

# A Related Matter:

Optimizing your webapp by using django-debug-toolbar,  
`select_related()`, and `prefetch_related()`

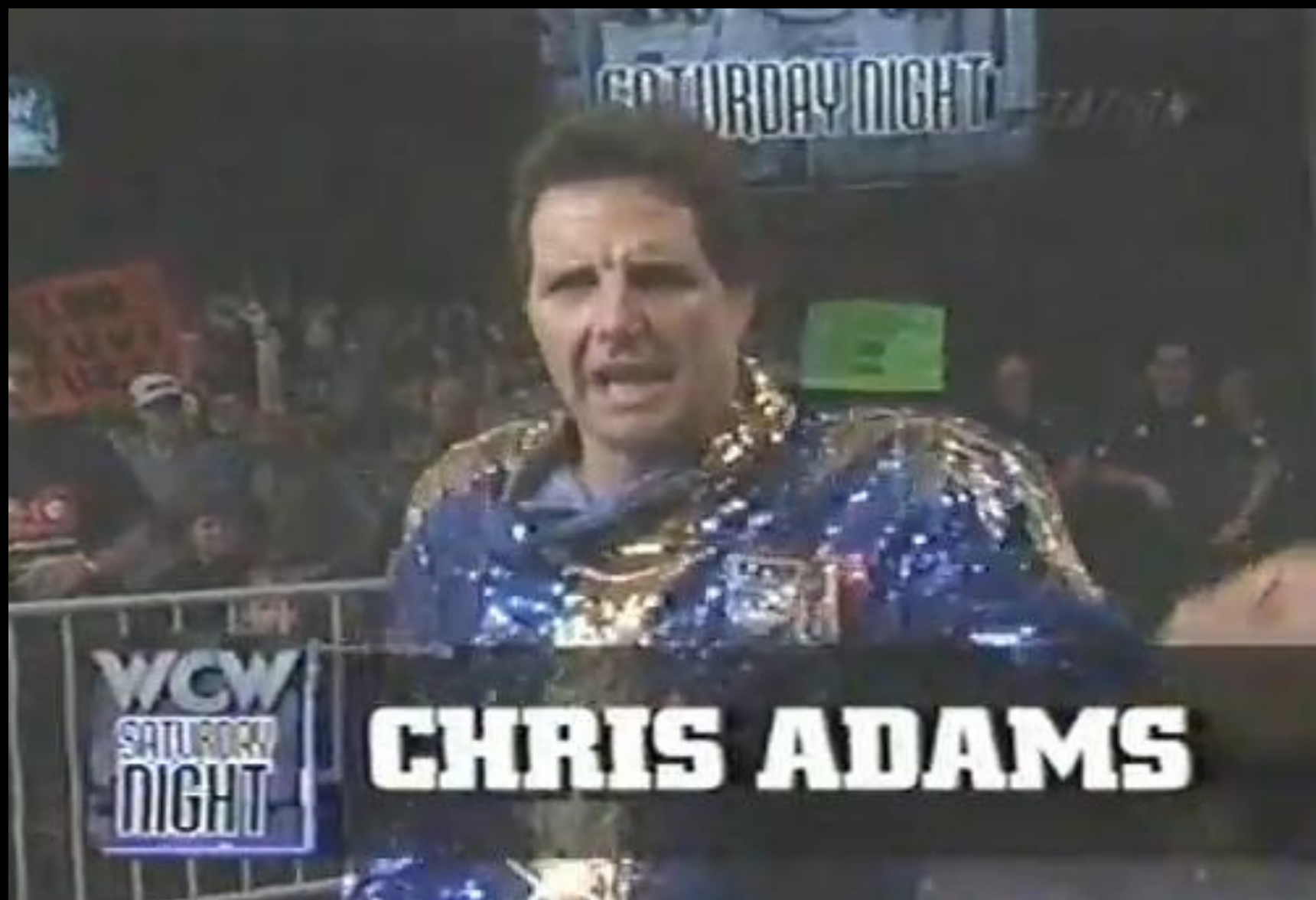
Christopher Adams  
DjangoCon 2024

[github.com/adamsc64/a-related-matter](https://github.com/adamsc64/a-related-matter)

