Writing a Python web framework in 2021

By Emmanuelle Delescolle

@EmmaDelescolle

LevIT

Who am I?

- Emma
- Co-founder of LevIT
- Individual Member of the DSF
- Maintainer of DRF-Schema-Adapter and Cordy
- Maintainer of Ember-cli-crudities

Why?

- The major Python webframeworks are over 10yo. Things have changed
- Explore libraries unavailable/undocumented at the time
- Build API and Websockets into the main code
- Thought exercise

Then Vs Now

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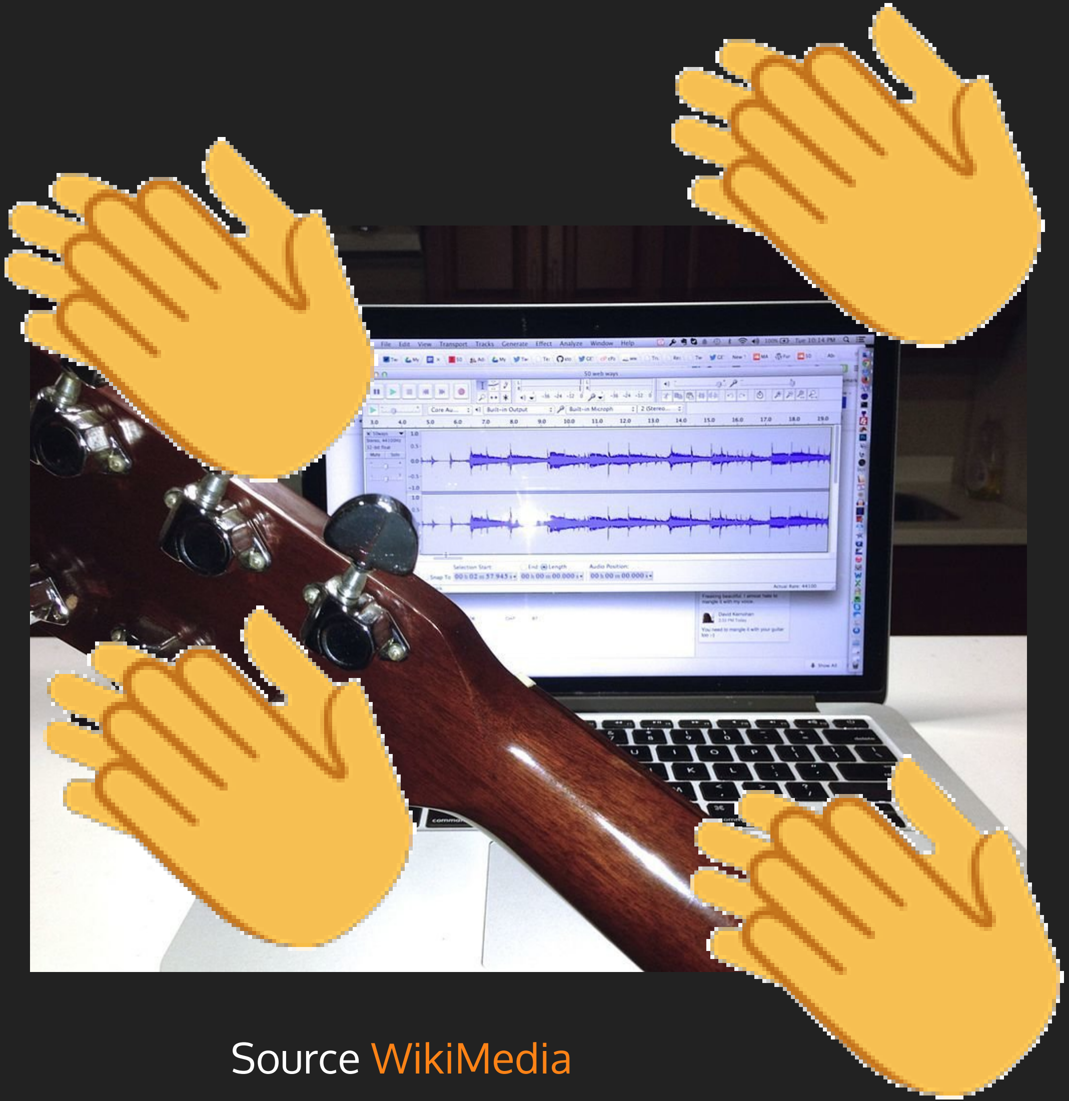


Source WikiMedia

Then Vs Now

Poor documentation of most libraries	A lot of Python packages are well documented
Little sense of community	Friendly Python community
Rails was the "reference"	Many Python web frameworks to get inspiration from. As well as Laravel, Spray, etc...
Server-rendered-pages was the main thing to have in mind	Rest API's and websockets have become primary concerns

What about…

- Sanic
- FastAPI
- Falcon
- Quark
- autobahn
- Starlet
- Tornado
- ….

Let's go on a tour!

