

PROJECT TRCKR

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27.05.2018

The main goal of the present 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 different 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 was 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 on the productivity of a team. Appropriate tools allow 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 fit 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 adapt 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 all the required information. 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 login to trckr
- create and edit projects
- create, track and edit tasks
- visit trckr on any device

2 Architecture

The trckr project consists of two separate applications. The business and data layers 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 through the clear decoupling between 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 without any further work required.

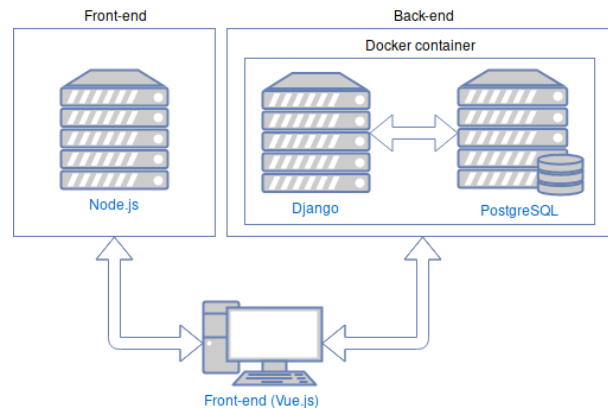


Figure 1: Architecture of trckr

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 the developer to create applications swiftly through its Model-View-Presenter scheme. Django also comes with support for various databases and 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 that adds an abstraction layer between the application environment and the underlying server infrastructure.[3] This means that the whole back-end environment can be setup inside multiple docker containers that can be run locally as well as on the 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 still remaining light-weight. 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 for building user interfaces.[5] Vue.js is used mainly for its simplicity and the rather shallow learning curve it provides inexperienced developers. The features of Vue.js allow the creation of data structures that can easily be displayed on a website. This and the ability to easily make calls to the back-end 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 nothing broke 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. Using this technology enabled the trckr developers to develop 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 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. This is necessary when updating an object via a POST request.

4.2 User Interface

When a user first opens up the trckr web application, the user is 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).

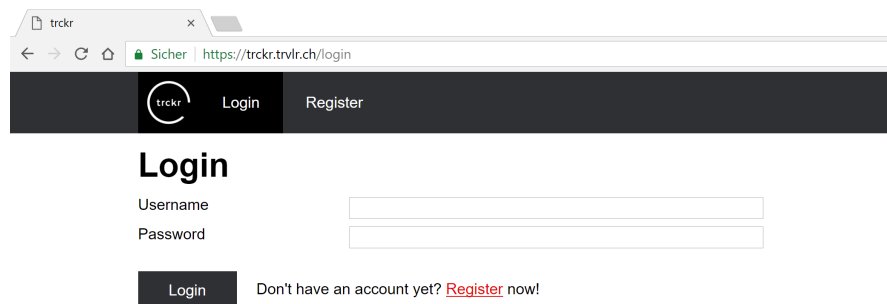
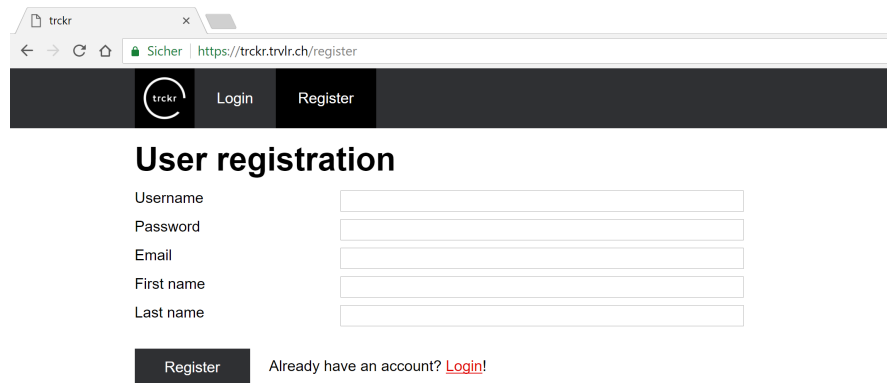


Figure 2: The trckr login page

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.

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 5. There is a search box above the projects table that allows a user to



trckr

Login Register

User registration

Username

Password

Email

First name


Last name

Register

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

Figure 3: The trckr registration page

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 discription (see Figure 4).



trckr

Dashboard Projects Time Entries Logout

Projects

[Create project](#)

Filter projects

Project	Description
trckr	this is the trckr project
birthday party	*CLASSIFIED* this is super secret

Figure 4: The dialog to create a new project

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 description of the task.

