

Web Development with Python and Django

Mike Crute • Mike Pirnat • David Stanek

Today

- Iteratively build a full-featured site
- Background for each feature
- Implement a feature
- Review our example solution
 - Keep yours? `git show tag`
 - Follow directly? `git reset --hard tag`



Useful Links

- <http://docs.python.org>
- <https://docs.djangoproject.com>
- <https://github.com/finiteloopsoftware/django-precompiler/wiki>



Let's Have a Show of Hands...

Django



Django?



Django

Django

- A high-level Python web framework
- Encourages rapid development and clean, pragmatic design
- “For perfectionists with deadlines”
- Focus on automation and DRY
- Widely supported, many deployment options



Perhaps You've Heard Of...

- Disqus
- Instagram
- Mozilla
- OpenStack
- Pinterest
- PolitiFact.com
- Rdio



Django

- ORM
- Automatic admin interface
- Regex-based URL design
- Templating system
- Cache infrastructure
- Internationalization
- Command-line job framework



Python

(the Short-Short Version)

Python is...

- Dynamic
- Interpreted
- Duck-Typed
- Object-Oriented
- Functional
- Strongly-Namespaced
- Exceptional
- Comfortable
- Readable
- Opinionated
- Batteries Included
- Community



Interactive Shell

```
$ python  
>>> print "Hello, world!"  
Hello, world!  
>>>
```

```
$ python3  
>>> print("Hello, world!")  
Hello, world!  
>>>
```



Comments

Best. Code. Evar.



Booleans and Null

True

False

None



Strings

`'Hello, world!'`

`"Hello, world!"`

`"""Hello,
world!"""`

`u"Hëllö, wörlD!"`



String Operations

```
"foo" + "bar"
```

```
"foo"[0]
```

```
"foo"[:1]
```

```
"foo".upper()
```

```
"{0}: {1}".format("foo", "bar")
```

```
"{foo}: {bar}".format(foo=42, bar=1138)
```

```
len("foo")
```



Numeric Types

42

42.0

42L



Lists, Tuples, and Sets

```
['a', 'b', 'c']
```

```
('Rush', '2112', 5.0)
```

```
set(['a', 'b', 'c'])
```



Sequence Operations

```
[...][0]
```

```
[...][-1]
```

```
[...][:1] # same as [...][0:1]
```

```
[...].append(4)
```

```
[...].extend([4, 5, 6])
```

```
[...].pop()
```

```
len([...])
```



Dictionaries

```
{'key1': 'value1', 'key2': 'value2'}
```



Dictionary Operations

```
{...}['key1']
```

```
{...}.get('key2', default)
```

```
{...}.keys()
```

```
{...}.values()
```

```
{...}.items()
```

```
len({...})
```



Assignment & Comparison

`foo = 'bar'`

`foo == 'baz'`

`foo != 'baz'`

`foo is None`

`foo is not None`



Flow Control

if expression:

...

elif expression:

...

else:

...



Flow Control

```
for item in sequence:
```

```
    if expression:  
        continue
```

```
    if expression:  
        break
```



Flow Control

while expression:

if expression:
 continue

if expression:
 break



Functions

```
def foo():  
    return 42
```

```
def foo(bar):  
    return bar
```

```
def foo(bar, baz='quux'):  
    return (bar, baz)
```

```
def foo(*args, **kwargs):  
    return (args, kwargs)
```



Decorators

```
@bar  
def foo():  
    return 42
```

```
@baz('xyzz')  
def quux():  
    return 42
```



Classes

```
class Foo(object):  
  
    def __init__(self, bar):  
        self.bar = bar
```



Docstrings

"Modules can have docstrings."

```
class Foo(object):  
    "Classes can have docstrings too."  
  
    def __init__(self, bar):  
        "So can functions/methods."
```



Exceptions

```
try:  
    raise Exception("OH NOES!")  
  
except:  
    log_error()  
    raise  
  
else:  
    do_some_more()  
  
finally:  
    clean_up()
```



Namespaces

```
import logging
```

```
from datetime import timedelta
```

```
from decimal import Decimal as D
```



Introspection

```
>>> dir(Foo)
['__class__', '__delattr__', '__dict__', '__doc__',
 '__format__', '__getattribute__', '__hash__',
 '__init__', '__module__', '__new__', '__reduce__',
 '__reduce_ex__', '__repr__', '__setattr__',
 '__sizeof__', '__str__', '__subclasshook__',
 '__weakref__']
```



Introspection

```
>>> help(Foo)
```

```
Help on class Foo in module __main__:
```

```
class Foo(__builtin__.object)
```

```
|   Classes can have docstrings too.
```

```
|   Methods defined here:
```

```
|   __init__(self, bar)
```

```
|       So can functions/methods.
```

```
|   ...
```

```
|   Data descriptors defined here:
```



And more...

- Generators
- Generator Expressions
- List Comprehensions
- Set Comprehensions
- Dictionary Comprehensions
- Properties
- Context Managers
- Class Decorators
- Abstract Base Classes
- Metaclasses



Style: PEP-8

- No tabs
- Four-space indents
- Don't mix tabs & spaces
- lower_case_methods
- CamelCaseClasses
- Line breaks around 78-79 chars
- Some other OCD-pleasing ideas :-)



Setup

Environment Setup

- Mac or Linux? You've already got Python!
- You'll also need Git if you don't have it; download it from <http://git-scm.com> or use your package manager to install it
- Windows? Well, then...



Windows Setup

- Portable Python and Portable Git
- Won't modify your system at all
- Can be easily uninstalled
- If you want to permanently install Python and Git you can easily do that too



Portable Python 2.7

- Download <http://bit.ly/13eyQGn>
http://ftp.osuosl.org/pub/portablepython/v2.7/PortablePython_2.7.3.1.exe
- Run the .EXE
- Install into c:\django-precompiler
- Download won't work?
ftp://ftp.codemash.org/webdev_with_django



Portable Git

- Download <http://bit.ly/X4dGps>
<http://msysgit.googlecode.com/files/Git-1.8.0-preview20121022.exe>
- Create a new folder
- Extract archive into a new folder:
`c:\django-precompiler\Portable Git
1.8.0-preview20121022`
- Download won't work?
ftp://ftp.codemash.org/webdev_with_dja



Fixing the Path

- Download:
<https://gist.github.com/4399659>
- Save it as a file named run-cmd.bat
- Run it
- Download won't work?
ftp://ftp.codemash.org/webdev_with_django



Installing Packages

- `easy_install`: `easy_install package`
- `pip`: `pip install package`



Installing Packages

- Installed packages go into a site-packages directory in your Python lib
- That's the "system Python" by default
- But different programs may need different versions of packages...
- So we have virtual environments!



Virtual Environments

- virtualenv
- Creates an isolated Python environment with its own site-packages
- Install whatever you want without fouling anything else up



Python 2 or 3?

