

**TRCKR**

**TIME MANAGEMENT MADE EASY**

**IT15<sub>TA</sub>\_ZH - PSIT4**

**Ankeshian, Gabriel**

`ankesgab@students.zhaw.ch`

**Balidis, Dimitri**

`baliddim@students.zhaw.ch`

**Christen, Luca**

`chrisluc@students.zhaw.ch`

**Jossi, Savino**

`jossisav@students.zhaw.ch`

**Milenkovic, Daniel**

`milendan@students.zhaw.ch`

**Nominato, Angelica Helena Moreira Alves**

`moreiane@students.zhaw.ch`

**Pacassi Torrico, David**

`pacasdav@students.zhaw.ch`

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The main goal of this article is to describe the idea, goals and main functionalities of the web based application trckr. We developed trckr for everyone who works on a project and needs an intuitive and simple web tool to accurately track their time spent on various tasks.

The back-end is written in Python with the help of the web application framework Django and the front-end with the Javascript UI framework Vue.js. Both technologies were new to most team members, but all members have proven themselves motivated to learn these skills which were ultimately a benefit to the outcome of the project.

In order to compete with similar tools and web services, trckr focuses on performance and usability. To distinguish trckr from the competition, many features are planned to manage projects and tasks in a user-friendly manner. This will allow the user to leverage trckr to handle the ever-increasing complexity in project management and task tracking found in large companies. Despite targeting large companies, trckr will remain open-source and anyone can contribute to the code-base who might wish to do so.

# 1 Introduction

Time and task tracking are important activities in many businesses to gain insights into the productivity of a team, requiring appropriate tools allowing easier and more accurate time tracking. Many processes and methods have been developed in the past to cover this need. Unfortunately, most of them only address a certain need or have been fine tuned to a specific company or team. This not only leads to a loss of experience that could have been leveraged by other teams but is also not generic enough to be adapted to different processes, causing other companies to inappropriately adapt to the tool instead of the tool adapting to the company.

## 1.1 Objectives

The goal with trckr is to develop and distribute a time tracking web application that is easy to both understand and use. The most important non-functional requirement is to focus on a small amount of steps for users to track the important measurements. Only this will keep the user engaged and increase the accuracy of the provided data.

## 1.2 Main Features

The user is able to:

- register and log in to trckr
- create and edit projects
- create, track and edit tasks
- visit trckr on any device

# 2 Architecture

The trckr architecture consists of two separate applications. The business and data layer are handled by the back-end application, while the presentation layer is implemented through the front-end application. The back-end provides a RESTful API, which is used by the front-end application to read and write the necessary data.

This separation of concerns, achieved by decoupling the front-end and back-end, allows for easy extensibility and fast development cycles. Additionally, a single back-end is able to serve multiple client applications.

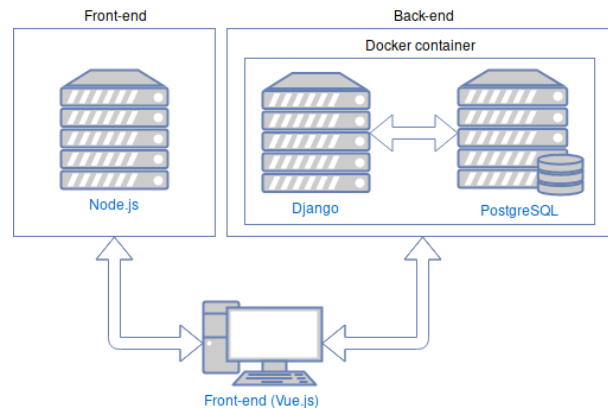


Figure 1: Architecture of trckr

## 3 Technologies

### 3.1 Django

Django is an open-source web framework written in Python.[1] It encourages fast, clean and simple development of web applications. One of the main advantages is its fast setup, enabling developers to create applications swiftly with its Model-View-Presenter scheme. Django also comes with support for various databases. Django also follows the DRY (Don't Repeat Yourself) principle.

