[

**A Complete Beginner's Guide to Django - Part 1**

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**Introduction**

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Today I'm starting a new tutorial series about Django fundamentals. It's a complete beginner's guide to start learning Django. The material is divided into seven parts. We're going to explore all the basic concepts in great detail, from installation, preparation of the development environment, models, views, templates, URLs to more advanced topics such as migrations, testing, and deployment.

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I wanted to do something different. A tutorial that would be easy to follow, informative and fun to read. That was when I came up with the idea to create some comics along the text to illustrate some concepts and scenarios. I hope you enjoy the reading!

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But before we start…

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Back when I worked as a substitute professor in a university, I used to teach an introduction to web development discipline for the newcomer students in the

Computer Science course. And I would always start new classes with this Confucius quote:

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So, hands on! Don't just read the tutorials. Let's do it together! You will learn much more by doing and practicing.

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**Why Django?**

Django is a Web framework written in Python. A Web framework is a software that supports the development of dynamic Web sites, applications, and services. It provides a set of tools and functionalities that solves many common problems associated with Web development, such as security features, database access, sessions, template processing, URL routing, internationalization, localization, and much more.

Using a Web framework, such as Django, enables us to develop secure and reliable Web applications very quickly in a standardized way, without having to reinvent the wheel.

So, what's so special about Django? For starters, it's a Python Web framework, which means you can benefit from wide a range of open source libraries out there. The Python Package Index repository hosts over **116K** packages (as per 6 of Sep. 2017). If you need to solve a specific problem, the chances are someone has already implemented a library for it.

Django is one of the most popular Web frameworks written in Python. It's definitely the most complete, offering a wide range of features out-of-the-box,

such as a standalone Web server for development and testing, caching, middleware system, ORM, template engine, form processing, interface with Python's unit testing tools. Django also comes with *battery included*, offering built-in applications such as an authentication system, an administrative interface with automatically generated pages for CRUD operations, generation of syndication feeds (RSS/Atom), sitemaps. There's even a Geographic Information System (GIS) framework built within Django.

The development of Django is supported by the Django Software Foundation, and it's sponsored by companies like JetBrains and Instagram. Django has also been around for quite some time now. It's under active development for more than 12 years now, proving to be a mature, reliable and secure Web framework.

**Who's Using Django?**

It's good to know who is using Django out there, so to have an idea what you can do with it. Among the biggest Web sites using Django we have: Instagram, Disqus, Mozilla, Bitbucket, Last.fm, National Geographic.

For more examples you can see the Django Sites database, they offer a list of over **5K** Django-powered Web sites.

By the way, last year, in the Django Under The Hood 2016 conference, Carl Meyer, a Django core developer, and Instagram employee, gave a talk on how Instagram use Django at scale and how it supported their growth. It's a one hour talk, but if you are interested in learning more, it was an entertaining talk.

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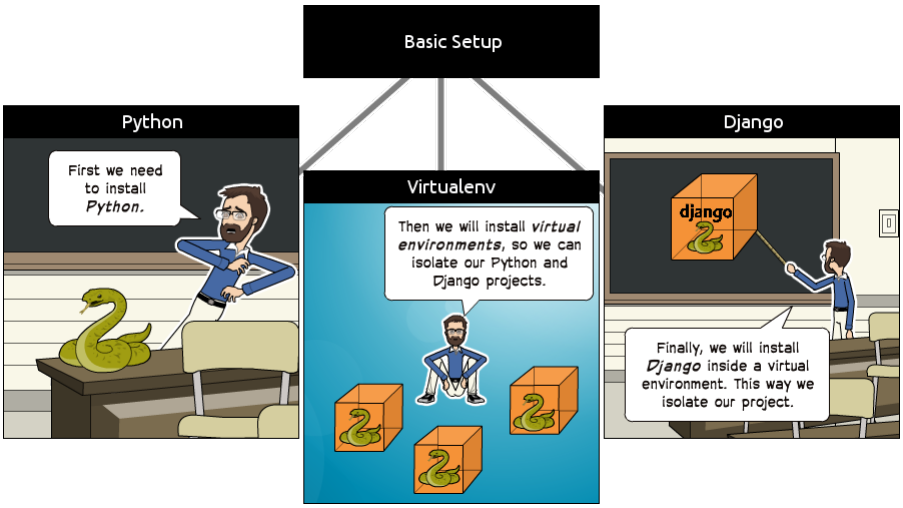
**Installation**

The first thing we need to do is install some programs on our machine so to be able to start playing with Django. The basic setup consists of installing **Python**, **Virtualenv**, and **Django**.




Using virtual environments is not mandatory, but it's highly recommended. If you are just getting started, it's better to start with the right foot.

When developing Web sites or Web projects with Django, it's very common to have to install external libraries to support the development. Using virtual environments, each project you develop will have its isolated environment. So the dependencies won't clash. It also allows you to maintain in your local machine projects that run on different Django versions.

It's very straightforward to use it, you will see!

**Installing Python 3.6.2**

The first thing we want to do is install the latest Python distribution, which is **Python 3.6.2**. At least it was, by the time I was writing this tutorial. If there's a newer version out there, go with it. The next steps should remain more or less the same.

We are going to use Python 3 because the most important Python libraries have already been ported to Python 3 and also the next major Django version (2.x) won't support Python 2 anymore. So Python 3 is the way to go.

The best way to go is with Homebrew. If you don't have it installed on your Mac yet, run the following command in the **Terminal**:

```
/usr/bin/ruby -e "$(curl -fsSL https://raw.githubuse
```

If you don't have the **Command Line Tools** installed, the Homebrew installation might take a little bit longer. But it will take care of everything for

you, so no worries. Just sit back and wait until the installation completes.

You will know when the installation completes when you see the following message:

```
==> Installation successful!

==> Homebrew has enabled anonymous aggregate user be
Read the analytics documentation (and how to opt-out
  https://docs.brew.sh/Analytics.html

==> Next steps:
- Run `brew help` to get started
- Further documentation:
    https://docs.brew.sh
```

To install Python 3, run the command below:

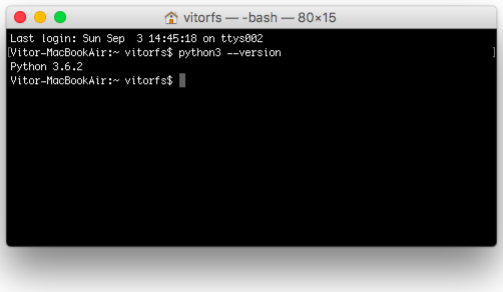
```
brew install python3
```

Since macOS already ships with Python 2 installed, after you install Python 3, you will have both versions available.

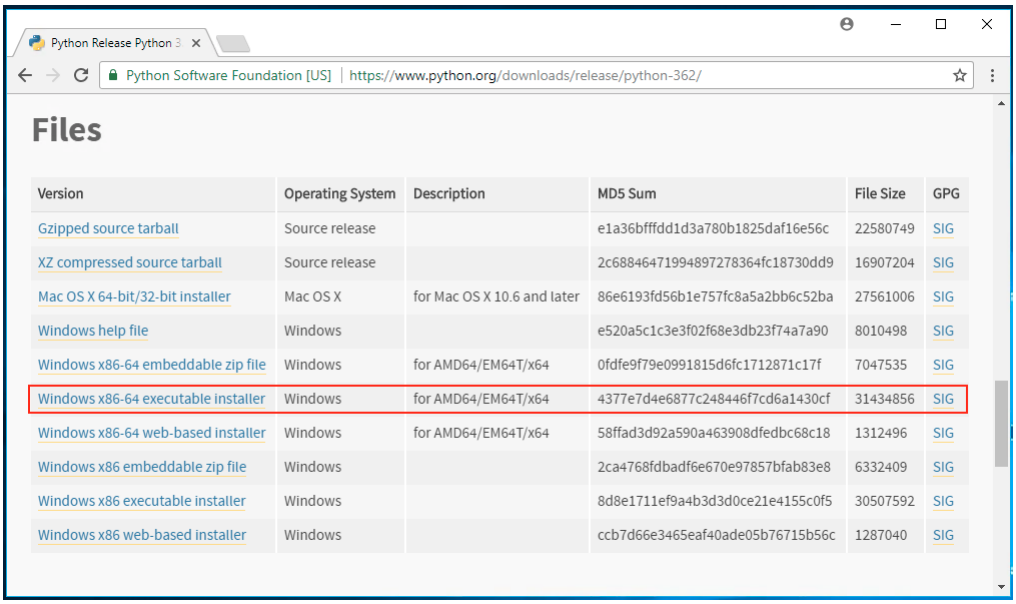
To run Python 2, use the `python` command in the Terminal. For Python 3, use `python3` instead.

We can test the installation by typing in the Terminal:

```
python3 --version
Python 3.6.2
```

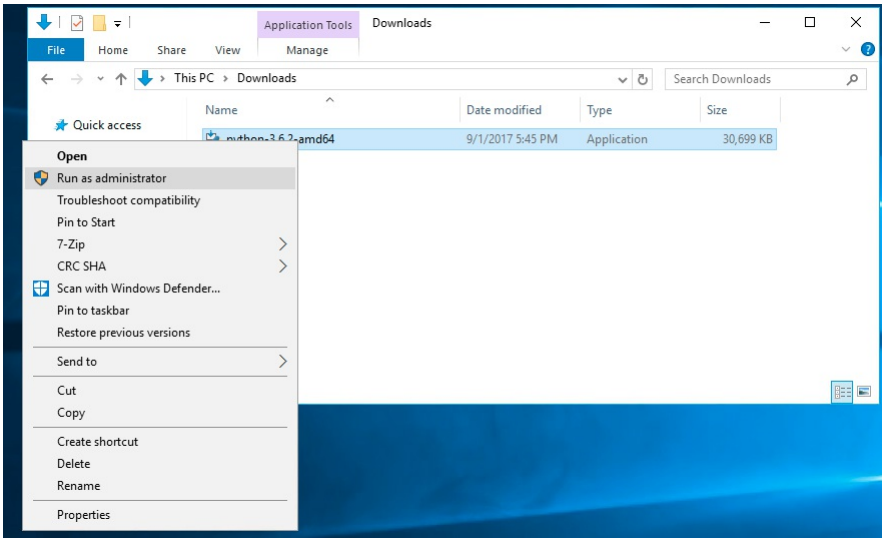



Go to www.python.org click on the Python 3.6.2 download page, scroll down until you see the download files listed below:

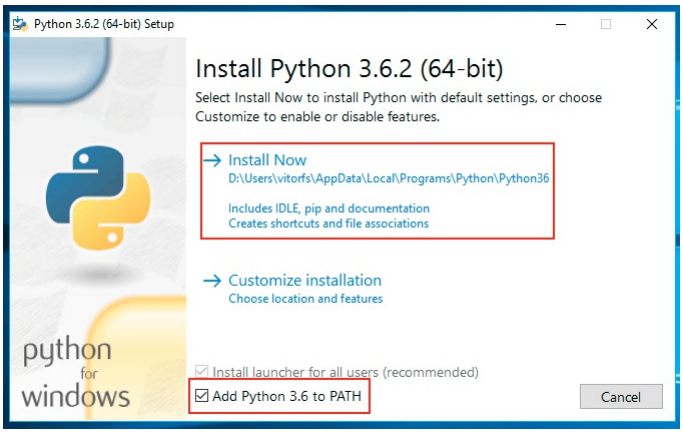



Pick the right version accordingly to your Windows distribution. If you are not sure which one is the right for you, the chances are you want to download the **Windows x86-64 executable installer** version.

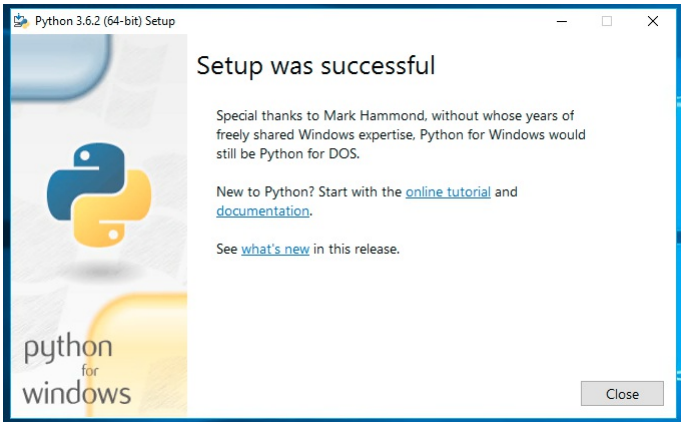
Go to your Downloads directory, right click on the installer and click on **Run as administrator**.



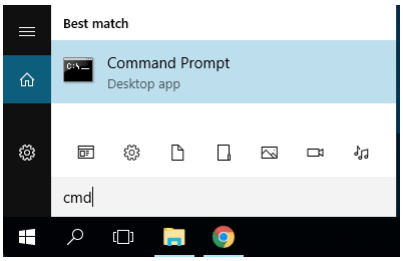

Make sure you check the option **Add Python 3.6 to PATH** and click on the **Install Now** option.




After the installation completes, you should see the following screen:




Now search for the **Command Prompt** program and open it:

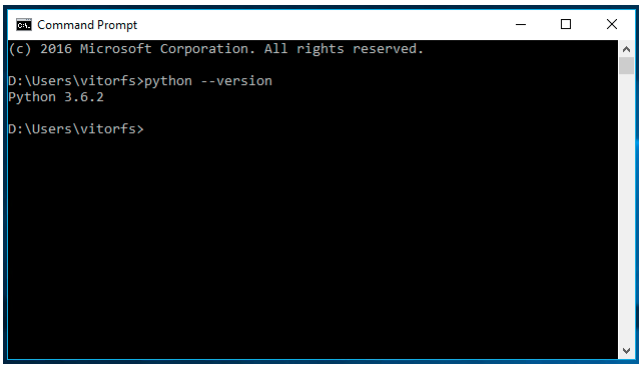



To test if everything is working fine so far, type following command:

```
python --version
```

As an output you should see:

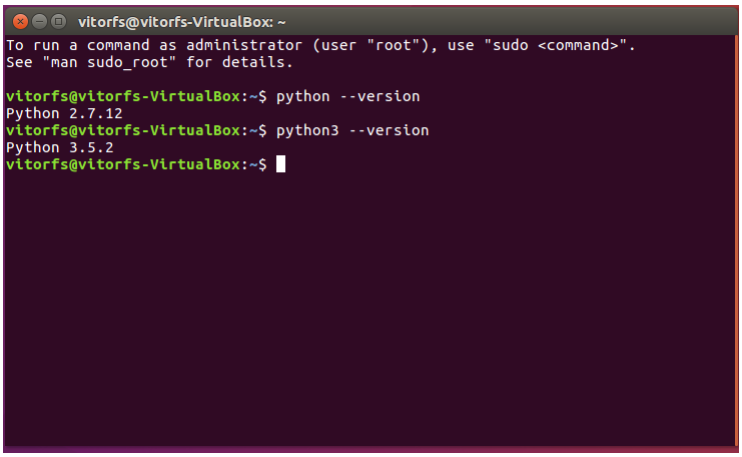
```
Python 3.6.2
```




For this tutorial, I will be using Ubuntu 16.04 as an example. Ubuntu 16.04 already comes with both Python 2 (available as `python`), and Python 3 (available as `python3`) installed. We can test the installation by opening the **Terminal** and checking the versions:

```
python --version
Python 2.7.12

python3 --version
Python 3.5.2
```




So all we have to do is install a newer Python 3 version. But we don't want to mess with the current Python 3.5.2, as the OS makes use of it. We're simply going to install Python 3.6.2 under the name `python3.6` and let the older version be.

If you are using Ubuntu 16.04 or an older version, first add the following repository:

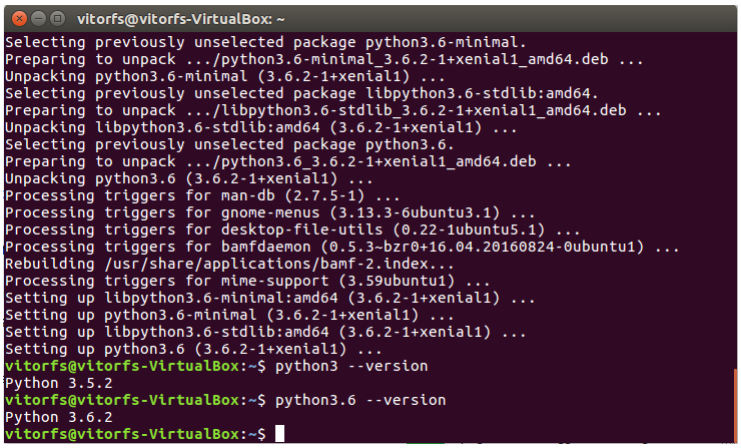
```
sudo add-apt-repository ppa:deadsnakes/ppa
```

If you are using Ubuntu 16.10, 17.04 or 17.10 you don't need to perform the step above.

Now everyone executes the following commands to install the latest Python 3 distribution:

```
sudo apt-get update
sudo apt-get install python3.6
```

The new installation will be available under `python3.6`, which is fine:




Great, Python is up and running. Next step: Virtual Environments!

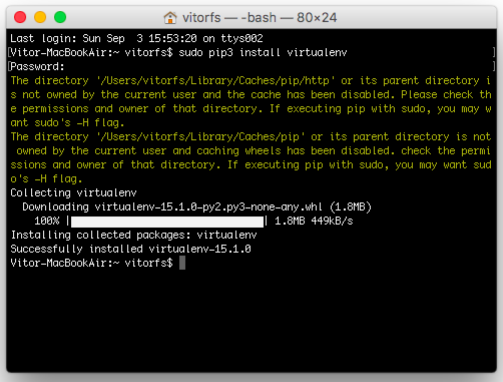
## Installing Virtualenv

For the next step, we are going to use **pip**, a tool to manage and install Python packages, to install **virtualenv**.

Note that Homebrew already installed **pip** for you under the name `pip3` for your Python 3.6.2 installation.

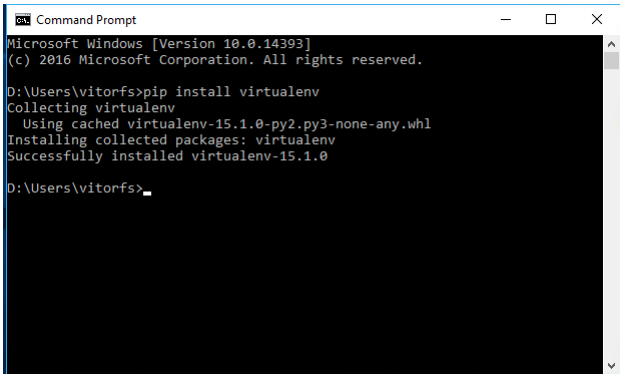
In the Terminal, execute the command below:

```
sudo pip3 install virtualenv
```




In the Command Prompt, execute the command below:

```
pip install virtualenv
```

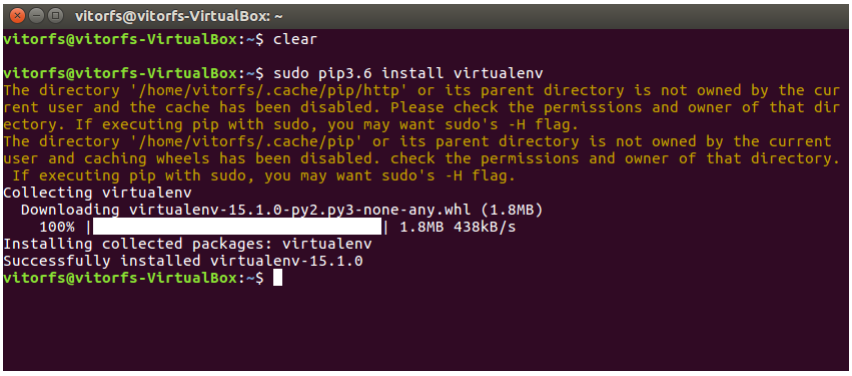



First let's install **pip** for our Python 3.6.2 version:

```
wget https://bootstrap.pypa.io/get-pip.py
sudo python3.6 get-pip.py
```

Now we can install **virtualenv**:

```
sudo pip3.6 install virtualenv
```



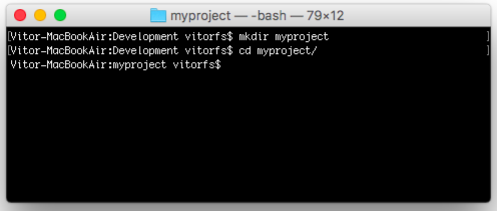
So far the installations that we performed was system-wide. From now on, everything we install, including Django itself, will be installed inside a Virtual Environment.

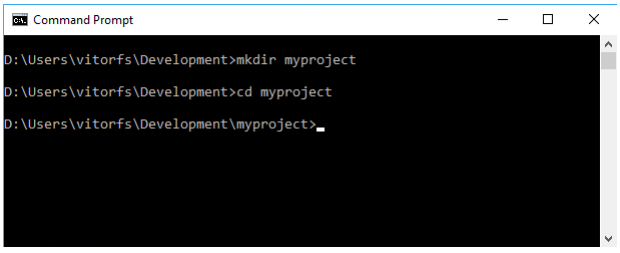
Think of it like this: for each Django project you start, you will first create a Virtual Environment for it. It's like having a sandbox for each Django project. So you can play around, install packages, uninstall packages without breaking anything.

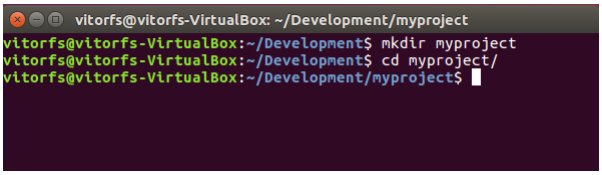
I like to create a folder named **Development** on my personal computer. Then, I use it to organize all my projects and websites. But you can follow the next steps creating the directories wherever it feels right for you.

Usually, I start by creating a new folder with the project name inside my **Development** folder. Since this is going to be our very first project, we don't need to pick a fancy name or anything. For now, we can call it **myproject**.

```
mkdir myproject
cd myproject
```



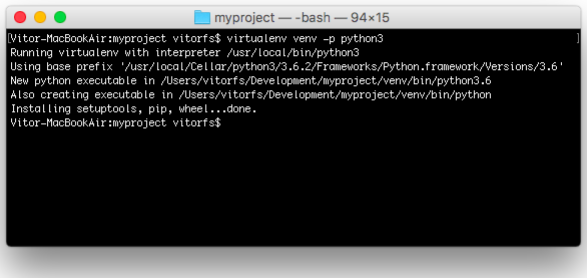




This folder is the higher level directory that will store all the files and things related to our Django project, including its virtual environment.

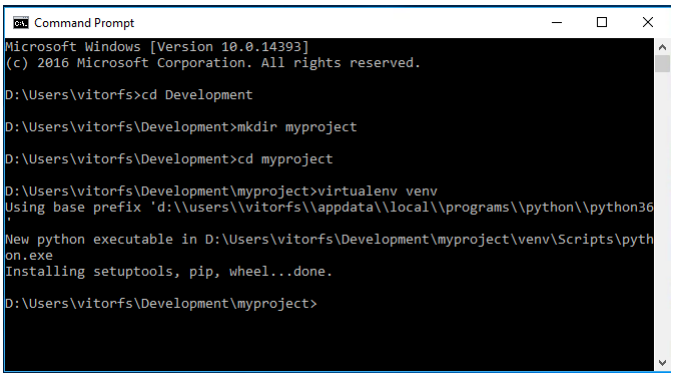
So let’s start by creating our very first virtual environment and installing Django.

Inside the **myproject** folder:

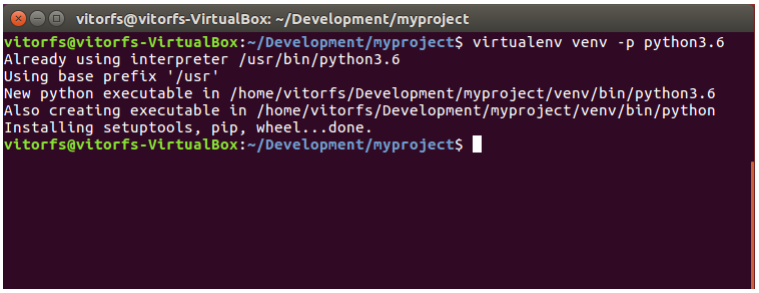
```
virtualenv venv -p python3
```




```
virtualenv venv
```




```
virtualenv venv -p python3.6
```



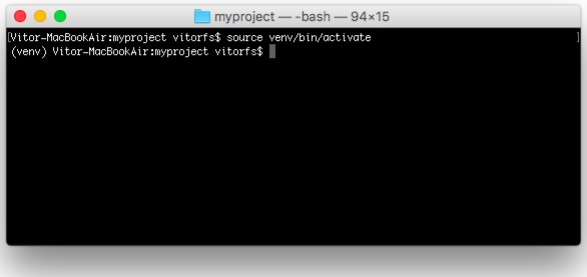

Our virtual environment is created. Now before we start using it, we need to activate:

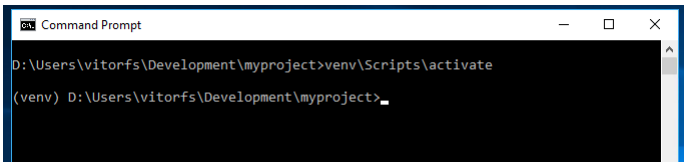
```
source venv/bin/activate
```

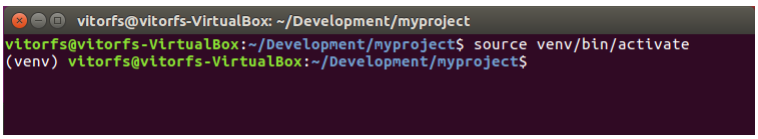
```
venv\Scripts\activate
```

```
source venv/bin/activate
```

You will know it worked if you see **(venv)** in front of the command line, like this:




Let's try to understand what happened here. We created a special folder named **venv**. It contains a copy of Python inside this folder. After we activated the **venv** environment, when we run the `python` command, it will use our local copy, stored inside **venv**, instead of the other one we installed earlier.

Another important thing is that the **pip** program is already installed as well, and when we use it to install a Python package, like Django, it will be installed *inside* the **venv** environment.

Note that when we have the **venv** activated, we will use the command `python` (instead of `python3`) to refer to Python 3.6.2, and just `pip` (instead of `pip3`) to install packages.

Note that when we have the **venv** activated, we will use the command `python` (instead of `python3.6`) to refer to Python 3.6.2, and just `pip` (instead of `pip3.6`) to install packages.

By the way, to deactivate the **venv** run the command below:

```
deactivate
```

```
venv\Scripts\deactivate.bat
```

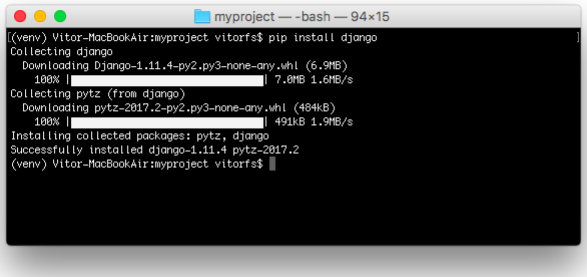
```
deactivate
```

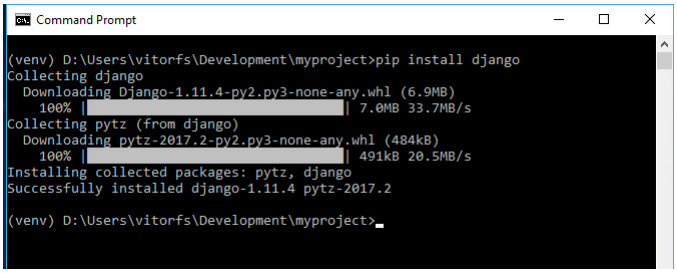
But let's keep it activated for the next steps.

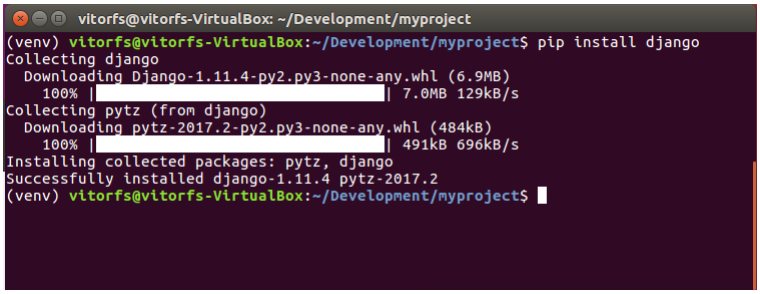
## Installing Django 1.11.4

It's very straightforward. Now that we have the **venv** activated, run the following command to install Django:

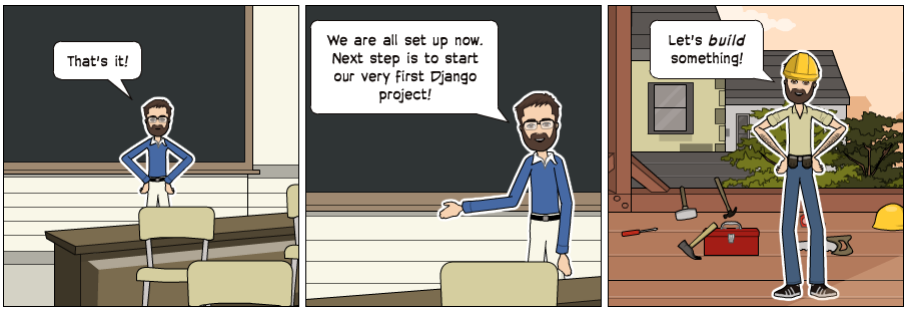
```
pip install django
```




We are all set up now!

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### Starting a New Project

To start a new Django project, run the command below:

```
django-admin startproject myproject
```

The command-line utility **django-admin** is automatically installed with Django.

After we run the command above, it will generate the base folder structure for a Django project.

Right now, our **myproject** directory looks like this:

```
myproject/                      <-- higher level folder
 |-- myproject/                 <-- django project folde
 |     |-- myproject/
 |     |     |-- __init__.py
 |     |     |-- settings.py
 |     |     |-- urls.py
 |     |     |-- wsgi.py
 |     +-- manage.py
 +-- venv/                      <-- virtual environment
```

Our initial project structure is composed of five files:

- **manage.py**: a shortcut to use the **django-admin** command-line utility. It's used to run management commands related to our project. We will use it to run the development server, run tests, create migrations and much more.
- **__init__.py**: this empty file tells Python that this folder is a Python package.
- **settings.py**: this file contains all the project's configuration. We will refer to this file all the time!
- **urls.py**: this file is responsible for mapping the routes and paths in our project. For example, if you want to show something in the URL `/about/`, you have to map it here first.

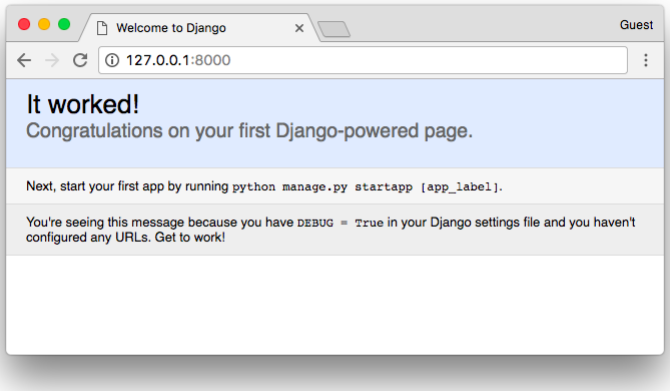
- **wsgi.py**: this file is a simple gateway interface used for deployment. You don't have to bother about it. Just let it be for now.

Django comes with a simple web server installed. It's very convenient during the development, so we don't have to install anything else to run the project locally. We can test it by executing the command:

```
python manage.py runserver
```

For now, you can ignore the migration errors; we will get to that later.

Now open the following URL in a Web browser: **http://127.0.0.1:8000** and you should see the following page:




Hit Control + C to stop the development server.

Hit CTRL + BREAK to stop the development server.

Hit Control + C to stop the development server.

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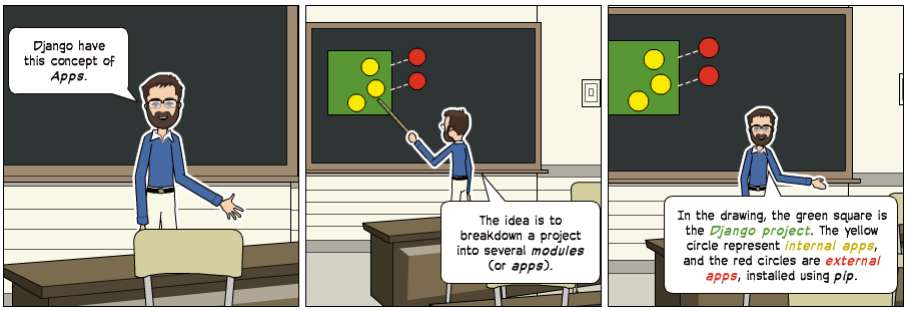
### Django Apps

In the Django philosophy we have two important concepts:

- **app**: is a Web application that does something. An app usually is composed of a set of models (database tables), views, templates, tests.
- **project**: is a collection of configurations and apps. One project can be composed of multiple apps, or a single app.

It's important to note that you can't run a Django **app** without a **project**. Simple

websites like a blog can be written entirely inside a single app, which could be named **blog** or **weblog** for example.




It's a way to organize the source code. In the beginning, it's not very trivial to determine what is an app or what is not. How to organize the code and so on. But don't worry much about that right now! Let's first get comfortable with Django's API and the fundamentals.

Alright! So, to illustrate let's create a simple Web Forum or Discussion Board. To create our first app, go to the directory where the **manage.py** file is and executes the following command:

```
django-admin startapp boards
```

Notice that we used the command **startapp** this time.

This will give us the following directory structure:

```
myproject/
 |-- myproject/
 |     |-- boards/                    <-- our new django
 |     |     |-- migrations/
 |     |     |     +-- __init__.py
 |     |     |-- __init__.py
 |     |     |-- admin.py
 |     |     |-- apps.py
 |     |     |-- models.py
 |     |     |-- tests.py
 |     |     +-- views.py
 |     |-- myproject/
 |     |     |-- __init__.py
 |     |     |-- settings.py
 |     |     |-- urls.py
 |     |     |-- wsgi.py
 |     +-- manage.py
 +-- venv/
```

So, let's first explore what each file does:

- **migrations/**: here Django store some files to keep track of the changes you create in the **models.py** file, so to keep the database and the **models.py** synchronized.
- **admin.py**: this is a configuration file for a built-in Django app called **Django Admin**.
- **apps.py**: this is a configuration file of the app itself.
- **models.py**: here is where we define the entities of our Web application. The models are translated automatically by Django into database tables.
- **tests.py**: this file is used to write unit tests for the app.
- **views.py**: this is the file where we handle the request/response cycle of our Web application.

Now that we created our first app, let's configure our project to *use* it.

To do that, open the **settings.py** and try to find the `INSTALLED_APPS` variable:

**settings.py**

```
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
]
```

As you can see, Django already come with 6 built-in apps installed. They offer common functionalities that most Web applications need, like authentication, sessions, static files management (images, javascripts, css, etc.) and so on.

We will explore those apps as we progress in this tutorial series. But for now, let them be and just add our **boards** app to the list of `INSTALLED_APPS`:

```
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
```

```
    'boards',
]
```

Using the analogy of the square and circles from the previous comic, the yellow circle would be our **boards** app, and the **django.contrib.admin**, **django.contrib.auth**, etc, would be the red circles.

---

**Hello, World!**

Let's write our first **view**. We will explore it in great detail in the next tutorial. But for now, let's just experiment how it looks like to create a new page with Django.

Open the **views.py** file inside the **boards** app, and add the following code:

**views.py**

```
from django.http import HttpResponse

def home(request):
    return HttpResponse('Hello, World!')
```

Views are Python functions that receive an `HttpRequest` object and returns an `HttpResponse` object. Receive a *request* as a parameter and returns a *response* as a result. That's the flow you have to keep in mind!

So, here we defined a simple view called **home** which simply returns a message saying **Hello, World!**.

Now we have to tell Django *when* to serve this view. It's done inside the **urls.py** file:

**urls.py**

```
from django.conf.urls import url
from django.contrib import admin

from boards import views

urlpatterns = [
    url(r'^$', views.home, name='home'),
    url(r'^admin/', admin.site.urls),
```

```
]
```

If you compare the snippet above with your **urls.py** file, you will notice I added the following new line: `url(r'^$', views.home, name='home')` and imported the **views** module from our app **boards** using `from boards import views`.

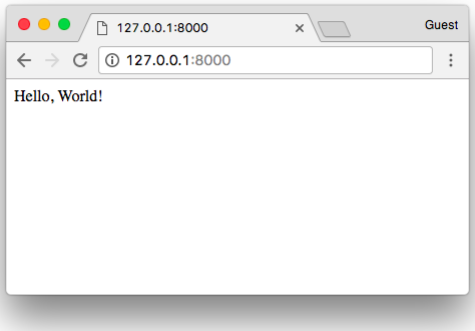
As I mentioned before, we will explore those concepts in great detail later on.

But for now, Django works with **regex** to match the requested URL. For our **home** view, I'm using the `^$` regex, which will match an empty path, which is the homepage (this url: **http://127.0.0.1:8000**). If I wanted to match the URL **http://127.0.0.1:8000/homepage/**, my url would be: `url(r'^homepage/$', views.home, name='home')`.

Let's see what happen:

```
python manage.py runserver
```

In a Web browser, open the http://127.0.0.1:8000 URL:




That's it! You just created your very first view.

---

**Conclusions**

That was the first part of this tutorial series. In this tutorial, we learned how to install the latest Python version and how to setup the development environment. We also had an introduction to virtual environments and started our very first Django project and already created our initial app.

I hope you enjoyed the first part! The second part is coming out next week, on

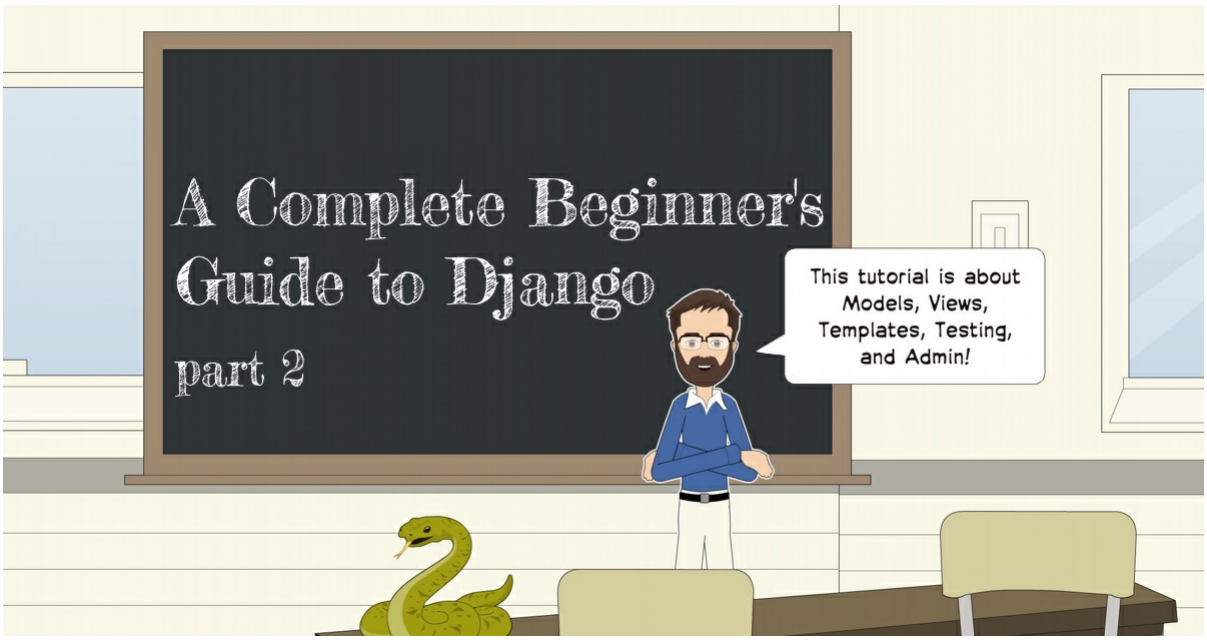
Sep 11, 2017. It's going to be about models, views, templates, and URLs. We will explore together all the Django fundamentals! If you would like to get notified when the second part is out, you can subscribe to our mailing list.

Just so we can stay on the same page, I made the source code available on GitHub. The current state of the project can be found under the release tag **v0.1-lw**. The link below will take you to the right place:

https://github.com/sibtc/django-beginners-guide/tree/v0.1-lw

---


**← Tutorial Series Index**



Part 2 - Fundamentals →

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[

**A Complete Beginner's Guide to Django - Part 2**

] ['\n',

**Introduction**

, '\n',

Welcome to the second part of our Django Tutorial! In the previous lesson, we installed everything that we needed. Hopefully, you are all setup with Python 3.6 installed and Django 1.11 running inside a Virtual Environment. We already created the project we are going to play around. In this lesson, we are going to keep writing code in the same project.

, '\n',

In the next section, we are going to talk a little bit about the project we are going to develop, so to give you some context. Then after that, you are going to learn all the Django fundamentals: models, admin, views, templates, and URLs.

, '\n',

Hands on!

, '\n',

---

**Web Board Project**

I don’t know about you, but personally, I learn much more by seeing practical examples and code snippets. For me, it’s difficult to process a concept where in the examples you read `Class A` and `Class B`, or when I see the classical `foo(bar)` examples. I don’t want to do that with you.

So, before we get into the fun part, playing with models, views, and everything. Let’s just take a moment and discuss very briefly about this project we are going to develop.

If you already have experience with Web development and feel it’s too much detail, you can just skim through the pictures to have an idea what we are going

to build and then jump to the **Models** section of this tutorial.

But if you are new to Web development, I highly suggest that you keep reading. It will give you some good insights on modeling and design of Web applications. Web development, and software development in general, is not just about coding.


## Use Case Diagram

Our project is a discussion board (a forum). The whole idea is to maintain several **boards**, which will behave like categories. Then, inside a specific board, a user can start a new discussion by creating a new **topic**. In this topic, other users can engage in the discussion posting replies.

We will need to find a way to differentiate a regular user from an admin user because only the admins are supposed to create new boards. Below, an overview of our main use cases and the role of each type of user:

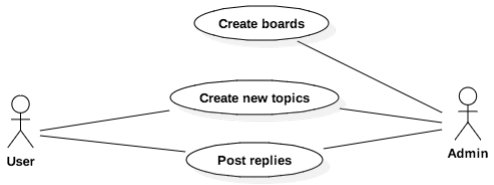



Figure 1: Use case diagram of the core functionalities offered by the Web Board

## Class Diagram

From the Use Case Diagram, we can start thinking concerning the **entities** of our project. The entities are the models we will create, and it's very closely related to the data our Django app will process.

For us to be able to implement the use cases described in the previous section,

we will need to implement at least the following models: **Board**, **Topic**, **Post**, and **User**.

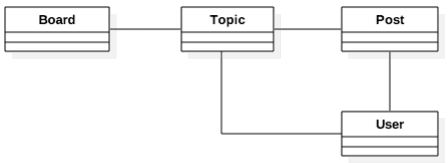



Figure 2: Draft of the class diagram of the Web Board

It's also important to take the time to think about how do models will relate to each other. What the solid lines are telling us is that, in a **Topic**, we will need to have a field to identify which **Board** it belongs to. Similarly, the **Post** will need a field to represent which **Topic** it belongs so that we can list in the discussions only **Posts** created within a specific **Topic**. Finally, we will need fields in both the **Topic** to know who started the discussion and in the **Post** so we can identify who is posting the reply.

We could also have an association with the **Board** and the **User** model, so we could identify who created a given **Board**. But this information is not relevant for the application. There are other ways to track this information, you will see later on.

Now that we have the basic class representation, we have to think what kind of information each of those models will carry. This sort of thing can get complicated very easily. So try to focus on the important bits. The information that you need to start the development. Later on, we can improve the model using **migrations**, which you will see in great detail in the next tutorial.

But for now, this would be a basic representation of our models' fields:

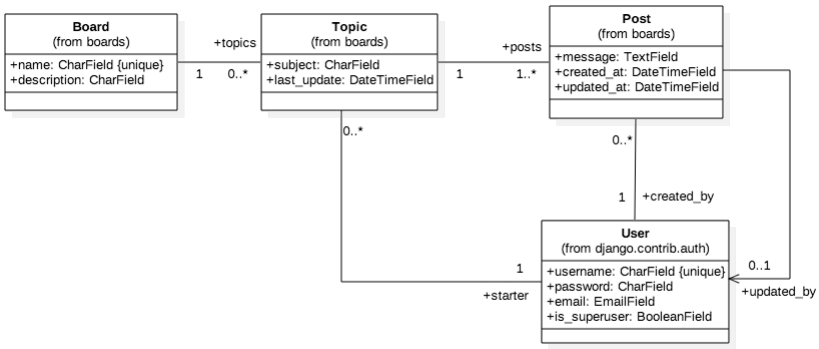



Figure 3: Class diagram emphasizing the relationship between the classes

(models)

This class diagram has the emphasis on the relationship between the models. Those lines and arrows will eventually be translated into fields later on.

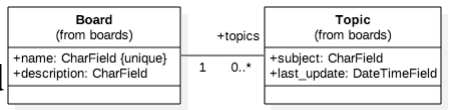
For the **Board** model, we will start with two fields: **name** and **description**. The **name** field has to be unique, so to avoid duplicated board names. The **description** is just to give a hint of what the board is all about.

The **Topic** model will be composed of four fields: **subject**, **last update** date which will be used to define the topics ordering, **topic starter** to identify the **User** who started the **Topic**, and a field called **board** to define which **Board** a specific **Topic** belongs to.

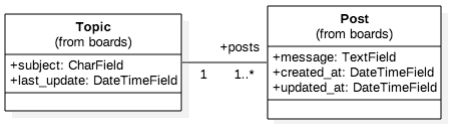
The **Post** model will have a **message** field, which will be used to store the text of the post replies, a **created at** date and time field mainly used to order the **Posts** within a **Topic**, an **updated at** date and time field to inform the **Users** when and if a given **Post** has been edited. Like the date and time fields, we will also have to reference the **User** model: **created by** and **updated by**.

Finally, the **User** model. In the class diagram, I only mentioned the fields **username**, **password**, **email** and **is superuser** flag because that's pretty much all we are going to use for now. It's important to note that we won't need to create a **User** model because Django already comes with a built-in **User** model inside the **contrib** package. We are going to use it.

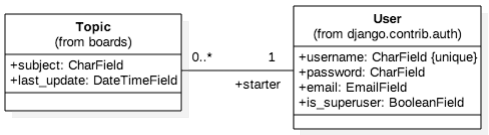
Regarding the multiplicity in the class diagram (the numbers `1`, `0..*`, etc.), here's how you read it:



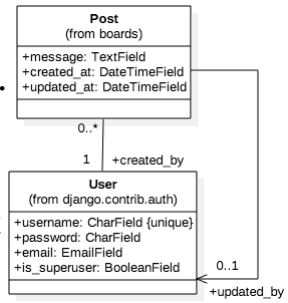

A **Topic** must be associated with exactly one (`1`) **Board** (which means it cannot be null), and a **Board** may be associated with many **Topics** or none (`0..*`). Which means a **Board** may exist without a single **Topic**.




A **Topic** should have at least one **Post** (the starter **Post**), and it may also have many **Posts** (`1..*`). A **Post** must be associated with one, and only one **Topic** (`1`).




A **Topic** must have one, and only one **User** associated with: the topic starter **User** (`1`). And a **User** may have many or none **Topics** (`0..*`).




A **Post** must have one, and only one **User** associated with: **created by** (`1`). A **User** may have many or none **Posts** (`0..*`). The second association between **Post** and **User** is a *direct association* (see the arrow at the end of the line), meaning we are interested only in one side of the relationship which is what **User** has edited a given **Post**. It will be translated into the **updated by** field. The multiplicity says `0..1`, meaning the **updated by** field may be null (the **Post** wasn't edited) and at most may be associated with only one **User**.

Another way to draw this class diagram is emphasizing the fields rather than in the relationship between the models:

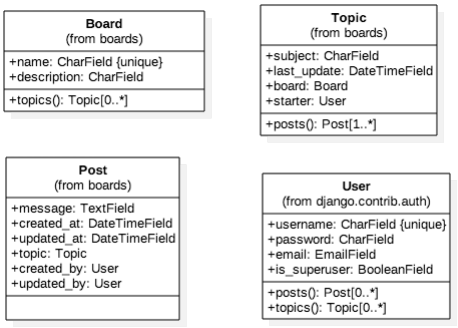



Figure 4: Class diagram emphasizing the attributes (fields) of the classes (models)

The representation above is equivalent to the previous one, and it's also closer to what we are going to design using the Django Models API. In this representation, we can see more clearly that in the **Post** model the associations **topic**, **created by**, and **updated by** became model fields. Another interesting thing to note is that in the **Topic** model we have now an *operation* (a class method) named **posts()**. We are going to achieve this by implementing a reverse relationship, where Django will automatically execute a query in the database to return a list of all the **Posts** that belongs to a specific **Topic**.

Alright, enough UML for now! To draw the diagrams presented in this section I used the StarUML tool.

## Wireframes

After spending some time designing the application models, I like to create some wireframes to define what needs to be done and also to have a clear picture of

where we are going.


Then based on the wireframes we can gain a deeper understanding of the entities involved in the application.

First thing, we need to show all the boards in the homepage:

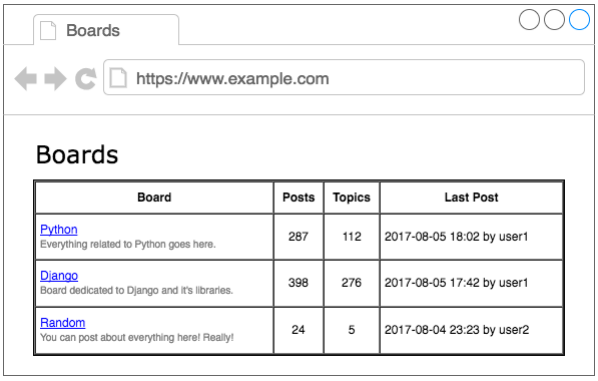



Figure 5: Boards project wireframe homepage listing all the available boards.

If the user clicks on a link, say in the Django board, it should list all the topics:

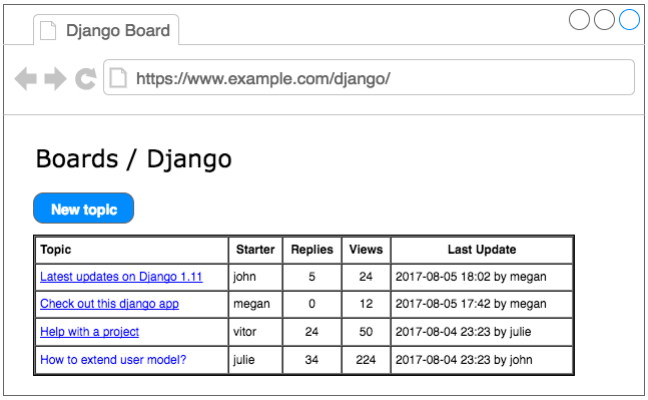



Figure 6: Boards project wireframe listing all topics in the Django board.

Here we have two main paths: either the user clicks on the “new topic” button to create a new topic, or the user clicks on a topic to see or engage in a discussion.

The “new topic” screen:

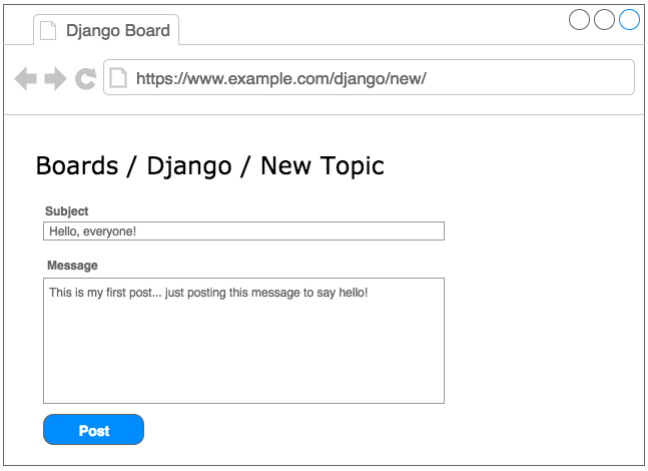



Figure 7: New topic screen

Now the topic screen, displaying the posts and discussions:

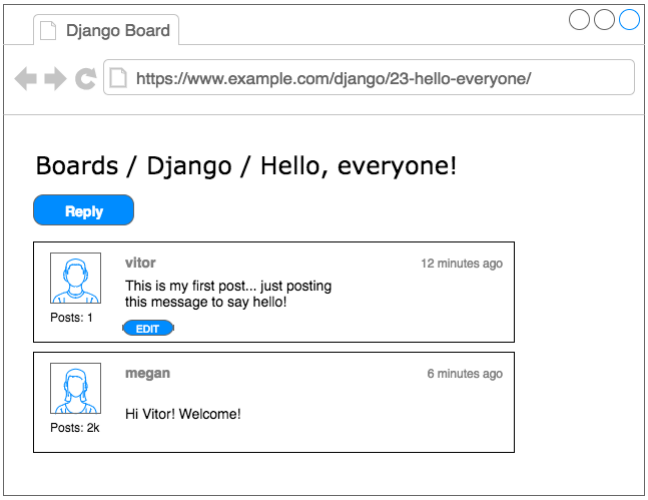



Figure 8: Topic posts listing screen

If the user clicks on the reply button, they will see the screen below, with a summary of the posts in reverse order (newest first):

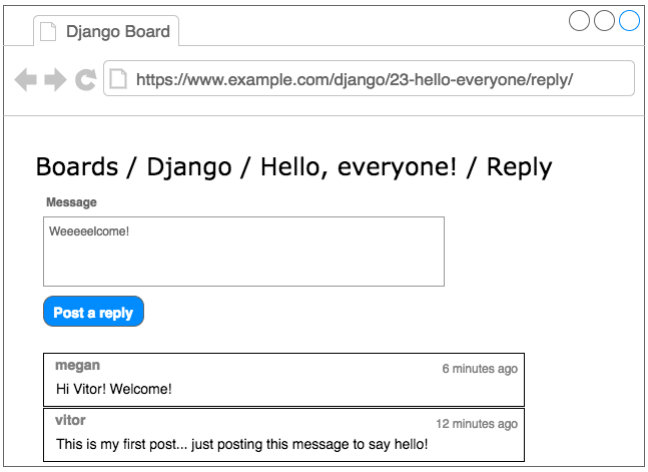



Figure 9: Reply topic screen

To draw your wireframes you can use the draw.io service, it's free.

---

## Models

The models are basically a representation of your application's database layout. What we are going to do in this section is create the Django representation of the classes we modeled in the previous section: **Board**, **Topic**, and **Post**. The **User** model is already defined inside a built-in app named **auth**, which is listed in our `INSTALLED_APPS` configuration under the namespace **django.contrib.auth**.

We will do all the work inside the **boards/models.py** file. Here is how we represent our class diagram (see Figure 4). in a Django application:

```
from django.db import models
from django.contrib.auth.models import User


class Board(models.Model):
    name = models.CharField(max_length=30, unique=Tr
    description = models.CharField(max_length=100)


class Topic(models.Model):
    subject = models.CharField(max_length=255)
    last_updated = models.DateTimeField(auto_now_add
    board = models.ForeignKey(Board, related_name='t
    starter = models.ForeignKey(User, related_name='
```

```
class Post(models.Model):
    message = models.TextField(max_length=4000)
    topic = models.ForeignKey(Topic, related_name='p
    created_at = models.DateTimeField(auto_now_add=T
    updated_at = models.DateTimeField(null=True)
    created_by = models.ForeignKey(User, related_nam
    updated_by = models.ForeignKey(User, null=True,
```

All models are subclass of the **django.db.models.Model** class. Each class will be transformed into *database tables*. Each field is represented by instances of **django.db.models.Field** subclasses (built-in Django core) and will be translated into *database columns*.

The fields `CharField`, `DateTimeField`, etc., are all subclasses of **django.db.models.Field** and they come included in the Django core – ready to be used.

Here we are only using `CharField`, `TextField`, `DateTimeField`, and `ForeignKey` fields to define our models. But Django offers a wide range of options to represent different types of data, such as `IntegerField`, `BooleanField`, `DecimalField`, and many others. We will refer to them as we need.

Some fields have required arguments, such as the `CharField`. We should always set a `max_length`. This information will be used to create the database column. Django needs to know how big the database column needs to be. The `max_length` parameter will also be used by the Django Forms API, to validate user input. More on that later.

In the `Board` model definition, more specifically in the `name` field, we are also setting the parameter `unique=True`, as the name suggests, it will enforce the uniqueness of the field at the database level.

In the `Post` model, the `created_at` field has an optional parameter, the `auto_now_add` set to `True`. This will instruct Django to set the current date and time when a `Post` object is created.

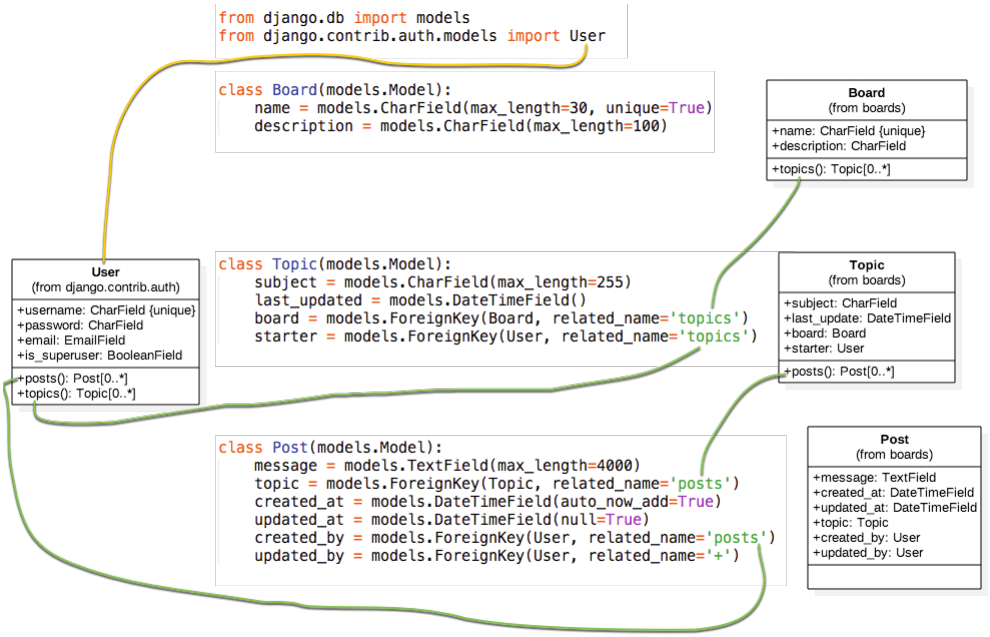
One way to create a relationship between the models is by using the `ForeignKey` field. It will create a link between the models and create a proper relationship at the database level. The `ForeignKey` field expects a positional parameter with the reference to the model it will relate to.

For example, in the `Topic` model, the `board` field is a `ForeignKey` to the `Board` model. It is telling Django that a `Topic` instance relates to only one `Board` instance. The `related_name` parameter will be used to create a *reverse relationship* where the `Board` instances will have access a list of `Topic` instances that belong to it.

Django automatically creates this reverse relationship – the `related_name` is optional. But if we don't set a name for it, Django will generate it with the name: `(class_name)_set`. For example, in the `Board` model, the `Topic` instances would be available under the `topic_set` property. Instead, we simply renamed it to `topics`, to make it feel more natural.

In the `Post` model, the `updated_by` field sets the `related_name='+'`. This instructs Django that we don't need this reverse relationship, so it will ignore it.

Below you can see the comparison between the class diagram and the source code to generate the models with Django. The green lines represent how we are handling the reverse relationships.




At this point, you may be asking yourself: "what about primary keys/IDs"? If we don't specify a primary key for a model, Django will automatically generate it for us. So we are good for now. In the next section, you will see better how it works.

**Migrating the Models**

The next step is to tell Django to create the database so we can start using it.

Open the Terminal Command Line Tools, activate the virtual environment, go to the folder where the **manage.py** file is, and run the commands below:

```
python manage.py makemigrations
```

As an output you will get something like this:

```
Migrations for 'boards':
  boards/migrations/0001_initial.py
    - Create model Board
    - Create model Post
    - Create model Topic
    - Add field topic to post
    - Add field updated_by to post
```

At this point, Django created a file named **0001_initial.py** inside the **boards/migrations** directory. It represents the current state of our application's models. In the next step, Django will use this file to create the tables and columns.

The migration files are translated into SQL statements. If you are familiar with SQL, you can run the following command to inspect the SQL instructions that will be executed in the database:

```
python manage.py sqlmigrate boards 0001
```

If you're not familiar with SQL, don't worry. We won't be working directly with SQL in this tutorial series. All the work will be done using just the Django ORM, which is an abstraction layer that communicates with the database.

The next step now is to *apply* the migration we generated to the database:

```
python manage.py migrate
```

The output should be something like this:

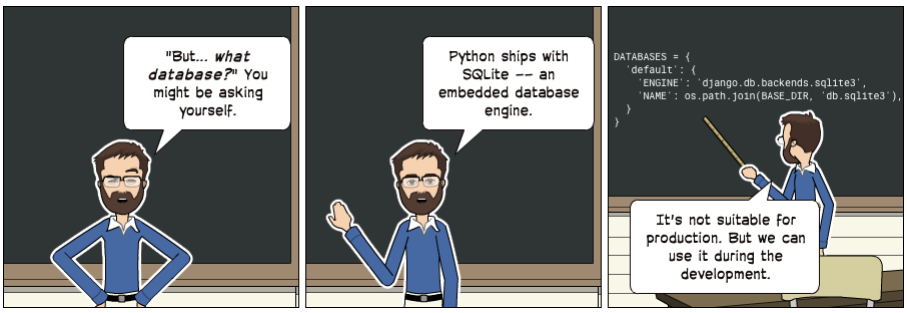
```
Operations to perform:
  Apply all migrations: admin, auth, boards, content
Running migrations:
  Applying contenttypes.0001_initial... OK
  Applying auth.0001_initial... OK
  Applying admin.0001_initial... OK
```

```
Applying admin.0002_logentry_remove_auto_add... OK
Applying contenttypes.0002_remove_content_type_nam
Applying auth.0002_alter_permission_name_max_lengt
Applying auth.0003_alter_user_email_max_length...
Applying auth.0004_alter_user_username_opts... OK
Applying auth.0005_alter_user_last_login_null... O
Applying auth.0006_require_contenttypes_0002... OK
Applying auth.0007_alter_validators_add_error_mess
Applying auth.0008_alter_user_username_max_length.
Applying boards.0001_initial... OK
Applying sessions.0001_initial... OK
```

Because this is the first time we are migrating the database, the `migrate` command also applied the existing migration files from the Django contrib apps, listed in the `INSTALLED_APPS`. This is expected.

The line `Applying boards.0001_initial... OK` is the migration we generated in the previous step.

That's it! Our database is ready to be used.




**Note:** It's important to note that **SQLite** is a production-quality database. SQLite is used by many companies across thousands of products, like all Android and iOS devices, all major Web browsers, Windows 10, macOS, etc.

It's just not suitable for all cases. SQLite doesn't compare with databases like MySQL, PostgreSQL or Oracle. High-volume websites, write-intensive applications, very large datasets, high concurrency, are some situations that will eventually result in a problem by using SQLite.