- The future of Python is Python 3
- Django 1.5 has experimental Python 3 support
- Python 2.7 is still recommended for production applications
- Django 1.6 will fully support Python 3



Activate the Virtual Environment

Mac/Linux/etc...

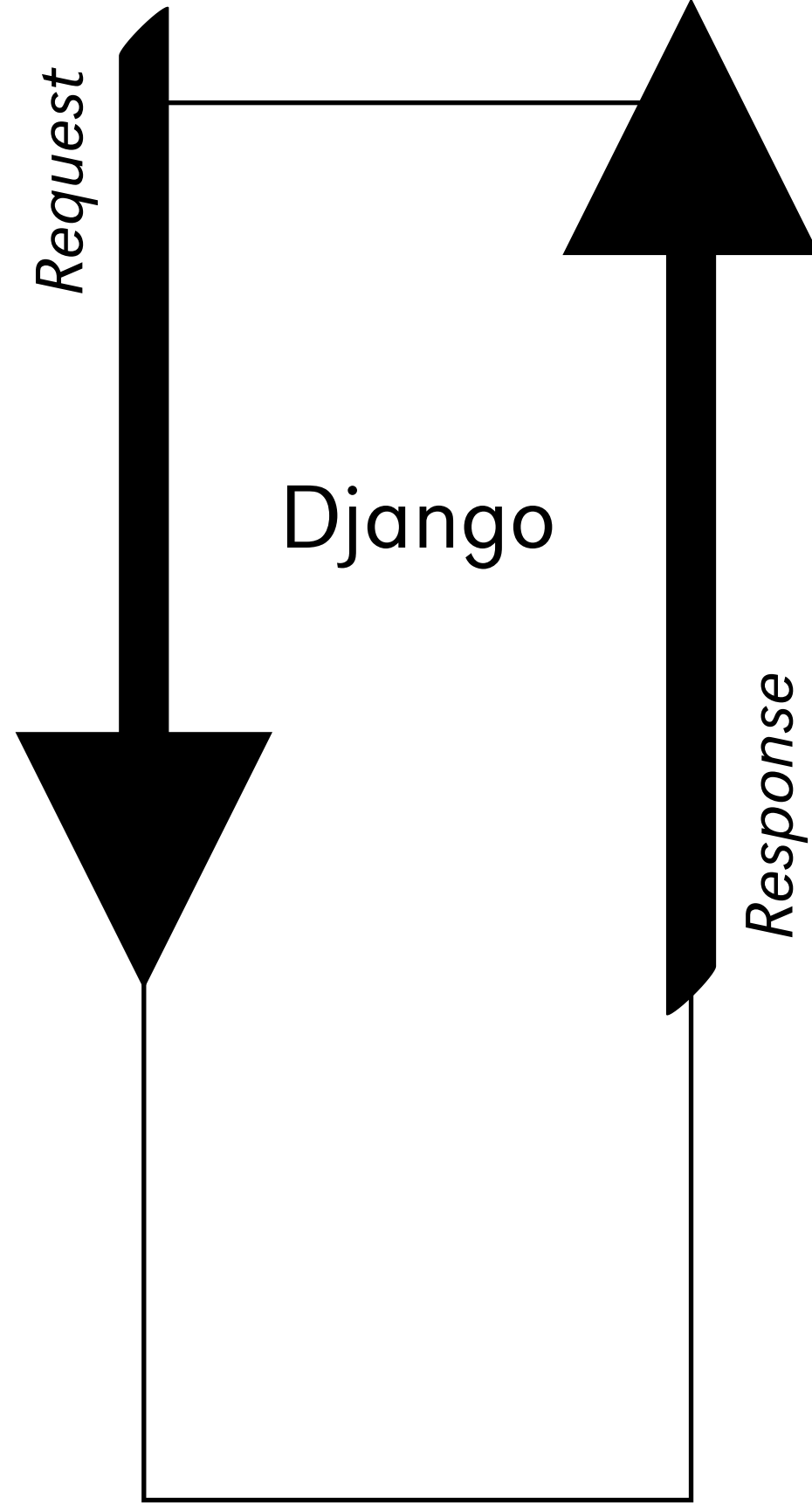
```
$ virtualenv django-precompiler  
$ cd django-precompiler  
$ source bin/activate
```

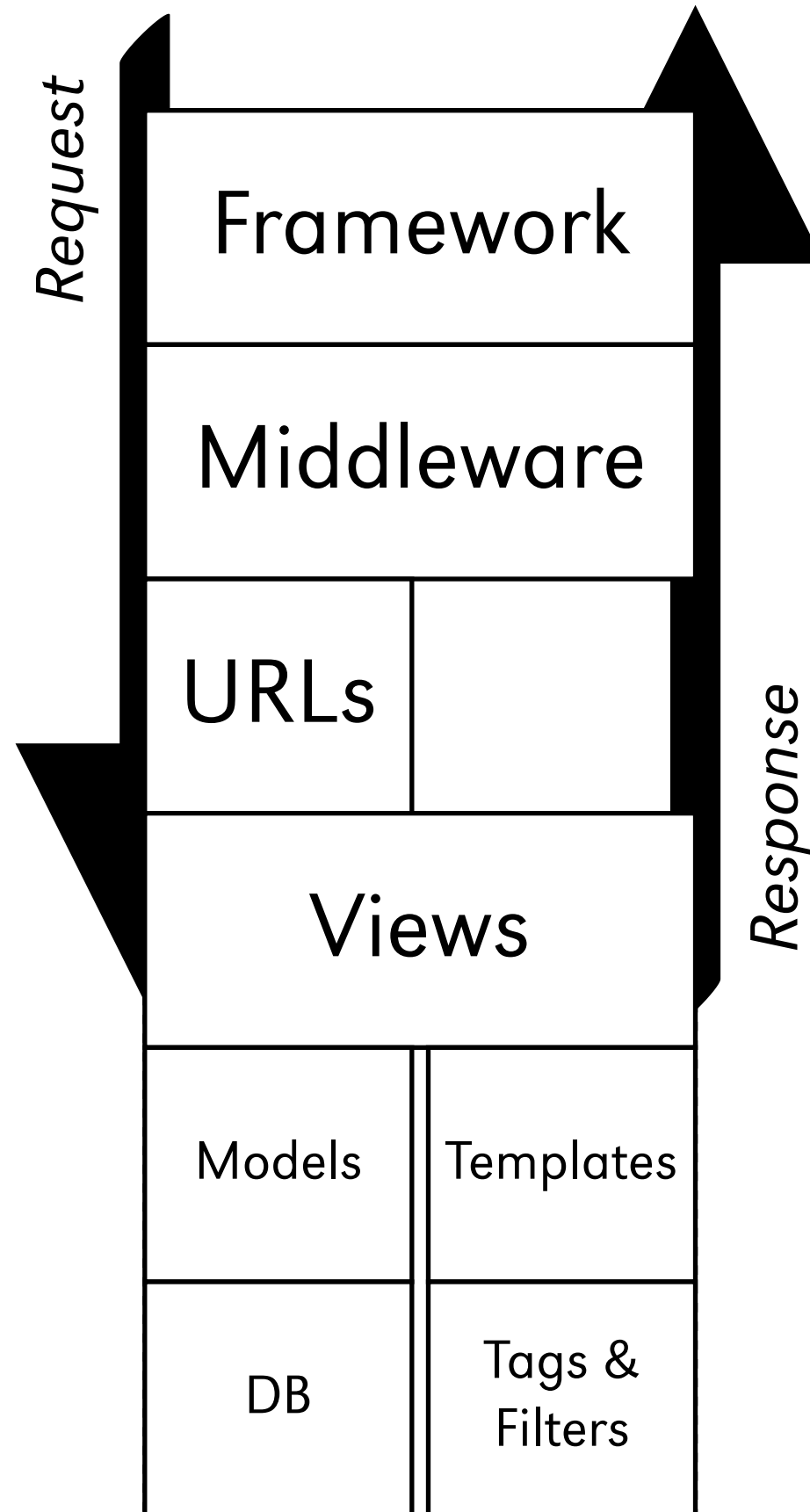
Windows

```
> python virtualenv django-precompiler  
> cd django-precompiler  
> Scripts/activate.bat
```