`christopheradams.info`

# Christopher Adams

- Currently at GitHub, previously at Venmo
- @adamsc64
- I'm not Chris Adams (@acdha), who works at Library of Congress
- Neither of us are "The Gentleman" Chris Adams (90's-era Professional Wrestler)



**CHRIS ADAMS**

The Django logo, featuring the word "django" in a white, lowercase, sans-serif font, centered within a dark green rounded rectangle.

django

Django is great

But Django is really a set of tools



# Tools are great

But tools can be used in good or bad ways

# The Django ORM:

## A set of tools

# Manage your own expectations for tools

- Many people approach a new tool with broad set of expectations as to what they think it will do for them.
- This may have little correlation with what the project actually has implemented.

As amazing as it  
would be if they did...



# Unicorns don't exist



# The Django ORM: An abstraction layer

# Abstraction layers

- Great because they take us away from the messy details
- Risky because they take us away from the messy details



# Don't forget

You're far from the ground

# The QuerySet API

QuerySets are Lazy

QuerySets are  
Immutable

Lazy: Does not evaluate  
until it needs to



Immutable: Never  
itself changes

# Each a new QuerySet, none hit the database

- `queryset = Model.objects.all()`
- `queryset = queryset.filter(...)`
- `queryset = queryset.values(...)`

# Hits the database (QuerySet is “evaluated”):

- `queryset = list(queryset)`
- `queryset = queryset[:]`
- `for model_object in queryset:`
- `if queryset:`

Our app:  
blogs hosting site

# Models

```
class Blog(models.Model):  
    submitter = models.ForeignKey('auth.User')  
  
class Post(models.Model):  
    blog = models.ForeignKey('blog.Blog', related_name='posts')  
    likers = models.ManyToManyField('auth.User')  
  
class PostComment(models.Model):  
    submitter = models.ForeignKey('auth.User')  
    post = models.ForeignKey('blog.Post', related_name='comments')
```

# List View

```
def blog_list(request):  
    blogs = Blog.objects.all()  
    return render(request, "blog/blog_list.html", {  
        "blogs": blogs,  
    })
```

# List Template

```
1 {% for blog in blogs %}
2   <li>
3     <a href="{% url 'blog_detail' blog.id %}">
4       {{ blog.name }}
5     </a>
6     | submitted by {{ blog.submitter.username }}
7   </li>
8 {% endfor %}
```

# Blogs:

- [dolor](#) | submitted by James
- [Duis](#) | submitted by Thomas
- [qui](#) | submitted by Isabella
- [irure](#) | submitted by Jack
- [magna](#) | submitted by Lachlan
- [occaecat](#) | submitted by Emma
- [reprehenderit](#) | submitted by James
- [Excepteur](#) | submitted by Oliver
- [non](#) | submitted by Noah
- [dolor](#) | submitted by William
- [veniam,](#) | submitted by Oliver
- [proident,](#) | submitted by Ella
- [aute](#) | submitted by Olivia
- [non](#) | submitted by William
- [magna](#) | submitted by Thomas
- [ut](#) | submitted by Lachlan
- [laborum.](#) | submitted by Thomas
- [fugiat](#) | submitted by Olivia
- [Lorem](#) | submitted by Olivia
- [culpa](#) | submitted by Cooper
- [non](#) | submitted by Thomas
- [sint](#) | submitted by Emily
- [adipiscing](#) | submitted by Isabella



# Detail View

```
def blog_detail(request, blog_id):  
    blog = get_object_or_404(Blog, id=blog_id)  
    posts = Post.objects.filter(blog=blog)  
    return render(request, "blog/blog_detail.html", {  
        "blog": blog,  
        "posts": posts,  
    })
```