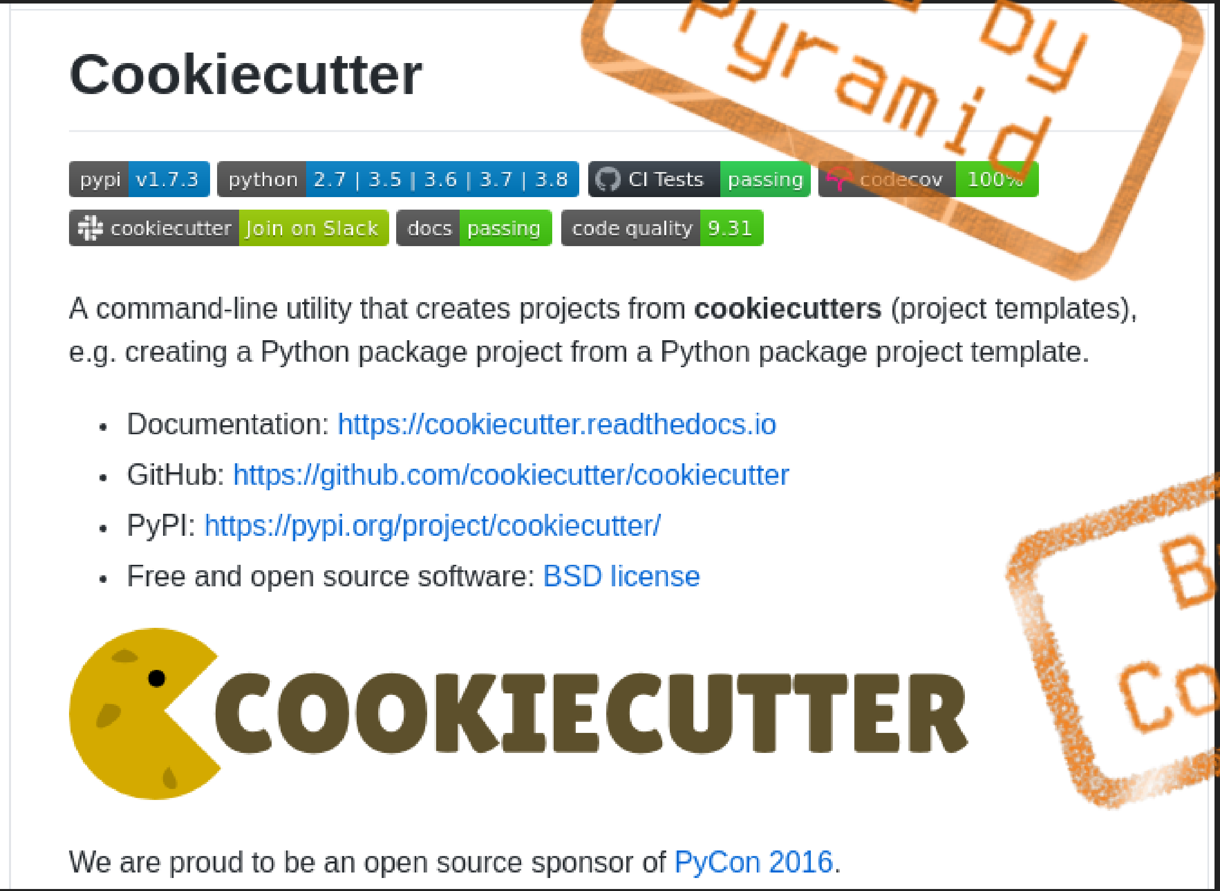
Source pixabay

Tour: Project Template

```
django-admin startproject splendid
./manage.py startapp core
```

```
cookiecutter gh:Pylons/pyramid-cookiecutter-starter \
--checkout 2.0-branch
```

```
cookiecutter cordy_project
cookiecutter cordy_app
```



Cookiecutter

pypi v1.7.3 | python 2.7 | 3.5 | 3.6 | 3.7 | 3.8 | CI Tests passing | codecov 100% | cookiecutter Join on Slack | docs passing | code quality 9.31

A command-line utility that creates projects from **cookiecutters** (project templates), e.g. creating a Python package project from a Python package project template.

- Documentation: https://cookiecutter.readthedocs.io
- GitHub: https://github.com/cookiecutter/cookiecutter
- PyPI: https://pypi.org/project/cookiecutter/
- Free and open source software: BSD license

COOKIECUTTER

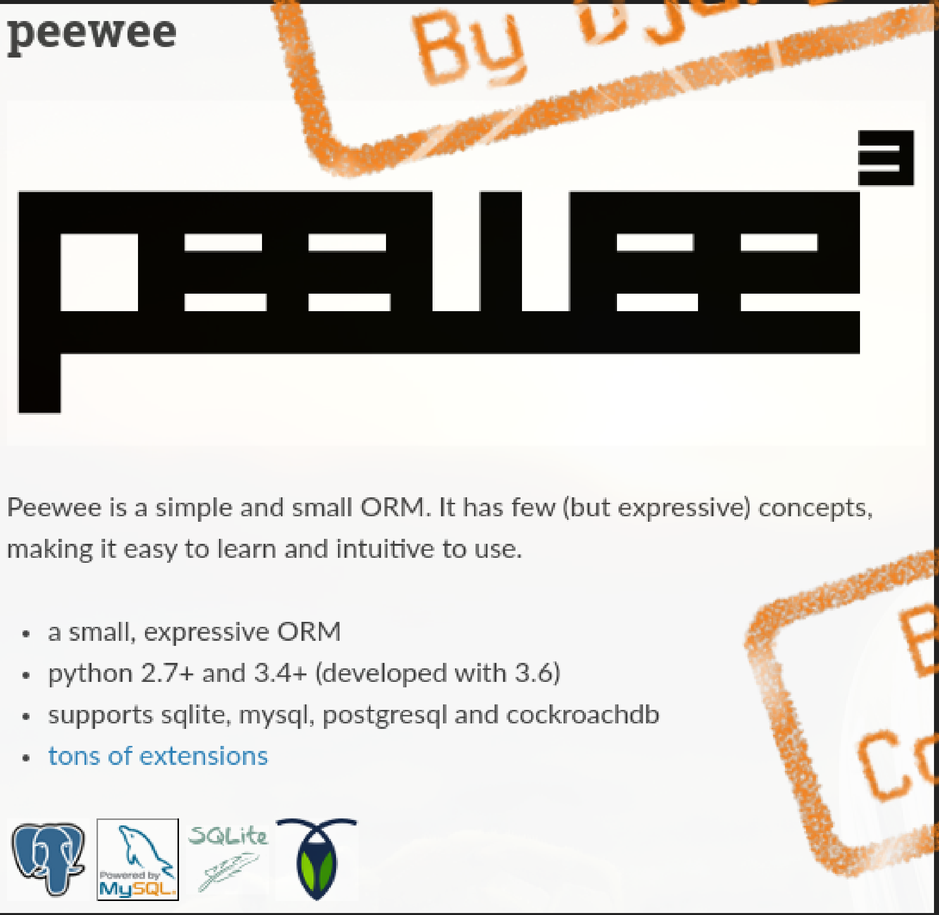
We are proud to be an open source sponsor of PyCon 2016.

Used by Pyramid

By Django Contributors

Tour: ORM

Inspired By Django


peewee

Peewee is a simple and small ORM. It has few (but expressive) concepts, making it easy to learn and intuitive to use.

