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I'm a passionate software developer and researcher from Brazil, currently living in Finland. I write about Python, Django and Web Development on a weekly basis. Read more.

TUTORIAL

How to Use RESTful APIs with Django

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(Picture: https://www.pexels.com/photo/green-circuit-board-with-clear-glass-case-163073/)

First, let's get those terms out of our way. The **REST** acronym stands for **Representational State Transfer**, which is an architectural design. Usually when we use the term **RESTful**, we are referring to an application that implements the **REST** architectural design. API stands for **Application Programming Interface**, which is a software application that we interact

programmatically, instead of using a graphical interface. In other words, we interact with it at a lower level at the source code, writing functions and routines.

In the context of Web development, usually when we are talking about a **RESTful API** we are referring to **Web Services** (or Web APIs). It's a common way to expose parts of your application to third-parties (external applications and Websites). It can be data-oriented, in a sense that your Web service (the RESTful API), simply make available the information you store in your databases using a common format, such as XML or JSON. This way, an external application can interact with your application and your data, without having to connect directly into your database. This way, it doesn't matter if your database is MySQL or PostgreSQL, or if your application was written in Java or Python. But RESTful APIs can also be used to modify data

As developers, we can be at either sides of the equation. We can be both the *provider* or the *consumer* of an API. However, in this tutorial we are going to explore the consumption part of the equation. We are going to write some code that consume public APIs. You will see that the process is very similar, and that's something that once you learn you can apply to many problems.

Now, if you want to provide a REST API, the Django REST Framework is the best option. It make easy to expose parts of your application as a REST API. But, that's a topic for another tutorial (I will publish it soon!)

Below, an outline of what I'm going to explore in this tutorial:

If you want to have a look on what we are going to build in this tutorial, see the code live at restful-apis-example.herokuapp.com.

Important Concepts

If you are planning to integrate your Django application with a third-party REST API, it's important to keep a few things in mind:

Consuming an API is slow.

We have to implement them carefully because it's an extra HTTP request performed in the server side, so it can increase considerably the time consumed during the request/response cycle. Caching is fundamental to assure the performance of the application.

You have no control over the API.

It's a third-party API, it may stop working without any notice. Something could change, the API server may go down. So be prepare to handle exception cases.

APIs are usually limited by number of requests you can make.

Usually, the API provider only let use do a handful of requests per hour. This limit can vary, but usually it's there. So, we have to take it into account when implementing the integration. Caching usually is the solution for the rate limits.

Secure your API keys.

Some APIs will required authentication, meaning you will have deal with sensitive data. Never commit this kind of information to public repositories.

There's probably a Python client for it.

Using a native Python client to access an API is usually a good idea. It makes the authentication process and the usage of its resources easier. Always check first if there is a Python client available. In some cases there will be even multiple options. In such cases, check their repositories first and pick the one with most active development.

Documentation is gold.

APIs are pretty much useless without a proper documentation. It's about your only guidance when using one. Unless the API server is open source, but then searching for endpoints and services directly in the source code can be very hard time consuming. So, before jumping into the implementation, make sure the provider has a reliable documentation.

Implementation

We are going to explore next a few implementations of public APIs so you can have an idea of how it works under the hoods. In the end of this post you will find the source code of the examples so you can explore and try it yourself.

Basic Example: GEO Location API

The first example is going to be an application that consumes the GEO API freegeoip.net. It's a simple API that provides geo location information (country, timezone, latitude, longitude, etc) based on IP addresses. It's a very simple API that doesn't require a client or authentication.

A nice thing about some RESTful APIs is that we can debug using our browser. Others may need authentication so it is little bit trickier, but can be done in the terminal using tools like **cURL** for example.

If we access the endpoint `http://freegeoip.net/json/` in our browser (without providing any parameter) it will show the information for your IP address:

Here is a very simple view using the requests Python library. Install it using pip:

```
pip install requests
```

Below, the code:

urls.py

```
from django.urls import path
from . import views

urlpatterns = [
    path('', views.home, name='home'),
]
```

views.py

```
from django.shortcuts import render
import requests

def home(request):
    response = requests.get('http://freegeoip.net/json/')
    geodata = response.json()
    return render(request, 'core/home.html', {
        'ip': geodata['ip'],
        'country': geodata['country_name']
    })
```

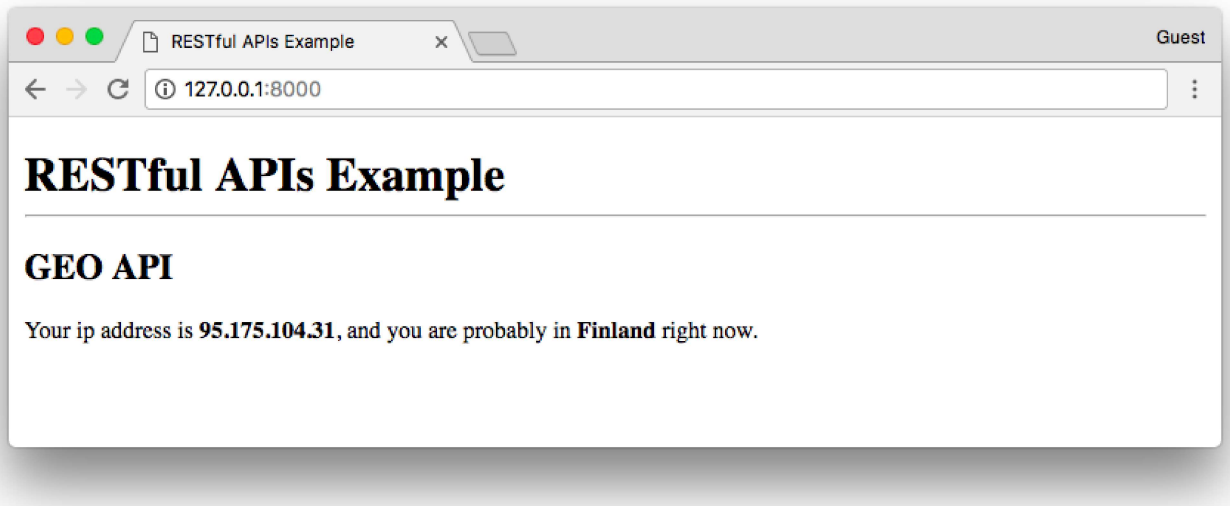
In the view above, we are performing a GET request to this URL (endpoint) and reading the data in JSON format into the `geodata` variable. We could have returned it directly to the template, but I opted to just pass the information that we need, so you can see how to read the data.