# Detail Template

```
1 <h1>Blog '{{ blog.name }}' by {{ blog.submitter.username }}:</h1>
2 <ul>
3   {% for post in posts %}
4     <li>Post '{{ post.name }}'
5       {% if post.likers.exists %}
6       (liked by
7       {% for liker in post.likers.all %}
8         {{ liker.username }}
9       {% endfor %})
10      {% endif %}
11     <ul>
12       {% for comment in post.comments.all %}
13         <li>Comment by {{ comment.submitter.username }}:
14           {{ comment.body|truncatechars:60 }}</li>
15       {% endfor %}
16     </ul>
17   </li>
18   {% endfor %}
```

## Blog 'magna' by Thomas:

- Post 'proident,' (liked by Lachlan Cooper William superuser )
  - Comment by superuser: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by James: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Oliver: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Lachlan: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by superuser: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Lucas: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Thomas: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
- Post 'exercitation' (liked by James )
  - Comment by Emma: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by William: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by superuser: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Thomas: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Lily: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Ava: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by William: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
- Post 'qui' (liked by Lachlan James Oliver Ella Lily Jack )
  - Comment by Sophia: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Oliver: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by superuser: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Lily: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Lucas: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by James: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Ava: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
- Post 'commodo' (liked by Lucas Isabella Ava Emma )

# SQL Queries?

# Solution 1: django logging

```
$ python manage.py shell
```

```
>>> import logging
>>> l = logging.getLogger(
    'django.db.backends'
)
>>> l.setLevel(logging.DEBUG)
>>> l.addHandler(logging.StreamHandler())
```

```
In [18]: queryset.aggregate(Avg('id'))
(0.005) SELECT AVG("blog_blog"."id") AS "id__avg" FROM "blog_blog"; args=(); alias=default
Out[18]: {'id__avg': 25.5}
```

# Solution 2: db all-statement logging

```
# postgresql.conf  
log_statement = 'all'
```

```
# my.cnf  
general_log = 1
```

# Django Debug Toolbar

- [Installation](#)
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  - [Quick setup](#)
  - [Explicit setup](#)
- [Configuration](#)
  - [DEBUG\\_TOOLBAR\\_PATCH\\_SETTINGS](#)
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- [Change log](#)
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# Installation

- `pip install django-debug-toolbar==4.4.6`
- Conditional Installation
- So, in `settings.py`:

```
if DEBUG:
    MIDDLEWARE += ['debug_toolbar.middleware.DebugToolbarMiddleware']
```



First view:  
The blog list page

# Blogs:

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## Time

CPU: 561.78ms (588.91ms)

## Settings

## Headers

## Request

BLOG\_LIST

## SQL

52 QUERIES IN 41.55MS

## Static files

0 FILES USED

## Templates

BLOG/BLOG\_LIST.HTML

## Cache

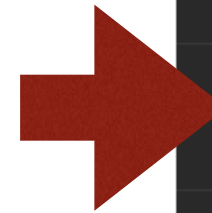
0 CALLS IN 0.00MS

## Signals

8 RECEIVERS OF 12 SIGNALS

# Blogs:

- [dolor](#) | submitted by James
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- [irure](#) | submitted by Jack
- [magna](#) | submitted by Lachlan
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



BLOG/BLOG\_LIST.HTML

## Cache

0 CALLS IN 0.00MS

## Signals

8 RECEIVERS OF 12 SIGNALS

| Query  | Timeline  |
|--|---|
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 1  |    |
| <input type="checkbox"/> SELECT ... FROM "blog_blog"                             |    |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 17 |    |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 15 |    |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 11 |    |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 2  |    |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 19 |    |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 4  |    |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 17 |    |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 14 |    |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 12 |   |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 3  |  |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 14 |  |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 10 |  |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 5  |  |
| <input type="checkbox"/> SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 3  |  |



```
SELECT "auth_user"."id", "auth_user"."password",  
"auth_user"."last_login", "auth_user"."is_superuser",  
"auth_user"."username", "auth_user"."first_name",  
"auth_user"."last_name", "auth_user"."email", "auth_user"."is_staff",  
"auth_user"."is_active", "auth_user"."date_joined" FROM "auth_user"  
WHERE "auth_user"."id" = 4
```