- a small, expressive ORM
- python 2.7+ and 3.4+ (developed with 3.6)
- supports sqlite, mysql, postgresql and cockroachdb
- tons of extensions

By Django Contributors

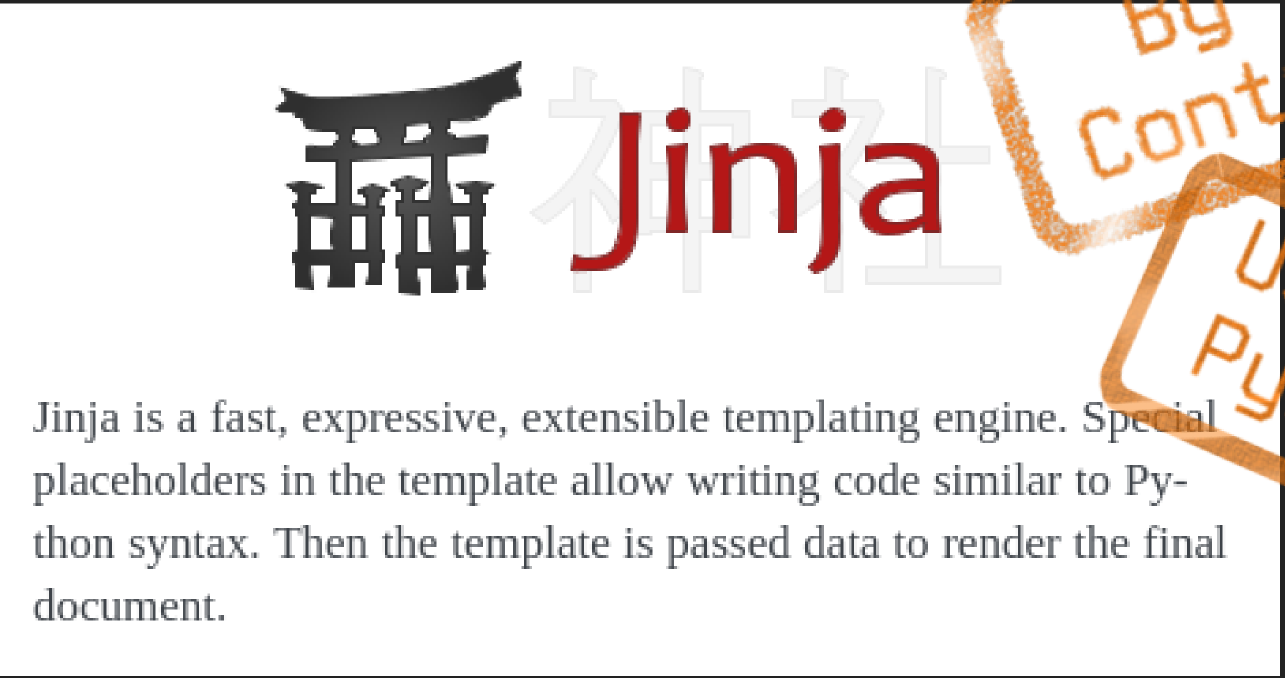
```
class Deck(Model):
    level = models.IntegerField()
    cards = JSONField()

Deck.objects.filter(level=2)
```

```
class Deck(Model):
    level = pw.IntegerField()
    cards = JSONField()

Deck.select().filter(level=2)
```

Tour: Template engine

```
<p>{{object.level}}</p>
{%if object.level == 3 %}
  <span>Many points</span>
{%endif%}
```

```
<p>{{object.level}}</p>
{%if object.level == 3 %}
  <span>Many points</span>
{%endif%}
```



Jinja

Jinja is a fast, expressive, extensible templating engine. Special placeholders in the template allow writing code similar to Python syntax. Then the template is passed data to render the final document.

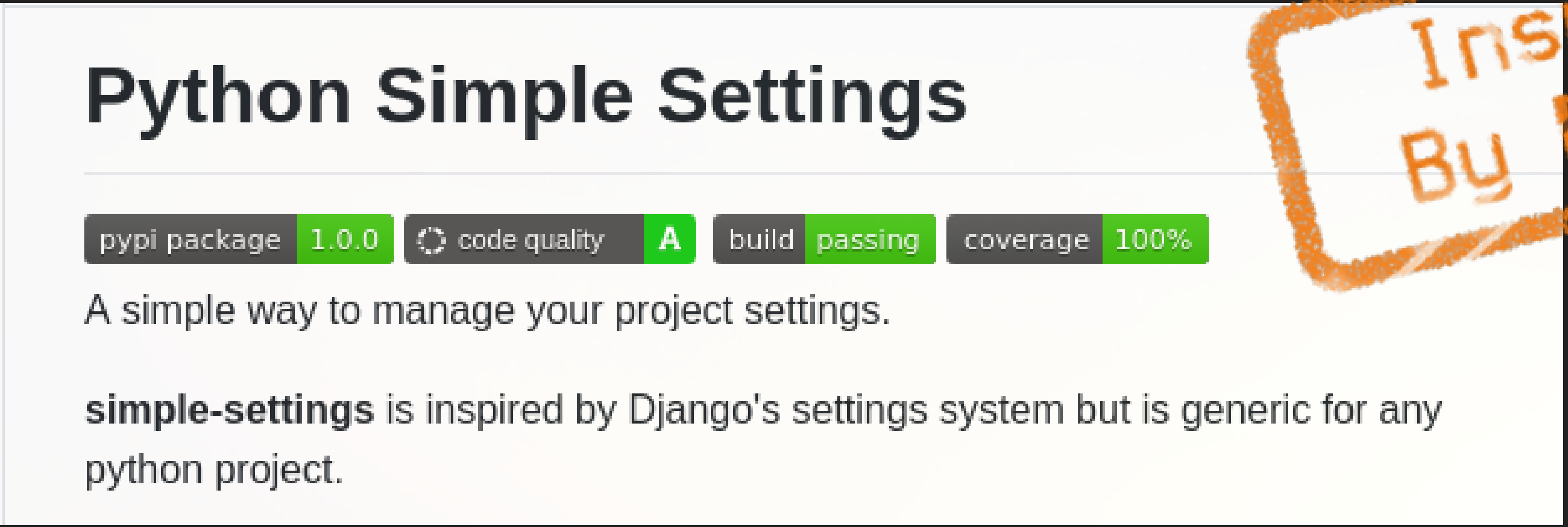
By Django Contributors

Used by Pyramid

Tour: Settings

```python
from django.conf import settings

print(settings.SOME_VAR)
```

```python
from simple_settings import settings

print(settings.SOME_VAR)
```