You can "debug" it inside the view, adding a `print` statement inside the view and print the `geodata` variable so you can see all the available information we could potentially use.

core/home.html

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

{% block content %}
  <h2>GEO API</h2>
  <p>Your ip address is <strong>{{ ip }}</strong>, and you are probably in <strong>{{ country }}<
{% endblock %}
```

And here is what the view looks like:



We can use this information in many ways. For example, we can get a Google Maps API key and render the current location using a Google Maps iframe:

> ⚠ **Attention:** This is just an example! Do **NOT** store API Keys directly in the source code or commit them to public repositories! To learn more about how to handle sensitive information refer to those articles I published previously: Protecting Sensitive Information and How to Use Python Decouple.

views.py

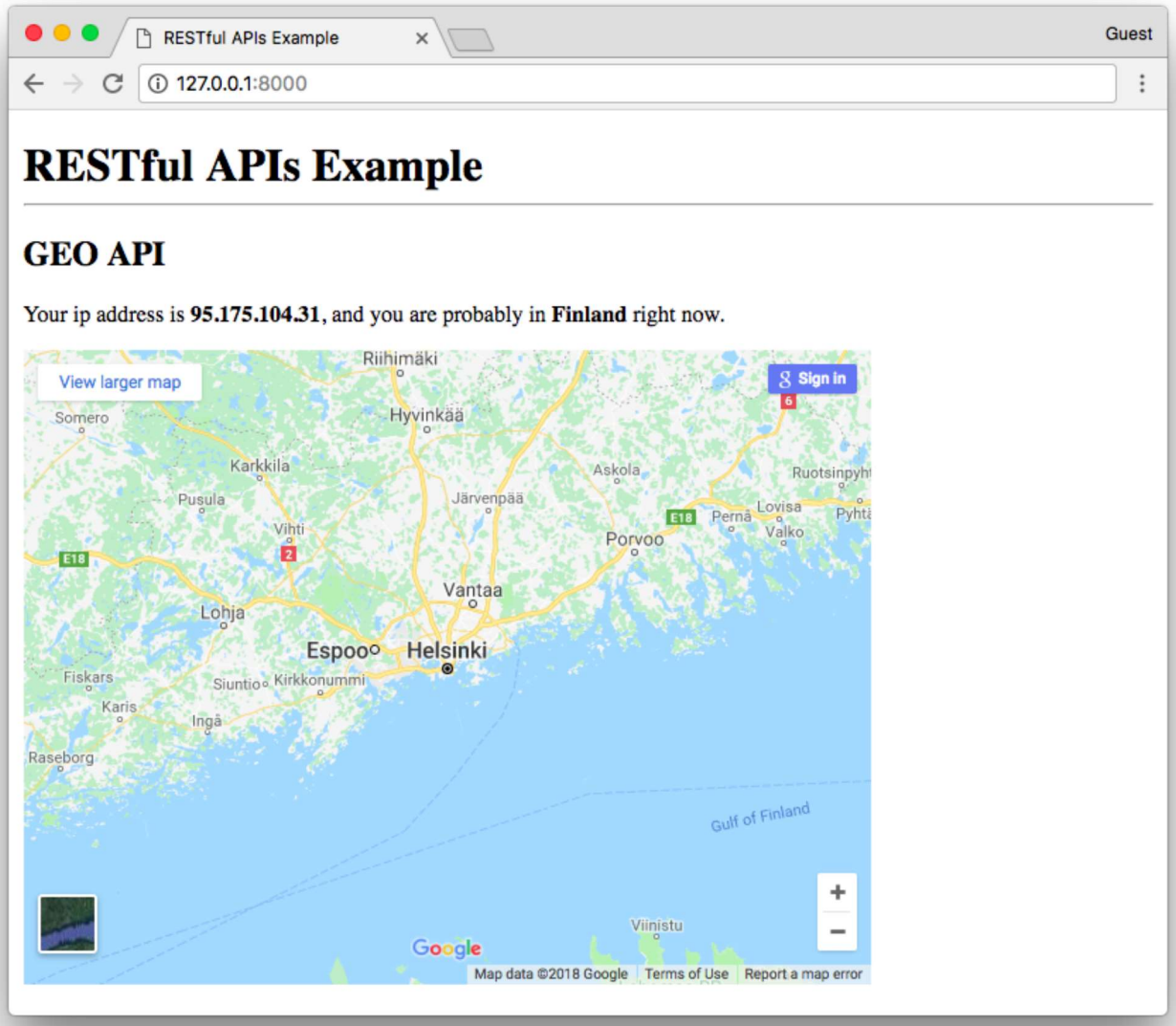
```
from django.shortcuts import render
import requests

def home(request):
    ip_address = request.META.get('HTTP_X_FORWARDED_FOR', '')
    response = requests.get('http://freegeoip.net/json/%s' % ip_address)
    geodata = response.json()
    return render(request, 'core/home.html', {
        'ip': geodata['ip'],
        'country': geodata['country_name'],
        'latitude': geodata['latitude'],
        'longitude': geodata['longitude'],
        'api_key': 'AIzaSyC1UpCQp9zHokhNOBK07AvZTiO09icwD8I'  # Don't do this! This is just an ex
    })
```

> ℹ **Note:** There is a small "hack" in the code above. When we are developing locally, our machine is both the server and the client. Basically, the `HTTP_X_FORWARDED_FOR` won't be set on the local machine, causing the request URL to be only `http://freegeoip.net/json/` instead of something like `http://freegeoip.net/json/95.175.104.31`. It will work because as I showed you previously, the `http://freegeoip.net/json/` URL return the result for your ip address. BUT! It wouldn't work in production, because it would show the location of the server instead of the visitor location. The difference is that the `HTTP_X_FORWARDED_FOR` will be set with the client's IP address so everything will work as expected.

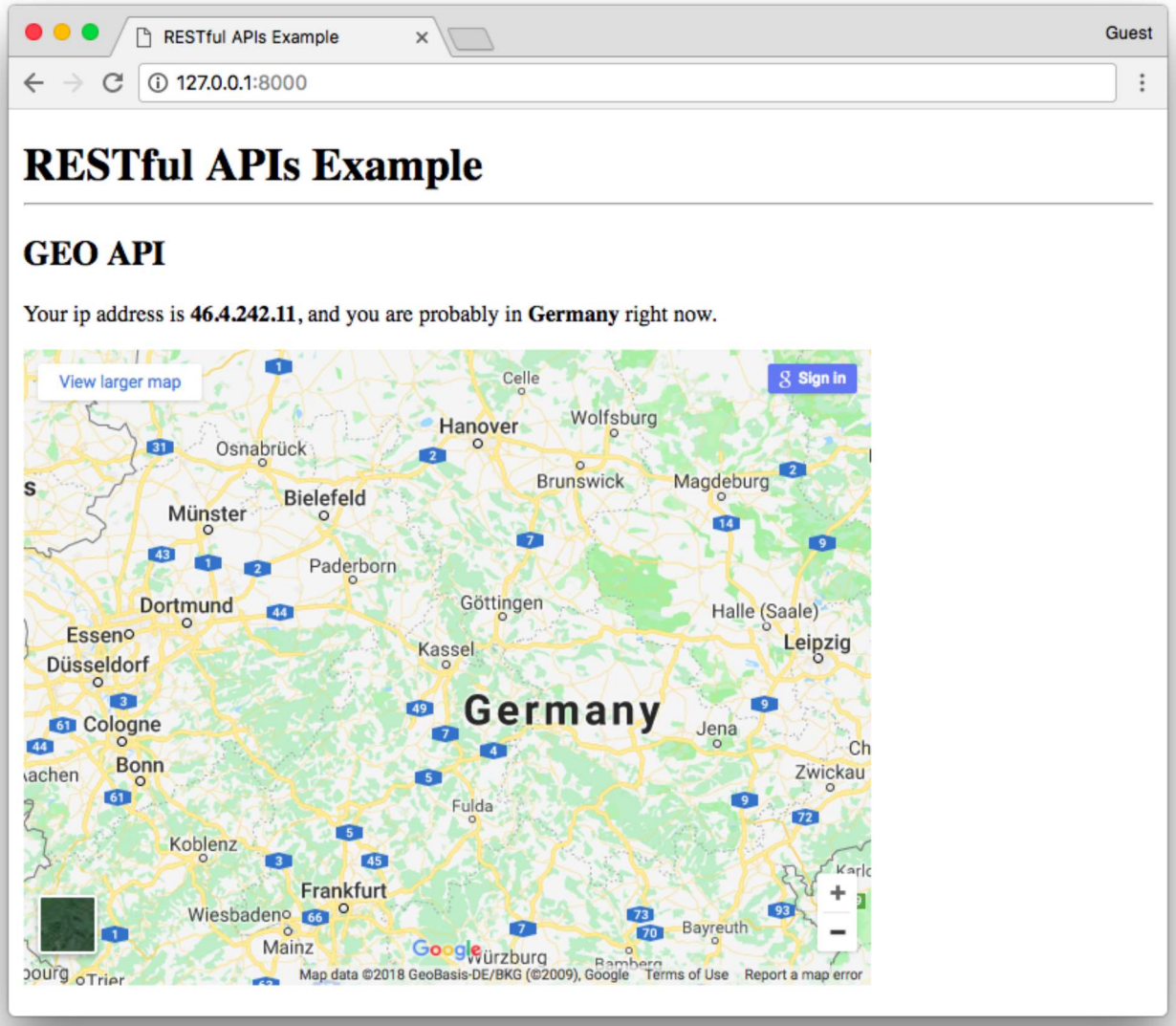
core/home.html

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

{% block content %}
  <h2>GEO API</h2>
  <p>Your ip address is <strong>{{ ip }}</strong>, and you are probably in <strong>{{ country }}<

  <iframe width="600"
          height="450"
          frameborder="0"
          style="border:0"
          src="https://www.google.com/maps/embed/v1/view?center={{ latitude }},{{ longitude }}&zc
```

```
        allowfullscreen></iframe>

{% endblock %}
```