The Django Stack

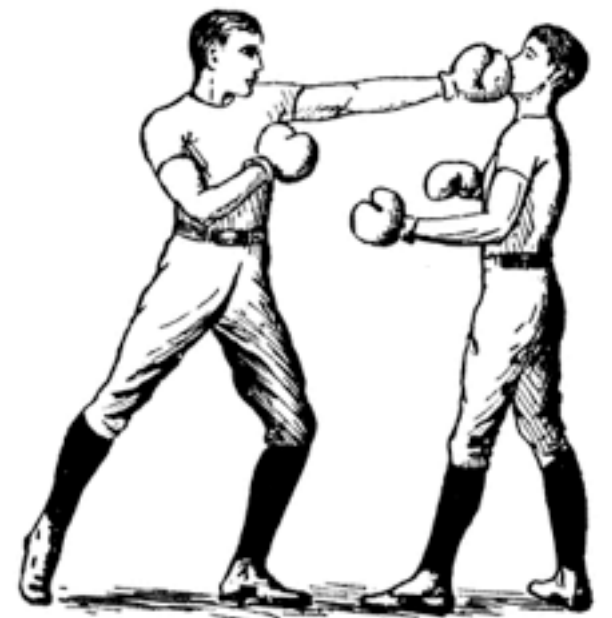




The Project...

CODE SMASH!

- Code Smash is a fictional software development conference for people who need to punch out awesome code
- It needs a website!
- We're going to build one



Starting a Project

Normally...

```
$ git init src
```

Today...

```
$ git clone https://github.com/finiteloopsoftware/  
django-precompiler.git src
```

```
$ cd src
```

```
$ git reset --hard ex00
```



Defining Requirements

- requirements.txt
- A basic example:

MyApp

Framework==0.9.4

Library>=0.2

<http://someserver.org/packages/MyPackage-3.0.tar.gz>



Requirements

- Create a requirements.txt
- Require Django version 1.5; use:
<https://www.djangoproject.com/download/1.5c1/tarball/>



Installing Requirements

```
$ pip install -r requirements.txt
```



Starting a Project

Mac/Linux/etc.

```
$ django-admin.py startproject codesmash ./  
$ python manage.py runserver
```

Windows

```
> python Scripts/django-admin.py startproject codesmash  
> python manage.py runserver
```



New Project Contents

src/

codesmash/

__init__.py

settings.py

urls.py

wsgi.py

manage.py



A Static Home Page

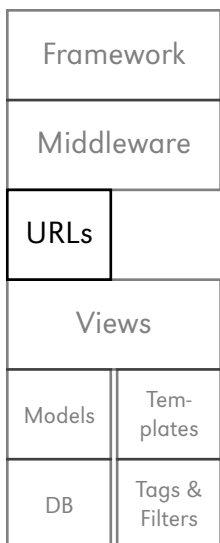
Templates

- Make a templates directory under src:
`$ mkdir templates`
- Update settings to tell Django where to find the templates
- Put an HTML file in the templates directory

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

URLs

- Map URLs in requests to code that can be executed
- Regular expressions!
- Subsections of your site can have their own urls.py modules (more on this later)



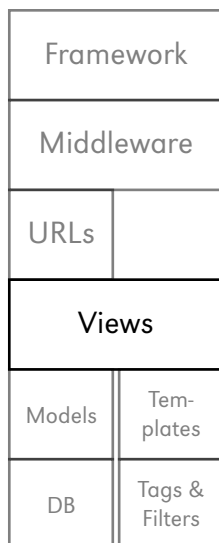
URLs

```
from django.conf.urls import patterns, include, url

urlpatterns = patterns('',
    url(r'^$', 'codesmash.views.home', name='home'),
)
```

Views

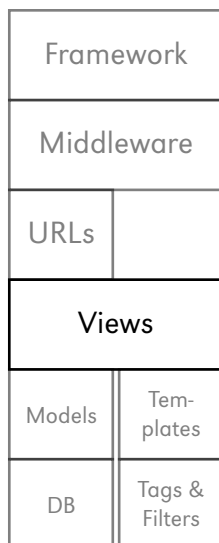
- Code that handles requests
- Other frameworks often call these “controllers”
- Basically a function that:
 - gets a request passed to it
 - returns text or a response



Views

```
from django.http import HttpResponse

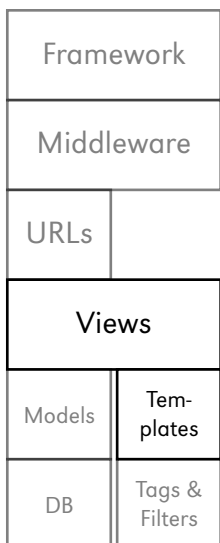
def my_view(request):
    return HttpResponse("Hello, world!")
```



Views

```
from django.http import HttpResponse
from django.template import Context, loader

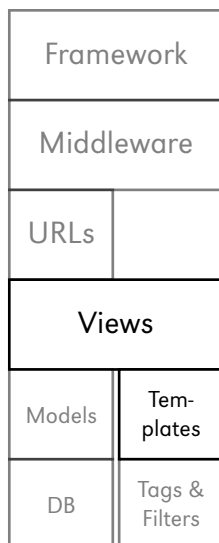
def my_view(request):
    template = loader.get_template('template.html')
    context = Context({ ... })
    return HttpResponse(template.render(context))
```



Views

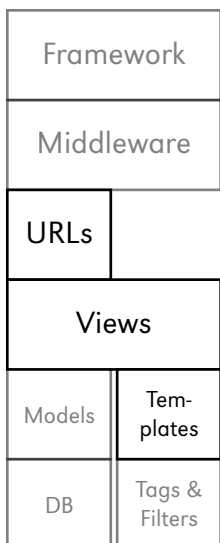
```
from django.shortcuts import render

def my_view(request):
    return render(request, 'template.html', {...})
```



