

# Table of Contents

This slide deck consists of slides used in 2 lecture videos in Week 1. Below is a list of shortcut hyperlinks for you to jump into specific sections.

- (page 2) [Week 1: Cookies and Sessions](#)
- (page 15) [Week 1:Django Sessions](#)

Charles Severance

[www.dj4e.com](http://www.dj4e.com)

# Cookies and Sessions

<https://samples.dj4e.com/session/>





Click

D  
O  
M

Parse  
Response

Javascript

Browser



N  
G  
I  
N  
X

WGSISConfig

settings.py

Linux

Django

Session  
Middleware

Session  
Storage

urls.py

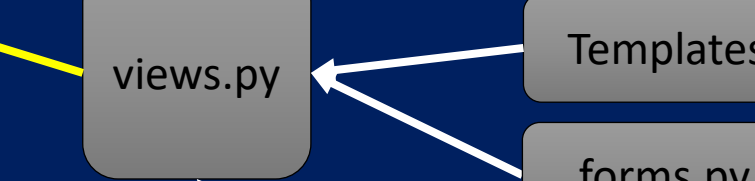
views.py

Templates

forms.py

models.py

Database



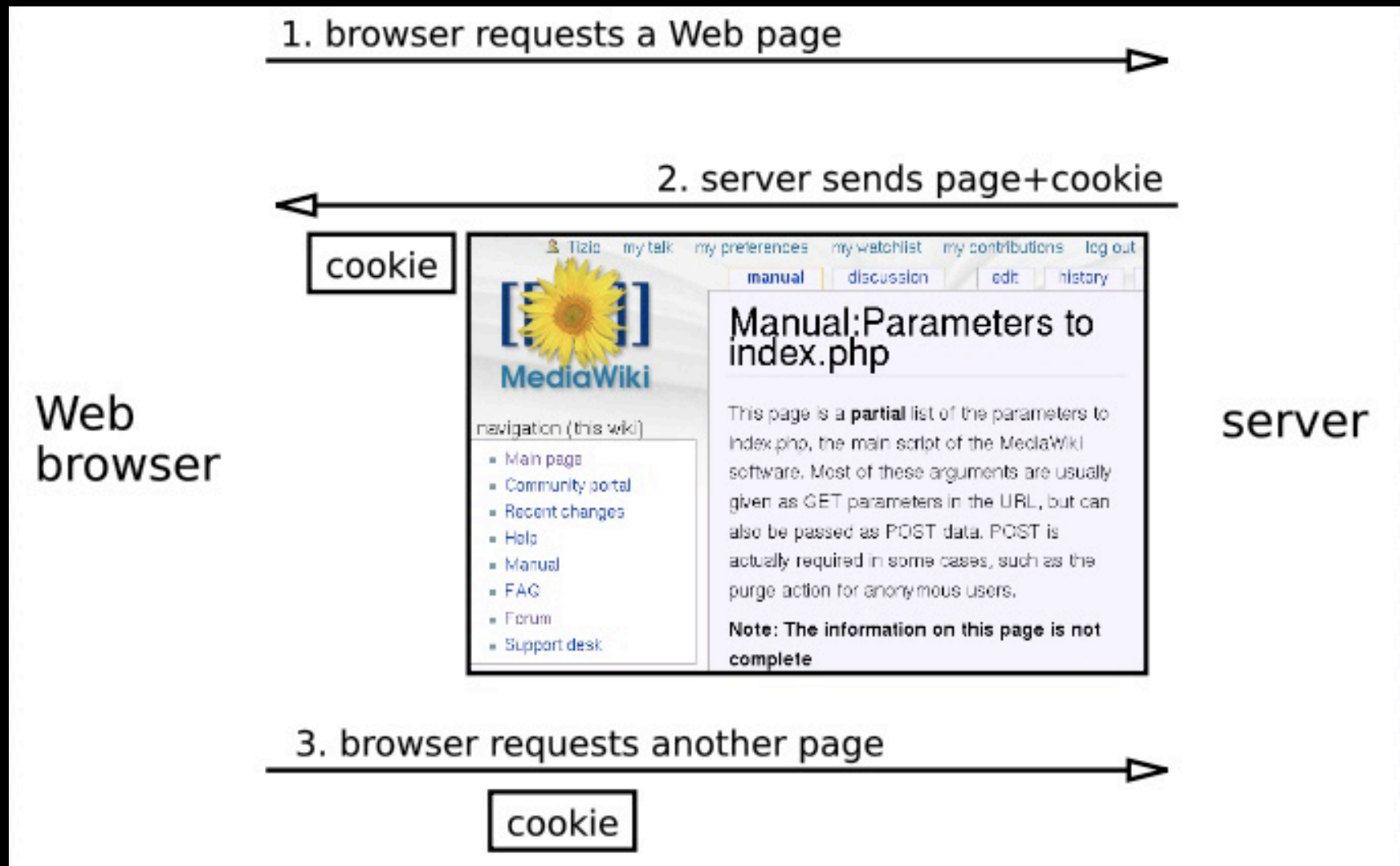
# Multi-User / Multi-Browser

- When a server is interacting with many different browsers at the same time, the server needs to know \*which\* browser a particular request came from.
- Request / Response initially was stateless - all browsers looked identical . This was really bad and did not last very long at all.

# Web Cookies to the Rescue

*Technically, cookies are arbitrary pieces of data chosen by the Web server and sent to the browser. The browser returns them unchanged to the server, introducing a state (memory of previous events) into otherwise stateless HTTP transactions. Without cookies, each retrieval of a Web page or component of a Web page is an isolated event, mostly unrelated to all other views of the pages of the same site.*

[http://en.wikipedia.org/wiki/HTTP\\_cookie](http://en.wikipedia.org/wiki/HTTP_cookie)



[http://en.wikipedia.org/wiki/HTTP\\_cookie](http://en.wikipedia.org/wiki/HTTP_cookie)