If I change my IP address using a VPN, we can see the changes just by refreshing the browser:



To try it yourself locally, go to developers.google.com/maps/web/ and click on “Get a Key”, generate an API for yourself.

Caching API Result

If you tried it locally probably you noticed it takes a little bit longer for the view to respond. If we reload the page, it will make an additional request to the API server again. But in this case, this information doesn’t generally change that quick (unless you moved geographically or connected to a VPN like I did). So, depending on the use case we can cache the result.

In this case, since every visitor is likely to have a different result, a solution could be to store the result in a session, like this:

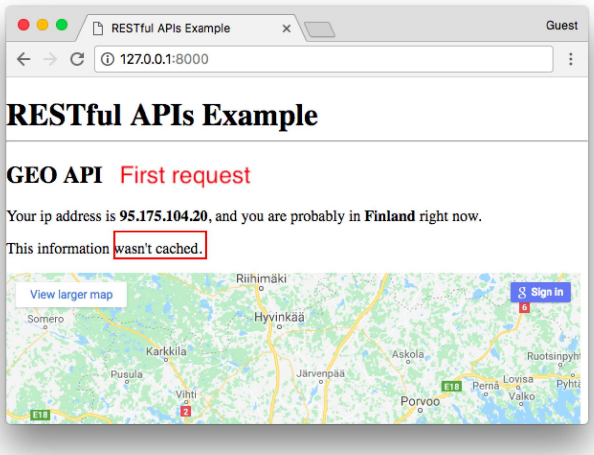
views.py

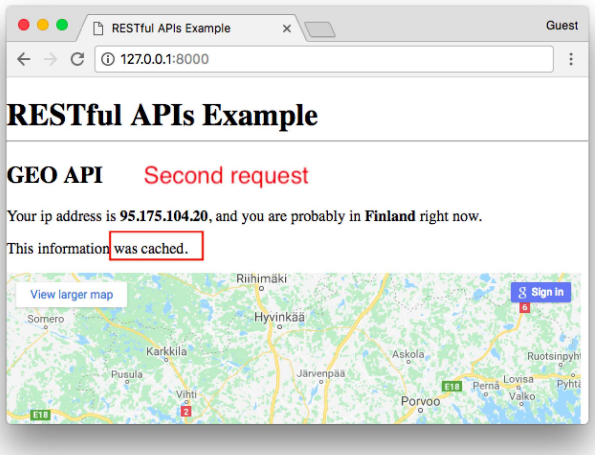
```
from django.shortcuts import render
import requests
```

```
def home(request):
    is_cached = ('geodata' in request.session)

    if not is_cached:
        ip_address = request.META.get('HTTP_X_FORWARDED_FOR', '')
        response = requests.get('http://freegeoip.net/json/%s' % ip_address)
        request.session['geodata'] = response.json()

    geodata = request.session['geodata']

    return render(request, 'core/home.html', {
        'ip': geodata['ip'],
        'country': geodata['country_name'],
        'latitude': geodata['latitude'],
        'longitude': geodata['longitude'],
        'api_key': 'AIzaSyC1UpCQp9zHokhNOBK07AvZTiO09icwD8I',  # Don't do this! This is just an e
        'is_cached': is_cached
    })
```

core/home.html

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

{% block content %}
  <h2>GEO API</h2>
  <p>Your ip address is <strong>{{ ip }}</strong>, and you are probably in <strong>{{ country }}<
  <p>This information {{ is_cached|yesno:"was,wasn't" }} cached.</p>
  <iframe width="600"
          height="450"
          frameborder="0"
          style="border:0"
          src="https://www.google.com/maps/embed/v1/view?center={{ latitude }},{{ longitude }}&zc
          allowfullscreen></iframe>

