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**Tasky**

Bachelor’s Thesis

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Abstract

Most of the people work with teams on their job or school. Following all the tasks and keep staying updated about the tasks is getting harder when the number of people that you work with and number of tasks that you worked on increase. Also, for the people who manage projects, getting reports about the project and the people who works on the project is really hard thing when you try to do it without using any software.

We designed a project and task management system that works on web browsers and smart phones to make working on a projects and tasks with the teams easier. The system is built top of two main concepts: Project and Task. Users can create projects and, in that project, they can create tasks. Each task has an assignee. Users can save their works on the tasks, list the tasks that is assigned to them. With that way planning the works gets easier. Also, there is a project report system which makes report about the project and team members for the project owners.

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# INTRODUCTION

## Problem Definition

Most of the people work on multiple tasks every day in their job, school or even in home. Working on these tasks is getting harder if you try to handle it with a pen and paper. Also, for the people who are responsible for managing a team, it is hard to monitor the project, tasks and the team. Especially for the large teams it is almost impossible to follow the situation about the project and tasks.

## Purpose of the System

Purpose of the task management system Tasky is making easier and more efficient working and managing the projects and tasks. Users will easily create, assign and prioritize tasks, set deadlines, track how much time spent on tasks and visualize the projects and tasks with the Tasky.

## Scope of the Project

Task management system Tasky is designed for making working on a project easier and more efficient. The system consists of a web site and mobile application. Users can create projects in the web site and add participants to the project. Once the project is created users can create tasks within the project. Each task has a reporter and assignee. Assignee should be selected when the task is created. The reporter of the tasks is the user that is created the task. Users can also create sub-task which is related with any of the existing tasks.

There are three roles in a single project. Project manager, watcher and team member. Project manager is the user who is the created the project by default. Project managers can view the reports about the project, tasks and team members. Team members can log work to the tasks. Users whose have watcher role in the project can only monitor the project. They can not do any operation.

## Objectives and Success Criteria of the Project

The objective of the task management system Tasky is providing a strong platform for managing projects and tasks with a web site and Mobile application. By developing this system, we aim to increasing the efficiency of the projects, making easier managing and working on the projects and giving the information about what has been done for the projects and tasks. Providing easy-to-use interface, wide accessibility opportunity and keeping updated the users are the key points for us.

The main success criteria is how many projects in the system are successful? Like we mentioned previously we aim to increasing efficiency of the projects. Therefore, if the projects in the system is successful the project is also successful. Also, number of the projects and tasks in the system and the daily usage of the web site and Mobile application are important success criteria for us.

## Organization of the Thesis

The organization of this document is as follows:

Chapter 1 introduces the problem. General approach to the problem and purpose of the system also explained in chapter 1. In the chapter 2, existing solutions for the problem are explained roughly. Chapter 3 explains the solution for the problem that introduced in chapter 1 in detail. All concepts within the project are defined in chapter 3. There are also functional and nonfunctional requirements and user role system explained in that chapter. More technical details of the proposed solution are explained in chapter 4. System decomposition, database design and hardware/software mapping diagrams are shown in chapter 4. Chapter 4 also contains the test scenarios of the system. Conclusion of the project, does the project reach to goals and what can be done in the future in order to improve the project are explained in the chapter 5.

# CURRENT SYSTEM

There are a lot of task management system in use. Jira, Azure Board and Trello are the most popular task management systems. In these systems basically there are projects, tasks and work logs. Monitoring of the projects are handling with these concepts. There are members within a project. Project members logs work under tasks and update the status of the task. By that way, they can track their tasks and plan their works.

In our system the concept is the same. But our main goal is making processes easier and faster than current systems. We aim to ensure simpler and more undersantable interface. Also, with the Mobile application we aim to make accessible our system from everywhere.

# PROPOSED SYSTEM

In this project, a project/task management system named Tasky is proposed. Tasky is designed to make easier and more efficient all the processes that can be done in a project by any member of the project team. Tasky system consists of a web application and mobile application.

For all the members of a project, there are different pages and screens that makes easier to follow the project and tasks. Users can easily monitor the project and tasks that is assigned to them with the task pages/screens. Users can display, filter, sort and search tasks and plan their daily works.