0.67

Sel

Expl

Connection: default

```
/Users/chris/coding/djangocon2014_project/adamsc64_djangocon2014/blog/views.py in blog_list(10)  
    "blogs": blogs,
```

```
7         <a href="{% url 'blog_detail' blog.id %}">  
8             {{ blog.name }}  
9         </a>  
10         | submitted by {{ blog.submitter.username }}  
11     </li>  
12 {% endfor %}  
13 </ul>
```

```
/Users/chris/coding/djangocon2014_project/adamsc64_djangocon2014/blog/templates/blog/blog_list.html
```



```
SELECT "auth_user"."id", "auth_user"."password",  
"auth_user"."last_login", "auth_user"."is_superuser",  
"auth_user"."username", "auth_user"."first_name",  
"auth_user"."last_name", "auth_user"."email", "auth_user"."is_staff",  
"auth_user"."is_active", "auth_user"."date_joined" FROM "auth_user"  
WHERE "auth_user"."id" = 4
```

0.67

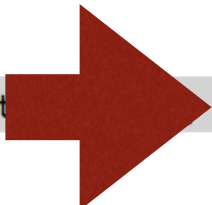
Sel

Expl

Connection: default

```
/Users/chris/coding/djangocon2014_project/adamsc64_djangocon2014/blog/views.py in blog_list(10)  
"blogs": blogs,
```

```
7         <a href="{% url 'blog_detail' blog.id %}">  
8             {{ blog.name }}  
9         </a>  
10         | submitter.username }}  
11     </li>  
12 {% endfor %}  
13 </ul>
```



```
/Users/chris/coding/djangocon2014_project/adamsc64_djangocon2014/blog/templates/blog/blog_list.html
```

# List Template

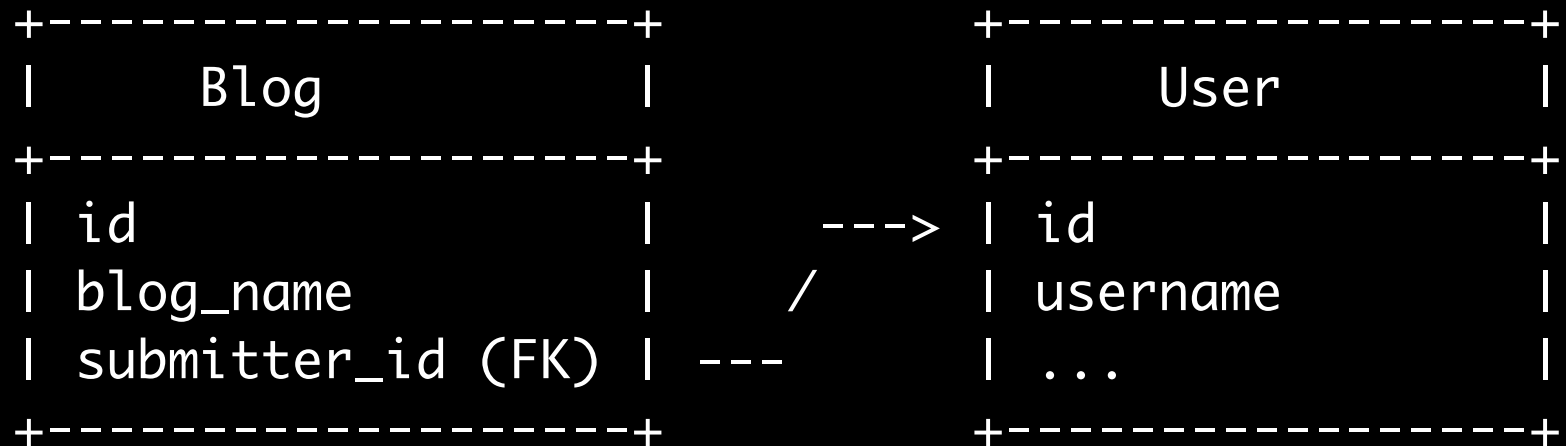
```
1 {% for blog in blogs %}
2   <li>
3     <a href="{% url 'blog_detail' blog.id %}">
4       {{ blog.name }}
5     </a>
6     | submitted by {{ blog.submitter.username }}
7   </li>
8 {% endfor %}
```

# select\_related()

- **select\_related** uses SQL joins to include fields from related objects in a single SELECT statement.
- This allows Django to fetch related objects in the **same database query**, improving efficiency.
- However, **select\_related** is only effective for single-valued relationships, such as **foreign key** and **one-to-one** relationships.



