

PyDash.io

Architectural Design Document



PyDash 2018

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Introduction

PyDash.io will be a platform for connecting existing Flask-monitoring dashboards to and monitor those dashboards as well. This document will describe the architecture and technologies used in the development of the PyDash.io platform. It will also provide a short overview of the API available.

There are several things this document focuses on, but they can be categorized in a handful of segments. Each will deal with a part of the design of PyDash.io. We will discuss the general architecture, tools used, use-cases, back-end, front-end, our database and the API we built for this piece of software.

Architectural Overview

The PyDash.IO application will be split into a couple of separate parts:

- The Back-End part, which will be written using the Python programming language, and the Flask micro-web-framework.
- The Front-End part, which will be written as a Single-Page-Application using the React.JS interactive user interface framework.

These two parts will talk with each-other using a well-defined AJAX API that will be outlined later in (*a future version of*) this document.

Technology Stack

Use-Cases

Back-end Design

The Back-End part of the application is written in Python using the Flask micro-web-framework. The reason to use Flask here is to be able to use the *flask-monitoring-dashboard*, a Python library whose functionality PyDash.IO builds on top of, to be used for the *PyDash.IO* web-application itself as well.

The Back-End is split up using the well-known *Model-View-Controller* architecture pattern.

The *Model* contains all the actual application logic. Its implementation can be found in the *pydash_app* folder. The web-application is only a consumer of this package.

The *Controller* contains the dispatching logic to know how to respond to the different endpoints a visitor might request. The actual route-dispatching happens in *pydash_web/routes.py*, with the handling of each of the different routes being handled by its own dedicated module in the *pydash_web/controller*/ folder.

The *View* part of the application currently consists of the *routes.py* file. This file serves as an interface between the front-end and back-end, thus being the view of the back-end with regards to the outside world.

Domain Driven Design

Inside the application logic (*pydash_app*), we use a simple variant of Domain Driven Design to split up our model's functionality in their respective concerns. For each data structure or finite-state-machine of interest, we create three parts:

1. A module of the entity name that contains the publicly available functions to interact with these entities.
2. A *Repository* module that knows how entities of this type are persisted: It exposes functionality to find certain entities of this type in the persistence layer, create new ones, update existing ones and possibly delete them. Only the actions that are actually relevant to the specific entities are modeled. The Repository is the only part that actually talks with the underlying persistence layer, and as such it can be considered an Adapter.
3. An *Entity* class which is a plain Python class with the properties of interest and the methods that make sense to prove and possibly manipulate this kind of entity.

Important to note is thus:

The Entity never knows how it itself is persisted,

The Repository does not care about the internals of the Entity's logic.

Because of this, both are easy to change without needing to touch the other.

Database Design

We intended to wait as long as possible before committing to the choice of a specific persistence layer implementation, because it is one of the choices that has the largest (negative) impact on the flexibility of a software project.

We have now decided on using the ZODB object-database as it provides a clear relationship between objects and elements in the database. ZODB in essence uses a large tree-like structure to store Python objects. Each class has its own branch which is a set of objects of that class. Each of these branches is called a repository.

To connect to ZODB we use ZOE. This is a tool that allows the database to be ran in a separate process to not poorly influence the performance of the web-app.