Also for the users who manages the project, there is a report page that summarize the project and providing the critical information about the project, task and project members.

## Introduction

Tasky system is built on top of three main entities: project, task and work log. Users can create projects. There are tasks under the projects and users can add tasks as many as they want. Project members log their work under tasks.

There are participants of the project. Each project participant has a role. There are three different roles within a project: Project manager, watcher and team member.

Project manager role is the owner of the project. There can be only single project manager in the project.

Team member role is the participants who works on the tasks.

Finally, there are watchers who can view the project pages but has no permission to do any operation.

### Project

Projects are created by registered users. All registered users can create projects. A project has title, description, status and files. There are also project participants who work on the project. Project participants can be invited when the project is created or after the project created.

### Task

In every project, there are tasks which are created by project manager or team member. A task has title, description, due date, status, assignee and reporter. Assignee and the reporter are one of the project participants. Assignee is who is the responsible of the project. Reporter is who will be notified about the task operations. Tracking of the tasks is done with the statuses of the tasks. There are 4 different statuses. To-do, active, resolved and closed. To-do status means the task is not started yet. Active status is means someone is working on the task. Resolved status means the task is finished but not closed/approved yet. Closed status means the task is completed.

Tasks help users to track responsibilities of them. Each task an assignee which is the responsible of the task and a reporter which tracks the progress of the task. Progress of the tasks represented by the status

### Work Log

Work log has duration, description and date. It represents the job that is done on the tasks. Work logs are created under the tasks by project manager or team member. Work logs are used when in the project reports that is visible to only project manager.

## Functional Requirements

### Registration

Users can register to the system by filling a registration form. They can login to the system with e-mail and password information. After they logged in to the system, they have a profile created by their registration credentials. They can view and edit their profile. Users also can manage their preferences which includes turn on/off notifications and change password functions. These functions are available in both platforms.

### Project Management

Users can create and manage projects via Tasky web application. While creating a project they can invite participants by indicating their e-mails. If there is already a user registered with the given e-mail, the system sends an invitation e-mail and mobile notification; otherwise, only an e-mail sent. Invited users can accept or decline the invitation. Creator of the project becomes the project manager. Project managers can assign a role to the project participants. Project managers can update the project by changing the status, name or description of the project. Project managers can add or remove participants to/from projects. Project managers can also delete the project.

Participants of the project can view project detail and project board in both platforms. Project detail contains name, description, participants and documents of the project. Project board contains tasks grouped by their status (To-do, active, resolved and closed).

Project managers can view the report of their projects via only web application. In the project report they can see the stats of tasks or team members.

### Task Management

Project managers and team members can create tasks under their projects via only Tasky web application. These tasks can have sub-tasks. The only difference between the task and sub-task is that sub-tasks have a root task.

These tasks can be assigned to a team member. Project managers can assign a task to anyone in the project except watchers. Team members can only assign tasks to themselves. Project managers and assignee of the task can update the task’s status, description, files. All participants of the project can view the detail of tasks. Project managers and team members can log work to the tasks. A task can be deleted by only a project manager. These functions are available in both platforms.

Project participants can view the task list of the project via both platforms. In this page they can filter or sort the tasks. Users also can view the last activities of their projects.

### Notifications

Registered users will receive e-mail and notification when:

* A project invitation sent to the user.
* They removed from a project.
* A task assigned to them.

Project managers will receive e-mail and notifications when:

* A user accepts or declines their invitation.

Project participants will receive e-mail and notifications when:

* The project is closed or activated.

Assignees of the task will receive e-mail and notification when:

* Task is updated.
* The status of the task changed.
* Task deleted.

Reporters of the task will receive e-mail and notification when:

* The status of the task changed.
* Task updated.
* Work logged under the task.

## Nonfunctional Requirements

### Usability

* Users should be able to complete their transactions with maximum 5 clicks.
* The components of web and Mobile application such as titles, button names, section names etc. should be descriptive and understandable for people who knows English.

### Reliability

* The system should be available 100% of time.
* The system should validate the data that will be stored in the database and if there are errors, users should be notified by the system.

### Performance

* Response time of the system should be maximum 30 seconds for heavy functions like preparing a project report, for other functions it should be maximum 10 seconds.