# ForeignKey



Multiple blogs can be associated with one user.

# List View

```
def blog_list(request):  
    blogs = Blog.objects.all()  
    blogs = blogs.select_related("submitter")  
    return render(request, "blog/blog_list.html", {  
        "blogs": blogs,  
    })
```

# SQL queries from 1 connection



default

5.49 ms (2 queries)

| Query   | Timeline | Time (ms) | Action                         |
|---|----------|-----------|--------------------------------|
| <div><div></div><div><div></div><div><b>SELECT ... FROM</b><br/>"auth_user" <b>WHERE</b><br/>"auth_user"."id" = 1</div></div></div>   |          | 3.08      | <div>Sel</div> <div>Expl</div> |
| <div><div></div><div><div></div><div><b>SELECT ... FROM</b> "blog_blog"<br/><b>INNER JOIN</b> "auth_user" <b>ON</b> (<br/>"blog_blog"."submitter_id" =<br/>"auth_user"."id" )</div></div></div> |          | 2.40      | <div>Sel</div> <div>Expl</div> |

Hide »

Versions



DJANGO 1.6.7

Time



CPU: 44.35ms (53.91ms)

Settings



Headers



Request



BLOG\_LIST

SQL



2 QUERIES IN 5.49MS

Static files



0 FILES USED

Templates











BLOG/BLOG\_LIST.HTML

# SQL queries from 1 connection



default

5.49 ms (2 queries)

| Query   | Timeline   | Time (ms) | Action  |
|---|--|-----------|---|
|  <b>SELECT ... FROM</b><br>"auth_user" <b>WHERE</b><br>"auth_user"."id" = 1  |   | 3.08      |   |
|  <b>SELECT ... FROM</b> "blog_blog"<br><b>INNER JOIN</b> "auth_user" <b>ON</b> (<br>"blog_blog"."submitter_id" =<br>"auth_user"."id" ) |  | 2.40      |   |

Hide »

Versions



DJANGO 1.6.7

Time



CPU: 44.35ms (53.91ms)

Settings



Headers



Request



BLOG\_LIST

SQL



2 QUERIES IN 5.49ms

Static files



0 FILES USED

Templates



BLOG/BLOG\_LIST.HTML

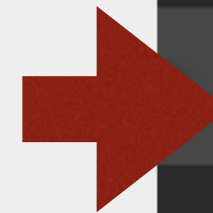
# SQL queries from 1 connection



default

5.49 ms (2 queries)

| Query   | Timeline | Time (ms) | Action |
|---|----------|-----------|--------|
| <b>SELECT ... FROM</b><br>"auth_user" <b>WHERE</b><br>"auth_user"."id" = 1  |          | 3.08      |        |
| <b>SELECT ... FROM</b> "blog_blog"<br><b>INNER JOIN</b> "auth_user" <b>ON</b> (<br>"blog_blog"."submitter_id" =<br>"auth_user"."id" ) |          | 2.40      |        |



Hide »

Versions

DJANGO 1.6.7

Time

CPU: 44.35ms (53.91ms)

Settings

Headers

Request

BLOG\_LIST

SQL

2 QUERIES IN 5.49MS

Static files

0 FILES USED

Templates

BLOG/BLOG\_LIST.HTML

Second view:  
The blog detail page

## Blog 'magna' by Thomas:

- Post 'proident,' (liked by Lachlan Cooper William superuser )
  - Comment by superuser: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by James: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Oliver: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Lachlan: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by superuser: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Lucas: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Thomas: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
- Post 'exercitation' (liked by James )
  - Comment by Emma: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by William: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by superuser: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Thomas: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
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  - Comment by Ava: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by William: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
- Post 'qui' (liked by Lachlan James Oliver Ella Lily Jack )
  - Comment by Sophia: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Oliver: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by superuser: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Lily: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
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  - Comment by James: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
  - Comment by Ava: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
- Post 'commodo' (liked by Lucas Isabella Ava Emma )