We are going to use SQLite during the development of our project because it's convenient and we won't need to install anything else. When we deploy our project to production, we will switch to PostgreSQL. For simple websites this work fine. But for complex websites, it's advisable to use the same database for development and production.

**Experimenting with the Models API**

One of the great advantages of developing with Python is the interactive shell. I use it all the time. It's a quick way to try things out and experiment libraries and APIs.

You can start a Python shell with our project loaded using the **manage.py** utility:

```
python manage.py shell

Python 3.6.2 (default, Jul 17 2017, 16:44:45)
[GCC 4.2.1 Compatible Apple LLVM 8.1.0 (clang-802.0.
Type "help", "copyright", "credits" or "license" for
(InteractiveConsole)
>>>

Python 3.6.2 (v3.6.2:5fd33b5, Jul  8 2017, 04:57:36)
Type "help", "copyright", "credits" or "license" for
(InteractiveConsole)
>>>

Python 3.6.2 (default, Jul 17 2017, 23:14:31)
[GCC 5.4.0 20160609] on linux
Type "help", "copyright", "credits" or "license" for
(InteractiveConsole)
>>>
```

This is very similar to calling the interactive console just by typing `python`, except when we use `python manage.py shell`, we are adding our project to the `sys.path` and loading Django. That means we can import our models and any other resource within the project and play with it.

Let's start by importing the **Board** class:

```
from boards.models import Board
```

To create a new board object, we can do the following:

```
board = Board(name='Django', description='This is a
```

To persist this object in the database, we have to call the `save` method:

```
board.save()
```

The `save` method is used both to *create* and *update* objects. Here Django created a new object because the **Board** instance had no **id**. After saving it for the first time, Django will set the id automatically:

```
board.id
1
```

You can access the rest of the fields as Python attributes:

```
board.name
'Django'

board.description
'This is a board about Django.'
```

To update a value we could do:

```
board.description = 'Django discussion board.'
board.save()
```

Every Django model comes with a special attribute; we call it a **Model Manager**. You can access it via the Python attribute `objects`. It is used mainly to execute queries in the database. For example, we could use it to directly create a new **Board** object:

```
board = Board.objects.create(name='Python', descript

board.id
2

board.name
'Python'
```

So, right now we have two boards. We can use the `objects` to list all existing boards in the database:

```
Board.objects.all()
<QuerySet [<Board: Board object>, <Board: Board obje
```

The result was a **QuerySet**. We will learn more about that later on. Basically, it's a list of objects from the database. We can see that we have two objects, but we can only read **Board object**. That's because we haven't defined the `__str__` method in the **Board** model.

The `__str__` method is a String representation of an object. We can use the board name to represent it.

First, exit the interactive console:

```
exit()
```

Now edit the **models.py** file inside the **boards** app:

```
class Board(models.Model):
    name = models.CharField(max_length=30, unique=Tr
    description = models.CharField(max_length=100)

    def __str__(self):
        return self.name
```

Let's try the query again. Open the interactive console again:

```
python manage.py shell

from boards.models import Board

Board.objects.all()
<QuerySet [<Board: Django>, <Board: Python>]>
```

Much better, right?

We can treat this **QuerySet** like a list. Let's say we wanted to iterate over it and print the description of each board:

```
boards_list = Board.objects.all()
for board in boards_list:
    print(board.description)
```

The result would be:

```
Django discussion board.
General discussion about Python.
```

Similarly, we can use the model **Manager** to query the database and return a single object. For that we use the `get` method:

```
django_board = Board.objects.get(id=1)

django_board.name
```

```
'Django'
```

But we have to be careful with this kind of operation. If we try to get an object that doesn't exist, for example, a board with `id=3`, it will raise an exception:

```
board = Board.objects.get(id=3)

boards.models.DoesNotExist: Board matching query doe
```

We can use the `get` method with any model field, but preferably use a field that can uniquely identify an object. Otherwise, the query may return more than one object, which will cause an exception.

```
Board.objects.get(name='Django')
<Board: Django>
```

Note that the query is *case sensitive*, a lower case "django" would not match:

```
Board.objects.get(name='django')
boards.models.DoesNotExist: Board matching query doe
```

**Summary of Model's Operations**

Find below a summary of the methods and operations we learned in this section, using the **Board** model as a reference. Uppercase **Board** refers to the class, lowercase **board** refers to an instance (or object) of the **Board** model class:

| Operation | Code sample |
|---|---|
| Create an object without saving | `board = Board()` |
| Save an object (create or update) | `board.save()` |
| Create and save an object in the database | `Board.objects.create(name='...', description='...')` |
| List all objects | `Board.objects.all()` |
| Get a single object, identified by a field | `Board.objects.get(id=1)` |

In the next section, we are going to start writing views and displaying our boards in HTML pages.

---

### Views, Templates, and Static Files

At the moment we already have a view named `home` displaying "Hello, World!" in the homepage of our application.

**myproject/urls.py**

```
from django.conf.urls import url
from django.contrib import admin

from boards import views

urlpatterns = [
    url(r'^$', views.home, name='home'),
    url(r'^admin/', admin.site.urls),
]
```

**boards/views.py**

```
from django.http import HttpResponse

def home(request):
    return HttpResponse('Hello, World!')
```

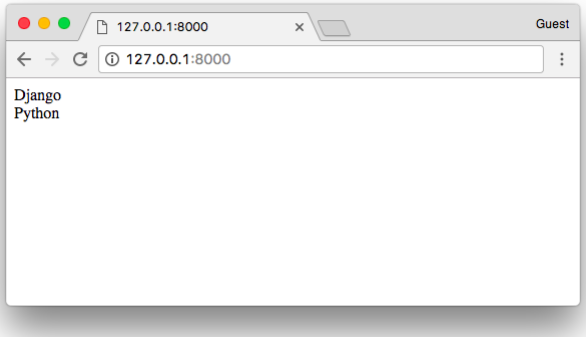
We can use this as our starting point. If you recall our wireframes, the Figure 5 showed how the homepage should look like. What we want to do is display a list of boards in a table alongside with some other information.

The first thing to do is import the **Board** model and list all the existing boards:

**boards/views.py**

```
from django.http import HttpResponse
from .models import Board

def home(request):
    boards = Board.objects.all()
    boards_names = list()

    for board in boards:
        boards_names.append(board.name)

    response_html = '<br>'.join(boards_names)

    return HttpResponse(response_html)
```

And the result would be this simple HTML page:




But let's stop right here. We are not going very far rendering HTML like this. For this simple view, all we need is a list of boards; then the rendering part is a job for the **Django Template Engine**.

## Django Template Engine Setup

Create a new folder named **templates** alongside with the **boards** and **mysite** folders:

```
myproject/
 |-- myproject/
 |     |-- boards/
 |     |-- myproject/
 |     |-- templates/    <-- here!
 |     +-- manage.py
 +-- venv/
```

Now within the **templates** folder, create an HTML file named **home.html**:

**templates/home.html**

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <title>Boards</title>
  </head>
  <body>
    <h1>Boards</h1>

    {% for board in boards %}
```

```
        {{ board.name }} <br>
      {% endfor %}

    </body>
  </html>
```

In the example above we are mixing raw HTML with some special tags `{% for ... in ... %}` and `{{ variable }}`. They are part of the Django Template Language. The example above shows how to iterate over a list of objects using a `for`. The `{{ board.name }}` renders the name of the board in the HTML template, generating a dynamic HTML document.

Before we can use this HTML page, we have to tell Django where to find our application's templates.

Open the **settings.py** inside the **myproject** directory and search for the `TEMPLATES` variable and set the `DIRS` key to `os.path.join(BASE_DIR, 'templates')`:

```
TEMPLATES = [
    {
        'BACKEND': 'django.template.backends.django.
        'DIRS': [
            os.path.join(BASE_DIR, 'templates')
        ],
        'APP_DIRS': True,
        'OPTIONS': {
            'context_processors': [
                'django.template.context_processors.
                'django.template.context_processors.
                'django.contrib.auth.context_process
                'django.contrib.messages.context_pro
            ],
        },
    },
]
```

Basically what this line is doing is finding the full path of your project directory and appending "/templates" to it.

We can debug this using the Python shell:

```
python manage.py shell

from django.conf import settings
```

```
settings.BASE_DIR
'/Users/vitorfs/Development/myproject'

import os

os.path.join(settings.BASE_DIR, 'templates')
'/Users/vitorfs/Development/myproject/templates'
```

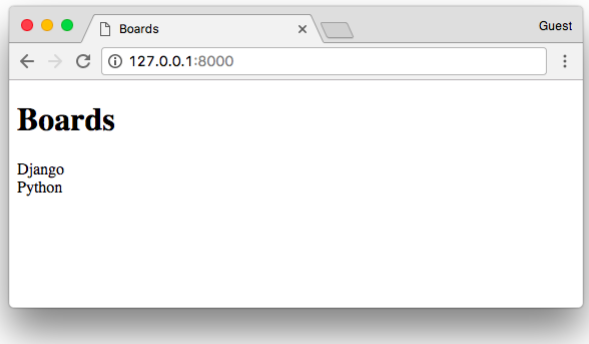
See? It's just pointing to the **templates** folder we created in the previous steps.

Now we can update our **home** view:

**boards/views.py**

```
from django.shortcuts import render
from .models import Board

def home(request):
    boards = Board.objects.all()
    return render(request, 'home.html', {'boards': b
```

The resulting HTML:

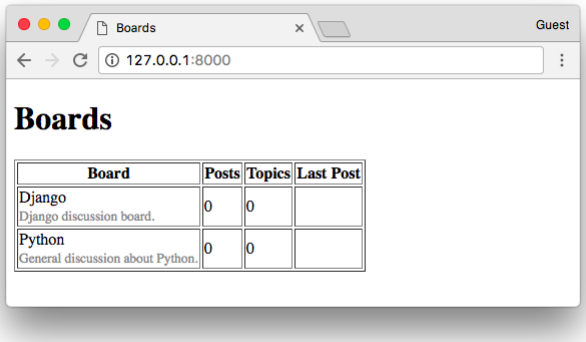



We can improve the HTML template to use a table instead:

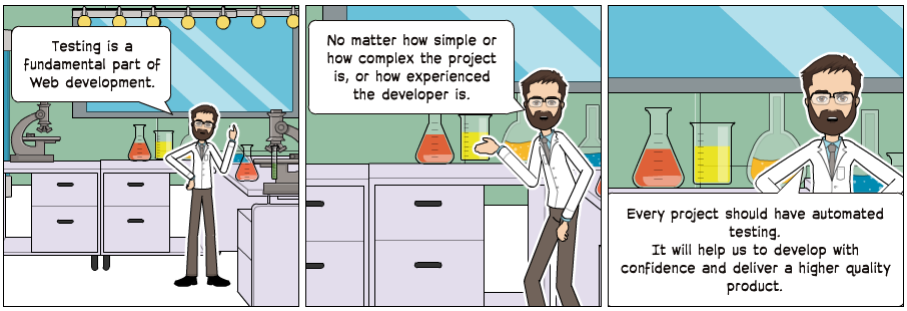
**templates/home.html**

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <title>Boards</title>
  </head>
  <body>
```

```
    <h1>Boards</h1>

    <table border="1">
      <thead>
        <tr>
          <th>Board</th>
          <th>Posts</th>
          <th>Topics</th>
          <th>Last Post</th>
        </tr>
      </thead>
      <tbody>
        {% for board in boards %}
          <tr>
            <td>
              {{ board.name }}<br>
              <small style="color: #888">{{ board.de
            </td>
            <td>0</td>
            <td>0</td>
            <td></td>
          </tr>
        {% endfor %}
      </tbody>
    </table>
  </body>
</html>
```




## Testing the Homepage




This is going to be a recurrent subject, and we are going to explore together different concepts and strategies throughout the whole tutorial series.

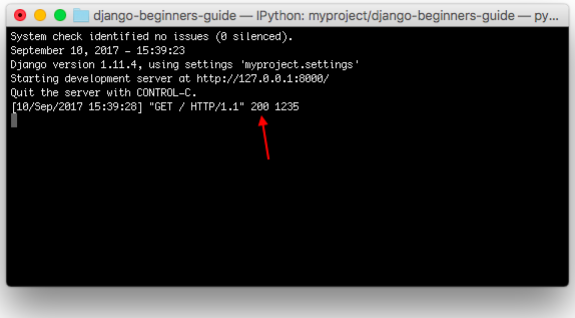
Let's write our first test. For now, we will be working in the **tests.py** file inside the **boards** app:

**boards/tests.py**

```
from django.core.urlresolvers import reverse
from django.test import TestCase

class HomeTests(TestCase):
    def test_home_view_status_code(self):
        url = reverse('home')
        response = self.client.get(url)
        self.assertEquals(response.status_code, 200)
```

This is a very simple test case but extremely useful. We are testing the *status code* of the response. The status code 200 means **success**.

We can check the status code of the response in the console:




If there were an uncaught exception, syntax error, or anything, Django would return a status code **500** instead, which means **Internal Server Error**. Now, imagine our application has 100 views. If we wrote just this simple test for all our views, with just one command, we would be able to test if all views are

returning a success code, so the user does not see any error message anywhere. Without automate tests, we would need to check each page, one by one.

To execute the Django's test suite:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
.
----------------------------------------------------------------------
Ran 1 test in 0.041s

OK
Destroying test database for alias 'default'...
```

Now we can test if Django returned the correct view function for the requested URL. This is also a useful test because as we progress with the development, you will see that the **urls.py** module can get very big and complex. The URL conf is all about resolving regex. There are some cases where we have a very permissive URL, so Django can end up returning the wrong view function.

Here's how we do it:

**boards/tests.py**

```
from django.core.urlresolvers import reverse
from django.urls import resolve
from django.test import TestCase
from .views import home

class HomeTests(TestCase):
    def test_home_view_status_code(self):
        url = reverse('home')
        response = self.client.get(url)
        self.assertEquals(response.status_code, 200)

    def test_home_url_resolves_home_view(self):
        view = resolve('/')
        self.assertEquals(view.func, home)
```

In the second test, we are making use of the `resolve` function. Django uses it to match a requested URL with a list of URLs listed in the **urls.py** module. This test will make sure the URL `/`, which is the root URL, is returning the home view.

Test it again:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
..
----------------------------------------------------------
Ran 2 tests in 0.027s

OK
Destroying test database for alias 'default'...
```

To see more detail about the test execution, set the **verbosity** to a higher level:

```
python manage.py test --verbosity=2

Creating test database for alias 'default' ('file:me
Operations to perform:
  Synchronize unmigrated apps: messages, staticfiles
  Apply all migrations: admin, auth, boards, content
Synchronizing apps without migrations:
  Creating tables...
    Running deferred SQL...
Running migrations:
  Applying contenttypes.0001_initial... OK
  Applying auth.0001_initial... OK
  Applying admin.0001_initial... OK
  Applying admin.0002_logentry_remove_auto_add... OK
  Applying contenttypes.0002_remove_content_type_nam
  Applying auth.0002_alter_permission_name_max_lengt
  Applying auth.0003_alter_user_email_max_length...
  Applying auth.0004_alter_user_username_opts... OK
  Applying auth.0005_alter_user_last_login_null... O
  Applying auth.0006_require_contenttypes_0002... OK
  Applying auth.0007_alter_validators_add_error_mess
  Applying auth.0008_alter_user_username_max_length.
  Applying boards.0001_initial... OK
  Applying sessions.0001_initial... OK
System check identified no issues (0 silenced).
test_home_url_resolves_home_view (boards.tests.HomeT
test_home_view_status_code (boards.tests.HomeTests)

----------------------------------------------------------
Ran 2 tests in 0.017s
```

```
OK
Destroying test database for alias 'default' ('file:
```

Verbosity determines the amount of notification and debug information that will be printed to the console; 0 is no output, 1 is normal output, and 2 is verbose output.

### Static Files Setup

Static files are the CSS, JavaScripts, Fonts, Images, or any other resources we may use to compose the user interface.

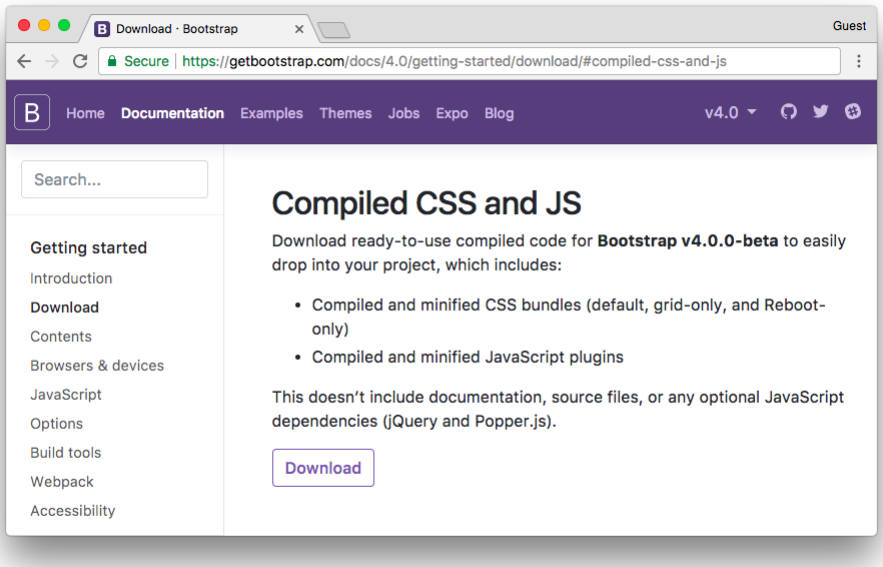
As it is, Django doesn't serve those files. Except during the development process, so to make our lives easier. But Django provides some features to help us manage the static files. Those features are available in the **django.contrib.staticfiles** application already listed in the `INSTALLED_APPS` configuration.

With so many front-end component libraries available, there's no reason for us keep rendering basic HTML documents. We can easily add Bootstrap 4 to our project. Bootstrap is an open source toolkit for developing with HTML, CSS, and JavaScript.

In the project root directory, alongside with the **boards**, **templates**, and **myproject** folders, create a new folder named **static**, and within the **static** folder create another one named **css**:

```
myproject/
 |-- myproject/
 |     |-- boards/
 |     |-- myproject/
 |     |-- templates/
 |     |-- static/        <-- here
 |     |     +-- css/     <-- and here
 |     +-- manage.py
 +-- venv/
```

Go to getbootstrap.com and download the latest version:




Download the **Compiled CSS and JS** version.

In your computer, extract the **bootstrap-4.0.0-beta-dist.zip** file you downloaded from the Bootstrap website, copy the file **css/bootstrap.min.css** to our project's css folder:

```
myproject/
 |-- myproject/
 |     |-- boards/
 |     |-- myproject/
 |     |-- templates/
 |     |-- static/
 |     |     +-- css/
 |     |           +-- bootstrap.min.css    <-- here
 |     +-- manage.py
 +-- venv/
```

The next step is to instruct Django where to find the static files. Open the **settings.py**, scroll to the bottom of the file and just after the `STATIC_URL`, add the following:

```
STATIC_URL = '/static/'

STATICFILES_DIRS = [
    os.path.join(BASE_DIR, 'static'),
]
```

Same thing as the `TEMPLATES` directory, remember?

Now we have to load the static files (the Bootstrap CSS file) in our template:

**templates/home.html**

```
{% load static %}<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <title>Boards</title>
    <link rel="stylesheet" href="{% static 'css/boot
  </head>
  <body>
    <!-- body suppressed for brevity ... -->
  </body>
</html>
```

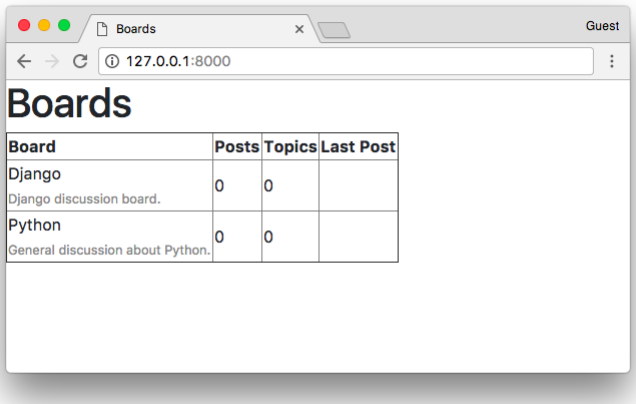
First we load the Static Files App template tags by using the `{% load static %}` in the beginning of the template.

The template tag `{% static %}` is used to compose the URL where the resource lives. In this case, the `{% static 'css/bootstrap.min.css' %}` will return **/static/css/bootstrap.min.css**, which is equivalent to **http://127.0.0.1:8000/static/css/bootstrap.min.css**.

The `{% static %}` template tag uses the `STATIC_URL` configuration in the **settings.py** to compose the final URL. For example, if you hosted your static files in a subdomain like **https://static.example.com/**, we would set the `STATIC_URL=https://static.example.com/` then the `{% static 'css/bootstrap.min.css' %}` would return **https://static.example.com/css/bootstrap.min.css**.

If none of this makes sense for you at the moment, don't worry. Just remember to use the `{% static %}` whenever you need to refer to a CSS, JavaScript or image file. Later on, when we start working with Deployment, we will discuss more it. For now, we are all set up.

Refreshing the page **127.0.0.1:8000** we can see it worked:

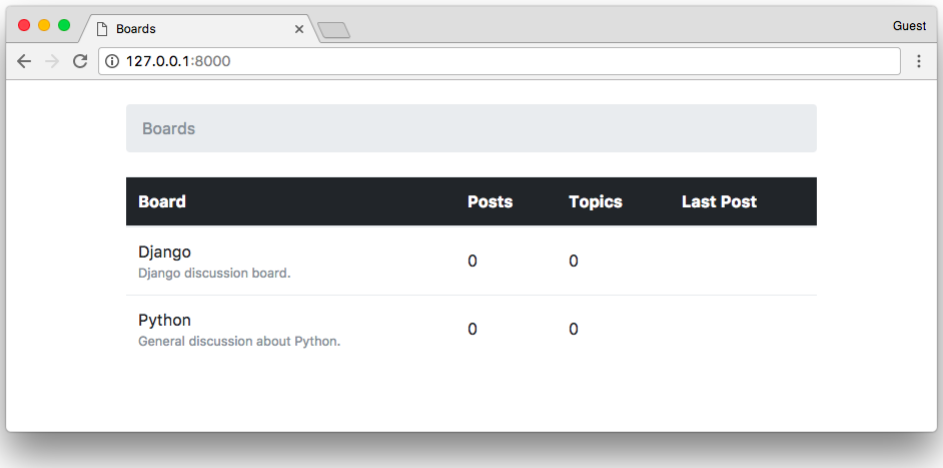



Now we can edit the template so to take advantage of the Bootstrap CSS:

```
{% load static %}<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <title>Boards</title>
    <link rel="stylesheet" href="{% static 'css/boot
  </head>
  <body>
    <div class="container">
      <ol class="breadcrumb my-4">
        <li class="breadcrumb-item active">Boards</l
      </ol>
      <table class="table">
        <thead class="thead-inverse">
          <tr>
            <th>Board</th>
            <th>Posts</th>
            <th>Topics</th>
            <th>Last Post</th>
          </tr>
        </thead>
        <tbody>
          {% for board in boards %}
            <tr>
              <td>
                {{ board.name }}
                <small class="text-muted d-block">{{
              </td>
              <td class="align-middle">0</td>
              <td class="align-middle">0</td>
              <td></td>
```

```
            </tr>
          {% endfor %}
        </tbody>
      </table>
    </div>
  </body>
</html>
```

The result now:




So far we are adding new boards using the interactive console (`python manage.py shell`). But we need a better way to do it. In the next section, we are going to implement an admin interface for the website administrator manage it.

---

### Introduction to Django Admin

When we start a new project, Django already comes configured with the **Django Admin** listed in the `INSTALLED_APPS`.


A good use case of the Django Admin is for example in a blog; it can be used by

the authors to write and publish articles. Another example is an e-commerce website, where the staff members can create, edit, delete products.

For now, we are going to configure the Django Admin to maintain our application's boards.

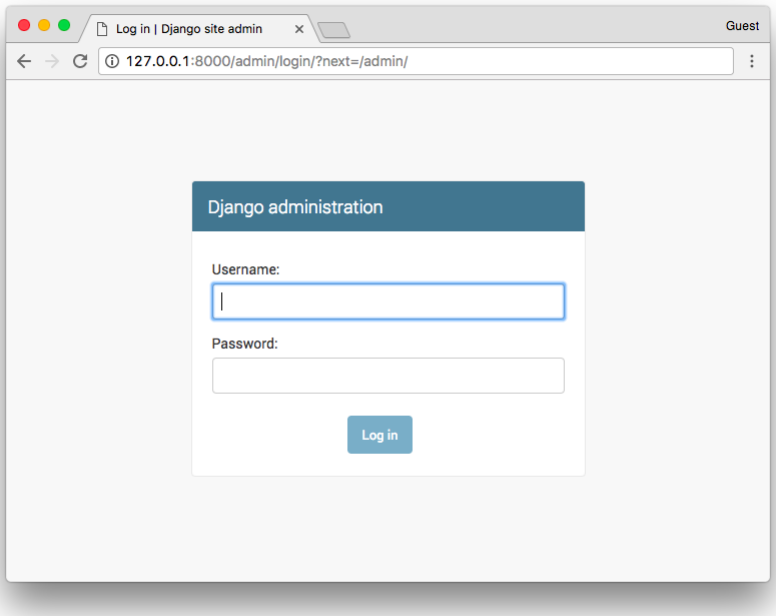
Let's start by creating an administrator account:

```
python manage.py createsuperuser
```

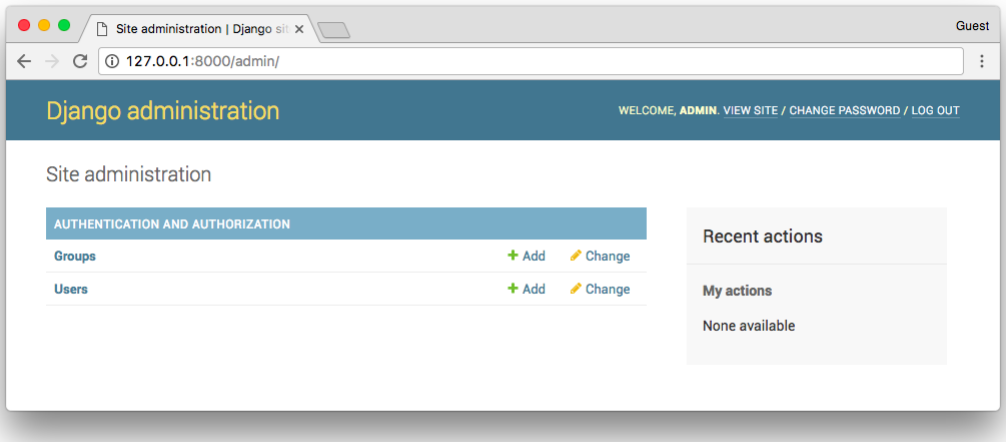
Follow the instructions:

```
Username (leave blank to use 'vitorfs'): admin
Email address: admin@example.com
Password:
Password (again):
Superuser created successfully.
```

Now open the URL in a web browser: **http://127.0.0.1:8000/admin/**




Enter the **username** and **password** to log into the administration interface:



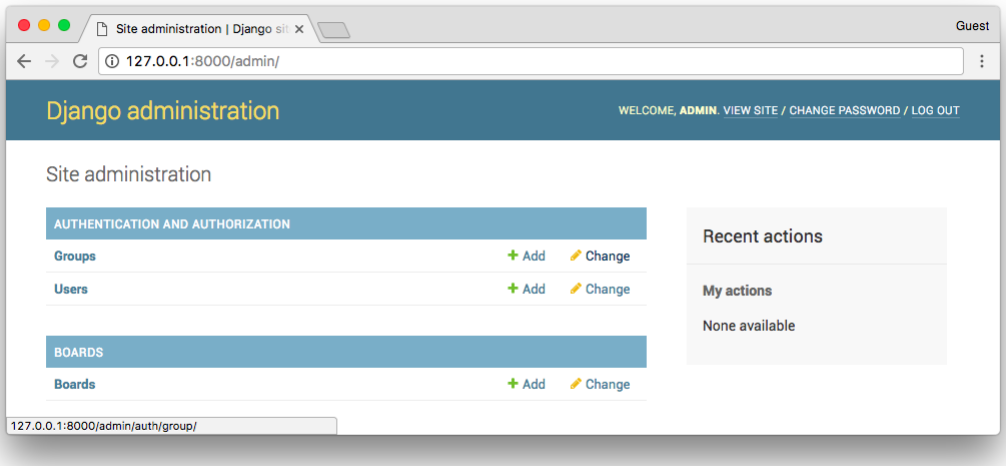

It already comes with some features configured. Here we can add **Users** and **Groups** to manage permissions. We will explore more of those concepts later on.

To add the **Board** model is very straightforward. Open the **admin.py** file in the **boards** directory, and add the following code:

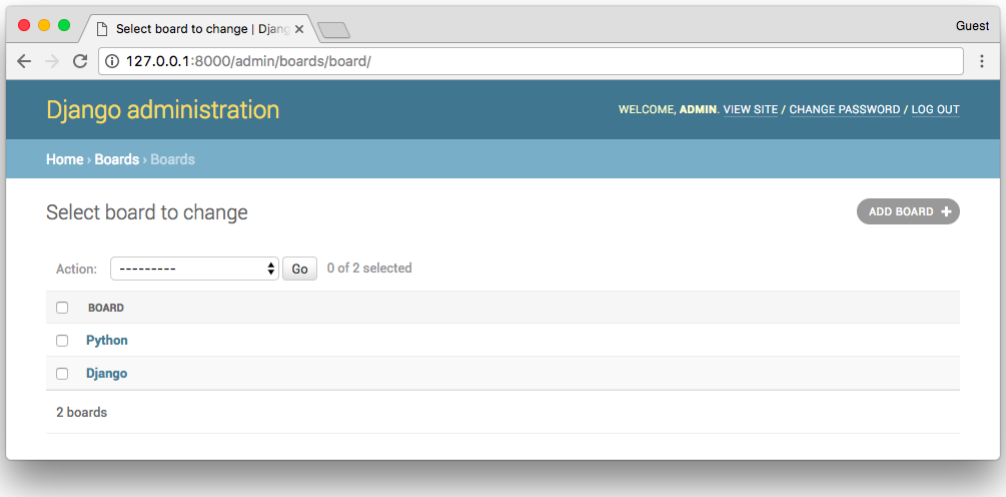
**boards/admin.py**

```
from django.contrib import admin
from .models import Board

admin.site.register(Board)
```

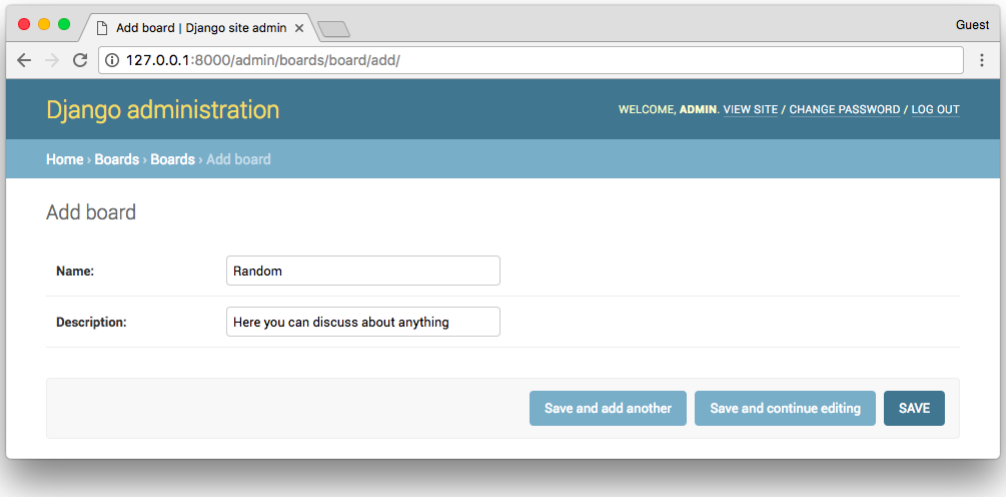
Save the **admin.py** file, and refresh the page on your web browser:



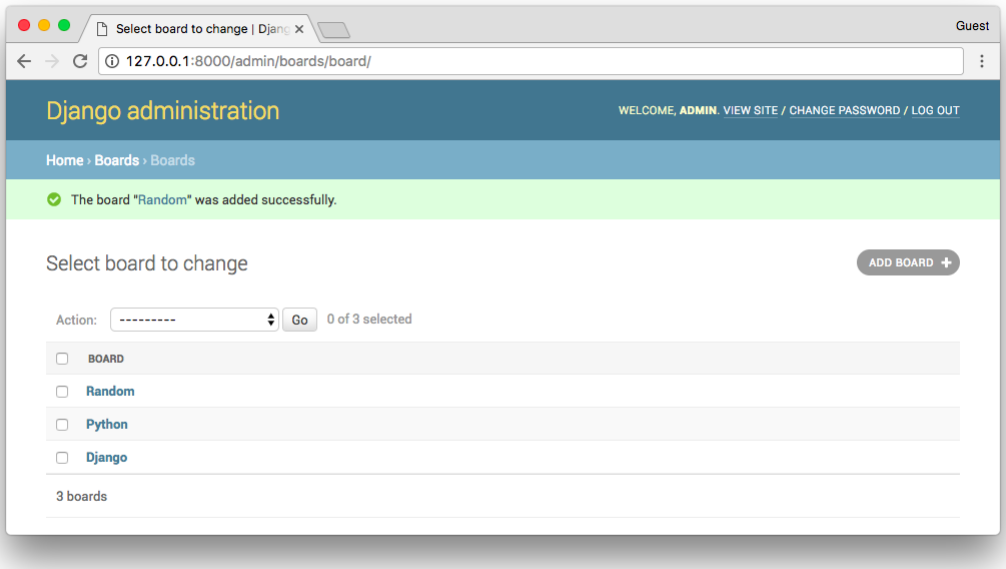

And that's it! It's ready to be used. Click on the **Boards** link to see the list of existing boards:



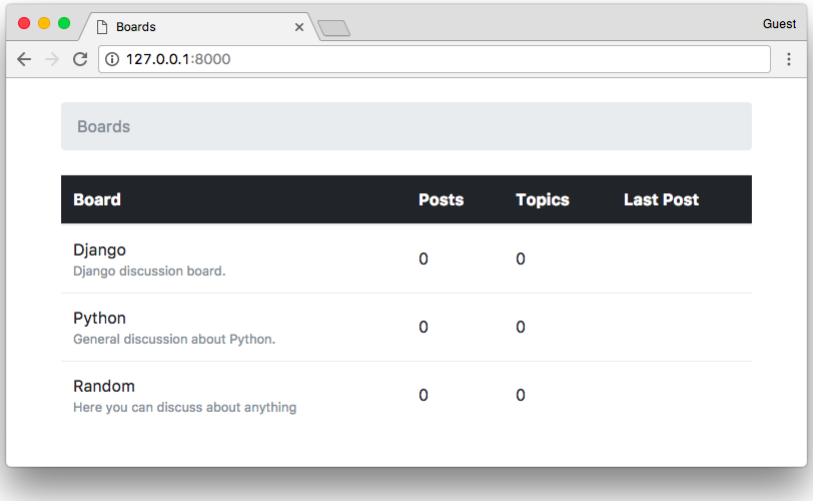

We can add a new board by clicking on the **Add Board** button:




Click on the **save** button:




We can check if everything is working be opening the **http://127.0.0.1:8000** URL:




---

## Conclusions

In this tutorial, we explored many new concepts. We defined some requirements for our project, created the first models, migrated the database, started playing with the Models API. We created our very first view and wrote some unit tests. We also configured the Django Template Engine, Static Files, and added the Bootstrap 4 library to the project. Finally, we had a very brief introduction the Django Admin interface.

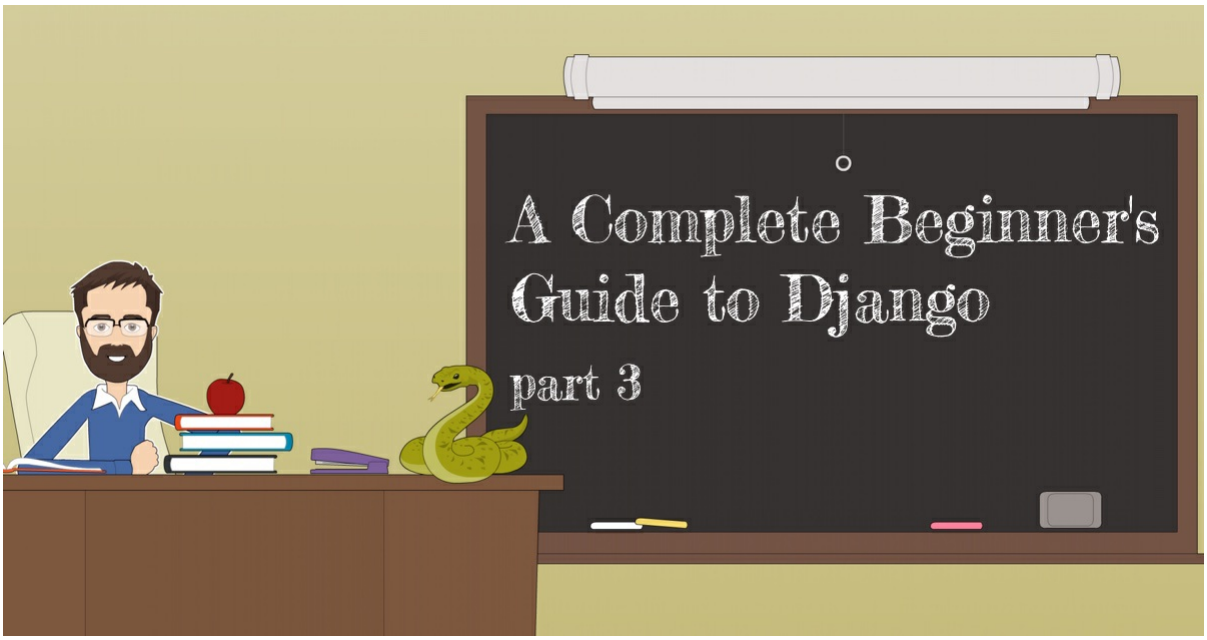
I hope you enjoyed the second part of this tutorial series! The third part is coming out next week, on Sep 18, 2017. In the next part, we are going to explore Django's URL routing, the forms API, reusable templates, and more testing. If you would like to get notified when the third part is out, you can subscribe to our mailing list.

The source code of the project is available on GitHub. The current state of the project can be found under the release tag **v0.2-lw**. The link below will take you to the right place:

https://github.com/sibtc/django-beginners-guide/tree/v0.2-lw

---


**← Part 1 - Getting Started**




**Part 3 - Advanced Concepts →**

]

[

**A Complete Beginner's Guide to Django - Part 3**

] ['\n',

**Introduction**

, '\n',

In this tutorial, we are going to dive deep into two fundamental concepts: URLs and Forms. In the process, we are going to explore many other concepts like creating reusable templates and installing third-party libraries. We are also going to write plenty of unit tests.

, '\n',

If you are following this tutorial series since the first part, coding your project and following the tutorial step by step, you may need to update your **models.py** before starting:

, '\n',

**boards/models.py**

, '\n',

```
class Topic(models.Model):
    # other fields...
    # Add `auto_now_add=True` to the `last_updated`
    last_updated = models.DateTimeField(auto_now_add

class Post(models.Model):
    # other fields...
    # Add `null=True` to the `updated_by` field
    updated_by = models.ForeignKey(User, null=True,
```

, '\n',

Now run the commands with the virtualenv activated:

, '\n',

```
python manage.py makemigrations
```

```
python manage.py migrate
```

, '\n',

If you already have `null=True` in the `updated_by` field and the `auto_now_add=True` in the `last_updated` field, you can safely ignore the instructions above.

, '\n',

If you prefer to use my source code as a starting point, you can grab it on GitHub.

, '\n',

The current state of the project can be found under the release tag **v0.2-lw**. The link below will take you to the right place:

, '\n',

https://github.com/sibtc/django-beginners-guide/tree/v0.2-lw

, '\n',

The development will follow from here.

, '\n',

---

**URLs**

Proceeding with the development of our application, now we have to implement a new page to list all the topics that belong to a given **Board**. Just to recap, below you can see the wireframe we drew in the previous tutorial:

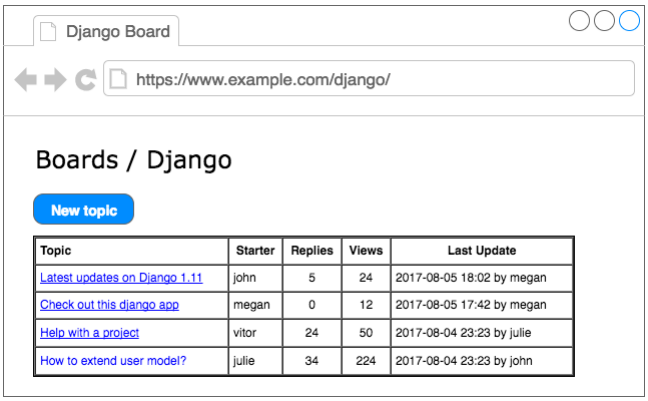



Figure 1: Boards project wireframe listing all topics in the Django board.

We will start by editing the **urls.py** inside the **myproject** folder:

**myproject/urls.py**

```
from django.conf.urls import url
from django.contrib import admin

from boards import views

urlpatterns = [
    url(r'^$', views.home, name='home'),
    url(r'^boards/(?P<pk>\d+)/$', views.board_topics
    url(r'^admin/', admin.site.urls),
]
```

This time let's take a moment and analyze the `urlpatterns` and `url`.

The URL dispatcher and **URLconf** (URL configuration) are fundamental parts of a Django application. In the beginning, it can look confusing; I remember having a hard time when I first started developing with Django.

In fact, right now the Django Developers are working on a proposal to make simplified routing syntax. But for now, as per the version 1.11, that's what we have. So let's try to understand how it works.

A project can have many **urls.py** distributed among the apps. But Django needs a **url.py** to use as a starting point. This special **urls.py** is called **root URLconf**. It's defined in the **settings.py** file.

**myproject/settings.py**

```
ROOT_URLCONF = 'myproject.urls'
```

It already comes configured, so you don't need to change anything here.

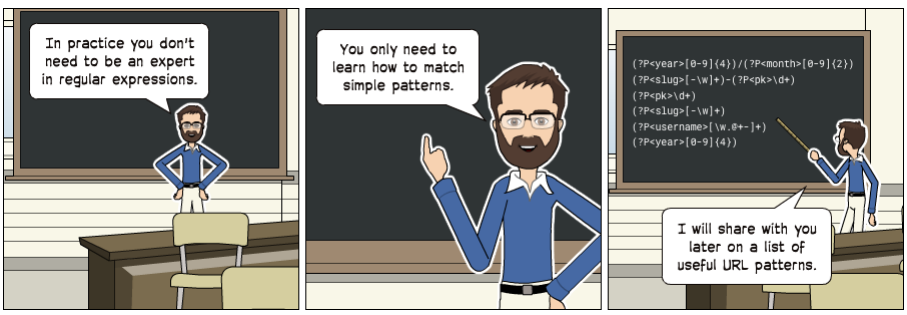
When Django receives a request, it starts searching for a match in the project's URLconf. It starts with the first entry of the `urlpatterns` variable, and test the requested URL against each `url` entry.

If Django finds a match, it will pass the request to the **view function**, which is the second parameter of the `url`. The order in the `urlpatterns` matters, because Django will stop searching as soon as it finds a match. Now, if Django doesn't find a match in the URLconf, it will raise a **404** exception, which is the error code for **Page Not Found**.

This is the anatomy of the `url` function:

```
def url(regex, view, kwargs=None, name=None):
    # ...
```

- **regex**: A regular expression for matching URL patterns in strings. Note that these regular expressions do not search **GET** or **POST** parameters. In a request to **http://127.0.0.1:8000/boards/?page=2** only **/boards/** will be processed.
- **view**: A view function used to process the user request for a matched URL. It also accepts the return of the **django.conf.urls.include** function, which is used to reference an external **urls.py** file. You can, for example, use it to define a set of app specific URLs, and include it in the root URLconf using a prefix. We will explore more on this concept later on.
- **kwargs**: Arbitrary keyword arguments that's passed to the target view. It is normally used to do some simple customization on reusable views. We don't use it very often.
- **name**: A unique identifier for a given URL. This is a very important feature. Always remember to name your URLs. With this, you can change a specific URL in the whole project by just changing the regex. So it's important to never hard code URLs in the views or templates, and always refer to the URLs by its name.



**Basic URLs**

Basic URLs are very simple to create. It's just a matter of matching strings. For example, let's say we wanted to create an "about" page, it could be defined like this:

```
from django.conf.urls import url
from boards import views

urlpatterns = [
    url(r'^$', views.home, name='home'),
    url(r'^about/$', views.about, name='about'),
]
```

We can also create deeper URL structures:

```
from django.conf.urls import url
from boards import views

urlpatterns = [
    url(r'^$', views.home, name='home'),
    url(r'^about/$', views.about, name='about'),
    url(r'^about/company/$', views.about_company, na
    url(r'^about/author/$', views.about_author, name
    url(r'^about/author/vitor/$', views.about_vitor,
    url(r'^about/author/erica/$', views.about_erica,
    url(r'^privacy/$', views.privacy_policy, name='p
]
```

Those are some examples of simple URL routing. For all the examples above, the view function will follow this structure:

```
def about(request):
    # do something...
    return render(request, 'about.html')

def about_company(request):
    # do something else...
    # return some data along with the view...
    return render(request, 'about_company.html', {'c
```

**Advanced URLs**

A more advanced usage of URL routing is achieved by taking advantage of the regex to match certain types of data and create dynamic URLs.

For example, to create a profile page, like many services do like github.com/vitorfs or twitter.com/vitorfs, where "vitorfs" is my username, we can do the following:

```
from django.conf.urls import url
from boards import views

urlpatterns = [
    url(r'^$', views.home, name='home'),
    url(r'^(?P<username>[\w.@+-]+)/$', views.user_pr
]
```

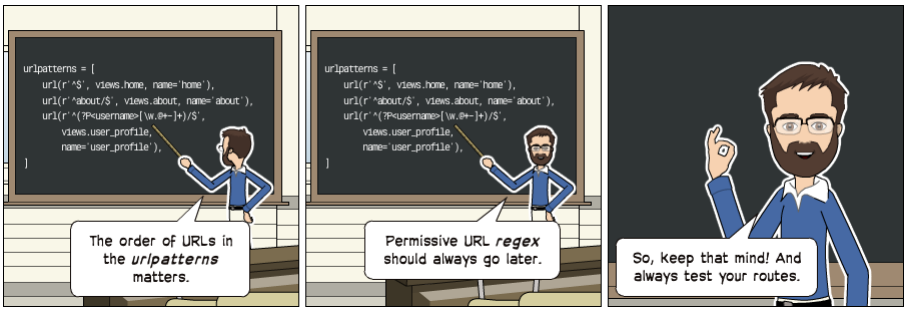
This will match all valid usernames for a Django User model.

Now observe that the example above is a very *permissive* URL. That means it will match lots of URL patterns because it is defined in the root of the URL, with no prefix like **/profile/<username>/**. In this case, if we wanted to define a URL named **/about/**, we would have do define it *before* the username URL pattern:

```
from django.conf.urls import url
from boards import views

urlpatterns = [
    url(r'^$', views.home, name='home'),
    url(r'^about/$', views.about, name='about'),
    url(r'^(?P<username>[\w.@+-]+)/$', views.user_pr
]
```

If the "about" page was defined *after* the username URL pattern, Django would never find it, because the word "about" would match the username regex, and the view `user_profile` would be processed instead of the `about` view function.

There are some side effects to that. For example, from now on, we would have to treat "about" as a forbidden username, because if a user picked "about" as their username, this person would never see their profile page.




**Sidenote:** If you want to design cool URLs for user profiles, the easiest solution to avoid URL collision is by adding a prefix like **/u/vitorfs/**, or like Medium does **/@vitorfs/**, where "@" is the prefix.

If you want no prefix at all, consider using a list of forbidden names like this: github.com/shouldbee/reserved-usernames. Or another example is an application I developed when I was learning Django; I created my list at the time: github.com/vitorfs/parsifal/.

Those collisions are very common. Take GitHub for example; they have this URL to list all the repositories you are currently watching: github.com/watching. Someone registered a username on GitHub with the name "watching," so this person can't see his profile page. We can see a user with this username exists by trying this URL: github.com/watching/repositories which was supposed to list the user's repositories, like mine for example github.com/vitorfs/repositories.

The whole idea of this kind of URL routing is to create dynamic pages where part of the URL will be used as an identifier for a certain resource, that will be used to compose a page. This identifier can be an integer ID or a string for example.

Initially, we will be working with the **Board** ID to create a dynamic page for the **Topics**. Let's read again the example I gave at the beginning of the **URLs** section:

```
url(r'^boards/(?P<pk>\d+)/$', views.board_topics, na
```

The regex `\d+` will match an integer of arbitrary size. This integer will be used to retrieve the **Board** from the database. Now observe that we wrote the regex as `(?P<pk>\d+)`, this is telling Django to capture the value into a keyword argument named **pk**.

Here is how we write a view function for it:

```
def board_topics(request, pk):
```

```
    # do something...
```

Because we used the `(?P<pk>\d+)` regex, the keyword argument in the `board_topics` must be named **pk**.

If we wanted to use any name, we could do it like this:

```
url(r'^boards/(\d+)/$', views.board_topics, name='bo
```

Then the view function could be defined like this:

```
def board_topics(request, board_id):
    # do something...
```

Or like this:

```
def board_topics(request, id):
    # do something...
```

The name wouldn't matter. But it's a good practice to use named parameters because when we start composing bigger URLs capturing multiple IDs and variables, it will be easier to read.

**Sidenote:** PK or ID?

**PK** stands for **Primary Key**. It's a shortcut for accessing a model's primary key. All Django models have this attribute.

For the most cases, using the `pk` property is the same as `id`. That's because if we don't define a primary key for a model, Django will automatically create an `AutoField` named `id`, which will be its primary key.

If you defined a different primary key for a model, for example, let's say the field `email` is your primary key. To access it you could either use `obj.email` or `obj.pk`.

### Using the URLs API

It's time to write some code. Let's implement the topic listing page (see Figure 1) I mentioned at the beginning of the **URLs** section.

First, edit the **urls.py** adding our new URL route:

**myproject/urls.py**

```
from django.conf.urls import url
from django.contrib import admin

from boards import views

urlpatterns = [
    url(r'^$', views.home, name='home'),
    url(r'^boards/(?P<pk>\d+)/$', views.board_topics
    url(r'^admin/', admin.site.urls),
]
```

Now let's create the view function `board_topics`:

**boards/views.py**

```
from django.shortcuts import render
from .models import Board

def home(request):
    # code suppressed for brevity

def board_topics(request, pk):
    board = Board.objects.get(pk=pk)
    return render(request, 'topics.html', {'board':
```

In the **templates** folder, create a new template named **topics.html**:

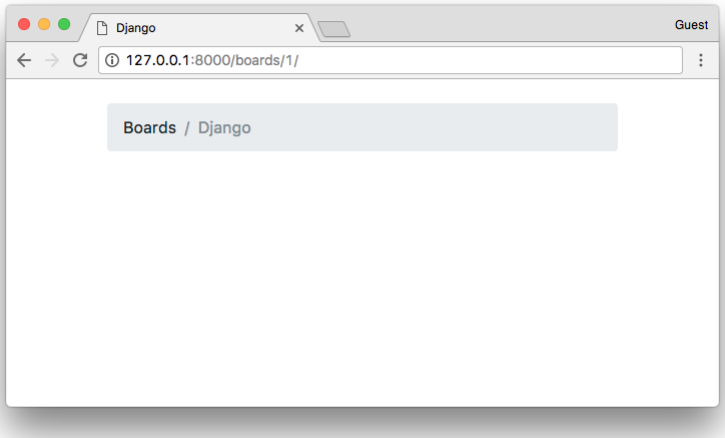
**templates/topics.html**

```
{% load static %}<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <title>{{ board.name }}</title>
    <link rel="stylesheet" href="{% static 'css/boot
  </head>
  <body>
    <div class="container">
      <ol class="breadcrumb my-4">
        <li class="breadcrumb-item">Boards</li>
        <li class="breadcrumb-item active">{{ board.
      </ol>
    </div>
  </body>
```

```
</html>
```

**Note:** For now we are simply creating new HTML templates. No worries, in the following section I will show you how to create reusable templates.

Now check the URL **http://127.0.0.1:8000/boards/1/** in a web browser. The result should be the following page:




Time to write some tests! Edit the **tests.py** file and add the following tests in the bottom of the file:

**boards/tests.py**

```
from django.core.urlresolvers import reverse
from django.urls import resolve
from django.test import TestCase
from .views import home, board_topics
from .models import Board

class HomeTests(TestCase):
    # ...

class BoardTopicsTests(TestCase):
    def setUp(self):
        Board.objects.create(name='Django', descript

    def test_board_topics_view_success_status_code(s
        url = reverse('board_topics', kwargs={'pk':
        response = self.client.get(url)
        self.assertEquals(response.status_code, 200)

    def test_board_topics_view_not_found_status_code
```

```
        url = reverse('board_topics', kwargs={'pk':
        response = self.client.get(url)
        self.assertEquals(response.status_code, 404)

    def test_board_topics_url_resolves_board_topics_
        view = resolve('/boards/1/')
        self.assertEquals(view.func, board_topics)
```

A few things to note here. This time we used the `setUp` method. In the setup method, we created a **Board** instance to use in the tests. We have to do that because the Django testing suite doesn't run your tests against the current database. To run the tests Django creates a new database on the fly, applies all the model migrations, runs the tests, and when done, destroys the testing database.

So in the `setUp` method, we prepare the environment to run the tests, so to simulate a scenario.

- The `test_board_topics_view_success_status_code` method: is testing if Django is returning a status code 200 (success) for an existing **Board**.
- The `test_board_topics_view_not_found_status_code` method: is testing if Django is returning a status code 404 (page not found) for a **Board** that doesn't exist in the database.
- The `test_board_topics_url_resolves_board_topics_view` method: is testing if Django is using the correct view function to render the topics.

Now it's time to run the tests:

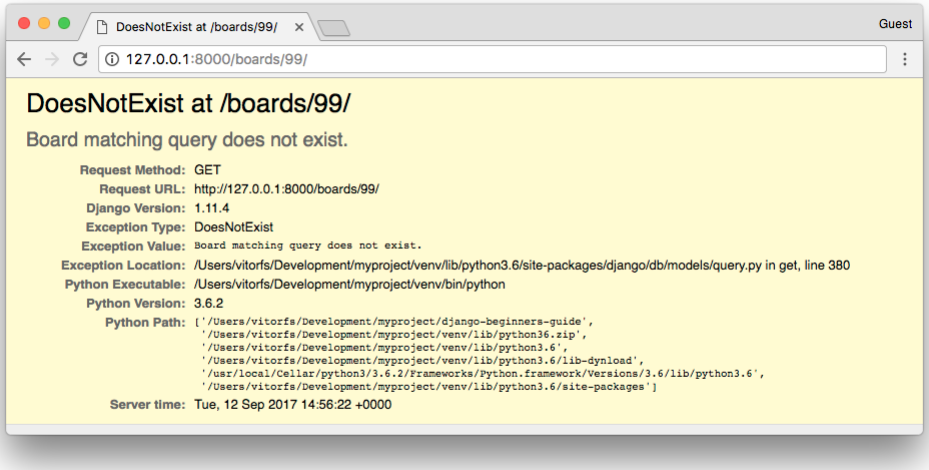
```
python manage.py test
```

And the output:

```
Creating test database for alias 'default'...
System check identified no issues (0 silenced).
.E...
======================================================
ERROR: test_board_topics_view_not_found_status_code
------------------------------------------------------
Traceback (most recent call last):
# ...
boards.models.DoesNotExist: Board matching query doe
```

```
----------------------------------------------------------------------
Ran 5 tests in 0.093s

FAILED (errors=1)
Destroying test database for alias 'default'...
```

The test **test_board_topics_view_not_found_status_code** failed. We can see in the Traceback it returned an exception "boards.models.DoesNotExist: Board matching query does not exist."




In production with `DEBUG=False`, the visitor would see a **500 Internal Server Error** page. But that's not the behavior we want.

We want to show a **404 Page Not Found**. So let's refactor our view:

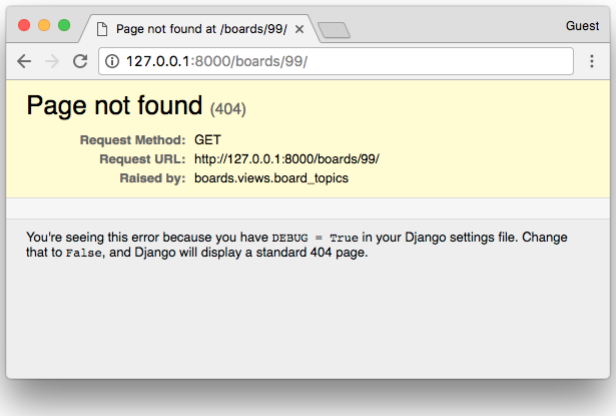
**boards/views.py**

```
from django.shortcuts import render
from django.http import Http404
from .models import Board

def home(request):
    # code suppressed for brevity

def board_topics(request, pk):
    try:
        board = Board.objects.get(pk=pk)
    except Board.DoesNotExist:
        raise Http404
    return render(request, 'topics.html', {'board':
```

Let's test again:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
.....
----------------------------------------------------------------------
Ran 5 tests in 0.042s

OK
Destroying test database for alias 'default'...
```

Yay! Now it's working as expected.




This is the default page Django show while with `DEBUG=False`. Later on, we can customize the 404 page to show something else.

Now that's a very common use case. In fact, Django has a shortcut to try to get an object, or return a 404 with the object does not exist.

So let's refactor the **board_topics** view again:

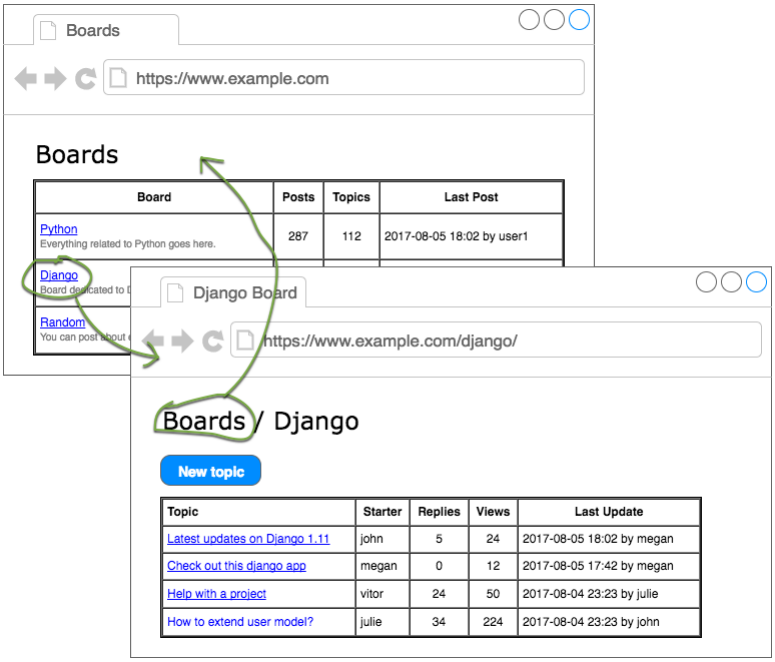
```
from django.shortcuts import render, get_object_or_4
from .models import Board

def home(request):
    # code suppressed for brevity

def board_topics(request, pk):
    board = get_object_or_404(Board, pk=pk)
    return render(request, 'topics.html', {'board':
```

Changed the code? Test it.

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
.....
----------------------------------------------------------------------
Ran 5 tests in 0.052s

OK
Destroying test database for alias 'default'...
```

Didn't break anything. We can proceed with the development.

The next step now is to create the navigation links in the screens. The homepage should have a link to take the visitor to the topics page of a given **Board**. Similarly, the topics page should have a link back to the homepage.




We can start by writing some tests for the `HomeTests` class:

**boards/tests.py**

```
class HomeTests(TestCase):
    def setUp(self):
        self.board = Board.objects.create(name='Djan
        url = reverse('home')
        self.response = self.client.get(url)
```

```
    def test_home_view_status_code(self):
        self.assertEquals(self.response.status_code,

    def test_home_url_resolves_home_view(self):
        view = resolve('/')
        self.assertEquals(view.func, home)

    def test_home_view_contains_link_to_topics_page(
        board_topics_url = reverse('board_topics', k
        self.assertContains(self.response, 'href="{0
```

Observe that now we added a **setUp** method for the **HomeTests** as well. That's because now we are going to need a **Board** instance and also we moved the **url** and **response** to the **setUp**, so we can reuse the same response in the new test.

The new test here is the **test_home_view_contains_link_to_topics_page**. Here we are using the **assertContains** method to test if the response body contains a given text. The text we are using in the test, is the `href` part of an `a` tag. So basically we are testing if the response body has the text `href="/boards/1/"`.

Let's run the tests:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
....F.
======================================================
FAIL: test_home_view_contains_link_to_topics_page (b
------------------------------------------------------
# ...

AssertionError: False is not true : Couldn't find 'h

------------------------------------------------------
Ran 6 tests in 0.034s

FAILED (failures=1)
Destroying test database for alias 'default'...
```

Now we can write the code that will make this test pass.

Edit the **home.html** template:

**templates/home.html**

```
<!-- code suppressed for brevity -->
<tbody>
  {% for board in boards %}
    <tr>
      <td>
        <a href="{% url 'board_topics' board.pk %}">
        <small class="text-muted d-block">{{ board.d
      </td>
      <td class="align-middle">0</td>
      <td class="align-middle">0</td>
      <td></td>
    </tr>
  {% endfor %}
</tbody>
<!-- code suppressed for brevity -->
```

So basically we changed the line:

```
{{ board.name }}
```

To:

```
<a href="{% url 'board_topics' board.pk %}">{{ board
```

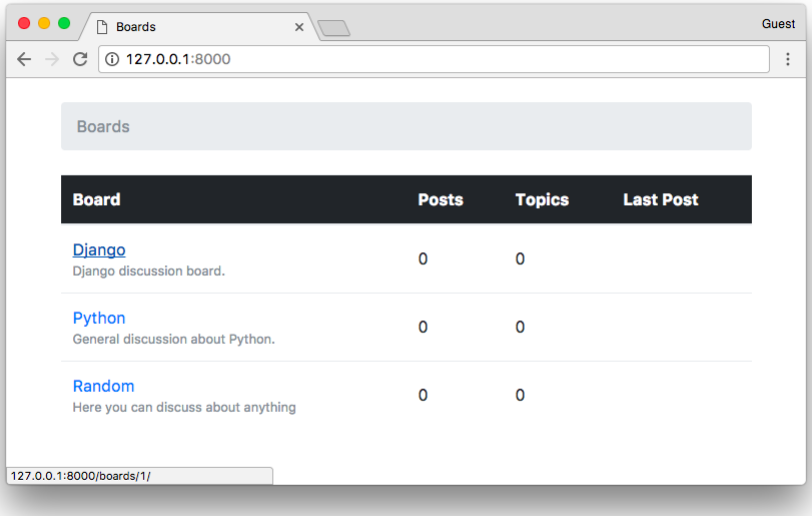
Always use the `{% url %}` template tag to compose the applications URLs. The first parameter is the **name** of the URL (defined in the URLconf, i.e., the **urls.py**), then you can pass an arbitrary number of arguments as needed.

If it were a simple URL, like the homepage, it would be just `{% url 'home' %}`.

Save the file and run the tests again:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
......
----------------------------------------------------------
Ran 6 tests in 0.037s

OK
Destroying test database for alias 'default'...
```

Good! Now we can check how it looks in the web browser:




Now the link back. We can write the test first:

**boards/tests.py**

```
class BoardTopicsTests(TestCase):
    # code suppressed for brevity...

    def test_board_topics_view_contains_link_back_to
        board_topics_url = reverse('board_topics', k
        response = self.client.get(board_topics_url)
        homepage_url = reverse('home')
        self.assertContains(response, 'href="{0}"'.f
```

Run the tests:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
.F.....
======================================================
FAIL: test_board_topics_view_contains_link_back_to_h
------------------------------------------------------
Traceback (most recent call last):
# ...