{% endblock %}
```





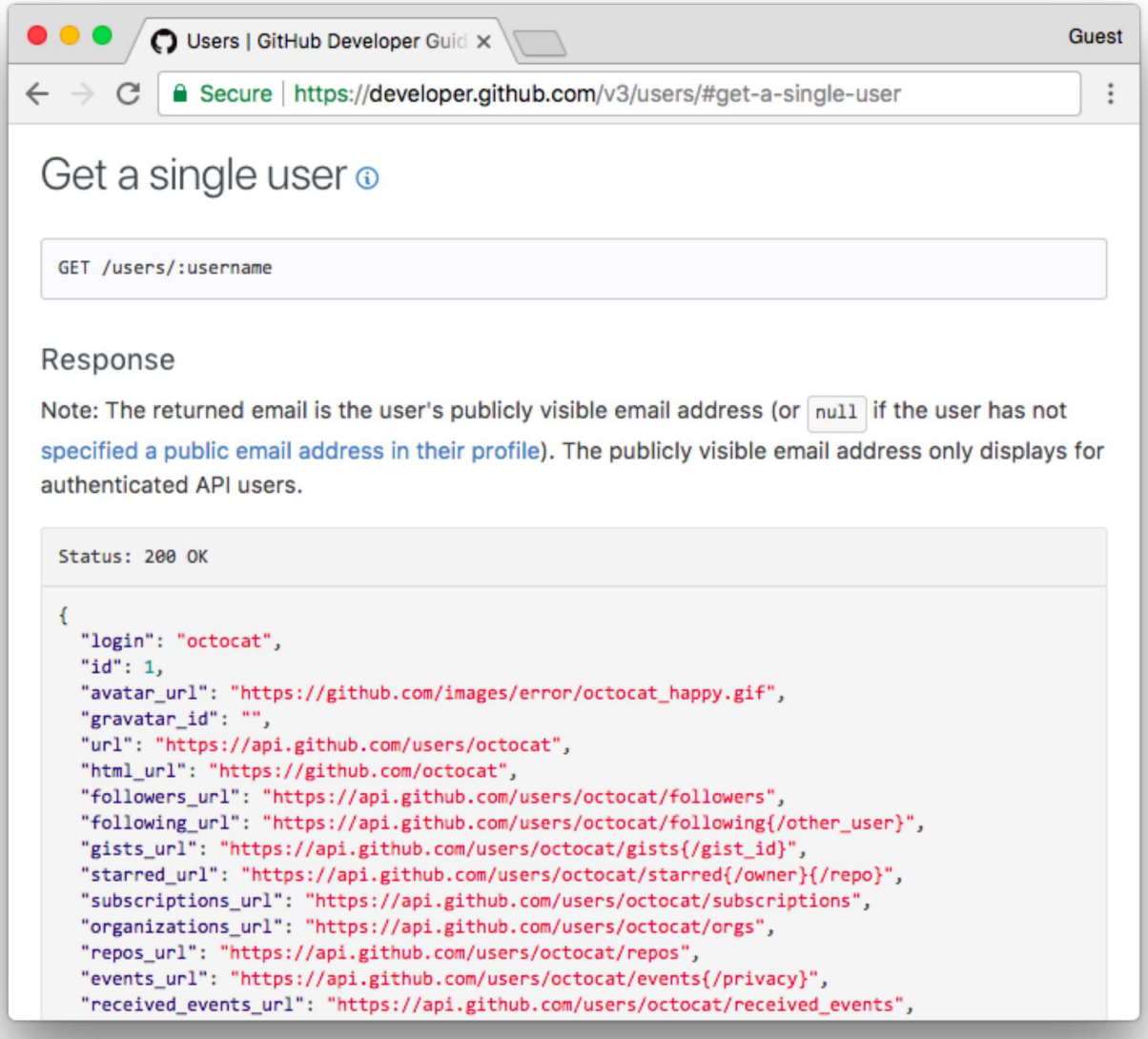
It is worth mentioning that there are several ways to cache an API result. It doesn't mean you have to use a proper machinery like Memcached or Redis. You can cache it in your database, in a session, in a file. Depends on the use case. There is always a trade-off. Sometimes a simple solution is more than enough.

Passing Parameters to an API: GitHub Public API

Next, we are going to explore GitHub's Public API. For some resources we won't need to authenticated. But the limits are very low in those cases.

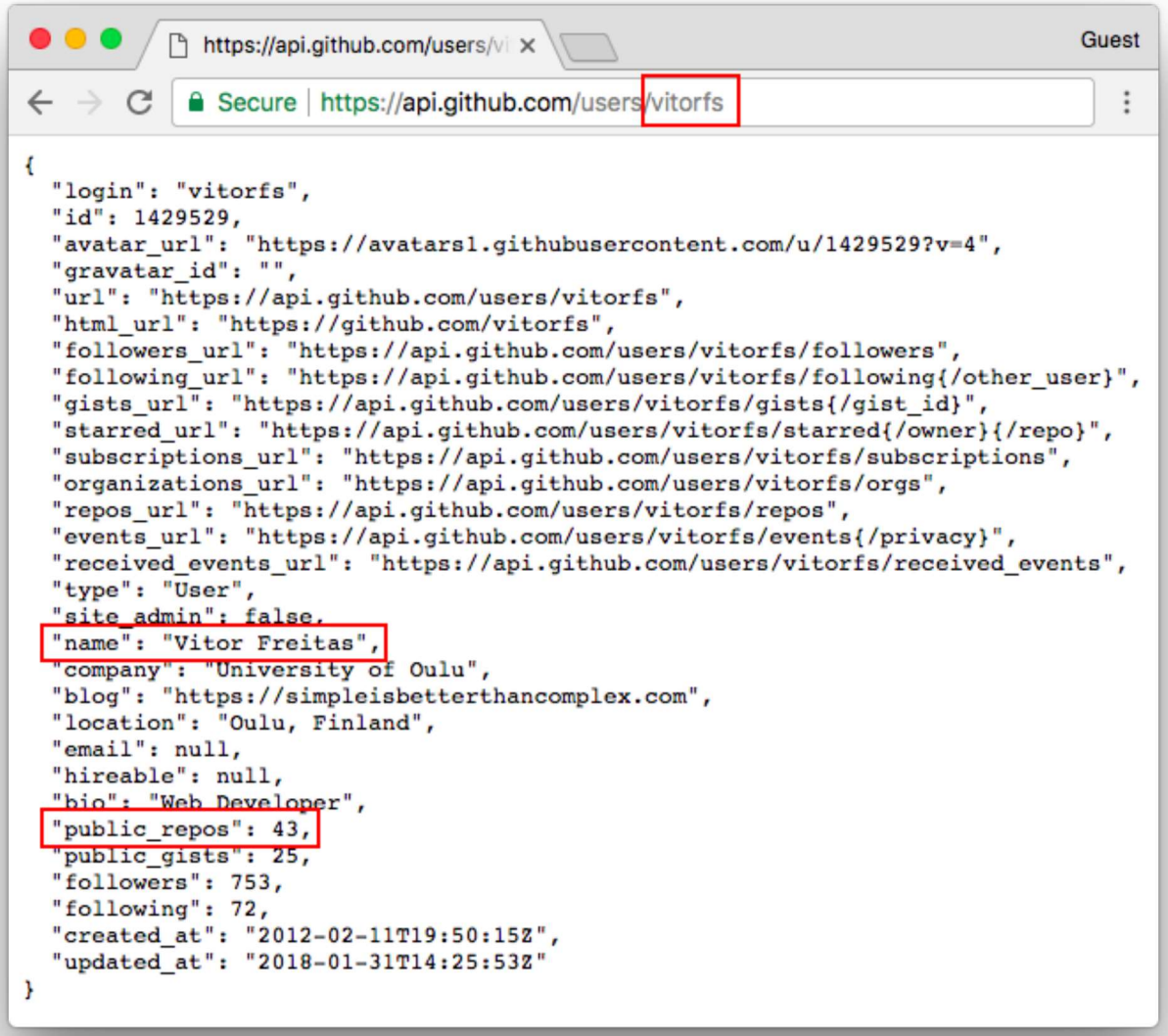
You can find GitHub's API documentation at developer.github.com Let's make a simple app that search for a GitHub user and displays their names and the number of open source repositories they have.

First, go to the docs.



From the documentation we know what is the endpoint of the resource we want to get, which is `/users/:username`. It will be used to build the logic of our application.

Now, let's debug the API endpoint using our browser:



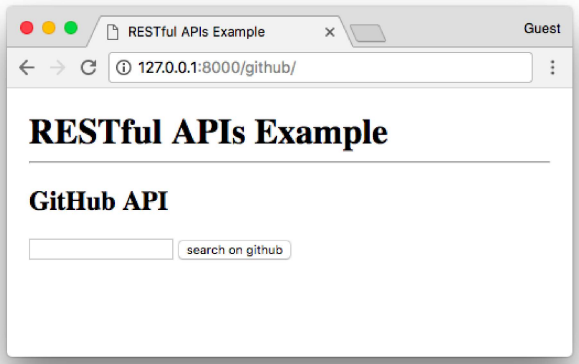
views.py

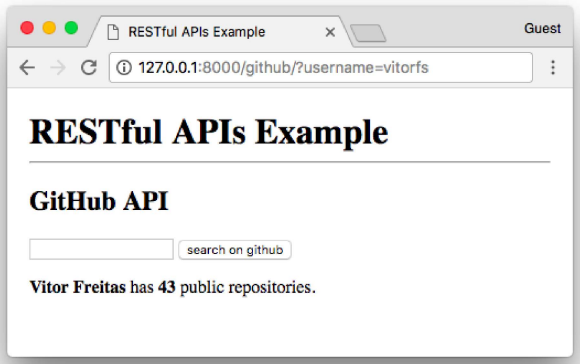
```
from django.shortcuts import render
import requests