Python Simple Settings

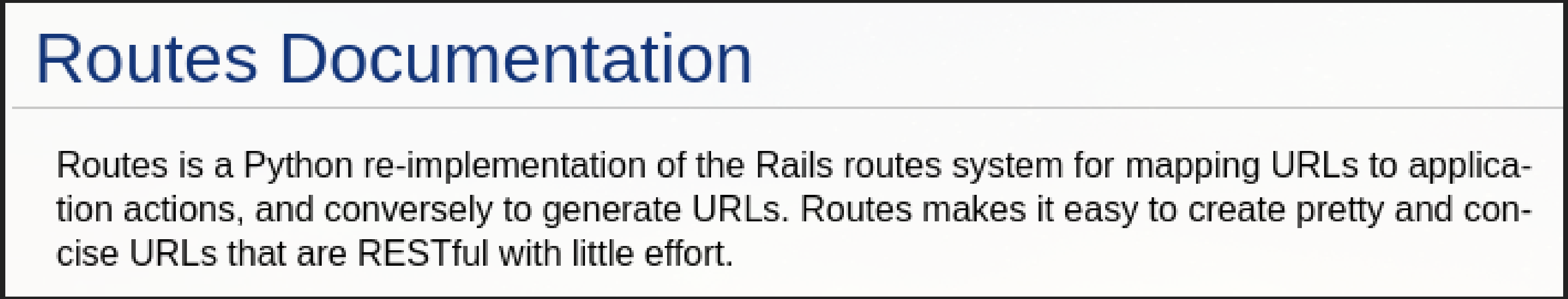
pypi package 1.0.0 | code quality A | build passing | coverage 100%

A simple way to manage your project settings.

simple-settings is inspired by Django's settings system but is generic for any python project.

Tour: Routing

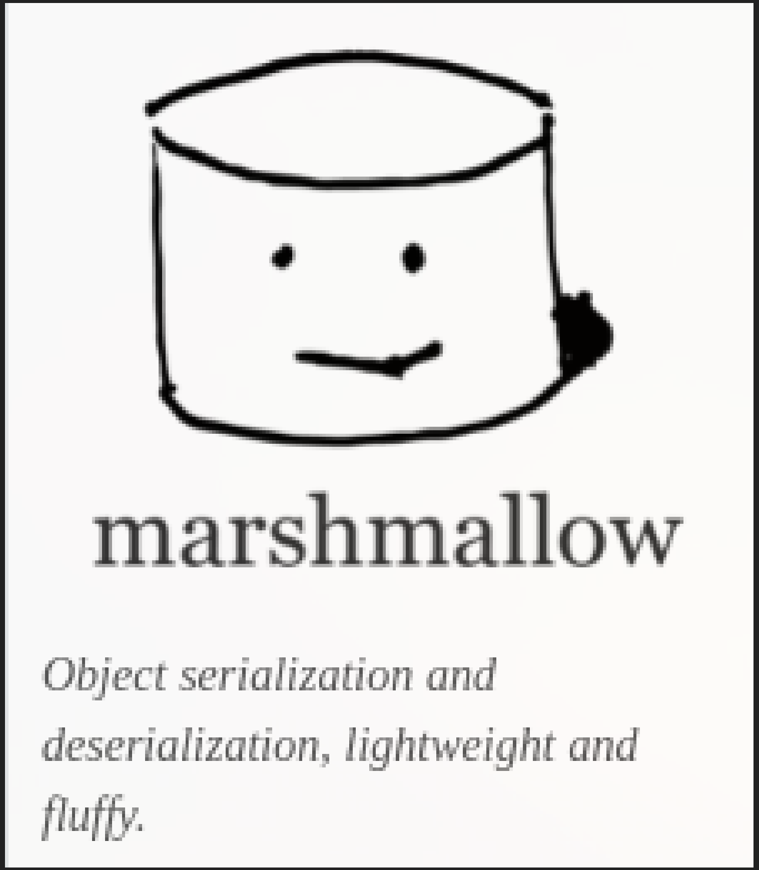
```python
from route.route import Route


url_map = [
        Route('infos', '/deck/{id}/info', controller='myapp.DeckViewSet', action='info'),
]
```



Routes Documentation

Routes is a Python re-implementation of the Rails routes system for mapping URLs to applica-
tion actions, and conversely to generate URLs. Routes makes it easy to create pretty and con-
cise URLs that are RESTful with little effort.

Tour: (De)Serialization


marshmallow
Object serialization and deserialization, lightweight and fluffy.

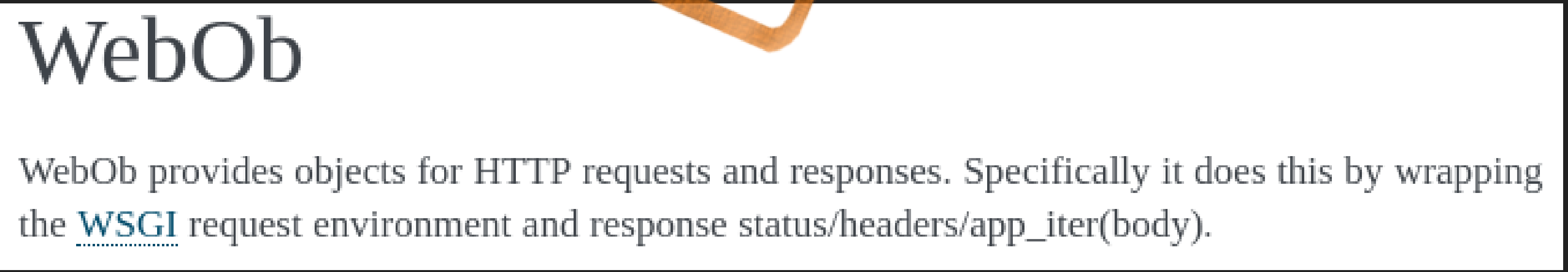
```python
from marshmallow import fields, Schema

class UserCreateSerializer(Schema):
    username = fields.String()
    password = fields.String()
```

Tour:

Request/Response

Used by Pyramid

```
if request.method == 'GET':
    do_something()
elif request.method == 'POST':
    do_something_else()

return Response(text="Here's the text of the Web page."')
```



WebOb

WebOb provides objects for HTTP requests and responses. Specifically it does this by wrapping the WSGI request environment and response status/headers/app_iter(body).