Exercise 1

- Create a template for the homepage
- Create a view that will respond with the rendered template
- Connect the / URL to the view



Let's see the code!

```
git reset --hard ex01
```

Contact Form

Apps

- Django believes strongly in separating chunks of a site into apps that can be reused
- Ecosystem of reusable apps available
- Create an app; from the src directory:

```
$ django-admin.py startapp myapp
```

```
> python Scripts/django-admin.py startapp myapp
```

- Add it to `INSTALLED_APPS` in `settings.py`

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

New App Contents

```
src/  
  codesmash/  
  
  myapp/  
    __init__.py  
    models.py  
    tests.py    <-- you should write them!  
    views.py  
  
    urls.py    <-- you'll want to make one of these  
    forms.py   <-- one of these too  
  
  templates/
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

App URLs

```
from django.conf.urls import patterns, include, url

urlpatterns = patterns('myapp.views',
    url(r'^$', 'my_view', name='my_form'),
    ...
)
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Connecting App URLs

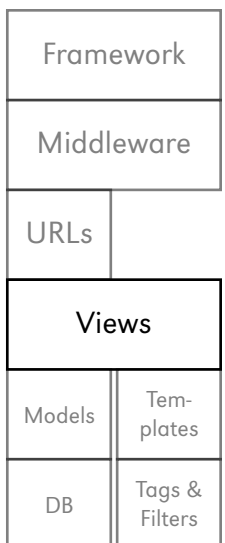
```
# Use include to connect a regex to an app's urls.py  
# Use namespace to keep app URL names nicely isolated
```

```
urlpatterns = patterns('',  
    (r'^myapp/',  
        include('myapp.urls', namespace='myapp')),  
    ...  
)
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Form Validation

- Why?
- Classes for each kind of input field
- Form class to gather input fields
- View method uses the form class to validate inputs



A Very Simple Form

```
from django import forms
```

```
class MyForm(forms.Form):  
    name = forms.CharField(max_length=30)  
    email = forms.EmailField()
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Using a Form in a View

```
from myapp.forms import MyForm

def my_view(request):
    form = MyForm(request.POST or None)
    if request.method == "POST" and form.is_valid():
        name = form.cleaned_data['name']
        email = form.cleaned_data['email']
        # do something great with that data

    return render(request, 'myapp/myform.html', {
        'form': form
    })
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Django Template Language

- Call a function or do logic:

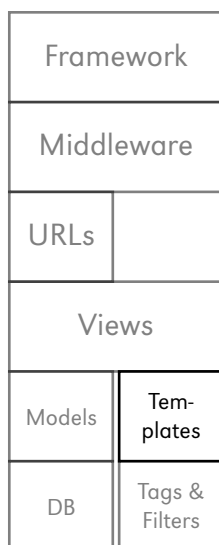
`{% ... %}`

- Variable substitution:

`{{ bar }}`

- Filters:

`{{ foo|bar }}`



Forms in Templates

```
<html>
...
  <body>

    <form action="{% url 'myapp:my_form' %}"
      method="post">
      {% csrf_token %}
      {{ form.as_p }}
      <button type="submit">Go!</button>
    </form>

  </body>
</html>
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Sending Mail

- Add an EMAIL_BACKEND in settings.py

```
EMAIL_BACKEND = \
    'django.core.mail.backends.console.EmailBackend'
```

- Import and use

```
from django.core.mail import send_mail
```

```
send_mail('subject', 'message', 'sender',
          ['recipient', ...])
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Exercise 2

- Create a contact app
- Create a contact form with subject, message, and sender's email address
- Create view to display and process the form and “send” the message
- Connect the view to “/contact” URL

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Let's see the code!

```
git reset --hard ex02
```

Redirecting on Success

- Make the POST action redirect with a GET on successful processing
- Avoid “resubmit form” issues when reloading or returning to success page (browser back button)

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Redirecting

```
from django.shortcuts import redirect

def my_view(request):
    ...
    return redirect('namespace:name')
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Exercise 3

- Make a separate contact form URL and template for displaying a success message
- Update the POST handler to redirect to the success page

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

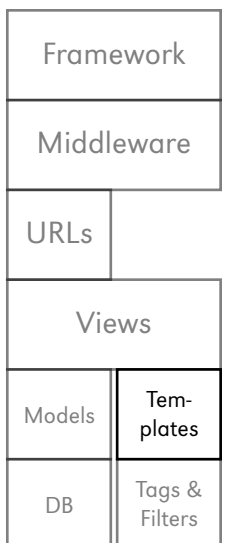
Let's see the code!

```
git reset --hard ex03
```

A Consistent Appearance

Template Inheritance

- Define a base template for the site
- Other templates extend the base template
- Blocks allow child templates to inject content into areas of the parent template



base.html

```
<!DOCTYPE html>
<html>
  <head>
    <meta name="..." content="...">
    <title>{% block title %}My Site{% endblock %}</
title>
  </head>
  <body>
    {% block content %}
    {% endblock %}
  </body>
</html>
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

helloworld.html

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

```
{% block title %}Hello, World{% endblock %}
```

```
{% block content %}
```

```
    <h1>Hey! Great!</h1>
```

```
    <p>Sure is some lovely content right here.</p>
```

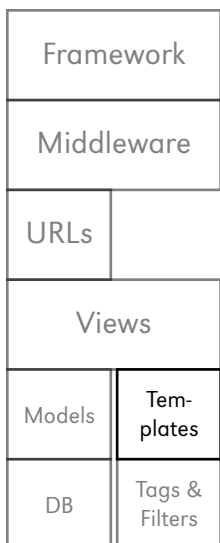
```
    <p>Yup.</p>
```

```
{% endblock %}
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Exercise 4

- Refactor those templates!
- Make a base.html with appropriate blocks
- Make other templates extend it and fill in the blocks



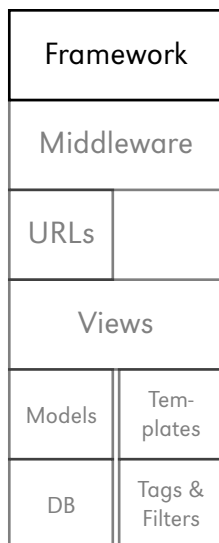
Let's see the code!

```
git reset --hard ex04
```

User Registration

No Need to Reinvent

- Django comes with a robust user framework: `django.contrib.auth`
- Registration
- Login/Logout
- Password Recovery
- Etc.