# Cookies In the Browser

- Cookies are marked as to the web addresses they come from. The browser only sends back cookies that were originally set by the same web server.
- Cookies have an expiration date. Some last for years, others are short-term and go away as soon as the browser is closed

4E samples.dj4e.com/session/ X +

← → ↻ 🏠 <https://samples.dj4e.com/session/> 🔍 Search 📁 📄 ⚙️ ⏏️ ☰

⚙️ Most Visited 🖼️ Drc 📁 SakaiCar 📁 Sakai 📁 Tsugi 📁 CRsera 📁 Teach 📁 LXP 📁 UMSI 📧 GMU 📧 GMD 📺 YT ⏏️

This is the sessions sample code

This page is coming from a file in templates/session/main.html

- [If you give a browser a cookie...](#)
- [Fun with sessions](#)

🖱️ 🛠️ Inspector 📄 Console 🐛 Debugger {} Style Editor 🎧 Performance 📁 Memory ⬆️⬆️ Network 📄 Storage ⏏️ 📄 ... X

▶ 📄 Cache Storage

▼ 📄 Cookies

🌐 <https://samples.dj4e.com>

▶ 📄 Indexed DB

▶ 📄 Local Storage

▶ 📄 Session Storage

🔍 Filter items + ↻

Name	Domain	Path	Expires	LastAccessed	Value	HttpOnly	SameSi...
__cfduid	.dj4e.com	/	Mon, 28 Sep 2020...	Sun, 29 Sep 2019 ...	d15bb58c09d1...	true	Unset

<https://samples.dj4e.com/session/>

<https://github.com/csev/dj4e-samples/blob/master/session/home/views.py>



<https://github.com/csev/dj4e-samples/blob/master/session/home/views.py>

```
def cookie(request):  
    print(request.COOKIES)  
    resp = HttpResponse('C is for cookie and that is good enough for me...')  
    resp.set_cookie('zap', 42) # No expired date = until browser close  
    resp.set_cookie('sakaicar', 42, max_age=1000) # seconds until expire  
    return resp
```