Tour: Command-Line

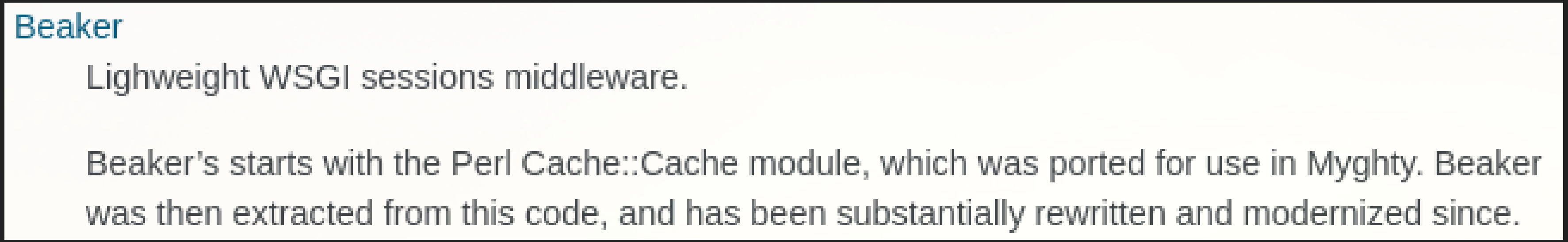
```
@click.command()
@click.argument('poll_ids', nargs=-1)
def hello(poll_ids=()):
    # do something
```

Click is a Python package for creating beautiful command line interfaces in a composable way with as little code as necessary. It's the "Command Line Interface Creation Kit". It's highly configurable but comes with sensible defaults out of the box.

Tour: Middlewares

WSGI middlewares

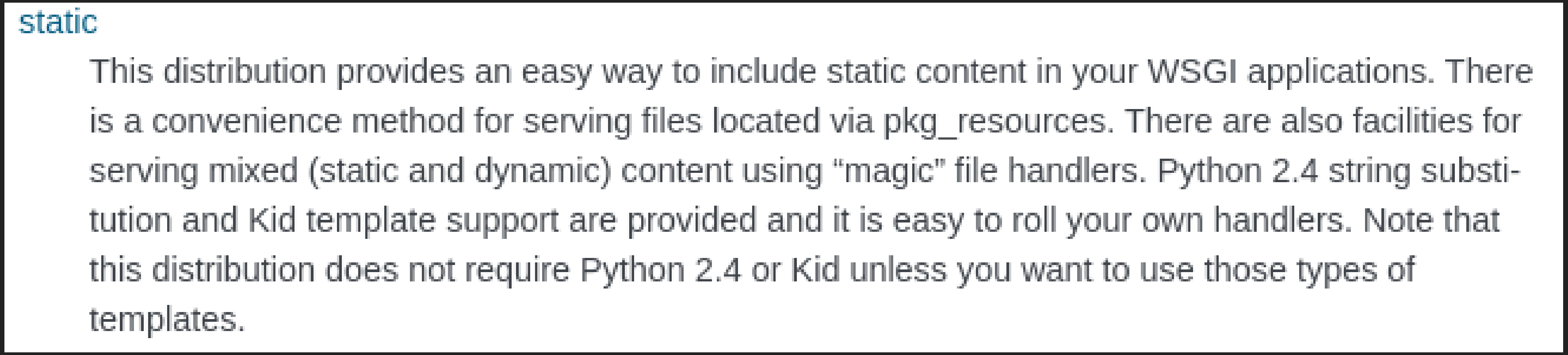
IE: fancy name function wrappers



Beaker

Lighweight WSGI sessions middleware.

Beaker's starts with the Perl Cache::Cache module, which was ported for use in Myghty. Beaker was then extracted from this code, and has been substantially rewritten and modernized since.



static

This distribution provides an easy way to include static content in your WSGI applications. There is a convenience method for serving files located via pkg_resources. There are also facilities for serving mixed (static and dynamic) content using "magic" file handlers. Python 2.4 string substitution and Kid template support are provided and it is easy to roll your own handlers. Note that this distribution does not require Python 2.4 or Kid unless you want to use those types of templates.

Tour: Special *SGI implementation

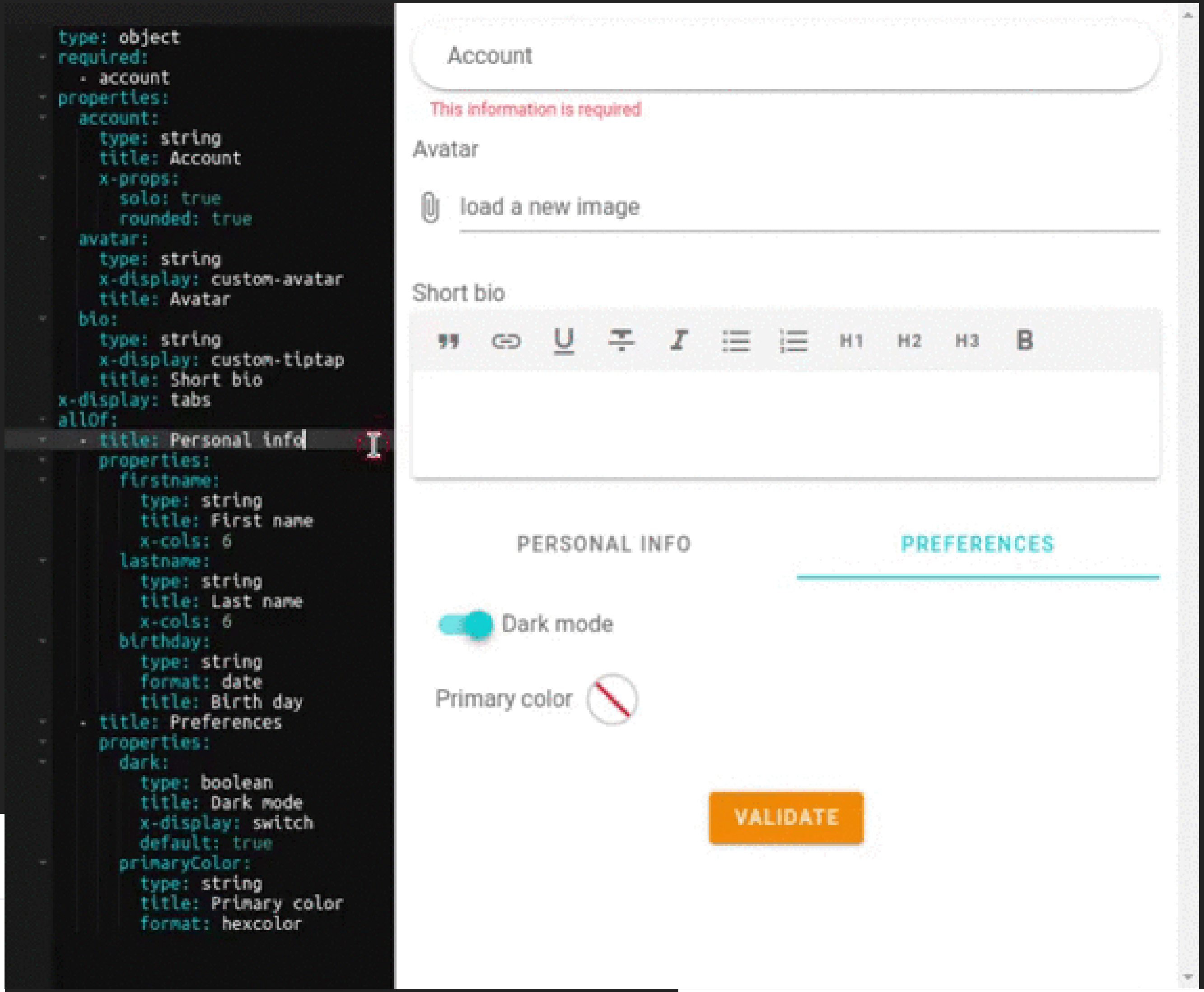
to support websockets

```
def application(env, start_response):
    uwsgi.websocket_handshake(env['HTTP_SEC_WEBSOCKET_KEY'], env.get('HTTP_ORIGIN', ''))
    while True:
        msg = uwsgi.websocket_recv()
        uwsgi.websocket_send(msg)
```

