SINGAPORE DJANGONAUTS

THE TRIED AND TESTED

AGENDA

- Pizza!
- Welcome to Pivotal Labs
- Django Test Driven Development Cookbook (Martin Brochhaus)
- Discussion & Smalltalk

SINGAPORE DJANGONAUTS

THE DJANGO TEST DRIVEN DEVELOPMENT COOKBOOK

AGENDA

- Project Setup
- Testing Models
- Testing Admins
- Testing Views
- Testing Authentication
- Testing Forms
- Testing POST Requests
- Testing 404 Errors
- Mocking Requests

PROJECT SETUP

- Let’s create a new Django project

```
$ mkvirtualenv tried_and_tested
$ pip install Django
$ django-admin.py startproject tested
```

PROJECT SETUP

- Add a “**test_settings.py**” file

```
$ cd tested/tested
$ touch test_settings.py
```

```
from .settings import *

DATABASES = {
    "default": {
        "ENGINE": "django.db.backends.sqlite3",
        "NAME": ":memory:",
    }
}

EMAIL_BACKEND = 'django.core.mail.backends.locmem.EmailBackend'
```

PROJECT SETUP

- Install pytest & plugins and create "**pytest.ini**"

```
$ pip install pytest
$ pip install ptest-django
$ pip install git+git://github.com/mverteuil/pytest-ipdb.git
$ pip install pytest-cov
$ deactivate
$ workon tried_and_tested
```

```
[pytest]
DJANGO_SETTINGS_MODULE = tested.test_settings
addopts = --nomigrations --cov=. --cov-report=html
```

- Try it!

```
$ py.test
```

PROJECT SETUP

- Create “**.coveragerc**” and try it

```
[run]
omit =
  *apps.py,
  *migrations/*,
  *settings*,
  *tests/*,
  *urls.py,
  *wsgi.py,
  manage.py
```

```
$ py.test
$ open htmlcov/index.html
```

PROJECT SETUP

- We are ready to test!
- py.test will find all files called “**test_*.py**”
- It will execute all functions called “**test_*()**” on all classes that start with “**Test***”

TESTING MODELS

- Install “**mixer**” and create your first app
- Remove “**tests.py**” and create “**tests**” folder instead
- Each Django app will have a “**tests**” folder
- For each code file, i.e. “**forms.py**” we will have a tests file i.e. “**test_forms.py**”

```
$ pip install mixer
$ django-admin.py startapp birdie
$ rm birdie/tests.py
$ mkdir birdie/tests
$ touch birdie/tests/__init__.py
$ touch birdie/tests/test_models.py
```

TESTING MODELS

- The main building block of most apps is a model
- We should start writing a test for our model
- Some models can have many mandatory fields and it can be quite tedious to create values for all those fields. “mixer” will help here.

TESTING MODELS

- Let’s test if the model can be instantiated and saved:

```python
# test_models.py

import pytest
from mixer.backend.django import mixer
pytestmark = pytest.mark.django_db


class TestPost:
    def test_init(self):
        obj = mixer.blend('birdie.Post')
        assert obj.pk == 1, 'Should save an instance'
```

TESTING MODELS

- Try to run your first test

```
E               ValueError: Invalid scheme: birdie.Post
```

- This tells you that you have not created a model named “**Post**” yet
- Also: Make sure to add “**birdie**” to your “**INSTALLED_APPS**” setting

TESTING MODELS

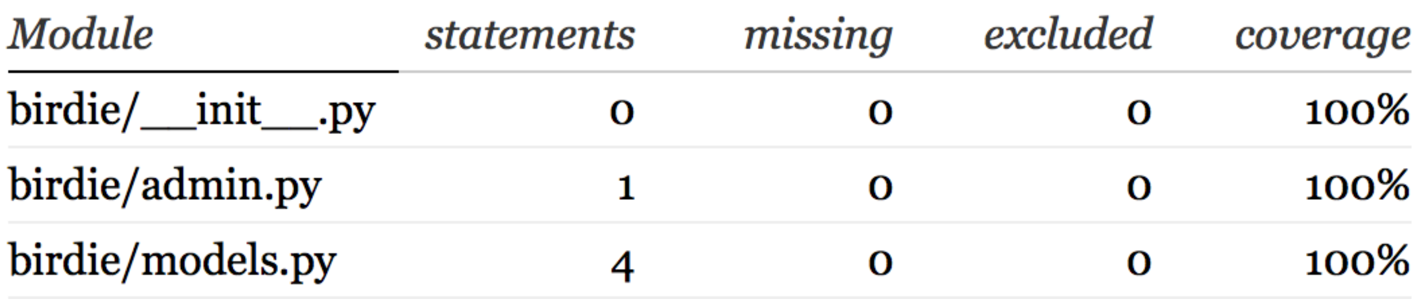
- Implement the model and run your tests again

```
# models.py

from __future__ import unicode_literals
from django.db import models


class Post(models.Model):
    body = models.TextField()
```