Database Settings

```
import os

PROJECT_ROOT = os.path.abspath(
    os.path.join(os.path.dirname(__file__), ".."))

DATABASES = {
    'default': {
        'ENGINE': 'django.db.backends.sqlite3',
        'NAME': os.path.join(
            PROJECT_ROOT, "database.db")
    }
}
```

Framework	
Middleware	
URLs	
Views	
Models	Tem- plates
DB	Tags & Filters

Create the Database

```
$ python manage.py syncdb
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Extend the UserCreationForm

```
from django.contrib.auth.forms import UserCreationForm
```

```
class RegistrationForm(UserCreationForm):
```

```
    class Meta(UserCreationForm.Meta):  
        fields = ("username", "email")
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Register the User

```
form = RegistrationForm(request.POST)

if form.is_valid():
    form.save()
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Login After Registration

```
from django.contrib.auth import authenticate, login
```

```
user = authenticate(  
    username=form.cleaned_data['username'],  
    password=form.cleaned_data['password1'])
```

```
login(request, user)
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

The User Object

- Always have one in every request
- Always available to templates
- Can be anonymous or populated depending on whether the user has authenticated

Exercise 5

- Start a new app called “accounts”
- Set up a UserCreationForm subclass in accounts.forms with username and email
- Set up a view that displays the form on GET
- Make the view handle POSTs – check the form, register the user, log in, and redirect to a user profile page
- Profile page should just display username and email
- Set up templates for the form and profile page in templates/accounts/
- Wire up the URLs (be sure to give them names)
- Link to registration from the header

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

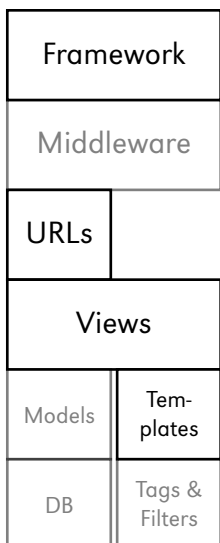
Let's see the code!

```
git reset --hard ex05
```

User Login & Logout

More Reusable Goodness

- `django.contrib.auth` provides URLs and views for login and logout
- Will want to provide our own templates



URLs

```
urlpatterns = patterns('',  
    ...  
    (r'auth/', include('django.contrib.auth.urls',  
        namespace='auth')),  
    ...  
)
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Templates to Override

- templates/registration/login.html
- templates/registration/logged_out.html

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Login/Logout Links

```
{% url 'auth:login' %}
```

```
{% url 'auth:logout' %}
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Differentiate Logged In/Out

```
{% if user.is_authenticated %}  
    ...  
{% else %}  
    ...  
{% endif %}
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Exercise 6

- Enable auth URLs
- Add login and logout links to the site header
- Show login when user is logged out, logout when user is logged in
- Show username in header when user is logged in
- Link to user profile when user is logged in
- Customize login and logout pages

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

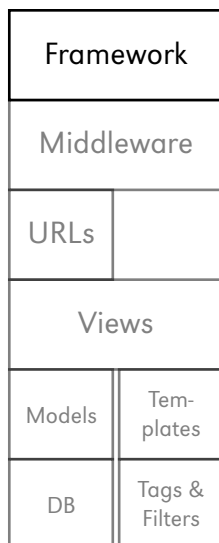
Let's see the code!

```
git reset --hard ex06
```

Django Admin

Django Admin

- Free CRUD!
- Navigate database data by model
- Make changes
- Highly customizable



Enabling the Admin App

- Uncomment admin lines from `INSTALLED_APPS` in `settings.py`
- Uncomment admin lines from the project's `urls.py`
- Mini-exercise: go do that :-)

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Demo Time!

```
git reset --hard ex07
```

CMS Pages

django.contrib.flatpages

- Store simple “flat” HTML pages in the database
- Has a URL, title, and content
- Useful for one-off pages with no logic that don’t deserve full apps
- Add/edit content via the admin app
- Let’s enable it now!

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

settings.py

- Add to INSTALLED_APPS:

```
django.contrib.flatpages
```

- Add to MIDDLEWARE_CLASSES:

```
django.contrib.flatpages.middleware.FlatpageFallback  
Middleware
```

Framework	
Middleware	
URLs	
Views	
Models	Tem- plates
DB	Tags & Filters

urls.py

- Change root URL to use flatpage:

```
url(r'^$', 'django.contrib.flatpages.views.flatpage',  
    {'url': '/' }, name='home')
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Make a Flatpage Template

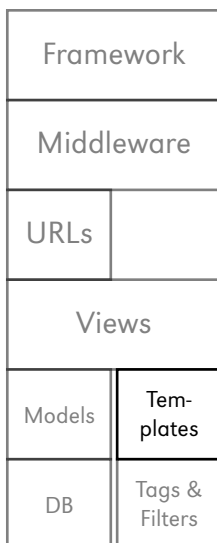
- Put it in templates/flatpages/default.html

- In the title block, add:

```
{{ flatpage.title }}
```

- In the content block, add:

```
{{ flatpage.content }}
```



Let's see the code!

```
git reset --hard ex08
```

Meanwhile, in the admin app...

Conference Talks:

An App with a Custom Data Model

Models

- Model classes are the nouns of the system
- Used to create database tables
- Integrated with the ORM to interact with the database
- Need to ``python manage.py syncdb`` when adding a new model class

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Models

```
from django.db import models

class Thingy(models.Model):

    name = models.CharField(max_length=255)
    awesome = models.BooleanField(default=True)
    description = models.TextField(blank=True)

    def __str__(self):
        return self.name

    def __unicode__(self):    # note: not in Python 3
        return unicode(str(self))
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Exercise 9

- Create a “talks” app to manage talks
- Create a Talk model; it should have:
 - title - up to 255 characters
 - approved - true or false, default false
 - recording_release - true or false, default false
 - abstract - text describing the talk
 - outline - text outlining the talk
 - notes - text about the talk that won't be public

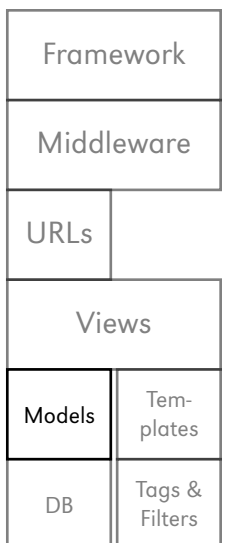
Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Let's see the code!