AssertionError: False is not true : Couldn't find 'h

------------------------------------------------------
```

```
Ran 7 tests in 0.054s

FAILED (failures=1)
Destroying test database for alias 'default'...
```

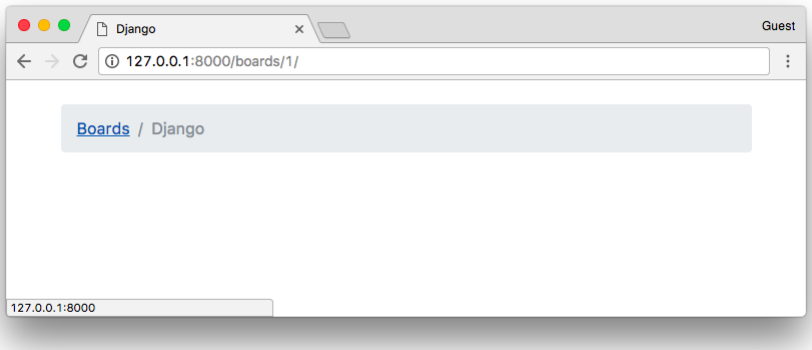
Update the board topics template:

**templates/topics.html**

```
{% load static %}<!DOCTYPE html>
<html>
  <head><!-- code suppressed for brevity --></head>
  <body>
    <div class="container">
      <ol class="breadcrumb my-4">
        <li class="breadcrumb-item"><a href="{% url
        <li class="breadcrumb-item active">{{ board.
      </ol>
    </div>
  </body>
</html>
```

Run the tests:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
.......
----------------------------------------------------------------------
Ran 7 tests in 0.061s

OK
Destroying test database for alias 'default'...
```



As I mentioned before, URL routing is a fundamental part of a web application. With this knowledge, we should be able to proceed with the development. Next, to complete the section about URLs, you will find a summary of useful URL patterns.

### List of Useful URL Patterns

The trick part is the **regex**. So I prepared a list of the most used URL patterns. You can always refer to this list when you need a specific URL.

**Primary Key AutoField**

| | |
|---|---|
| **Regex** | `(?P<pk>\d+)` |
| **Example** | `url(r'^questions/(?P<pk>\d+)/$', views.question, name='question')` |
| **Valid URL** | `/questions/934/` |
| **Captures** | `{'pk': '934'}` |

**Slug Field**

| | |
|---|---|
| **Regex** | `(?P<slug>[-\w]+)` |
| **Example** | `url(r'^posts/(?P<slug>[-\w]+)/$', views.post, name='post')` |
| **Valid URL** | `/posts/hello-world/` |
| **Captures** | `{'slug': 'hello-world'}` |

**Slug Field with Primary Key**

| | |
|---|---|
| **Regex** | `(?P<slug>[-\w]+)-(?P<pk>\d+)` |
| **Example** | `url(r'^blog/(?P<slug>[-\w]+)-(?P<pk>\d+)/$', views.blog_post, name='blog_post')` |
| **Valid URL** | `/blog/hello-world-159/` |
| **Captures** | `{'slug': 'hello-world', 'pk': '159'}` |

**Django User Username**

| | |
|---|---|
| **Regex** | `(?P<username>[\w.@+-]+)` |
| **Example** | `url(r'^profile/(?P<username>[\w.@+-]+)/$', views.user_profile, name='user_profile')` |
| **Valid URL** | `/profile/vitorfs/` |
| **Captures** | |

| | |
|---|---|
| | `{'username': 'vitor'}` |

**Year**

| | |
|---|---|
| **Regex** | `(?P<year>[0-9]{4})` |
| **Example** | `url(r'^articles/(?P<year>[0-9]{4})/$', views.year_archive, name='year')` |
| **Valid URL** | `/articles/2016/` |
| **Captures** | `{'year': '2016'}` |

**Year / Month**

| | |
|---|---|
| **Regex** | `(?P<year>[0-9]{4})/(?P<month>[0-9]{2})` |
| **Example** | `url(r'^articles/(?P<year>[0-9]{4})/(?P<month>[0-9]{2})/$', views.month_archive, name='month')` |
| **Valid URL** | `/articles/2016/01/` |
| **Captures** | `{'year': '2016', 'month': '01'}` |

You can find more details about those patterns in this post: List of Useful URL Patterns.

---

### Reusable Templates

Until now we've been copying and pasting HTML repeating several parts of the HTML document, which is not very sustainable in the long run. It's also a bad practice.

In this section we are going to refactor our HTML templates, creating a **master page** and only adding the unique part for each template.

Create a new file named **base.html** in the **templates** folder:

**templates/base.html**

```
{% load static %}<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <title>{% block title %}Django Boards{% endblock
    <link rel="stylesheet" href="{% static 'css/boot
  </head>
  <body>
```

```
    <div class="container">
      <ol class="breadcrumb my-4">
        {% block breadcrumb %}
        {% endblock %}
      </ol>
      {% block content %}
      {% endblock %}
    </div>
  </body>
</html>
```

This is going to be our master page. Every template we create, is going to **extend** this special template. Observe now we introduced the `{% block %}` tag. It is used to reserve a space in the template, which a "child" template (which extends the master page) can insert code and HTML within that space.

In the case of the `{% block title %}` we are also setting a default value, which is "Django Boards." It will be used if we don't set a value for the `{% block title %}` in a child template.

Now let's refactor our two templates: **home.html** and **topics.html**.

**templates/home.html**

```
{% extends 'base.html' %}

{% block breadcrumb %}
  <li class="breadcrumb-item active">Boards</li>
{% endblock %}

{% block content %}
  <table class="table">
    <thead class="thead-inverse">
      <tr>
        <th>Board</th>
        <th>Posts</th>
        <th>Topics</th>
        <th>Last Post</th>
      </tr>
    </thead>
    <tbody>
      {% for board in boards %}
        <tr>
          <td>
            <a href="{% url 'board_topics' board.pk
```

```
              <small class="text-muted d-block">{{ boa
            </td>
            <td class="align-middle">0</td>
            <td class="align-middle">0</td>
            <td></td>
          </tr>
        {% endfor %}
      </tbody>
    </table>
{% endblock %}
```

The first line in the **home.html** template is `{% extends 'base.html' %}`. This tag is telling Django to use the **base.html** template as a master page. After that, we are using the the *blocks* to put the unique content of the page.

**templates/topics.html**

```
{% extends 'base.html' %}

{% block title %}
  {{ board.name }} - {{ block.super }}
{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item"><a href="{% url 'home'
  <li class="breadcrumb-item active">{{ board.name }
{% endblock %}

{% block content %}
    <!-- just leaving it empty for now. we will add
{% endblock %}
```

In the **topics.html** template, we are changing the `{% block title %}` default value. Notice that we can reuse the default value of the block by calling `{{ block.super }}`. So here we are playing with the website title, which we defined in the **base.html** as "Django Boards." So for the "Python" board page, the title will be "Python - Django Boards," for the "Random" board the title will be "Random - Django Boards."

Now let's run the tests and see we didn't break anything:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
```

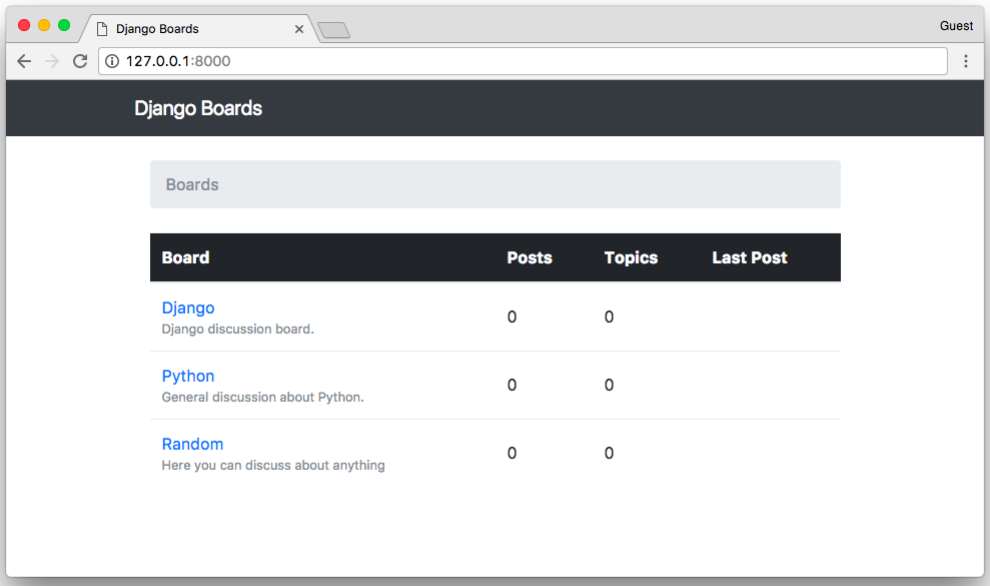
```
.......
----------------------------------------------------------------
Ran 7 tests in 0.067s

OK
Destroying test database for alias 'default'...
```

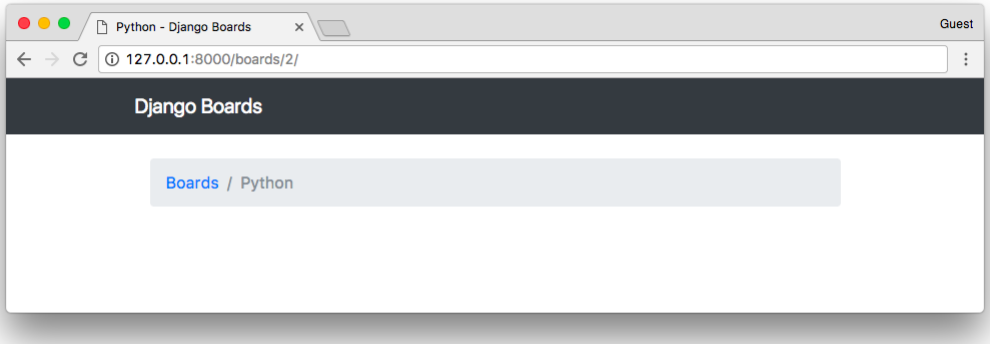
Great! Everything is looking good.

Now that we have the **base.html** template, we can easily add a top bar with a menu:

**templates/base.html**

```
{% load static %}<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <title>{% block title %}Django Boards{% endblock
    <link rel="stylesheet" href="{% static 'css/boot
  </head>
  <body>

    <nav class="navbar navbar-expand-lg navbar-dark
      <div class="container">
        <a class="navbar-brand" href="{% url 'home'
      </div>
    </nav>

    <div class="container">
      <ol class="breadcrumb my-4">
        {% block breadcrumb %}
        {% endblock %}
      </ol>
      {% block content %}
      {% endblock %}
    </div>
  </body>
</html>
```

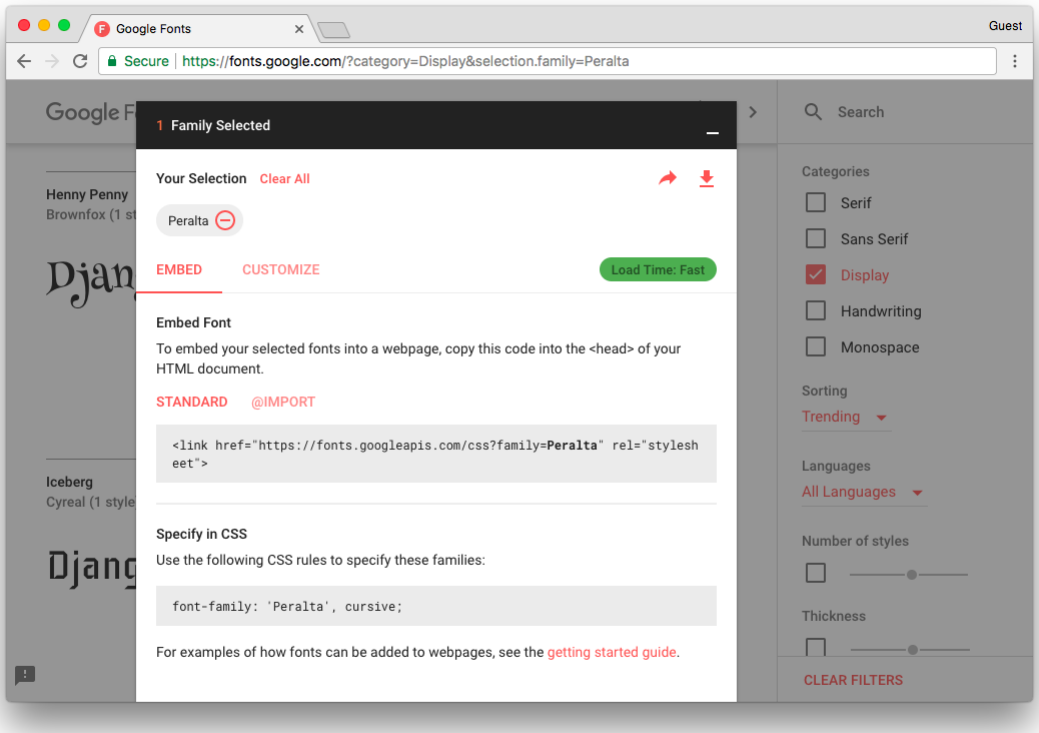



The HTML I used is part of the Bootstrap 4 Navbar Component.

A nice touch I like to add is to change the font in the "logo" (`.navbar-brand`) of the page.

Go to fonts.google.com, type "Django Boards" or whatever name you gave to your project then click on **apply to all fonts**. Browse a bit, find one that you like.



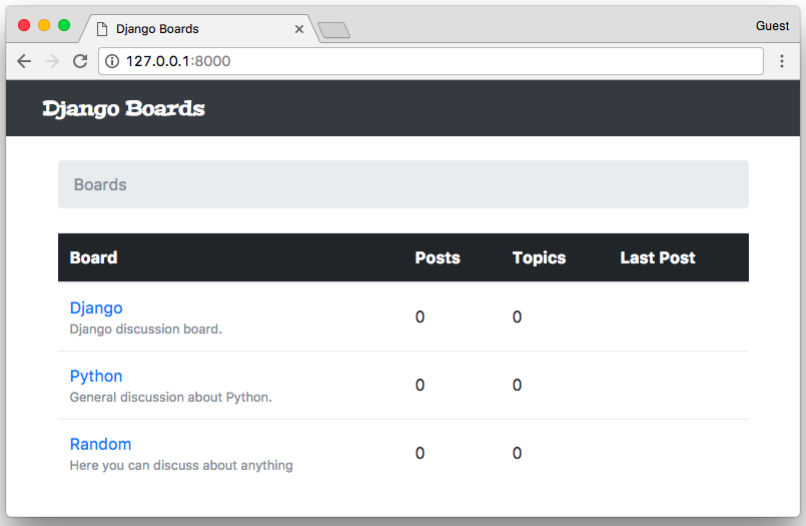

Add the font in the **base.html** template:

```
{% load static %}<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <title>{% block title %}Django Boards{% endblock
    <link href="https://fonts.googleapis.com/css?fam
    <link rel="stylesheet" href="{% static 'css/boot
    <link rel="stylesheet" href="{% static 'css/app.
  </head>
  <body>
    <!-- code suppressed for brevity -->
  </body>
</html>
```

Now create a new CSS file named **app.css** inside the **static/css** folder:

**static/css/app.css**

```
.navbar-brand {
  font-family: 'Peralta', cursive;
}
```




---

## Forms

Forms are used to deal with user input. It's a very common task in any web application or website. The standard way to do it is through HTML forms, where the user input some data, submit it to the server, and then the server does something with it.


Form processing is a fairly complex task because it involves interacting with many layers of an application. There are also many issues to take care of. For example, all data submitted to the server comes in a string format, so we have to transform it into a proper data type (integer, float, date, etc.) before doing anything with it. We have to validate the data regarding the business logic of the application. We also have to clean, sanitize the data properly so to avoid security issues such as SQL Injection and XSS attacks.

Good news is that the Django Forms API makes the whole process a lot easier, automating a good chunk of this work. Also, the final result is a much more secure code than most programmers would be able to implement by themselves.

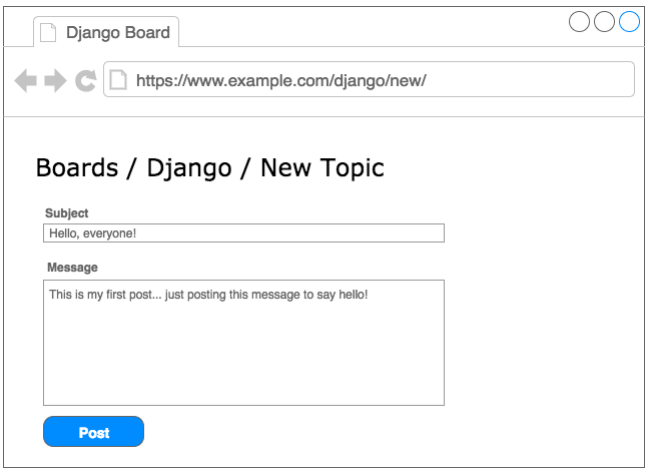
So, no matter how simple the HTML form is, always use the forms API.

## How Not Implement a Form

At first, I thought about jumping straight to the forms API. But I think it would be a good idea for us to spend some time trying to understand the underlying details of form processing. Otherwise, it will end up looking like magic, which is a bad thing, because when things go wrong, you have no idea where to look for the problem.

With a deeper understanding of some programming concepts, we can feel more in control of the situation. Being in control is important because it let us write code with more confidence. The moment we know exactly what is going on, it's much easier to implement a code of predictable behavior. It's also a lot easier to debug and find errors because you know where to look.

Anyway, let's start by implementing the form below:




It's one of the wireframes we drew in the previous tutorial. I now realize this may be a bad example to start because this particular form involves processing data of two different models: **Topic** (subject) and **Post** (message).

There's another important aspect that we haven't discussed it so far, which is user authentication. We are only supposed to show this screen for authenticated users. This way we can tell who created a **Topic** or a **Post**.

So let's abstract some details for now and focus on understanding how to save user input in the database.

First thing, let's create a new URL route named **new_topic**:

**myproject/urls.py**

```
from django.conf.urls import url
from django.contrib import admin

from boards import views

urlpatterns = [
    url(r'^$', views.home, name='home'),
    url(r'^boards/(?P<pk>\d+)/$', views.board_topics
    url(r'^boards/(?P<pk>\d+)/new/$', views.new_topi
    url(r'^admin/', admin.site.urls),
]
```

The way we are building the URL will help us identify the correct **Board**.

Now let's create the **new_topic** view function:

**boards/views.py**

```
from django.shortcuts import render, get_object_or_4
from .models import Board

def new_topic(request, pk):
    board = get_object_or_404(Board, pk=pk)
    return render(request, 'new_topic.html', {'board
```

For now, the **new_topic** view function is looking exactly the same as the **board_topics**. That's on purpose, let's take a step at a time.

Now we just need a template named **new_topic.html** to see some code working:

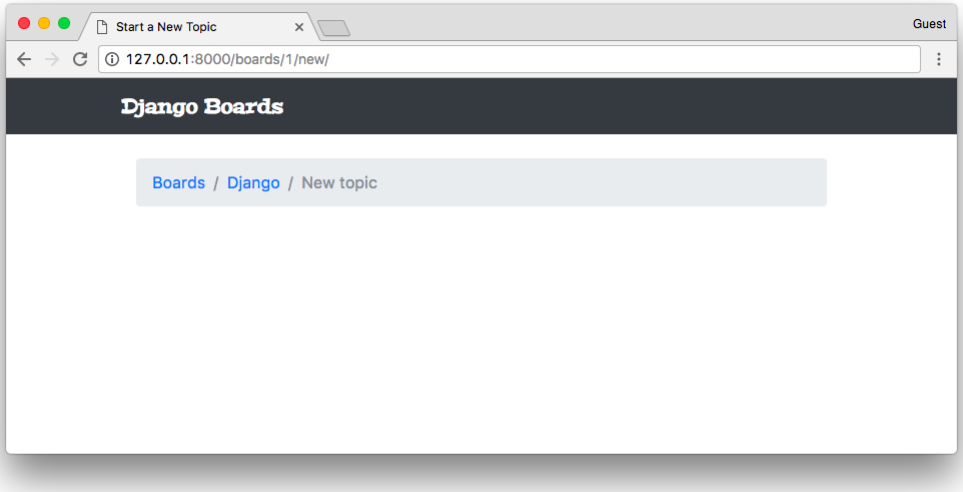
**templates/new_topic.html**

```
{% extends 'base.html' %}

{% block title %}Start a New Topic{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item"><a href="{% url 'home'
  <li class="breadcrumb-item"><a href="{% url 'board
  <li class="breadcrumb-item active">New topic</li>
{% endblock %}

{% block content %}
```

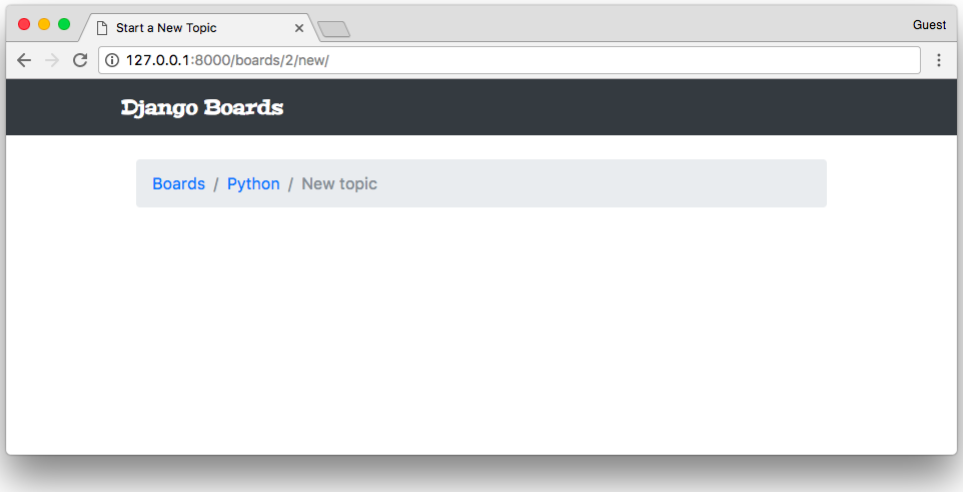
```
{% endblock %}
```

For now we just have the breadcrumb assuring the navigation. Observe that we included the URL back to the **board_topics** view.

Open the URL **http://127.0.0.1:8000/boards/1/new/**. The result, for now, is the following page:




We still haven't implemented a way to reach this new page, but if we change the URL to **http://127.0.0.1:8000/boards/2/new/**, it should take us to the **Python Board**:




**Note:**

The result may be different for you if you haven't followed the steps from the

previous tutorial. In my case, I have three **Board** instances in the database, being Django = 1, Python = 2, and Random = 3. Those numbers are the IDs from the database, used from the URL to identify the right resource.

We can already add some tests:

**boards/tests.py**

```
from django.core.urlresolvers import reverse
from django.urls import resolve
from django.test import TestCase
from .views import home, board_topics, new_topic
from .models import Board

class HomeTests(TestCase):
    # ...

class BoardTopicsTests(TestCase):
    # ...

class NewTopicTests(TestCase):
    def setUp(self):
        Board.objects.create(name='Django', descript

    def test_new_topic_view_success_status_code(self
        url = reverse('new_topic', kwargs={'pk': 1})
        response = self.client.get(url)
        self.assertEquals(response.status_code, 200)

    def test_new_topic_view_not_found_status_code(se
        url = reverse('new_topic', kwargs={'pk': 99}
        response = self.client.get(url)
        self.assertEquals(response.status_code, 404)

    def test_new_topic_url_resolves_new_topic_view(s
        view = resolve('/boards/1/new/')
        self.assertEquals(view.func, new_topic)

    def test_new_topic_view_contains_link_back_to_bo
        new_topic_url = reverse('new_topic', kwargs=
        board_topics_url = reverse('board_topics', k
        response = self.client.get(new_topic_url)
        self.assertContains(response, 'href="{0}"'.f
```

A quick summary of the tests of our new class **NewTopicTests**:

- **setUp**: creates a **Board** instance to be used during the tests
- **test_new_topic_view_success_status_code**: check if the request to the view is successful
- **test_new_topic_view_not_found_status_code**: check if the view is raising a 404 error when the **Board** does not exist
- **test_new_topic_url_resolves_new_topic_view**: check if the right view is being used
- **test_new_topic_view_contains_link_back_to_board_topics_view**: ensure the navigation back to the list of topics

Run the tests:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
..........
----------------------------------------------------------
Ran 11 tests in 0.076s

OK
Destroying test database for alias 'default'...
```

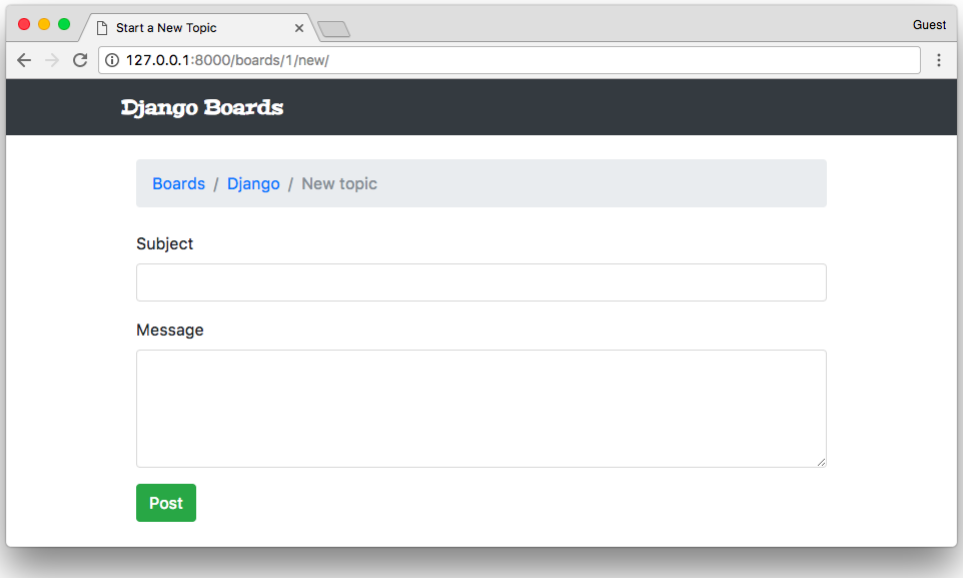
Good, now it's time to start creating the form.

**templates/new_topic.html**

```
{% extends 'base.html' %}

{% block title %}Start a New Topic{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item"><a href="{% url 'home'
  <li class="breadcrumb-item"><a href="{% url 'board
  <li class="breadcrumb-item active">New topic</li>
{% endblock %}

{% block content %}
  <form method="post">
    {% csrf_token %}
    <div class="form-group">
      <label for="id_subject">Subject</label>
      <input type="text" class="form-control" id="id
    </div>
    <div class="form-group">
```

```
        <label for="id_message">Message</label>
        <textarea class="form-control" id="id_message"
      </div>
      <button type="submit" class="btn btn-success">Po
    </form>
{% endblock %}
```

This is a raw HTML form created by hand using the CSS classes provided by Bootstrap 4. It looks like this:




In the `<form>` tag, we have to define the `method` attribute. This instructs the browser on how we want to communicate with the server. The HTTP spec defines several request methods (verbs). But for the most part, we will only be using **GET** and **POST** request types.

**GET** is perhaps the most common request type. It's used to *retrieve* data from the server. Every time you click on a link or type a URL directly into the browser, you are creating a **GET** request.

**POST** is used when we want to change data on the server. So, generally speaking, every time we send data to the server that will result in a change in the state of a resource, we should always send it via **POST** request.

Django protects all **POST** requests using a **CSRF Token** (Cross-Site Request Forgery Token). It's a security measure to avoid external sites or applications to submit data to our application. Every time the application receives a **POST**, it will first look for the **CSRF Token**. If the request has no token, or the token is

invalid, it will discard the posted data.

The result of the **csrf_token** template tag:

```
{% csrf_token %}
```

Is a hidden field that's submitted along with the other form data:

```
<input type="hidden" name="csrfmiddlewaretoken" valu
```

Another thing, we have to set the **name** of the HTML inputs. The **name** will be used to retrieve the data on the server side.

```
<input type="text" class="form-control" id="id_subje
<textarea class="form-control" id="id_message" name=
```

Here is how we retrieve the data:

```
subject = request.POST['subject']
message = request.POST['message']
```

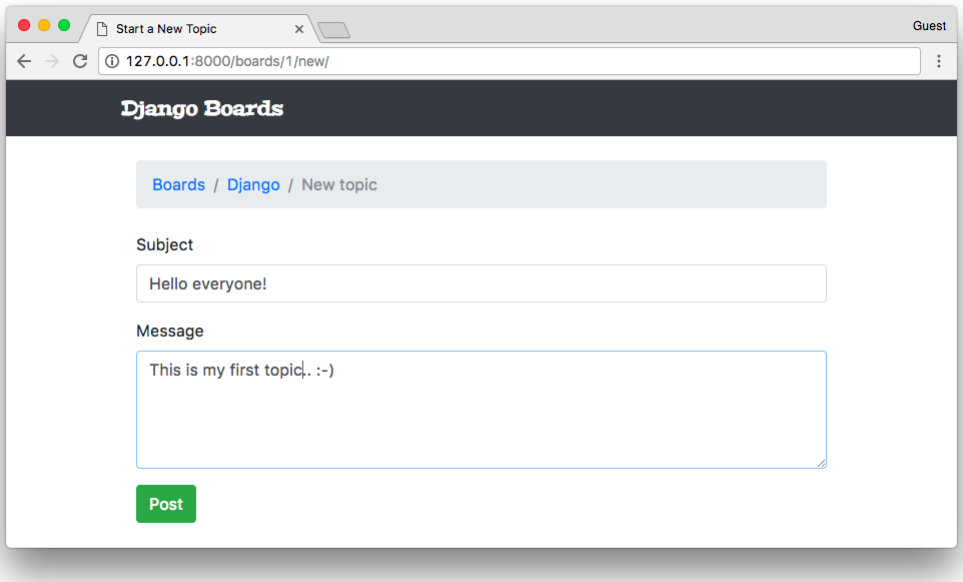
So, a naïve implementation of a view that grabs the data from the HTML and starts a new topic can be written like this:

```
from django.contrib.auth.models import User
from django.shortcuts import render, redirect, get_o
from .models import Board, Topic, Post

def new_topic(request, pk):
    board = get_object_or_404(Board, pk=pk)

    if request.method == 'POST':
        subject = request.POST['subject']
        message = request.POST['message']

        user = User.objects.first()  # TODO: get the

        topic = Topic.objects.create(
            subject=subject,
            board=board,
            starter=user
        )

        post = Post.objects.create(
            message=message,
```

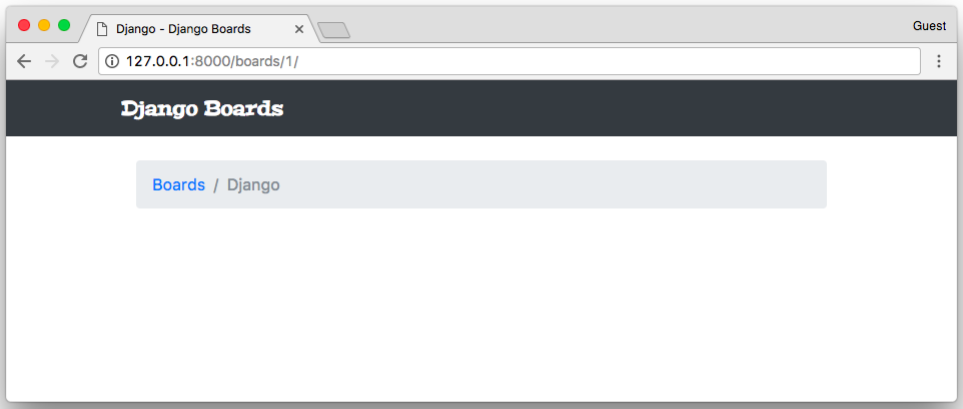
```
            topic=topic,
            created_by=user
        )

        return redirect('board_topics', pk=board.pk)

    return render(request, 'new_topic.html', {'board
```

This view is only considering the *happy path*, which is receiving the data and saving it into the database. But there are some missing parts. We are not validating the data. The user could submit an empty form or a **subject** that's bigger than 255 characters.

So far we are hard-coding the **User** fields because we haven't implemented the authentication yet. But there's an easy way to identify the logged in user. We will get to that part in the next tutorial. Also, we haven't implemented the view where we will list all the posts within a topic, so upon success, we are redirecting the user to the page where we list all the board topics.




Submitted the form clicking on the **Post** button:

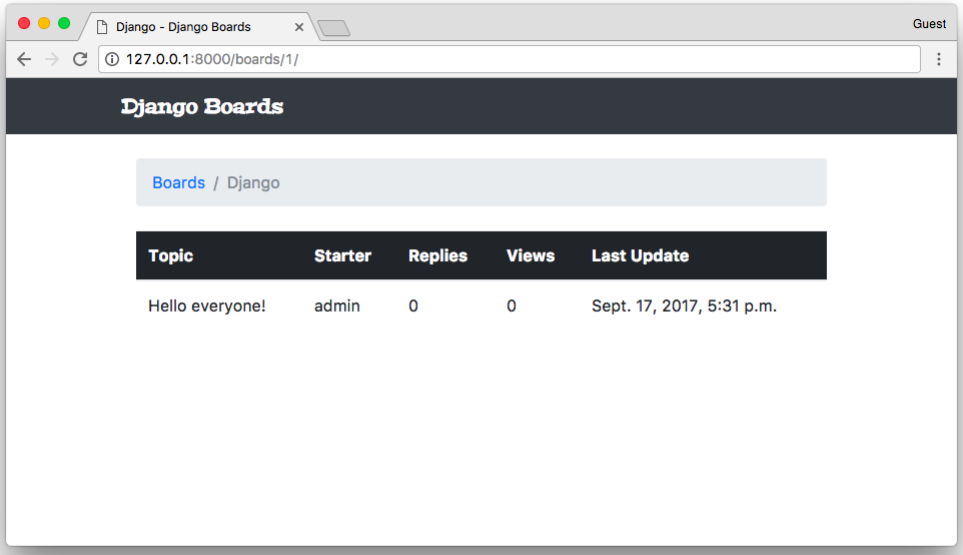



It looks like it worked. But we haven't implemented the topics listing yet, so there's nothing to see here. Let's edit the **templates/topics.html** file to do a proper listing:

**templates/topics.html**

```
{% extends 'base.html' %}

{% block title %}
  {{ board.name }} - {{ block.super }}
{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item"><a href="{% url 'home'
  <li class="breadcrumb-item active">{{ board.name }
{% endblock %}

{% block content %}
  <table class="table">
    <thead class="thead-inverse">
      <tr>
        <th>Topic</th>
        <th>Starter</th>
        <th>Replies</th>
        <th>Views</th>
        <th>Last Update</th>
      </tr>
    </thead>
    <tbody>
      {% for topic in board.topics.all %}
        <tr>
          <td>{{ topic.subject }}</td>
```

```
            <td>{{ topic.starter.username }}</td>
            <td>0</td>
            <td>0</td>
            <td>{{ topic.last_updated }}</td>
          </tr>
        {% endfor %}
      </tbody>
    </table>
{% endblock %}
```




Yep! The **Topic** we created is here.

Two new concepts here:

We are using for the first time the **topics** property in the **Board** model. The **topics** property is created automatically by Django using a reverse relationship. In the previous steps, we created a **Topic** instance:

```
def new_topic(request, pk):
    board = get_object_or_404(Board, pk=pk)

    # ...

    topic = Topic.objects.create(
        subject=subject,
        board=board,
        starter=user
    )
```

In the line `board=board`, we set the **board** field in **Topic** model, which is a `ForeignKey(Board)`. With that, now our **Board** instance is aware that it has an **Topic** instance associated with it.

The reason why we used `board.topics.all` instead of just `board.topics` is because `board.topics` is a **Related Manager**, which is pretty much similar to a **Model Manager**, usually available on the `board.objects` property. So, to return all topics associated with a given board, we have to run `board.topics.all()`. To filter some data, we could do `board.topics.filter(subject__contains='Hello')`.

Another important thing to note is that, inside Python code, we have to use parenthesis: `board.topics.all()`, because `all()` is a method. When writing code using the Django Template Language, in an HTML template file, we don't use parenthesis, so it's just `board.topics.all`.

The second thing is that we are making use of a `ForeignKey`:

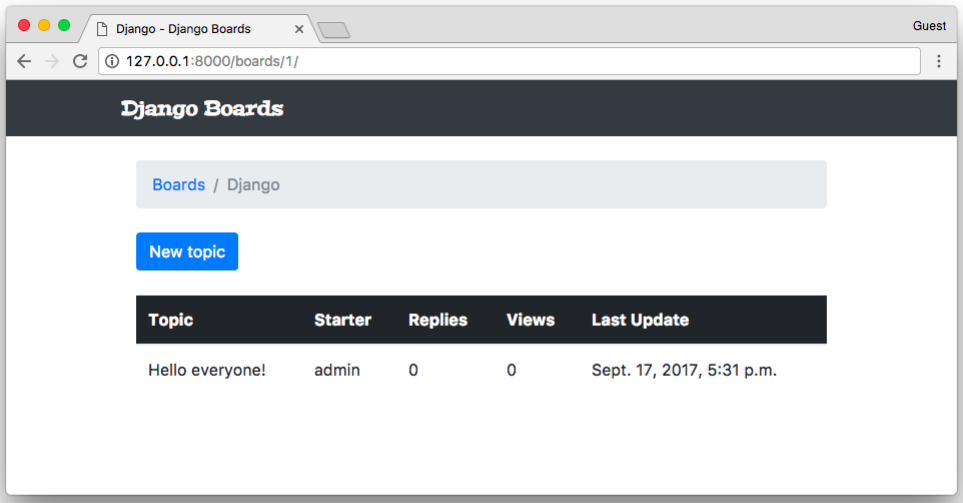
```
{{ topic.starter.username }}
```

Just create a *path* through the property using dots. We can pretty much access any property of the **User** model. If we wanted the user's email, we could use `topic.starter.email`.

Since we are already modifying the **topics.html** template, let's create the button that takes us to the **new topic** screen:

**templates/topics.html**

```
{% block content %}
  <div class="mb-4">
    <a href="{% url 'new_topic' board.pk %}" class="
  </div>

  <table class="table">
    <!-- code suppressed for brevity -->
  </table>
{% endblock %}
```




We can include a test to make sure the user can reach the **New topic** view from this page:

**boards/tests.py**

```
class BoardTopicsTests(TestCase):
    # ...

    def test_board_topics_view_contains_navigation_l
        board_topics_url = reverse('board_topics', k
        homepage_url = reverse('home')
        new_topic_url = reverse('new_topic', kwargs=

        response = self.client.get(board_topics_url)

        self.assertContains(response, 'href="{0}"'.f
        self.assertContains(response, 'href="{0}"'.f
```

Basically here I renamed the old **test_board_topics_view_contains_link_back_to_homepage** method and add an extra `assertContains`. This test is now responsible for making sure our view contains the required navigation links.

## Testing The Form View

Before we code the previous form example in a Django way, let's write some tests for the form processing:

**boards/tests.py**

```
''' new imports below '''
from django.contrib.auth.models import User
from .views import new_topic
from .models import Board, Topic, Post

class NewTopicTests(TestCase):
    def setUp(self):
        Board.objects.create(name='Django', descript
        User.objects.create_user(username='john', em

    # ...

    def test_csrf(self):
        url = reverse('new_topic', kwargs={'pk': 1})
        response = self.client.get(url)
        self.assertContains(response, 'csrfmiddlewar

    def test_new_topic_valid_post_data(self):
        url = reverse('new_topic', kwargs={'pk': 1})
        data = {
            'subject': 'Test title',
            'message': 'Lorem ipsum dolor sit amet'
        }
        response = self.client.post(url, data)
        self.assertTrue(Topic.objects.exists())
        self.assertTrue(Post.objects.exists())

    def test_new_topic_invalid_post_data(self):
        '''
        Invalid post data should not redirect
        The expected behavior is to show the form ag
        '''
        url = reverse('new_topic', kwargs={'pk': 1})
        response = self.client.post(url, {})
        self.assertEquals(response.status_code, 200)

    def test_new_topic_invalid_post_data_empty_field
        '''
        Invalid post data should not redirect
        The expected behavior is to show the form ag
        '''
        url = reverse('new_topic', kwargs={'pk': 1})
        data = {
            'subject': '',
```

```
            'message': ''
        }
        response = self.client.post(url, data)
        self.assertEquals(response.status_code, 200)
        self.assertFalse(Topic.objects.exists())
        self.assertFalse(Post.objects.exists())
```

First thing, the **tests.py** file is already starting to get big. We will improve it soon, breaking the tests into several files. But for now, let's keep working on it.

- **setUp**: included the `User.objects.create_user` to create a **User** instance to be used in the tests
- **test_csrf**: since the **CSRF Token** is a fundamental part of processing **POST** requests, we have to make sure our HTML contains the token.
- **test_new_topic_valid_post_data**: sends a valid combination of data and check if the view created a **Topic** instance and a **Post** instance.
- **test_new_topic_invalid_post_data**: here we are sending an empty dictionary to check how the application is behaving.
- **test_new_topic_invalid_post_data_empty_fields**: similar to the previous test, but this time we are sending some data. The application is expected to validate and reject empty subject and message.

Let's run the tests:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
........EF.....
======================================================
ERROR: test_new_topic_invalid_post_data (boards.test
------------------------------------------------------
Traceback (most recent call last):
...
django.utils.datastructures.MultiValueDictKeyError:

======================================================
FAIL: test_new_topic_invalid_post_data_empty_fields
------------------------------------------------------
Traceback (most recent call last):
  File "/Users/vitorfs/Development/myproject/django-
    self.assertEquals(response.status_code, 200)
AssertionError: 302 != 200
```

```
----------------------------------------------------
Ran 15 tests in 0.512s

FAILED (failures=1, errors=1)
Destroying test database for alias 'default'...
```

We have one failing test and one error. Both related to invalid user input. Instead of trying to fix it with the current implementation, let's make those tests pass using the Django Forms API.

**Creating Forms The Right Way**

So, we came a long way since we started working with Forms. Finally, it's time to use the Forms API.

The Forms API is available in the module `django.forms`. Django works with two types of forms: `forms.Form` and `forms.ModelForm`. The `Form` class is a general purpose form implementation. We can use it to process data that are not directly associated with a model in our application. A `ModelForm` is a subclass of `Form`, and it's associated with a model class.

Let's create a new file named **forms.py** inside the **boards**' folder:

**boards/forms.py**

```
from django import forms
from .models import Topic

class NewTopicForm(forms.ModelForm):
    message = forms.CharField(widget=forms.Textarea(

    class Meta:
        model = Topic
        fields = ['subject', 'message']
```

This is our first form. It's a `ModelForm` associated with the **Topic** model. The `subject` in the `fields` list inside the **Meta** class is referring to the `subject` field in the **Topic** class. Now observe that we are defining an extra field named `message`. This refers to the message in the **Post** we want to save.

Now we have to refactor our **views.py**:

**boards/views.py**

```
from django.contrib.auth.models import User
from django.shortcuts import render, redirect, get_o
from .forms import NewTopicForm
from .models import Board, Topic, Post

def new_topic(request, pk):
    board = get_object_or_404(Board, pk=pk)
    user = User.objects.first()  # TODO: get the cur
    if request.method == 'POST':
        form = NewTopicForm(request.POST)
        if form.is_valid():
            topic = form.save(commit=False)
            topic.board = board
            topic.starter = user
            topic.save()
            post = Post.objects.create(
                message=form.cleaned_data.get('messa
                topic=topic,
                created_by=user
            )
            return redirect('board_topics', pk=board
    else:
        form = NewTopicForm()
    return render(request, 'new_topic.html', {'board
```

This is how we use the forms in a view. Let me remove the extra noise so we can focus on the core of the form processing:

```
if request.method == 'POST':
    form = NewTopicForm(request.POST)
    if form.is_valid():
        topic = form.save()
        return redirect('board_topics', pk=board.pk)
else:
    form = NewTopicForm()
return render(request, 'new_topic.html', {'form': fo
```

First we check if the request is a **POST** or a **GET**. If the request came from a **POST**, it means the user is submitting some data to the server. So we instantiate a form instance passing the **POST** data to the form: `form = NewTopicForm(request.POST)`.

Then, we ask Django to verify the data, check if the form is valid if we can save it in the database: `if form.is_valid():`. If the form was valid, we proceed to save the data in the database using `form.save()`. The `save()`

method returns an instance of the Model saved into the database. So, since this is a **Topic** form, it will return the **Topic** that was created: `topic = form.save()`. After that, the common path is to redirect the user somewhere else, both to avoid the user re-submitting the form by pressing F5 and also to keep the flow of the application.

Now, if the data was invalid, Django will add a list of errors to the form. After that, the view does nothing and returns in the last statement: `return render(request, 'new_topic.html', {'form': form})`. That means we have to update the **new_topic.html** to display errors properly.

If the request was a **GET**, we just initialize a new and empty form using `form = NewTopicForm()`.

Let's run the tests and see how is everything:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
...............
----------------------------------------------------------------------
Ran 15 tests in 0.522s

OK
Destroying test database for alias 'default'...
```

We even fixed the last two tests.

The Django Forms API does much more than processing and validating the data. It also generates the HTML for us.

Let's update the **new_topic.html** template to fully use the Django Forms API:

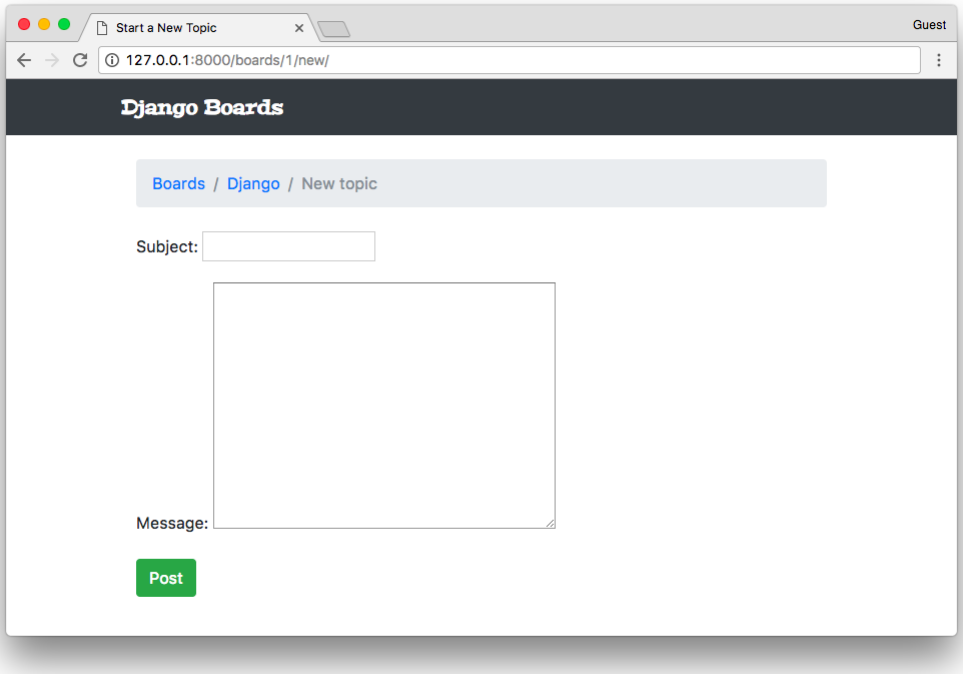
**templates/new_topic.html**

```
{% extends 'base.html' %}

{% block title %}Start a New Topic{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item"><a href="{% url 'home'
  <li class="breadcrumb-item"><a href="{% url 'board
  <li class="breadcrumb-item active">New topic</li>
```

```
{% endblock %}

{% block content %}
  <form method="post">
    {% csrf_token %}
    {{ form.as_p }}
    <button type="submit" class="btn btn-success">Po
  </form>
{% endblock %}
```

The `form` have three rendering options: `form.as_table`, `form.as_ul`, and `form.as_p`. It's a quick way to render all the fields of a form. As the name suggests, the `as_table` uses table tags to format the inputs, the `as_ul` creates an HTML list of inputs, etc.

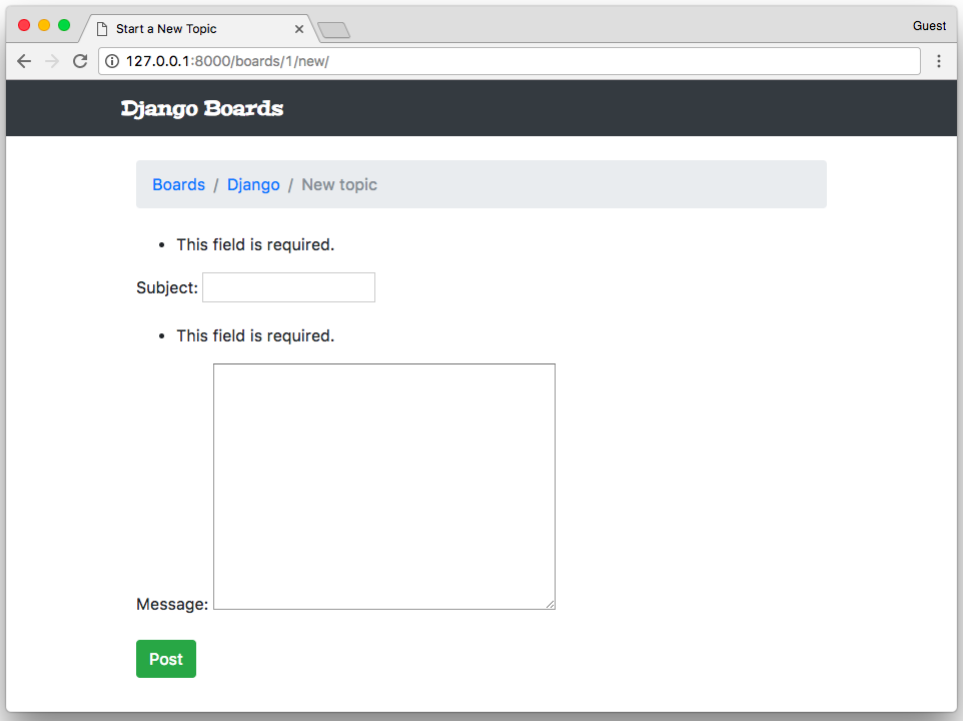
Let's see how it looks like:




Well, our previous form was looking better, right? We are going to fix it in a moment.

It can look broken right now but trust me; there's a lot of things behind it right now. And it's extremely powerful. For example, if our form had 50 fields, we could render all the fields just by typing `{{ form.as_p }}`.

And more, using the Forms API, Django will validate the data and add error messages to each field. Let's try submitting an empty form:




**Note:**

If you see something like this:  when you submit the form, that's not Django. It's your browser doing a pre-validation. To disable it add the `novalidate` attribute to your form tag: `<form method="post" novalidate>`

You can keep it; there's no problem with it. It's just because our form is very simple right now, and we don't have much data validation to see.

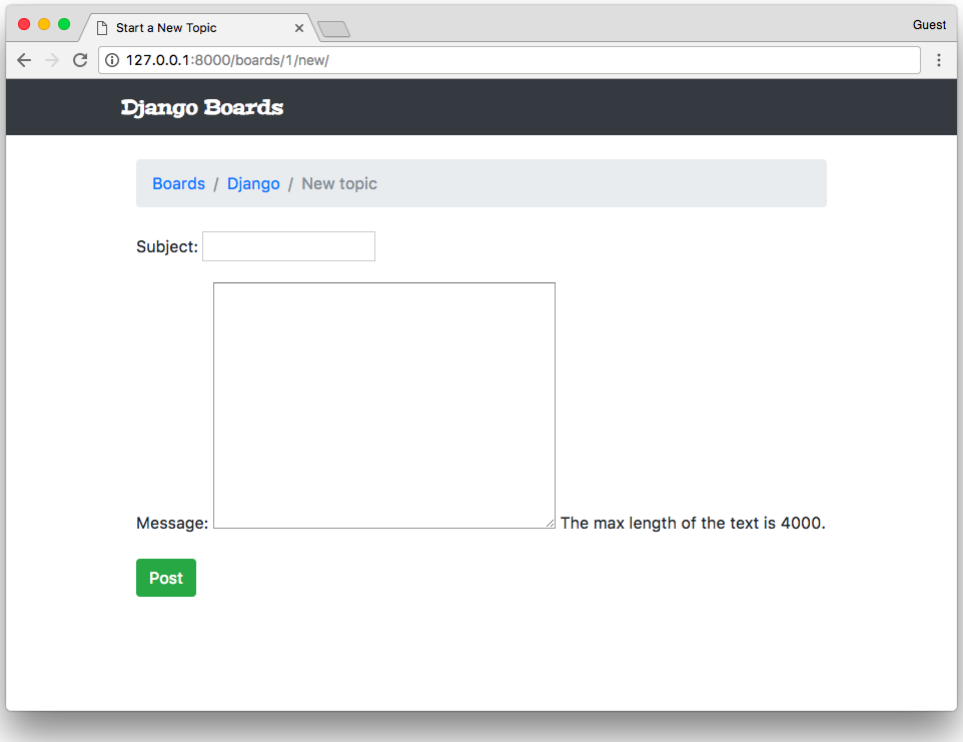
Another important thing to note is that: there is no such a thing as "client-side validation." JavaScript validation or browser validation is just for **usability** purpose. And also to reduce the number of requests to the server. Data validation should always be done on the server side, where we have full control over the data.

It also handles help texts, which can be defined both in a **Form** class or in a **Model** class:

**boards/forms.py**

```
from django import forms
from .models import Topic
```

```
class NewTopicForm(forms.ModelForm):
    message = forms.CharField(
        widget=forms.Textarea(),
        max_length=4000,
        help_text='The max length of the text is 400
    )

    class Meta:
        model = Topic
        fields = ['subject', 'message']
```

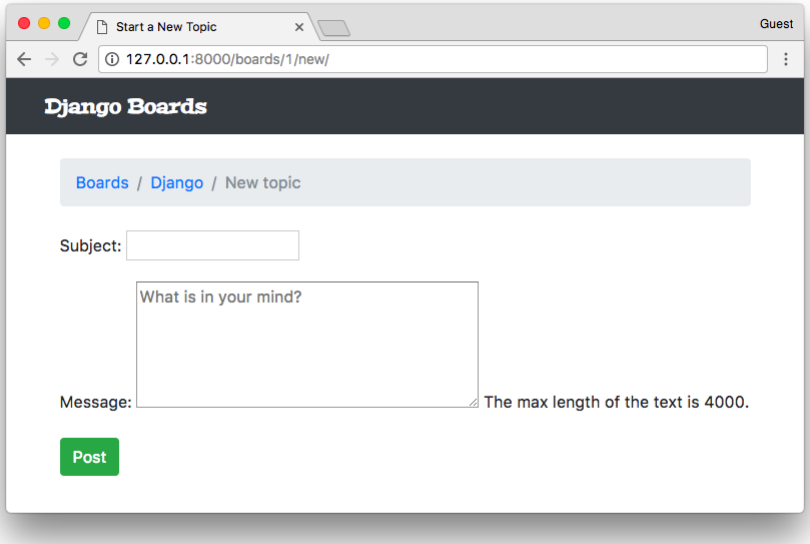



We can also set extra attributes to a form field:

**boards/forms.py**

```
from django import forms
from .models import Topic

class NewTopicForm(forms.ModelForm):
    message = forms.CharField(
        widget=forms.Textarea(
            attrs={'rows': 5, 'placeholder': 'What i
        ),
        max_length=4000,
        help_text='The max length of the text is 400
```

```
    )

    class Meta:
        model = Topic
        fields = ['subject', 'message']
```




## Rendering Bootstrap Forms

Alright, so let's make things pretty again.

When working with Bootstrap or any other Front-End library, I like to use a Django package called **django-widget-tweaks**. It gives us more control over the rendering process, keeping the defaults and just adding extra customizations on top of it.

Let's start off by installing it:

```
pip install django-widget-tweaks
```

Now add it to the `INSTALLED_APPS`:

**myproject/settings.py**

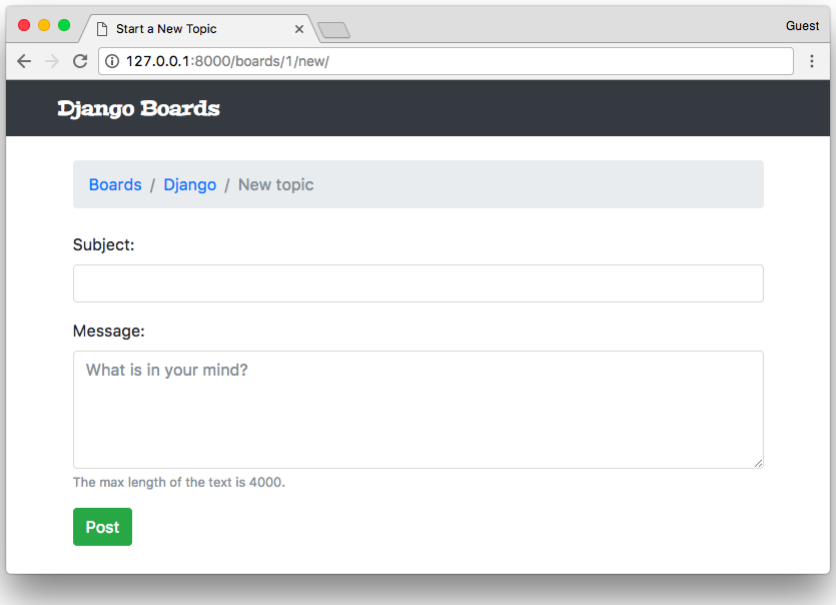
```
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
```

```
    'django.contrib.messages',
    'django.contrib.staticfiles',

    'widget_tweaks',

    'boards',
]
```

Now let's take it into use:

**templates/new_topic.html**

```
{% extends 'base.html' %}

{% load widget_tweaks %}

{% block title %}Start a New Topic{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item"><a href="{% url 'home'
  <li class="breadcrumb-item"><a href="{% url 'board
  <li class="breadcrumb-item active">New topic</li>
{% endblock %}

{% block content %}
  <form method="post" novalidate>
    {% csrf_token %}

    {% for field in form %}
      <div class="form-group">
        {{ field.label_tag }}

        {% render_field field class="form-control" %

        {% if field.help_text %}
          <small class="form-text text-muted">
            {{ field.help_text }}
          </small>
        {% endif %}
      </div>
    {% endfor %}

    <button type="submit" class="btn btn-success">Po
  </form>
{% endblock %}
```




There it is! So, here we are using the **django-widget-tweaks**. First, we load it in the template by using the `{% load widget_tweaks %}` template tag. Then the usage:

```
{% render_field field class="form-control" %}
```

The `render_field` tag is not part of Django; it lives inside the package we installed. To use it we have to pass a form field instance as the first parameter, and then after we can add arbitrary HTML attributes to complement it. It will be useful because then we can assign classes based on certain conditions.

Some examples of the `render_field` template tag:

```
{% render_field form.subject class="form-control" %}
{% render_field form.message class="form-control" pl
{% render_field field class="form-control" placehold
{% render_field field style="font-size: 20px" %}
```

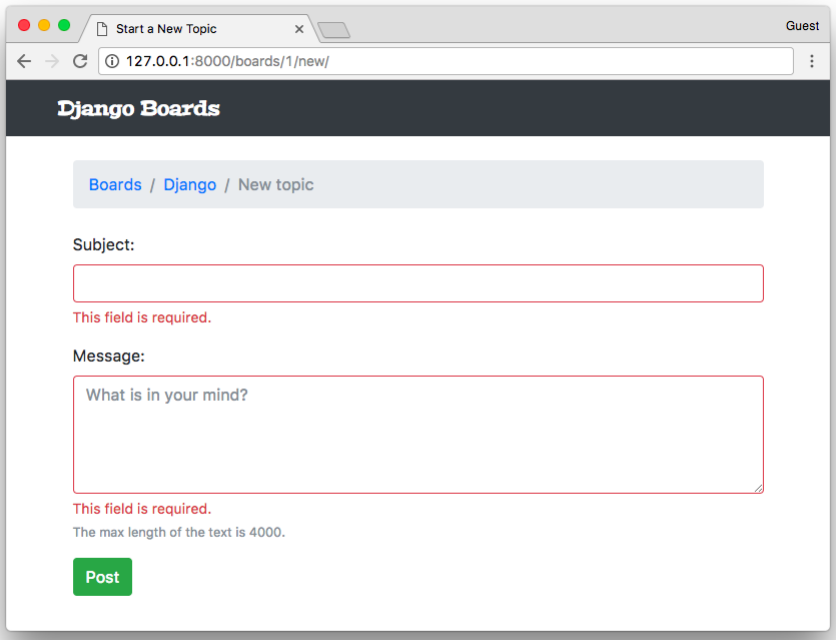
Now to implement the Bootstrap 4 validation tags, we can change the **new_topic.html** template:

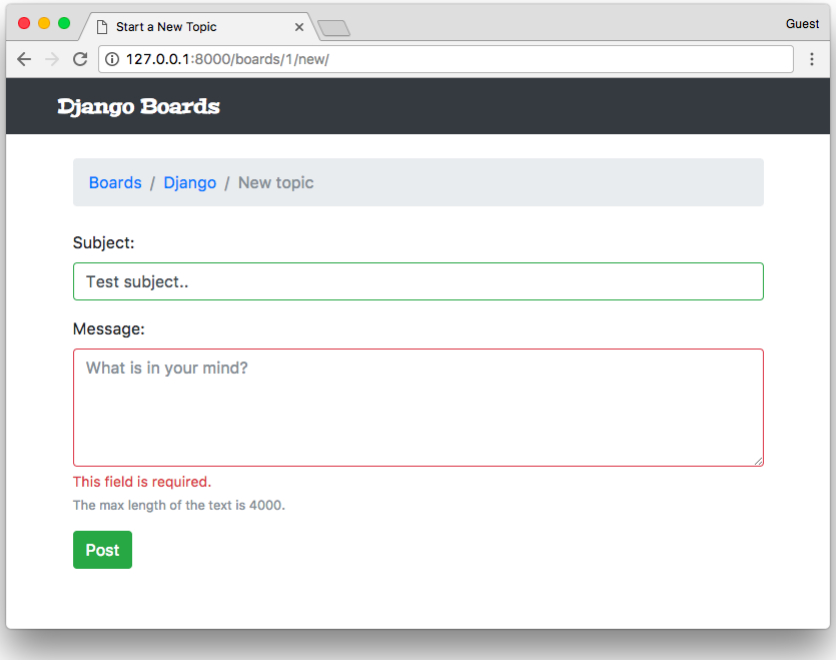
**templates/new_topic.html**

```
<form method="post" novalidate>
  {% csrf_token %}

  {% for field in form %}
    <div class="form-group">
```

```
        {{ field.label_tag }}

        {% if form.is_bound %}
          {% if field.errors %}

            {% render_field field class="form-control
            {% for error in field.errors %}
              <div class="invalid-feedback">
                {{ error }}
              </div>
            {% endfor %}

          {% else %}
            {% render_field field class="form-control
          {% endif %}
        {% else %}
          {% render_field field class="form-control" %
        {% endif %}

        {% if field.help_text %}
          <small class="form-text text-muted">
            {{ field.help_text }}
          </small>
        {% endif %}
      </div>
    {% endfor %}

    <button type="submit" class="btn btn-success">Post
  </form>
```

The result is this:




So, we have three different rendering states:

- **Initial state**: the form has no data (is not bound)
- **Invalid**: we add the `.is-invalid` CSS class and add error messages in an element with a class `.invalid-feedback`. The form field and the messages are rendered in red.
- **Valid**: we add the `.is-valid` CSS class so to paint the form field in green, giving feedback to the user that this field is good to go.