### 3.2 PostgreSQL

PostgreSQL is an open-source object-relational database.[2] The database is used to store all the data for trckr. PostgreSQL is fully supported by Django and requires minimal configuration. The communication between the web application and the database is done through Django's model layer.

### 3.3 Docker

Docker is a containerization platform, which adds an abstraction layer between the application environment and the underlying server infrastructure[3]. This means that the whole back-end environment can be set up inside multiple docker containers which can be run locally as well as on the production server.

### 3.4 Node.js

Node.js is a Javascript runtime which brings Javascript to the server environment.[4] It uses an event-driven and non-blocking I/O model for maximum efficiency while staying lightweight. This makes node.js the ideal technology to implement the server side of the trckr front-end application.

### 3.5 Vue.js

Vue.js is a progressive framework used to build user interfaces[5]. It is preferred for its simplicity and the rather shallow learning curve it provides to new developers. The features of Vue.js allow the creation of data structures that can be easily displayed on a website. This and the ability to make calls to the back-end without difficulty make it a good fit for trckr.

### 3.6 CircleCI

CircleCI is a continuous integration and deployment platform, enabling teams to build software quickly and safely.[6] Every time new code is committed, it runs a test suite to confirm that the new code is working correctly and then immediately deploys this new version. Thus enabling features to be created quickly, without long and complicated deployments where certain bugs are discovered when the product should be going live. This technology enabled the trckr developers to implement features and immediately use them, motivating everybody to constantly improve the product in small steps and see and feel the results immediately.

## 4 Results

### 4.1 API

The back-end of the trckr application implements a RESTful API using the Django REST framework. The API provides basic CRUD (create, read, update, delete) operations for all the entities available in the database. There are five main endpoints to retrieve and save data on the server: authentication, user, projects, tasks and time entries. Except for the authentication and user endpoints, all endpoints need an authentication token to be accessed.

#### 4.1.1 Endpoints

**authentication** allows users to retrieve an authentication token from the server to access the other parts of the API. Via this endpoint, one can also invalidate the token.

**user** is only used to create new user accounts.

**projects** allows users to create, read, update and delete projects and display all the tasks associated with a project.

**task** is used to create, read and update tasks for a given project. There is also a way to list all relevant time entries for a task.

**time entries** are also used to create, read, update and delete operations

Each object of an entity has a unique ID. This ID can be used to retrieve information for that specific object by providing it in the URL when calling the server.

## 4.2 User Interface

Before logging in, users are presented with the login screen as shown in Figure 2. For users who have not yet registered an account, they can create one by clicking on "Register" and entering their basic information, i.e. their username, password, email address as well as first and last name (see Figure 3)

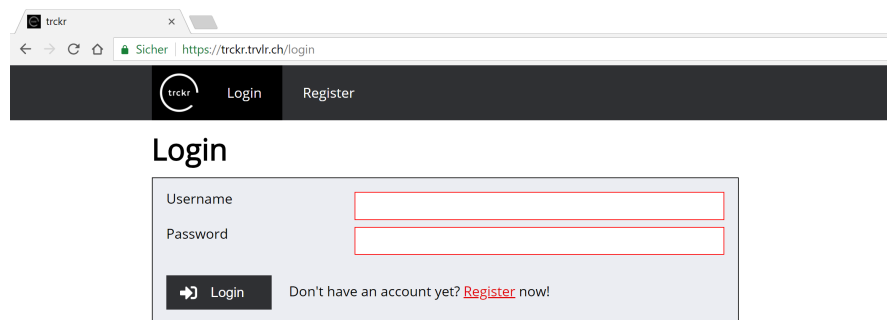


Figure 2: The trckr login page

Once the registration process has been completed, the user can log in at the login page. After a successful login, the navigation bar at the top of the interface will contain links to the dashboard, the projects page and the time entries page as well as a logout button. The dashboard displays different graphs to provide the user with a visual overview of their recent activities. This way the user can easily see how much time was already tracked for each task and it enables the user to quickly proceed with their work, without having to search for a relevant task first.