```
git reset --hard ex09
```

Wiring the Model for Admin Access

- Each app manages its own admin wiring
- Goes into an `admin.py` within the app



admin.py

```
from django.contrib import admin  
from myapp.models import Thingy
```

```
admin.site.register(Thingy)
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Exercise 10

- Create an admin.py for the talks app
- Register the Talk model
- Start up the admin app and verify that Talks appears

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Let's see the code!

```
git reset --hard ex10
```

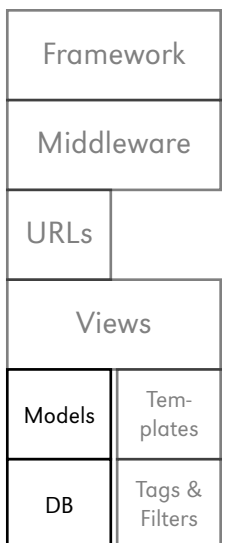
Pluralize All the Thingys!

```
class Thingy(model.models):  
    ...  
  
    class Meta:  
        verbose_name_plural = "Thingies"
```

Framework	
Middleware	
URLs	
Views	
Models	Tem- plates
DB	Tags & Filters

Relations

- Foreign key (one-to-many)
- Many-to-many



Foreign Key Relations

```
class Thingy(models.Model):  
    ...  
  
class Gadget(models.Model):  
    ...  
  
class Gizmo(models.Model):  
    thingy = models.ForeignKey(Thingy)  
  
    gadget = models.ForeignKey(Gadget,  
                                blank=True, null=True)
```

Framework	
Middleware	
URLs	
Views	
Models	Tem- plates
DB	Tags & Filters

Many-to-Many Relations

```
class Thingy(models.Model):  
    ...  
  
class Gizmo(models.Model):  
    thingies = models.ManyToManyField(Thingy)
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Saving a Model Object

```
thingy = Thingy()  
thingy.size = 'big'  
thingy.save()
```

```
gadget = Gadget(thingy=thingy)  
gadget.save()
```

```
gizmo = Gizmo(thingies=[thingy])  
gizmo.save()
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Exercise 11

- Create new model classes for foreign keys:
 - Category
 - Talk Type
 - Audience Skill Level
 - Location
 - Time Slot
- All should have a name, up to 255 characters
- All should have a `__str__`; Time Slot's should use `strftime` (see strftime.net)
- Location and Time Slot should be optional
- Do a many-to-many on `django.contrib.auth.models.User` for talk speakers

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Let's see the code!

```
git reset --hard ex11
```


Meanwhile, in the admin app...

Changing Existing Models

- Adding/removing/changing fields in a model requires a schema migration
- Django doesn't support it out of the box
- Pro mode: use South

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Cheesy Precompiler Way

```
$ ./manage.py dbshell
```

```
> DROP TABLE talks;
```

```
$ ./manage.py syncdb
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Querying the Model

```
all_thingies = Thingy.objects.all()
```

```
single_thingy = Thingy.objects.get(id=1)
```

```
big_thingies = Thingy.objects.filter(size='big')
```

```
ordered_thingies = Thingy.objects.all().order_by('size')
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

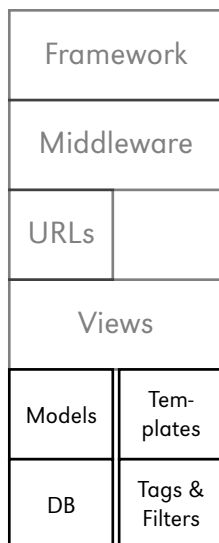
Relations in Templates

- When a model object retrieved from the ORM has relations, you get a relation manager and not an actual iterable collection
- Need to call `.all()` (or `get` or `filter`) on it before you get back the related model objects

Framework	
Middleware	
URLs	
Views	
Models	Tem- plates
DB	Tags & Filters

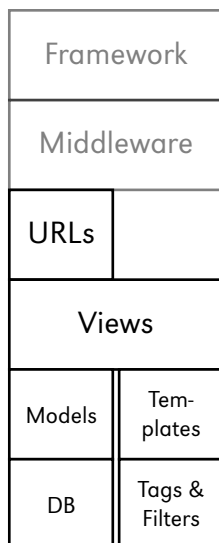
Relations in Templates

```
{% for gizmo in gizmos %}  
    {% for thingy in gizmo.thingies.all %}  
        ...  
    {% endfor %}  
{% endfor %}
```



Exercise 12

- Create a view and template to display a list of all talks, ordered by title
- Be sure to display all of the talk speakers



Let's see the code!

```
git reset --hard ex12
```

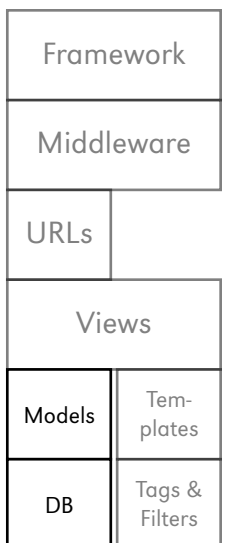

Optimizing Queries

- What we just did will make lots of extra database queries (because of the loops)
- Go read up on:
 - `select_related`: does a join in SQL
 - `prefetch_related`: queries in advance, caches results, allows “join” in Python



Model Managers

- A place to encapsulate data queries
- Extend to provide extra queries with developer-friendly interfaces



Model Managers

```
class ThingyManager(models.Manager):  
  
    def big_ones(self):  
        return self.get_query_set().filter(size='big')  
  
    def of_color(self, color):  
        return self.get_query_set().filter(color=color)  
  
class Thingy(models.Model):  
  
    objects = ThingyManager()
```

Framework	
Middleware	
URLs	
Views	
Models	Tem- plates
DB	Tags & Filters

Using a Model Manager

```
big_thingsies = Thingy.objects.big_ones()
```

```
green_thingsies = Thingy.objects.of_color('green')
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Exercise 13

- Move the queries from the previous exercise into a TalkManager
- Change the queries to only get talks that have been approved

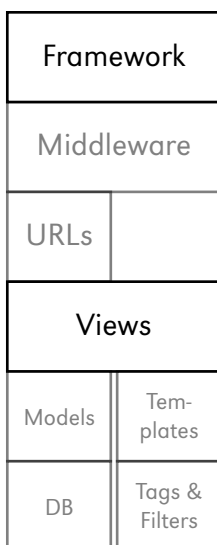
Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Let's see the code!

```
git reset --hard ex13
```

Generic Views

- Many views fall into the same patterns
- Django provides generic view classes for things like showing a list of objects, creating an object, updating an object, deleting, etc.
- Subclass and set properties or override certain methods to customize



Generic List Views

```
from django.views.generic import ListView
```

```
class ThingyListView(ListView):
```

```
    queryset = Thingy.objects.all()
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Generic List View URLs

```
from django.conf.urls import patterns, include, url
from myapp.views import ThingyListView
```

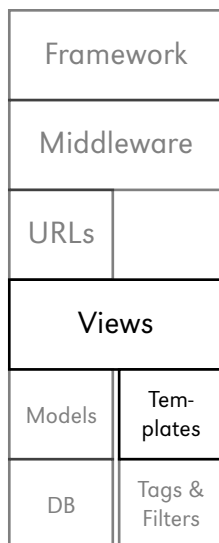
```
urlpatterns = patterns('myapp.views',
    ...
    url(r'^$', ThingyListView.as_view(), name='things')
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Generic List View Templates

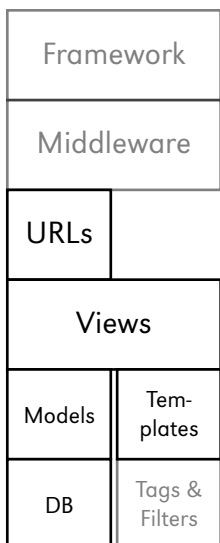
- Generic List Views are automatically wired to templates
- Naming convention: lowercase model name + “_list.html”, eg:

`templates/myapp/thingy_list.html`



Exercise 14

- Replace the view that lists talks with a generic list view
- Redo the URL mapping to use your new generic list view subclass

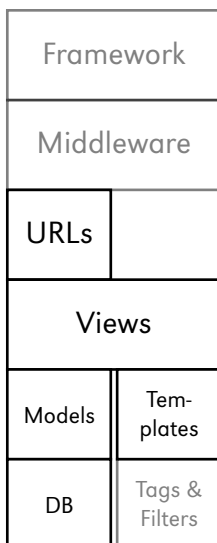


Let's see the code!