def github(request):
    user = {}
    if 'username' in request.GET:
        username = request.GET['username']
        url = 'https://api.github.com/users/%s' % username
        response = requests.get(url)
        user = response.json()
    return render(request, 'core/github.html', {'user': user})
```

core/github.html

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

{% block content %}
  <h2>GitHub API</h2>
  <form method="get">
    <input type="text" name="username">
    <button type="submit">search on github</button>
  </form>
  {% if user %}
    <p><strong>{{ user.name }}</strong> has <strong>{{ user.public_repos }}</strong> public repos
  {% endif %}
{% endblock %}
```

The result you can see below:





We can improve the code by treating searches for non-existing username (or empty username) by checking the status of the request (also taking the time to check the number of requests left):

views.py

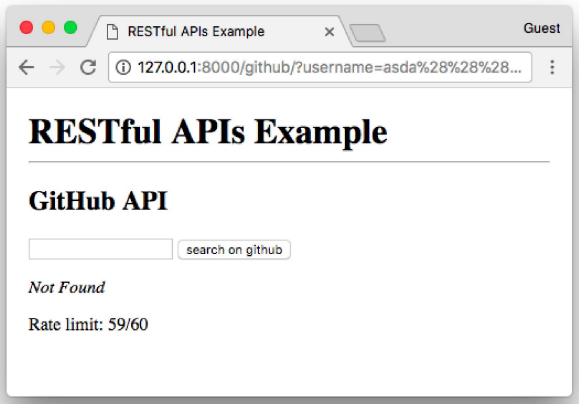
```
def github(request):
    search_result = {}
    if 'username' in request.GET:
        username = request.GET['username']
        url = 'https://api.github.com/users/%s' % username
        response = requests.get(url)
        search_was_successful = (response.status_code == 200)  # 200 = SUCCESS
        search_result = response.json()
        search_result['success'] = search_was_successful
        search_result['rate'] = {
            'limit': response.headers['X-RateLimit-Limit'],
            'remaining': response.headers['X-RateLimit-Remaining'],
        }
    return render(request, 'core/github.html', {'search_result': search_result})
```

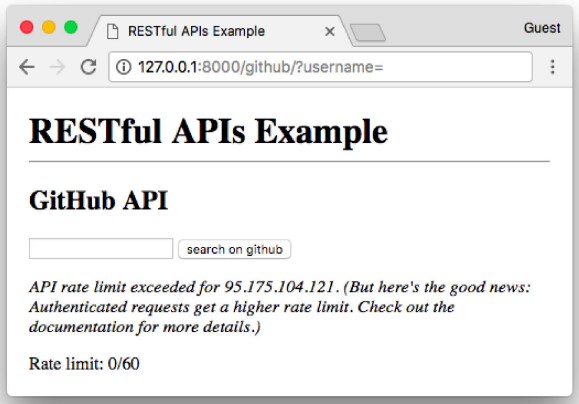
core/github.html

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

{% block content %}
  <h2>GitHub API</h2>
  <form method="get">
    <input type="text" name="username">
    <button type="submit">search on github</button>
  </form>
  {% if search_result %}
    {% if search_result.success %}
      <p>
        <strong>{{ search_result.name|default_if_none:search_result.login }}</strong> has
        <strong>{{ search_result.public_repos }}</strong> public repositories.
      </p>
    {% else %}
      <p><em>{{ search_result.message }}</em></p>
    {% endif %}
    <p>Rate limit: {{ search_result.rate.remaining }}/{{ search_result.rate.limit }}</p>
  {% endif %}
{% endblock %}
```

A small detail here is that I'm using the `default_if_none` template filter to fallback to the user "login" when there is no "name".

Here is how it looks like now:





Using a Client: GitHub Public API

Another way to interact with GitHub services is through an API client. A client is a library implemented in a specific programming language. It's the bridge between your application and the third-party application you are integrating. What an API client does under the hood is basically what we did in the previous sections.

A good Python client for the GitHub API is the PyGithub. You can install it using pip:

```
pip install PyGithub
```

A similar implementation with the same results using the API client:

views.py

```
from django.shortcuts import render
from github import Github, GithubException

def github_client(request):
    search_result = {}
    if 'username' in request.GET:
        username = request.GET['username']
        client = Github()

        try:
            user = client.get_user(username)
            search_result['name'] = user.name
            search_result['login'] = user.login
            search_result['public_repos'] = user.public_repos
            search_result['success'] = True
        except GithubException as ge:
            search_result['message'] = ge.data['message']
            search_result['success'] = False

        rate_limit = client.get_rate_limit()
        search_result['rate'] = {
            'limit': rate_limit.rate.limit,
            'remaining': rate_limit.rate.remaining,
        }