### Supportability

* The system should be separated into packages/components to accomplish easy maintenance.

### Implementation

* The Mobile application should be implemented with React-native (JavaScript).
* Web application should be implemented with React (JavaScript).
* Web API’s that will be used in the Mobile and web application should be implemented with .NET Core (C#).
* Database should be MSSQL.
* Visual Studio Code should be used for React and React-native. Visual Studio 2019 should be used for .NET Core.

### Interface

* There is no interface requirement in this project.

### Packaging

* Our web application does not require any installation. It should be run on any internet browser.
* Mobile application should be run on Android and iOS platforms by installing the application.

### Legal

* Mobile application should be signed with a signing key for android. For iOS, it should be signed with a certificate.

## Use Case Model

Use case model of the project that represents the functionalities of each role is given below.

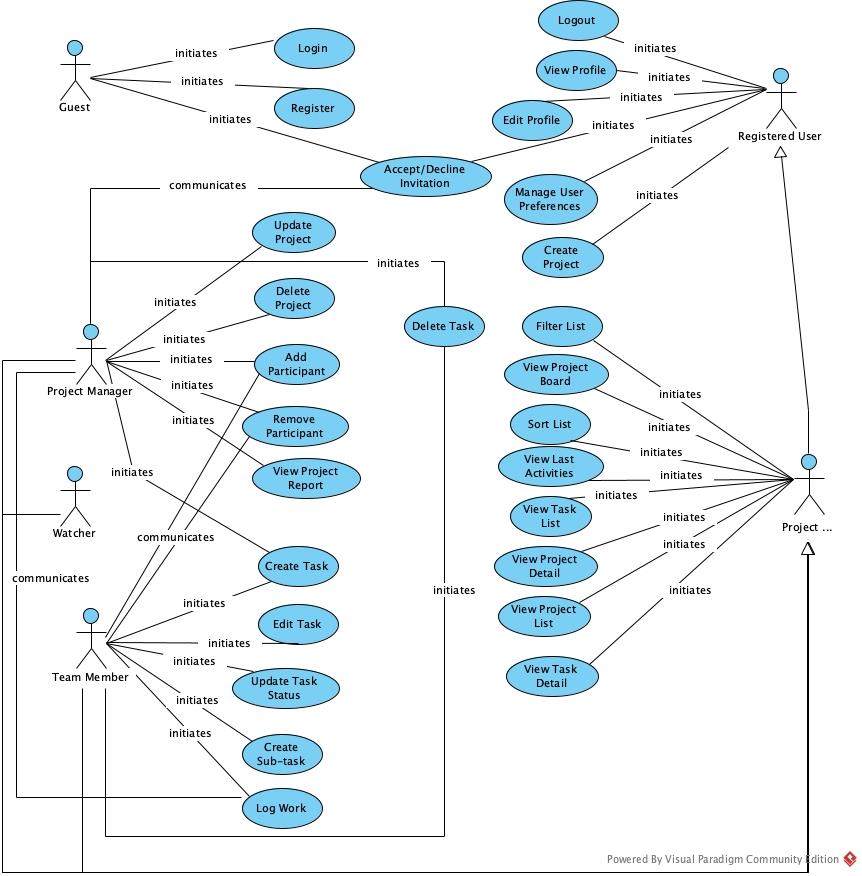


Figure Use Case Model

# Implementation, tests, experiments

## Implementation

### System Decomposition

## Tasky system is divided into three layers. First layer is interface. In this layer we have two subsystems.

1) **Tasky Web App:** Web application of the Tasky system which runs on internet browsers. All of the user interfaces and interactions in the Tasky web application belongs to this subsystem.

2) **Tasky Mobile App:** Mobile application of the Tasky system which runs on smart phones. All of the user interfaces and interactions in the Tasky mobile application belongs to this subsystem.

## Second layer of the Tasky system is application logic layer. This layer contains the server side controllers. Functions of this layer’s subsystems control and validate the data that is sent by user. There are 5 subsystems in this layer.

1)  **User Controller:** This subsystem is responsible of the user data. All operations related to user data such as profile and user preferences run on this subsystem. This subsystem also handles the login and register functions of the system. It creates a JWT token for the user and check its authorization in each API call.

2)  **Project Controller:** This subsystem handles the operations that is related to project.