In the log:

```
[29/Sep 23:17:55] "GET /session/cookie HTTP/1.1" 200 26  
{ 'sessionid': 'xy414ikma0p80jw19mrg146inewhzp3s', 'zap':  
'42', 'sakaicar': '42' }
```

The screenshot shows a web browser window with the address bar displaying `https://samples.dj4e.com/session/`. The page content includes the text "This is the sessions sample code" and "This page is coming from a file in templates/session/main.html", followed by two links: [If you give a browser a cookie...](#) and [Fun with sessions](#).

The browser's developer tools are open, specifically the "Storage" tab. The left sidebar shows a tree view with "Cache Storage", "Cookies", "Indexed DB", "Local Storage", and "Session Storage". The "Cookies" section is expanded, showing a table of cookies for the domain `https://samples.dj4e.com`.

Name	Domain	Path	Expires	LastAccessed	Value	HttpOnly	SameSi...
<code>__cfduid</code>	<code>.dj4e.com</code>	<code>/</code>	Mon, 28 Sep 2020...	Sun, 29 Sep 2019 ...	<code>d15bb58c09d1...</code>	<code>true</code>	Unset

<https://samples.dj4e.com/session/>

<https://github.com/csev/dj4e-samples/blob/master/session/home/views.py>

4E samples.dj4e.com/session/ X +

4E samples.dj4e.com/session/cookie X +

https://samples.dj4e.com/session/cookie

Most Visited Drc SakaiCar Sakai Tsugi CRsera Teach LXP UMSI GMU GMD YT

This is the session...

This page is controlled by cookies.

C is for cookie and that is good enough for me...

```
def cookie(request):  
    print(request.COOKIE)  
    resp = HttpResponse('C is for cookie and that is good enough for me...')  
    resp.set_cookie('zap', 42) # No expired date = until browser close  
    resp.set_cookie('sakaicar', 42, max_age=1000) # seconds until expire  
    return resp
```

Inspector Console Debugger Style Editor Performance Memory Network Storage

Filter URLs

Persist Logs Disable cache No throttling HAR

Status	Method	Domain	File
200	GET	samples.dj4e.com	cookie
200	GET	samples.dj4e.com	favicon.ico

2 requests 15.09 KB / 2.59 KB transferred Finish: 2.10 s

Headers Cookies Params Response Timings Security

expect-ct: max-age=604800, report-uri="https://report-uri.cloudflare.com/cdn-cgi/beacon/expect-ct"

server: cloudflare

set-cookie: zap=42; Path=

set-cookie: sakaicar=42; expires=Sun, 29 Sep 2014 03:03:03 GMT; Max-Age=1000; Path=

x-clacks-overhead: GNU Terry Pratchett

X-Firefox-Spdy: h2

4E samples.dj4e.com/session/

4E samples.dj4e.com/session/cookie

4E samples.dj4e.com/session/cookie

← → ↺

Most Visited

This is the session

This page is coming from the cache

- If you give me a cookie
- Fun with cookies

Inspector

Cache Storage

Cookies

Indexed DB

Local Storage

Session Storage

200 GET

200 GET

2 requests

← → ↺

Most Visited

C is for cookie and that is good enough for me...

← → ↺

https://samples.dj4e.com/session/cookie

Search

Most Visited

Drc

SakaiCar

Sakai

Tsugi

CRsera

Teach

LXP

UMSI

GMU

GMD

YT

Inspector

Console

Debugger

Style Editor

Performance

Memory

Network

Storage

Filter items

Name	Domain	Path	Expires	LastAccessed	Value	HttpOnly	SameSite
__cfduid	.dj4e.com	/	Mon, 28 Sep 2020...	Sun, 29 Sep 2019 ...	d15bb58c09d...	true	Unset
sakaicar	samples.dj...	/	Sun, 29 Sep 2019 ...	Sun, 29 Sep 2019 ...	42	false	Unset
zap	samples.dj...	/	Session	Sun, 29 Sep 2019 ...	42	false	Unset

samples.dj4e.com/session/

samples.dj4e.com/session/cookie

samples.dj4e.com/session/cookie

samples.dj4e.com/session/cookie

https://samples.dj4e.com/session/cookie

Search

Most Visited Drc SakaiCar Sakai Tsugi CRsera Teach LXP UMSI GMU GMD YT

C is for cookie and that is good enough for me...