Hide »

### Versions

DJANGO 1.6.7

### Time

CPU: 464.95ms (500.62ms)

### Settings

### Headers

### Request

BLOG\_DETAIL

### SQL

44 QUERIES IN 42.43MS

### Static files

0 FILES USED

### Templates

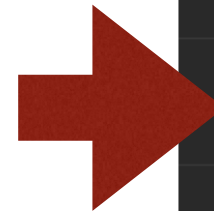
BLOG/BLOG\_DETAIL.HTML

### Cache

0 CALLS IN 0.00MS

## Blog 'magna' by Thomas:

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  - Comment by superuser: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
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  - Comment by James: Lorem ipsum dolor sit amet, consectetur adipiscing elit, ...
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Hide »

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Request

BLOG\_DETAIL

SQL

44 QUERIES IN 42.43MS

Static files

0 FILES USED

Templates

BLOG/BLOG\_DETAIL.HTML

Cache

0 CALLS IN 0.00MS



# SQL queries from 1 connection



default

42.56 ms (44 queries)

| Query  | Timeline | Time (ms) | Action                                   |
|--|----------|-----------|--|
| SELECT ... FROM "blog_blog" WHERE "blog_blog"."id" = 15  |          | 2.45      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 1   |          | 2.45      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 15  |          | 0.76      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "blog_post" WHERE "blog_post"."blog_id" = 15   |          | 1.50      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" INNER JOIN "blog_post_likers" ON ( "auth_user"."id" = "blog_post_likers"."user_id" ) WHERE "blog_post_likers"."post_id" = 60 LIMIT 1 |          | 1.75      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" INNER JOIN "blog_post_likers" ON ( "auth_user"."id" = "blog_post_likers"."user_id" ) WHERE "blog_post_likers"."post_id" = 60         |          | 1.57      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "blog_postcomment" WHERE "blog_postcomment"."post_id" = 60   |          | 1.26      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 1   |          | 0.77      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 17  |          | 0.95      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 14  |          | 0.73      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 19  |          | 0.84      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 1   |          | 0.99      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 18  |          | 0.67      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 15  |          | 1.18      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" INNER JOIN "blog_post_likers" ON ( "auth_user"."id" = "blog_post_likers"."user_id" ) WHERE "blog_post_likers"."post_id" = 59 LIMIT 1 |          | 1.06      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "auth_user" INNER JOIN "blog_post_likers" ON ( "auth_user"."id" = "blog_post_likers"."user_id" ) WHERE "blog_post_likers"."post_id" = 59         |          | 1.27      | <a href="#">Sel</a> <a href="#">Expl</a> |
| SELECT ... FROM "blog_postcomment" WHERE "blog_postcomment"."post_id" = 59   |          | 0.64      | <a href="#">Sel</a> <a href="#">Expl</a> |

```
- SELECT "auth_user"."id", "auth_user"."password",  
  "auth_user"."last_login", "auth_user"."is_superuser",  
  "auth_user"."username", "auth_user"."first_name",  
  "auth_user"."last_name", "auth_user"."email", "auth_user"."is_staff",  
  "auth_user"."is_active", "auth_user"."date_joined" FROM "auth_user"  
WHERE "auth_user"."id" = 14
```

0.73

Sel

Expl

Connection: default

```
/Users/chris/coding/djangocon2014_project/adamsc64_djangocon2014/blog/views.py in blog_detail(21)  
    "posts": posts,
```

```
12         {% endif %}  
13     <ul>  
14         {% for comment in post.comments.all %}  
15             <li>Comment by {{ comment.submitter.username }}:  
16                 {{ comment.body|truncatechars:60 }}</li>  
17         {% endfor %}  
18     </ul>
```

```
/Users/chris/coding/djangocon2014_project/adamsc64_djangocon2014/blog/templates/blog/blog_detail.html
```

```
- SELECT "auth_user"."id", "auth_user"."password",  
  "auth_user"."last_login", "auth_user"."is_superuser",  
  "auth_user"."username", "auth_user"."first_name",  
  "auth_user"."last_name", "auth_user"."email", "auth_user"."is_staff",  
  "auth_user"."is_active", "auth_user"."date_joined" FROM "auth_user"  
WHERE "auth_user"."id" = 14
```