Front-end Design

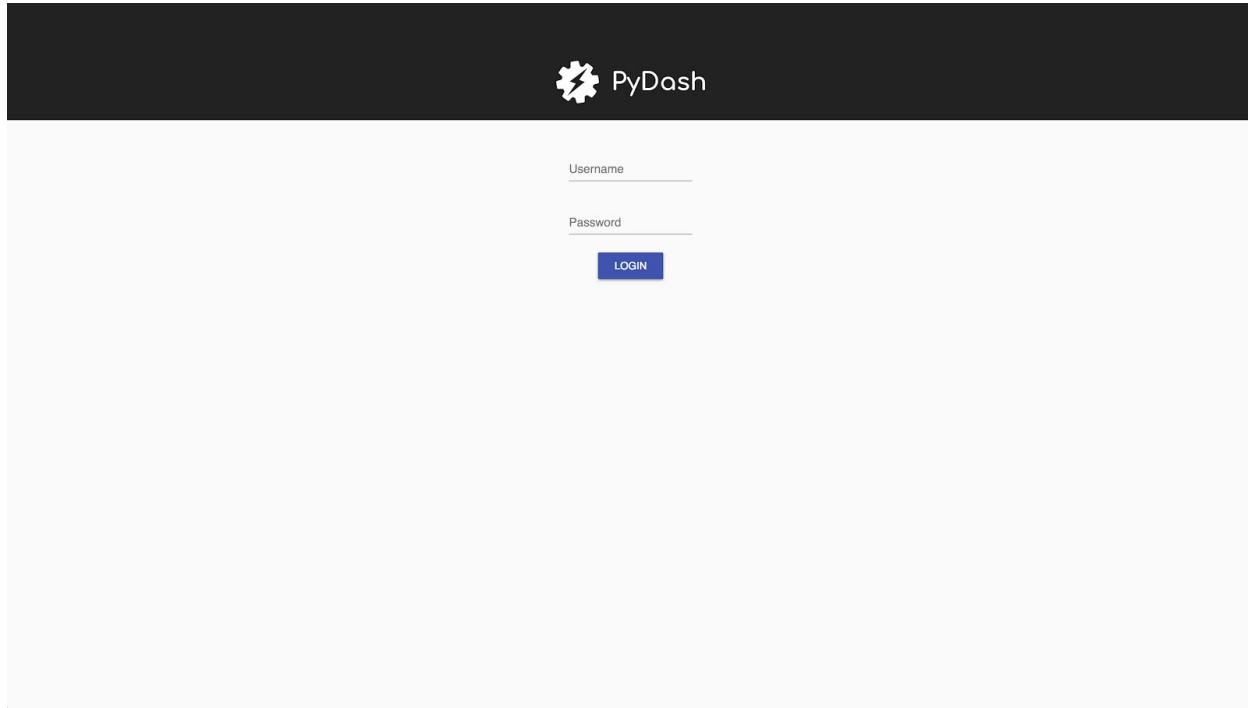
For the front-end part of the application, we will be creating a one-page application using the React.js framework, requesting all necessary information from the back-end using AJAX (Asynchronous Javascript and XML) calls.

For the User interface, we will be using the Material-UI framework, with the pages looking like this:

For the time being, there will be a few different pages:

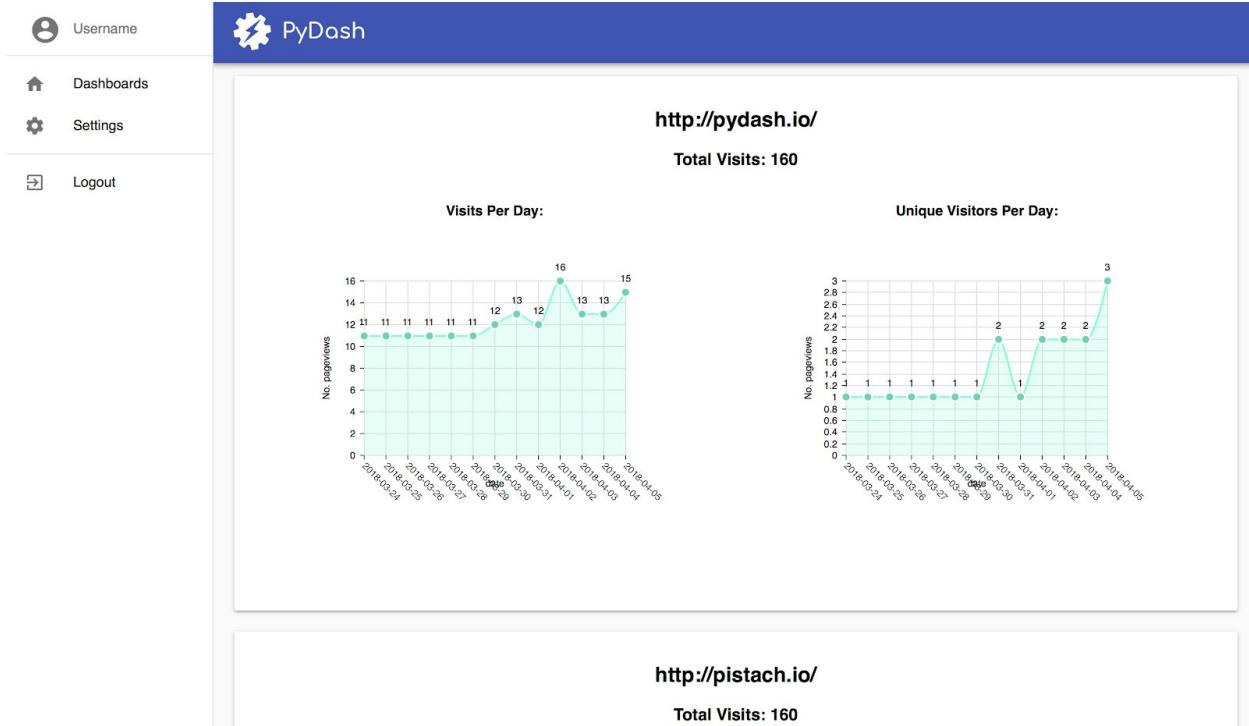
- The landing page/login page: When the users enter the website, this will be the first page they see. They will be able to login to an existing account.