```
git reset --hard ex14
```

Can You Guess What's Next?

- Need to create new talks
- We could do it the hard way...
 - Make a Form
 - Make a View
 - Read validated data, put it into a model object
 - Save the model, redirect...



Model Forms

```
from django import forms
from myapp.models import Thingy
```

```
class ThingyForm(forms.ModelForm):

    class Meta:
        model = Thingy
        exclude = ('flavor', 'user')
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Generic Create Views

```
from django.views.generic.edit import CreateView
from myapp.forms import ThingyForm
```

```
class ThingyCreationView(CreateView):
```

```
    model = Thingy
```

```
    form_class = ThingyForm
```

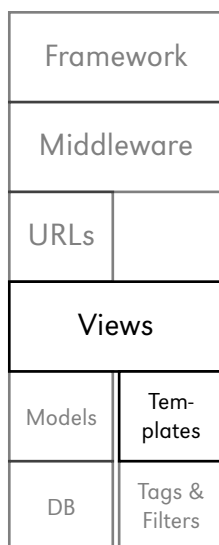
```
    success_url = "/accounts/profile"
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Generic Create View Templates

- Generic Create Views are automatically wired to templates
- Naming convention: lowercase model name + “_form.html”; eg:

`templates/myapp/thingy_form.html`



Exercise 15

- Make a Generic Create View and Model Form to submit new talk proposals
- Exclude approval status, location, and time slot (since the speaker doesn't control them)
- Be sure to connect a "create" URL to the new Generic Create View
- Don't forget a template!
- Link to the create form from user profile
- List user's submitted talks on user profile

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Let's see the code!

```
git reset --hard ex15
```

Generic Edit Views

```
from django.shortcuts import resolve_url
from django.view.generic.edit import UpdateView

from myapp.forms import ThingyForm

class ThingyUpdateView(UpdateView):

    form_class = ThingyForm
    queryset = Thingy.objects.all()

    def get_success_url(self):
        return resolve_url('myapp:thingy')

    def get_context_data(self, **kwargs):
        context = super(ThingyUpdateView, self).get_context_data(**kwargs)
        context['editing'] = True
        return context
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Generic Edit View URLs

```
from django.conf.urls import patterns, include, url
from myapp.views import ThingyUpdateView
```

```
urlpatterns = patterns('myapp.views',
    ...
    url(r'(?P<pk>[0-9]+)$', ThingyUpdateView.as_view(),
        name='update'),
)
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Exercise 16

- Create a Generic Edit View for talks
- Use the Model Form from the previous exercise
- Be sure to wire it to a URL for editing
- Change the existing template to indicate whether we're editing or creating

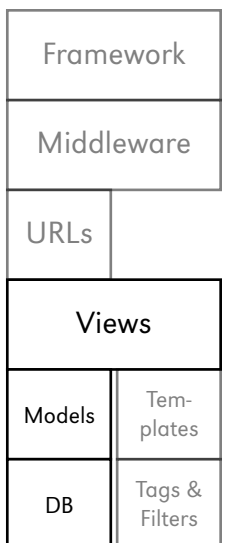
Framework	
Middleware	
URLs	
Views	
Models	Tem- plates
DB	Tags & Filters

Let's see the code!

```
git reset --hard ex16
```

Security in Views

- Can you spot a security problem in the previous exercise?
- Anyone can edit any talk!
- Generic views can restrict access by limiting the queryset available in the view



Restricting Object Access

```
# In models.py...
class ThingyManager(models.Manager):

    def for_user(self, user):
        return self.get_queryset().filter(user=user)
```

```
# In views.py...
class ThingyUpdateView(UpdateView):

    def get_queryset(self):
        return Thingy.objects.for_user(
            self.request.user)
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Exercise 17

- Lock down the update view from the previous exercise so that a talk may only be edited by its speakers

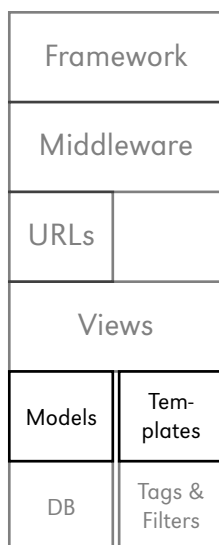
Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Let's see the code!

```
git reset --hard ex17
```

Read-Only Data in Generic Edit Views

- Model Form automatically builds form elements for everything in the model
- Model Form excludes anything that it was told to exclude
- Excluded fields are still available as attributes of a variable called “object” (the object being displayed/edited)



Read-Only Data in Generic Edit Views

```
<form ...>
  {% csrf_token %}

  {{ form.as_p }}

  <p><input type="text" id="flavor"
    value="{{ object.flavor }}" disabled ></p>

  <input type="submit" value="Save Changes">
</form>
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Exercise 18

- Change the talk form from the previous exercises
- Show time slot, location, and approval status without allowing them to be modified

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Let's see the code!

```
git reset --hard ex18
```

Requiring Login

```
from django.contrib.auth.decorators import \
    login_required
```

@login_required

```
def my_login_only_view(request):
    return render(request, "myapp/my_view.html")
```

Framework	
Middleware	
URLs	
Views	
Models	Tem- plates
DB	Tags & Filters

Exercise 19

- Require login on the user profile page

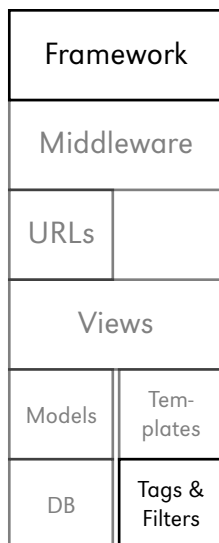
Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Let's see the code!