**Reusable Forms Templates**

The template code looks a little bit complicated, right? Well, the good news is that we can reuse this snippet across the project.

In the **templates** folder, create a new folder named **includes**:

```
myproject/
 |-- myproject/
 |     |-- boards/
 |     |-- myproject/
 |     |-- templates/
 |     |     |-- includes/    <-- here!
 |     |     |-- base.html
 |     |     |-- home.html
 |     |     |-- new_topic.html
 |     |     +-- topics.html
 |     +-- manage.py
 +-- venv/
```

Now inside the **includes** folder, create a file named **form.html**:

**templates/includes/form.html**

```
{% load widget_tweaks %}

{% for field in form %}
  <div class="form-group">
    {{ field.label_tag }}

    {% if form.is_bound %}
      {% if field.errors %}
        {% render_field field class="form-control is
        {% for error in field.errors %}
          <div class="invalid-feedback">
            {{ error }}
          </div>
        {% endfor %}
      {% else %}
        {% render_field field class="form-control is
      {% endif %}
    {% else %}
      {% render_field field class="form-control" %}
    {% endif %}
```

```
      {% if field.help_text %}
        <small class="form-text text-muted">
          {{ field.help_text }}
        </small>
      {% endif %}
    </div>
  {% endfor %}
```

Now we change our **new_topic.html** template:

**templates/new_topic.html**

```
{% extends 'base.html' %}

{% block title %}Start a New Topic{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item"><a href="{% url 'home'
  <li class="breadcrumb-item"><a href="{% url 'board
  <li class="breadcrumb-item active">New topic</li>
{% endblock %}

{% block content %}
  <form method="post" novalidate>
    {% csrf_token %}
    {% include 'includes/form.html' %}
    <button type="submit" class="btn btn-success">Po
  </form>
{% endblock %}
```

As the name suggests, the `{% include %}` is used to *include* HTML templates in another template. It's a very useful way to reuse HTML components in a project.

The next form we implement, we can simply use `{% include 'includes/form.html' %}` to render it.

**Adding More Tests**

Now we are using Django Forms; we can add more tests to make sure it is running smoothly:

**boards/tests.py**

```
# ... other imports
from .forms import NewTopicForm

class NewTopicTests(TestCase):
    # ... other tests

    def test_contains_form(self):  # <- new test
        url = reverse('new_topic', kwargs={'pk': 1})
        response = self.client.get(url)
        form = response.context.get('form')
        self.assertIsInstance(form, NewTopicForm)

    def test_new_topic_invalid_post_data(self):  # <
        '''
        Invalid post data should not redirect
        The expected behavior is to show the form ag
        '''
        url = reverse('new_topic', kwargs={'pk': 1})
        response = self.client.post(url, {})
        form = response.context.get('form')
        self.assertEquals(response.status_code, 200)
        self.assertTrue(form.errors)
```

Now we are using the `assertIsInstance` method for the first time. Basically we are grabbing the form instance in the context data, and checking if it is a `NewTopicForm`. In the last test, we added the `self.assertTrue(form.errors)` to make sure the form is showing errors when the data is invalid.

---

**Conclusions**

In this tutorial, we focused on URLs, Reusable Templates, and Forms. As usual, we also implement several test cases. That's how we develop with confidence.

Our tests file is starting to get big, so in the next tutorial, we are going to refactor it to improve the maintainability so to sustain the growth of our code base.

We are also reaching a point where we need to interact with the logged in user. In the next tutorial, we are going to learn everything about authentication and how to protect our views and resources.

I hope you enjoyed the third part of this tutorial series! The fourth part is coming out next week, on Sep 25, 2017. If you would like to get notified when the fourth

part is out, you can subscribe to our mailing list.

The source code of the project is available on GitHub. The current state of the project can be found under the release tag **v0.3-lw**. The link below will take you to the right place:

https://github.com/sibtc/django-beginners-guide/tree/v0.3-lw

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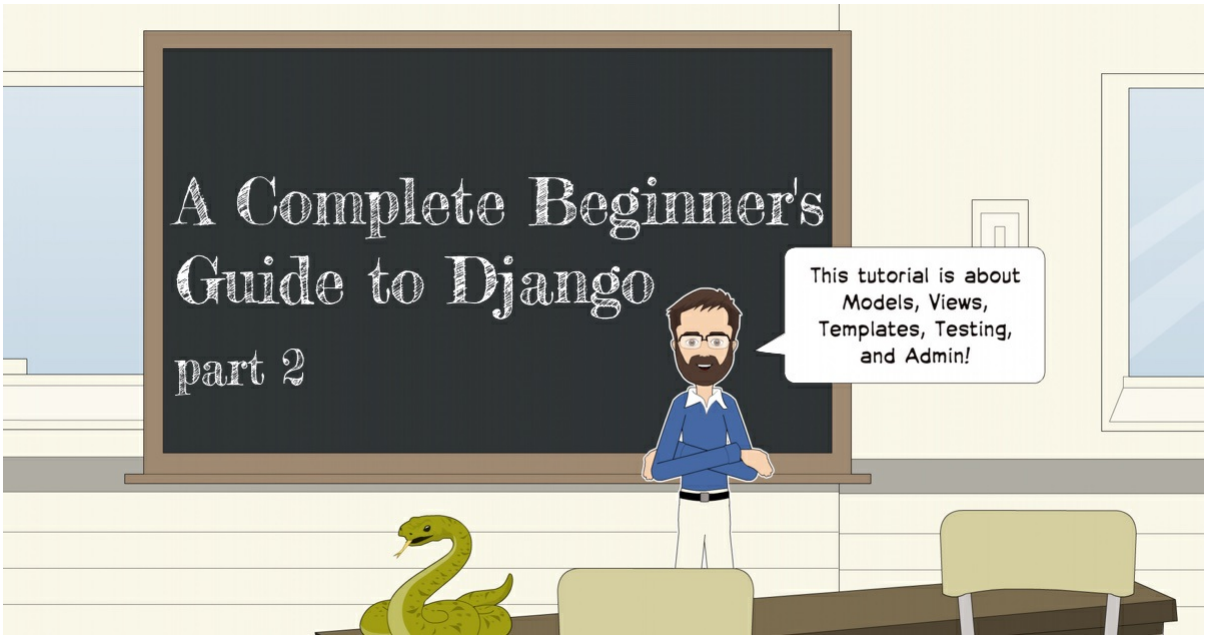
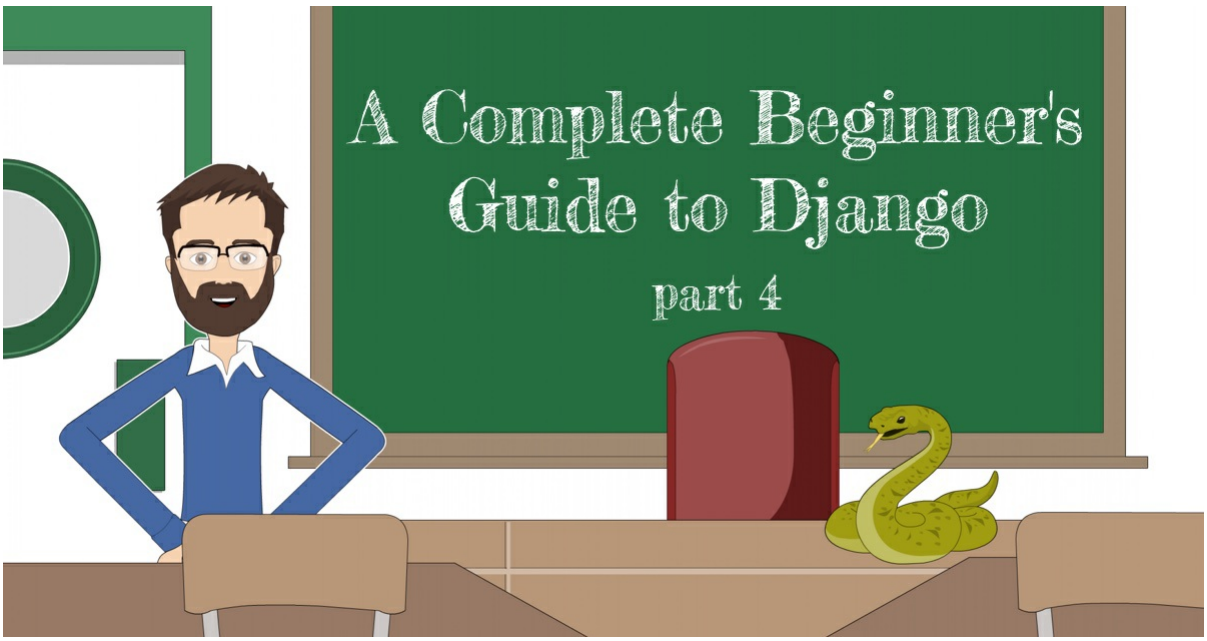



**← Part 2 - Fundamentals**




**Part 4 - Authentication →**

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[

**A Complete Beginner's Guide to Django - Part 4**

] ['\n',

## Introduction

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This tutorial is going to be all about Django's authentication system. We are going to implement the whole thing: registration, login, logout, password reset, and password change.

, '\n',

You are also going to get a brief introduction on how to protect some views from non-authorized users and how to access the information of the logged in user.

, '\n',

In the next section, you will find a few wireframes of authentication-related pages that we are going to implement in this tutorial. After that, you will find an initial setup of a new Django app. So far we have been working on an app named **boards**. But all the authentication related stuff can live in a different app, so to achieve a better organization of the code.

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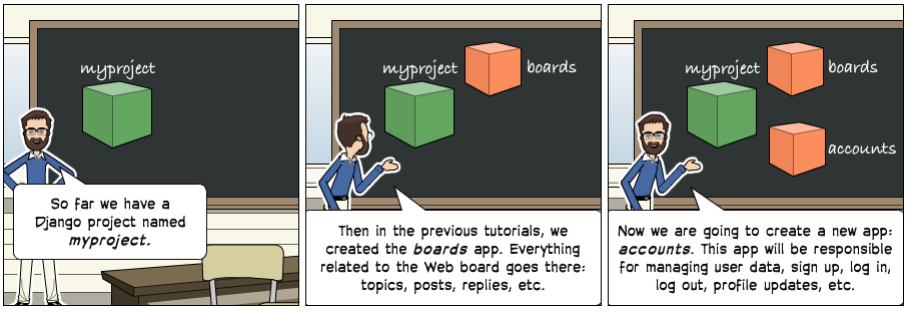


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## Wireframes

We have to update the wireframes of the application. First, we are going to add

new options for the top menu. If the user is not authenticated, we should have two buttons: sign up and log in.


Figure 1: Top menu for not authenticated users.

If the user is authenticated, we should instead display their names along with a dropdown menu with three options: my account, change password and log out.


Figure 2: Top menu for authenticated users.

On the log in page, we need a form with **username** and **password**, a button with the main action (log in) and two alternative paths: sign up page and password reset page.

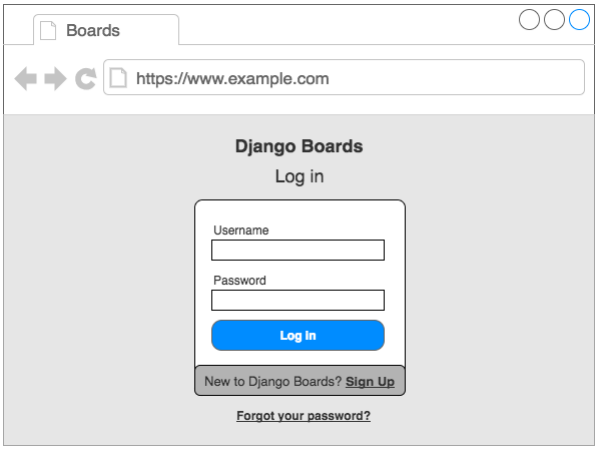



Figure 3: Log in page

On the sign up page, we should have a form with four fields: **username**, **email**

**address**, **password**, and **password confirmation**. The user should also be able to reach the log in page.

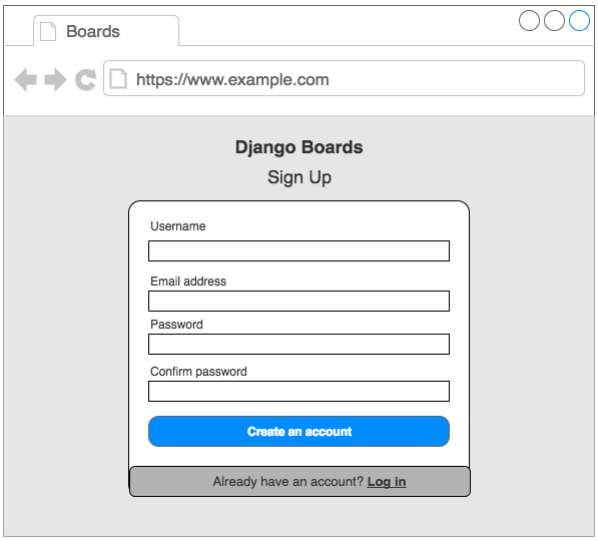



Figure 4: Sign up page

On the password reset page, we will have a form with just the **email address**.

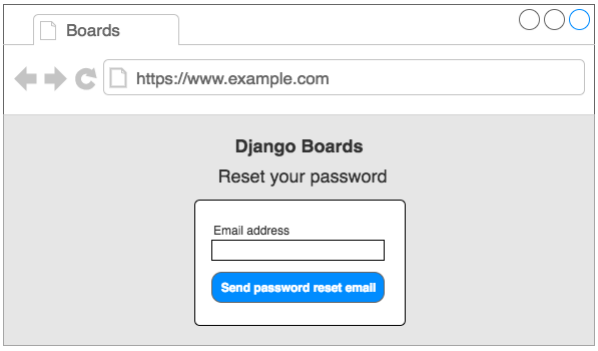



Figure 5: Password reset

Then, after clicking on a special token link, the user will be redirected to a page where they can set a new password:

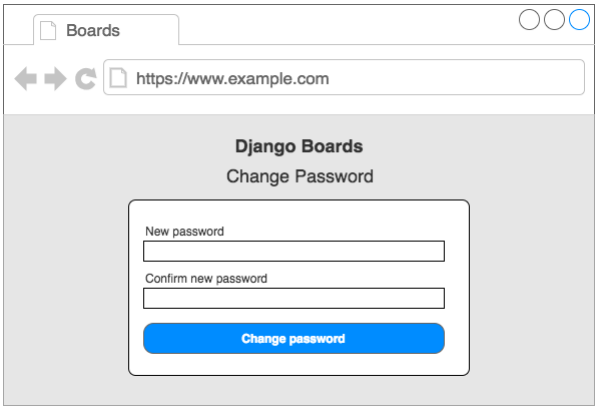


Figure 6: Change password

---

**Initial Setup**

To manage all this information, we can break it down in a different app. In the project root, in the same page where the **manage.py** script is, run the following command to start a new app:

```
django-admin startapp accounts
```

The project structure should like this right now:

```
myproject/
 |-- myproject/
 |     |-- accounts/     <-- our new django app!
 |     |-- boards/
 |     |-- myproject/
 |     |-- static/
 |     |-- templates/
 |     |-- db.sqlite3
 |     +-- manage.py
 +-- venv/
```

Next step, include the **accounts** app to the `INSTALLED_APPS` in the **settings.py** file:

```
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',

    'widget_tweaks',

    'accounts',
    'boards',
]
```

From now on, we will be working on the **accounts** app.

---

## Sign Up


Let's start by creating the sign up view. First thing, create a new route in the **urls.py** file:

**myproject/urls.py**

```
from django.conf.urls import url
from django.contrib import admin

from accounts import views as accounts_views
from boards import views

urlpatterns = [
    url(r'^$', views.home, name='home'),
    url(r'^signup/$', accounts_views.signup, name='s
    url(r'^boards/(?P<pk>\d+)/$', views.board_topics
    url(r'^boards/(?P<pk>\d+)/new/$', views.new_topi
    url(r'^admin/', admin.site.urls),
]
```

Notice how we are importing the **views** module from the **accounts** app in a different way:

```
from accounts import views as accounts_views
```

We are giving an alias because otherwise, it would clash with the **boards'** views. We can improve the **urls.py** design later on. But for now, let's focus on the authentication features.

Now edit the **views.py** inside the **accounts** app and create a new view named **signup**:

**accounts/views.py**

```
from django.shortcuts import render
```

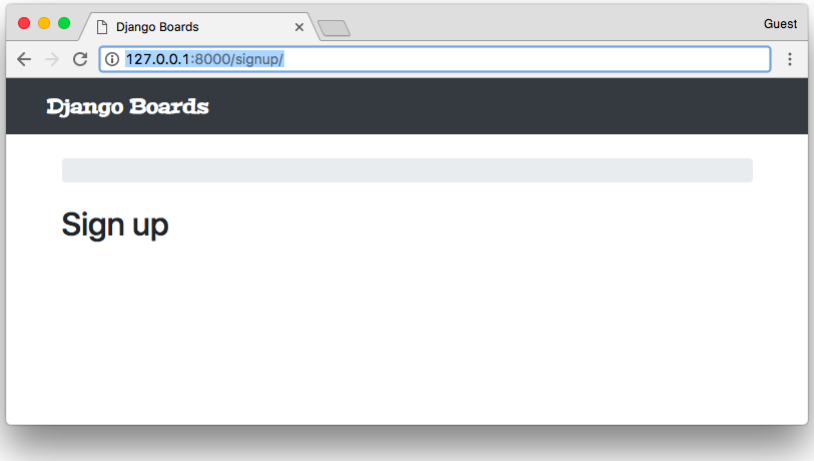
```
def signup(request):
    return render(request, 'signup.html')
```

Create the new template, named **signup.html**:

**templates/signup.html**

```
{% extends 'base.html' %}

{% block content %}
  <h2>Sign up</h2>
{% endblock %}
```

Open the URL **http://127.0.0.1:8000/signup/** in the browser, check if everything is working:




Time to write some tests:

**accounts/tests.py**

```
from django.core.urlresolvers import reverse
from django.urls import resolve
from django.test import TestCase
from .views import signup

class SignUpTests(TestCase):
    def test_signup_status_code(self):
        url = reverse('signup')
        response = self.client.get(url)
        self.assertEquals(response.status_code, 200)
```

```
    def test_signup_url_resolves_signup_view(self):
        view = resolve('/signup/')
        self.assertEquals(view.func, signup)
```

Testing the status code (200 = success) and if the URL **/signup/** is returning the correct view function.

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
..................
----------------------------------------------------------------------
Ran 18 tests in 0.652s

OK
Destroying test database for alias 'default'...
```

For the authentication views (sign up, log in, password reset, etc.) we won't use the top bar or the breadcrumb. We can still use the **base.html** template. It just needs some tweaks:

**templates/base.html**

```
{% load static %}<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <title>{% block title %}Django Boards{% endblock
    <link href="https://fonts.googleapis.com/css?fam
    <link rel="stylesheet" href="{% static 'css/boot
    <link rel="stylesheet" href="{% static 'css/app.
    {% block stylesheet %}{% endblock %}  <!-- HERE
  </head>
  <body>
    {% block body %}  <!-- HERE -->
      <nav class="navbar navbar-expand-lg navbar-dar
        <div class="container">
          <a class="navbar-brand" href="{% url 'home
        </div>
      </nav>
      <div class="container">
        <ol class="breadcrumb my-4">
          {% block breadcrumb %}
          {% endblock %}
        </ol>
```

```
          {% block content %}
          {% endblock %}
        </div>
      {% endblock body %}  <!-- AND HERE -->
    </body>
  </html>
```

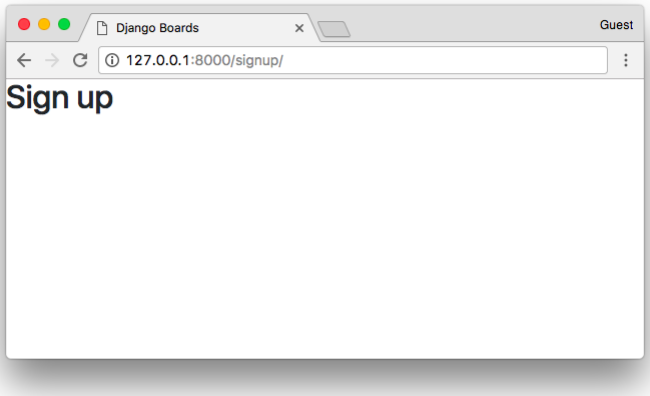
I marked with comments the new bits in the **base.html** template. The block `{% block stylesheet %}{% endblock %}` will be used to add extra CSS, specific to some pages.

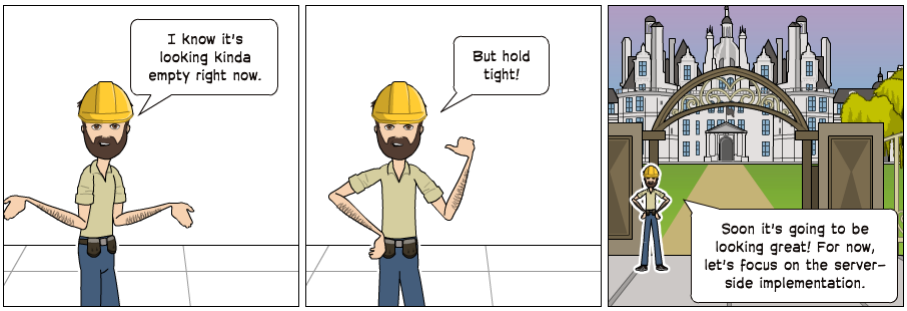
The block `{% block body %}` is wrapping the whole HTML document. We can use it to have an empty document taking advantage of the head of the **base.html**. Notice how we named the end block `{% endblock body %}`. In cases like this, it's a good practice to name the closing tag, so it's easier to identify where it ends.

Now on the **signup.html** template, instead of using the `{% block content %}`, we can use the `{% block body %}`.

**templates/signup.html**

```
{% extends 'base.html' %}

{% block body %}
  <h2>Sign up</h2>
{% endblock %}
```





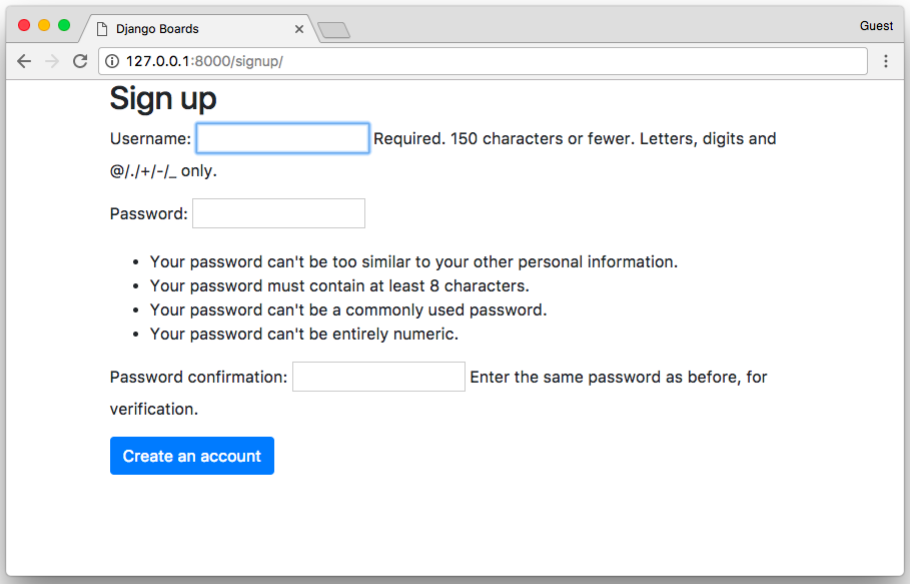

Time to create the sign up form. Django has a built-in form named **UserCreationForm**. Let's use it:

**accounts/views.py**

```
from django.contrib.auth.forms import UserCreationFo
from django.shortcuts import render

def signup(request):
    form = UserCreationForm()
    return render(request, 'signup.html', {'form': f
```

**templates/signup.html**

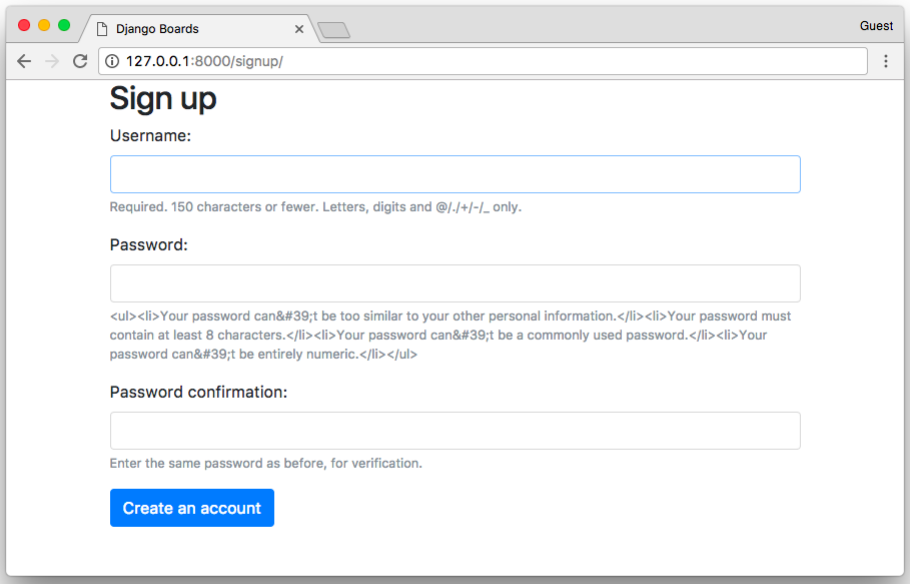
```
{% extends 'base.html' %}

{% block body %}
  <div class="container">
    <h2>Sign up</h2>
    <form method="post" novalidate>
      {% csrf_token %}
      {{ form.as_p }}
      <button type="submit" class="btn btn-primary">
    </form>
  </div>
{% endblock %}
```




Looking a little bit messy, right? We can use our **form.html** template to make it look better:

**templates/signup.html**

```
{% extends 'base.html' %}

{% block body %}
  <div class="container">
    <h2>Sign up</h2>
    <form method="post" novalidate>
      {% csrf_token %}
      {% include 'includes/form.html' %}
      <button type="submit" class="btn btn-primary">
    </form>
  </div>
{% endblock %}
```



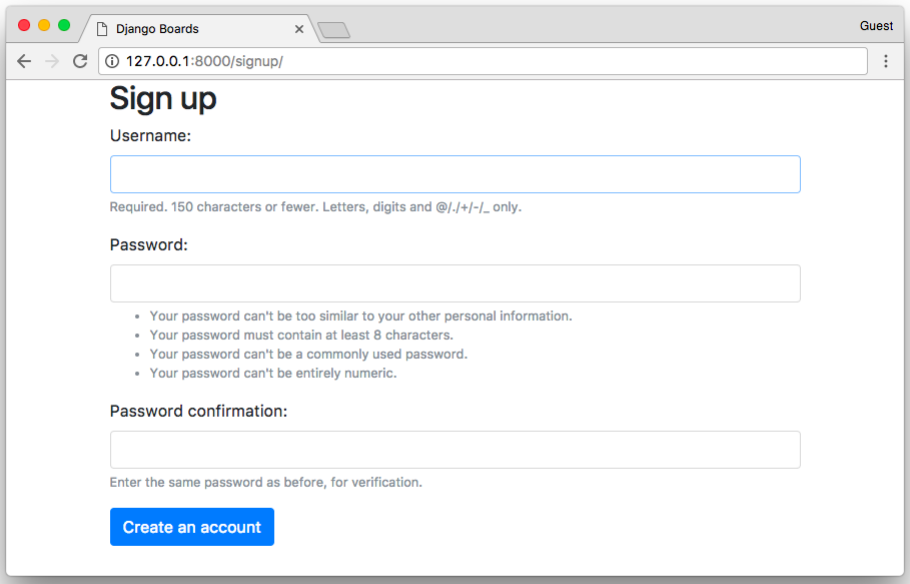

Uh, almost there. Currently, our **form.html** partial template is displaying some raw HTML. It's a security feature. By default Django treats all strings as unsafe, escaping all the special characters that may cause trouble. But in this case, we can trust it.

**templates/includes/form.html**

```
{% load widget_tweaks %}

{% for field in form %}
  <div class="form-group">
    {{ field.label_tag }}

    <!-- code suppressed for brevity -->

    {% if field.help_text %}
      <small class="form-text text-muted">
        {{ field.help_text|safe }}  <!-- new code he
      </small>
    {% endif %}
  </div>
{% endfor %}
```

Basically, in the previous template we added the option `safe` to the `field.help_text`: `{{ field.help_text|safe }}`.

Save the **form.html** file, and check the sign up page again:




Now let's implement the business logic in the **signup** view:

**accounts/views.py**

```
from django.contrib.auth import login as auth_login
from django.contrib.auth.forms import UserCreationFo
from django.shortcuts import render, redirect

def signup(request):
    if request.method == 'POST':
        form = UserCreationForm(request.POST)
        if form.is_valid():
            user = form.save()
            auth_login(request, user)
            return redirect('home')
    else:
        form = UserCreationForm()
    return render(request, 'signup.html', {'form': f
```

A basic form processing with a small detail: the **login** function (renamed to **auth_login** to avoid clashing with the built-in login view).

**Note:** I renamed the `login` function to `auth_login`, but later I realized that Django 1.11 has a class-based view for the login view, `LoginView`, so there was no risk of clashing the names.

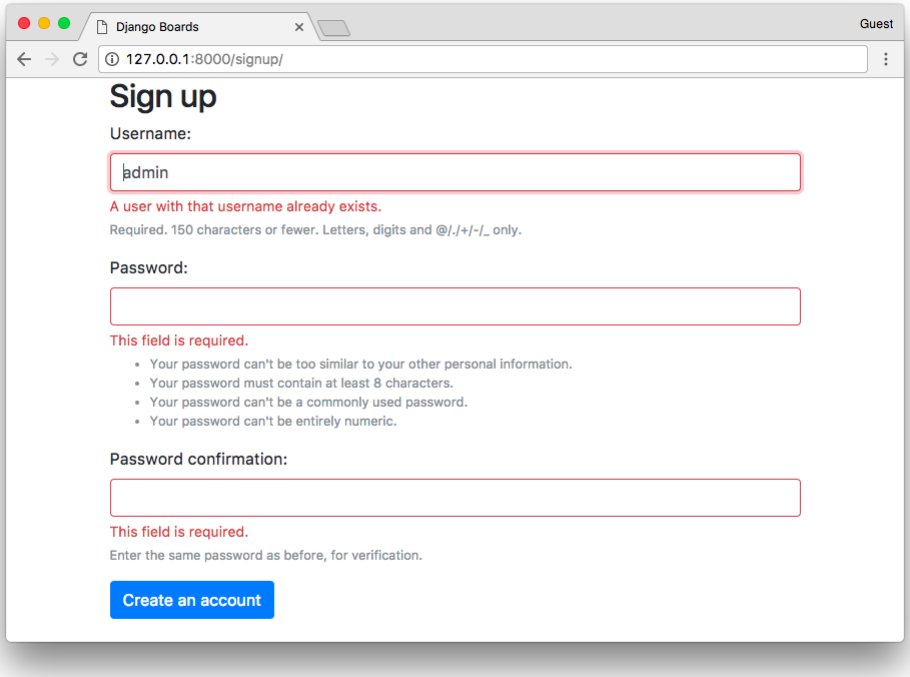
On the older versions there was a `auth.login` and `auth.view.login`, which used to cause some confusion, because one was the function that logs the

user in, and the other was the view.

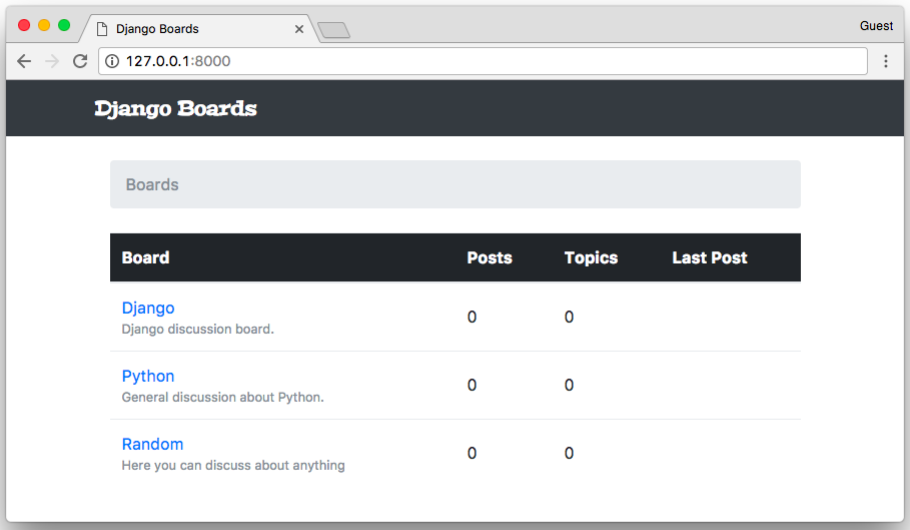
Long story short: you can import it just as `login` if you want, it will not cause any problem.

If the form is valid, a **User** instance is created with the `user = form.save()`. The created user is then passed as an argument to the **auth_login** function, manually authenticating the user. After that, the view redirects the user to the homepage, keeping the flow of the application.

Let's try it. First, submit some invalid data. Either an empty form, non-matching fields, or an existing username:




Now fill the form and submit it, check if the user is created and redirected to the homepage:



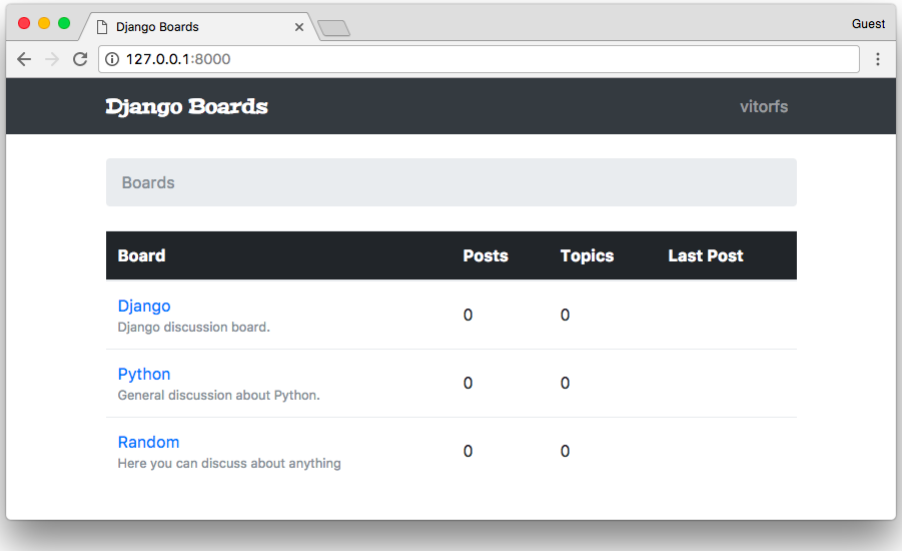

## Referencing the Authenticated User in the Template

How can we know if it worked? Well, we can edit the **base.html** template to add the name of the user on the top bar:

**templates/base.html**

```
{% block body %}
  <nav class="navbar navbar-expand-sm navbar-dark bg
    <div class="container">
      <a class="navbar-brand" href="{% url 'home' %}
      <button class="navbar-toggler" type="button" d
        <span class="navbar-toggler-icon"></span>
      </button>
      <div class="collapse navbar-collapse" id="main
        <ul class="navbar-nav ml-auto">
          <li class="nav-item">
            <a class="nav-link" href="#">{{ user.use
          </li>
        </ul>
      </div>
    </div>
  </nav>

  <div class="container">
    <ol class="breadcrumb my-4">
      {% block breadcrumb %}
      {% endblock %}
```

```
    </ol>
    {% block content %}
    {% endblock %}
  </div>
{% endblock body %}
```




## Testing the Sign Up View

Let's now improve our test cases:

**accounts/tests.py**

```
from django.contrib.auth.forms import UserCreationFo
from django.core.urlresolvers import reverse
from django.urls import resolve
from django.test import TestCase
from .views import signup

class SignUpTests(TestCase):
    def setUp(self):
        url = reverse('signup')
        self.response = self.client.get(url)

    def test_signup_status_code(self):
        self.assertEquals(self.response.status_code,

    def test_signup_url_resolves_signup_view(self):
        view = resolve('/signup/')
        self.assertEquals(view.func, signup)
```

```
    def test_csrf(self):
        self.assertContains(self.response, 'csrfmidd

    def test_contains_form(self):
        form = self.response.context.get('form')
        self.assertIsInstance(form, UserCreationForm
```

We changed a little bit the **SignUpTests** class. Defined a **setUp** method, moved the response object to there. Then now we are also testing if there are a form and the CSRF token in the response.

Now we are going to test a successful sign up. This time, let's create a new class to organize better the tests:

**accounts/tests.py**

```
from django.contrib.auth.models import User
from django.contrib.auth.forms import UserCreationFo
from django.core.urlresolvers import reverse
from django.urls import resolve
from django.test import TestCase
from .views import signup

class SignUpTests(TestCase):
    # code suppressed...

class SuccessfulSignUpTests(TestCase):
    def setUp(self):
        url = reverse('signup')
        data = {
            'username': 'john',
            'password1': 'abcdef123456',
            'password2': 'abcdef123456'
        }
        self.response = self.client.post(url, data)
        self.home_url = reverse('home')

    def test_redirection(self):
        '''
        A valid form submission should redirect the
        '''
        self.assertRedirects(self.response, self.hom

    def test_user_creation(self):
```

```
        self.assertTrue(User.objects.exists())

    def test_user_authentication(self):
        '''
        Create a new request to an arbitrary page.
        The resulting response should now have a `us
        after a successful sign up.
        '''
        response = self.client.get(self.home_url)
        user = response.context.get('user')
        self.assertTrue(user.is_authenticated)
```

Run the tests.

Using a similar strategy, now let's create a new class for sign up tests when the data is invalid:

```
from django.contrib.auth.models import User
from django.contrib.auth.forms import UserCreationFo
from django.core.urlresolvers import reverse
from django.urls import resolve
from django.test import TestCase
from .views import signup

class SignUpTests(TestCase):
    # code suppressed...

class SuccessfulSignUpTests(TestCase):
    # code suppressed...

class InvalidSignUpTests(TestCase):
    def setUp(self):
        url = reverse('signup')
        self.response = self.client.post(url, {})  #

    def test_signup_status_code(self):
        '''
        An invalid form submission should return to
        '''
        self.assertEquals(self.response.status_code,

    def test_form_errors(self):
        form = self.response.context.get('form')
        self.assertTrue(form.errors)

    def test_dont_create_user(self):
```

```
        self.assertFalse(User.objects.exists())
```

**Adding the Email Field to the Form**

Everything is working, but… The **email address** field is missing. Well, the **UserCreationForm** does not provide an **email** field. But we can extend it.

Create a file named **forms.py** inside the **accounts** folder:

**accounts/forms.py**

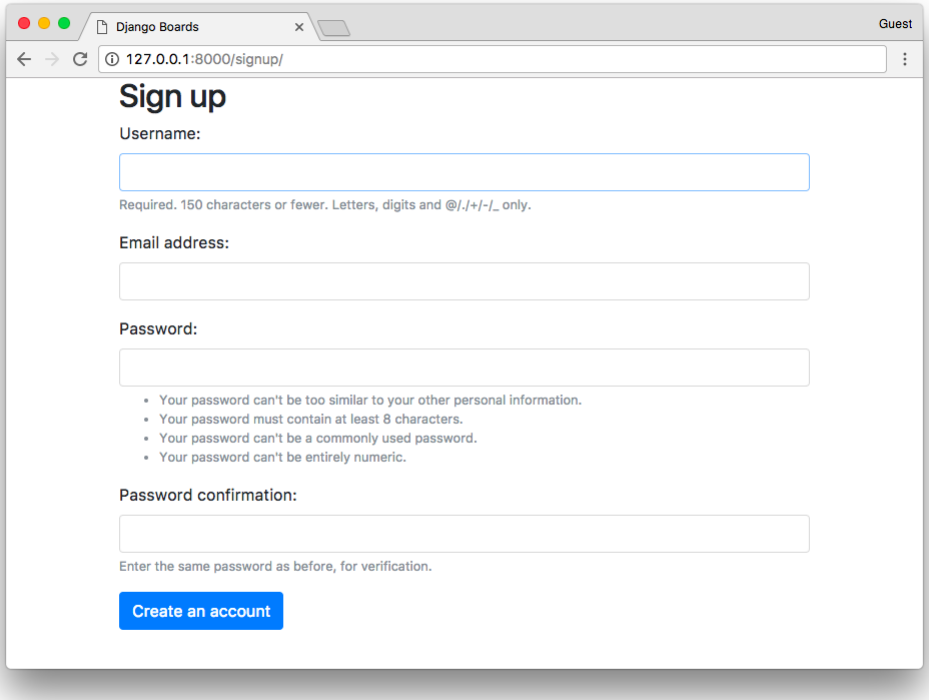
```
from django import forms
from django.contrib.auth.forms import UserCreationFo
from django.contrib.auth.models import User

class SignUpForm(UserCreationForm):
    email = forms.CharField(max_length=254, required
    class Meta:
        model = User
        fields = ('username', 'email', 'password1',
```

Now, instead of using the **UserCreationForm** in our **views.py**, let's import the new form, **SignUpForm**, and use it instead:

**accounts/views.py**

```
from django.contrib.auth import login as auth_login
from django.shortcuts import render, redirect

from .forms import SignUpForm

def signup(request):
    if request.method == 'POST':
        form = SignUpForm(request.POST)
        if form.is_valid():
            user = form.save()
            auth_login(request, user)
            return redirect('home')
    else:
        form = SignUpForm()
    return render(request, 'signup.html', {'form': f
```

Just with this small change, everything is already working:




Remember to change the test case to use the **SignUpForm** instead of **UserCreationForm**:

```
from .forms import SignUpForm

class SignUpTests(TestCase):
    # ...

    def test_contains_form(self):
        form = self.response.context.get('form')
        self.assertIsInstance(form, SignUpForm)

class SuccessfulSignUpTests(TestCase):
    def setUp(self):
        url = reverse('signup')
        data = {
            'username': 'john',
            'email': 'john@doe.com',
            'password1': 'abcdef123456',
            'password2': 'abcdef123456'
        }
        self.response = self.client.post(url, data)
        self.home_url = reverse('home')

    # ...
```

The previous test case would still pass because since **SignUpForm** extends the **UserCreationForm**, *it is* an instance of **UserCreationForm**.

Now let's think about what happened for a moment. We added a new form field:

```
fields = ('username', 'email', 'password1', 'passwor
```

And it automatically reflected in the HTML template. It's good, right? Well, depends. What if in the future, a new developer wanted to re-use the **SignUpForm** for something else, and add some extra fields to it. Then those new fields would also show up in the **signup.html**, which may not be the desired behavior. This change could pass unnoticed, and we don't want any surprises.

So let's create a new test, that verifies the HTML inputs in the template:

**accounts/tests.py**

```
class SignUpTests(TestCase):
    # ...

    def test_form_inputs(self):
        '''
        The view must contain five inputs: csrf, use
        password1, password2
        '''
        self.assertContains(self.response, '<input',
        self.assertContains(self.response, 'type="te
        self.assertContains(self.response, 'type="em
        self.assertContains(self.response, 'type="pa
```

**Improving the Tests Layout**

Alright, so we are testing the inputs and everything, but we still have to test the form itself. Instead of just keep adding tests to the **accounts/tests.py** file, let's improve the project design a little bit.

Create a new folder named **tests** within the **accounts** folder. Then, inside the **tests** folder, create an empty file named **__init__.py**.

Now, move the **tests.py** file to inside the **tests** folder, and rename it to **test_view_signup.py**.

The final result should be the following:

```
myproject/
 |-- myproject/
 |     |-- accounts/
 |     |     |-- migrations/
 |     |     |-- tests/
 |     |     |     |-- __init__.py
 |     |     |     +-- test_view_signup.py
 |     |     |-- __init__.py
 |     |     |-- admin.py
 |     |     |-- apps.py
 |     |     |-- models.py
 |     |     +-- views.py
 |     |-- boards/
 |     |-- myproject/
 |     |-- static/
 |     |-- templates/
 |     |-- db.sqlite3
 |     +-- manage.py
 +-- venv/
```

Note that since we are using relative import within the context of the apps, we need to fix the imports in the new **test_view_signup.py**:

**accounts/tests/test_view_signup.py**

```
from django.contrib.auth.models import User
from django.core.urlresolvers import reverse
from django.urls import resolve
from django.test import TestCase

from ..views import signup
from ..forms import SignUpForm
```

We are using relative imports inside the app modules so we can have the freedom to rename the Django app later on, without having to fix all the absolute imports.

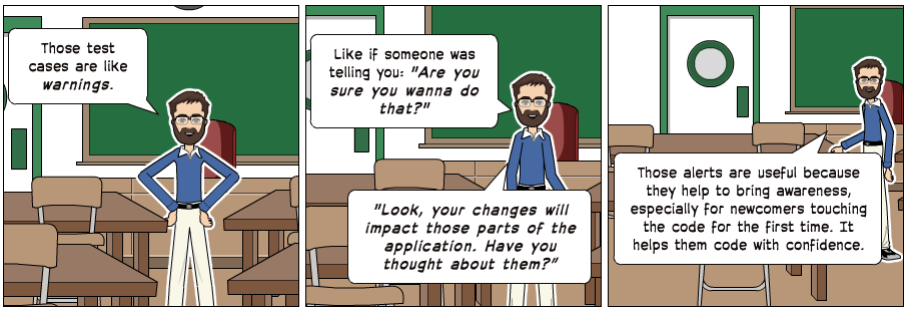
Now let's create a new test file, to test the **SignUpForm**. Add a new test file named **test_form_signup.py**:

**accounts/tests/test_form_signup.py**

```
from django.test import TestCase
from ..forms import SignUpForm
```

```
class SignUpFormTest(TestCase):
    def test_form_has_fields(self):
        form = SignUpForm()
        expected = ['username', 'email', 'password1'
        actual = list(form.fields)
        self.assertSequenceEqual(expected, actual)
```

It looks very strict, right? For example, if in the future we have to change the **SignUpForm**, to include the user's first and last name, we will probably end up having to fix a few test cases, even if we didn't break anything.




Those alerts are useful because they help to bring awareness, especially for newcomers touching the code for the first time. It helps them code with confidence.

**Improving the Sign Up Template**

Let's work a little bit on it. Here we can use Bootstrap 4 cards components to make it look good.

Go to https://www.toptal.com/designers/subtlepatterns/ and find a nice background pattern to use as a background of the accounts pages. Download it, create a new folder named **img** inside the **static** folder, and place the image there.

Then after that, create a new CSS file named **accounts.css** in the **static/css**. The result should be the following:

```
myproject/
 |-- myproject/
 |     |-- accounts/
 |     |-- boards/
 |     |-- myproject/
 |     |-- static/
 |     |     |-- css/
```

```
|     |     |     |-- accounts.css  <-- here
|     |     |     |-- app.css
|     |     |     +-- bootstrap.min.css
|     |     +-- img/
|     |     |     +-- shattered.png  <-- here (the nam
|     |-- templates/
|     |-- db.sqlite3
|     +-- manage.py
+-- venv/
```

Now edit the **accounts.css** file:

**static/css/accounts.css**

```
body {
  background-image: url(../img/shattered.png);
}

.logo {
  font-family: 'Peralta', cursive;
}

.logo a {
  color: rgba(0,0,0,.9);
}

.logo a:hover,
.logo a:active {
  text-decoration: none;
}
```

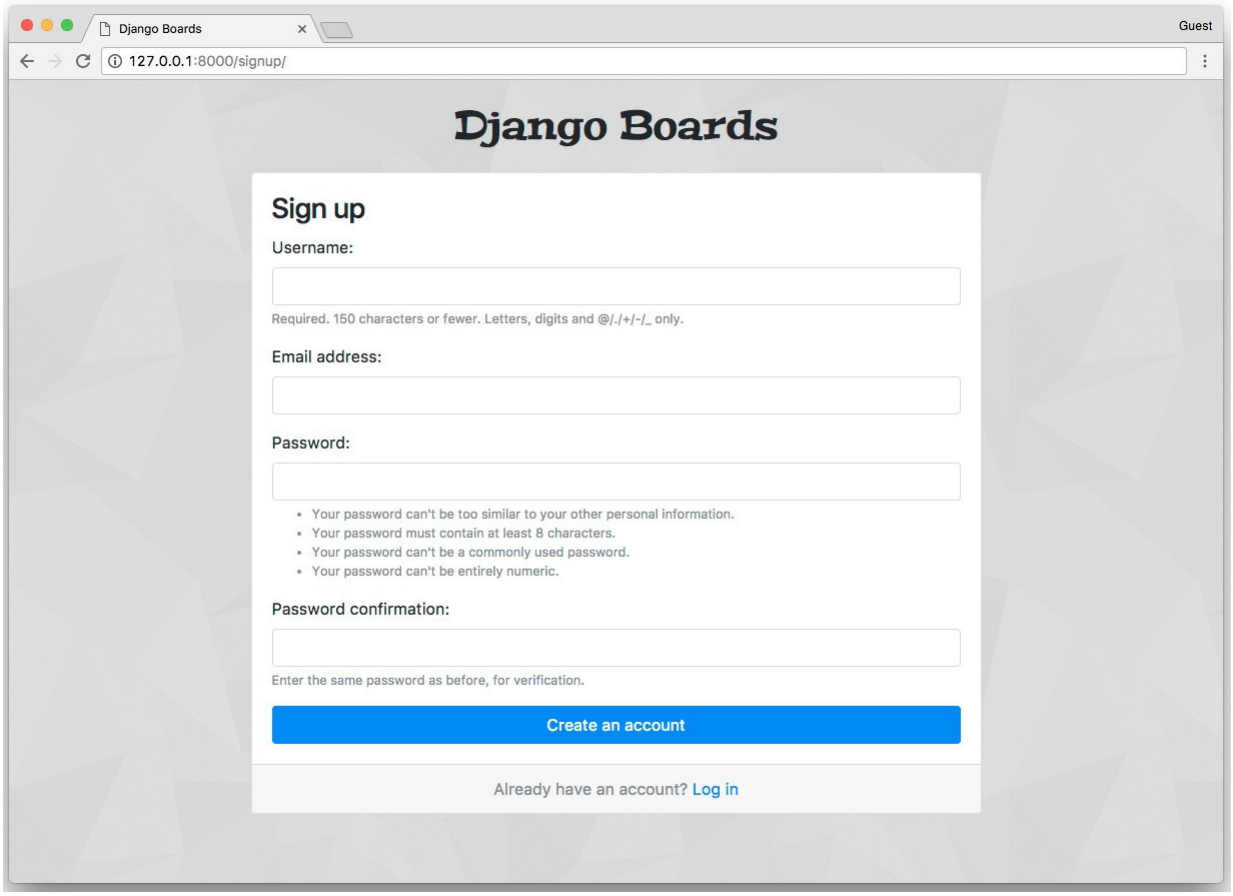
In the **signup.html** template, we can change it to make use of the new CSS and also take the Bootstrap 4 card components into use:

**templates/signup.html**

```
{% extends 'base.html' %}

{% load static %}

{% block stylesheet %}
  <link rel="stylesheet" href="{% static 'css/accoun
{% endblock %}

{% block body %}
  <div class="container">
```

```
      <h1 class="text-center logo my-4">
        <a href="{% url 'home' %}">Django Boards</a>
      </h1>
      <div class="row justify-content-center">
        <div class="col-lg-8 col-md-10 col-sm-12">
          <div class="card">
            <div class="card-body">
              <h3 class="card-title">Sign up</h3>
              <form method="post" novalidate>
                {% csrf_token %}
                {% include 'includes/form.html' %}
                <button type="submit" class="btn btn-p
              </form>
            </div>
            <div class="card-footer text-muted text-ce
              Already have an account? <a href="#">Log
            </div>
          </div>
        </div>
      </div>
    </div>
  {% endblock %}
```

With that, this should be our sign up page right now:



## Logout

To keep a natural flow in the implementation, let's add the log out view. First, edit the **urls.py** to add a new route:

**myproject/urls.py**

```
from django.conf.urls import url
from django.contrib import admin
from django.contrib.auth import views as auth_views

from accounts import views as accounts_views
from boards import views

urlpatterns = [
    url(r'^$', views.home, name='home'),
    url(r'^signup/$', accounts_views.signup, name='s
    url(r'^logout/$', auth_views.LogoutView.as_view(
    url(r'^boards/(?P<pk>\d+)/$', views.board_topics
    url(r'^boards/(?P<pk>\d+)/new/$', views.new_topi
    url(r'^admin/', admin.site.urls),
]
```

We imported the **views** from the Django's contrib module. We renamed it to **auth_views** to avoid clashing with the **boards.views**. Notice that this view is a little bit different: `LogoutView.as_view()`. It's a Django's class-based view. So far we have only implemented classes as Python functions. The class-based views provide a more flexible way to extend and reuse views. We will discuss more that subject later on.

Open the **settings.py** file and add the `LOGOUT_REDIRECT_URL` variable to the bottom of the file:

**myproject/settings.py**

```
LOGOUT_REDIRECT_URL = 'home'
```

Here we are passing the name of the URL pattern we want to redirect the user after the log out.

After that, it's already done. Just access the URL **127.0.0.1:8000/logout/** and you will be logged out. But hold on a second. Before you log out, let's create the

dropdown menu for logged in users.

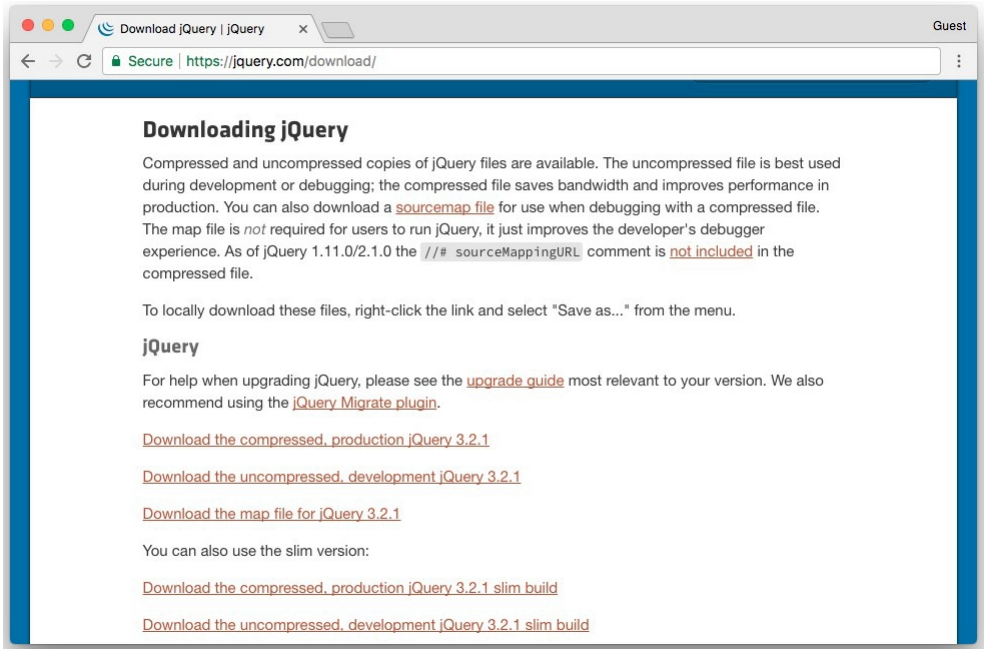
---

### Displaying Menu For Authenticated Users

Now we will need to do some tweaks in our **base.html** template. We have to add a dropdown menu with the logout link.

The Bootstrap 4 dropdown component needs jQuery to work.

First, go to jquery.com/download/ and download the **compressed, production jQuery 3.2.1** version.




Inside the **static** folder, create a new folder named **js**. Copy the **jquery-3.2.1.min.js** file to there.

Bootstrap 4 also needs a library called **Popper** to work. Go to popper.js.org and download the latest version.

Inside the **popper.js-1.12.5** folder, go to **dist/umd** and copy the file **popper.min.js** to our **js** folder. Pay attention here; Bootstrap 4 will only work with the **umd/popper.min.js**. So make sure you are copying the right file.

If you no longer have all the Bootstrap 4 files, download it again from getbootstrap.com.

Similarly, copy the **bootstrap.min.js** file to our **js** folder as well.

The final result should be:

```
myproject/
 |-- myproject/
 |     |-- accounts/
 |     |-- boards/
 |     |-- myproject/
 |     |-- static/
 |     |     |-- css/
 |     |     +-- js/
 |     |           |-- bootstrap.min.js
 |     |           |-- jquery-3.2.1.min.js
 |     |           +-- popper.min.js
 |     |-- templates/
 |     |-- db.sqlite3
 |     +-- manage.py
 +-- venv/
```

In the bottom of the **base.html** file, add the scripts *after* the `{% endblock body %}`:

**templates/base.html**

```
{% load static %}<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8">
    <title>{% block title %}Django Boards{% endblock
    <link href="https://fonts.googleapis.com/css?fam
    <link rel="stylesheet" href="{% static 'css/boot
    <link rel="stylesheet" href="{% static 'css/app.
    {% block stylesheet %}{% endblock %}
  </head>
  <body>
    {% block body %}
    <!-- code suppressed for brevity -->
    {% endblock body %}
    <script src="{% static 'js/jquery-3.2.1.min.js'
    <script src="{% static 'js/popper.min.js' %}"></
    <script src="{% static 'js/bootstrap.min.js' %}"
  </body>
</html>
```

If you found the instructions confusing, just download the files using the direct links below:

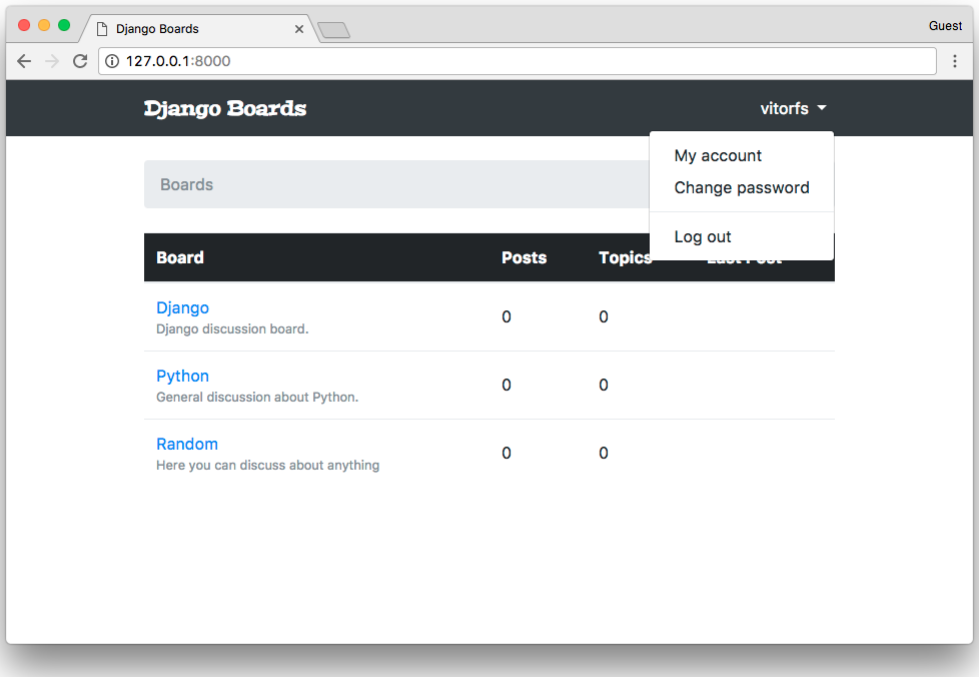
- https://code.jquery.com/jquery-3.2.1.min.js
- https://cdnjs.cloudflare.com/ajax/libs/popper.js/1.11.0/umd/popper.min.js
- https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0-beta/js/bootstrap.min.js

Right-click and ***Save link as…**.

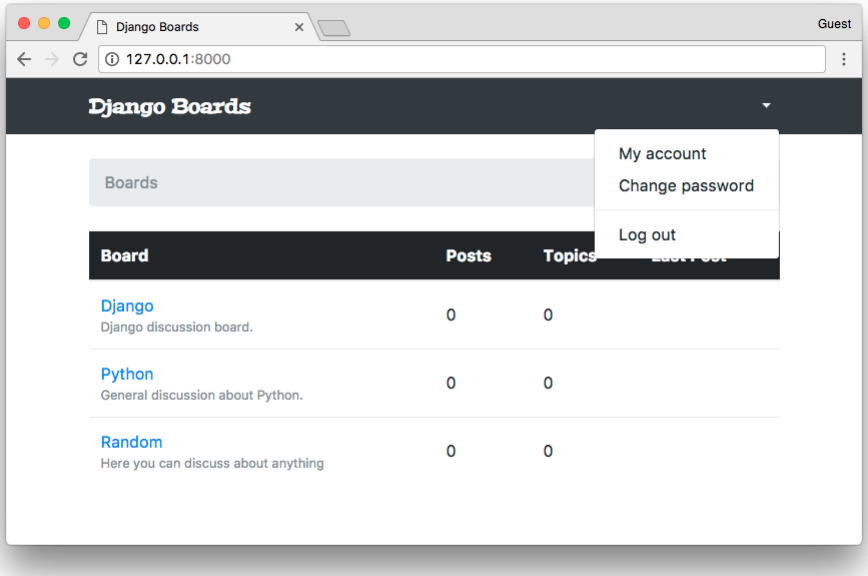
Now we can add the Bootstrap 4 dropdown menu:

**templates/base.html**