    return render(request, 'core/github.html', {'search_result': search_result})
```

The main difference here is that we use the methods `get_user()` and `get_rate_limit()` to perform the requests.

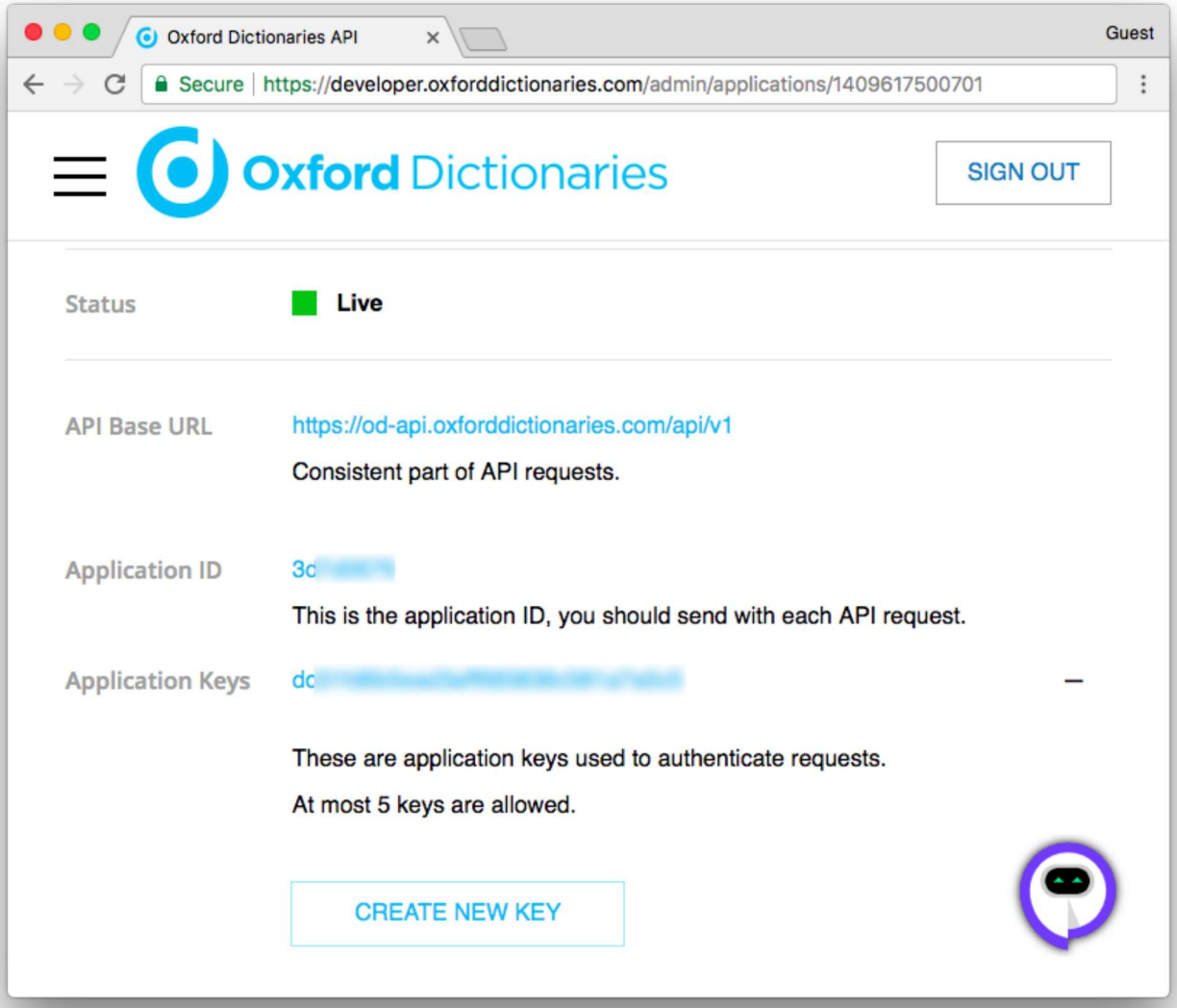
Also, it provides an easy interface to authenticate using username and password or an access token:

```
from github import Github

client = Github('user', 'password')

# or using an access token
client = Github('access_token')
```

Managing API Keys: Oxford Dictionaries API

The example below is to show how to interact with an API that requires authentication using and API Key. Usually, the API provider will ask you to register your application and provide some information. This can vary a lot from provider to provider.

Here I'm going to use the Oxford Dictionary API. It's mainly a paid API, but they also offer a free plan that let's use do a few requests per hour. After you register you will see the information below:



Here we have all the necessary information to connect with their API. To understand better how the authentication process works it's usually a good idea to refer to their documentation. In this case, we need to provide this information in the header of each request we perform.

There is a slight difference between those keys and the Google Maps API key for example. Even though I recommended several time to protect your keys and everything, fact is the Google Maps API key is a different type of key which is meant to be used in the client side (inside the iframe). But in such cases the provider (Google), give you mechanisms to protect your key (for example

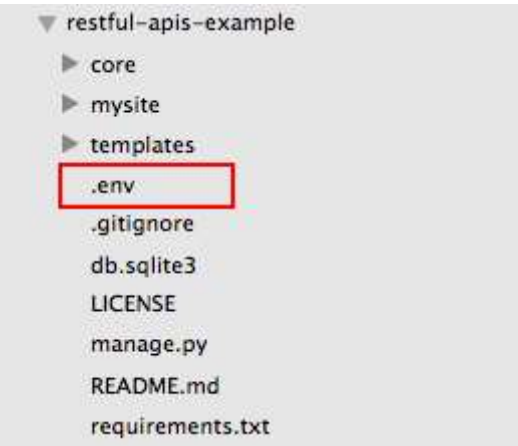
whitelisting domains that can use this particular key). But that's not the case with the Oxford API keys (and majority of the keys you will work). Those are only supposed to be used on the server side.

Here is how I usually protect my keys:

First, install **python-decouple**:

```
pip install python-decouple
```

Now, create a **.env** file in the project root:



In this file, create two environment variables to store the application ID and the application key:

.env

```
OXFORD_APP_ID=EIiHAFqo
OXFORD_APP_KEY=nJzxp5Fk21v7D9ASIWd8Vkhs47C0j6cS
```

Now, in the **settings.py** module, we import the **python-decouple** library and create two settings variables to store this information:

settings.py

```
from decouple import config

# other settings... SECRET_KEY, DEBUG, INSTALLED_APPS etc etc

# at the bottom of the settings.py file:

OXFORD_APP_ID = config('OXFORD_APP_ID', default='')
OXFORD_APP_KEY = config('OXFORD_APP_KEY', default='')
```

Here the `config()` function will search for a **.env** file in the project root, if there is no **.env** file it will fallback to the OS environment variables, if there is no environment variable, it will fallback to the `default` value in the `config()` function. In this case the default value is just an empty string to avoid the application breaking in case you have no API key.

Below, an example implementation of an application that search for words in English and displays its definitions:

forms.py

```
from django import forms
from django.conf import settings
import requests

class DictionaryForm(forms.Form):
    word = forms.CharField(max_length=100)

    def search(self):
        result = {}
        word = self.cleaned_data['word']
        endpoint = 'https://od-api.oxforddictionaries.com/api/v1/entries/{source_lang}/{word_id}'
        url = endpoint.format(source_lang='en', word_id=word)
        headers = {'app_id': settings.OXFORD_APP_ID, 'app_key': settings.OXFORD_APP_KEY}
        response = requests.get(url, headers=headers)
        if response.status_code == 200:  # SUCCESS
            result = response.json()
            result['success'] = True
        else:
            result['success'] = False
            if response.status_code == 404:  # NOT FOUND
                result['message'] = 'No entry found for "%s"' % word
            else:
                result['message'] = 'The Oxford API is not available at the moment. Please try ag
        return result
```

This time we are working inside a form class, which usually is a good place to move processing from the views. The code to consume the API is now inside a form class, where this `search` method will be called only after the form data is validated.

views.py