The uWSGI project

The uWSGI project aims at developing a full stack for building hosting services.

Tour: Form Builder



```
type: object
required:
  - account
properties:
  account:
    type: string
    title: Account
    x-props:
      solo: true
      rounded: true
  avatar:
    type: string
    x-display: custom-avatar
    title: Avatar
  bio:
    type: string
    x-display: custom-tiptap
    title: Short bio
x-display: tabs
allOf:
  - title: Personal info
    properties:
      firstname:
        type: string
        title: First name
        x-cols: 6
      lastname:
        type: string
        title: Last name
        x-cols: 6
      birthday:
        type: string
        format: date
        title: Birth day
  - title: Preferences
    properties:
      dark:
        type: boolean
        title: Dark mode
        x-display: switch
        default: true
      primaryColor:
        type: string
        title: Primary color
        format: hexcolor
```

Account

This information is required

Avatar

load a new image

Short bio

Dark mode

Primary color

vjsf

vuetify-jsonschema-form

Create beautiful and low-effort forms that output valid data.

Based on Vue.js / Vuetify / JSON Schema.

marshmallow-jsonschema v0.11.1

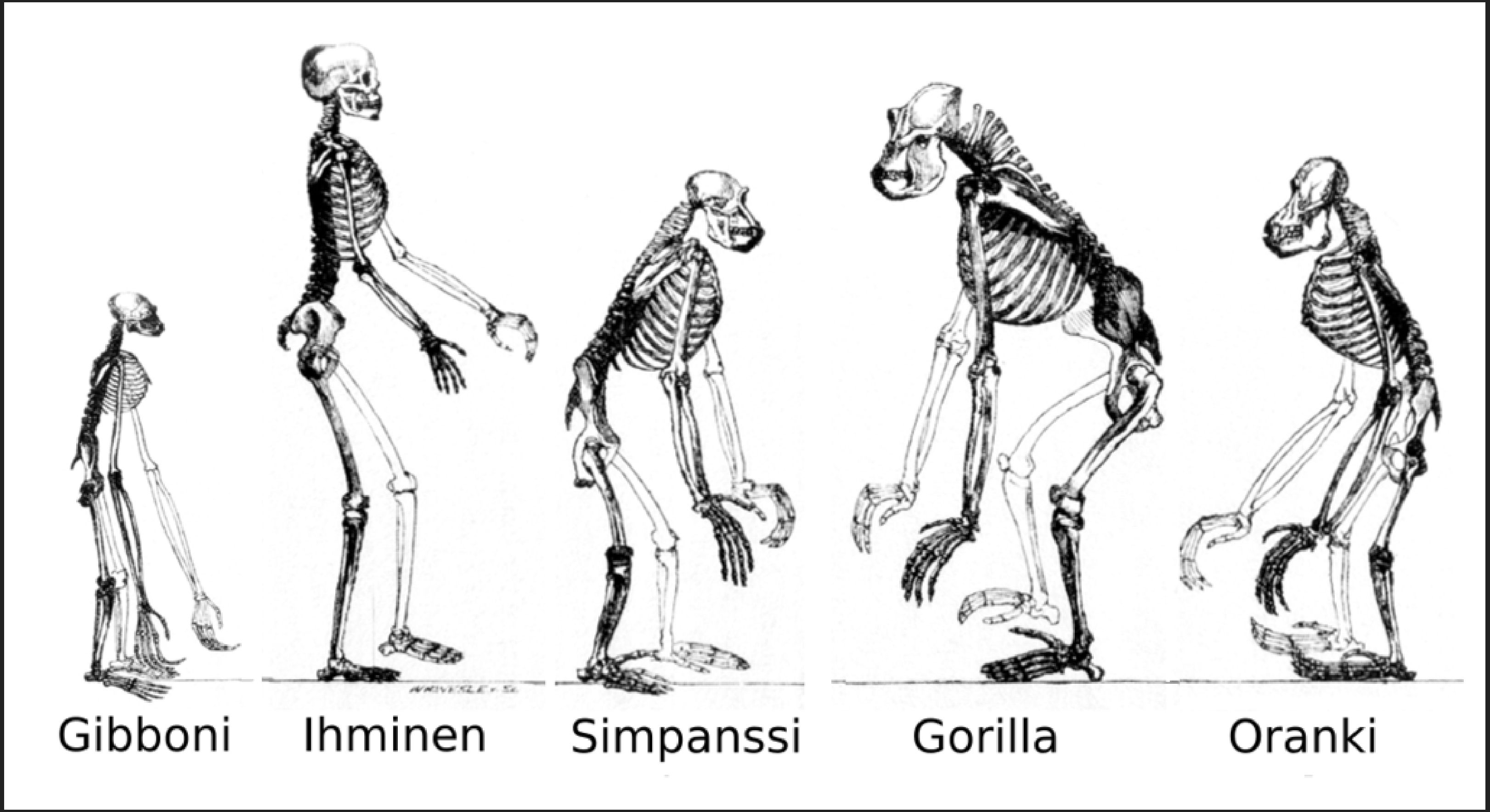
JSON Schema Draft v7 (http://json-schema.org/) formatting with marshmallow

Put everything in the blender and press power ?