The "Projects" page shows a table of all projects that the currently logged in user is a part of; this can be seen in Figure 4. There is a search box above the projects table that allows a

trckr

← → ↻ 🔒 Sicher | https://trckr.tvlr.ch/register

trckr Login Register

### User registration

Username

Password

Email

First name

Last name

Register

Already have an account? [Login!](#)

Figure 3: The trckr registration page

user to filter for a project or a group of projects containing the given keywords. To create a new project, the user will have to navigate to the projects page and click the "Create project" link which will open the project creation form. The user specifies the name for the project and also has the option to enter a description (see Figure 5).

trckr

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trckr Dashboard Projects Time Entries Logout

### Projects

Filter projects

Project	Description
<a href="#">Birthday party</a>	*Classified*
<a href="#">trckr</a>	this is the trckr project.
<a href="#">Release</a>	TODOS: for the next release

Create project

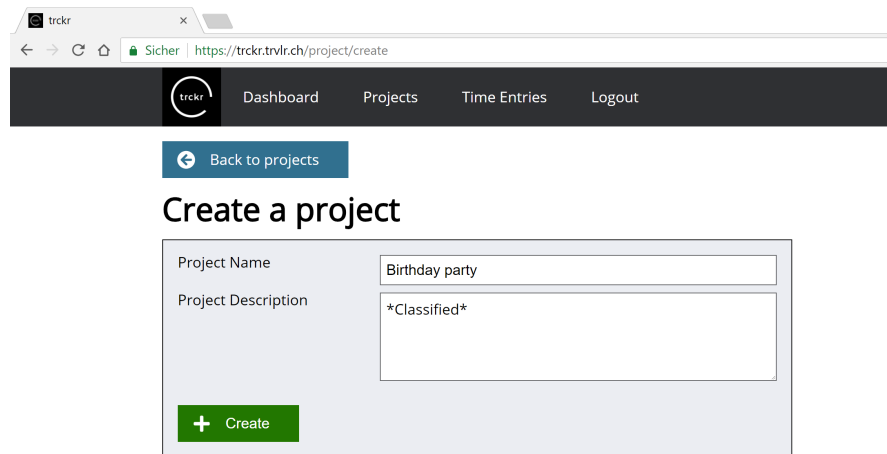
Figure 4: The projects page with the table containing the projects

Each project can be viewed in more detail by clicking the project name in the table shown in Figure 6. The project page contains the name, the description and a table of all the tasks in the selected project.

Clicking on a task will display its details like the name and the description of the task.

On the "Time Entries" page, the user can create a time entry for a specific task of a project with the entry form shown in Figure 7. The user selects a project and a corresponding task for which the time entry should be created.

All time entries will be displayed on the time entries page.



trckr

Dashboard Projects Time Entries Logout

Back to projects

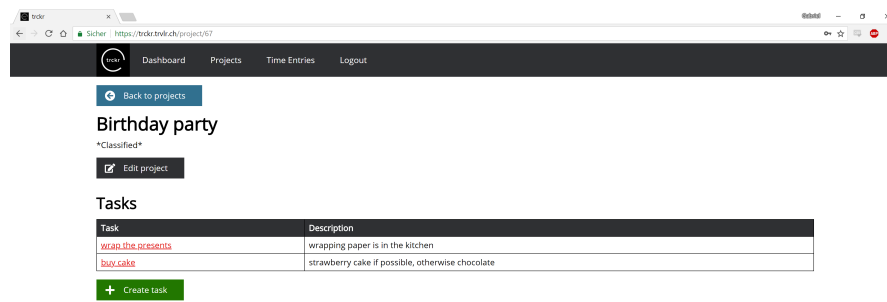
### Create a project

Project Name: Birthday party

Project Description: \*Classified\*

+ Create

Figure 5: The dialog to create a new project



trckr

Dashboard Projects Time Entries Logout

Back to projects

### Birthday party

\*Classified\*

Edit project

#### Tasks

Task	Description
wrap the presents	wrapping paper is in the kitchen
buy cake	strawberry cake if possible, otherwise chocolate