```
<nav class="navbar navbar-expand-sm navbar-dark bg-d
  <div class="container">
    <a class="navbar-brand" href="{% url 'home' %}">
    <button class="navbar-toggler" type="button" dat
      <span class="navbar-toggler-icon"></span>
    </button>
    <div class="collapse navbar-collapse" id="mainMe
      <ul class="navbar-nav ml-auto">
        <li class="nav-item dropdown">
          <a class="nav-link dropdown-toggle" href="
            {{ user.username }}
          </a>
          <div class="dropdown-menu dropdown-menu-ri
            <a class="dropdown-item" href="#">My acc
            <a class="dropdown-item" href="#">Change
            <div class="dropdown-divider"></div>
            <a class="dropdown-item" href="{% url 'l
          </div>
        </li>
      </ul>
    </div>
  </div>
</nav>
```




Let's try it. Click on logout:



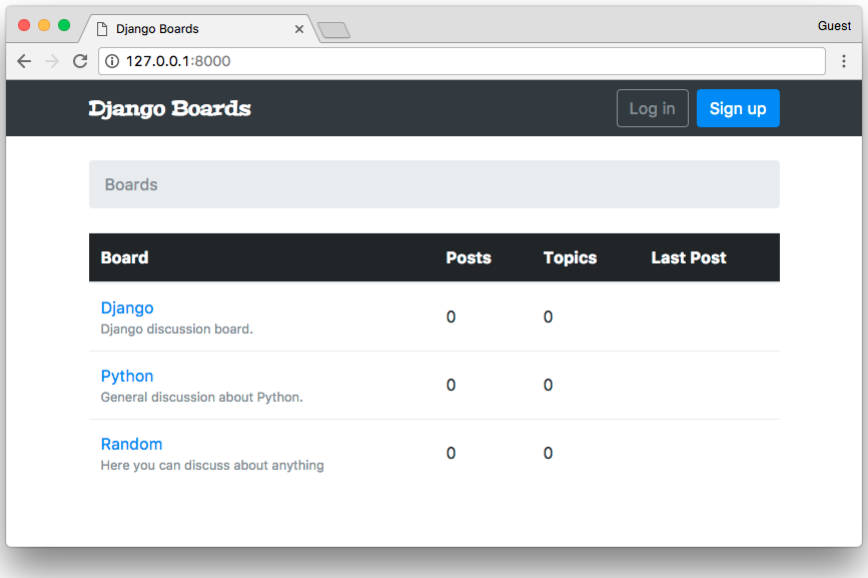

It's working. But the dropdown is showing regardless of the user being logged in or not. The difference is that now the username is empty, and we can only see an arrow.

We can improve it a little bit:

```
<nav class="navbar navbar-expand-sm navbar-dark bg-d
  <div class="container">
```

```
      <a class="navbar-brand" href="{% url 'home' %}">
      <button class="navbar-toggler" type="button" dat
        <span class="navbar-toggler-icon"></span>
      </button>
      <div class="collapse navbar-collapse" id="mainMe
        {% if user.is_authenticated %}
          <ul class="navbar-nav ml-auto">
            <li class="nav-item dropdown">
              <a class="nav-link dropdown-toggle" href
                {{ user.username }}
              </a>
              <div class="dropdown-menu dropdown-menu-
                <a class="dropdown-item" href="#">My a
                <a class="dropdown-item" href="#">Chan
                <div class="dropdown-divider"></div>
                <a class="dropdown-item" href="{% url
              </div>
            </li>
          </ul>
        {% else %}
          <form class="form-inline ml-auto">
            <a href="#" class="btn btn-outline-seconda
            <a href="{% url 'signup' %}" class="btn bt
          </form>
        {% endif %}
      </div>
    </div>
  </nav>
```

Now we are telling Django to show the dropdown menu if the user is logged in, and if not, show the log in and sign up buttons:




---

## Login

First thing, add a new URL route:

**myproject/urls.py**

```
from django.conf.urls import url
from django.contrib import admin
from django.contrib.auth import views as auth_views

from accounts import views as accounts_views
from boards import views

urlpatterns = [
    url(r'^$', views.home, name='home'),
    url(r'^signup/$', accounts_views.signup, name='s
    url(r'^login/$', auth_views.LoginView.as_view(te
    url(r'^logout/$', auth_views.LogoutView.as_view(
    url(r'^boards/(?P<pk>\d+)/$', views.board_topics
    url(r'^boards/(?P<pk>\d+)/new/$', views.new_topi
    url(r'^admin/', admin.site.urls),
]
```

Inside the `as_view()` we can pass some extra parameters, so to override the defaults. In this case, we are instructing the **LoginView** to look for a template at **login.html**.

Edit the **settings.py** and add the following configuration:

**myproject/settings.py**

```
LOGIN_REDIRECT_URL = 'home'
```

This configuration is telling Django where to redirect the user after a successful login.

Finally, add the login URL to the **base.html** template:

**templates/base.html**

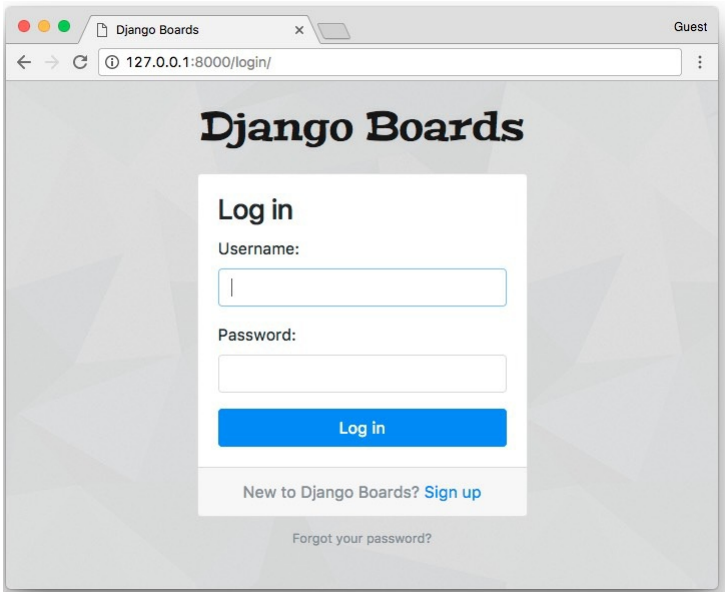
```
<a href="{% url 'login' %}" class="btn btn-outline-s
```

We can create a template similar to the sign up page. Create a new file named **login.html**:

**templates/login.html**

```
{% extends 'base.html' %}

{% load static %}

{% block stylesheet %}
  <link rel="stylesheet" href="{% static 'css/accoun
{% endblock %}

{% block body %}
  <div class="container">
    <h1 class="text-center logo my-4">
      <a href="{% url 'home' %}">Django Boards</a>
    </h1>
    <div class="row justify-content-center">
      <div class="col-lg-4 col-md-6 col-sm-8">
        <div class="card">
          <div class="card-body">
            <h3 class="card-title">Log in</h3>
            <form method="post" novalidate>
              {% csrf_token %}
              {% include 'includes/form.html' %}
              <button type="submit" class="btn btn-p
            </form>
          </div>
          <div class="card-footer text-muted text-ce
```

```
            New to Django Boards? <a href="{% url 's
          </div>
        </div>
        <div class="text-center py-2">
          <small>
            <a href="#" class="text-muted">Forgot yo
          </small>
        </div>
      </div>
    </div>
  </div>
{% endblock %}
```




And we are repeating HTML templates. Let's refactor it.

Create a new template named **base_accounts.html**:

**templates/base_accounts.html**

```
{% extends 'base.html' %}

{% load static %}

{% block stylesheet %}
  <link rel="stylesheet" href="{% static 'css/accoun
{% endblock %}

{% block body %}
  <div class="container">
    <h1 class="text-center logo my-4">
      <a href="{% url 'home' %}">Django Boards</a>
```

```
      </h1>
      {% block content %}
      {% endblock %}
    </div>
  {% endblock %}
```

Now use it on both **signup.html** and **login.html**:

**templates/login.html**

```
{% extends 'base_accounts.html' %}

{% block title %}Log in to Django Boards{% endblock

{% block content %}
  <div class="row justify-content-center">
    <div class="col-lg-4 col-md-6 col-sm-8">
      <div class="card">
        <div class="card-body">
          <h3 class="card-title">Log in</h3>
          <form method="post" novalidate>
            {% csrf_token %}
            {% include 'includes/form.html' %}
            <button type="submit" class="btn btn-pri
          </form>
        </div>
        <div class="card-footer text-muted text-cent
          New to Django Boards? <a href="{% url 'sig
        </div>
      </div>
      <div class="text-center py-2">
        <small>
          <a href="#" class="text-muted">Forgot your
        </small>
      </div>
    </div>
  </div>
{% endblock %}
```

We still don't have the password reset URL, so let's leave it as `#` for now.

**templates/signup.html**

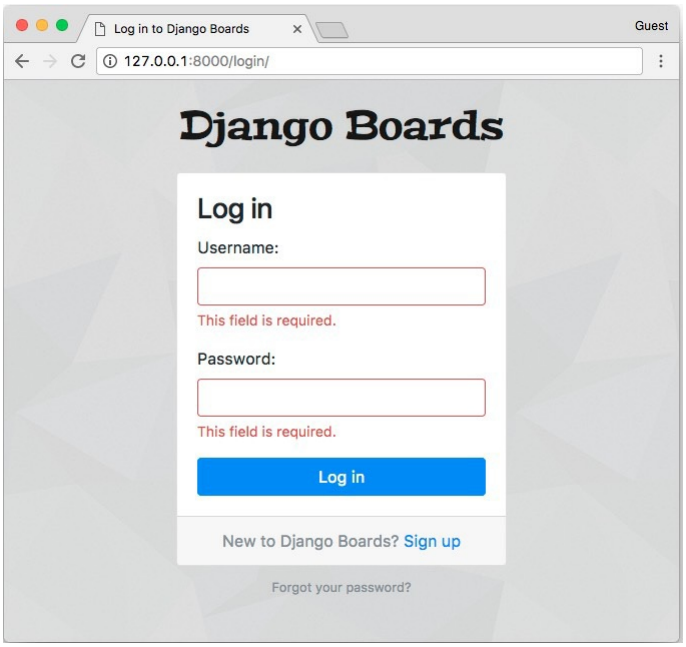
```
{% extends 'base_accounts.html' %}

{% block title %}Sign up to Django Boards{% endblock
```

```
{% block content %}
  <div class="row justify-content-center">
    <div class="col-lg-8 col-md-10 col-sm-12">
      <div class="card">
        <div class="card-body">
          <h3 class="card-title">Sign up</h3>
          <form method="post" novalidate>
            {% csrf_token %}
            {% include 'includes/form.html' %}
            <button type="submit" class="btn btn-pri
          </form>
        </div>
        <div class="card-footer text-muted text-cent
          Already have an account? <a href="{% url '
        </div>
      </div>
    </div>
  </div>
{% endblock %}
```

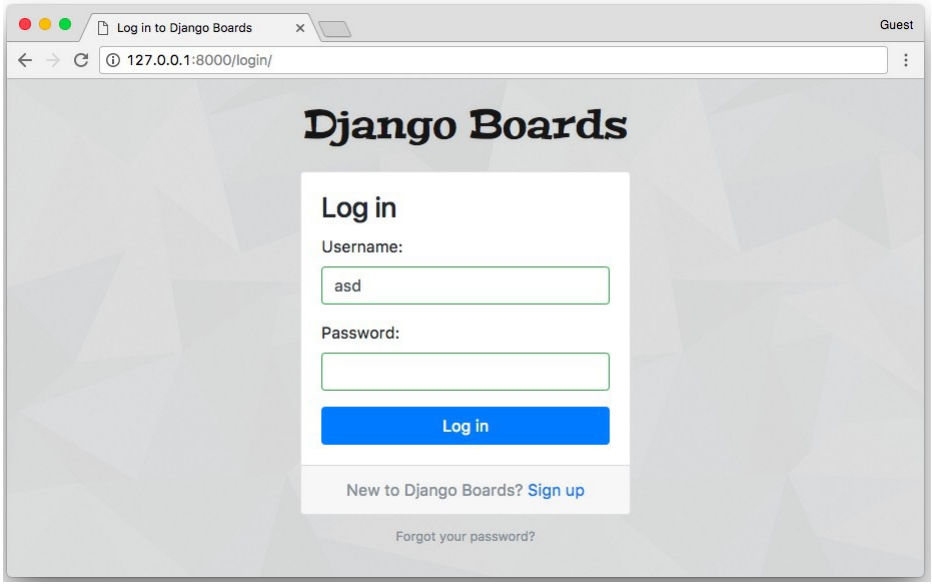
Notice that we added the log in URL: `<a href="{% url 'login' %}">Log in</a>`.

### Log In Non Field Errors

If we submit the log in form empty, we get some nice error messages:



But if we submit an username that doesn't exist or an invalid password, right now that's what's going to happen:




A little bit misleading. The fields are showing green, suggesting they are okay. Also, there's no message saying anything.

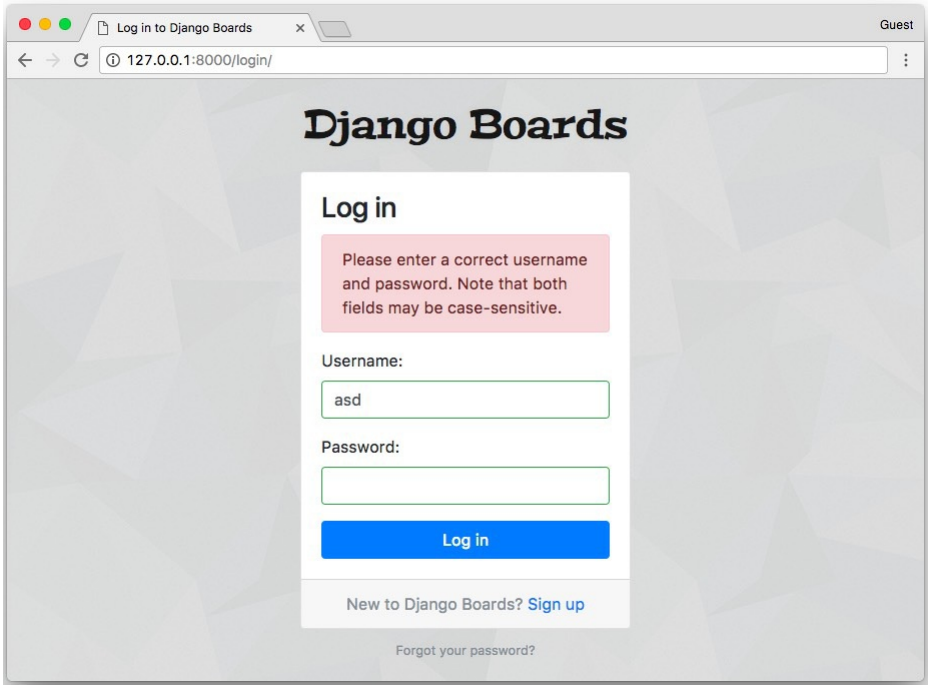
That's because forms have a special type of error, which is called **non-field errors**. It's a collection of errors that are not related to a specific field. Let's refactor the **form.html** partial template to display those errors as well:

**templates/includes/form.html**

```
{% load widget_tweaks %}

{% if form.non_field_errors %}
  <div class="alert alert-danger" role="alert">
    {% for error in form.non_field_errors %}
      <p{% if forloop.last %} class="mb-0"{% endif %
    {% endfor %}
  </div>
{% endif %}

{% for field in form %}
  <!-- code suppressed -->
{% endfor %}
```

The `{% if forloop.last %}` is just a minor thing. Because the `p` tag has a `margin-bottom`. And a form may have several non-field errors. For each non-field error, we render a `p` tag with the error. Then I'm checking if it's the last error to render. If so, we add a Bootstrap 4 CSS class `mb-0` which stands

for “margin bottom = 0”. Then the alert doesn’t look weird, with some extra space. Again, just a very minor detail. I did that just to keep the consistency of the spacing.




We still have to deal with the password field though. The thing is, Django never returned the data of password fields to the client. So, instead of trying to do something smart, let’s just ignore the `is-valid` and `is-invalid` CSS classes in some cases. But our form template already looks complicated. We can move some of the code to a **template tag**.

## Creating Custom Template Tags

Inside the **boards** app, create a new folder named **templatetags**. Then inside this folder, create two empty files named **__init__.py** and **form_tags.py**.

The structure should be the following:

```
myproject/
 |-- myproject/
 |     |-- accounts/
 |     |-- boards/
 |     |     |-- migrations/
 |     |     |-- templatetags/          <-- here
 |     |     |     |-- __init__.py
 |     |     |     +-- form_tags.py
 |     |     |-- __init__.py
```

```
|     |     |-- admin.py
|     |     |-- apps.py
|     |     |-- models.py
|     |     |-- tests.py
|     |     +-- views.py
|     |-- myproject/
|     |-- static/
|     |-- templates/
|     |-- db.sqlite3
|     +-- manage.py
+-- venv/
```

In the **form_tags.py** file, let's create two template tags:

**boards/templatetags/form_tags.py**

```
from django import template

register = template.Library()

@register.filter
def field_type(bound_field):
    return bound_field.field.widget.__class__.__name

@register.filter
def input_class(bound_field):
    css_class = ''
    if bound_field.form.is_bound:
        if bound_field.errors:
            css_class = 'is-invalid'
        elif field_type(bound_field) != 'PasswordInp
            css_class = 'is-valid'
    return 'form-control {}'.format(css_class)
```

Those are *template filters*. They work like this:

First, we load it in a template as we do with the **widget_tweaks** or **static** template tags. Note that after creating this file, you will have to manually stop the development server and start it again so Django can identify the new template tags.

```
{% load form_tags %}
```

Then after that, we can use them in a template:

```
{{ form.username|field_type }}
```

Will return:

```
'TextInput'
```

Or in case of the **input_class**:

```
{{ form.username|input_class }}

<!-- if the form is not bound, it will simply return
'form-control '

<!-- if the form is bound and valid: -->
'form-control is-valid'

<!-- if the form is bound and invalid: -->
'form-control is-invalid'
```

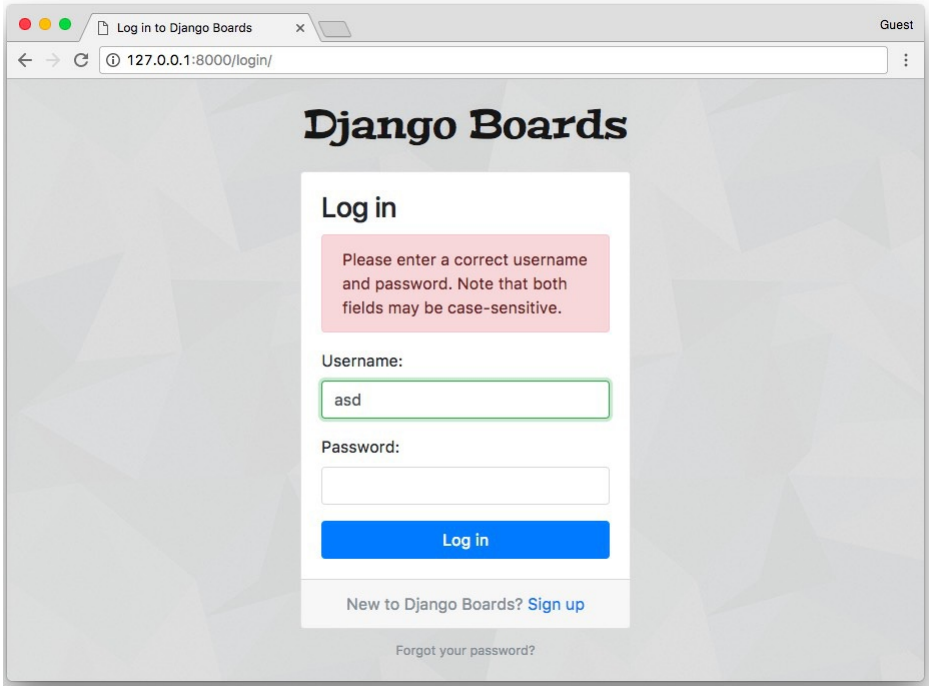
Now update the **form.html** to use the new template tags:

**templates/includes/form.html**

```
{% load form_tags widget_tweaks %}

{% if form.non_field_errors %}
  <div class="alert alert-danger" role="alert">
    {% for error in form.non_field_errors %}
      <p{% if forloop.last %} class="mb-0"{% endif %
    {% endfor %}
  </div>
{% endif %}

{% for field in form %}
  <div class="form-group">
    {{ field.label_tag }}
    {% render_field field class=field|input_class %}
    {% for error in field.errors %}
      <div class="invalid-feedback">
        {{ error }}
      </div>
    {% endfor %}
    {% if field.help_text %}
      <small class="form-text text-muted">
        {{ field.help_text|safe }}
      </small>
```

```
      {% endif %}
    </div>
  {% endfor %}
```

Much better, right? Reduced the complexity of the template. It looks cleaner now. And it also solved the problem with the password field displaying a green border:




## Testing the Template Tags

First, let's just organize the **boards'** tests a little bit. Like we did with the **accounts** app, create a new folder named **tests**, add a **__init__.py**, copy the **tests.py** and rename it to just **test_views.py** for now.

Add a new empty file named **test_templatetags.py**.

```
myproject/
 |-- myproject/
 |     |-- accounts/
 |     |-- boards/
 |     |     |-- migrations/
 |     |     |-- templatetags/
 |     |     |-- tests/
 |     |     |     |-- __init__.py
 |     |     |     |-- test_templatetags.py  <-- new fi
 |     |     |     +-- test_views.py  <-- our old file
```

```
|     |     |-- __init__.py
|     |     |-- admin.py
|     |     |-- apps.py
|     |     |-- models.py
|     |     +-- views.py
|     |-- myproject/
|     |-- static/
|     |-- templates/
|     |-- db.sqlite3
|     +-- manage.py
+-- venv/
```

Fix the **test_views.py** imports:

**boards/tests/test_views.py**

```
from ..views import home, board_topics, new_topic
from ..models import Board, Topic, Post
from ..forms import NewTopicForm
```

Execute the tests just to make sure everything is working.

**boards/tests/test_templatetags.py**

```
from django import forms
from django.test import TestCase
from ..templatetags.form_tags import field_type, inp

class ExampleForm(forms.Form):
    name = forms.CharField()
    password = forms.CharField(widget=forms.Password
    class Meta:
        fields = ('name', 'password')

class FieldTypeTests(TestCase):
    def test_field_widget_type(self):
        form = ExampleForm()
        self.assertEquals('TextInput', field_type(fo
        self.assertEquals('PasswordInput', field_typ

class InputClassTests(TestCase):
    def test_unbound_field_initial_state(self):
        form = ExampleForm()  # unbound form
        self.assertEquals('form-control ', input_cla

    def test_valid_bound_field(self):
```

```
            form = ExampleForm({'name': 'john', 'passwor
            self.assertEquals('form-control is-valid', i
            self.assertEquals('form-control ', input_cla

        def test_invalid_bound_field(self):
            form = ExampleForm({'name': '', 'password':
            self.assertEquals('form-control is-invalid',
```

We created a form class to be used in the tests then added test cases covering the possible scenarios in the two template tags.

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
................................
----------------------------------------------------------
Ran 32 tests in 0.846s

OK
Destroying test database for alias 'default'...
```

---

**Password Reset**

The password reset process involves some nasty URL patterns. But as we discussed in the previous tutorial, we don't need to be an expert in regular expressions. It's just a matter of knowing the common ones.

Another important thing before we start is that, for the password reset process, we need to send emails. It's a little bit complicated in the beginning because we need an external service. For now, we won't be configuring a production quality email service. In fact, during the development phase, we can use Django's debug tools to check if the emails are being sent correctly.

### Console Email Backend

The idea is during the development of the project, instead of sending real emails, we just log them. There are two options: writing all emails in a text file or simply displaying them in the console. I find the latter option more convenient because we are already using a console to run the development server and the setup is a bit easier.

Edit the **settings.py** module and add the `EMAIL_BACKEND` variable to the end of the file:

**myproject/settings.py**

```
EMAIL_BACKEND = 'django.core.mail.backends.console.E
```

### Configuring the Routes

The password reset process requires four views:

- A page with a form to start the reset process;
- A success page saying the process initiated, instructing the user to check their spam folders, etc.;
- A page to check the token sent via email;
- A page to tell the user if the reset was successful or not.

The views are built-in, we don't need to implement anything. All we need to do is add the routes to the **urls.py** and create the templates.

**myproject/urls.py** (view complete file contents)

```
url(r'^reset/$',
    auth_views.PasswordResetView.as_view(
        template_name='password_reset.html',
        email_template_name='password_reset_email.ht
        subject_template_name='password_reset_subjec
    ),
    name='password_reset'),
url(r'^reset/done/$',
    auth_views.PasswordResetDoneView.as_view(templat
    name='password_reset_done'),
url(r'^reset/(?P<uidb64>[0-9A-Za-z_\-]+)/(?P<token>[
    auth_views.PasswordResetConfirmView.as_view(temp
```

```
    name='password_reset_confirm'),
url(r'^reset/complete/$',
    auth_views.PasswordResetCompleteView.as_view(tem
    name='password_reset_complete'),
]
```

The `template_name` parameter in the password reset views are optional. But I thought it would be a good idea to re-define it, so the link between the view and the template be more obvious than just using the defaults.

Inside the **templates** folder, the following template files:

- **password_reset.html**
- **password_reset_email.html**: this template is the body of the email message sent to the user
- **password_reset_subject.txt**: this template is the subject line of the email, it should be a single line file
- **password_reset_done.html**
- **password_reset_confirm.html**
- **password_reset_complete.html**

Before we start implementing the templates, let's prepare a new test file.

We can add just some basic tests because those views and forms are already tested in the Django code. We are going to test just the specifics of our application.

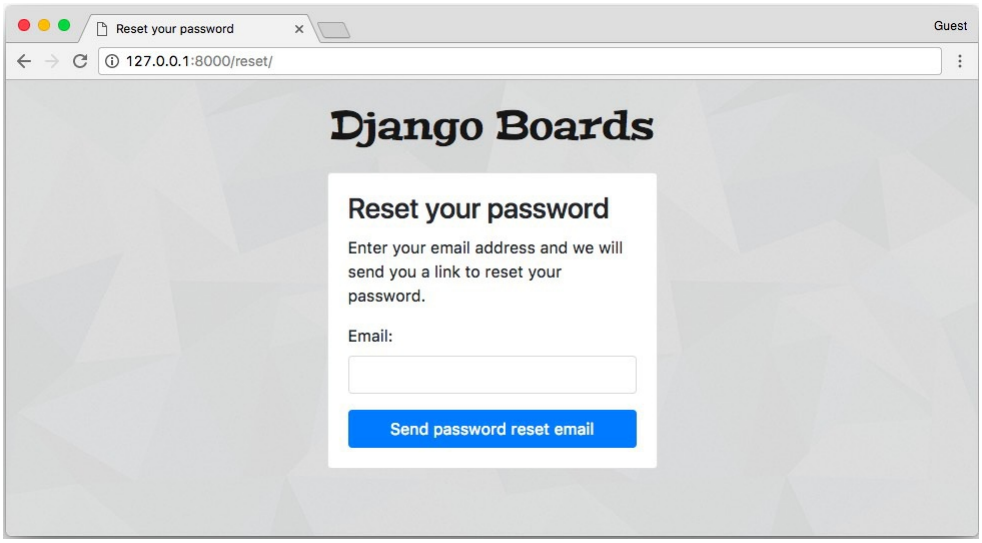
Create a new test file named **test_view_password_reset.py** inside the **accounts/tests** folder.

### Password Reset View

#### templates/password_reset.html

```
{% extends 'base_accounts.html' %}

{% block title %}Reset your password{% endblock %}

{% block content %}
  <div class="row justify-content-center">
    <div class="col-lg-4 col-md-6 col-sm-8">
      <div class="card">
```

```
          <div class="card-body">
            <h3 class="card-title">Reset your password
            <p>Enter your email address and we will se
            <form method="post" novalidate>
              {% csrf_token %}
              {% include 'includes/form.html' %}
              <button type="submit" class="btn btn-pri
            </form>
          </div>
        </div>
      </div>
    </div>
  {% endblock %}
```




**accounts/tests/test_view_password_reset.py**

```
from django.contrib.auth import views as auth_views
from django.contrib.auth.forms import PasswordResetF
from django.contrib.auth.models import User
from django.core import mail
from django.core.urlresolvers import reverse
from django.urls import resolve
from django.test import TestCase


class PasswordResetTests(TestCase):
    def setUp(self):
        url = reverse('password_reset')
        self.response = self.client.get(url)

    def test_status_code(self):
        self.assertEquals(self.response.status_code,
```

```
    def test_view_function(self):
        view = resolve('/reset/')
        self.assertEquals(view.func.view_class, auth

    def test_csrf(self):
        self.assertContains(self.response, 'csrfmidd

    def test_contains_form(self):
        form = self.response.context.get('form')
        self.assertIsInstance(form, PasswordResetFor

    def test_form_inputs(self):
        '''
        The view must contain two inputs: csrf and e
        '''
        self.assertContains(self.response, '<input',
        self.assertContains(self.response, 'type="em


class SuccessfulPasswordResetTests(TestCase):
    def setUp(self):
        email = 'john@doe.com'
        User.objects.create_user(username='john', em
        url = reverse('password_reset')
        self.response = self.client.post(url, {'emai

    def test_redirection(self):
        '''
        A valid form submission should redirect the
        '''
        url = reverse('password_reset_done')
        self.assertRedirects(self.response, url)

    def test_send_password_reset_email(self):
        self.assertEqual(1, len(mail.outbox))


class InvalidPasswordResetTests(TestCase):
    def setUp(self):
        url = reverse('password_reset')
        self.response = self.client.post(url, {'emai

    def test_redirection(self):
        '''
        Even invalid emails in the database should
```

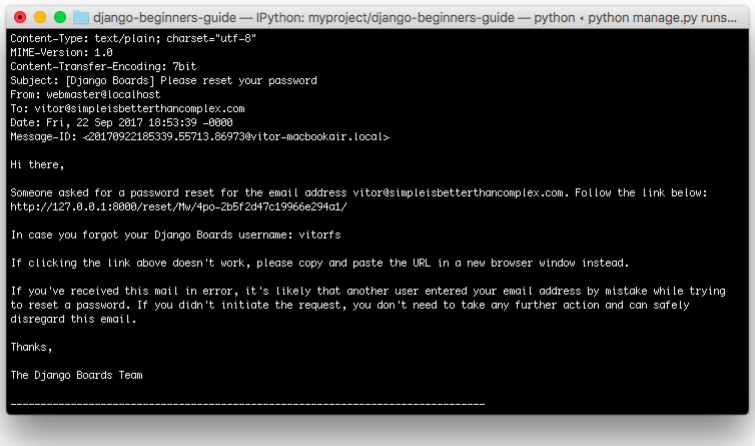
```
        redirect the user to `password_reset_done` v
        '''
        url = reverse('password_reset_done')
        self.assertRedirects(self.response, url)

    def test_no_reset_email_sent(self):
        self.assertEqual(0, len(mail.outbox))
```

**templates/password_reset_subject.txt**

```
[Django Boards] Please reset your password
```

**templates/password_reset_email.html**

```
Hi there,

Someone asked for a password reset for the email add
Follow the link below:
{{ protocol }}://{{ domain }}{% url 'password_reset_

In case you forgot your Django Boards username: {{ u

If clicking the link above doesn't work, please copy
in a new browser window instead.

If you've received this mail in error, it's likely t
your email address by mistake while trying to reset
initiate the request, you don't need to take any fur
disregard this email.

Thanks,

The Django Boards Team
```




We can create a specific file to test the email message. Create a new file named **test_mail_password_reset.py** inside the **accounts/tests** folder:

**accounts/tests/test_mail_password_reset.py**

```
from django.core import mail
from django.contrib.auth.models import User
from django.urls import reverse
from django.test import TestCase

class PasswordResetMailTests(TestCase):
    def setUp(self):
        User.objects.create_user(username='john', em
        self.response = self.client.post(reverse('pa
        self.email = mail.outbox[0]

    def test_email_subject(self):
        self.assertEqual('[Django Boards] Please res

    def test_email_body(self):
        context = self.response.context
        token = context.get('token')
        uid = context.get('uid')
        password_reset_token_url = reverse('password
            'uidb64': uid,
            'token': token
        })
        self.assertIn(password_reset_token_url, self
        self.assertIn('john', self.email.body)
        self.assertIn('john@doe.com', self.email.bod

    def test_email_to(self):
```

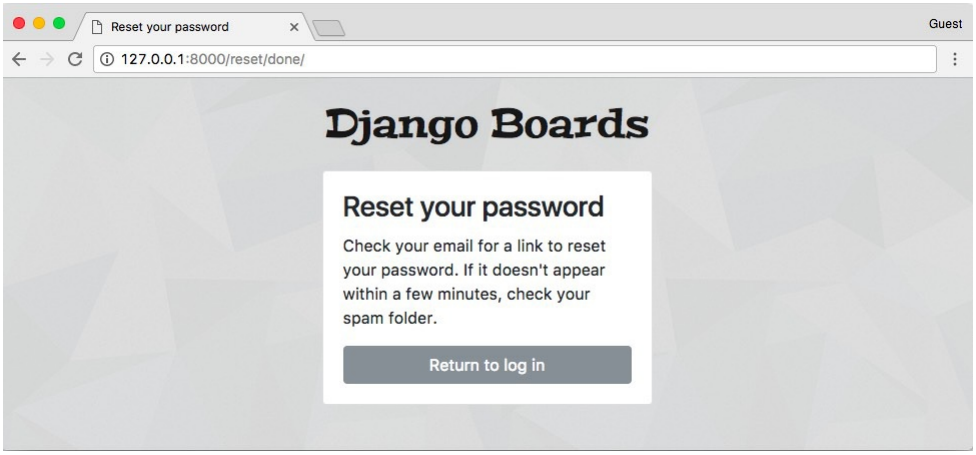
```
        self.assertEqual(['john@doe.com',], self.ema
```

This test case grabs the email sent by the application, and examine the subject line, the body contents, and to who was the email sent to.

### Password Reset Done View

### templates/password_reset_done.html

```
{% extends 'base_accounts.html' %}

{% block title %}Reset your password{% endblock %}

{% block content %}
  <div class="row justify-content-center">
    <div class="col-lg-4 col-md-6 col-sm-8">
      <div class="card">
        <div class="card-body">
          <h3 class="card-title">Reset your password
          <p>Check your email for a link to reset yo
          <a href="{% url 'login' %}" class="btn btn
        </div>
      </div>
    </div>
  </div>
{% endblock %}
```




### accounts/tests/test_view_password_reset.py

```
from django.contrib.auth import views as auth_views
from django.core.urlresolvers import reverse
from django.urls import resolve
from django.test import TestCase
```

```
class PasswordResetDoneTests(TestCase):
    def setUp(self):
        url = reverse('password_reset_done')
        self.response = self.client.get(url)

    def test_status_code(self):
        self.assertEquals(self.response.status_code,

    def test_view_function(self):
        view = resolve('/reset/done/')
        self.assertEquals(view.func.view_class, auth
```

**Password Reset Confirm View**

**templates/password_reset_confirm.html**

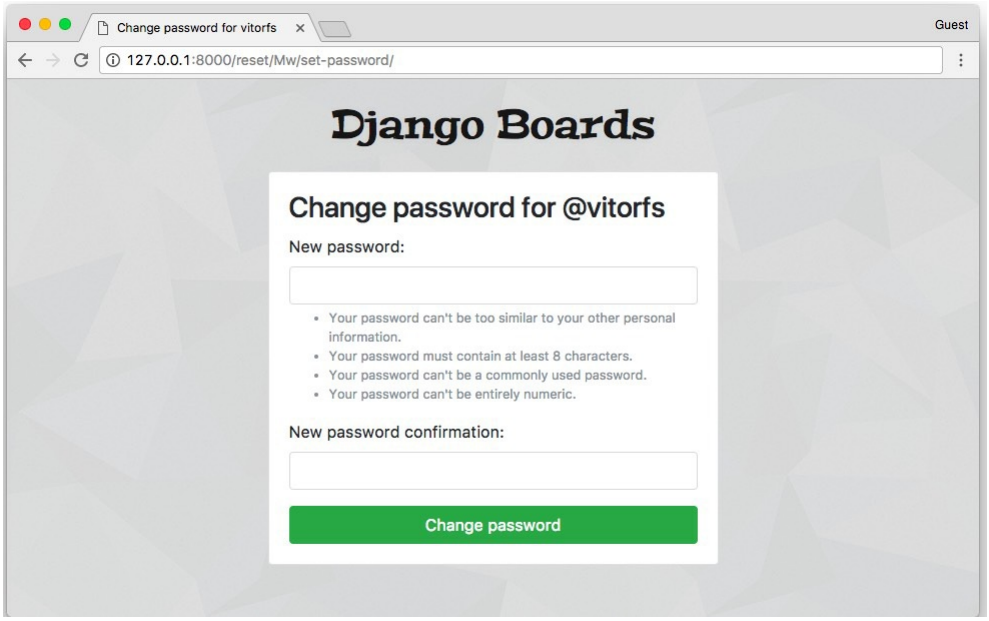
```
{% extends 'base_accounts.html' %}

{% block title %}
  {% if validlink %}
    Change password for {{ form.user.username }}
  {% else %}
    Reset your password
  {% endif %}
{% endblock %}

{% block content %}
  <div class="row justify-content-center">
    <div class="col-lg-6 col-md-8 col-sm-10">
      <div class="card">
        <div class="card-body">
          {% if validlink %}
            <h3 class="card-title">Change password f
            <form method="post" novalidate>
              {% csrf_token %}
              {% include 'includes/form.html' %}
              <button type="submit" class="btn btn-s
            </form>
          {% else %}
            <h3 class="card-title">Reset your passwo
            <div class="alert alert-danger" role="al
              It looks like you clicked on an invali
            </div>
            <a href="{% url 'password_reset' %}" cla
```

```
            {% endif %}
          </div>
        </div>
      </div>
    </div>
  {% endblock %}
```

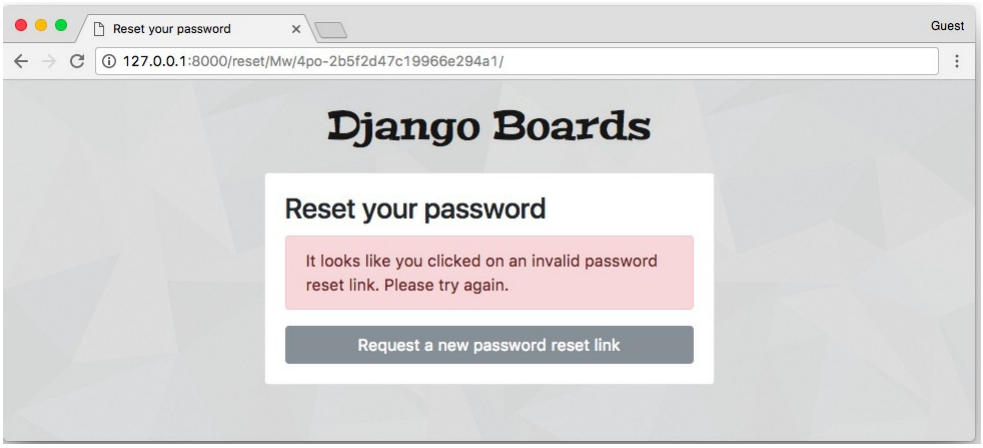
This page can only be accessed with the link sent in the email. It looks like this: **http://127.0.0.1:8000/reset/Mw/4po-2b5f2d47c19966e294a1/**

During the development phase, grab this link from the email in the console.

If the link is valid:




Or if the link has already been used:




**accounts/tests/test_view_password_reset.py**

```
from django.contrib.auth.tokens import default_token
from django.utils.encoding import force_bytes
from django.utils.http import urlsafe_base64_encode
from django.contrib.auth import views as auth_views
from django.contrib.auth.forms import SetPasswordFor
from django.contrib.auth.models import User
from django.core.urlresolvers import reverse
from django.urls import resolve
from django.test import TestCase


class PasswordResetConfirmTests(TestCase):
    def setUp(self):
        user = User.objects.create_user(username='jo

        '''
        create a valid password reset token
        based on how django creates the token intern
        https://github.com/django/django/blob/1.11.5
        '''
        self.uid = urlsafe_base64_encode(force_bytes
        self.token = default_token_generator.make_to

        url = reverse('password_reset_confirm', kwar
        self.response = self.client.get(url, follow=

    def test_status_code(self):
        self.assertEquals(self.response.status_code,

    def test_view_function(self):
        view = resolve('/reset/{uidb64}/{token}/'.fo
        self.assertEquals(view.func.view_class, auth

    def test_csrf(self):
        self.assertContains(self.response, 'csrfmidd

    def test_contains_form(self):
        form = self.response.context.get('form')
        self.assertIsInstance(form, SetPasswordForm)

    def test_form_inputs(self):
        '''
        The view must contain two inputs: csrf and t
        '''
        self.assertContains(self.response, '<input',
        self.assertContains(self.response, 'type="pa
```

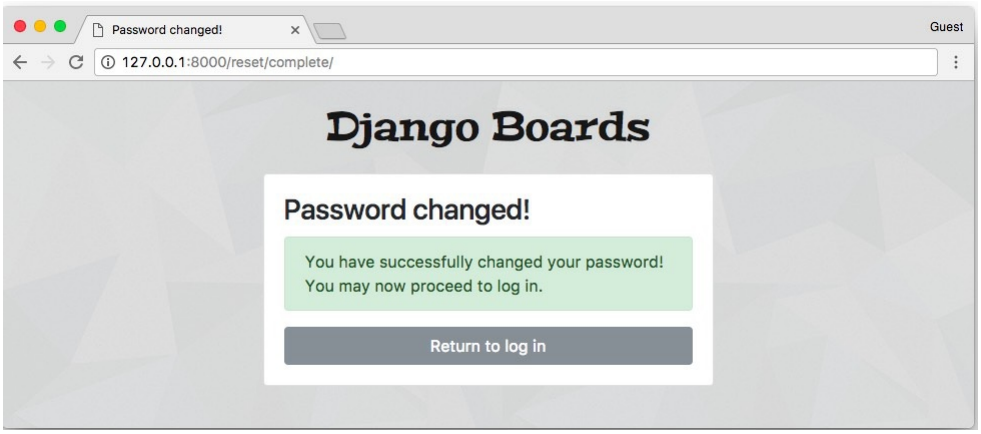
```
class InvalidPasswordResetConfirmTests(TestCase):
    def setUp(self):
        user = User.objects.create_user(username='jo
        uid = urlsafe_base64_encode(force_bytes(user
        token = default_token_generator.make_token(u

        '''
        invalidate the token by changing the passwor
        '''
        user.set_password('abcdef123')
        user.save()

        url = reverse('password_reset_confirm', kwar
        self.response = self.client.get(url)

    def test_status_code(self):
        self.assertEquals(self.response.status_code,

    def test_html(self):
        password_reset_url = reverse('password_reset
        self.assertContains(self.response, 'invalid
        self.assertContains(self.response, 'href="{0
```

**Password Reset Complete View**

**templates/password_reset_complete.html**

```
{% extends 'base_accounts.html' %}

{% block title %}Password changed!{% endblock %}

{% block content %}
  <div class="row justify-content-center">
    <div class="col-lg-6 col-md-8 col-sm-10">
      <div class="card">
        <div class="card-body">
          <h3 class="card-title">Password changed!</
          <div class="alert alert-success" role="ale
            You have successfully changed your passw
          </div>
          <a href="{% url 'login' %}" class="btn btn
        </div>
      </div>
```

```
      </div>
    </div>
{% endblock %}
```




**accounts/tests/test_view_password_reset.py** (view complete file contents)

```
from django.contrib.auth import views as auth_views
from django.core.urlresolvers import reverse
from django.urls import resolve
from django.test import TestCase

class PasswordResetCompleteTests(TestCase):
    def setUp(self):
        url = reverse('password_reset_complete')
        self.response = self.client.get(url)

    def test_status_code(self):
        self.assertEquals(self.response.status_code,

    def test_view_function(self):
        view = resolve('/reset/complete/')
        self.assertEquals(view.func.view_class, auth
```

---

## Password Change View

This view is meant to be used by logged in users that want to change their password. Usually, those forms are composed of three fields: old password, new password, and new password confirmation.

**myproject/urls.py** (view complete file contents)

```
url(r'^settings/password/$', auth_views.PasswordChan
    name='password_change'),
```

```
    url(r'^settings/password/done/$', auth_views.Passwor
        name='password_change_done'),
```

Those views only works for logged in users. They make use of a view decorator named `@login_required`. This decorator prevents non-authorized users to access this page. If the user is not logged in, Django will redirect them to the login page.

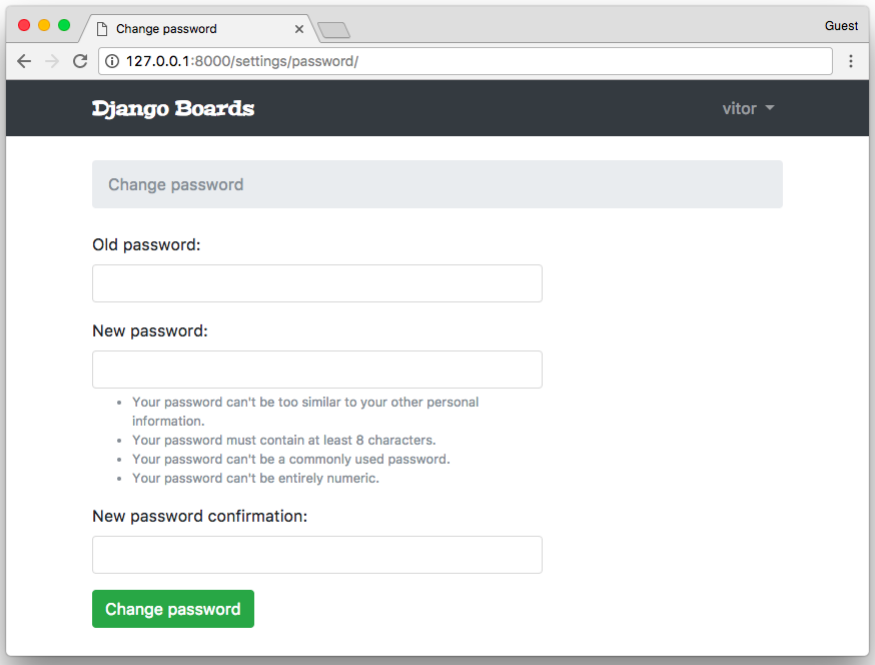
Now we have to define what is the login URL of our application in the **settings.py**:

**myproject/settings.py** (view complete file contents)

```
LOGIN_URL = 'login'
```

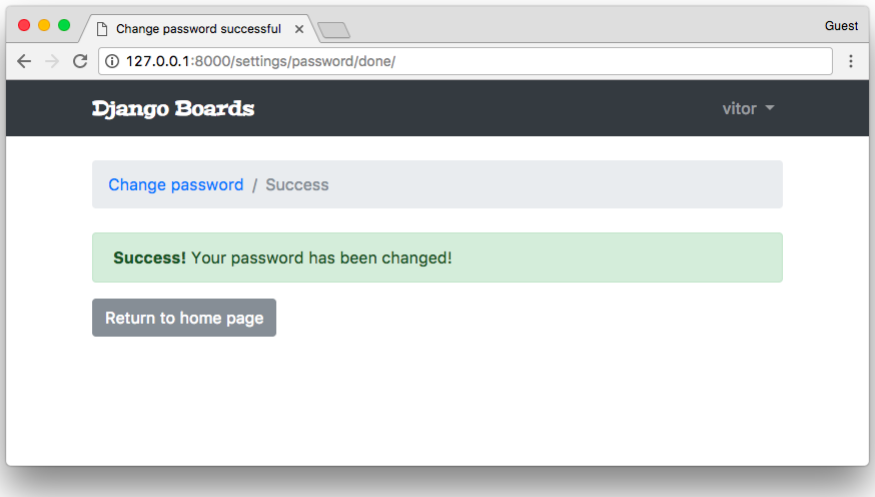
**templates/password_change.html**

```
{% extends 'base.html' %}

{% block title %}Change password{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item active">Change password
{% endblock %}

{% block content %}
  <div class="row">
    <div class="col-lg-6 col-md-8 col-sm-10">
      <form method="post" novalidate>
        {% csrf_token %}
        {% include 'includes/form.html' %}
        <button type="submit" class="btn btn-success
      </form>
    </div>
  </div>
{% endblock %}
```




## templates/password_change_done.html

```
{% extends 'base.html' %}

{% block title %}Change password successful{% endblo

{% block breadcrumb %}
  <li class="breadcrumb-item"><a href="{% url 'passw
  <li class="breadcrumb-item active">Success</li>
{% endblock %}

{% block content %}
  <div class="alert alert-success" role="alert">
    <strong>Success!</strong> Your password has been
  </div>
  <a href="{% url 'home' %}" class="btn btn-secondar
{% endblock %}
```




Regarding the password change view, we can implement similar test cases as we have already been doing so far. Create a new test file named **test_view_password_change.py**.

I will list below new types of tests. You can check all the tests I wrote for the password change view clicking in the *view complete file contents* link next to the code snippet. Most of the tests are similar to what we have been doing so far. I moved to an external file to avoid being too repetitive.

**accounts/tests/test_view_password_change.py** (view complete file contents)

```
class LoginRequiredPasswordChangeTests(TestCase):
    def test_redirection(self):
        url = reverse('password_change')
        login_url = reverse('login')
        response = self.client.get(url)
        self.assertRedirects(response, f'{login_url}
```

The test above tries to access the **password_change** view without being logged in. The expected behavior is to redirect the user to the login page.

**accounts/tests/test_view_password_change.py** (view complete file contents)

```
class PasswordChangeTestCase(TestCase):
    def setUp(self, data={}):
        self.user = User.objects.create_user(usernam
        self.url = reverse('password_change')
        self.client.login(username='john', password=
        self.response = self.client.post(self.url, d
```

Here we defined a new class named **PasswordChangeTestCase**. It does a basic setup, creating a user and making a **POST** request to the **password_change** view. In the next set of test cases, we are going to use this class instead of the **TestCase** class and test a successful request and an invalid request:

**accounts/tests/test_view_password_change.py** (view complete file contents)

```
class SuccessfulPasswordChangeTests(PasswordChangeTe
    def setUp(self):
        super().setUp({
            'old_password': 'old_password',
            'new_password1': 'new_password',
            'new_password2': 'new_password',
        })

    def test_redirection(self):
        '''
        A valid form submission should redirect the
        '''
        self.assertRedirects(self.response, reverse(

    def test_password_changed(self):
        '''
        refresh the user instance from database to g
        hash updated by the change password view.
        '''
        self.user.refresh_from_db()
        self.assertTrue(self.user.check_password('ne

    def test_user_authentication(self):
        '''
        Create a new request to an arbitrary page.
        The resulting response should now have an `u
        '''
        response = self.client.get(reverse('home'))
        user = response.context.get('user')
        self.assertTrue(user.is_authenticated)


class InvalidPasswordChangeTests(PasswordChangeTestC
    def test_status_code(self):
        '''
        An invalid form submission should return to
        '''
        self.assertEquals(self.response.status_code,
```

```
    def test_form_errors(self):
        form = self.response.context.get('form')
        self.assertTrue(form.errors)

    def test_didnt_change_password(self):
        '''
        refresh the user instance from the database
        sure we have the latest data.
        '''
        self.user.refresh_from_db()
        self.assertTrue(self.user.check_password('ol
```

The `refresh_from_db()` method make sure we have the latest state of the data. It forces Django to query the database again to update the data. We have to do it because the **change_password** view update the password in the database. So to test if the password *really* changed, we have to grab the latest data from the database.

---

**Conclusions**

Authentication is a very common use case for most Django applications. In this tutorial, we implemented all the important views: sign up, log in, log out, password reset, and change password. Now that we have a way to create users and authenticate them, we will be able to proceed with the development of the other views of our application.

We still have to improve lots of things regarding the code design: the templates folder is starting to get messy with too many files. The **boards** app tests are still disorganized. Also, we have to start refactoring the **new topic** view, because now we can retrieve the logged in user. We will get to that part soon.

I hope you enjoyed the forth part of this tutorial series! The fifth part is coming out next week, on Oct 2, 2017. If you would like to get notified when the fifth part is out, you can subscribe to our mailing list.

The source code of the project is available on GitHub. The current state of the project can be found under the release tag **v0.4-lw**. The link below will take you to the right place:

https://github.com/sibtc/django-beginners-guide/tree/v0.4-lw

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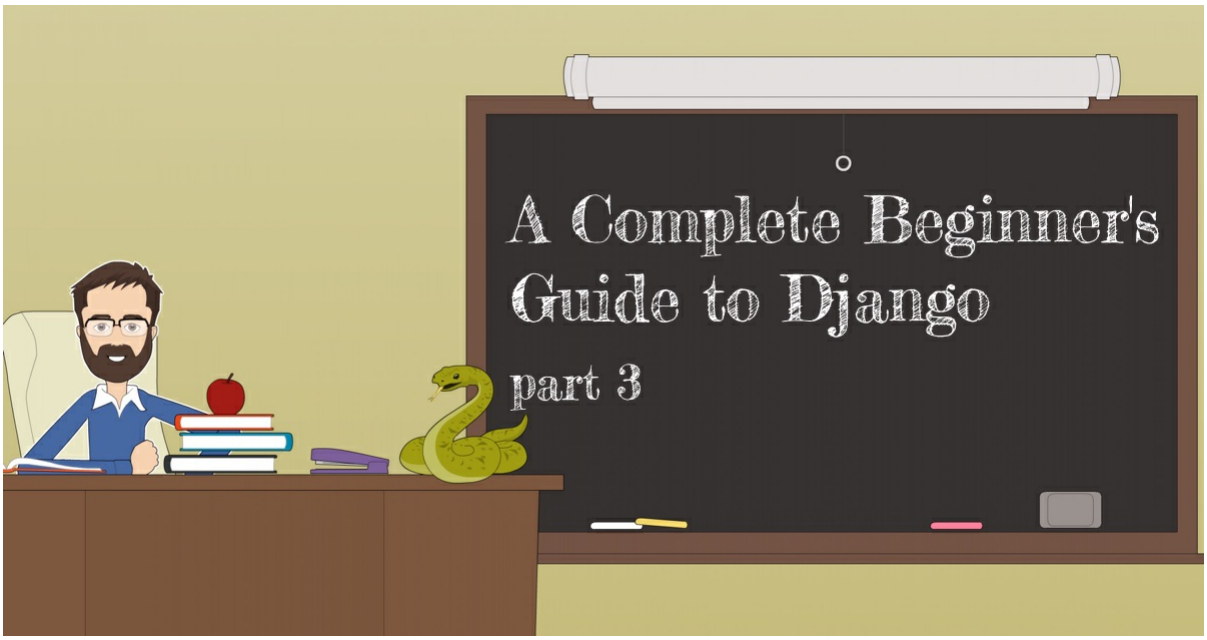



← Part 3 - Advanced Concepts


Part 5 - Django ORM →

]

[

## A Complete Beginner's Guide to Django - Part 5

] ['\n',

## Introduction

, '\n',

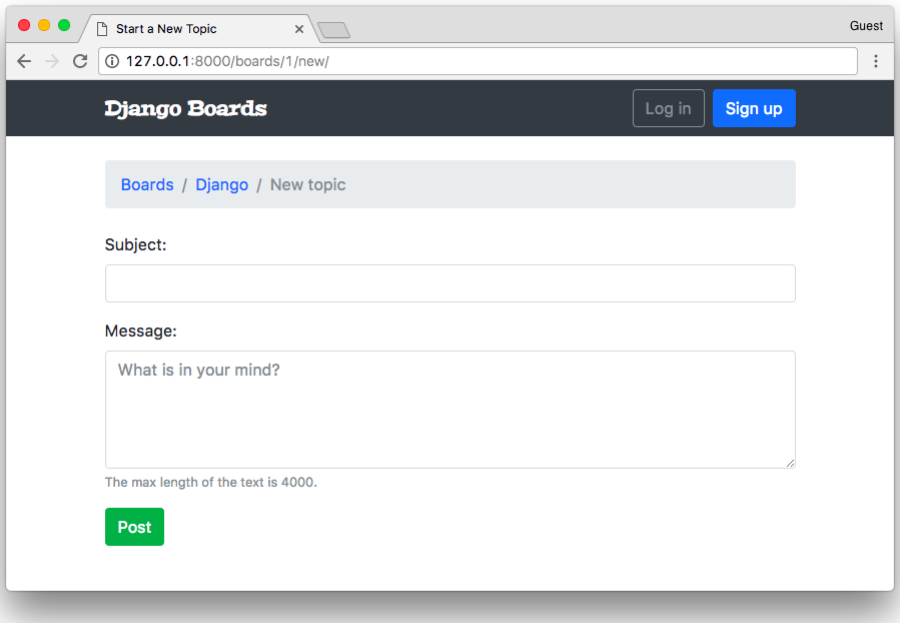
Welcome to the 5th part of the tutorial series! In this tutorial, we are going to learn more about protecting views against unauthorized users and how to access the authenticated user in the views and forms. We are also going to implement the topic posts listing view and the reply view. Finally, we are going to explore some features of Django ORM and have a brief introduction to migrations.

, '\n',

---

## Protecting Views

We have to start protecting our views against non-authorized users. So far we have the following view to start new posts:



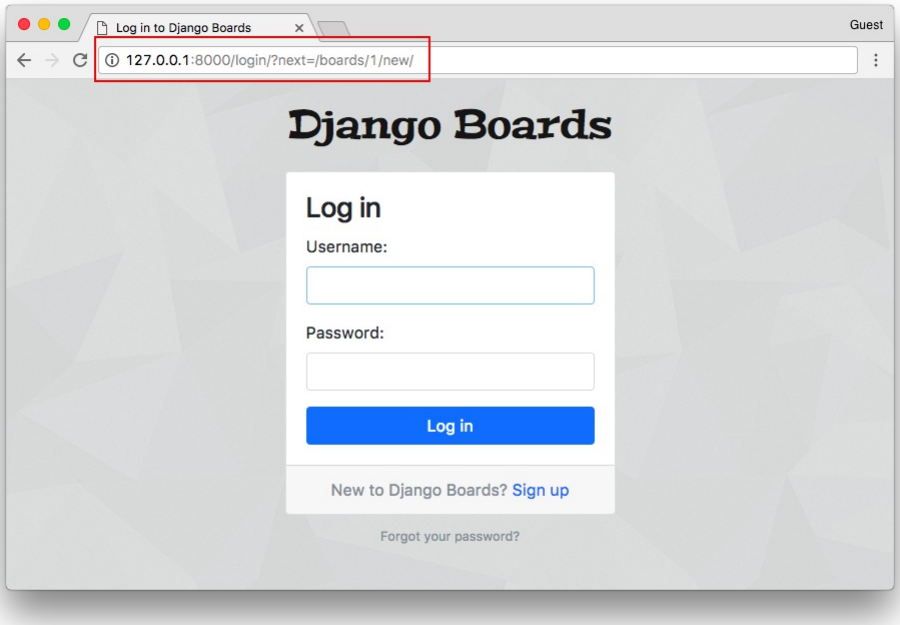

In the picture above the user is not logged in, and even though they can see the page and the form.

Django has a built-in *view decorator* to avoid that issue:

**boards/views.py** (view complete file contents)

```
from django.contrib.auth.decorators import login_req

@login_required
def new_topic(request, pk):
    # ...
```

From now on, if the user is not authenticated they will be redirected to the login page:




Notice the query string **?next=/boards/1/new/**. We can improve the log in template to make use of the **next** variable and improve the user experience.

### Configuring Login Next Redirect

**templates/login.html** (view complete file contents)

```
<form method="post" novalidate>
  {% csrf_token %}
  <input type="hidden" name="next" value="{{ next }}
  {% include 'includes/form.html' %}
  <button type="submit" class="btn btn-primary btn-b
</form>
```

Then if we try to log in now, the application will direct us back to where we were.


So the **next** parameter is part of a built-in functionality.

### Login Required Tests

Let's now add a test case to make sure this view is protected by the `@login_required` decorator. But first, let's do some refactoring in the **boards/tests/test_views.py** file.

Let's split the **test_views.py** into three files:

- **test_view_home.py** will include the **HomeTests** class (view complete file contents)
- **test_view_board_topics.py** will include the **BoardTopicsTests** class (view complete file contents)
- **test_view_new_topic.py** will include the **NewTopicTests** class (view complete file contents)

```
myproject/
 |-- myproject/
 |     |-- accounts/
 |     |-- boards/
 |     |     |-- migrations/
 |     |     |-- templatetags/
 |     |     |-- tests/
 |     |     |     |-- __init__.py
 |     |     |     |-- test_templatetags.py
 |     |     |     |-- test_view_home.py           <-- h
 |     |     |     |-- test_view_board_topics.py   <-- h
 |     |     |     +-- test_view_new_topic.py      <-- a
 |     |     |-- __init__.py
 |     |     |-- admin.py
 |     |     |-- apps.py
```

```
|     |     |-- models.py
|     |     +-- views.py
|     |-- myproject/
|     |-- static/
|     |-- templates/
|     |-- db.sqlite3
|     +-- manage.py
+-- venv/
```

Run the tests to make sure everything is working.

New let's add a new test case in the **test_view_new_topic.py** to check if the view is decorated with `@login_required`:

**boards/tests/test_view_new_topic.py** (view complete file contents)

```
from django.test import TestCase
from django.urls import reverse
from ..models import Board

class LoginRequiredNewTopicTests(TestCase):
    def setUp(self):
        Board.objects.create(name='Django', descript
        self.url = reverse('new_topic', kwargs={'pk'
        self.response = self.client.get(self.url)

    def test_redirection(self):
        login_url = reverse('login')
        self.assertRedirects(self.response, '{login_
```

In the test case above we are trying to make a request to the **new topic** view without being authenticated. The expected result is for the request be redirected to the login view.

---

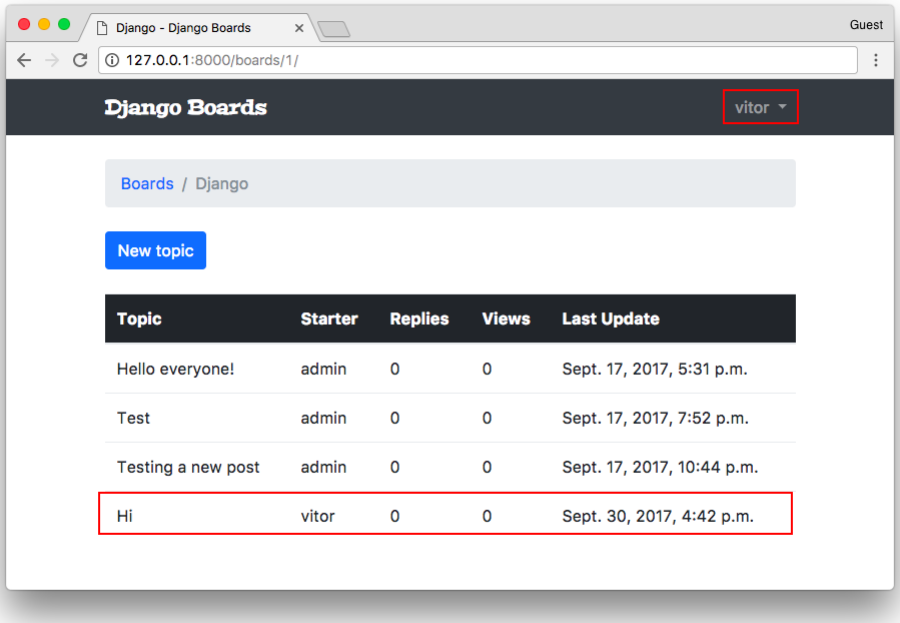
### Accessing the Authenticated User

Now we can improve the **new_topic** view and this time set the proper user, instead of just querying the database and picking the first user. That code was temporary because we had no way to authenticate the user. But now we can do better:

**boards/views.py** (view complete file contents)

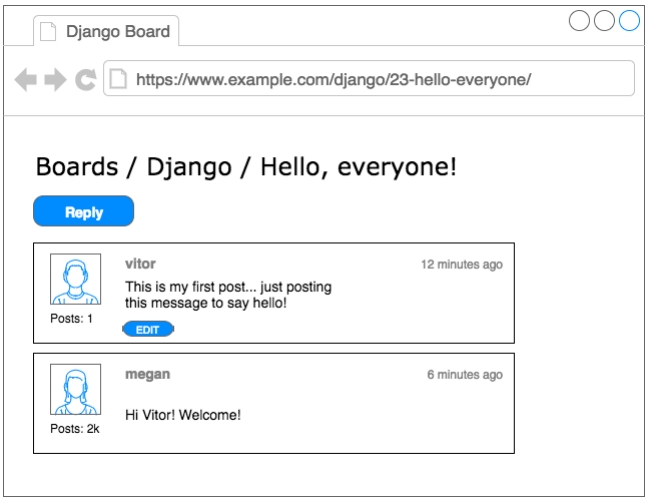
```
from django.contrib.auth.decorators import login_req
from django.shortcuts import get_object_or_404, redi

from .forms import NewTopicForm
from .models import Board, Post

@login_required
def new_topic(request, pk):
    board = get_object_or_404(Board, pk=pk)
    if request.method == 'POST':
        form = NewTopicForm(request.POST)
        if form.is_valid():
            topic = form.save(commit=False)
            topic.board = board
            topic.starter = request.user  # <- here
            topic.save()
            Post.objects.create(
                message=form.cleaned_data.get('messa
                topic=topic,
                created_by=request.user  # <- and he
            )
            return redirect('board_topics', pk=board
    else:
        form = NewTopicForm()
    return render(request, 'new_topic.html', {'board
```

We can do a quick test here by adding a new topic:



## Topic Posts View

Let's take the time now to implement the posts listing page, accordingly to the wireframe below:




First, we need a route:

**myproject/urls.py** (view complete file contents)

```
url(r'^boards/(?P<pk>\d+)/topics/(?P<topic_pk>\d+)/$
```

Observe that now we are dealing with two keyword arguments: `pk` which is used to identify the Board, and now we have the `topic_pk` which is used to identify which topic to retrieve from the database.