```
git reset --hard ex19
```

Custom Template Filters

- Django comes with many filters
- You can add your own
- Function that accepts a value and returns a string



Defining a Custom Filter

```
# In myapp/templatetags/myfilters.py...
```

```
from django import template
from django.utils.html import format_html
```

```
register = template.Library()
```

```
@register.filter
def my_filter(value):
    ...
    return format_html("...")
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Using a Custom Filter

```
{% load myfilters %}
```

```
{% block content %}
```

```
    <p>{{ foo|my_filter }}</p>
```

```
    <p>{{ bar }}</p>
```

```
{% endblock %}
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Exercise 20

- Create a custom filter function “boolean_icon” that will show one image if a value is True and another if it’s False
- Use the boolean_icon in the user’s profile to indicate whether a talk has been approved
- Use static icons from the admin site:

```
from django.contrib.admin templatetags.admin_static import static

icon_url = static('admin/img/icon-{0}.gif'.format(
    {True: 'yes', False: 'no', None: 'unknown'}[value]))
```

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

Let's see the code!

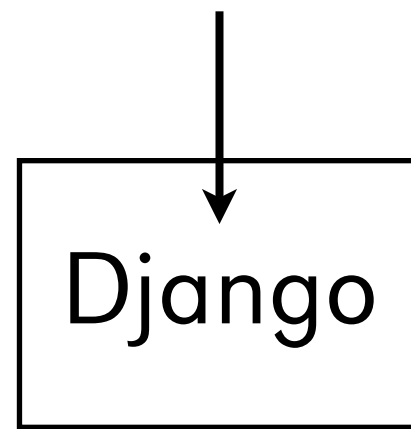
```
git reset --hard ex20
```

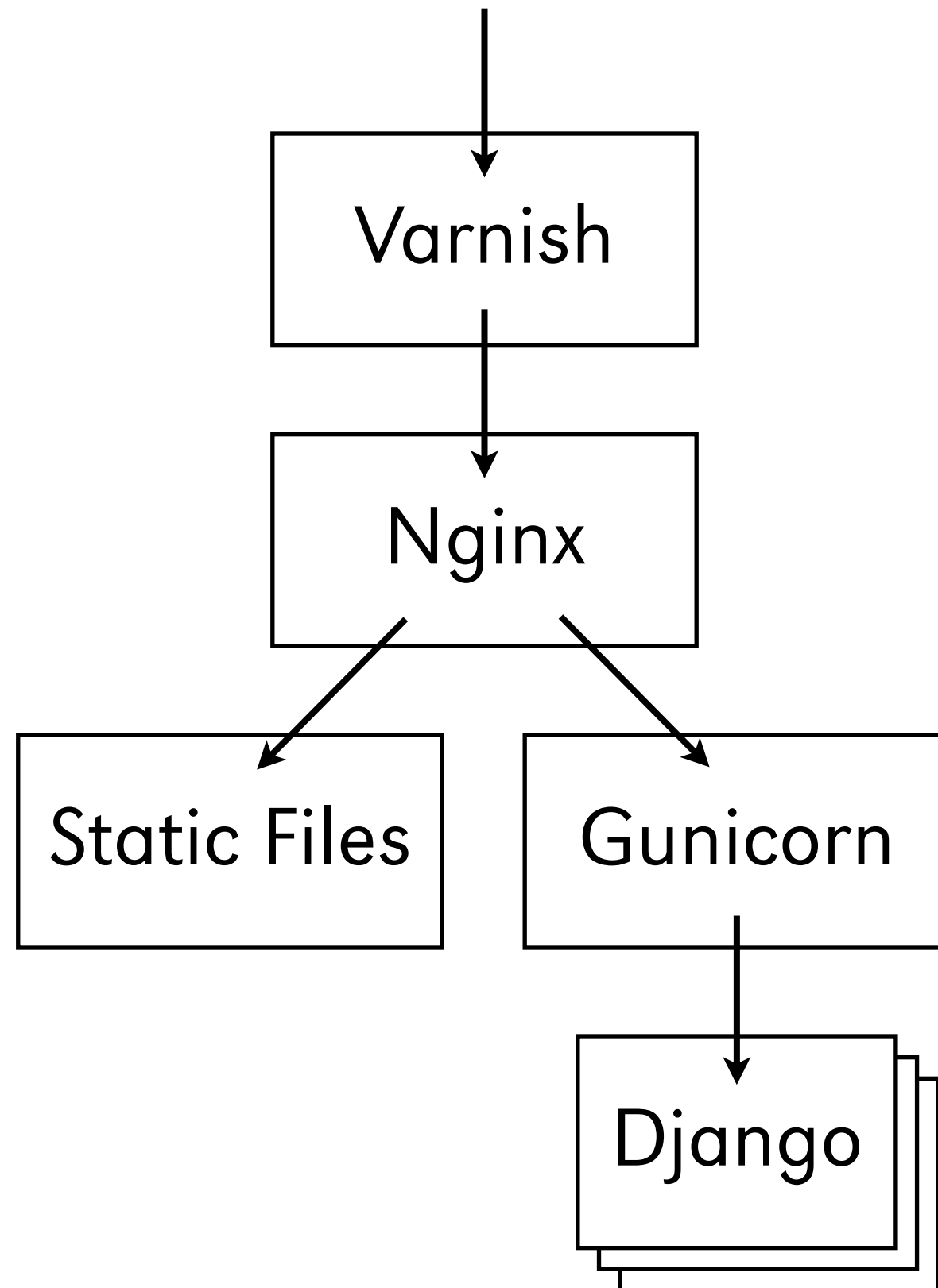
Bonus Exercises

- Show talks by time slot and/or location
- Blog; include RSS feed
- Sponsorship; include sponsor image upload and display
- Enhance user profiles; include image upload, default to Gravatar
- Room swap/ticket swap

Framework	
Middleware	
URLs	
Views	
Models	Tem-plates
DB	Tags & Filters

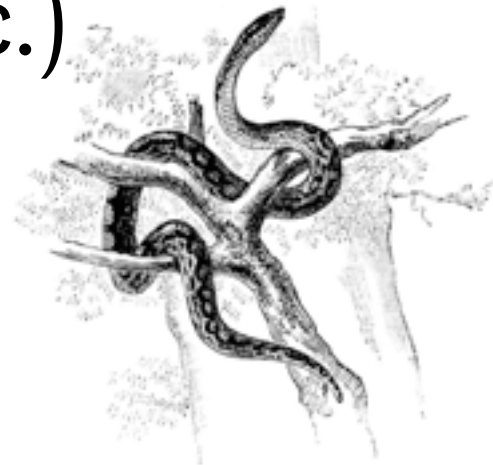
A Little Bit About Deployment





Where to Deploy

- Gondor.io
- Heroku
- Webfaction
- Google App Engine
(if that's what you're into)
- Your favorite VPS (Rackspace, AWS, etc.)



Questions?

Links

- <http://python.org>
- <https://djangoproject.com>
- <https://github.com/finiteloopsoftware/django-precompiler>



Credits

- Image from *Django Unchained* by Sony Pictures

<http://www.nydailynews.com/entertainment/tv-movies/django-star-foxx-life-built-race-article-1.1220275>

- Image of Django Reinhardt by ~Raimondsy

<http://raimondsy.deviantart.com/art/Django-Reinhardt-314914547>

- Other images from ClipArt Etc.

<http://etc.usf.edu/clipart/>



Contact Information

Mike Crute

Finite Loop Software

<http://mike.crute.org>

@mcrute

David Stanek

American Greetings

<http://traceback.org>

@dstanek

Mike Pirnat

American Greetings

<http://mike.pirnat.com>

@mpirnat



**Thanks for coming
& happy hacking!**