The login page will look approximately like this.



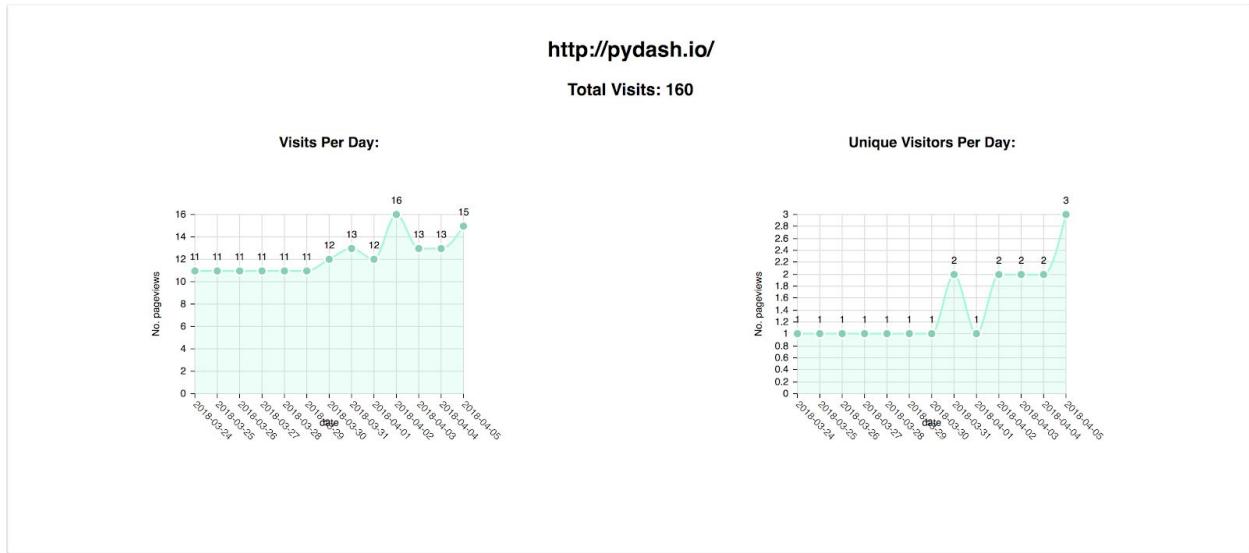
- The overview page: Here the users will be able to see an overview of all dashboards they are monitoring.

The overview page will look approximately like this.



- The dashboard page (one for each dashboard): Here the users will be able to see all information coming in from the specified dashboard.

The dashboard page will look approximately like this.



We will likely add more pages in the future, like “creating an account page” or “create a dashboard” page.

Front-End Technology stack

We use a lot of different technologies in the Front-End. Mainly, we follow some of the conventions used in the React build tool [create-react-app](#). Technologies we use include:



webpack

Webpack is a module bundler. Its main purpose is to bundle JavaScript files for usage in a browser, yet it is also capable of transforming, bundling, or packaging just about any resource or asset.

- ★ Module-bundling
- ★ Asset compression
- ★ Code minification



LiveReload

LiveReload monitors changes in the file system. As soon as you save a file, it is preprocessed as needed, and the browser is refreshed. Even cooler, when you change a CSS file or an image, the browser is updated instantly without reloading the page.

- ★ Fast development cycle



ESLint

A pluggable and configurable linter tool for identifying and reporting on patterns in JavaScript. (a Lint or a Linter is a program that supports linting, e.g., verifying code quality)

- ★ Find errors early



JSX

JSX is a preprocessor step that adds XML syntax to JavaScript. Just like XML, JSX tags have a tag name, attributes, and children.

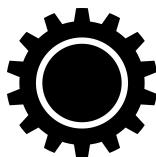
- ★ Write HTML in JS
- ★ Cleaner code



babel

Babel is a transpiler for JavaScript best known for its ability to turn ES6 (the next version of JavaScript) into code that runs in your browser (or on your server) today.

★ Modern JS



Service Worker

A service worker will automatically precache all of your local assets and keep them up to date as you deploy updates. The service worker uses a cache-first strategy for handling all requests for local assets, including the initial HTML, ensuring that your web app is reliably fast, even on a slow or unreliable network.

★ Cache assets

That's it for the frontend technology stack! 🎉

API Specification

Customer Contact

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Meeting Log

For communication with the customer it was decided that we solely rely on using Slack. We therefore did not meet in person regarding issues the customer should be notified of.

Changelog

Date	Iteration	Changes	Author
2018-03-08	First delivery.	None. Initial document	<i>Shared Effort</i>
2018-04-05	Sprint 3	Updating front-end with Patrick notes.	Alberto Encinas
2018-04-06	Sprint 3	Updated back-end info	Jeroen