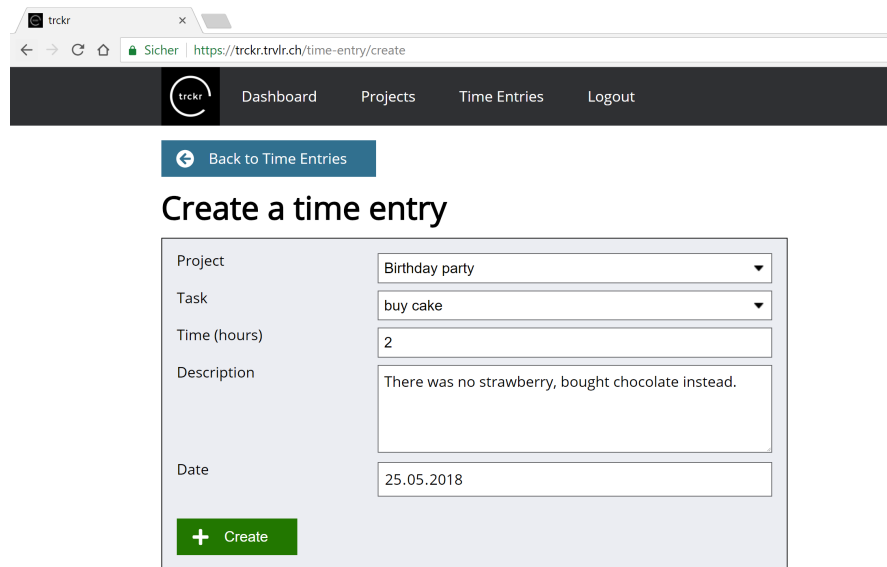
+ Create task

Figure 6: The project page with the table of all tasks

## 5 Working with Scrum

Scrum describes a framework for agile software development. Agile in this context means, that requirements and results can evolve during the development. The development team uses Scrum for developing trckr and places the tasks into two weeks long periods, so-called sprints. The team holds a short meeting every two days per week, where every team member presents completed and ongoing tasks. Every two weeks there is a sprint review, where the past and upcoming development phase gets reviewed and planned. Also, every team member is asked to talk about positive and negative experiences during the last sprint. This is called the sprint retrospective. Finally, the upcoming sprint has to be planned by the team. Every team member estimates the effort for each task the product owner chose for the upcoming sprint.





The screenshot shows a web browser window with the URL <https://trckr.trvlr.ch/time-entry/create>. The application has a dark navigation bar with links for Dashboard, Projects, Time Entries, and Logout. Below the navigation bar is a blue button labeled 'Back to Time Entries'. The main heading is 'Create a time entry'. The form contains the following fields:

Project	Birthday party
Task	buy cake
Time (hours)	2
Description	There was no strawberry, bought chocolate instead.
Date	25.05.2018

At the bottom of the form is a green button with a plus icon and the text 'Create'.

Figure 7: The form to add a time entry to a task.

## 6 Outlook

By focusing on doing one thing and doing it right, it was possible to create a modular platform. This did not just allow a clean development process, but also enables open-source contributors to easily extend the trckr application. The main focus now should be to gather real life user experience and feedback to determine which features should be added next or be improved upon.

Project-focused features can be extended to enable more specific project methods, maybe even an interface with ticketing or project management tools. This would enable the team leaders to gain more insight on the progress.

A desktop application could be developed to automatically track usage of certain applications or integrations for development environments to track time worked on a project. By reducing the manual intervention of the user, the tracking could become even more accurate. This might even uncover certain inefficiencies, e.g. by detecting too much time wasted waiting for tests or deployments.

## 7 Conclusion

The aim of the project trckr was to create a tool which helps people and corporations to easily track time on their projects. With the help of sophisticated technologies like Django and Vue.js,

the trckr development team was able to create a modern and responsive web application.

Even though the team had almost no prior experience with the used technologies, they proved themselves motivated to invest time to properly learn them. The agile software development process only helped them to achieve this by providing clear short-term goals.

The result is a usable web application that can still be improved upon, maybe even with the help of open-source software developers.

## References

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