```
from django.shortcuts import render
from .forms import DictionaryForm

def oxford(request):
    search_result = {}
    if 'word' in request.GET:
        form = DictionaryForm(request.GET)
```

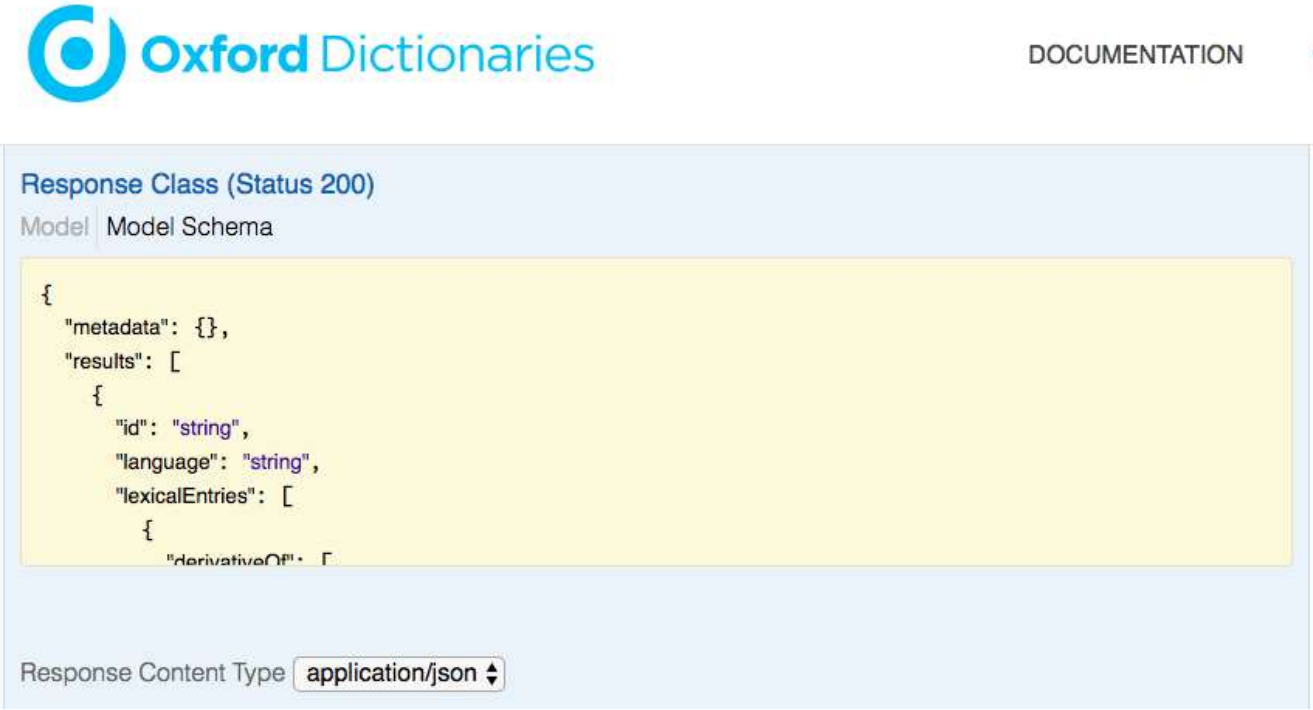
```
        if form.is_valid():
            search_result = form.search()
    else:
        form = DictionaryForm()
    return render(request, 'core/oxford.html', {'form': form, 'search_result': search_result})
```

Finally, the template to display the results:

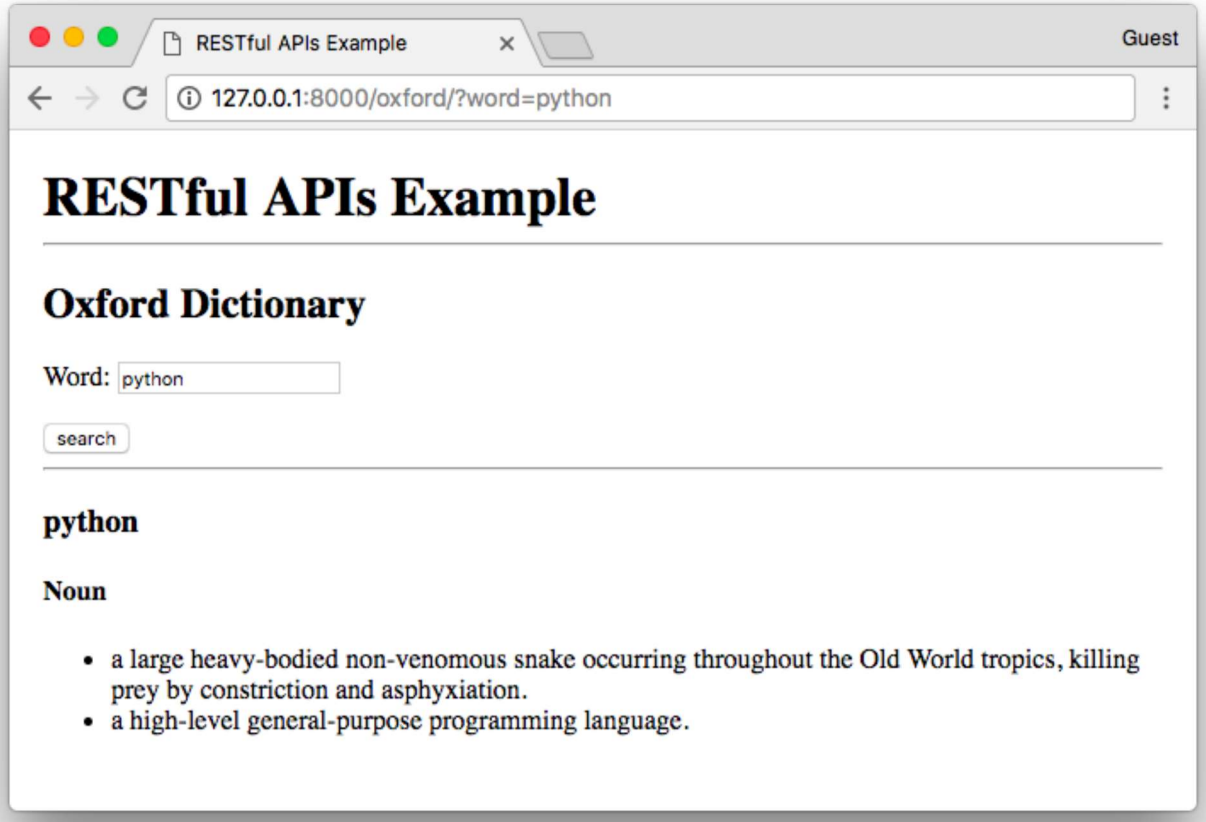
core/oxford.html

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

{% block content %}
  <h2>Oxford Dictionary</h2>

  <form method="get">
    {{ form.as_p }}
    <button type="submit">search</button>
  </form>

  {% if search_result %}
    <hr>
    {% if search_result.success %}
      {% for result in search_result.results %}
        <h3>{{ result.word }}</h3>
        {% for lexicalentry in result.lexicalEntries %}
          <h4>{{ lexicalentry.lexicalCategory }}</h4>
          <ul>
            {% for entry in lexicalentry.entries %}
              {% for sense in entry.senses %}
                {% for definition in sense.definitions %}
                  <li>{{ definition }}</li>
                {% endfor %}
              {% endfor %}
            {% endfor %}
          </ul>
        {% endfor %}
      {% endfor %}
    {% else %}
      <p><em>{{ search_result.message }}</em></p>
    {% endif %}
  {% endif %}

{% endblock %}
```

The template looks complicated but that's how we work out the data returned by the API. We can check its format in the documentation:



And the final result is this:



Conclusions

In this tutorial we explored a few concepts of consuming third-party APIs in a Django application. I just wanted to share some general advices and show some practical code that integrates with external resources. With small amount of code we can already achieve some fun results.

You can see those examples live at restful-apis-example.herokuapp.com.