Source flickr

Almost... But not exactly!

Missing links



Source WikiMedia

Missing Links

- CSRF
- Authentication
- Admin?
- "glue"

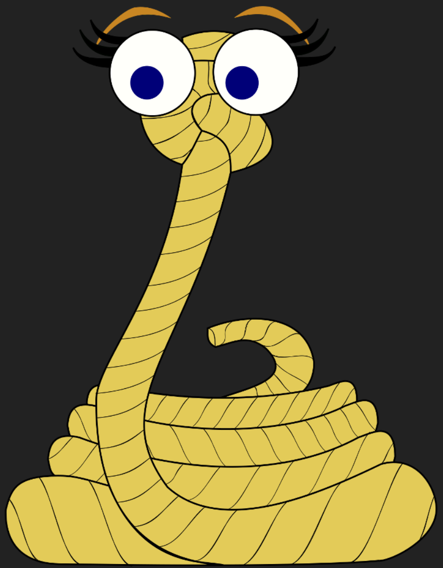
Missing Links

- CSRF
- Authentication
- Admin
- "glue"

} -> Copy from Django

-> Use "regular" form handling

-> Cordy

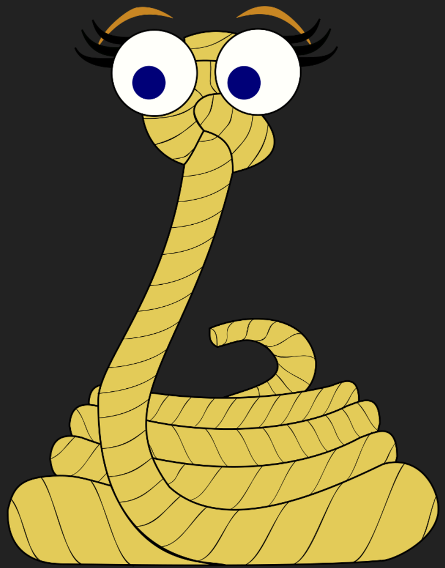


What is Cordy?

Annie Cordy

Belgian actress and singer

Léonie, Baroness Cooreman, known by the stage name Annie Cordy, was a Belgian actress and singer. She appeared in more than 50 films from 1954. King Albert II of Belgium bestowed upon her the title of Baroness in recognition for her life's achievements.

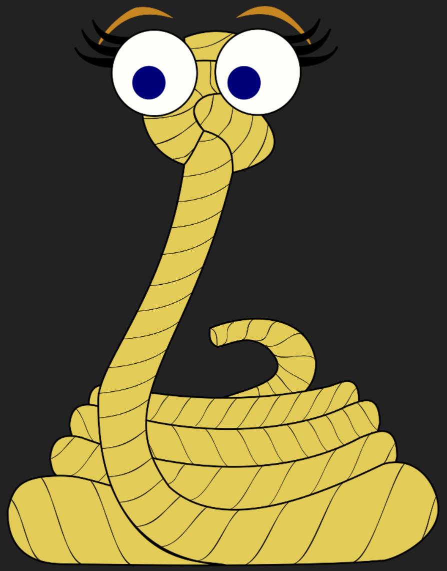


What is Cordy?

Cordy is a way to rope-in all the libraries and components mentioned before.

It is a thought experiment

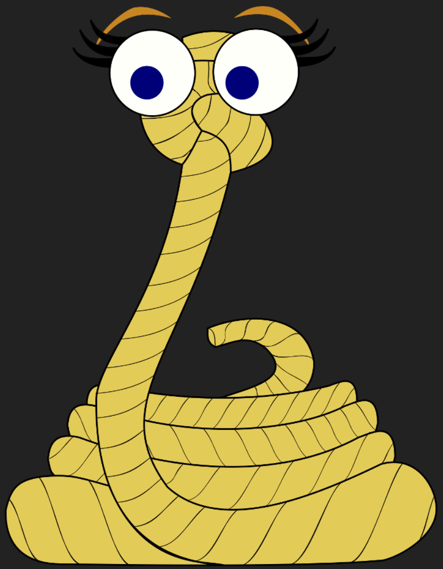
Hopefully it can serve as inspiration for the future of Django



What is Cordy?

models.py example

```python
from cordy.auth.models import BaseUser, Group
from cordy.db.models import Model

import peewee as pw


class ToDo(Model):

    description = pw.TextField()
    is_done = pw.BooleanField(null=True)


class User(BaseUser):

    groups = pw.ManyToManyField(Group, backref='users')


UserGroup = User.groups.get_through_model()
```

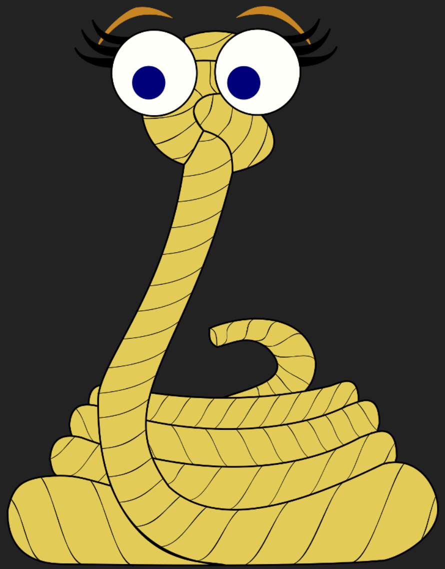


What is Cordy?

controllers.py example

```python
class Controller(CordyController):

    @action(needs_id=False)
    def index(self):
        return HTMLResponse(content="<h1>Hello World</h1>")


 class ToDoViewSet(CRUDViewSet):

    Model = ToDo
    pagination_class = PageNumberPagination
    page_size = 2
    filter_fields = ['is_done']
    search_fields = ['description', ]


@authorize_with(AllowAll)
class ToDoHTML(HTMLCRUDViewSet):

    Model = ToDo

    @action(needs_id=False)
    @login_required()
    def index(self, *args, **kwargs):
        return super().index(*args, **kwargs)
```