3)  **Task Controller:** This subsystem handles the operations that is related to task.

4)  **Work Log Controller:** This subsystem handles the operations that is related to work log.

5)  **Notification Controller:** This subsystem handles the sending notification to the users. Sending e-mail and mobile notification operations run on this subsystem.

Third and final layer of the system is storage layer. All the data of the system is stored and handled in this layer. This layer has a single subsystem.

1) **Database:** This subsystem stores all the data. It also makes insert, update and delete operations.

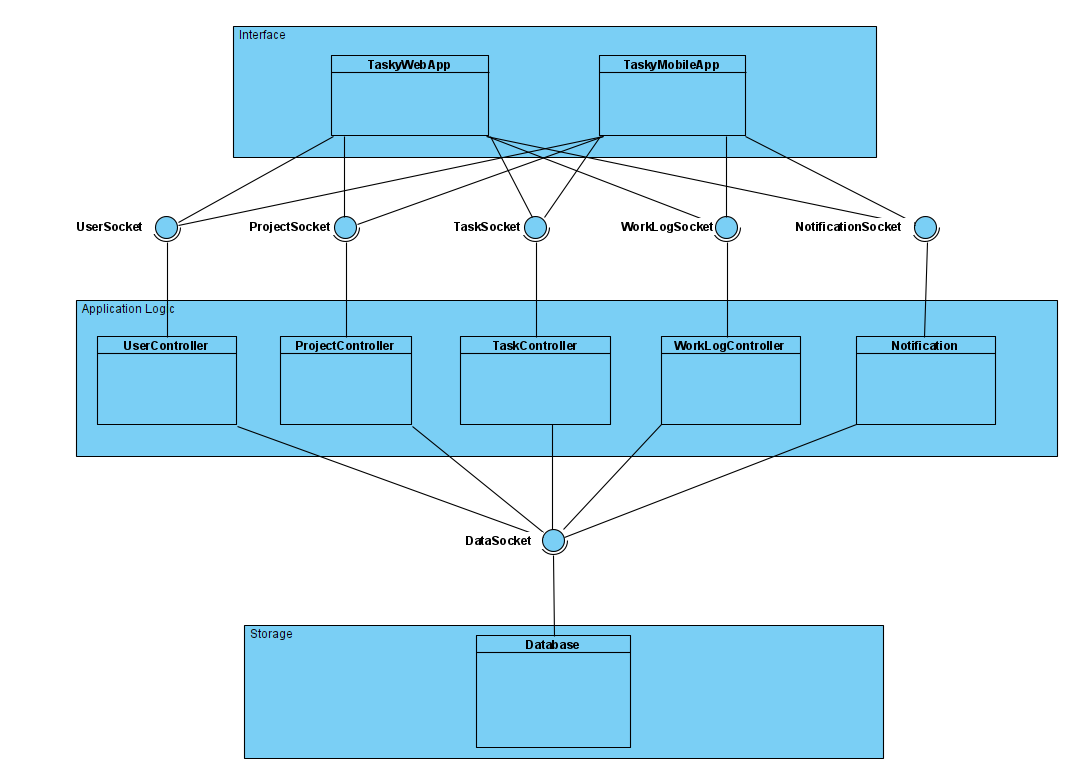


Figure System Decomposition

### Hardware-Software Mapping

## There are three hardware components in the system.

## First one is client device. Client device is the device that our web or mobile application run. It contains the components of Interface layer. It can be a computer or a smart phone.

## Second hardware component is web server. It contains the components of application logic layer. The operations are done in this hardware. And the

## Final hardware component is data server. It contains the database component. All of the dynamic data of the system is stored in this hardware component.