For the source code, go to github.com/sibtc/restful-apis-example.

If you want some inspiration, or want to build something using some public API, you can visit this list on GitHub which provides a curated list of public APIs.

Be safe and happy coding!

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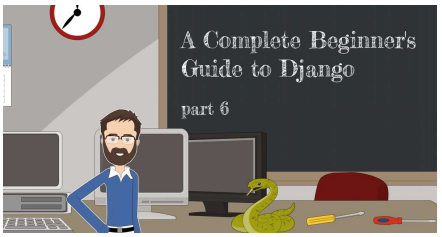
How to Implement Token Authentication using Django REST Framework



A Complete Beginner's Guide to Django - Part 6

django views rest api

Share this post

Mohammad Kamran Hossain • 10 months ago

Hi Victor again great tutorial. I also see the export in excel. I have a question that if I can fetch data from api. How can I export it to excel?

29 ^ | v • Reply • Share ›

ashis kar • a year ago • edited

hey Vitor!! Again a great article simplifying complex concepts. Your blog is boon for beginners like me. Looking forward more such SIMPLE articles. Cheers!

7 ^ | v • Reply • Share ›

abhilash l ➚ ashis kar • a year ago

hey ashis did u susbcribe for ias 4 sure note

^ | v • Reply • Share ›

Farha shazmeen • a year ago

Hi

I tried to execute the 'github.com/sibtc/restful-ap... but i get an error 'KeyError at 'ip'

1 ^ | v • Reply • Share ›

Marcelo C. Lopes • 4 months ago

Hi Victor! Incredible article, I performed the procedures and worked perfectly. I only had one question if I wanted to use 2 fields as I do to represent the character (&) in the url?

```
url = 'https://api.github.com/users/%s' % username
```

thanks !

^ | v • Reply • Share ›

sonia miah • 5 months ago

Hey! How would you store the api responses into your database, using models?

^ | v • Reply • Share ›

Sachin Agarwal • 6 months ago • edited

I loved the post. Wouldn't it be nirvana for us Python developers if the front-end for an API-driven application could be coded in Python like in your post :). Unfortunately the approach in the article means the server does all the work of accessing the REST API (including the blocking IO). The economics of any large scale application on the other hand requires that to be delegated to the client's browser. So I think we are still going to have to look at client side JS frameworks when working with APIs. But your approach is useful when there are very few clients.

^ | v • Reply • Share ›

Dev Universal • 6 months ago

Hey Victor, is it good choice to go with flask rest api framework in django project ?

^ | v • Reply • Share ›

Benekli Fil • 6 months ago

Hi, thanks for the tutorial! I am having difficulty in figuring out why a form is defined in the

forms.py file in the Dictionary example while it is not implemented in the Github example. In both examples we have one field search forms on the view, but the API call is made through the form in the dictionary case. What's the reasoning behind that difference?

Reply • Share ›

Sanjeev Siva • 7 months ago

Amazing post, Really well explained

Reply • Share ›

문제는 사회구조야!! • 7 months ago

How can you do that migration from Csv file?
Looking settings.py, views.py and App's migtate folder files,

But I couldn't find any clue of this!

Reply • Share ›

Weste15 • 10 months ago

Thanks for the great article! I am able to connect to the oxford https url in my code and retrieve data. However when I use another https url, I am receiving an SSL error - Caused by SSLError(SSLError(1, '[SSL: CERTIFICATE_VERIFY_FAILED] certificate verify failed (_ssl.c:748)'),))
Why am I able to connect to the oxford https url but not another https url? How do I resolve this error? Thanks.

Reply • Share ›

Tim Vogt • 10 months ago

great tutorial! but in the example the url is down http://freegeoip.net/shutdown

Reply • Share ›

WellWisher • a year ago

Just a HeadUp
freegoip has been deprecated.

https://github.com/apilayer...

We need to sign up for a new account now and take the free trial plan and the API key.

Reply • Share ›

DjangoUnchained • a year ago

This tutorial was invaluable, thanks a ton!

Reply • Share ›

Nishant Bhardwaj • a year ago

cool ! . Amazong man i didn't know that we can do so much using these api. Thanks again for sharing This kind of stuff.

Reply • Share ›

Anchondo Robert • a year ago

how would you get a list from JSON like lets say you wanted to get all the posts from a blog

not just one kind of like you would do with a model with the Post.objects.all() but with JSON when your using request module to consume a api from another source how would you return a list of posts not just one
Thank you Vitor

Reply • Share ›

Rakibul Bashar • a year ago

Hey vitor!! awesome article but when i fetch data from another url.Data will show but it contain's u(unicode) like u'name':u'value'.I don't want to see my view like this.any helper method to remove u' on template or others solutions.

Reply • Share ›

Lucas • a year ago

Belo post, man!
Brasil ama você! <3

Reply • Share ›

Villancikos • a year ago

Wish someone wrote this when I was starting out with APIS and Django. Super cool post!

Reply • Share ›

Jefferson Marreira • a year ago

Hey Vitor, ótimo artigo, como sempre um material de alta qualidade. Seus artigos tem me ajudado muito. Obrigado por compartilhar conosco um pouco de seu conhecimento. Um abraço do Brasil!

Reply • Share ›

Alibek • a year ago

Thanks for the article, Vitor! Good catch with that HTTP_X_FORWARDED_FOR header. Here is article suggestion for you: How to create Restful APIs with Django. Would love to read about ur approach and practices.

Reply • Share ›

Royhan Anwar ➚ Alibek • a year ago

i think use Django Rest Framework is very very good.
now i'm trying to create Restful APIs with Django to!

Reply • Share ›

Oleg Kleschynov • a year ago

Hey, Vitor! Happy to see you again! Three articles for two weeks - it's amazing!

Reply • Share ›

Vitor Freitas Mod ➚ Oleg Kleschynov • a year ago

Hi Oleg! Thanks buddy! :D

Reply • Share ›

Alex • a year ago

Is using the Requests module Ok? it won't cause the server to freeze until the request finished

processing?

Reply • Share ›

Vitor Freitas Mod → Alex • a year ago

for the most cases it is not! specially because we do not have control over the api or it could take too long to answer, blocking the incoming requests from other visitors.. in a high traffic app it could be a shoot in the foot

for low traffic apps it may be acceptable in some cases

in the next tutorials on restful apis i will explore more about caching, async tasks, how to use celery to execute api queries in the background and how to use it without affecting the performance of the app

1 Reply • Share ›

samuellinde → Vitor Freitas • a year ago

I just saw that Channels 2.0 is out. Having used celery a little bit in the past, I'm curious to see if Channels might be a legitimate alternative for some tasks? Obviously it's meant to solve a whole different set of tasks but it seems very promising.

Btw, I'm trying to wrap my head around Channels/Websockets – if you ever would consider at tutorial on this subject I'd be delighted. :-)

1 Reply • Share ›

Eti Uthakima. • a year ago

Another great one! I recently built a simple Bitcoin tracker with Flask, with this tutorial i feel confident enough to port it to Django and in the process learn the pros and cons of both paths. Thanks.

Reply • Share ›

Vitor Freitas Mod → Eti Uthakima. • a year ago

Nice one, Eti! When it's ready, share it on the comments so we can see your work :D

1 Reply • Share ›

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