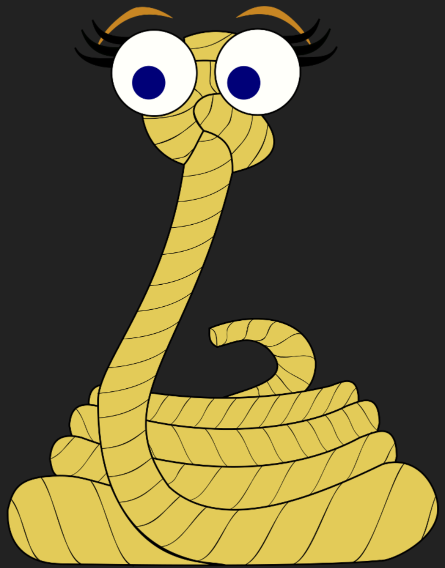
```python
class WSController(CordyWSController):

    def on_connect(self):
        print('WS Connect')

    def on_receive(self, data):
        self.send(data['data'])

    def on_message(self, message):
        print('Received message:', message)

    def on_disconnect(self):
        print('WS Disconnected')
```



What is Cordy?

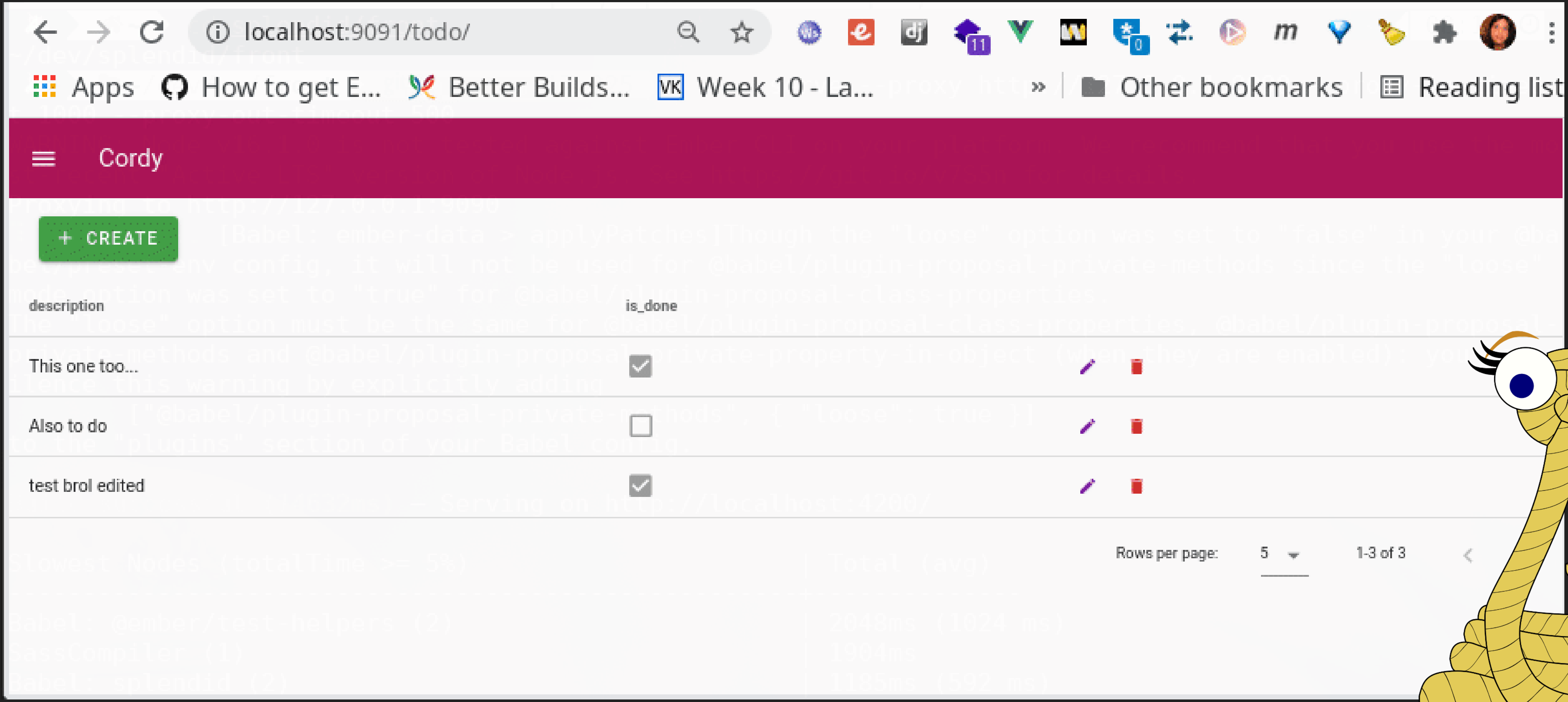
urls.py example

```python
from routes.route import Route

from cordy.auth.controllers import AuthController
from cordy.crud.controllers import OpenAPIView
from cordy.utils import include

from myapp.controllers import Controller, ToDoViewSet, Routes, ToDoHTML


url_map = [
    *Controller.get_routes(prefix=''),
    *Routes.get_routes(),
    include(ToDoViewSet.get_routes(), '/api/v1'),
    include(OpenAPIView.get_routes(prefix='v1', path='/api/v1/'), '/apidocs'),
    include(ToDoHTML.get_routes(prefix='todo'), ''),
    include(AuthController.get_routes(prefix='auth'), '/api'),
    Route('websocket', '/ws/', controller='myapp.WSController', action='connect'),
    Route('static', "/public/{path_info:.*}", controller='cordy.base.StaticFiles', action='serve'),
]
```



What is Cordy?

In Action



localhost:9091/todo/

Apps | How to get E... | Better Builds... | Week 10 - La... | Other bookmarks | Reading list

Cordy

+ CREATE

description	is_done
This one too...	✓
Also to do	☐
test brol edited	✓

Rows per page: 5 1-3 of 3

What would be the pros & cons?

People involved in Python web libraries are already involved in those libraries

Resources can be dedicated to the **core** of the framework

Overall less work needed

Loss of agency (dependent on library maintainers)

Maintaining a framework as a whole is easier

Possible loss of backward compatibility with new library releases

Questions

Root

Curry

Shell