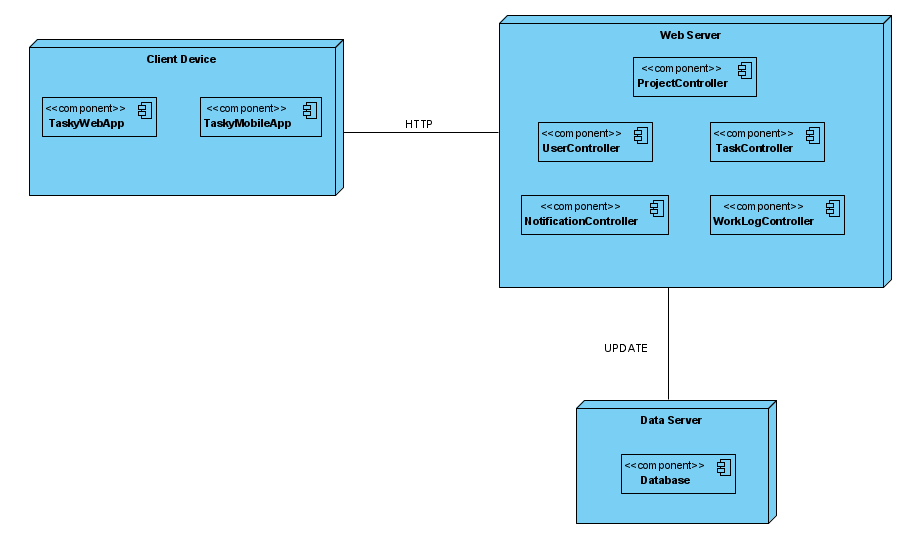


Figure Hardware Software Mapping

### Persistent Data Management

## Data of the Tasky system is stored in relational database which is run on the Azure server. System will keep the backup of the database in order to prevent any data loss. The password of the users will be kept as encrypted for avoiding the security problems. There will be 12 different tables in the database.

Diagram

Description automatically generated

Figure Database Design

### Used Frameworks, Libraries and Templates

1. ***Web App Implementation***

## Tasky web application is implemented with React.js. React is a strong library that allows us to implement web applications. There are a lot of npm packages used in the web project of Tasky. react-bootstrap, rsuite, semantic-ui-react, antd and material-ui are used for the UI components. All the charts in the tasky web application are taken from rechart package. Form validations in the tasky web application provided by Formik and yup packages.

1. ***Mobile App Implementation***

## Tasky mobile application is implemented with React-native. The advantage of the React-native is that we can run the application on both iOS and Android platforms with a single source code. This is the biggest reason of using react-native in Tasky. We also thought that using similar libraries in mobile and web applications will save time.

## We used a lot of npm packages in our mobile application. React-navigation package used for navigating between screens. Most of the UI elements of the Tasky mobile app are taken from react-native-paper and native-base packages. For the push notification feature of Tasky mobile app, we used Firebase. Firebase allows us to register iOS and Android apps to their system and send notifications. In the Tasky mobile application project, we used react-native-firebase/app and react-native-firebase/messaging packages to receive notifications sent by Firebase. Also, we took some of the UI elements from Antiqueruby material design template.

1. ***Web Service Implementation***

## Web services of the Tasky are implemented with .NET Core. Entity framework core package is used to connect the database with web services. We used database first approach in the Tasky. Database tables created first, then the classes that represents the tables and views in the database are implemented in the web service project. These web services are used in the web and mobile applications of the Tasky in order to make operations within the system. The data that is coming from client side of the system (web and mobile apps) reaches web services and processes to the database.

## Tests

These test result tables are for both mobile and web (except create task and create project since they are not available in mobile app).

Table : Login Test



Table : Register Test



Table : Forgot Password Test



Table : Create Project Test



Table : Create Task Test



Table : Create Work Log Test



Table : Register and Verify Email Test



Table : Accept Project Invitation Test



Table : Close Project Test



# conclusions and future work

As a result of the project, strong and promising project management platform Tasky has developed. As mentioned in previous chapters, there are three main goals of the project. First goal is having easy-to-use interface on both mobile and web applications. The user interface in the mobile and web applications of final product is very understandable for any type of users. Second goal of the project is providing a fully accessible online platform. Although, the main platform of the project is the web platform, with the mobile application we provide a wide accessibility opportunity to the system. Finally, third goal of the project is keeping the users updated about the project that they involved. System gives information about all operations within the project to the related users by sending notification, email and push notification. Therefore, we can say that the Tasky project has received all the main goals according to the final product.

As a future work, the system can provide more customizable features to the users. For example, task statuses can be defined by the project manager or there can be more role options within the project. Also, we can improve the mobile application of the Tasky by adding the features which are available on the web application but not in the mobile.

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