0.73


Sel

Expl

Connection: default

```
/Users/chris/coding/djangocon2014_project/adamsc64_djangocon2014/blog/views.py in blog_detail(21)  
    "posts": posts,
```

```
12         {% endif %}  
13     <ul>  
14         {% for comment in post.comments.all %}  
15         <li>Comment by {{ comment.submitter.username }}:  
16             {{ comment.body|truncatechars:60 }}</li>  
17         {% endfor %}  
18     </ul>
```



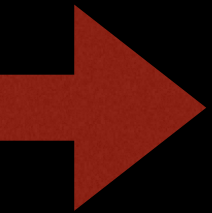
```
/Users/chris/coding/djangocon2014_project/adamsc64_djangocon2014/blog/templates/blog/blog_detail.html
```

# Models

```
class Blog(models.Model):  
    submitter = models.ForeignKey('auth.User')  
  
class Post(models.Model):  
    blog = models.ForeignKey('blog.Blog', related_name='posts')  
    likers = models.ManyToManyField('auth.User')  
  
class PostComment(models.Model):  
    submitter = models.ForeignKey('auth.User')  
    post = models.ForeignKey('blog.Post', related_name='comments')
```

# Models

```
class Blog(models.Model):  
    submitter = models.ForeignKey('auth.User')  
  
class Post(models.Model):  
    blog = models.ForeignKey('blog.Blog', related_name='posts')  
    likers = models.ManyToManyField('auth.User')  
  
class PostComment(models.Model):  
    submitter = models.ForeignKey('auth.User')  
    post = models.ForeignKey('blog.Post', related_name='comments')
```



# prefetch\_related()

- **prefetch\_related** performs separate database lookups for each relationship and combines the results in Python.
- This enables efficient prefetching of many-to-many, reverse foreign key (many-to-one).
- It also supports prefetching for more complex relationships, such as GenericRelation and GenericForeignKey.

# Detail View

```
def blog_detail(request, blog_id):  
    blog = get_object_or_404(Blog, id=blog_id)  
    posts = Post.objects.filter(blog=blog)  
    posts = posts.prefetch_related(  
        "comments__submitter"  
    )  
    return render(request, "blog/blog_detail.html", {  
        "blog": blog,  
        "posts": posts,  
    })
```

# "comments\_\_submitter"

- "comments": i.e., all the comments for each post.
  - A reverse-relation: the related\_name="comments" in the PostComment model
- For each comment, it also fetches the user ("\_\_submitter") who made that comment.
- This prefetch instruction reduces queries and makes the retrieval of related data more efficient.



 **SELECT** "auth\_user"."id", "auth\_user"."password",  
"auth\_user"."last\_login", "auth\_user"."is\_superuser",  
"auth\_user"."username", "auth\_user"."first\_name",  
"auth\_user"."last\_name", "auth\_user"."email", "auth\_user"."is\_staff",  
"auth\_user"."is\_active", "auth\_user"."date\_joined" **FROM** "auth\_user"  
**INNER JOIN** "blog\_post\_likers" **ON** ( "auth\_user"."id" =  
"blog\_post\_likers"."user\_id" ) **WHERE** "blog\_post\_likers"."post\_id" = 58

1.06

Sel

Expl

**Connection:** default

/Users/chris/coding/djangocon2014\_project/adamsc64\_djangocon2014/blog/views.py in blog\_detail(21)  
"posts": posts,

```
6         <li>Post '{{ post.name }}'  
7             {% if post.likers.exists %}  
8             (liked by  
9                 {% for liker in post.likers.all %}  
10                 '{{ liker.username }}'  
11                 {% endfor %})  
12             {% endif %}
```