- Your test should now pass and you have 100% coverage



Module	*statements*	*missing*	*excluded*	*coverage*
birdie/__init__.py	0	0	0	100%
birdie/admin.py	1	0	0	100%
birdie/models.py	4	0	0	100%

TESTING MODELS

- Imagine a model function that returns truncated body text
- Before you implement the function, you have to write the test
- That means you have to “use” your function before it even exists
- This helps to think deeply about it, come up with a name, with allowed arguments, with type of return value, with different kinds of invocations etc.

TESTING MODELS

- The function shall be called “get_excerpt” and expect one argument:

```
# test_models.py:

def test_get_excerpt(self):
    obj = mixer.blend('birdie.Post', body='Hello World!')
    result = obj.get_excerpt(5)
    expected = 'Hello'
    assert result == expected, (
        'Should return the given number of characters')
```

- Run your tests often and fix each error until they pass

```
E       AttributeError: 'Post' object has no attribute 'get_excerpt'
```

```
E       TypeError: get_excerpt() takes exactly 1 argument (2 given)
```

```
E       AssertionError: Should return the given number of characters
```

```
E       assert None == 'Hello'
```

TESTING MODELS

- Implement the function and run the tests again

```
# models.py

class Post(models.Model):
    body = models.TextField()

    def get_excerpt(self, chars):
        return self.body[:chars]
```

- Your test should now pass and you have 100% coverage

TESTING ADMINS

- We want to show the excerpt in our admin list view
- We need to write a function for this because "**excerpt**" is not a database field on the model
- Whenever we need to write a function, we know: We must also write a test for that function
- In order to instantiate an admin class, you must pass in a model class and an AdminSite() instance

TESTING ADMINS

- Instantiate your admin class and call the new "**excerpt**" function

```
# test_admin.py

import pytest
from django.contrib.admin.sites import AdminSite
from mixer.backend.django import mixer
from .. import admin
from .. import models
pytestmark = pytest.mark.django_db


class TestPostAdmin:
    def test_excerpt(self):
        site = AdminSite()
        post_admin = admin.PostAdmin(models.Post, site)
        obj = mixer.blend('birdie.Post', body='Hello World')

        result = post_admin.excerpt(obj)
        expected = obj.get_excerpt(5)
        assert result == expected, (
            'Should return the result form the .excerpt() function')
```

```
E       AttributeError: 'module' object has no attribute 'PostAdmin'
```

TESTING ADMINS

- Implement the admin and run the tests again

```
# admin.py

from django.contrib import admin
from . import models


class PostAdmin(admin.ModelAdmin):
    list_display = ['excerpt', ]

    def excerpt(self, obj):
        return obj.get_excerpt(5)
admin.site.register(models.Post, PostAdmin)
```

- All tests should pass and you should have 100% coverage

TESTING VIEWS

- We want to create a view that can be seen by anyone
- Django's "**self.client.get()**" is slow
- We will use Django's "**RequestFactory**" instead
- We can instantiate our class-based views just like we do it in our "**urls.py**", via "**ViewName.as_view()**"
- To test our views, we create a **Request**, pass it into our **View**, then make assertions on the returned **Response**.
- Treat class-based views as black-boxes

TESTING VIEWS

- We want to create a view that can be seen by anyone

```
# test_views.py

from django.test import RequestFactory

from .. import views


class TestHomeView:
    def test_anonymous(self):
        req = RequestFactory().get('/')
        resp = views.HomeView.as_view()(req)
        assert resp.status_code == 200, 'Should be callable by anyone'
```