C is for cookie and that is good enough for me...

Inspector

Cache Storage

Cookies

https://sam

Indexed DB

Local Storage

Session Storage

Status Method

200 GET

200 GET

2 requests

Inspector Console Debugger Style Editor Performance Memory Network Storage

Filter URLs

Persist Logs Disable cache No throttling HAR

All HTML CSS JS XHR Fonts Images Media WS Other

Status	Method	Domain	File
200	GET	samples.dj4e.com	cookie
200	GET	samples.dj4e.com	favicon.ico
200	GET	samples.dj4e.com	cookie
200	GET	samples.dj4e.com	favicon.ico

4 requests 30.19 KB / 5.17 KB transferred Finish: 6.23 min

Headers Cookies Params Response Timings Stack Trace


- Cache-Control: no-cache
- Connection: keep-alive
- Cookie: \_\_cfduid=d15bb58c09d1c97435a5f...69796218; zap=42; sakaicar=42
- Host: samples.dj4e.com
- Pragma: no-cache
- Upgrade-Insecure-Requests: 1
- User-Agent: Mozilla/5.0 (Macintosh; Intel... Gecko/20100101 Firefox/69.0

Time



Browser




Browser  
zap=42 




zap=42



Browser  
zap=42 



Browser  
zap=42 



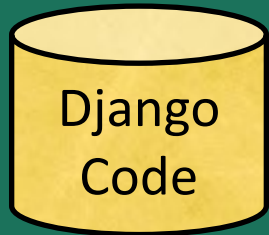
Apache

set\_cookie()

