server-side

1.2.1 User

User entity represents someone who have completed registration flow using one of the client app. This entity contains such properties as: firstName, last-



Name, email, password, university. Due to the fact, that StudyPad provides several ways for user to authorize, some of the properties will either come from the user's input or from the 3rd party API (Google or Facebook).

1.2.2 Note

Note represent a single piece of information. It consists of two properties: title and content. These can be described as term and defenition or question and answer. Every note must be assigned to one of the notebooks, hence theres a 1:N relation

1.2.3 Notebook

Notebook is one of the main entities used in the application flow, and can be created by an authenticated user. Soul purpose of the Notebook is to store

Notes and serve as a source for Shared Notebook. Properties name and color are used to help users distinct between different Notebooks

1.2.4 University

University represents school, where User can assign himself as a student during registration flow. It is used to unite users from the same schools, so they could faster find content they are looking for.

1.2.5 Published Notebook

Published Notebook represents a shareable content. It can be created by user, based on one of his/her notebooks by providing some additional details: name, optional description, Topic and optional set of Tags. All these details are later used for Search flow to optimize searching results.

1.2.6 Published Note

Published Note represent the note inside of the Published Notebook and contains the exact same properties as usual note

1.2.7 Topic

Topic represents main topic or subject of the Published Notebook. Topic consist of only one property: name

1.2.8 Tag

Tag is us short label thats attached to the Published Notebook. It is mainly used to narrow the topic or school. Tag has only one property - it's actual value stored as name

1.2.9 Comment

Users can comment on published notebooks. Most of the properties are assigned automatically, the only exception is content which is property that represents the body of the comment. All other properties are assigned automatically and can not be changed

1.3 Android Platform

1.4 Requirements

It is important to establish all functional and non-functional requirements for StudyPad. Section bellow contains all requirements designed before the start of the development

1.4.1 Functional requirements

User Authentication

- **F1: Registration/Login using email** Access to StudyPad is possible by creating an account using email address/password combination.
- **F2: Registration/Login using Facebook** User will be able to use his/her Facebook account to access StudyPad.
- **F3: Registration/Login using Google** User will be able to use his/her Google account to access StudyPad.
- **F4: Store OAuth token** API Authentication Token will be stored in device memory.
- **F5: Token refreshment** API Token will be refreshed when needed, so user won't have to login again.
- **F6: University selection** As a part of user registration flow, user will be able to select his/her university.

Library Management (Notes & Notebooks)

- **F7: Notebook creation** User will be able to create new notebooks with the name he/she choose.
- **F8: Notebook deletion** User will be able to delete existing notebooks.
- **F9: Notebook name edition** User will be able to edit notebooks names.
- **F10: Note creation** User will be able to create a note with specific title and content.
- **F11: Note edition** User will be able to edit existing note, or completely delete it.
- **F12: Show Notebooks** : User will be able to view all the notebooks he/she created.

- **F13: Show Notes**: By clicking on notebook item, user will be able to view the list of notes that are assigned to this notebook.

Sharing Hub

- **F14: View published notebooks** User will be able to view notebooks published by other users.
- **F15: Search through published books** User will be able to search through the published notebooks by applying different filters (such as author, university and subject/topic).
- **F16: Browse through published notebook** User will be able to see notes inside the notebook that's been published.
- **F17: View comments** User will be able to view others users comments discussing a notebook that's been published.
- **F18: Leave a comment** User can comment on other user published notebook.
- **F19: Delete a comment** Application will let user to delete his/her comment.
- **F20: Save published notebook** User will be able to save published notebook to his/her library.
- **F21: Publish notebook** User will be able to publish his/her notebook.
- **F22: Update published notebook** Author of the published notebook will be able to update its information.
- **F23: Delete published notebook** Author of the published notebook will be able to delete the his/her notebook from shared space.
- **F24: Share notebook** User will be able to share his/her notebook by generating a deep-link.

Study Hub

- **F25: Start a basic self-check** User will be able to use an interactive way to look through his/her notes
- **F26: Start a written test** User will be able to participate in a written test based on one of notebooks to test his/her knowledge
- **F27: Start a quiz** User will be able to participate in quiz challenge that will be based on one of his/her notebooks

Settings

- **F28: View Profile Information** User will be able to view his/her profile information such as first name, last name and university.
- **F29: Edit Profile Information** User will be able to edit his/her profile information.
- **F30: Logout** User will be able to logout from the application.