TESTING VIEWS

- Implement the view and run the tests again

```
# views.py

from django.views import generic


class HomeView(generic.TemplateView):
    template_name = 'birdie/home.html'
```

- Your tests should pass with 100% coverage
- This does NOT render the view and test the template
- This does NOT call “**urls.py**”

TESTING AUTHENTICATION

- We want to create a view that can only be accessed by superusers
- We will use the “**@method_decorator(login_required)**” trick to protect our view
- That means, that there must be a “**.user**” attribute on the Request.
- Even if we want to test as an anonymous user, in that case Django automatically attaches a “**AnonymousUser**” instance to the Request, so we have to fake this as well

TESTING AUTHENTICATION

```
# test_views.py

import pytest
from django.contrib.auth.models import AnonymousUser
from django.test import RequestFactory
from mixer.backend.django import mixer
pytestmark = pytest.mark.django_db

from .. import views


class TestAdminView:
    def test_anonymous(self):
        req = RequestFactory().get('/')
        req.user = AnonymousUser()
        resp = views.AdminView.as_view()(req)
        assert 'login' in resp.url, 'Should redirect to login'

    def test_superuser(self):
        user = mixer.blend('auth.User', is_superuser=True)
        req = RequestFactory().get('/')
        req.user = user
        resp = views.AdminView.as_view()(req)
        assert resp.status_code == 200, 'Should be callable by superuser'
```

TESTING AUTHENTICATION

- Implement the view and run the tests again

```
# test_views.py

from django.contrib.auth.decorators import login_required
from django.utils.decorators import method_decorator
from django.views import generic


class AdminView(generic.TemplateView):
    template_name = 'birdie/admin.html'

    @method_decorator(login_required)
    def dispatch(self, request, *args, **kwargs):
        return super(AdminView, self).dispatch(request, *args, **kwargs)
```

TESTING FORMS

- We want to create a form that creates a Post object

```
# test_forms.py

from .. import forms


class TestPostForm:
    def test_form(self):
        form = forms.PostForm(data={})
        assert form.is_valid() is False, (
            'Should be invalid if no data is given')

        data = {'body': 'Hello'}
        form = forms.PostForm(data=data)
        assert form.is_valid() is False, (
            'Should be invalid if body text is less than 10 characters')
        assert 'body' in form.errors, 'Should return field error for `body`'

        data = {'body': 'Hello World!'}
        form = forms.PostForm(data=data)
        assert form.is_valid() is True, 'Should be valid when data is given'
```

TESTING FORMS

- When you implement the form step by step, you will see various test errors
- They guide you towards your final goal

```
E   ImportError: cannot import name forms
```

```
E       AttributeError: 'module' object has no attribute 'PostForm'
```

```
E   ImproperlyConfigured: Creating a ModelForm without either the 'fields'
attribute or the 'exclude' attribute is prohibited; form PostForm needs
updating.
```

```
E       AssertionError: Should be invalid if body text is less than 10
characters
```

TESTING FORMS

- Implement the form and run the tests again

```
# forms.py

from django import forms

from . import models


class PostForm(forms.ModelForm):
    class Meta:
        model = models.Post
        fields = ('body', )

    def clean_body(self):
        data = self.cleaned_data.get('body')
        if len(data) < 10:
            raise forms.ValidationError('Please enter at least 10 characters')
        return data
```

- Your tests should pass with 100% coverage

TESTING POST REQUESTS

- We want to create a view that uses the PostForm to update a Post
- Testing POST requests works in the same way like GET requests
- The next example also shows how to pass POST data into the view and how to pass URL kwargs into the view

TESTING POST REQUESTS

```
# test_views.py

import pytest
from django.test import RequestFactory
from mixer.backend.django import mixer
pytestmark = pytest.mark.django_db

from .. import views


class TestPostUpdateView:
    def test_get(self):
        post = mixer.blend('birdie.Post')
        req = RequestFactory().get('/')
        resp = views.PostUpdateView.as_view()(req, pk=post.pk)
        assert resp.status_code == 200, 'Should be callable by anyone'

    def test_post(self):
        post = mixer.blend('birdie.Post')
        data = {'body': 'New Body Text!'}
        req = RequestFactory().post('/', data=data)
        resp = views.PostUpdateView.as_view()(req, pk=post.pk)
        assert resp.status_code == 302, 'Should redirect to success view'
        post.refresh_from_db()
        assert post.body == 'New Body Text!', 'Should update the post'
```