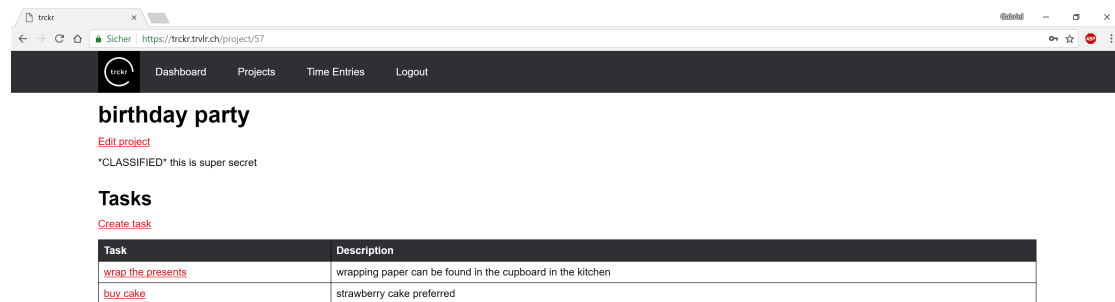
On the "Time Entries" page, the user can create a time entry for a specific task of a project with the entry form shown in Figure 7. The user selects a project and a corresponding task for which the time entry should be created.

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



Project	Description
trckr	this is the trckr project
birthday party	*CLASSIFIED* this is super secret

Figure 5: The projects page with the table containing the projects



Task	Description
wrap the presents	wrapping paper can be found in the cupboard in the kitchen
buy cake	strawberry cake preferred

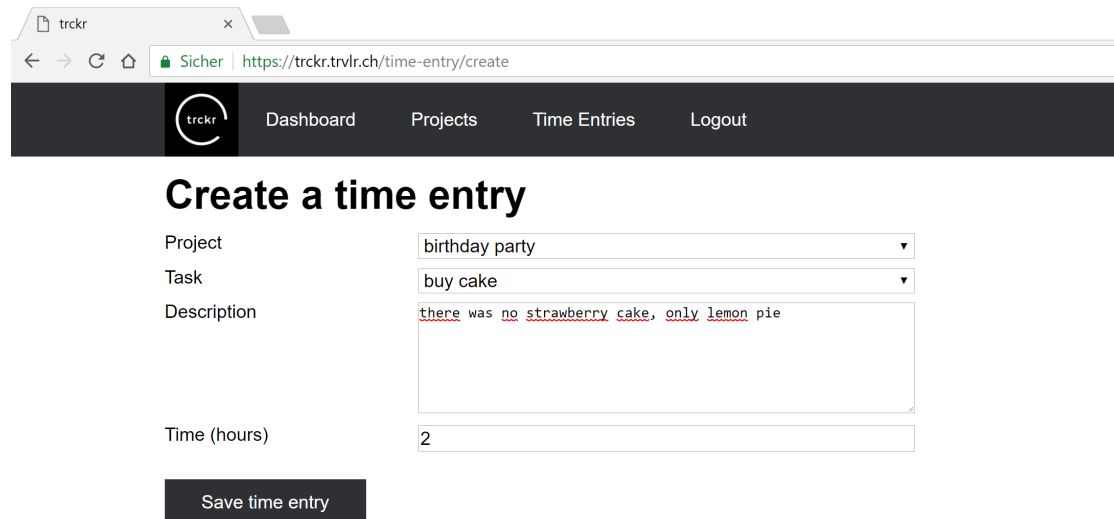
Figure 6: The project page with the table of all tasks

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 sprints that are two weeks long. 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 Scrum master (the person, who leads Scrum) chose for the upcoming sprint.

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



The screenshot shows a web browser window with the URL <https://trckr.trvlr.ch/time-entry/create>. The page has a dark navigation bar with the 'trckr' logo and links to 'Dashboard', 'Projects', 'Time Entries', and 'Logout'. The main content area is titled 'Create a time entry' and contains a form with the following fields:

- Project:** A dropdown menu with 'birthday party' selected.
- Task:** A dropdown menu with 'buy cake' selected.
- Description:** A text area containing the text 'there was no strawberry cake, only lemon pie'.
- Time (hours):** A text input field containing the value '2'.

Below the form is a dark button labeled 'Save time entry'.

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

experience and feedback to determine which features should be added next or be improved upon.

Project-focused features can be improved to enable more specific project methods, maybe even an interface with ticketing or project management tools. This enables 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.

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