1.4.2 Non-functional requirements

- **N1: Native Android application** Application will be written using native Android SDK.
- **N2: Android Version** Application minimal SDK version must be low enough to support as many devices as possible and high enough to use most applicable Android APIs considering other functional and non-functional requirements.
- **N3: Material Design** Application user interface will follow latest Material design guidelines and best practises.
- **N4: Scalable app architecture** Application's architecture must be scalable and easy testable.
- **N5: Tablet & Phone support** Application GUI must be well suited for multiple screen sizes.
- **N6: App Localization** Application will be able to adapt to different languages based on user locale

1.5 Existing solutions

There are several apps out there, whose goal is similar to StudyPad. However, most of the solutions are limited to learning languages and have limited sharing and discovering options. Table bellow shows requirements comparison such apps

Application Requirement	**Quizlet**	**Cram**	**TinyCards**
F1	Present	Present	Present
F2	Present	Present	Present
F3	Present	Present	Present
F4	Present	Present	Present
F5	Present	Present	Present
F6	Absent	Absent	Absent
F7	Present	Present	Present
F8	Present	Present	Present
F9	Present	Present	Present
F10	Present	Present	Present
F11	Present	Present	Present
F12	Present	Present	Present
F13	Present	Present	Present
F14	Absent	Absent	Present
F15	Limited	Limited	Limited
F16	Present	Present	Present
F17	Absent	Absent	Absent
F18	Absent	Absent	Absent
F19	Absent	Absent	Absent
F20	Present	Limited	Limited
F21	Limited	Limited	Limited
F22	Present	Present	Present
F23	Present	Present	Present
F24	Present	Limited	Limited
F25	Present	Present	Limited
F26	Present	Present	Limited
F27	Present	Present	Limited
F28	Present	Present	Limited
F29	Limted	Limted	Limited
F30	Present	Present	Limited

1.5.1 Quzlet - Key differences

Quizlet is primarily used for learning languages, from where most of the limitations come from. Closest analogy to Notebook there is Study set with Terms inside. This makes it easier for tests generation, but limits user when he/she is trying to learn anything other than new words

- **Publishing**: Content publishing process is very different to what StudyPad is trying to achieve. All study sets are visible to other users by default, which makes it hard, if not impossible, to distinct between local and shared published set.
- **Importing**: Importing flow allows user to either copy or save study set to a specific folder. This flow may confuse some of the users, because only copy allows actually add set to user library and modify it. Saving study set to the specific folder only saves the link to it and splits library management in 2 parts.
- **Discovering:** This limitation comes from the fact, that Quizlet is an app for language learners. As a consequence, the only distinctions between Study sets are its name and a language. These are the only 2 options available for filtering published study sets.

1.5.2 Cram - Key differences

Cram is very similar to Quizlet but feels much more outdated in terms of UX and brings some sharing limitations to the table.

- **Publishing:** Content publishing is similar to Quizlet - All sets are either visible by other users or not. Sharing a deep-link to a single study set was not functional at the time of writing this section
- **Discovering** Searching for content in Cram is even more limited comparing to Quizlet, only name of the study set is used
- **Importing** Library management here is splitted in 3 parts: User personal sets, Favourite sets, and Recently studied. When searching, there is no way to save published study set to personal library, it can only be automatically saved to Recent section, or manually added to Favourites. This makes it impossible to make local edits

1.5.3 TinyCards - Key Differences

TinyCards is app made by Duolingo, one of the biggest app for learning languages. TinyCard is meant to be more generic as it offers users to create custom study sets, often not limited to languages

- **Importing:** Similar to Cram, it is not possible to edit the study set user have downloaded and saved to his library
- **Challenges:** Tests for user are generated automatically and there is no way to choose test type

Chapter 2

Design

Chapter 3

Implementation

3.1 Choice of technologies

3.2 Component diagram

3.3 Installation

Chapter 4

Testing

Conclusion

Appendix A

Acronyms

GUI Graphical user interface

XML Extensible markup language

Appendix B

Contents of enclosed CD

- `readme.txt` ..... the file with CD contents description
- `exe` ..... the directory with executables
- `src` ..... the directory of source codes
  - `wbdcm` ..... implementation sources
  - `thesis` ..... the directory of LaTeX source codes of the thesis
- `text` ..... the thesis text directory
  - `thesis.pdf` ..... the thesis text in PDF format
  - `thesis.ps` ..... the thesis text in PS format