The matching view would be like this:

**boards/views.py** (view complete file contents)

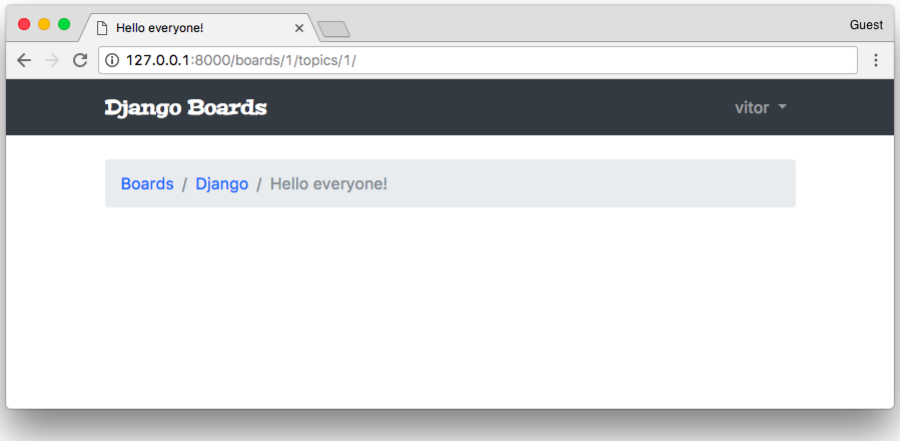
```
from django.shortcuts import get_object_or_404, rend
from .models import Topic

def topic_posts(request, pk, topic_pk):
    topic = get_object_or_404(Topic, board__pk=pk, p
    return render(request, 'topic_posts.html', {'top
```

Note that we are indirectly retrieving the current board. Remember that the topic model is related to the board model, so we can access the current board. You will see in the next snippet:

**templates/topic_posts.html** (view complete file contents)

```
{% extends 'base.html' %}

{% block title %}{{ topic.subject }}{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item"><a href="{% url 'home'
  <li class="breadcrumb-item"><a href="{% url 'board
  <li class="breadcrumb-item active">{{ topic.subjec
{% endblock %}

{% block content %}

{% endblock %}
```

Observe that now instead of using `board.name` in the template, we are navigating through the topic properties, using `topic.board.name`.




Now let's create a new test file for the **topic_posts** view:

**boards/tests/test_view_topic_posts.py**

```
from django.contrib.auth.models import User
from django.test import TestCase
from django.urls import resolve, reverse

from ..models import Board, Post, Topic
from ..views import topic_posts


class TopicPostsTests(TestCase):
    def setUp(self):
        board = Board.objects.create(name='Django',
```

```
        user = User.objects.create_user(username='jo
        topic = Topic.objects.create(subject='Hello,
        Post.objects.create(message='Lorem ipsum dol
        url = reverse('topic_posts', kwargs={'pk': b
        self.response = self.client.get(url)

    def test_status_code(self):
        self.assertEquals(self.response.status_code,

    def test_view_function(self):
        view = resolve('/boards/1/topics/1/')
        self.assertEquals(view.func, topic_posts)
```

Note that the test setup is starting to get more complex. We can create mixins or an abstract class to reuse the code as needed. We can also use a third party library to setup some test data, to reduce the boilerplate code.

Also, by now we already have a significant amount of tests, and it's gradually starting to run slower. We can instruct the test suite just to run tests from a given app:

```
python manage.py test boards

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
.......................
----------------------------------------------------
Ran 23 tests in 1.246s

OK
Destroying test database for alias 'default'...
```

We could also run only a specific test file:

```
python manage.py test boards.tests.test_view_topic_p

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
..
----------------------------------------------------
Ran 2 tests in 0.129s

OK
Destroying test database for alias 'default'...
```

Or just a specific test case:

```
python manage.py test boards.tests.test_view_topic_p

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
.
----------------------------------------------------
Ran 1 test in 0.100s

OK
Destroying test database for alias 'default'...
```

Cool, right?

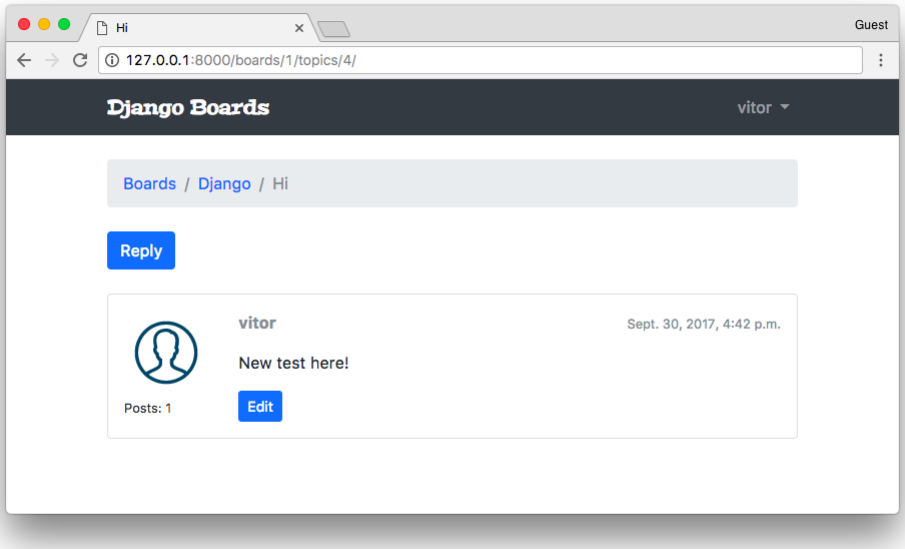
Let's keep moving forward.

Inside the **topic_posts.html**, we can create a for loop iterating over the topic posts:

**templates/topic_posts.html**

```
{% extends 'base.html' %}

{% load static %}

{% block title %}{{ topic.subject }}{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item"><a href="{% url 'home'
  <li class="breadcrumb-item"><a href="{% url 'board
  <li class="breadcrumb-item active">{{ topic.subjec
{% endblock %}

{% block content %}

  <div class="mb-4">
    <a href="#" class="btn btn-primary" role="button
  </div>

  {% for post in topic.posts.all %}
    <div class="card mb-2">
      <div class="card-body p-3">
        <div class="row">
          <div class="col-2">
            <img src="{% static 'img/avatar.svg' %}"
```

```
            <small>Posts: {{ post.created_by.posts.c
          </div>
          <div class="col-10">
            <div class="row mb-3">
              <div class="col-6">
                <strong class="text-muted">{{ post.c
              </div>
              <div class="col-6 text-right">
                <small class="text-muted">{{ post.cr
              </div>
            </div>
            {{ post.message }}
            {% if post.created_by == user %}
              <div class="mt-3">
                <a href="#" class="btn btn-primary b
              </div>
            {% endif %}
          </div>
        </div>
      </div>
    {% endfor %}

{% endblock %}
```




Since right now we don't have a way to upload a user picture, let's just have an empty image.

I downloaded a free image from IconFinder and saved in the **static/img** folder of the project.

We still haven't really explored Django's ORM, but the code `{{ post.created_by.posts.count }}` is executing a `select count` in the database. Even though the result is correct, it is a bad approach. Right now it's causing several unnecessary queries in the database. But hey, don't worry about that right now. Let's focus on how we interact with the application. Later on, we are going to improve this code, and how to diagnose heavy queries.

Another interesting point here is that we are testing if the current post belongs to the authenticated user: `{% if post.created_by == user %}`. And we are only showing the edit button for the owner of the post.

Since we now have the URL route to the topic posts listing, update the **topics.html** template with the link:

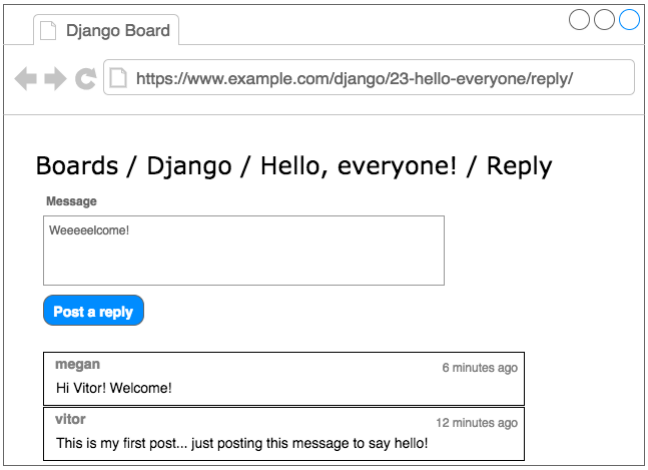
**templates/topics.html** (view complete file contents)

```
{% for topic in board.topics.all %}
  <tr>
    <td><a href="{% url 'topic_posts' board.pk topic
    <td>{{ topic.starter.username }}</td>
    <td>0</td>
    <td>0</td>
    <td>{{ topic.last_updated }}</td>
  </tr>
{% endfor %}
```

---

## Reply Post View

Let's implement now the reply post view so that we can add more data and progress with the implementation and tests.



New URL route:

**myproject/urls.py** (view complete file contents)

```
url(r'^boards/(?P<pk>\d+)/topics/(?P<topic_pk>\d+)/r
```

Create a new form for the post reply:

**boards/forms.py** (view complete file contents)

```
from django import forms
from .models import Post

class PostForm(forms.ModelForm):
    class Meta:
        model = Post
        fields = ['message', ]
```

A new view protected by `@login_required` and with a simple form processing logic:

**boards/views.py** (view complete file contents)

```
from django.contrib.auth.decorators import login_req
from django.shortcuts import get_object_or_404, redi
from .forms import PostForm
from .models import Topic

@login_required
def reply_topic(request, pk, topic_pk):
    topic = get_object_or_404(Topic, board__pk=pk, p
    if request.method == 'POST':
        form = PostForm(request.POST)
        if form.is_valid():
            post = form.save(commit=False)
            post.topic = topic
            post.created_by = request.user
            post.save()
            return redirect('topic_posts', pk=pk, to
    else:
        form = PostForm()
    return render(request, 'reply_topic.html', {'top
```

Also take the time to update the return redirect of the **new_topic** view function (marked with the comment **# TODO**).

```
@login_required
def new_topic(request, pk):
    board = get_object_or_404(Board, pk=pk)
    if request.method == 'POST':
        form = NewTopicForm(request.POST)
        if form.is_valid():
            topic = form.save(commit=False)
            # code suppressed ...
            return redirect('topic_posts', pk=pk, to
    # code suppressed ...
```

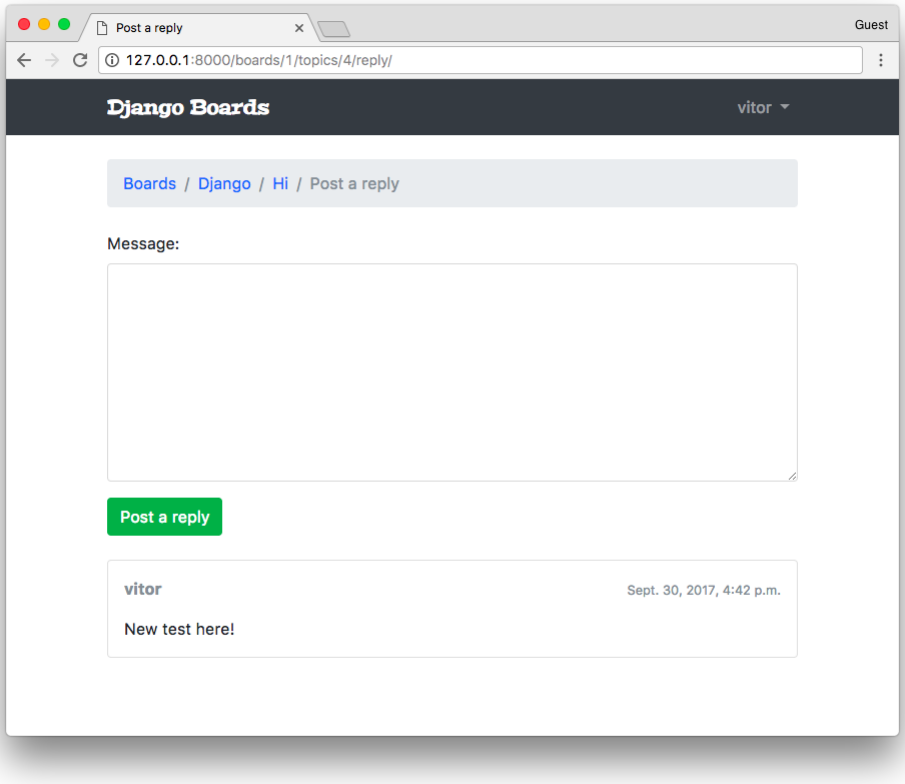
Very important: in the view **reply_topic** we are using `topic_pk` because we are referring to the keyword argument of the function, in the view **new_topic** we are using `topic.pk` because a `topic` is an object (Topic model instance) and `.pk` we are accessing the `pk` property of the Topic model instance. Small detail, big difference.

The first version of our template:

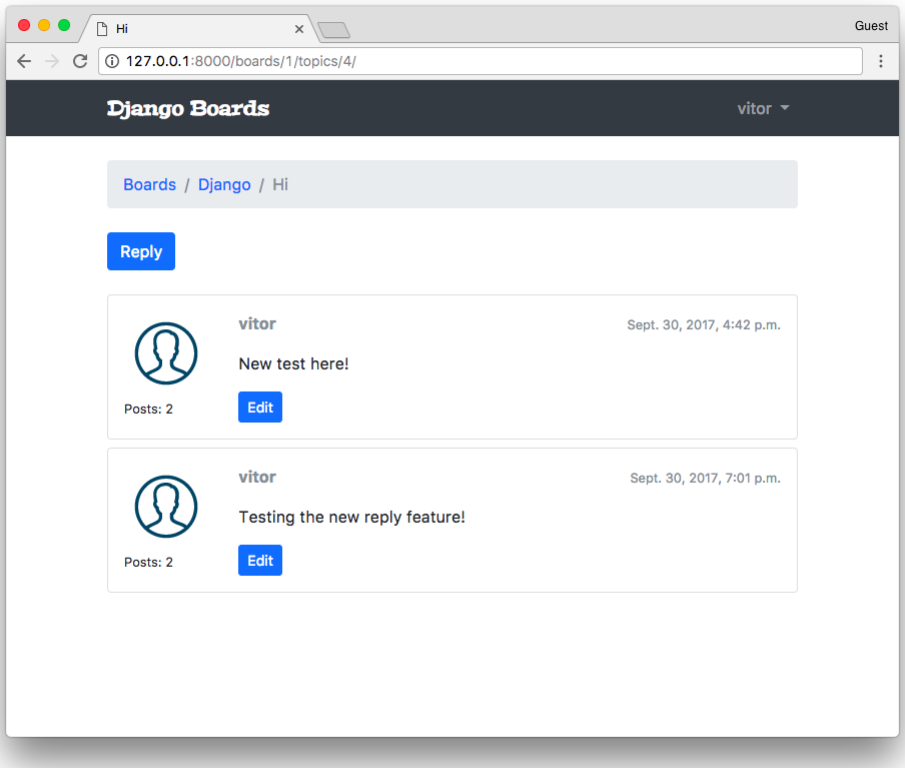
**templates/reply_topic.html**

```
{% extends 'base.html' %}

{% load static %}

{% block title %}Post a reply{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item"><a href="{% url 'home'
  <li class="breadcrumb-item"><a href="{% url 'board
  <li class="breadcrumb-item"><a href="{% url 'topic
  <li class="breadcrumb-item active">Post a reply</l
{% endblock %}

{% block content %}

  <form method="post" class="mb-4">
    {% csrf_token %}
    {% include 'includes/form.html' %}
    <button type="submit" class="btn btn-success">Po
  </form>

  {% for post in topic.posts.all %}
    <div class="card mb-2">
      <div class="card-body p-3">
```

```
          <div class="row mb-3">
            <div class="col-6">
              <strong class="text-muted">{{ post.creat
            </div>
            <div class="col-6 text-right">
              <small class="text-muted">{{ post.create
            </div>
          </div>
          {{ post.message }}
        </div>
      </div>
    {% endfor %}

{% endblock %}
```



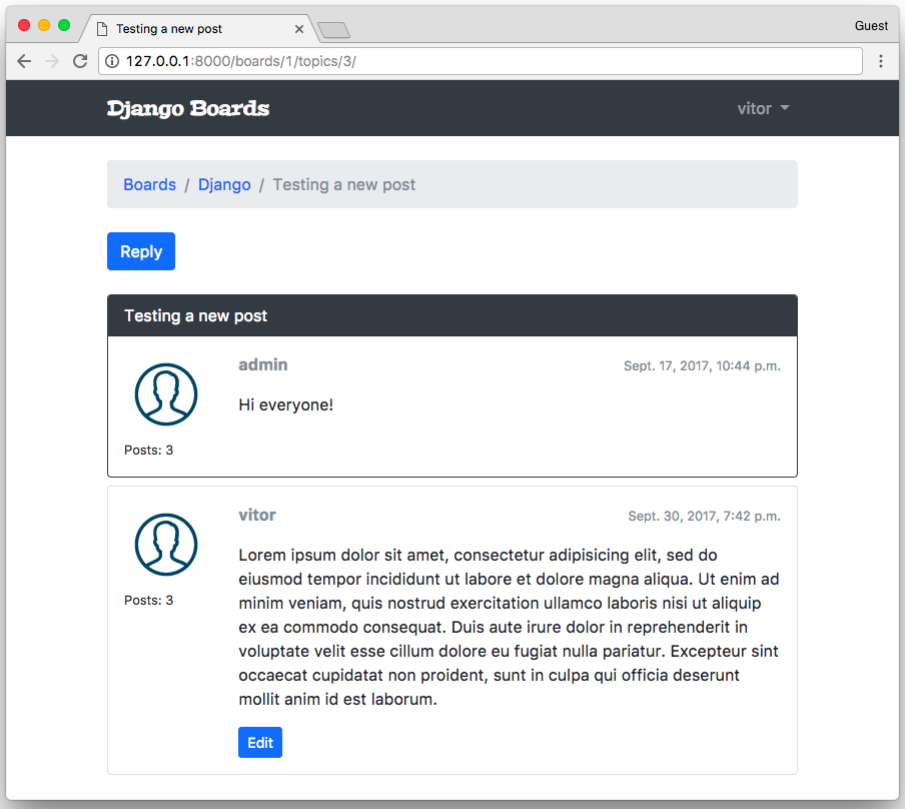

Then after posting a reply, the user is redirected back to the topic posts:




We could now change the starter post, so to give it more emphasis in the page:

**templates/topic_posts.html** (view complete file contents)

```
{% for post in topic.posts.all %}
  <div class="card mb-2 {% if forloop.first %}border
    {% if forloop.first %}
      <div class="card-header text-white bg-dark py-
    {% endif %}
    <div class="card-body p-3">
      <!-- code suppressed -->
    </div>
  </div>
{% endfor %}
```




Now for the tests, pretty standard, just like we have been doing so far. Create a new file **test_view_reply_topic.py** inside the **boards/tests** folder:

**boards/tests/test_view_reply_topic.py** (view complete file contents)

```
from django.contrib.auth.models import User
from django.test import TestCase
from django.urls import reverse
from ..models import Board, Post, Topic
from ..views import reply_topic

class ReplyTopicTestCase(TestCase):
    '''
    Base test case to be used in all `reply_topic` v
    '''
    def setUp(self):
        self.board = Board.objects.create(name='Djan
        self.username = 'john'
        self.password = '123'
        user = User.objects.create_user(username=sel
        self.topic = Topic.objects.create(subject='H
        Post.objects.create(message='Lorem ipsum dol
        self.url = reverse('reply_topic', kwargs={'p
```

```
class LoginRequiredReplyTopicTests(ReplyTopicTestCas
    # ...

class ReplyTopicTests(ReplyTopicTestCase):
    # ...

class SuccessfulReplyTopicTests(ReplyTopicTestCase):
    # ...

class InvalidReplyTopicTests(ReplyTopicTestCase):
    # ...
```

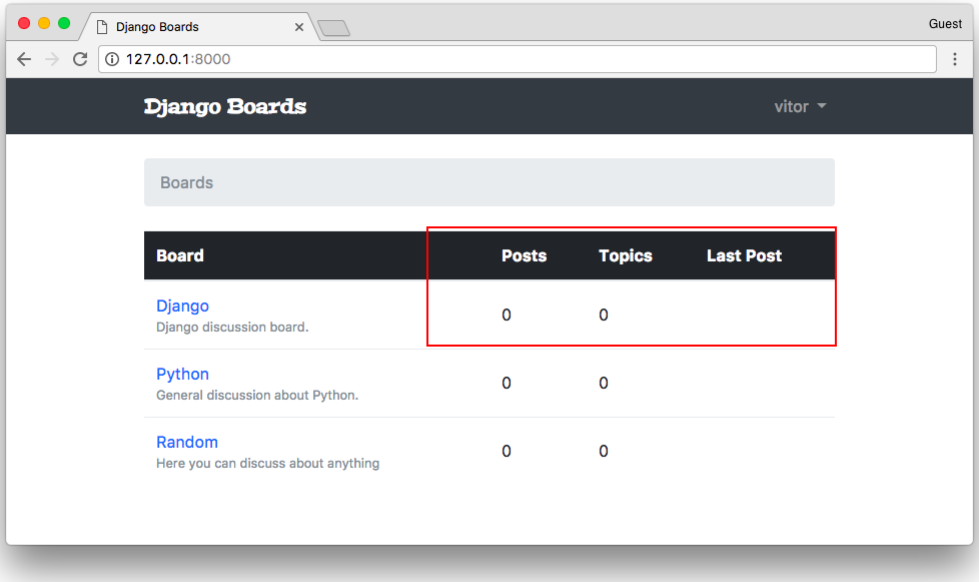
The essence here is the custom test case class **ReplyTopicTestCase**. Then all the four classes will extend this test case.

First, we test if the view is protected with the `@login_required` decorator, then check the HTML inputs, status code. Finally, we test a valid and an invalid form submission.

---

### QuerySets

Let's take the time now to explore some of the models' API functionalities a little bit. First, let's improve the home view:




We have three tasks here:

- Display the posts count of the board;
- Display the topics count of the board;
- Display the last user who posted something and the date and time.

Let's play with the Python terminal first, before we jump into the implementation.

Since we are going to try things out in the Python terminal, it's a good idea to define a `__str__` method for all our models.

**boards/models.py** (view complete file contents)

```
from django.db import models
from django.utils.text import Truncator

class Board(models.Model):
    # ...
    def __str__(self):
        return self.name

class Topic(models.Model):
    # ...
    def __str__(self):
        return self.subject

class Post(models.Model):
    # ...
    def __str__(self):
        truncated_message = Truncator(self.message)
        return truncated_message.chars(30)
```

In the Post model we are using the **Truncator** utility class. It's a convenient way to truncate long strings into an arbitrary string size (here we are using 30).

Now let's open the Python shell terminal:

```
python manage.py shell

# First get a board instance from the database
board = Board.objects.get(name='Django')
```

The easiest of the three tasks is to get the current topics count, because the Topic and Board are directly related:

```
board.topics.all()
```

```
<QuerySet [<Topic: Hello everyone!>, <Topic: Test>,

board.topics.count()
4
```

That's about it.

Now the number of *posts* within a *board* is a little bit trickier because Post is not directly related to Board.

```
from boards.models import Post

Post.objects.all()
<QuerySet [<Post: This is my first topic.. :-)>, <Po
  <Post: New test here!>, <Post: Testing the new rep
  <Post: hi there>, <Post: test>, <Post: Testing..>,
]>

Post.objects.count()
11
```

Here we have 11 posts. But not all of them belongs to the "Django" board.

Here is how we can filter it:

```
from boards.models import Board, Post

board = Board.objects.get(name='Django')

Post.objects.filter(topic__board=board)
<QuerySet [<Post: This is my first topic.. :-)>, <Po
  <Post: Hi everyone!>, <Post: Lorem ipsum dolor sit
  <Post: Testing the new reply feature!>
]>

Post.objects.filter(topic__board=board).count()
7
```

The double underscores `topic__board` is used to navigate through the models' relationships. Under the hoods, Django builds the bridge between the Board - Topic - Post, and build a SQL query to retrieve just the posts that belong to a specific board.

Now our last mission is to identify the last post.

```
# order by the `created_at` field, getting the most
Post.objects.filter(topic__board=board).order_by('-c
<QuerySet [<Post: testing>, <Post: new post>, <Post:
  <Post: Testing the new reply feature!>, <Post: New
  <Post: test.>, <Post: This is my first topic.. :-)
]>

# we can use the `first()` method to just grab the r
Post.objects.filter(topic__board=board).order_by('-c
<Post: testing>
```

Sweet. Now we can implement it.

**boards/models.py** (view complete file contents)

```
from django.db import models

class Board(models.Model):
    name = models.CharField(max_length=30, unique=Tr
    description = models.CharField(max_length=100)

    def __str__(self):
        return self.name

    def get_posts_count(self):
        return Post.objects.filter(topic__board=self

    def get_last_post(self):
        return Post.objects.filter(topic__board=self
```

Observe that we are using `self`, because this method will be used by a Board instance. So that means we are using this instance to filter the QuerySet.

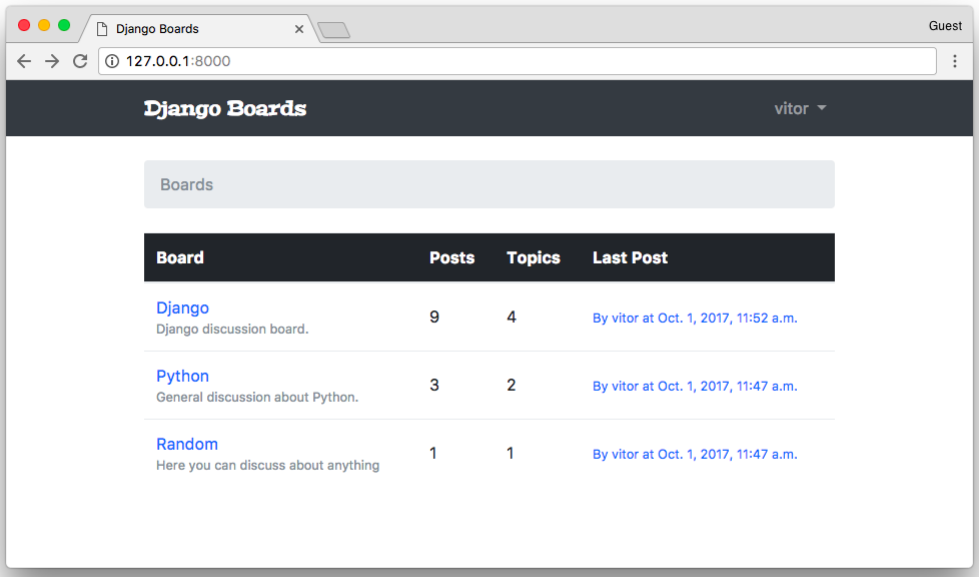
Now we can improve the home HTML template to display this brand new information:

**templates/home.html**

```
{% extends 'base.html' %}

{% block breadcrumb %}
  <li class="breadcrumb-item active">Boards</li>
{% endblock %}

{% block content %}
```

```
    <table class="table">
      <thead class="thead-inverse">
        <tr>
          <th>Board</th>
          <th>Posts</th>
          <th>Topics</th>
          <th>Last Post</th>
        </tr>
      </thead>
      <tbody>
        {% for board in boards %}
          <tr>
            <td>
              <a href="{% url 'board_topics' board.pk
              <small class="text-muted d-block">{{ boa
            </td>
            <td class="align-middle">
              {{ board.get_posts_count }}
            </td>
            <td class="align-middle">
              {{ board.topics.count }}
            </td>
            <td class="align-middle">
              {% with post=board.get_last_post %}
                <small>
                  <a href="{% url 'topic_posts' board.
                    By {{ post.created_by.username }}
                  </a>
                </small>
              {% endwith %}
            </td>
          </tr>
        {% endfor %}
      </tbody>
    </table>
  {% endblock %}
```

And that's the result for now:




Run the tests:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
.....................................................
======================================================
ERROR: test_home_url_resolves_home_view (boards.test
------------------------------------------------------
django.urls.exceptions.NoReverseMatch: Reverse for '

======================================================
ERROR: test_home_view_contains_link_to_topics_page (
------------------------------------------------------
django.urls.exceptions.NoReverseMatch: Reverse for '

======================================================
ERROR: test_home_view_status_code (boards.tests.test
------------------------------------------------------
django.urls.exceptions.NoReverseMatch: Reverse for '

------------------------------------------------------
Ran 80 tests in 5.663s

FAILED (errors=3)
Destroying test database for alias 'default'...
```

It seems like we have a problem with our implementation here. The application

is crashing if there are no posts.

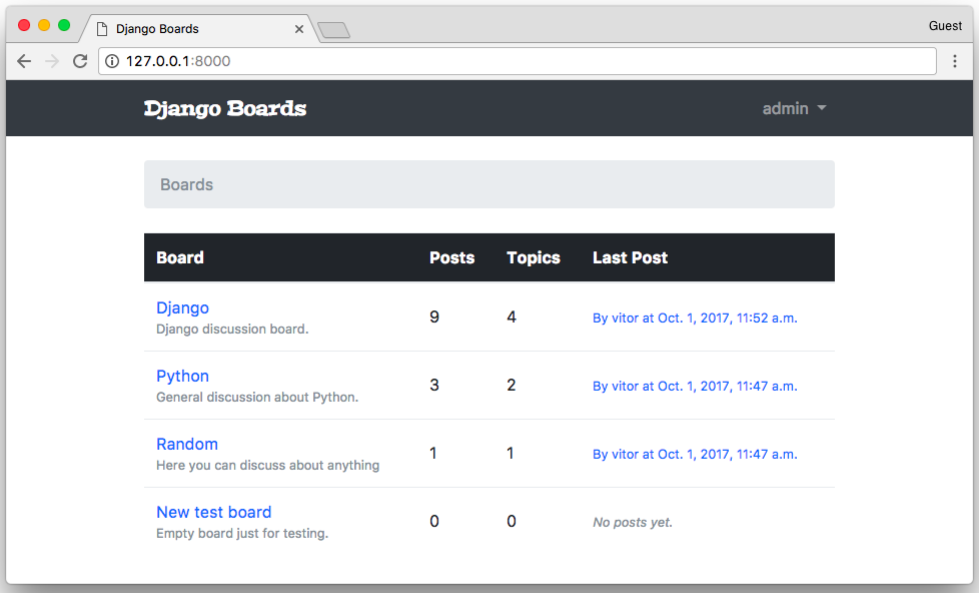
**templates/home.html**

```
{% with post=board.get_last_post %}
  {% if post %}
    <small>
      <a href="{% url 'topic_posts' board.pk post.to
        By {{ post.created_by.username }} at {{ post
      </a>
    </small>
  {% else %}
    <small class="text-muted">
      <em>No posts yet.</em>
    </small>
  {% endif %}
{% endwith %}
```

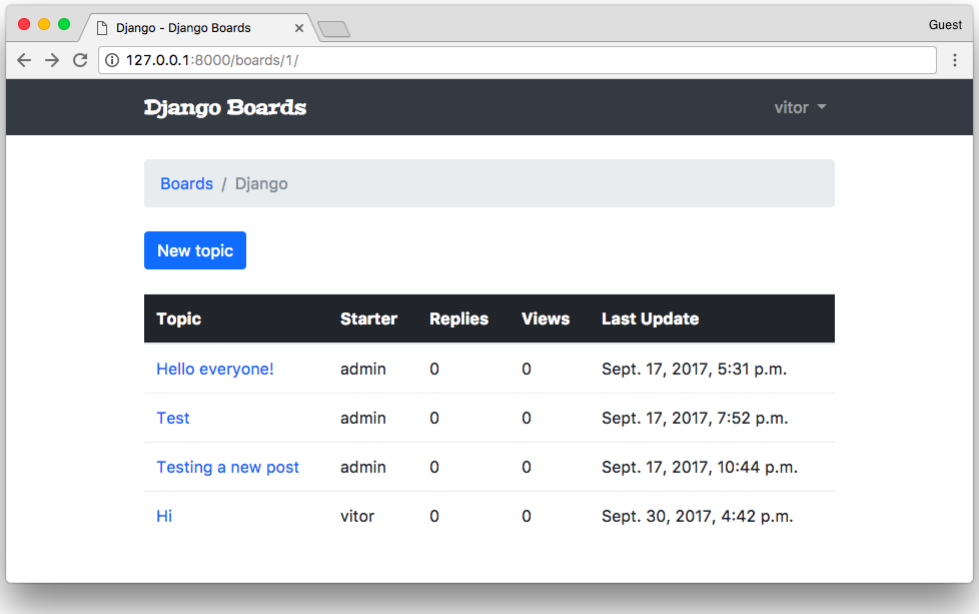
Run the tests again:

```
python manage.py test

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
..................................................
----------------------------------------------------
Ran 80 tests in 5.630s

OK
Destroying test database for alias 'default'...
```

I added a new board with no messages just to check the “empty message”:




Now it's time to improve the topics listing view.




I will show you another way to include the count, this time to the number of replies, in a more effective way.

As usual, let's try first with the Python shell:

```
python manage.py shell

from django.db.models import Count
from boards.models import Board
```

```
board = Board.objects.get(name='Django')

topics = board.topics.order_by('-last_updated').anno

for topic in topics:
    print(topic.replies)

2
4
2
1
```

Here we are using the `annotate` QuerySet method to generate a new "column" on the fly. This new column, which will be translated into a property, accessible via `topic.replies` contain the count of posts a given topic has.

We can do just a minor fix because the replies should not consider the starter topic (which is also a Post instance).

So here is how we do it:

```
topics = board.topics.order_by('-last_updated').anno

for topic in topics:
    print(topic.replies)

1
3
1
0
```

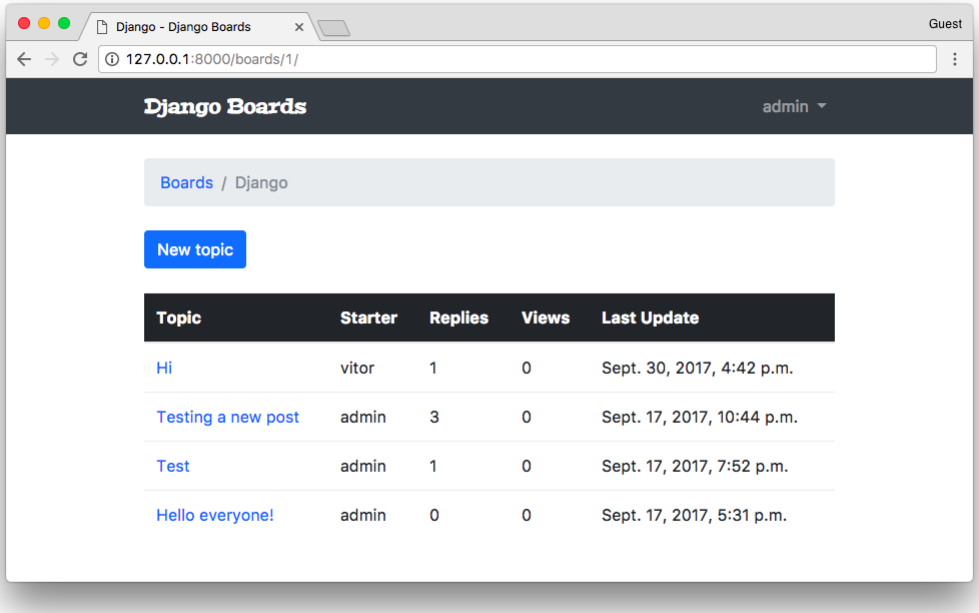
Cool, right?

**boards/views.py** (view complete file contents)

```
from django.db.models import Count
from django.shortcuts import get_object_or_404, rend
from .models import Board

def board_topics(request, pk):
    board = get_object_or_404(Board, pk=pk)
    topics = board.topics.order_by('-last_updated').
    return render(request, 'topics.html', {'board':
```

**templates/topics.html** (view complete file contents)

```
{% for topic in topics %}
  <tr>
    <td><a href="{% url 'topic_posts' board.pk topic
    <td>{{ topic.starter.username }}</td>
    <td>{{ topic.replies }}</td>
    <td>0</td>
    <td>{{ topic.last_updated }}</td>
  </tr>
{% endfor %}
```




Next step now is to fix the *views* count. But for that, we will need to create a new field.

---

## Migrations

Migration is a fundamental part of Web development with Django. It's how we evolve our application's models keeping the models' files synchronized with the database.

When we first run the command `python manage.py migrate` Django grab all migration files and generate the database schema.

When Django applies a migration, it has a special table called **django_migrations**. In this table, Django registers all the applied migrations.

So if we try to run the command again:

```
python manage.py migrate

Operations to perform:
  Apply all migrations: admin, auth, boards, content
Running migrations:
  No migrations to apply.
```

Django will know there's nothing to do.

Let's create a migration by adding a new field to the Topic model:

**boards/models.py** (view complete file contents)

```
class Topic(models.Model):
    subject = models.CharField(max_length=255)
    last_updated = models.DateTimeField(auto_now_add
    board = models.ForeignKey(Board, related_name='t
    starter = models.ForeignKey(User, related_name='
    views = models.PositiveIntegerField(default=0)

    def __str__(self):
        return self.subject
```

Here we added a `PositiveIntegerField`. Since this field is going to store the number of page views, a negative page view wouldn't make sense.

Before we can use our new field, we have to update the database schema. Execute the `makemigrations` command:

```
python manage.py makemigrations

Migrations for 'boards':
  boards/migrations/0003_topic_views.py
    - Add field views to topic
```

The `makemigrations` command automatically generated the **0003_topic_views.py** file, which will be used to modify the database, adding the **views** field.

Now apply the migration by running the command `migrate`:

```
python manage.py migrate
```

```
Operations to perform:
  Apply all migrations: admin, auth, boards, content
Running migrations:
  Applying boards.0003_topic_views... OK
```

Now we can use it to keep track of the number of views a given topic is receiving:

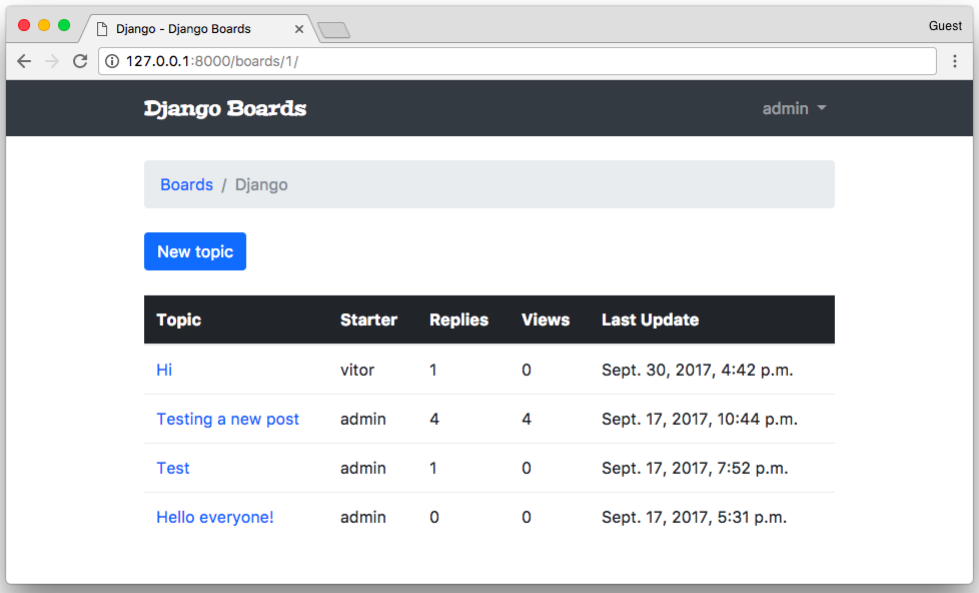
**boards/views.py** (view complete file contents)

```
from django.shortcuts import get_object_or_404, rend
from .models import Topic

def topic_posts(request, pk, topic_pk):
    topic = get_object_or_404(Topic, board__pk=pk, p
    topic.views += 1
    topic.save()
    return render(request, 'topic_posts.html', {'top
```

**templates/topics.html** (view complete file contents)

```
{% for topic in topics %}
  <tr>
    <td><a href="{% url 'topic_posts' board.pk topic
    <td>{{ topic.starter.username }}</td>
    <td>{{ topic.replies }}</td>
    <td>{{ topic.views }}</td>  <!-- here -->
    <td>{{ topic.last_updated }}</td>
  </tr>
{% endfor %}
```

Now open a topic and refresh the page a few times, and see if it's counting the page views:

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## Conclusions

In this tutorial, we made some progress in the development of the Web boards functionalities. There are a few things left to implement: the edit post view, the "my account" view for the user to update their names, etc. After those two views, we are going to enable markdown in the posts and implement pagination in both topic listing and topic replies listing.

The next tutorial will be focused on using class-based views to solve those problems. And after that, we are going to learn how to deploy our application to a Web server.

I hope you enjoyed the fifth part of this tutorial series! The sixth part is coming out next week, on Oct 9, 2017. If you would like to get notified when the fifth part is out, you can subscribe to our mailing list.

The source code of the project is available on GitHub. The current state of the project can be found under the release tag **v0.5-lw**. The link below will take you to the right place:

https://github.com/sibtc/django-beginners-guide/tree/v0.5-lw

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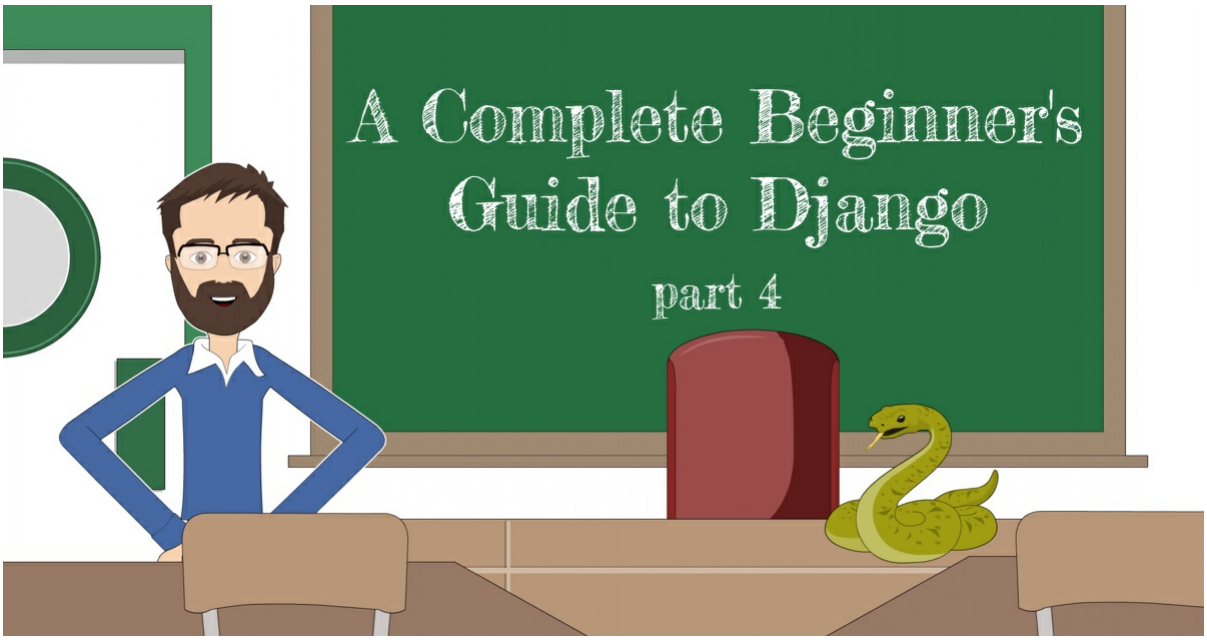
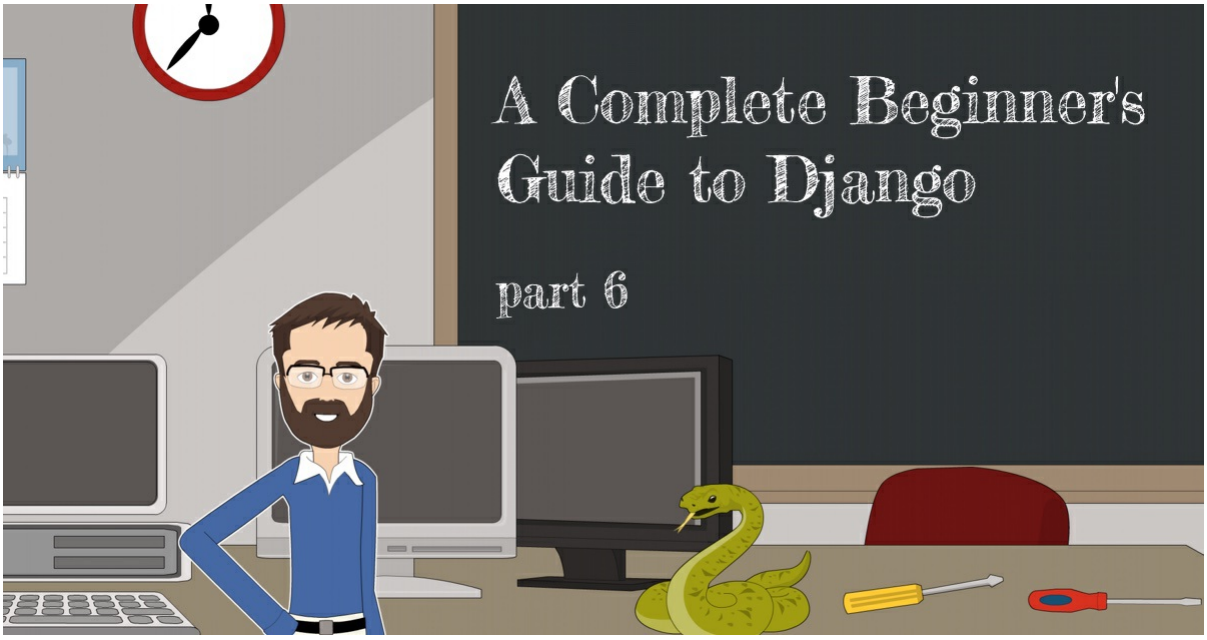



← Part 4 - Authentication




Part 6 - Class-Based Views →

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**A Complete Beginner's Guide to Django - Part 6**

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**Introduction**

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Welcome to the sixth part of the tutorial series! In this tutorial, we are going to explore in great detail the Class-Based Views. We are also going to refactor some of the existing views so to take advantage of the built-in Generic Class-Based Views.

, '\n',

There are many other topics that we are going to touch with this tutorial, such as how to work with pagination, how to work with Markdown and how to add a simple editor. We are also going to explore a built-in package called Humanize, which is used to give a "human touch" to the data.

, '\n',

Alright, folks! Let's implement some code. We have plenty of work to do today!

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---

**Views Strategies**

At the end of the day, all Django views are *functions*. Even class-based views (CBV). Behind the scenes, it does all the magic and ends up returning a view function.

Class-based views were introduced to make it easier for developers to reuse and extend views. There are many benefits of using them, such as the extendability, the ability to use O.O. techniques such as multiple inheritances, the handling of HTTP methods are done in separate methods, rather than using conditional branching, and there are also the Generic Class-Based Views (GCBV).

Before we move forward, let's clarify what those three terms mean:

- Function-Based Views (FBV)
- Class-Based Views (CBV)
- Generic Class-Based Views (GCBV)

A FBV is the simplest representation of a Django view: it's just a function that receives an **HttpRequest** object and returns an **HttpResponse**.

A CBV is every Django view defined as a Python class that extends the `django.views.generic.View` abstract class. A CBV essentially is a class that wraps a FBV. CBVs are great to extend and reuse code.

GCBVs are built-in CBVs that solve specific problems such as listing views, create, update, and delete views.

Below we are going to explore some examples of the different implementation strategies.

**Function-Based View**

**views.py**

```
def new_post(request):
    if request.method == 'POST':
        form = PostForm(request.POST)
        if form.is_valid():
            form.save()
            return redirect('post_list')
    else:
        form = PostForm()
    return render(request, 'new_post.html', {'form':
```

**urls.py**

```
urlpatterns = [
    url(r'^new_post/$', views.new_post, name='new_po
]
```

**Class-Based View**

A CBV is a view that extends the **View** class. The main difference here is that the requests are handled inside class methods named after the HTTP methods, such as **get**, **post**, **put**, **head**, etc.

So, here we don't need to do a conditional to check if the request is a **POST** or if it's a **GET**. The code goes straight to the right method. This logic is handled internally in the **View** class.

**views.py**

```
from django.views.generic import View

class NewPostView(View):
    def post(self, request):
        form = PostForm(request.POST)
        if form.is_valid():
            form.save()
            return redirect('post_list')
        return render(request, 'new_post.html', {'fo

    def get(self, request):
        form = PostForm()
        return render(request, 'new_post.html', {'fo
```

The way we refer to the CBVs in the **urls.py** module is a little bit different:

**urls.py**

```
urlpatterns = [
    url(r'^new_post/$', views.NewPostView.as_view(),
]
```

Here we need to use the `as_view()` class method, which returns a view function to the url patterns. In some cases, we can also feed the `as_view()` with some keyword arguments, so to customize the behavior of the CBV, just like we did with some of the authentication views to customize the templates.

Anyway, the good thing about CBV is that we can add more methods, and perhaps do something like this:

```
from django.views.generic import View

class NewPostView(View):
    def render(self, request):
        return render(request, 'new_post.html', {'fo

    def post(self, request):
        self.form = PostForm(request.POST)
        if self.form.is_valid():
```

```
            self.form.save()
            return redirect('post_list')
        return self.render(request)

    def get(self, request):
        self.form = PostForm()
        return self.render(request)
```

It's also possible to create some generic views that accomplish some tasks so that we can reuse it across the project.

But that's pretty much all you need to know about CBVs. Simple as that.

**Generic Class-Based View**

Now about the GCBV. That's a different story. As I mentioned earlier, those views are built-in CBVs for common use cases. Their implementation makes heavy usage of multiple inheritances (mixins) and other O.O. strategies.

They are very flexible and can save many hours of work. But in the beginning, it can be difficult to work with them.

When I first started working with Django, I found GCBV hard to work with. At first, it's hard to tell what is going on, because the code flow is not obvious, as there is good chunk of code hidden in the parent classes. The documentation is a little bit challenging to follow too, mostly because the attributes and methods are sometimes spread across eight parent classes. When working with GCBV, it's always good to have the ccbv.co.uk opened for quick reference. No worries, we are going to explore it together.

Now let's see a GCBV example.

**views.py**

```
from django.views.generic import CreateView

class NewPostView(CreateView):
    model = Post
    form_class = PostForm
    success_url = reverse_lazy('post_list')
    template_name = 'new_post.html'
```

Here we are using a generic view used to create model objects. It does all the

form processing and save the object if the form is valid.

Since it's a CBV, we refer to it in the **urls.py** the same way as any other CBV:

**urls.py**

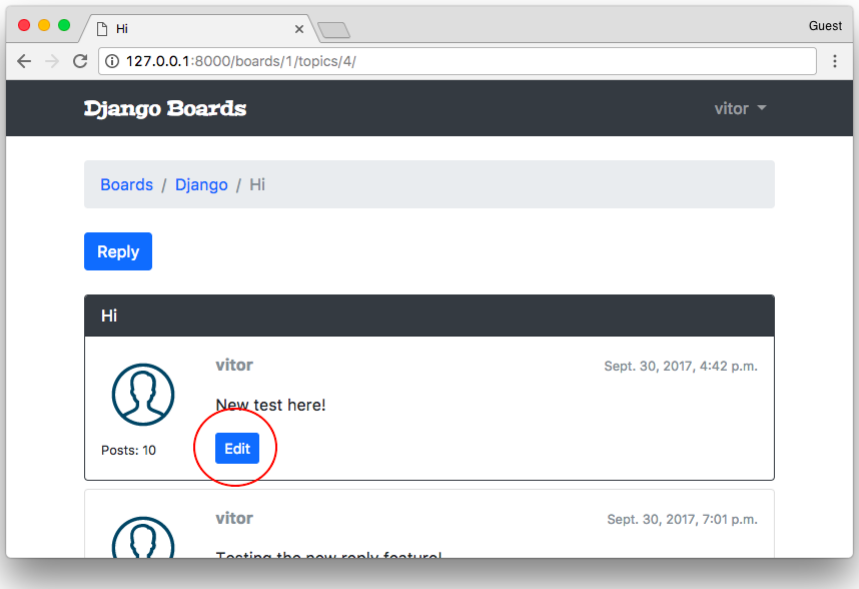
```
urlpatterns = [
    url(r'^new_post/$', views.NewPostView.as_view(),
]
```

Other examples of GCBVs are **DetailView**, **DeleteView**, **FormView**, **UpdateView**, **ListView**.

---

### Update View

Let's get back to the implementation of our project. This time we are going to use a GCBV to implement the **edit post** view:




**boards/views.py** (view complete file contents)

```
from django.shortcuts import redirect
from django.views.generic import UpdateView
from django.utils import timezone

class PostUpdateView(UpdateView):
    model = Post
    fields = ('message', )
```

```
    template_name = 'edit_post.html'
    pk_url_kwarg = 'post_pk'
    context_object_name = 'post'

    def form_valid(self, form):
        post = form.save(commit=False)
        post.updated_by = self.request.user
        post.updated_at = timezone.now()
        post.save()
        return redirect('topic_posts', pk=post.topic
```

With the **UpdateView** and the **CreateView**, we have the option to either define **form_class** or the **fields** attribute. In the example above we are using the **fields** attribute to create a model form on-the-fly. Internally, Django will use a model form factory to compose a form of the **Post** model. Since it's a very simple form with just the **message** field, we can afford to work like this. But for complex form definitions, it's better to define a model form externally and refer to it here.

The **pk_url_kwarg** will be used to identify the name of the keyword argument used to retrieve the **Post** object. It's the same as we define in the **urls.py**.

If we don't set the **context_object_name** attribute, the **Post** object will be available in the template as "object." So, here we are using the **context_object_name** to rename it to **post** instead. You will see how we are using it in the template below.

In this particular example, we had to override the **form_valid()** method so as to set some extra fields such as the **updated_by** and **updated_at**. You can see what the base **form_valid()** method looks like here: UpdateView#form_valid.

**myproject/urls.py** (view complete file contents)

```
from django.conf.urls import url
from boards import views

urlpatterns = [
    # ...
    url(r'^boards/(?P<pk>\d+)/topics/(?P<topic_pk>\d
        views.PostUpdateView.as_view(), name='edit_p
]
```

Now we can add the link to the edit page:

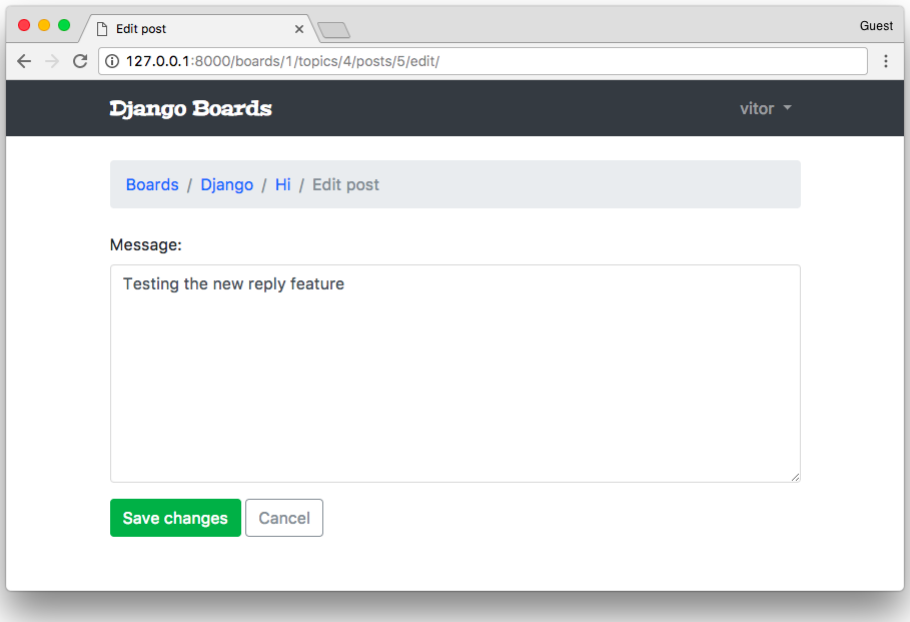
**templates/topic_posts.html** (view complete file contents)

```
{% if post.created_by == user %}
  <div class="mt-3">
    <a href="{% url 'edit_post' post.topic.board.pk
       class="btn btn-primary btn-sm"
       role="button">Edit</a>
  </div>
{% endif %}
```

**templates/edit_post.html** (view complete file contents)

```
{% extends 'base.html' %}

{% block title %}Edit post{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item"><a href="{% url 'home'
  <li class="breadcrumb-item"><a href="{% url 'board
  <li class="breadcrumb-item"><a href="{% url 'topic
  <li class="breadcrumb-item active">Edit post</li>
{% endblock %}

{% block content %}
  <form method="post" class="mb-4" novalidate>
    {% csrf_token %}
    {% include 'includes/form.html' %}
    <button type="submit" class="btn btn-success">Sa
    <a href="{% url 'topic_posts' post.topic.board.p
  </form>
{% endblock %}
```

Observe now how we are navigating through the post object: **post.topic.board.pk**. If we didn't set the **context_object_name** to **post**, it would be available as: **object.topic.board.pk**. Got it?




## Testing The Update View

Create a new test file named **test_view_edit_post.py** inside the **boards/tests** folder. Clicking on the link below you will see many routine tests, just like we have been doing in this tutorial. So I will just highlight the new parts here:

**boards/tests/test_view_edit_post.py** (view complete file contents)

```
from django.contrib.auth.models import User
from django.test import TestCase
from django.urls import reverse
from ..models import Board, Post, Topic
from ..views import PostUpdateView

class PostUpdateViewTestCase(TestCase):
    '''
    Base test case to be used in all `PostUpdateView
    '''
    def setUp(self):
        self.board = Board.objects.create(name='Djan
        self.username = 'john'
        self.password = '123'
        user = User.objects.create_user(username=sel
        self.topic = Topic.objects.create(subject='H
        self.post = Post.objects.create(message='Lor
        self.url = reverse('edit_post', kwargs={
            'pk': self.board.pk,
```

```
            'topic_pk': self.topic.pk,
            'post_pk': self.post.pk
        })

class LoginRequiredPostUpdateViewTests(PostUpdateVie
    def test_redirection(self):
        '''
        Test if only logged in users can edit the po
        '''
        login_url = reverse('login')
        response = self.client.get(self.url)
        self.assertRedirects(response, '{login_url}?

class UnauthorizedPostUpdateViewTests(PostUpdateView
    def setUp(self):
        '''
        Create a new user different from the one who
        '''
        super().setUp()
        username = 'jane'
        password = '321'
        user = User.objects.create_user(username=use
        self.client.login(username=username, passwor
        self.response = self.client.get(self.url)

    def test_status_code(self):
        '''
        A topic should be edited only by the owner.
        Unauthorized users should get a 404 response
        '''
        self.assertEquals(self.response.status_code,


class PostUpdateViewTests(PostUpdateViewTestCase):
    # ...

class SuccessfulPostUpdateViewTests(PostUpdateViewTe
    # ...

class InvalidPostUpdateViewTests(PostUpdateViewTestC
    # ...
```

For now, the important parts are: **PostUpdateViewTestCase** is a class we defined to be reused across the other test cases. It's just the basic setup, creating users, topic, boards, and so on.

The class **LoginRequiredPostUpdateViewTests** will test if the view is protected with the `@login_required` decorator. That is if only authenticated users can access the edit page.

The class **UnauthorizedPostUpdateViewTests** creates a new user, different from the one who posted and tries to access the edit page. The application should only authorize the owner of the post to edit it.

Let's run the tests:

```
python manage.py test boards.tests.test_view_edit_po

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
..F.......F
======================================================
FAIL: test_redirection (boards.tests.test_view_edit_
------------------------------------------------------
...
AssertionError: 200 != 302 : Response didn't redirec

======================================================
FAIL: test_status_code (boards.tests.test_view_edit_
------------------------------------------------------
...
AssertionError: 200 != 404

----------------------------------------------------------------------
Ran 11 tests in 1.360s

FAILED (failures=2)
Destroying test database for alias 'default'...
```

First, let's fix the problem with the `@login_required` decorator. The way we use view decorators on class-based views is a little bit different. We need an extra import:

**boards/views.py** (view complete file contents)

```
from django.contrib.auth.decorators import login_req
from django.shortcuts import redirect
from django.views.generic import UpdateView
from django.utils import timezone
from django.utils.decorators import method_decorator
from .models import Post
```

```
@method_decorator(login_required, name='dispatch')
class PostUpdateView(UpdateView):
    model = Post
    fields = ('message', )
    template_name = 'edit_post.html'
    pk_url_kwarg = 'post_pk'
    context_object_name = 'post'

    def form_valid(self, form):
        post = form.save(commit=False)
        post.updated_by = self.request.user
        post.updated_at = timezone.now()
        post.save()
        return redirect('topic_posts', pk=post.topic
```

We can't decorate the class directly with the `@login_required` decorator. We have to use the utility `@method_decorator`, and pass a decorator (or a list of decorators) and tell which method should be decorated. In class-based views it's common to decorate the **dispatch** method. It's an internal method Django use (defined inside the View class). All requests pass through this method, so it's safe to decorate it.

Run the tests:

```
python manage.py test boards.tests.test_view_edit_po

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
.........F
======================================================
FAIL: test_status_code (boards.tests.test_view_edit_
------------------------------------------------------
...
AssertionError: 200 != 404

------------------------------------------------------
Ran 11 tests in 1.353s

FAILED (failures=1)
Destroying test database for alias 'default'...
```

Okay! We fixed the `@login_required` problem. Now we have to deal with the other users editing any posts problem.

The easiest way to solve this problem is by overriding the `get_queryset` method of the **UpdateView**. You can see what the original method looks like here UpdateView#get_queryset.

**boards/views.py** (view complete file contents)