TESTING POST REQUESTS

- Implement the view

```
# views.py

from django.views import generic

from . import forms
from . import models


class PostUpdateView(generic.UpdateView):
    model = models.Post
    form_class = forms.PostForm
    success_url = '/'
```

- Your tests should pass with 100% coverage

TESTING 404 ERRORS

- Your views will often raise 404 errors
- Unfortunately, they are exceptions and they bubble up all the way into your tests, so you cannot simply check "**assert resp.status_code == 404**"
- Instead, you have to execute the view inside a "with-statement"

TESTING 404 ERRORS

- If the user’s name is “Martin”, the PostUpdateView should raise a 404 error

```
# test_views.py

import pytest
from django.http import Http404
from django.test import RequestFactory
from mixer.backend.django import mixer
pytestmark = pytest.mark.django_db

from .. import views


class TestPostUpdateView:
    def test_security(self):
        user = mixer.blend('auth.User', first_name='Martin')
        post = mixer.blend('birdie.Post')
        req = RequestFactory().post('/', data={})
        req.user = user
        with pytest.raises(Http404):
            views.PostUpdateView.as_view()(req, pk=post.pk)
```

```
E           Failed: DID NOT RAISE
```

TESTING 404 ERRORS

- Update your implementation

```
# views.py

from django.http import Http404
from django.views import generic

from . import models
from . import forms


class PostUpdateView(generic.UpdateView):
    model = models.Post
    form_class = forms.PostForm
    success_url = '/'

    def post(self, request, *args, **kwargs):
        if getattr(request.user, 'first_name', None) == 'Martin':
            raise Http404()
        return super(PostUpdateView, self).post(request, *args, **kwargs)
```

- Your tests should pass with 100% coverage

MOCKING REQUESTS

- We want to implement a Stripe integration and send an email notification when we get a payment
- We will use the official “stripe” Python wrapper
- *Fictional*: We learned from their docs that we can call “**stripe.Charge()**” and it returns a dictionary with “**{‘id’: ‘chargeId’}**”
- How can we avoid making actual HTTP requests to the Stripe API when we run our tests but still get the return dictionary because our view code depends on it?

MOCKING REQUESTS

- We will mock the stripe Python wrapper and create our own expected fake-response

```python
# test_views.py

import pytest
from django.core import mail
from django.test import RequestFactory
from mock import patch
pytestmark = pytest.mark.django_db

from .. import views


class TestPaymentView:
    @patch('birdie.views.stripe')
    def test_payment(self, mock_stripe):
        mock_stripe.Charge.return_value = {'id': '234'}
        req = RequestFactory().post('/', data={'token': '123'})
        resp = views.PaymentView.as_view()(req)
        assert resp.status_code == 302, 'Should redirect to success_url'
        assert len(mail.outbox) == 1, 'Should send an email'
```

MOCKING REQUESTS

- Implement your view

```
# views.py

from django.core.mail import send_mail
from django.shortcuts import redirect
from django.views import generic

import stripe


class PaymentView(generic.View):
    def post(self, request, *args, **kwargs):
        charge = stripe.Charge.create(
            amount=100,
            currency='sgd',
            description='',
            token=request.POST.get('token'),
        )
        send_mail(
            'Payment received',
            'Charge {} succeeded!'.format(charge['id']),
            'server@example.com',
            ['admin@example.com', ],
        )
        return redirect('/')
```

ONE LAST THING

- You can run specific tests like so:

```
py.test birdie/tests/test_views.py::TestAdminView::test_superuser
```

- You can put breakpoints into your tests like so:

```
pytest.set_trace()
```

TO BE CONTINUED…

- Testing Templatetags
- Testing Django Management Commands
- Testing with Sessions
- Testing with Files
- Testing Django Rest Framework APIViews
- Running Tests in Parallel

THANK YOU! ASK ME ANYTHING!

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