/Users/chris/coding/djangocon2014\_project/adamsc64\_djangocon2014/blog/templates/blog/blog\_detail.html

```
SELECT "auth_user"."id", "auth_user"."password",  
"auth_user"."last_login", "auth_user"."is_superuser",  
"auth_user"."username", "auth_user"."first_name",  
"auth_user"."last_name", "auth_user"."email", "auth_user"."is_staff",  
"auth_user"."is_active", "auth_user"."date_joined" FROM "auth_user"  
INNER JOIN "blog_post_likers" ON ( "auth_user"."id" =  
"blog_post_likers"."user_id" ) WHERE "blog_post_likers"."post_id" = 58
```

1.06

Sel

Expl

**Connection:** default

```
/Users/chris/coding/djangocon2014_project/adamsc64_djangocon2014/blog/views.py in blog_detail(21)  
"posts": posts,
```

```
6         <li>Post '{{ post.name }}'  
7             {% if post.likers.exists %}  
8                 (liked by  
9                 {% for liker in post.likers.all %}  
10                    '{{ liker.username }}'  
11                 {% endfor %})  
12             {% endif %}
```

```
/Users/chris/coding/djangocon2014_project/adamsc64_djangocon2014/blog/templates/blog/blog_detail.html
```





























# Detail View

```
def blog_detail(request, blog_id):  
    blog = get_object_or_404(Blog, id=blog_id)  
    posts = Post.objects.filter(blog=blog)  
    posts = posts.prefetch_related(  
        "comments__submitter", "likers",  
    )  
    return render(request, "blog/blog_detail.html", {  
        "blog": blog,  
        "posts": posts,  
    })
```

## SQL queries from 1 connection

default

12.16 ms (7 queries)

| Query  | Timeline  | Time (ms) | Action  |
|--|---|-----------|---|
|  <b>SELECT ... FROM "blog_blog" WHERE "blog_blog"."id" = 15</b>   |      | 3.58      |       |
|  <b>SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 1</b>  |     | 2.09      |       |
|  <b>SELECT ... FROM "auth_user" WHERE "auth_user"."id" = 15</b>   |    | 0.69      |       |
|  <b>SELECT ... FROM "blog_post" WHERE "blog_post"."blog_id" = 15</b>  |    | 1.06      |       |
|  <b>SELECT ... FROM "blog_postcomment" WHERE "blog_postcomment"."post_id" IN (60, 59, 58, 57)</b>   |    | 1.70      |       |
|  <b>SELECT ... FROM "auth_user" WHERE "auth_user"."id" IN (1, 2, 3, 4, 7, 8, 9, 10, 14, 15, 16, 17, 18, 19)</b>   |    | 0.95      |       |
|  <b>SELECT ... FROM "auth_user" INNER JOIN "blog_post_likers" ON ( "auth_user"."id" = "blog_post_likers"."user_id" ) WHERE "blog_post_likers"."post_id" IN (60, 59, 58, 57)</b> |  | 2.09      |   |

Hide »

Versions

DJANGO 1.6.7

Time

CPU: 86.12ms (100.47ms)

Settings

Headers

Request

BLOG\_DETAIL

SQL

7 QUERIES IN 12.16ms

Static files

0 FILES USED

Templates

BLOG/BLOG\_DETAIL.HTML

Cache

# Beyond SQL Queries

- **Cache:** Shows Django cache hits, misses, and the time taken for cache operations.
- **Signals:** Django signals sent during the request-response cycle.
- **Headers and Request Info:** HTTP headers, session data, environment information.
- **Static Files:** information about static media used to render the page

# Summary

- The QuerySet API methods `select_related()` and `prefetch_related()` implement best practices to reduce unnecessary queries.
- Use **`select_related()`** for one-to-many or one-to-one relations.
- Use **`prefetch_related()`** for many-to-many or reverse foreign key relations.

# Thanks!

Christopher Adams (@adamsc64)

[github.com/adamsc64/a-related-matter](https://github.com/adamsc64/a-related-matter)

[christopheradams.info](http://christopheradams.info)