```
@method_decorator(login_required, name='dispatch')
class PostUpdateView(UpdateView):
    model = Post
    fields = ('message', )
    template_name = 'edit_post.html'
    pk_url_kwarg = 'post_pk'
    context_object_name = 'post'

    def get_queryset(self):
        queryset = super().get_queryset()
        return queryset.filter(created_by=self.reque

    def form_valid(self, form):
        post = form.save(commit=False)
        post.updated_by = self.request.user
        post.updated_at = timezone.now()
        post.save()
        return redirect('topic_posts', pk=post.topic
```

With the line `queryset = super().get_queryset()` we are reusing the `get_queryset` method from the parent class, that is, the **UpateView** class. Then, we are adding an extra filter to the queryset, which is filtering the post using the logged in user, available inside the **request** object.

Test it again:

```
python manage.py test boards.tests.test_view_edit_po

Creating test database for alias 'default'...
System check identified no issues (0 silenced).
..........
----------------------------------------------------
Ran 11 tests in 1.321s

OK
Destroying test database for alias 'default'...
```

All good!

---

**List View**

We could refactor some of our existing views to take advantage of the CBV capabilities. Take the home page for example. We are just grabbing all the boards from the database and listing it in the HTML:

**boards/views.py**

```
from django.shortcuts import render
from .models import Board

def home(request):
    boards = Board.objects.all()
    return render(request, 'home.html', {'boards': b
```

Here is how we could rewrite it using a GCBV for models listing:

**boards/views.py** (view complete file contents)

```
from django.views.generic import ListView
from .models import Board

class BoardListView(ListView):
    model = Board
    context_object_name = 'boards'
    template_name = 'home.html'
```

Then we have to change the reference in the **urls.py** module:

**myproject/urls.py** (view complete file contents)

```
from django.conf.urls import url
from boards import views

urlpatterns = [
    url(r'^$', views.BoardListView.as_view(), name='
    # ...
]
```

If we check the homepage we will see that nothing really changed, everything is working as expected. But we have to tweak our tests a little bit because now we are dealing with a class-based view:

**boards/tests/test_view_home.py** (view complete file contents)

```
from django.test import TestCase
from django.urls import resolve
from ..views import BoardListView

class HomeTests(TestCase):
    # ...
    def test_home_url_resolves_home_view(self):
        view = resolve('/')
        self.assertEquals(view.func.view_class, Boar
```

**Pagination**

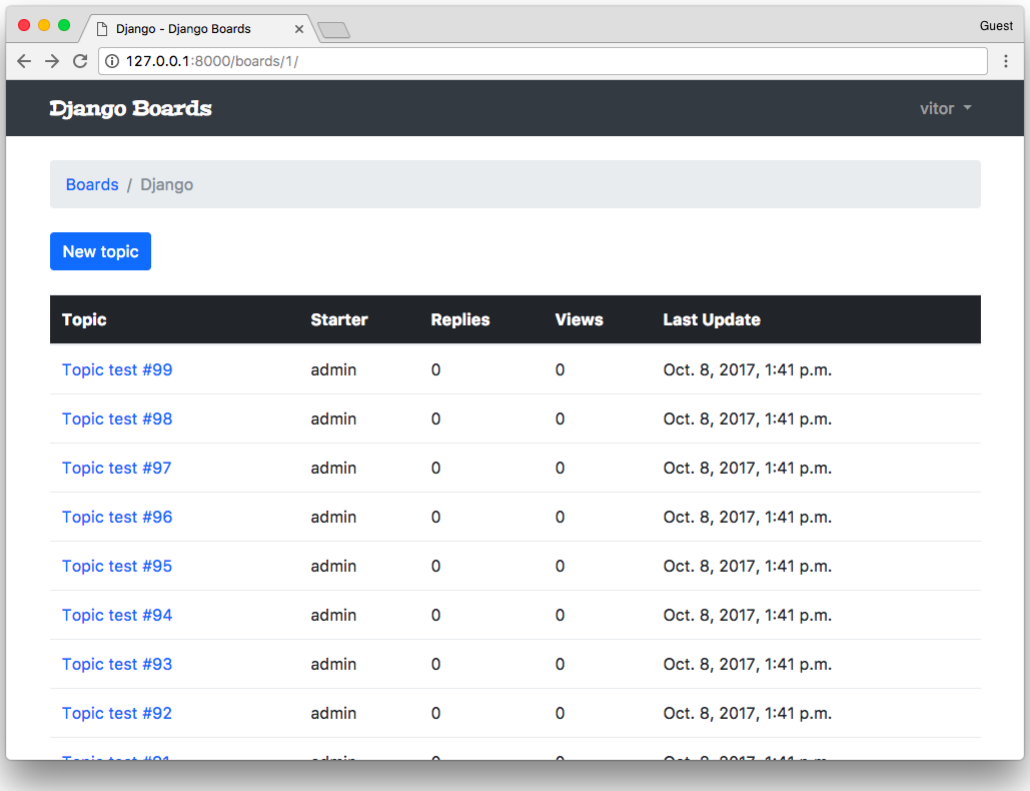
We can very easily implement pagination with class-based views. But first I wanted to do a pagination by hand, so that we can explore better the mechanics behind it, so it doesn't look like magic.

It wouldn't really make sense to paginate the boards listing view because we do not expect to have many boards. But definitely the topics listing and the posts listing need some pagination.

From now on, we will be working on the **board_topics** view.

First, let's add some volume of posts. We could just use the application's user interface and add several posts, or open the Python shell and write a small script to do it for us:

```
python manage.py shell

from django.contrib.auth.models import User
from boards.models import Board, Topic, Post

user = User.objects.first()

board = Board.objects.get(name='Django')

for i in range(100):
    subject = 'Topic test #{}'.format(i)
    topic = Topic.objects.create(subject=subject, bo
    Post.objects.create(message='Lorem ipsum...', to
```




Good, now we have some data to play with.

Before we jump into the code, let's experiment a little bit more with the Python shell:

```
python manage.py shell

from boards.models import Topic

# All the topics in the app
Topic.objects.count()
107

# Just the topics in the Django board
Topic.objects.filter(board__name='Django').count()
104

# Let's save this queryset into a variable to pagina
queryset = Topic.objects.filter(board__name='Django'
```

It's very important always define an ordering to a **QuerySet** you are going to paginate! Otherwise, it can give you inconsistent results.

Now let's import the **Paginator** utility:

```
from django.core.paginator import Paginator

paginator = Paginator(queryset, 20)
```

Here we are telling Django to paginate our **QuerySet** in pages of 20 each. Now let's explore some of the paginator properties:

```
# count the number of elements in the paginator
paginator.count
104

# total number of pages
# 104 elements, paginating 20 per page gives you 6 p
# where the last page will have only 4 elements
paginator.num_pages
6

# range of pages that can be used to iterate and cre
# links to the pages in the template
paginator.page_range
range(1, 7)

# returns a Page instance
paginator.page(2)
<Page 2 of 6>

page = paginator.page(2)

type(page)
django.core.paginator.Page

type(paginator)
django.core.paginator.Paginator
```

Here we have to pay attention because if we try to get a page that doesn't exist, the Paginator will throw an exception:

```
paginator.page(7)
EmptyPage: That page contains no results
```

Or if we try to pass an arbitrary parameter, which is not a page number:

```
paginator.page('abc')
PageNotAnInteger: That page number is not an integer
```

We have to keep those details in mind when designing the user interface.

Now let's explore the attributes and methods offered by the **Page** class a little bit:

```
page = paginator.page(1)

# Check if there is another page after this one
page.has_next()
True

# If there is no previous page, that means this one
page.has_previous()
False

page.has_other_pages()
True

page.next_page_number()
2

# Take care here, since there is no previous page,
# if we call the method `previous_page_number() we w
page.previous_page_number()
EmptyPage: That page number is less than 1
```

**FBV Pagination**

Here is how we do it using regular function-based views:

**boards/views.py** (view complete file contents)

```
from django.db.models import Count
from django.core.paginator import Paginator, EmptyPa
from django.shortcuts import get_object_or_404, rend
from django.views.generic import ListView
from .models import Board

def board_topics(request, pk):
    board = get_object_or_404(Board, pk=pk)
    queryset = board.topics.order_by('-last_updated'
    page = request.GET.get('page', 1)

    paginator = Paginator(queryset, 20)

    try:
```

```
            topics = paginator.page(page)
        except PageNotAnInteger:
            # fallback to the first page
            topics = paginator.page(1)
        except EmptyPage:
            # probably the user tried to add a page numb
            # in the url, so we fallback to the last pag
            topics = paginator.page(paginator.num_pages)

        return render(request, 'topics.html', {'board': 
```

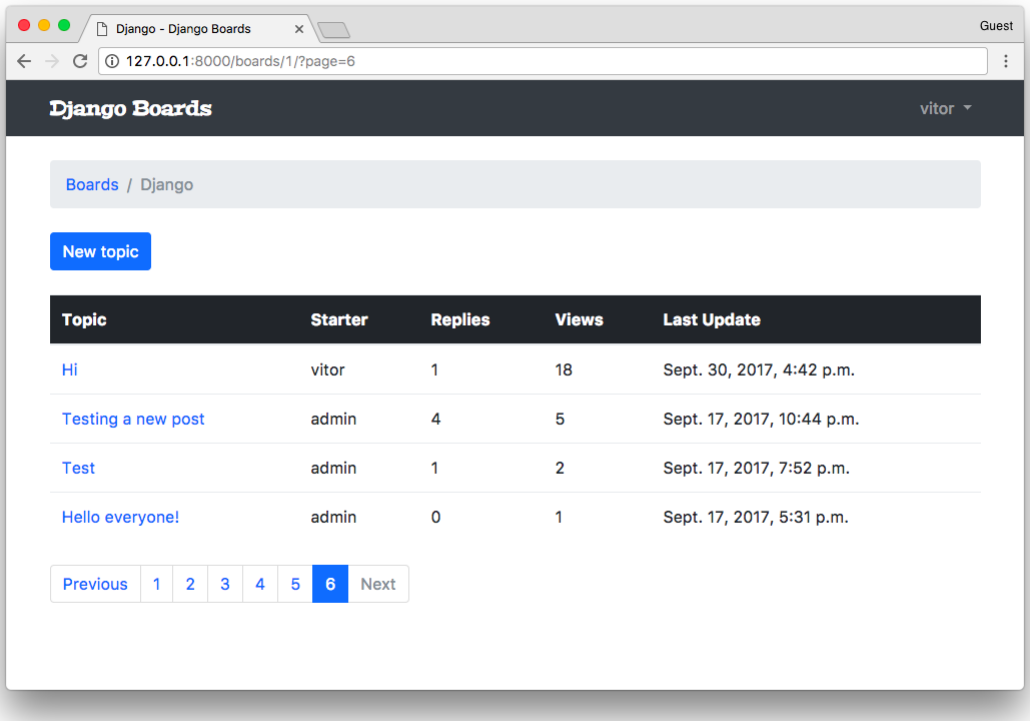
Now the trick part is to render the pages correctly using the Bootstrap 4 pagination component. But take the time to read the code and see if it makes sense for you. We are using here all the methods we played with before. And here in that context, `topics` is no longer a QuerySet but a `paginator.Page` instance.

Right after the topics HTML table, we can render the pagination component:

**templates/topics.html** (view complete file contents)

```
{% if topics.has_other_pages %}
  <nav aria-label="Topics pagination" class="mb-4">
    <ul class="pagination">
      {% if topics.has_previous %}
        <li class="page-item">
          <a class="page-link" href="?page={{ topics
        </li>
      {% else %}
        <li class="page-item disabled">
          <span class="page-link">Previous</span>
        </li>
      {% endif %}

      {% for page_num in topics.paginator.page_range
        {% if topics.number == page_num %}
          <li class="page-item active">
            <span class="page-link">
              {{ page_num }}
              <span class="sr-only">(current)</span>
            </span>
          </li>
        {% else %}
          <li class="page-item">
            <a class="page-link" href="?page={{ page
```

```
            </li>
          {% endif %}
        {% endfor %}

        {% if topics.has_next %}
          <li class="page-item">
            <a class="page-link" href="?page={{ topics
          </li>
        {% else %}
          <li class="page-item disabled">
            <span class="page-link">Next</span>
          </li>
        {% endif %}
      </ul>
    </nav>
{% endif %}
```




## GCBV Pagination

Below, the same implementation but this time using the **ListView**.

**boards/views.py** (view complete file contents)

```
class TopicListView(ListView):
    model = Topic
```

```
    context_object_name = 'topics'
    template_name = 'topics.html'
    paginate_by = 20

    def get_context_data(self, **kwargs):
        kwargs['board'] = self.board
        return super().get_context_data(**kwargs)

    def get_queryset(self):
        self.board = get_object_or_404(Board, pk=sel
        queryset = self.board.topics.order_by('-last
        return queryset
```

While using pagination with class-based views, the way we interact with the paginator in the template is a little bit different. It will make available the following variables in the template: **paginator**, **page_obj**, **is_paginated**, **object_list**, and also a variable with the name we defined in the **context_object_name**. In our case this extra variable will be named **topics**, and it will be equivalent to **object_list**.

Now about the whole **get_context_data** thing, well, that's how we add stuff to the request context when extending a GCBV.

But the main point here is the **paginate_by** attribute. In some cases, just by adding it will be enough.

Remember to update the **urls.py**:

**myproject/urls.py** (view complete file contents)

```
from django.conf.urls import url
from boards import views

urlpatterns = [
    # ...
    url(r'^boards/(?P<pk>\d+)/$', views.TopicListVie
]
```

Now let's fix the template:

**templates/topics.html** (view complete file contents)

```
{% block content %}
  <div class="mb-4">
    <a href="{% url 'new_topic' board.pk %}" class="
```

```
</div>

<table class="table mb-4">
  <!-- table content suppressed -->
</table>

{% if is_paginated %}
  <nav aria-label="Topics pagination" class="mb-4"
    <ul class="pagination">
      {% if page_obj.has_previous %}
        <li class="page-item">
          <a class="page-link" href="?page={{ page
        </li>
      {% else %}
        <li class="page-item disabled">
          <span class="page-link">Previous</span>
        </li>
      {% endif %}

      {% for page_num in paginator.page_range %}
        {% if page_obj.number == page_num %}
          <li class="page-item active">
            <span class="page-link">
              {{ page_num }}
              <span class="sr-only">(current)</spa
            </span>
          </li>
        {% else %}
          <li class="page-item">
            <a class="page-link" href="?page={{ pa
          </li>
        {% endif %}
      {% endfor %}

      {% if page_obj.has_next %}
        <li class="page-item">
          <a class="page-link" href="?page={{ page
        </li>
      {% else %}
        <li class="page-item disabled">
          <span class="page-link">Next</span>
        </li>
      {% endif %}
    </ul>
  </nav>
{% endif %}
```

```
{% endblock %}
```

Now take the time to run the tests and fix if needed.

**boards/tests/test_view_board_topics.py**

```
from django.test import TestCase
from django.urls import resolve
from ..views import TopicListView

class BoardTopicsTests(TestCase):
    # ...
    def test_board_topics_url_resolves_board_topics_
        view = resolve('/boards/1/')
        self.assertEquals(view.func.view_class, Topi
```

**Reusable Pagination Template**

Just like we did with the **form.html** partial template, we can also create something similar for the pagination HTML snippet.

Let's paginate the topic posts page, and then find a way to reuse the pagination component.

**boards/views.py** (view complete file contents)

```
class PostListView(ListView):
    model = Post
    context_object_name = 'posts'
    template_name = 'topic_posts.html'
    paginate_by = 2

    def get_context_data(self, **kwargs):
        self.topic.views += 1
        self.topic.save()
        kwargs['topic'] = self.topic
        return super().get_context_data(**kwargs)

    def get_queryset(self):
        self.topic = get_object_or_404(Topic, board_
        queryset = self.topic.posts.order_by('create
        return queryset
```

Now update the **urls.py** (view complete file contents)

```
from django.conf.urls import url
from boards import views

urlpatterns = [
    # ...
    url(r'^boards/(?P<pk>\d+)/topics/(?P<topic_pk>\d
]
```

Now we grab that pagination HTML snippet from the **topics.html** template, and create a new file named **pagination.html** inside the **templates/includes** folder, alongside with the **forms.html** file:

```
myproject/
 |-- myproject/
 |     |-- accounts/
 |     |-- boards/
 |     |-- myproject/
 |     |-- static/
 |     |-- templates/
 |     |     |-- includes/
 |     |     |     |-- form.html
 |     |     |     +-- pagination.html  <-- here!
 |     |     +-- ...
 |     |-- db.sqlite3
 |     +-- manage.py
 +-- venv/
```

**templates/includes/pagination.html**

```
{% if is_paginated %}
  <nav aria-label="Topics pagination" class="mb-4">
    <ul class="pagination">
      {% if page_obj.has_previous %}
        <li class="page-item">
          <a class="page-link" href="?page={{ page_o
        </li>
      {% else %}
        <li class="page-item disabled">
          <span class="page-link">Previous</span>
        </li>
      {% endif %}

      {% for page_num in paginator.page_range %}
        {% if page_obj.number == page_num %}
```

```
            <li class="page-item active">
              <span class="page-link">
                {{ page_num }}
                <span class="sr-only">(current)</span>
              </span>
            </li>
          {% else %}
            <li class="page-item">
              <a class="page-link" href="?page={{ page
            </li>
          {% endif %}
        {% endfor %}

        {% if page_obj.has_next %}
          <li class="page-item">
            <a class="page-link" href="?page={{ page_o
          </li>
        {% else %}
          <li class="page-item disabled">
            <span class="page-link">Next</span>
          </li>
        {% endif %}
      </ul>
    </nav>
  {% endif %}
```

Now in the **topic_posts.html** template we use it:

**templates/topic_posts.html** (view complete file contents)

```
  {% block content %}

    <div class="mb-4">
      <a href="{% url 'reply_topic' topic.board.pk top
    </div>

    {% for post in posts %}
      <div class="card {% if forloop.last %}mb-4{% els
        {% if forloop.first %}
          <div class="card-header text-white bg-dark p
        {% endif %}
        <div class="card-body p-3">
          <div class="row">
            <div class="col-2">
              <img src="{% static 'img/avatar.svg' %}"
              <small>Posts: {{ post.created_by.posts.c
```

```
            </div>
            <div class="col-10">
              <div class="row mb-3">
                <div class="col-6">
                  <strong class="text-muted">{{ post.c
                </div>
                <div class="col-6 text-right">
                  <small class="text-muted">{{ post.cr
                </div>
              </div>
              {{ post.message }}
              {% if post.created_by == user %}
                <div class="mt-3">
                  <a href="{% url 'edit_post' post.top
                     class="btn btn-primary btn-sm"
                     role="button">Edit</a>
                </div>
              {% endif %}
            </div>
          </div>
        </div>
      </div>
    {% endfor %}

    {% include 'includes/pagination.html' %}

  {% endblock %}
```

Don't forget to change the main forloop to `{% for post in posts %}`.

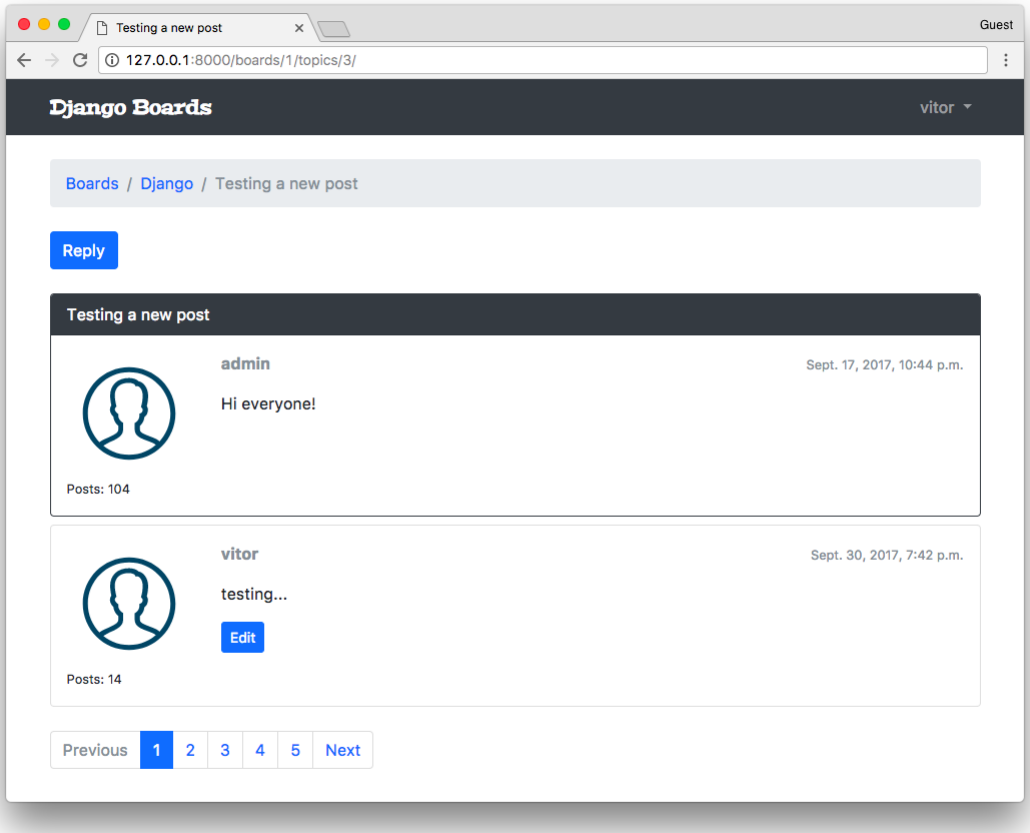
We can also update the previous template, the **topics.html** template to use the pagination partial template too:

**templates/topics.html** (view complete file contents)

```
  {% block content %}
    <div class="mb-4">
      <a href="{% url 'new_topic' board.pk %}" class="
    </div>

    <table class="table mb-4">
      <!-- table code suppressed -->
    </table>

    {% include 'includes/pagination.html' %}
```

```
{% endblock %}
```

Just for testing purpose, you could just add a few posts (or create some using the Python Shell) and change the **paginate_by** to a low number, say 2, and see how it's looking like:




(view complete file contents)

Update the test cases:

**boards/tests/test_view_topic_posts.py**

```
from django.test import TestCase
from django.urls import resolve
from ..views import PostListView

class TopicPostsTests(TestCase):
    # ...
    def test_view_function(self):
        view = resolve('/boards/1/topics/1/')
        self.assertEquals(view.func.view_class, Post
```

### My Account View

Okay, so, this is going to be our last view. After that, we will be working on improving the existing features.

**accounts/views.py** (view complete file contents)

```
from django.contrib.auth.decorators import login_req
from django.contrib.auth.models import User
from django.urls import reverse_lazy
from django.utils.decorators import method_decorator
from django.views.generic import UpdateView

@method_decorator(login_required, name='dispatch')
class UserUpdateView(UpdateView):
    model = User
    fields = ('first_name', 'last_name', 'email', )
    template_name = 'my_account.html'
    success_url = reverse_lazy('my_account')

    def get_object(self):
        return self.request.user
```

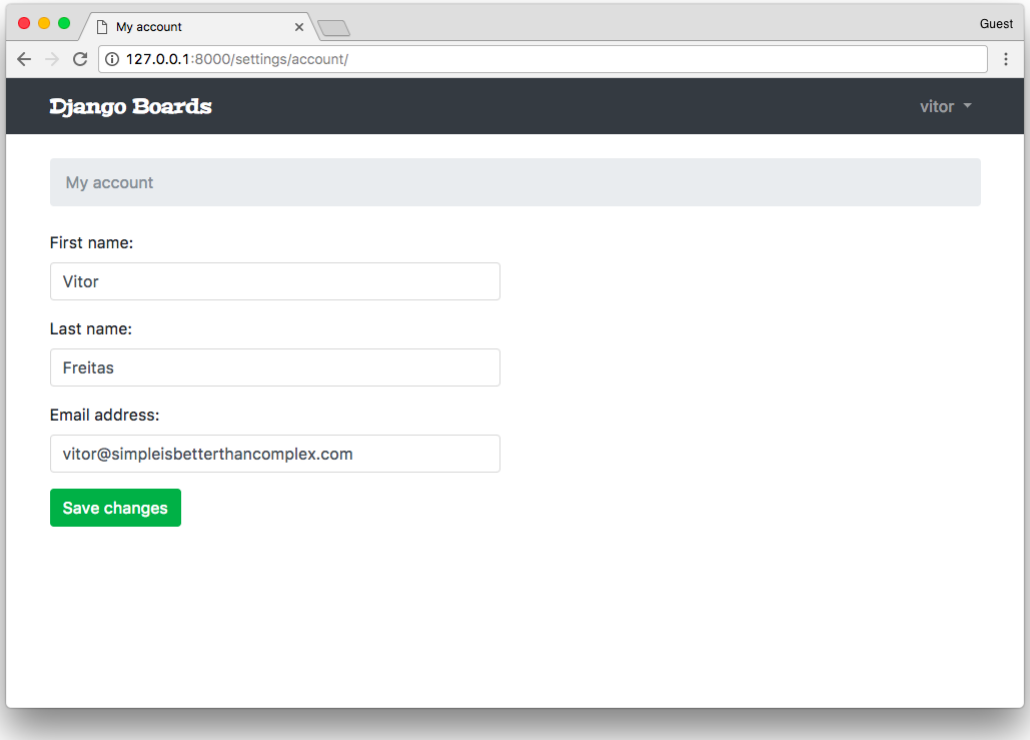
**myproject/urls.py** (view complete file contents)

```
from django.conf.urls import url
from accounts import views as accounts_views

urlpatterns = [
    # ...
    url(r'^settings/account/$', accounts_views.UserU
]
```

**templates/my_account.html**

```
{% extends 'base.html' %}

{% block title %}My account{% endblock %}

{% block breadcrumb %}
  <li class="breadcrumb-item active">My account</li>
{% endblock %}

{% block content %}
  <div class="row">
```

```
      <div class="col-lg-6 col-md-8 col-sm-10">
        <form method="post" novalidate>
          {% csrf_token %}
          {% include 'includes/form.html' %}
          <button type="submit" class="btn btn-success
        </form>
      </div>
    </div>
{% endblock %}
```




---

### Adding Markdown

Let's improve the user experience by adding Markdown to our text areas. You will see it's very easy and simple.

First, let's install a library called **Python-Markdown**:

```
pip install markdown
```

We can add a new method to the **Post** model:

**boards/models.py** (view complete file contents)

```
from django.db import models
from django.utils.html import mark_safe
from markdown import markdown

class Post(models.Model):
    # ...

    def get_message_as_markdown(self):
        return mark_safe(markdown(self.message, safe
```

Here we are dealing with user input, so we must take care. When using the `markdown` function, we are instructing it to escape the special characters first and then parse the markdown tags. After that, we mark the output string as safe to be used in the template.

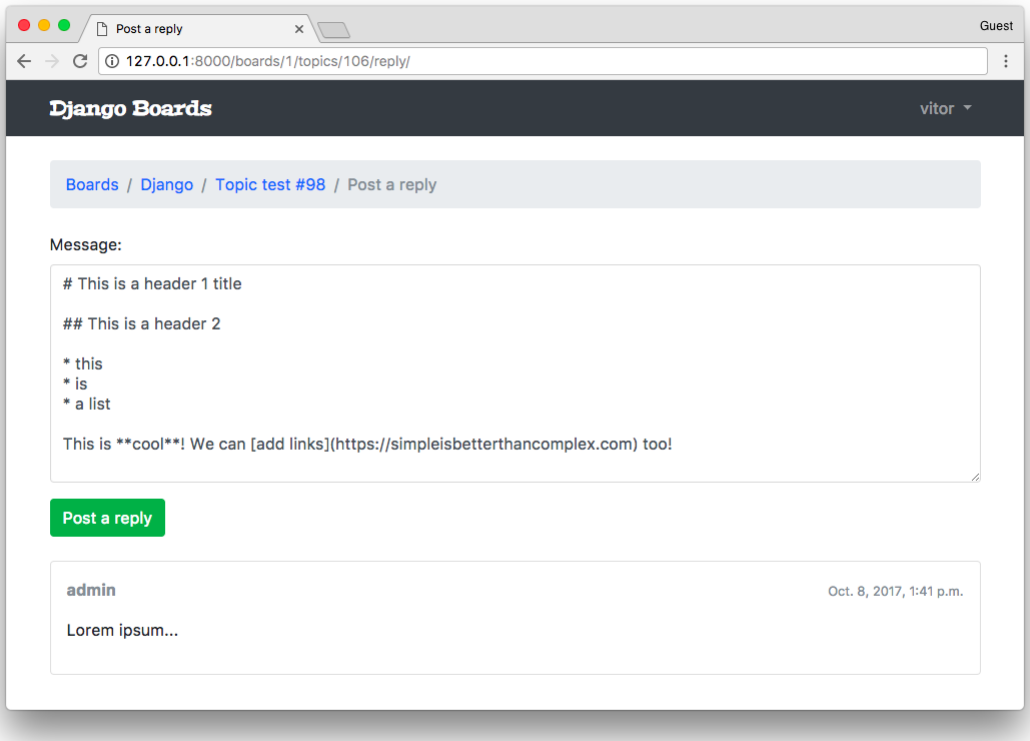
Now in the templates **topic_posts.html** and **reply_topic.html** just change from:

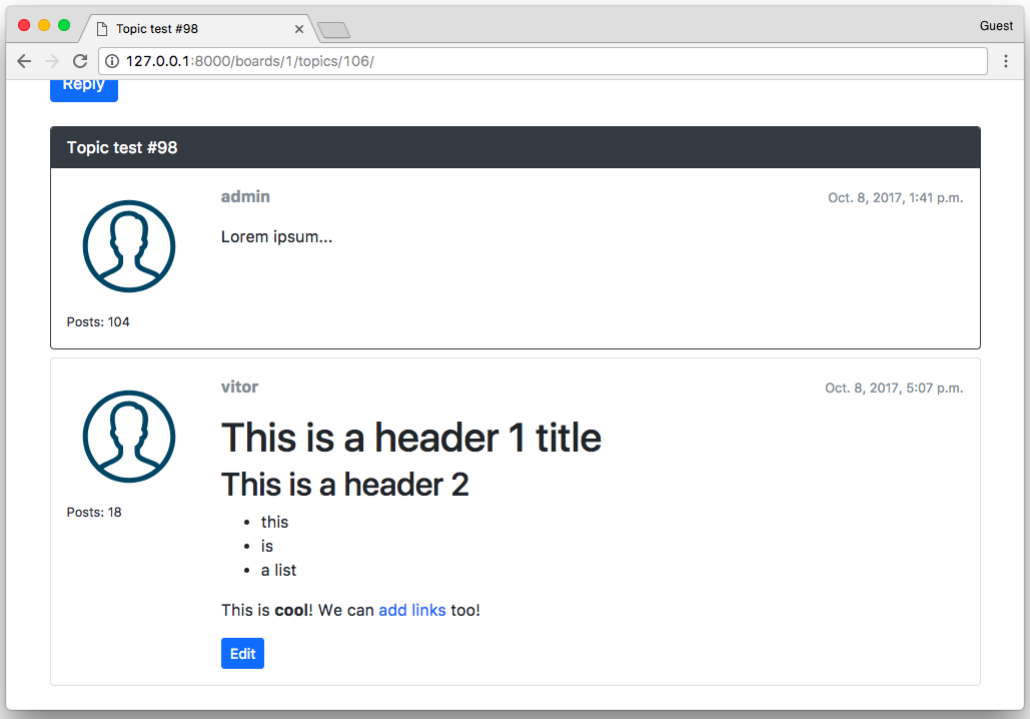
```
{{ post.message }}
```

To:

```
{{ post.get_message_as_markdown }}
```

From now on the users can already use markdown in the posts:






**Markdown Editor**

We can also add a very cool Markdown editor called SimpleMD.

Either download the JavaScript library or use their CDN:

```
<link rel="stylesheet" href="https://cdn.jsdelivr.ne
<script src="https://cdn.jsdelivr.net/simplemde/late
```

Now edit the **base.html** to make space for extra JavaScripts:

**templates/base.html** (view complete file contents)

```
    <script src="{% static 'js/jquery-3.2.1.min.js'
    <script src="{% static 'js/popper.min.js' %}"></
    <script src="{% static 'js/bootstrap.min.js' %}"
    {% block javascript %}{% endblock %}  <!-- Add t
```

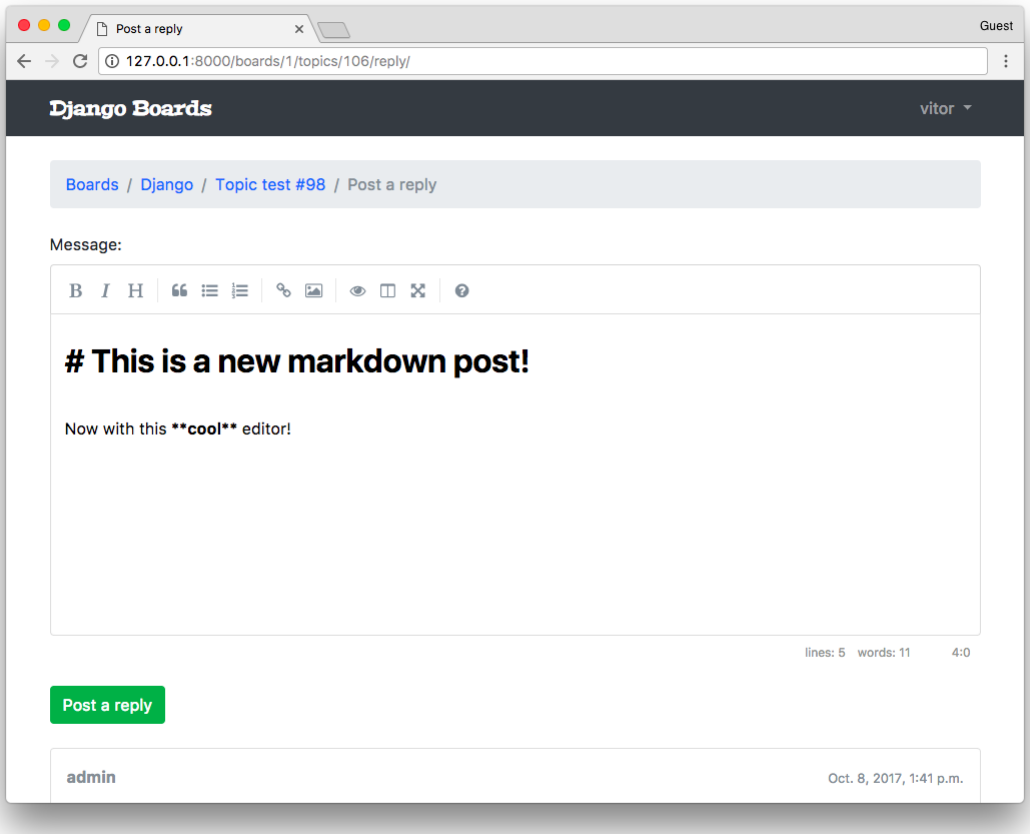
First edit the **reply_topic.html** template:

**templates/reply_topic.html** (view complete file contents)

```
{% extends 'base.html' %}
```

```
{% load static %}

{% block title %}Post a reply{% endblock %}

{% block stylesheet %}
  <link rel="stylesheet" href="{% static 'css/simple
{% endblock %}

{% block javascript %}
  <script src="{% static 'js/simplemde.min.js' %}"><
  <script>
    var simplemde = new SimpleMDE();
  </script>
{% endblock %}
```

By default, this plugin will transform the first text area it finds into a markdown editor. So just that code should be enough:

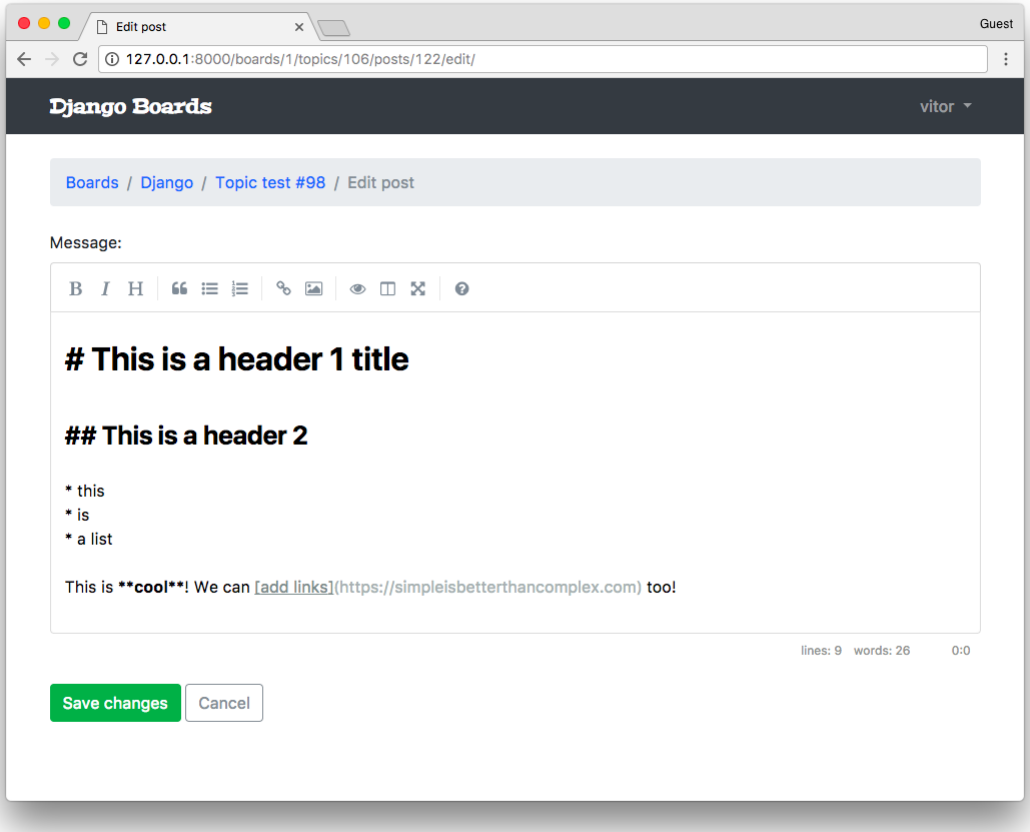



Now do the same thing with the **edit_post.html** template:

**templates/edit_post.html** (view complete file contents)

```
{% extends 'base.html' %}
```

```
{% load static %}

{% block title %}Edit post{% endblock %}

{% block stylesheet %}
  <link rel="stylesheet" href="{% static 'css/simple
{% endblock %}

{% block javascript %}
  <script src="{% static 'js/simplemde.min.js' %}"><
  <script>
    var simplemde = new SimpleMDE();
  </script>
{% endblock %}
```




---

## Humanize

I just thought it would be a nice touch to add the built-in **humanize** package. It's a set of utility functions to add a "human touch" to data.

For example, we can use it to display date and time fields more naturally. Instead of showing the whole date, we can simply show: “2 minutes ago”.

Let’s do it. First, add the `django.contrib.humanize` to the `INSTALLED_APPS`.

**myproject/settings.py**

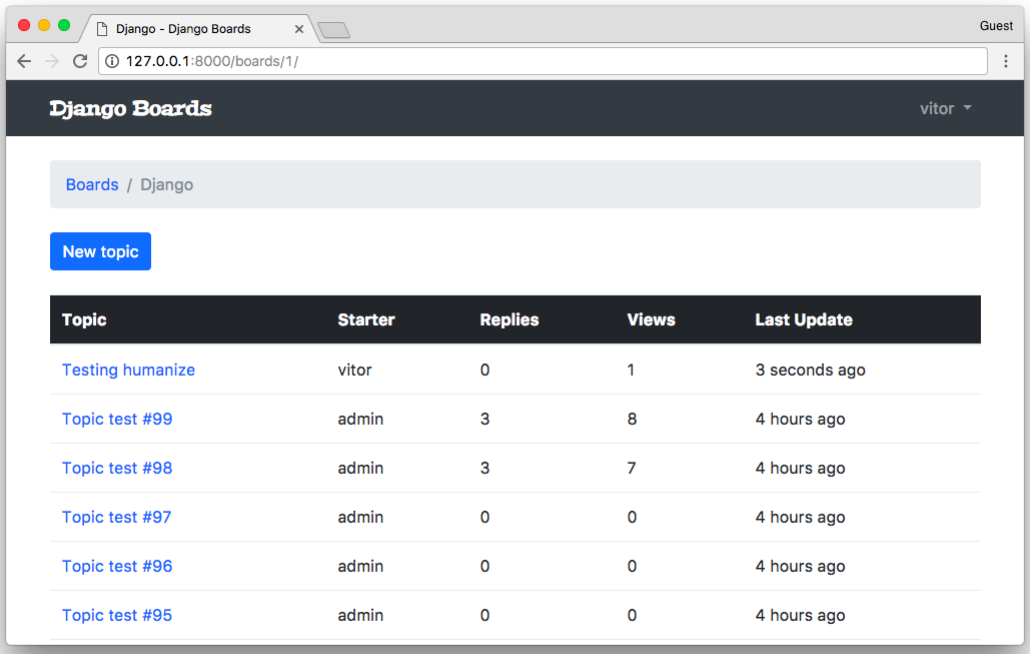
```
INSTALLED_APPS = [
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
    'django.contrib.humanize',  # <- here

    'widget_tweaks',

    'accounts',
    'boards',
]
```

Now we can use it in the templates. First, let’s edit the **topics.html** template:

**templates/topics.html** (view complete file contents)

```
{% extends 'base.html' %}

{% load humanize %}

{% block content %}
  <!-- code suppressed -->

  <td>{{ topic.last_updated|naturaltime }}</td>

  <!-- code suppressed -->
{% endblock %}
```

All we have to do is to load the template tags using `{% load humanize %}` and then apply the template filter: `{{ topic.last_updated|naturaltime }}`




You may add it to other places you like.

---

### Gravatar

A very easy way to add user profile pictures is by using Gravatar.

Inside the **boards/templatetags** folder, create a new file named **gravatar.py**:

**boards/templatetags/gravatar.py**

```
import hashlib
from urllib.parse import urlencode

from django import template
from django.conf import settings

register = template.Library()


@register.filter
def gravatar(user):
    email = user.email.lower().encode('utf-8')
    default = 'mm'
    size = 256
    url = 'https://www.gravatar.com/avatar/{md5}?{pa
```

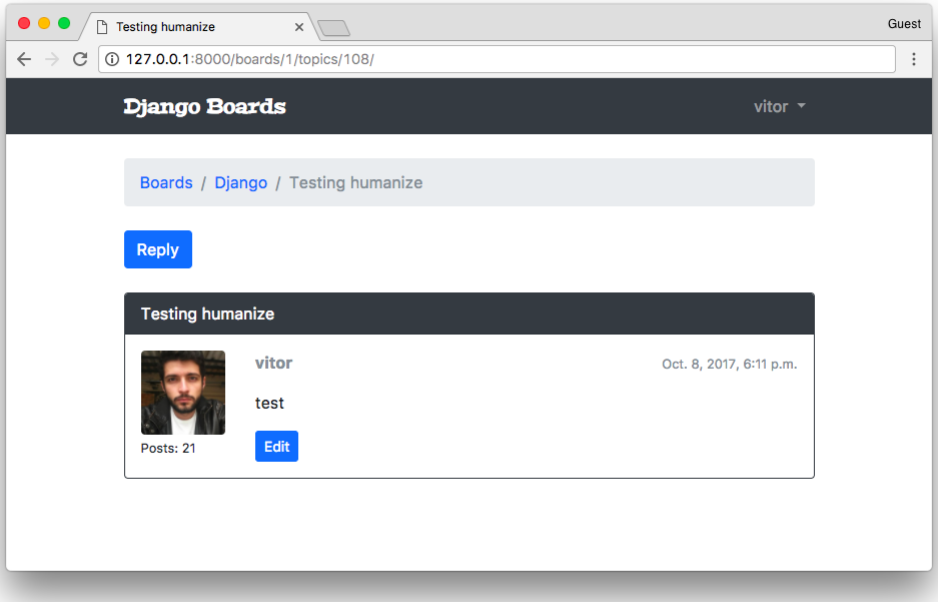
```
        md5=hashlib.md5(email).hexdigest(),
        params=urlencode({'d': default, 's': str(siz
    )
    return url
```

Basically I'm using the code snippet they provide. I just adapted it to work with Python 3.

Great, now we can load it in our template, just like we did with the Humanize template filter:

**templates/topic_posts.html** (view complete file contents)

```
{% extends 'base.html' %}

{% load gravatar %}

{% block content %}
  <!-- code suppressed -->

  <img src="{{ post.created_by|gravatar }}" alt="{{

  <!-- code suppressed -->
{% endblock %}
```




---

## Final Adjustments

Maybe you have already noticed, but there's a small issue when someone replies to a post. It's not updating the `last_update` field, so the ordering of the topics is broken right now.

Let's fix it:

**boards/views.py**

```
@login_required
def reply_topic(request, pk, topic_pk):
    topic = get_object_or_404(Topic, board__pk=pk, p
    if request.method == 'POST':
        form = PostForm(request.POST)
        if form.is_valid():
            post = form.save(commit=False)
            post.topic = topic
            post.created_by = request.user
            post.save()

            topic.last_updated = timezone.now()  # <
            topic.save()                         # <

            return redirect('topic_posts', pk=pk, to
    else:
        form = PostForm()
    return render(request, 'reply_topic.html', {'top
```

Next thing we want to do is try to control the view counting system a little bit more. We don't want to the same user refreshing the page counting as multiple views. For this we can use sessions:

**boards/views.py**

```
class PostListView(ListView):
    model = Post
    context_object_name = 'posts'
    template_name = 'topic_posts.html'
    paginate_by = 20

    def get_context_data(self, **kwargs):

        session_key = 'viewed_topic_{}'.format(self.
        if not self.request.session.get(session_key,
            self.topic.views += 1
            self.topic.save()
```

```
            self.request.session[session_key] = True

        kwargs['topic'] = self.topic
        return super().get_context_data(**kwargs)

    def get_queryset(self):
        self.topic = get_object_or_404(Topic, board_
        queryset = self.topic.posts.order_by('create
        return queryset
```

Now we could provide a better navigation in the topics listing. Currently the only option is for the user to click in the topic title and go to the first page. We could workout something like this:

**boards/models.py**

```
import math
from django.db import models

class Topic(models.Model):
    # ...

    def __str__(self):
        return self.subject

    def get_page_count(self):
        count = self.posts.count()
        pages = count / 20
        return math.ceil(pages)

    def has_many_pages(self, count=None):
        if count is None:
            count = self.get_page_count()
        return count > 6

    def get_page_range(self):
        count = self.get_page_count()
        if self.has_many_pages(count):
            return range(1, 5)
        return range(1, count + 1)
```

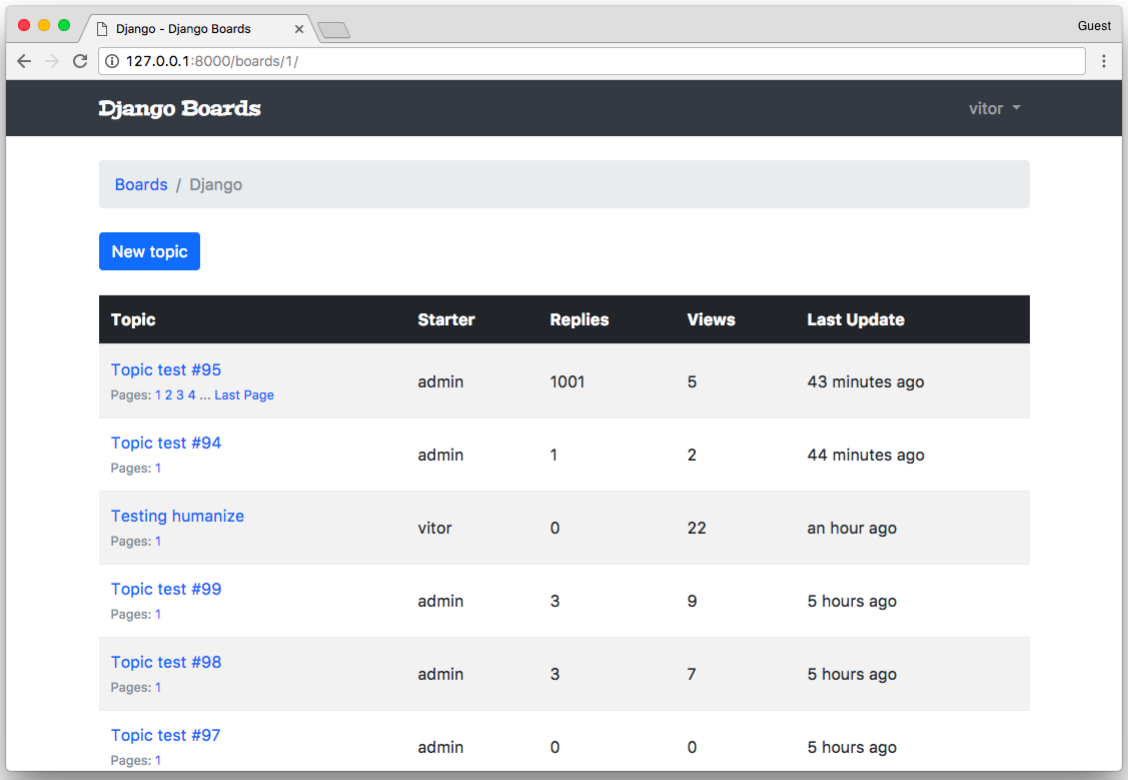
Then in the **topics.html** template we could implement something like this:

**templates/topics.html**

```
    <table class="table table-striped mb-4">
```

```
    <thead class="thead-inverse">
      <tr>
        <th>Topic</th>
        <th>Starter</th>
        <th>Replies</th>
        <th>Views</th>
        <th>Last Update</th>
      </tr>
    </thead>
    <tbody>
      {% for topic in topics %}
        {% url 'topic_posts' board.pk topic.pk as to
        <tr>
          <td>
            <p class="mb-0">
              <a href="{{ topic_url }}">{{ topic.sub
            </p>
            <small class="text-muted">
              Pages:
              {% for i in topic.get_page_range %}
                <a href="{{ topic_url }}?page={{ i }
              {% endfor %}
              {% if topic.has_many_pages %}
              ... <a href="{{ topic_url }}?page={{ t
              {% endif %}
            </small>
          </td>
          <td class="align-middle">{{ topic.starter.
          <td class="align-middle">{{ topic.replies
          <td class="align-middle">{{ topic.views }}
          <td class="align-middle">{{ topic.last_upd
        </tr>
      {% endfor %}
    </tbody>
  </table>
```

Like a tiny pagination for each topic. Note that I also took the time to add the `table-striped` class for a better styling of the table.




In the reply page, we are currently listing all topic replies. We could limit it to just the last ten posts.

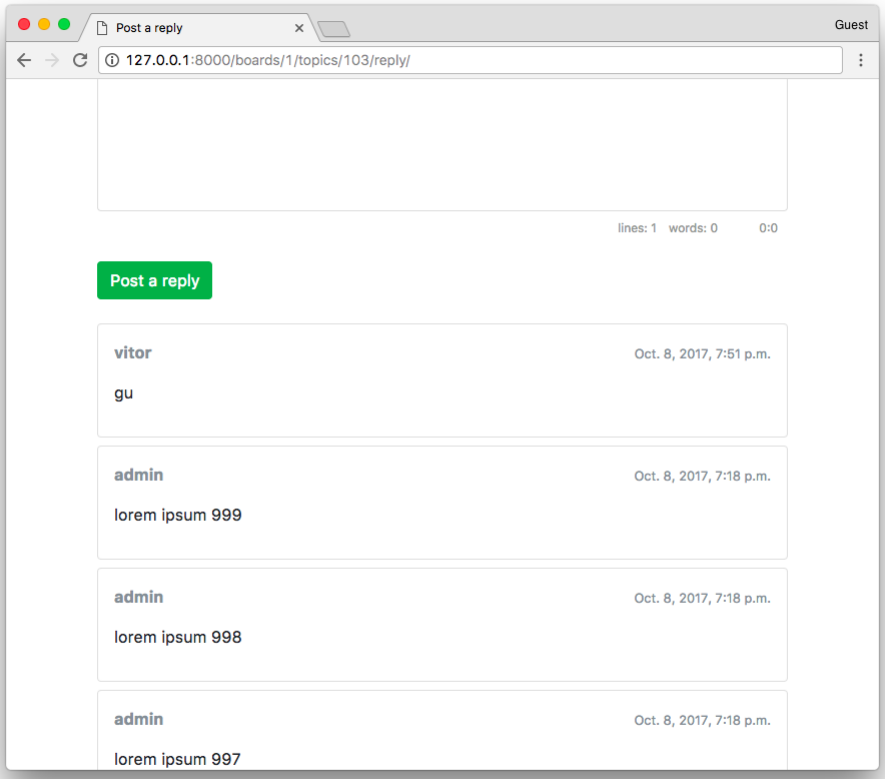
**boards/models.py**

```
class Topic(models.Model):
    # ...

    def get_last_ten_posts(self):
        return self.posts.order_by('-created_at')[:1
```

**templates/reply_topic.html**

```
{% block content %}

  <form method="post" class="mb-4" novalidate>
    {% csrf_token %}
    {% include 'includes/form.html' %}
    <button type="submit" class="btn btn-success">Po
  </form>

  {% for post in topic.get_last_ten_posts %}  <!-- h
    <div class="card mb-2">
      <!-- code suppressed -->
```

```
    </div>
  {% endfor %}

{% endblock %}
```




Another thing is that when the user replies to a post, we are redirecting the user to the first page again. We could improve it by sending the user to the last page.

We can add an id to the post card:

**templates/topic_posts.html**

```
{% block content %}

  <div class="mb-4">
    <a href="{% url 'reply_topic' topic.board.pk top
  </div>

  {% for post in posts %}
    <div id="{{ post.pk }}" class="card {% if forloo
      <!-- code suppressed -->
    </div>
  {% endfor %}
```

```
    {% include 'includes/pagination.html' %}

  {% endblock %}
```

The important bit here is the `<div id="{{ post.pk }}" ...>`.

Then we can play with it like this in the views:

**boards/views.py**

```
@login_required
def reply_topic(request, pk, topic_pk):
    topic = get_object_or_404(Topic, board__pk=pk, p
    if request.method == 'POST':
        form = PostForm(request.POST)
        if form.is_valid():
            post = form.save(commit=False)
            post.topic = topic
            post.created_by = request.user
            post.save()

            topic.last_updated = timezone.now()
            topic.save()

            topic_url = reverse('topic_posts', kwarg
            topic_post_url = '{url}?page={page}#{id}
                url=topic_url,
                id=post.pk,
                page=topic.get_page_count()
            )

            return redirect(topic_post_url)
    else:
        form = PostForm()
    return render(request, 'reply_topic.html', {'top
```

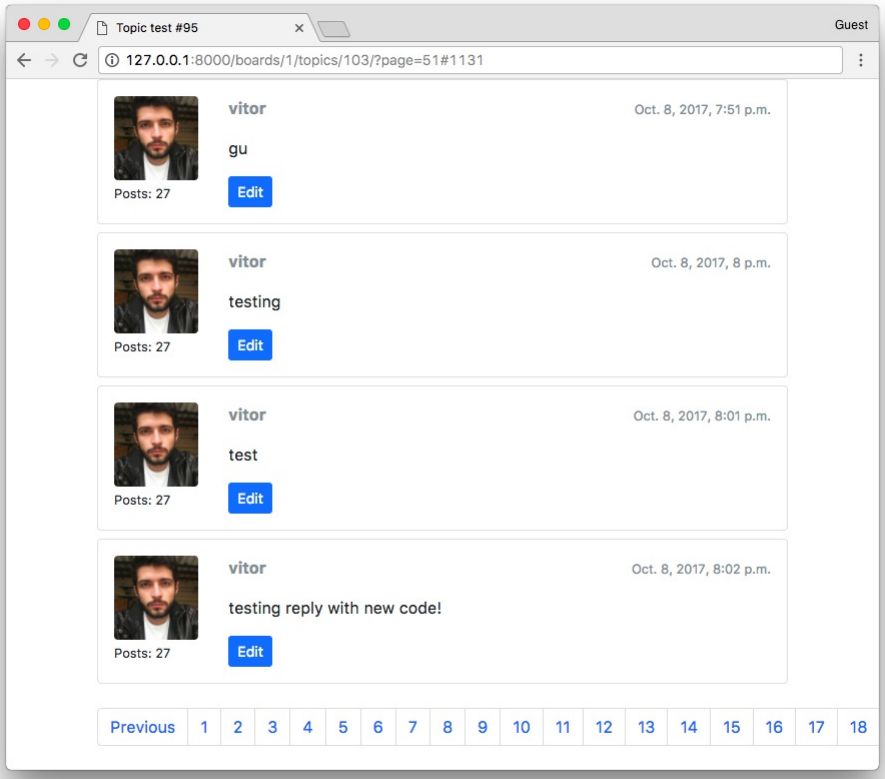
In the **topic_post_url** we are building a URL with the last page and adding an anchor to the element with id equals to the post ID.

With this, it will required us to update the following test case:

**boards/tests/test_view_reply_topic.py**

```
class SuccessfulReplyTopicTests(ReplyTopicTestCase):
    # ...
```

```
    def test_redirection(self):
        '''
        A valid form submission should redirect the
        '''
        url = reverse('topic_posts', kwargs={'pk': s
        topic_posts_url = '{url}?page=1#2'.format(ur
        self.assertRedirects(self.response, topic_po
```




Next issue, as you can see in the previous screenshot, is to solve the problem with the pagination when the number of pages is too high.

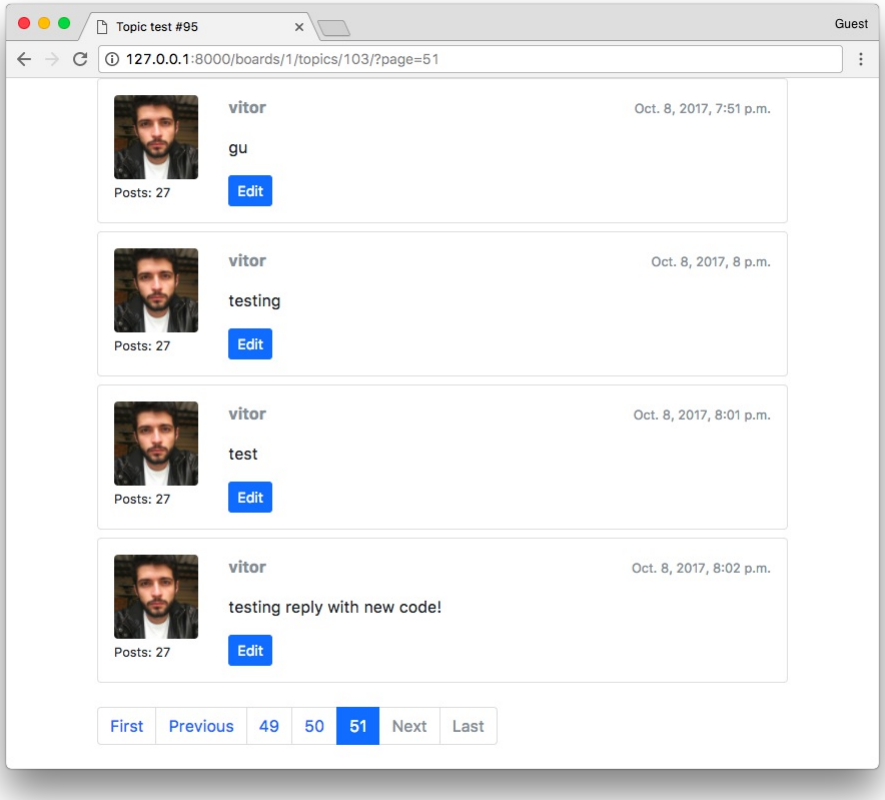
The easiest way is to tweak the **pagination.html** template:

**templates/includes/pagination.html**

```
{% if is_paginated %}
  <nav aria-label="Topics pagination" class="mb-4">
    <ul class="pagination">
      {% if page_obj.number > 1 %}
        <li class="page-item">
          <a class="page-link" href="?page=1">First<
        </li>
      {% else %}
        <li class="page-item disabled">
```

```
    <span class="page-link">First</span>
  </li>
{% endif %}

{% if page_obj.has_previous %}
  <li class="page-item">
    <a class="page-link" href="?page={{ page_o
  </li>
{% else %}
  <li class="page-item disabled">
    <span class="page-link">Previous</span>
  </li>
{% endif %}

{% for page_num in paginator.page_range %}
  {% if page_obj.number == page_num %}
    <li class="page-item active">
      <span class="page-link">
        {{ page_num }}
        <span class="sr-only">(current)</span>
      </span>
    </li>
  {% elif page_num > page_obj.number|add:'-3' 
    <li class="page-item">
      <a class="page-link" href="?page={{ page
    </li>
  {% endif %}
{% endfor %}

{% if page_obj.has_next %}
  <li class="page-item">
    <a class="page-link" href="?page={{ page_o
  </li>
{% else %}
  <li class="page-item disabled">
    <span class="page-link">Next</span>
  </li>
{% endif %}

{% if page_obj.number != paginator.num_pages %
  <li class="page-item">
    <a class="page-link" href="?page={{ pagina
  </li>
{% else %}
  <li class="page-item disabled">
    <span class="page-link">Last</span>
```

```
          </li>
        {% endif %}
      </ul>
    </nav>
{% endif %}
```




---

## Conclusions

With this tutorial, we finalized the implementation of our Django board application. I will probably release a follow-up implementation tutorial to improve the code. There are many things we can explore together. For example, database optimizations, improve the user interface, play with file uploads, create a moderation system, and so on.

The next tutorial will be focused on deployment. It's going to be a complete guide on how to put your code in production taking care of all the important details.

I hope you enjoyed the sixth part of this tutorial series! The last part is coming out next week, on Oct 16, 2017. If you would like to get notified when the last part is out, you can subscribe to our mailing list.

The source code of the project is available on GitHub. The current state of the project can be found under the release tag **v0.6-lw**. The link below will take you to the right place:

https://github.com/sibtc/django-beginners-guide/tree/v0.6-lw

---


**← Part 5 - Django ORM**


**Part 7 - Deployment →**

]

[

**A Complete Beginner's Guide to Django - Part 7**

] ['\n',

**Introduction**

, '\n',

Welcome to the last part of our tutorial series! In this tutorial, we are going to deploy our Django application to a production server. We are also going to configure an Email service and HTTPS certificates for our servers.

, '\n',

At first, I thought about given an example using a Virtual Private Server (VPS), which is more generic and then using one Platform as a Service such as Heroku. But it was too much detail, so I ended up creating this tutorial focused on VPSs.

, '\n',

Our project is live! If you want to check online before you go through the text, this is the application we are going to deploy: www.djangoboards.com.

, '\n',

---

**Version Control**

Version control is an extremely important topic in software development. Especially when working with teams and maintaining production code at the same time, several features are being developed in parallel. No matter if it's a one developer project or a multiple developers project, every project should use version control.

There are several options of version control systems out there. Perhaps because of the popularity of GitHub, **Git** become the *de facto* standard in version control. So if you are not familiar version control, Git is a good place to start. There are many tutorials, courses, and resources in general so that it's easy to find help.

GitHub and Code School have a great interactive tutorial about Git, which I used

years ago when I started moving from SVN to Git. It's a very good introduction.

This is such an important topic that I probably should have brought it up since the first tutorial. But the truth is I wanted the focus of this tutorial series to be on Django. If all this is new for you, don't worry. It's important to take one step at a time. Your first project won't be perfect. It's important to keep learning and evolving your skills slowly but with constancy.

A very good thing about Git is that it's much more than just a version control system. There's a rich ecosystem of tools and services built around it. Some good examples are continuous integration, deployment, code review, code quality, and project management.

Using Git to support the deployment process of Django projects works very well. It's a convenient way to pull the latest version from the source code repository or to rollback to a specific version in case of a problem. There are many services that integrate with Git so to automate test execution and deployment for example.

If you don't have Git installed on your local machine, grab the installed from https://git-scm.com/downloads.

**Basic Setup**

First thing, set your identity:

```
git config --global user.name "Vitor Freitas"
git config --global user.email vitor@simpleisbetterth
```

In the project root (the same directory as **manage.py** is), initialize a git repository:

```
git init

Initialized empty Git repository in /Users/vitorfs/D
```

Check the status of the repository:

```
git status

On branch master
```

```
Initial commit

Untracked files:
  (use "git add <file>..." to include in what will b

  accounts/
  boards/
  manage.py
  myproject/
  requirements.txt
  static/
  templates/

nothing added to commit but untracked files present
```

Before we proceed in adding the source files, create a new file named **.gitignore** in the project root. This special file will help us keep the repository clean, without unnecessary files like cache files or logs for example.

You can grab a generic .gitignore file for Python projects from GitHub.

Make sure to rename it from **Python.gitignore** to just **.gitignore** (the dot is important!).

You can complement the **.gitignore** file telling it to ignore SQLite database files for example:

**.gitignore**

```
__pycache__/
*.py[cod]
.env
venv/


# SQLite database files

*.sqlite3
```

Now add the files to the repository:

```
git add .
```

Notice the dot here. The command above is telling Git to add *all* untracked files within the current directory.

Now make the first commit:

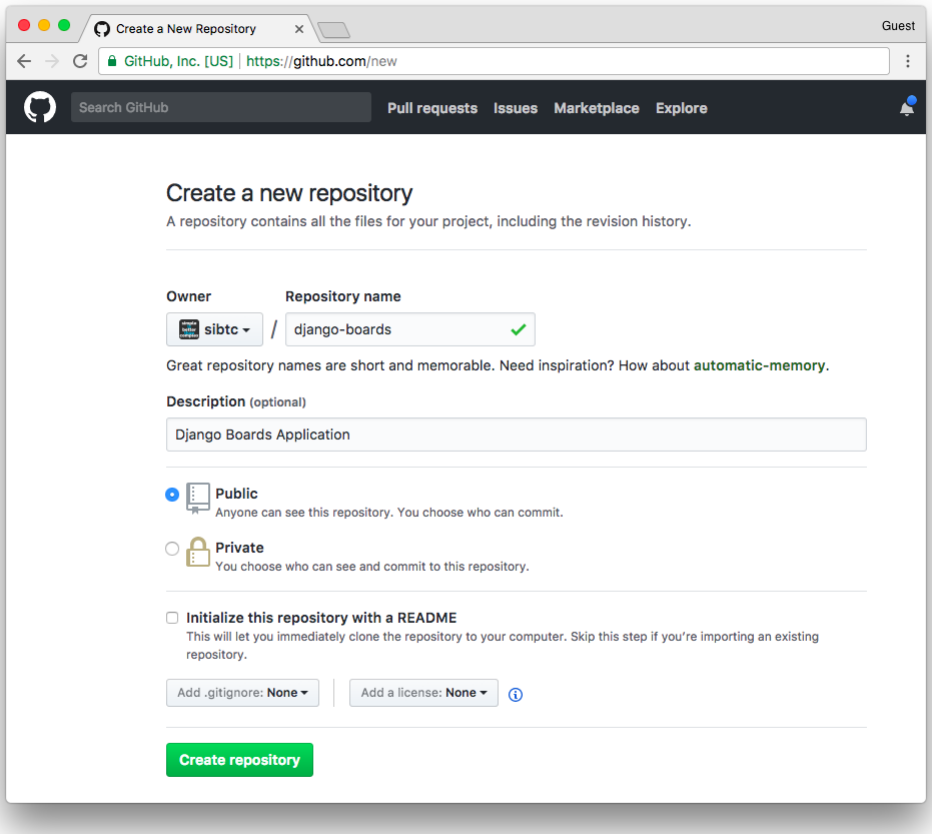
```
git commit -m "Initial commit"
```

Always write a comment telling what this commit is about, briefly describing what have you changed.

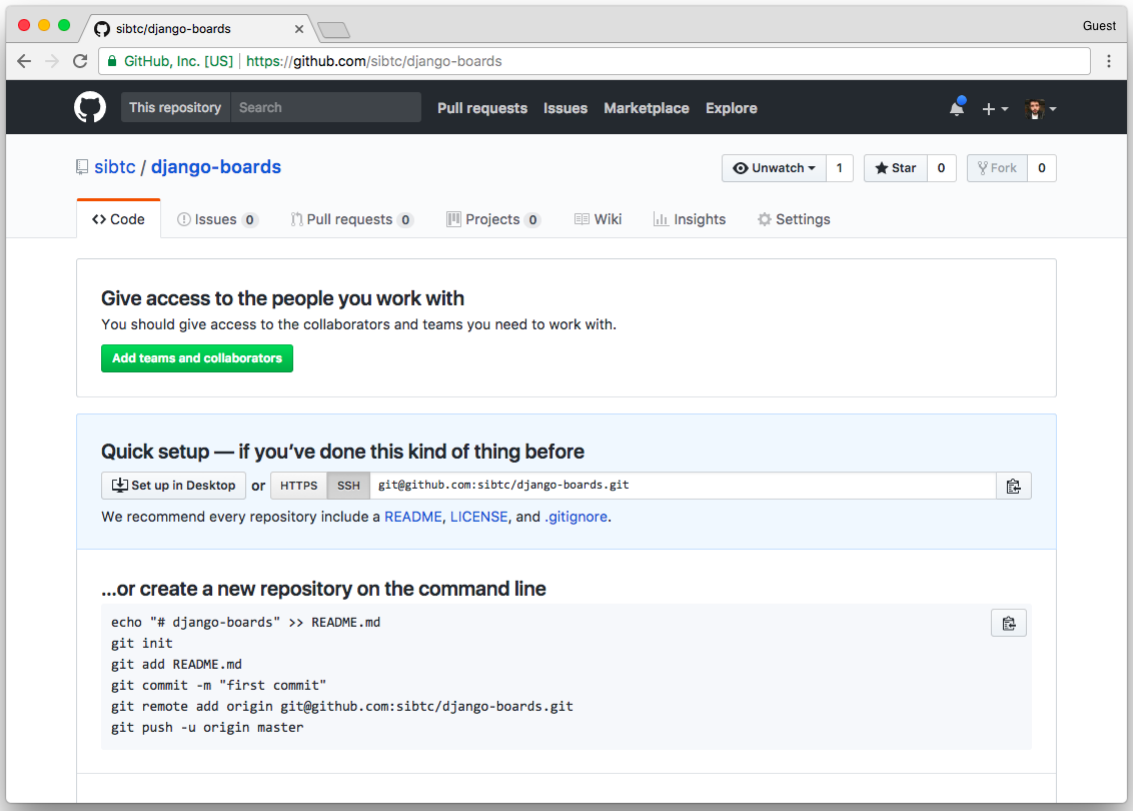
## Remote Repository

Now let's setup GitHub as a remote repository. First, create a free account on GitHub, then confirm your email address. After that, you will be able to create public repositories.

For now, just pick a name for the repository, don't initialize it with a README, or add a .gitignore or add a license so far. Make sure you start the repository empty:




After you create the repository you should see something like this:

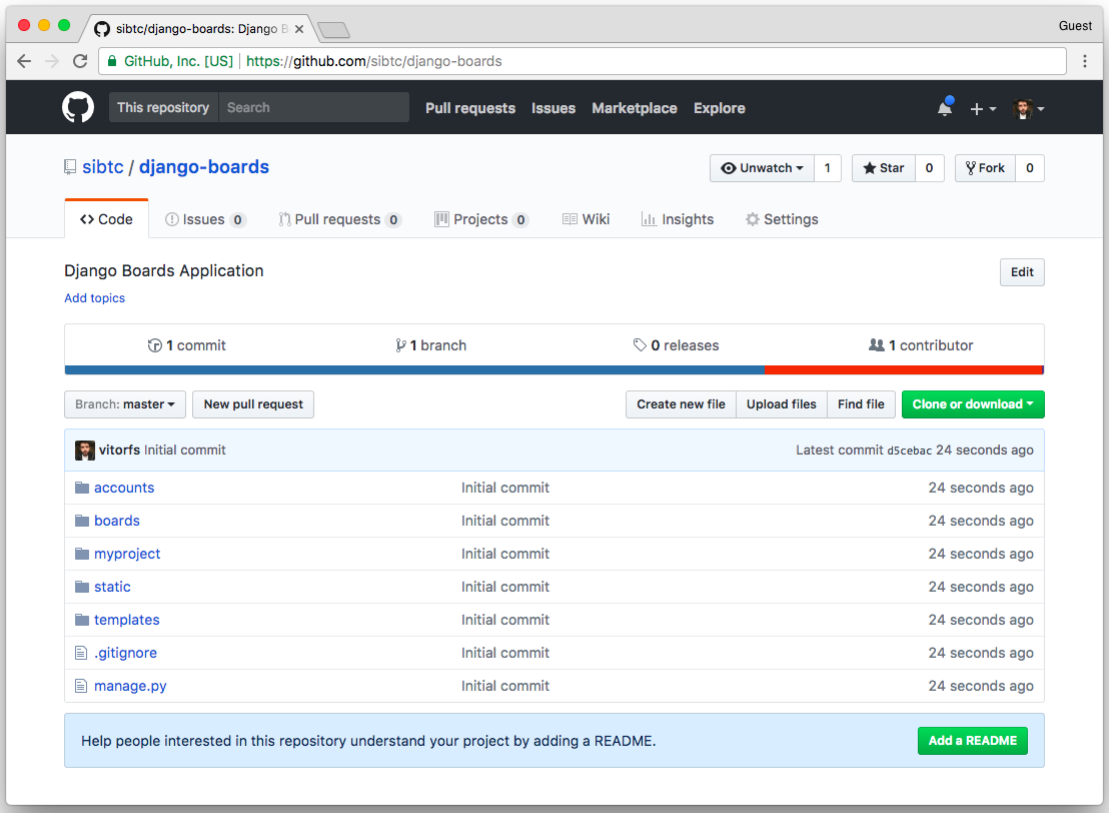



Now let's configure it as our remote repository:

```
git remote add origin git@github.com:sibtc/django-bo
```

Now push the code to the remote server, that is, to the GitHub repository:

```
git push origin master

Counting objects: 84, done.
Delta compression using up to 4 threads.
Compressing objects: 100% (81/81), done.
Writing objects: 100% (84/84), 319.70 KiB | 0 bytes/
Total 84 (delta 10), reused 0 (delta 0)
remote: Resolving deltas: 100% (10/10), done.
To git@github.com:sibtc/django-boards.git
 * [new branch]      master -> master
```




I create this repository just to demonstrate the process to create a remote repository with an existing code base. The source code of the project is officially hosted in this repository: https://github.com/sibtc/django-beginners-guide.

---

## Project Settings

No matter if the code is stored in a public or private remote repository, sensitive information should **never** be committed and pushed to the remote repository. That includes secret keys, passwords, API keys, etc.

At this point, we have to deal with two specific types of configuration in our **settings.py** module:

- Sensitive information such as keys and passwords;
- Configurations that are specific to a given environment.

Passwords and keys can be stored in environment variables or using local files (not committed to the remote repository):

```
# environment variables
```

```
import os
SECRET_KEY = os.environ['SECRET_KEY']

# or local files
with open('/etc/secret_key.txt') as f:
    SECRET_KEY = f.read().strip()
```

For that, there's a great utility library called Python Decouple that I use in every single Django project I develop. It will search for a local file named **.env** to set the configuration variables and will fall back to the environment variables. It also provides an interface to define default values, transform the data into **int**, **bool**, and **list** when applicable.

It's not mandatory, but I really find it a very useful tool. And it works like a charm with services like Heroku.

First, let's install it:

```
pip install python-decouple
```

**myproject/settings.py**

```
from decouple import config

SECRET_KEY = config('SECRET_KEY')
```

Now we can place the sensitive information in a special file named **.env** (notice the dot in front) in the same directory where the **manage.py** file is:

```
myproject/
 |-- myproject/
 |    |-- accounts/
 |    |-- boards/
 |    |-- myproject/
 |    |-- static/
 |    |-- templates/
 |    |-- .env          <-- here!
 |    |-- .gitignore
 |    |-- db.sqlite3
 |    +-- manage.py
 +-- venv/
```

**.env**

```
SECRET_KEY=rqr_cjv4igscyu8&&(0ce(=sy=f2)p=f_wn&@0xsp
```

The **.env** file is ignored in the **.gitignore** file, so every time we are going to deploy the application or run in a different machine, we will have to create a **.env** file and add the necessary configuration.

Now let's install another library to help us write the database connection in a single line. This way it's easier to write different database connection strings in different environments:

```
pip install dj-database-url
```

For now, all the configurations we will need to decouple:

**myproject/settings.py**

```
from decouple import config, Csv
import dj_database_url

SECRET_KEY = config('SECRET_KEY')
DEBUG = config('DEBUG', default=False, cast=bool)
ALLOWED_HOSTS = config('ALLOWED_HOSTS', cast=Csv())
DATABASES = {
    'default': dj_database_url.config(
        default=config('DATABASE_URL')
    )
}
```

Example of a **.env** file for our local machine:

```
SECRET_KEY=rqr_cjv4igscyu8&&(0ce(=sy=f2)p=f_wn&@0xsp
DEBUG=True
ALLOWED_HOSTS=.localhost,127.0.0.1
```

Notice that in the `DEBUG` configuration we have a default, so in production we can ignore this configuration because it will be set to `False` automatically, as it is supposed to be.

Now the `ALLOWED_HOSTS` will be transformed into a list like `['.localhost', '127.0.0.1'. ]`. Now, this is on our local machine, for production we will set it to something like `['.djangoboards.com', ]` or whatever domain you have.

This particular configuration makes sure your application is only served to this domain.

---

### Tracking Requirements

It's a good practice to keep track of the project's dependencies, so to be easier to install it on another machine.

We can check the currently installed Python libraries by running the command:

```
pip freeze

dj-database-url==0.4.2
Django==1.11.6
django-widget-tweaks==1.4.1
Markdown==2.6.9
python-decouple==3.1
pytz==2017.2
```

Create a file named **requirements.txt** in the project root, and add the dependencies there:

**requirements.txt**

```
dj-database-url==0.4.2
Django==1.11.6
django-widget-tweaks==1.4.1
Markdown==2.6.9
python-decouple==3.1
```

I kept the **pytz==2017.2** out, because it is automatically installed by Django.

You can update your source code repository:

```
git add .
git commit -m "Add requirements.txt file"
git push origin master
```

---

### Domain Name

If we are going to deploy a Django application properly, we will need a domain name. It's important to have a domain name to serve the application, configure an email service and configure an https certificate.

Lately, I've been using Namecheap a lot. You can get a **.com** domain for $8.88/year, or if you are just trying things out, you could register a **.xyz** domain

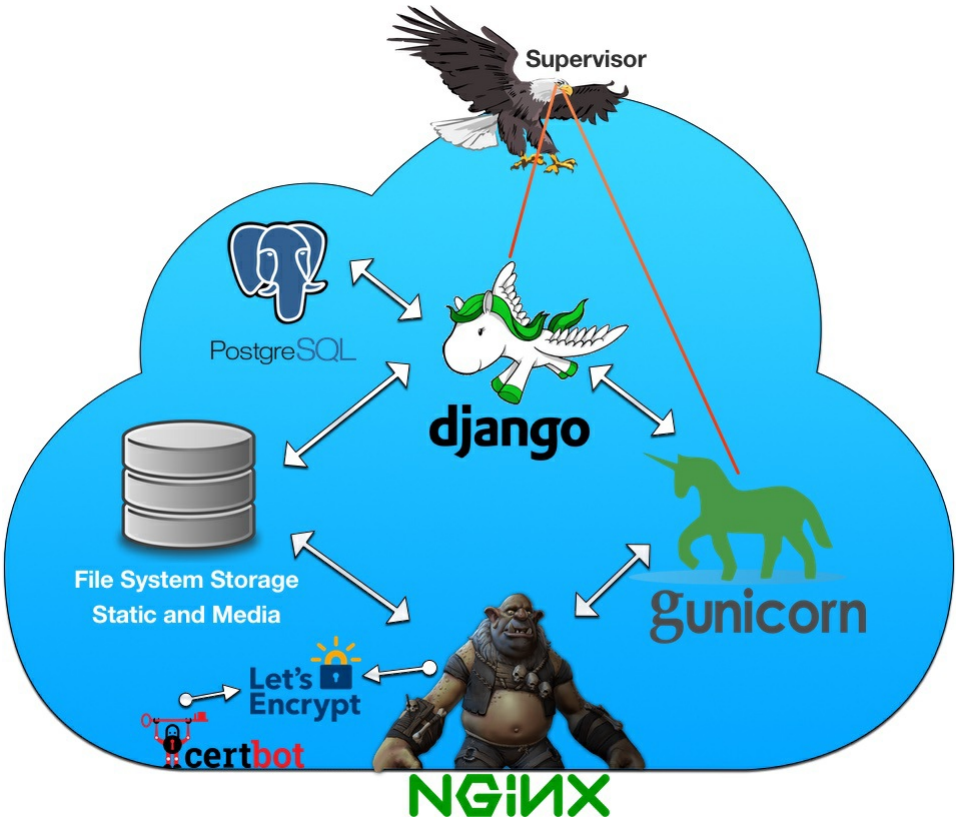
for $0.99/year.

Anyway, you are free to use any registrar. To demonstrate the deployment process, I registered the www.DjangoBoards.com domain.

---

**Deployment Strategy**

Here is an overview of the deployment strategy we are going to use in this tutorial:




The cloud is our Virtual Private Server provided by Digital Ocean. You can sign up to Digital Ocean using my affiliate link to get a free $10 credit (only valid for new accounts).

Upfront we will have NGINX, illustrated by the ogre. NGINX will receive all requests to the server. But it won't try to do anything smart if the request data. All it is going to do is decide if the requested information is a static asset that it can serve by itself, or if it's something more complicated. If so, it will pass the request to Gunicorn.

The NGINX will also be configured with HTTPS certificates. Meaning it will only accept requests via HTTPS. If the client tries to request via HTTP, NGINX

will first redirect the user to the HTTPS, and only then it will decide what to do with the request.

We are also going to install this certbot to automatically renew the Let's Encrypt certificates.

Gunicorn is an application server. Depending on the number of processors the server has, it can spawn multiple workers to process multiple requests in parallel. It manages the workload and executes the Python and Django code.

Django is the one doing the hard work. It may access the database (PostgreSQL) or the file system. But for the most part, the work is done inside the views, rendering templates, all those things that we've been coding for the past weeks. After Django process the request, it returns a response to Gunicorn, who returns the result to NGINX that will finally deliver the response to the client.

We are also going to install PostgreSQL, a production quality database system. Because of Django's ORM system, it's easy to switch databases.

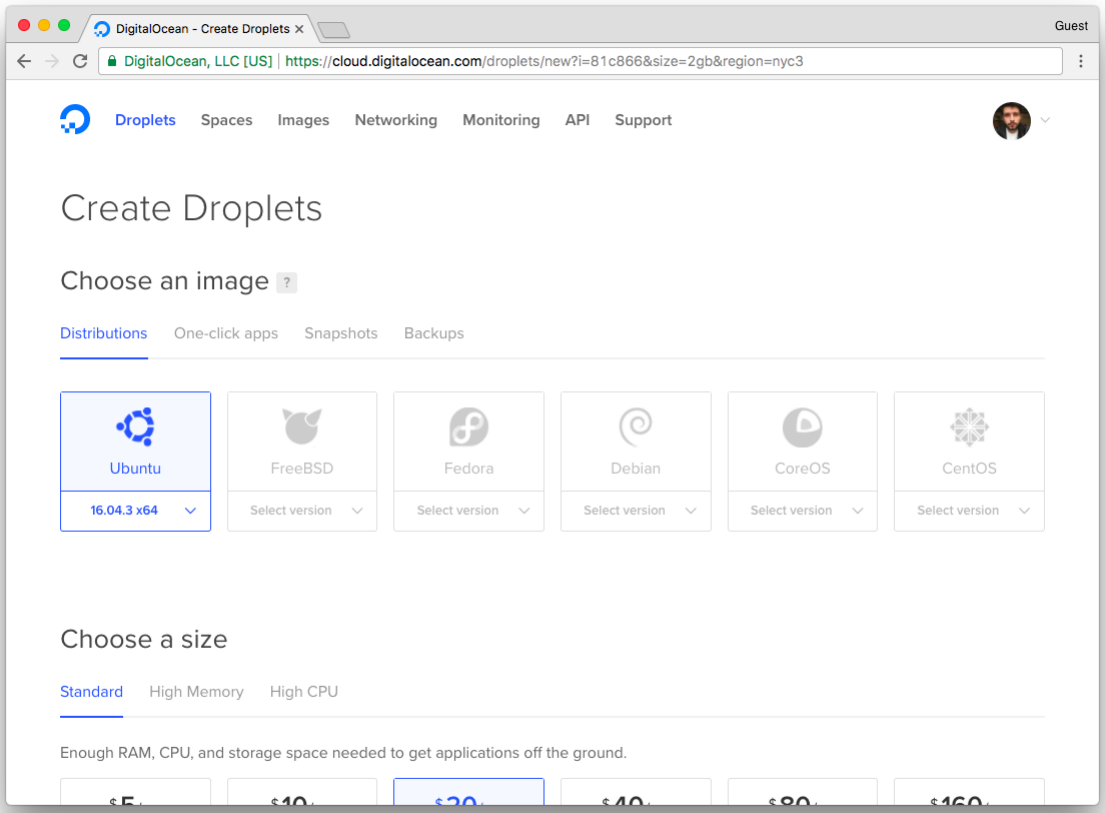
The last step is to install Supervisor. It's a process control system and it will keep an eye on Gunicorn and Django to make sure everything runs smoothly. If the server restarts, or if Gunicorn crashes, it will automatically restart it.

---

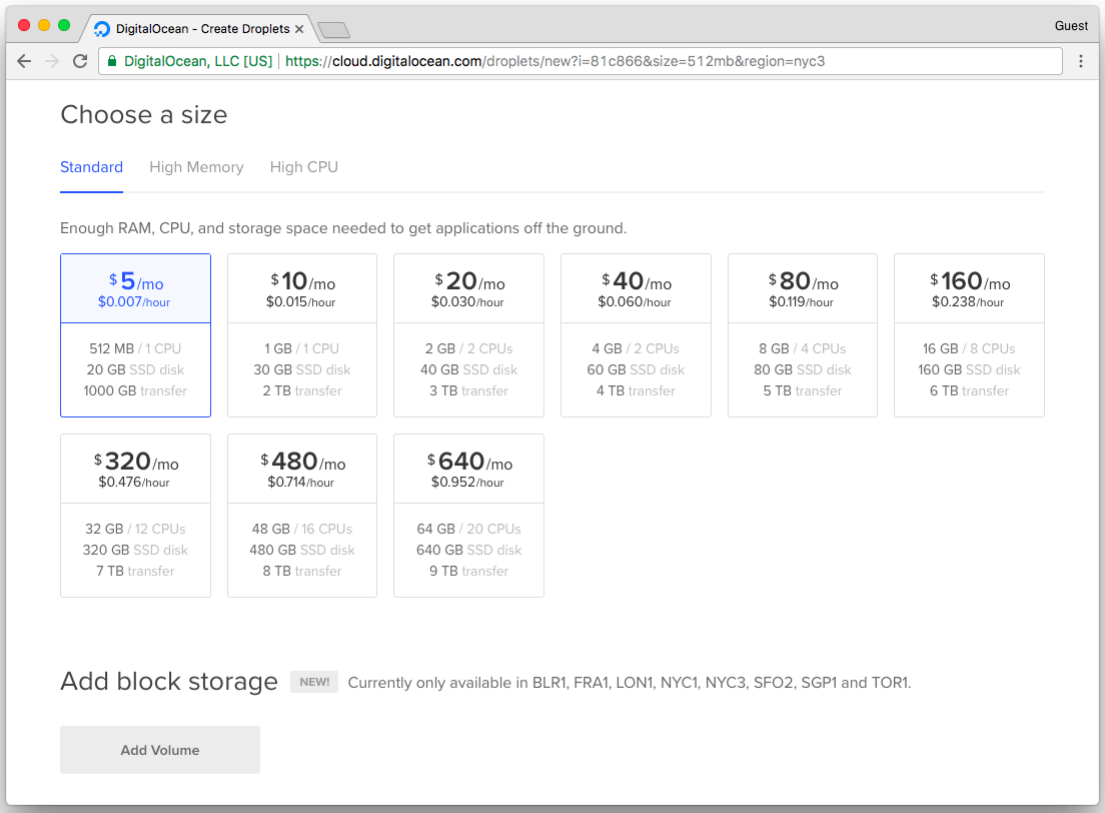
**Deploying to a VPS (Digital Ocean)**

You may use any other VPS (Virtual Private Server) you like. The configuration should be very similar, after all, we are going to use Ubuntu 16.04 as our server.

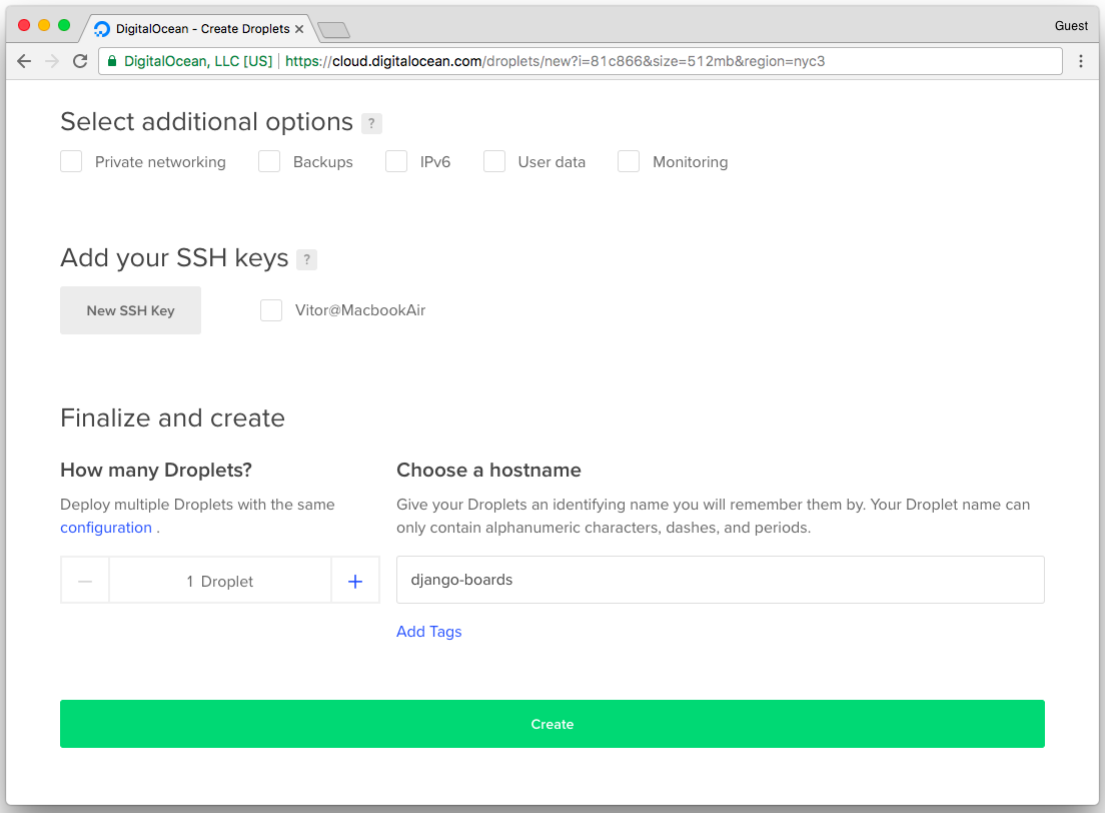
First, let's create a new server (on Digital Ocean they call it "Droplet"). Select Ubuntu 16.04:




Pick the size. The smallest droplet is enough:

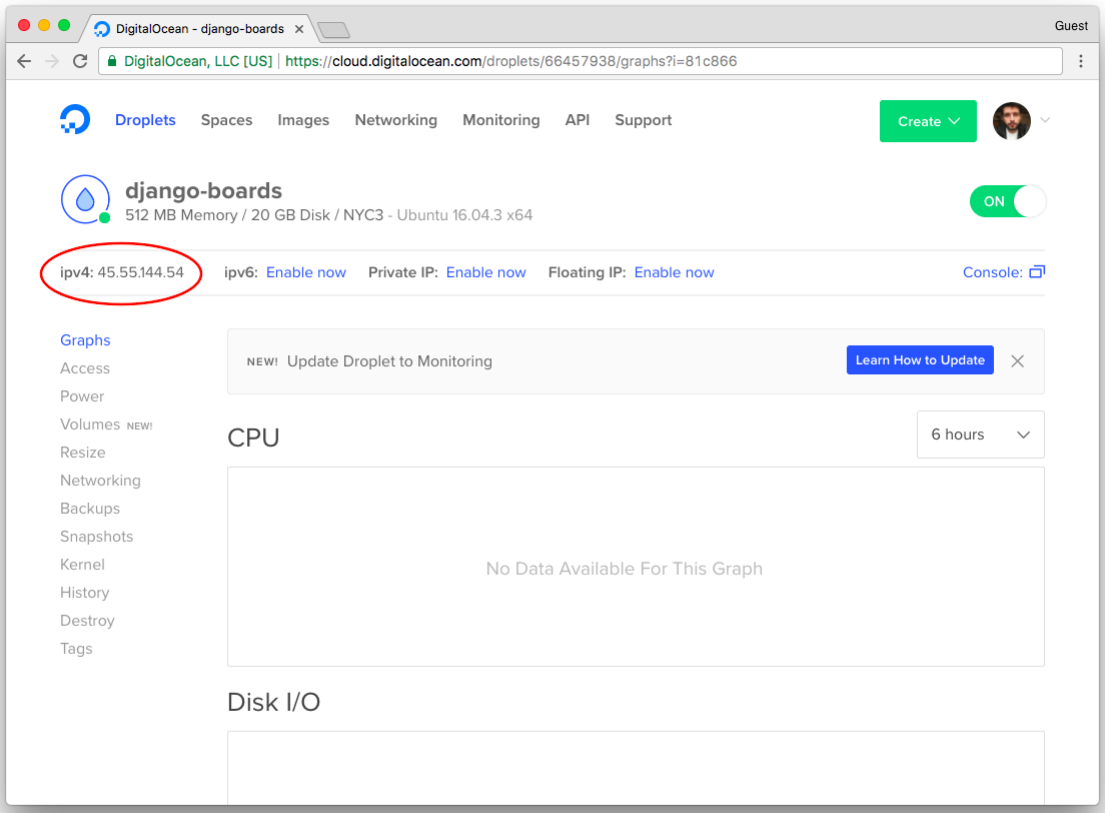



Then choose a hostname for your droplet (in my case “django-boards”):

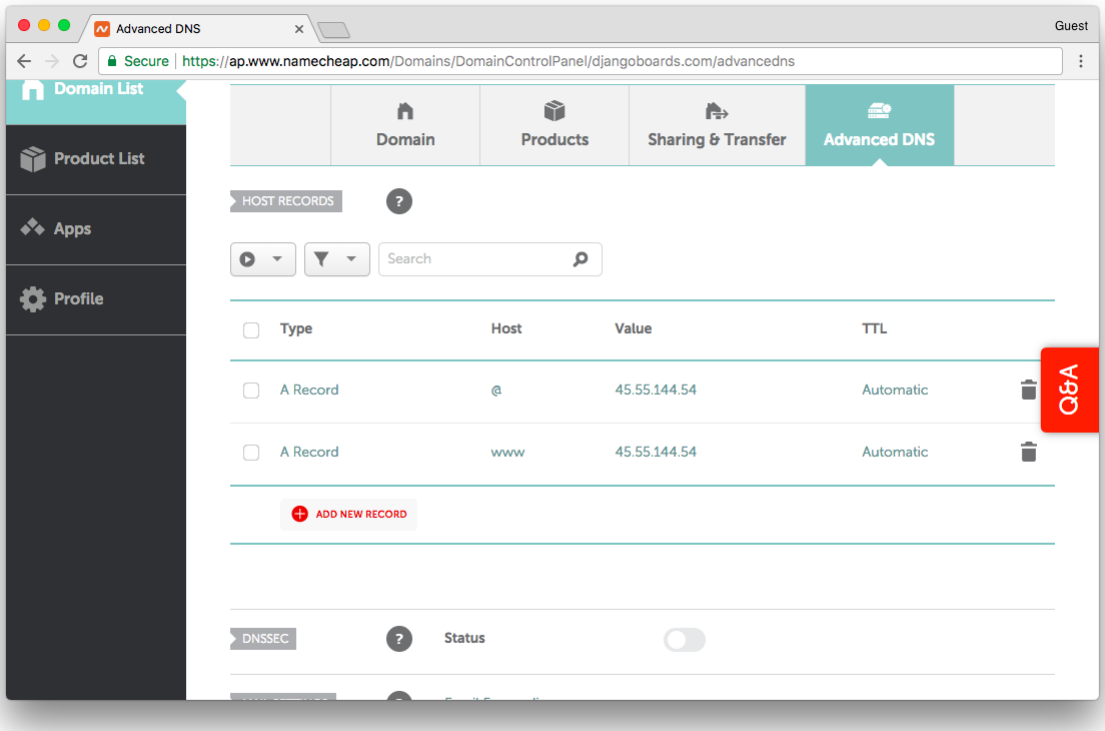



If you have an SSH key, you can add it to your account. Then you will be able to log in the server using it. Otherwise, they will email you the root password.

Now pick the server's IP address:




Before we log in to the server, let's point our domain name to this IP address. This will save some time because DNS settings usually take a few minutes to propagate.




So here we added two A records, one pointing to the naked domain "djangoboards.com" and the other one for "www.djangoboards.com". We will use NGINX to configure a canonical URL.

Now let's log in to the server using your terminal:

```
ssh root@45.55.144.54
root@45.55.144.54's password:
```

Then you should see the following message:

```
You are required to change your password immediately
Welcome to Ubuntu 16.04.3 LTS (GNU/Linux 4.4.0-93-ge

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

  Get cloud support with Ubuntu Advantage Cloud Gues
    http://www.ubuntu.com/business/services/cloud

0 packages can be updated.
0 updates are security updates.
```

```
Last login: Sun Oct 15 18:39:21 2017 from 82.128.188
Changing password for root.
(current) UNIX password:
```

Set the new password, and let's start to configure the server.

```
sudo apt-get update
sudo apt-get -y upgrade
```

If you get any prompt during the upgrade, select the option "keep the local version currently installed".

**Python 3.6**

```
sudo add-apt-repository ppa:deadsnakes/ppa
sudo apt-get update
sudo apt-get install python3.6
```

**PostgreSQL**

```
sudo apt-get -y install postgresql postgresql-contri
```

**NGINX**

```
sudo apt-get -y install nginx
```

**Supervisor**

```
sudo apt-get -y install supervisor

sudo systemctl enable supervisor
sudo systemctl start supervisor
```

**Virtualenv**

```
wget https://bootstrap.pypa.io/get-pip.py
sudo python3.6 get-pip.py
sudo pip3.6 install virtualenv
```

**Application User**

Create a new user with the command below:

```
adduser boards
```

Usually, I just pick the name of the application. Enter a password and optionally add some extra info to the prompt.

Now add the user to the sudoers list:

```
gpasswd -a boards sudo
```

**PostgreSQL Database Setup**

First switch to the postgres user:

```
sudo su - postgres
```

Create a database user:

```
createuser u_boards
```

Create a new database and set the user as the owner:

```
createdb django_boards --owner u_boards
```

Define a strong password for the user:

```
psql -c "ALTER USER u_boards WITH PASSWORD 'BcAZoYWs
```

We can now exit the postgres user:

```
exit
```

**Django Project Setup**

Switch to the application user:

```
sudo su - boards
```

First, we can check where we are:

```
pwd
/home/boards
```

First, let's clone the repository with our code:

```
git clone https://github.com/sibtc/django-beginners-
```

Start a virtual environment:

```
virtualenv venv -p python3.6
```

Initialize the virtualenv:

```
source venv/bin/activate
```

Install the requirements:

```
pip install -r django-beginners-guide/requirements.t
```

We will have to add two extra libraries here, the Gunicorn and the PostgreSQL driver:

```
pip install gunicorn
pip install psycopg2
```

Now inside the **/home/boards/django-beginners-guide** folder, let's create a **.env** file to store the database credentials, the secret key and everything else:

**/home/boards/django-beginners-guide/.env**

```
SECRET_KEY=rqr_cjv4igscyu8&&(0ce(=sy=f2)p=f_wn&@0xsp
ALLOWED_HOSTS=.djangoboards.com
DATABASE_URL=postgres://u_boards:BcAZoYWsJbvE7RMgBPz
```

Here is the syntax of the database URL:
postgres://db_user:db_password@db_host:db_port/db_name.

Now let's migrate the database, collect the static files and create a super user:

```
cd django-beginners-guide

python manage.py migrate

Operations to perform:
  Apply all migrations: admin, auth, boards, content
Running migrations:
  Applying contenttypes.0001_initial... OK
  Applying auth.0001_initial... OK
  Applying admin.0001_initial... OK
  Applying admin.0002_logentry_remove_auto_add... OK
  Applying contenttypes.0002_remove_content_type_nam
  Applying auth.0002_alter_permission_name_max_lengt
```

```
  Applying auth.0003_alter_user_email_max_length... 
  Applying auth.0004_alter_user_username_opts... OK
  Applying auth.0005_alter_user_last_login_null... O
  Applying auth.0006_require_contenttypes_0002... OK
  Applying auth.0007_alter_validators_add_error_mess
  Applying auth.0008_alter_user_username_max_length.
  Applying boards.0001_initial... OK
  Applying boards.0002_auto_20170917_1618... OK
  Applying boards.0003_topic_views... OK
  Applying sessions.0001_initial... OK
```

Now the static files:

```
python manage.py collectstatic

Copying '/home/boards/django-beginners-guide/static/
Copying '/home/boards/django-beginners-guide/static/
Copying '/home/boards/django-beginners-guide/static/
Copying '/home/boards/django-beginners-guide/static/
Copying '/home/boards/django-beginners-guide/static/
Copying '/home/boards/django-beginners-guide/static/
Copying '/home/boards/django-beginners-guide/static/
Copying '/home/boards/django-beginners-guide/static/
Copying '/home/boards/django-beginners-guide/static/
Copying '/home/boards/django-beginners-guide/static/
...
```

This command copy all the static assets to an external directory where NGINX can serve the files for us. More on that later.

Now create a super user for the application:

```
python manage.py createsuperuser
```

**Configuring Gunicorn**

So, Gunicorn is the one responsible for executing the Django code behind a proxy server.

Create a new file named **gunicorn_start** inside **/home/boards**:

```
#!/bin/bash

NAME="django_boards"
```

```
DIR=/home/boards/django-beginners-guide
USER=boards
GROUP=boards
WORKERS=3
BIND=unix:/home/boards/run/gunicorn.sock
DJANGO_SETTINGS_MODULE=myproject.settings
DJANGO_WSGI_MODULE=myproject.wsgi
LOG_LEVEL=error

cd $DIR
source ../venv/bin/activate

export DJANGO_SETTINGS_MODULE=$DJANGO_SETTINGS_MODUL
export PYTHONPATH=$DIR:$PYTHONPATH

exec ../venv/bin/gunicorn ${DJANGO_WSGI_MODULE}:appl
  --name $NAME \
  --workers $WORKERS \
  --user=$USER \
  --group=$GROUP \
  --bind=$BIND \
  --log-level=$LOG_LEVEL \
  --log-file=-
```

This script will start the application server. We are providing some information such as where the Django project is, which application user to be used to run the server, and so on.

Now make this file executable:

```
chmod u+x gunicorn_start
```

Create two empty folders, one for the socket file and one to store the logs:

```
mkdir run logs
```

Right now the directory structure inside **/home/boards** should look like this:

```
django-beginners-guide/
gunicorn_start
logs/
run/
staticfiles/
venv/
```

The **staticfiles** folder was created by the **collectstatic** command.

## Configuring Supervisor

First, create an empty log file inside the **/home/boards/logs/** folder:

```
touch logs/gunicorn.log
```

Now create a new supervisor file:

```
sudo vim /etc/supervisor/conf.d/boards.conf

[program:boards]
command=/home/boards/gunicorn_start
user=boards
autostart=true
autorestart=true
redirect_stderr=true
stdout_logfile=/home/boards/logs/gunicorn.log
```

Save the file and run the commands below:

```
sudo supervisorctl reread
sudo supervisorctl update
```

Now check the status:

```
sudo supervisorctl status boards

boards                                RUNNING   pid 308,
```

## Configuring NGINX

Next step is to set up the NGINX server to serve the static files and to pass the requests to Gunicorn:

Add a new configuration file named **boards** inside **/etc/nginx/sites-available/**:

```
upstream app_server {
    server unix:/home/boards/run/gunicorn.sock fail_
}

server {
    listen 80;
    server_name www.djangoboards.com;  # here can al
```

```
    keepalive_timeout 5;
    client_max_body_size 4G;

    access_log /home/boards/logs/nginx-access.log;
    error_log /home/boards/logs/nginx-error.log;

    location /static/ {
        alias /home/boards/staticfiles/;
    }

    # checks for static file, if not found proxy to
    location / {
        try_files $uri @proxy_to_app;
    }

    location @proxy_to_app {
      proxy_set_header X-Forwarded-For $proxy_add_x_
      proxy_set_header Host $http_host;
      proxy_redirect off;
      proxy_pass http://app_server;
    }
}
```

Create a symbolic link to the **sites-enabled** folder:

```
sudo ln -s /etc/nginx/sites-available/boards /etc/ng
```

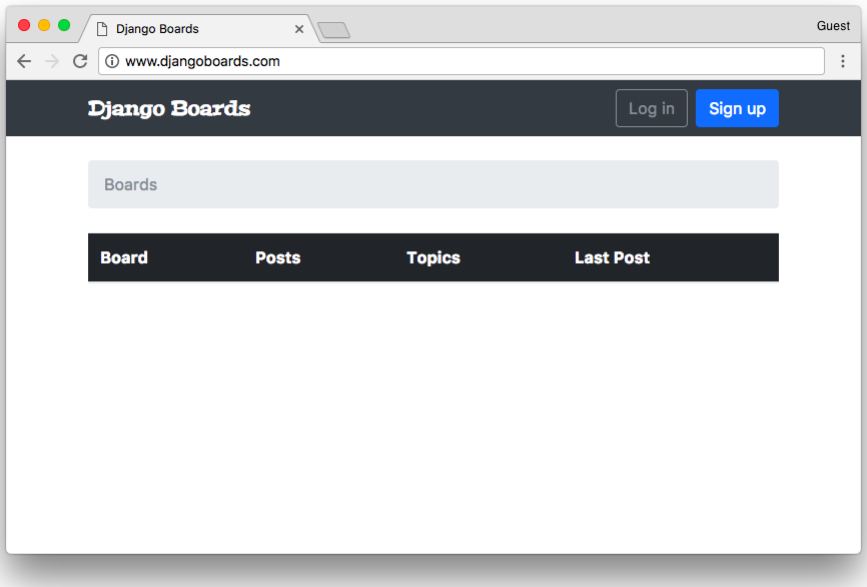
Remove the default NGINX website:

```
sudo rm /etc/nginx/sites-enabled/default
```

Restart the NGINX service:

```
sudo service nginx restart
```

At this point, if the DNS have already propagated, the website should be available on the URL www.djangoboards.com.

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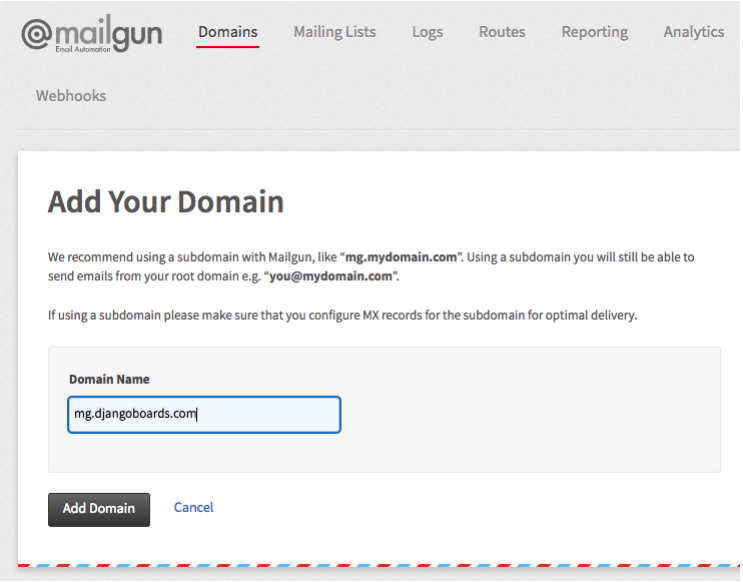
## Configuring an Email Service

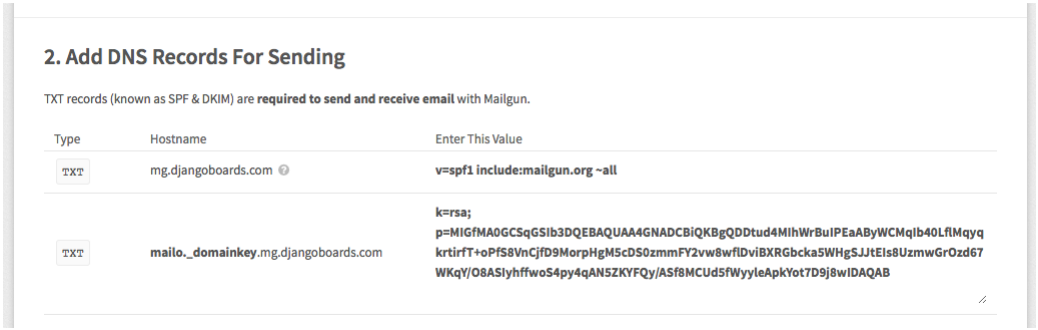
One of the best options to get started is Mailgun. It offers a very reliable free plan covering 12,000 emails per month.

Sign up for a free account. Then just follow the steps, it's very straightforward. You will have to work together with the service you registered your domain. In my case, it was Namecheap.

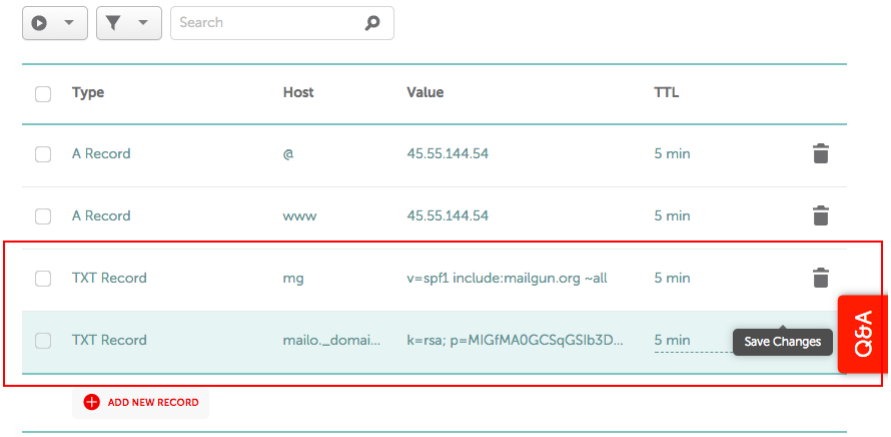
Click on add domain to add a new domain to your account. Follow the instructions and make sure you use "mg." subdomain:



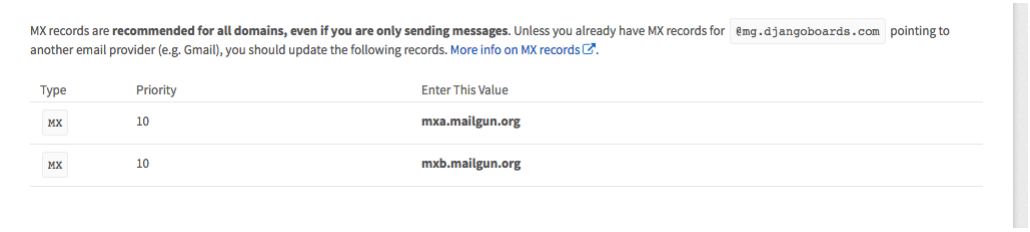
Now grab the first set of DNS records, it's two TXT records:



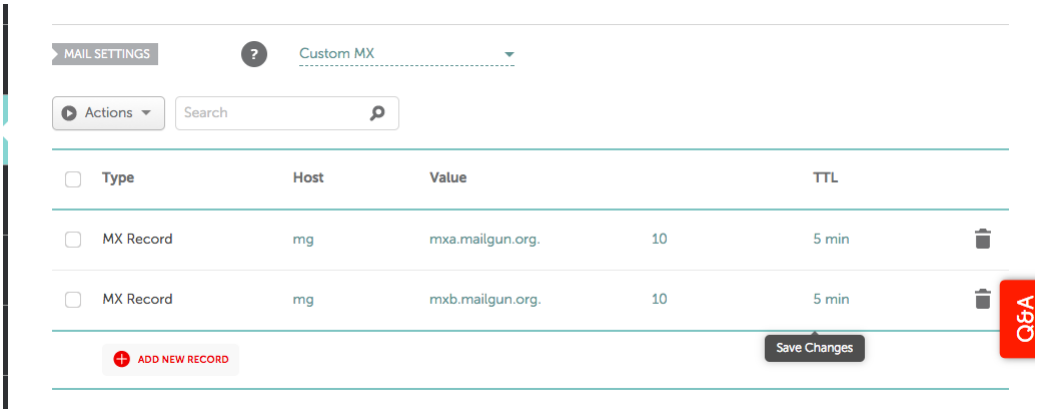

Add it to your domain, using the web interface offered by your registrar:



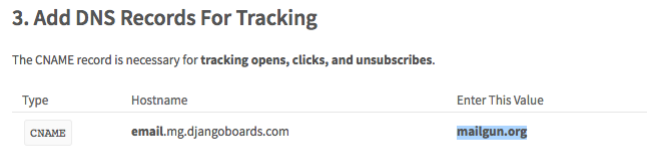

Do the same thing with the MX records:

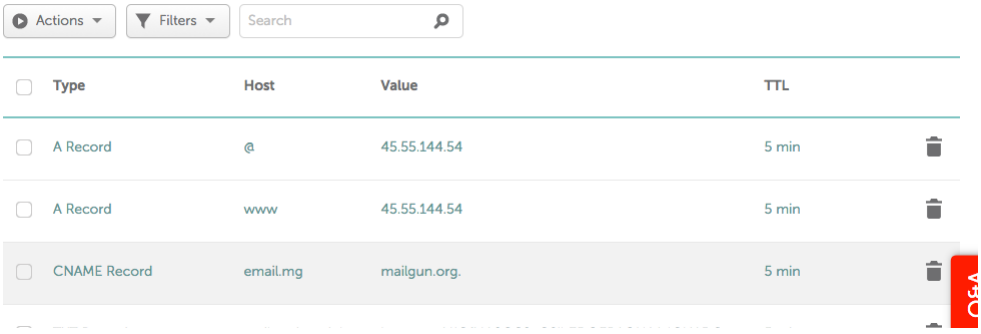



Add them to the domain:

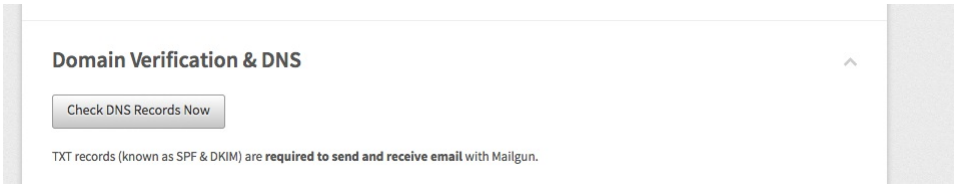


Now this step is not mandatory, but since we are already here, confirm it as well:




After adding all the DNS records, click in the **Check DNS Records Now** button:




Now we need to have some patience. Sometimes it takes a while to validate the DNS.

Meanwhile, we can configure the application to receive the connection parameters.

**myproject/settings.py**

```
EMAIL_BACKEND = config('EMAIL_BACKEND', default='dja
EMAIL_HOST = config('EMAIL_HOST', default='')
EMAIL_PORT = config('EMAIL_PORT', default=587, cast=
EMAIL_HOST_USER = config('EMAIL_HOST_USER', default=
EMAIL_HOST_PASSWORD = config('EMAIL_HOST_PASSWORD',
EMAIL_USE_TLS = config('EMAIL_USE_TLS', default=True

DEFAULT_FROM_EMAIL = 'Django Boards <noreply@djangob
EMAIL_SUBJECT_PREFIX = '[Django Boards] '
```

Then, my local machine **.env** file would look like this:

```
SECRET_KEY=rqr_cjv4igscyu8&&(0ce(=sy=f2)p=f_wn&@0xsp
DEBUG=True
ALLOWED_HOSTS=.localhost,127.0.0.1
DATABASE_URL=sqlite:///db.sqlite3
EMAIL_BACKEND=django.core.mail.backends.console.Emai
```

And my production **.env** file would look like this:

```
SECRET_KEY=rqr_cjv4igscyu8&&(0ce(=sy=f2)p=f_wn&@0xsp
ALLOWED_HOSTS=.djangoboards.com
DATABASE_URL=postgres://u_boards:BcAZoYWsJbvE7RMgBPz
EMAIL_HOST=smtp.mailgun.org
EMAIL_HOST_USER=postmaster@mg.djangoboards.com
EMAIL_HOST_PASSWORD=ED2vmrnGTM1Rdwlhazyhxxcd0F
```

You can find your credentials in the **Domain Information** section on Mailgun.

- EMAIL_HOST: SMTP Hostname
- EMAIL_HOST_USER: Default SMTP Login
- EMAIL_HOST_PASSWORD: Default Password

We can test the new settings in the production server. Make the changes in the **settings.py** file on your local machine, commit the changes to the remote repository. Then, in the server pull the new code and restart the Gunicorn process:

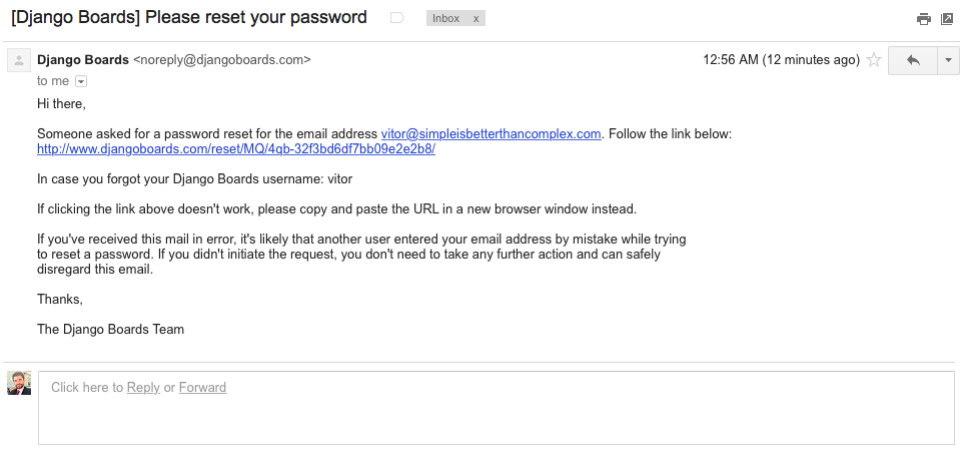
```
git pull
```

Edit the **.env** file with the email credentials.

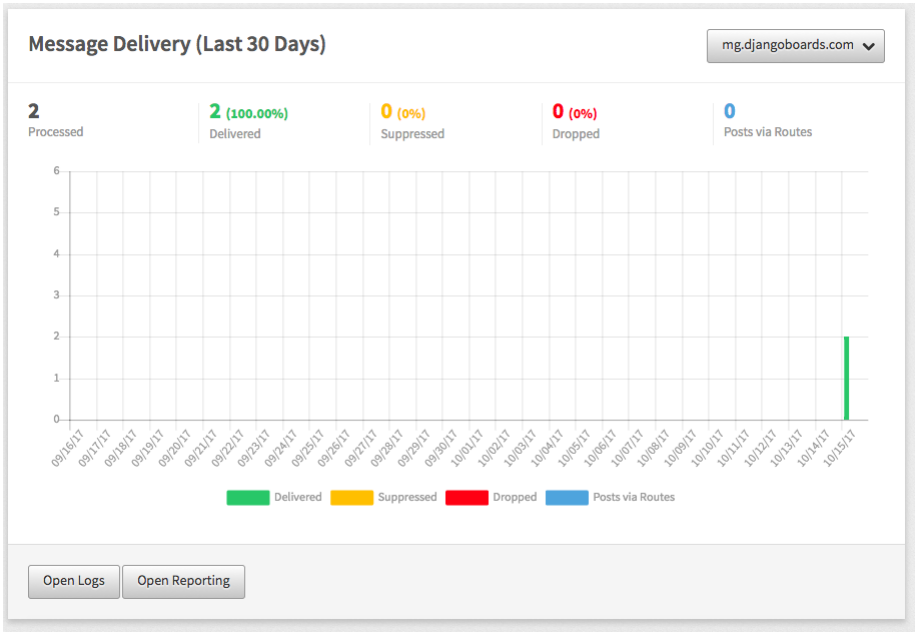
Then restart the Gunicorn process:

```
sudo supervisorctl restart boards
```

Now we can try to start the password reset process:




On the Mailgun dashboard you can have some statistics about the email delivery:




---

## Configuring HTTPS Certificate

Now let's protect our application with a nice HTTPS certificate provided by Let's Encrypt.

Setting up HTTPS has never been this easy. And better, we can get it for free nowadays. They provide a solution called **certbot** which takes care of installing and renewing the certificates for us. It's very straightforward:

```
sudo apt-get update
sudo apt-get install software-properties-common
sudo add-apt-repository ppa:certbot/certbot
```

```
sudo apt-get update
sudo apt-get install python-certbot-nginx
```

Now install the certs:

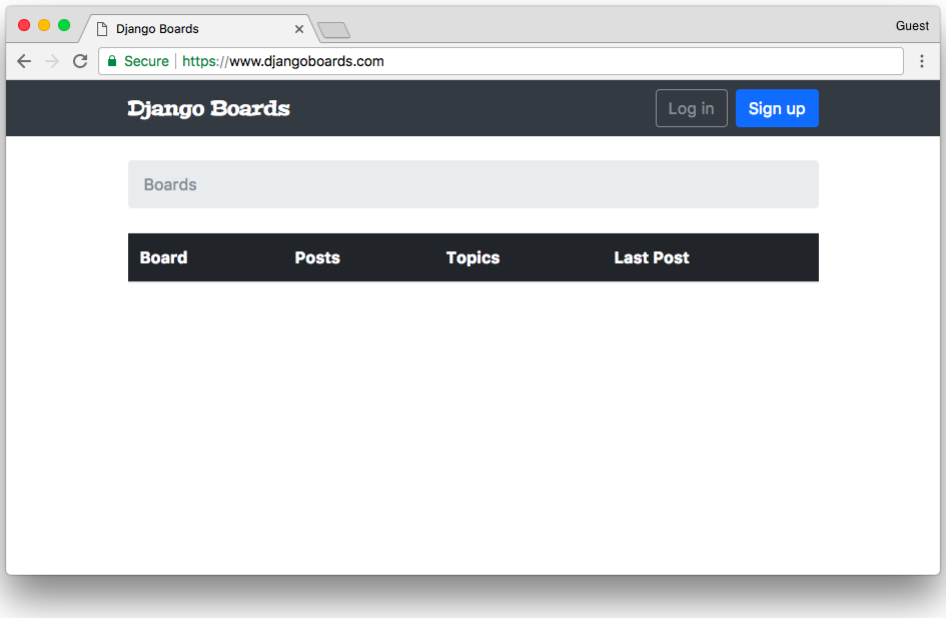
```
sudo certbot --nginx
```

Just follow the prompts. When asked about:

```
Please choose whether or not to redirect HTTP traffi
```

Choose `2` to redirect all HTTP traffic to HTTPS.

With that the site is already being served over HTTPS:




Setup the auto renew of the certs. Run the command below to edit the crontab file:

```
sudo crontab -e
```

Add the following line to the end of the file:

```
0 4 * * * /usr/bin/certbot renew --quiet
```

This command will run every day at 4 am. All certificates expiring within 30 days will automatically be renewed.

---

**Conclusions**

Thanks a lot for all those who followed this tutorial series, giving comments and feedback! I really appreciate! This was the last tutorial of the series. I hope you enjoyed it!

Even though this was the last part of the tutorial series, I plan to write a few follow-up tutorials exploring other interesting topics as well, such as database optimization and adding more features on top of what we have at the moment.

By the way, if you are interested in contributing to the project, few free to submit pull requests! The source code of the project is available on GitHub: https://github.com/sibtc/django-beginners-guide/

And please let me know what else you would like to see next! :-)

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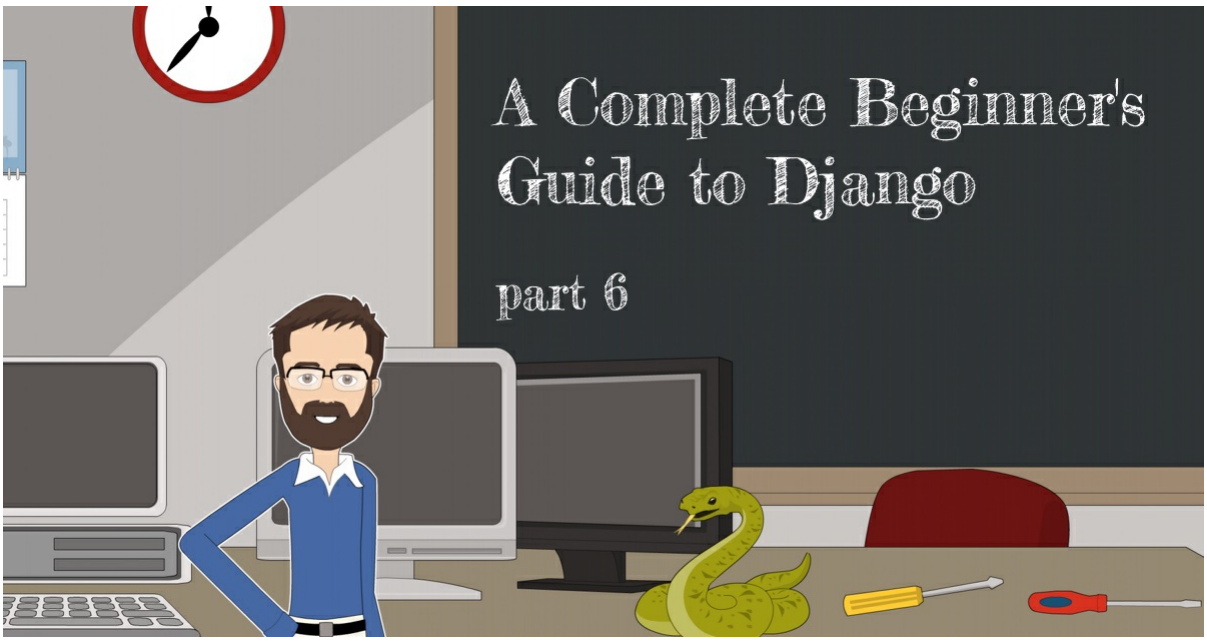


**← Part 6 - Class-Based Views**


**Tutorial Series Index →**

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