request.COOKIES

request.COOKIES

request.COOKIES



Django  
Code

# Django Sessions

<https://samples.dj4e.com/session/sessfun>

<https://github.com/csev/dj4e-samples/tree/master/session>



Click

D  
O  
M

Parse  
Response

Javascript

Browser



N  
G  
I  
N  
X

WGSISConfig

settings.py

Linux

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Session  
Middleware

urls.py

views.py

Templates

forms.py

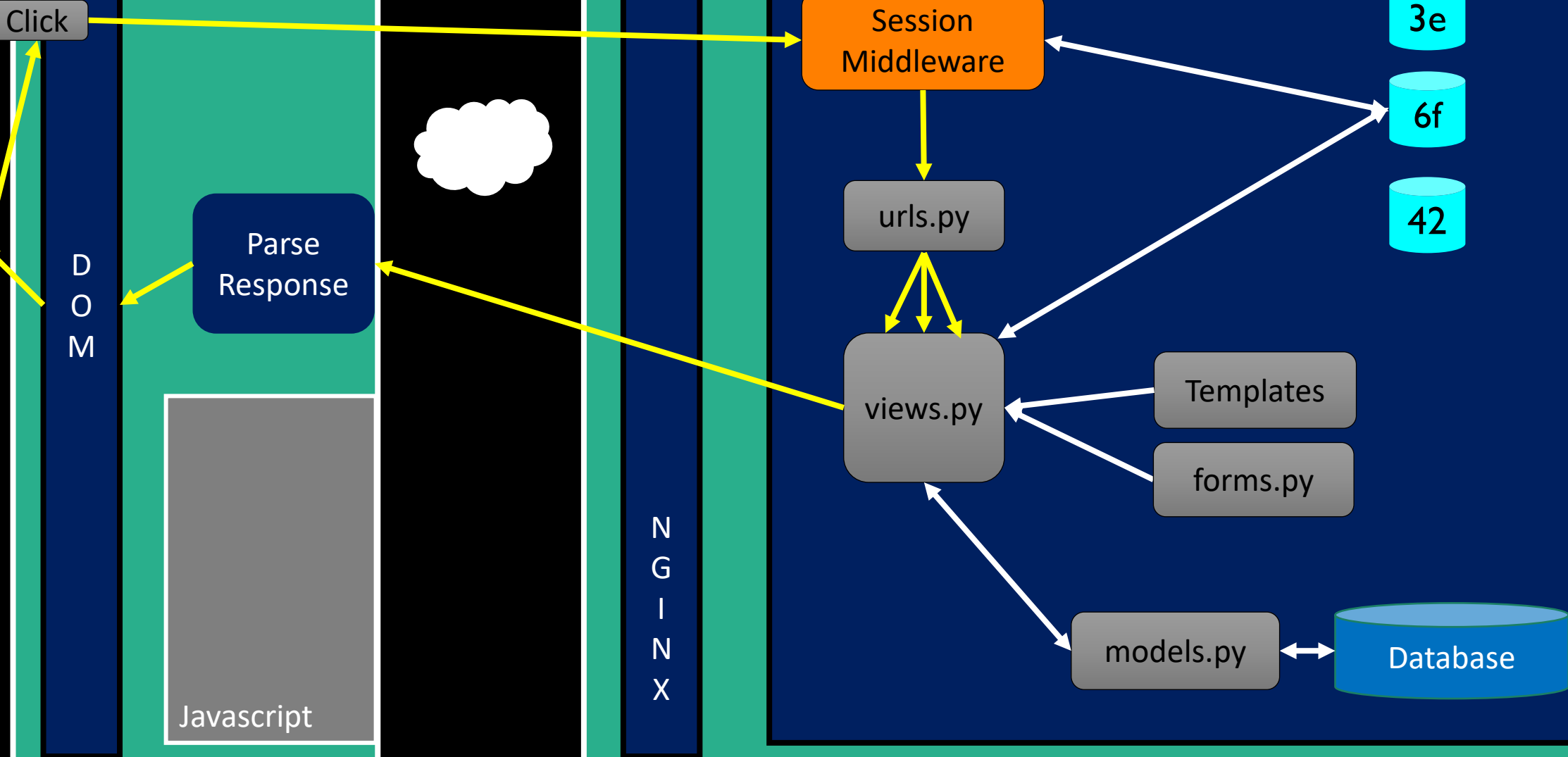
models.py

3e

6f

42

Database





# In the Server - Sessions

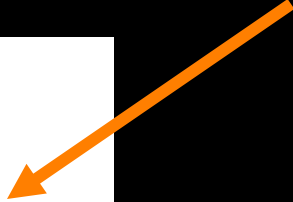
- In most server applications, as soon as we start a session for a new (unmarked) browser we create a session.
- We set a session cookie to be stored in the browser, which indicates the session id in use – gives this browser a unique “mark”.
- The creation and destruction of sessions is handled by a Django middleware that we use in our applications.

# Session Identifier

- A large, random number that we place in a browser cookie the first time we encounter a browser
- This number is used to pick from the many sessions that the server has active at any one time.
- Server software stores data in the session that it wants to have from one request to another from the same browser.
- Shopping cart or login information is stored in the session in the server.

# Middleware

```
MIDDLEWARE = [  
    'django.middleware.security.SecurityMiddleware',  
    'django.contrib.sessions.middleware.SessionMiddleware',  
    'django.middleware.common.CommonMiddleware',  
    'django.middleware.csrf.CsrfViewMiddleware',  
    'django.contrib.auth.middleware.AuthenticationMiddleware',  
    'django.contrib.messages.middleware.MessageMiddleware',  
    'django.middleware.clickjacking.XFrameOptionsMiddleware',  
]
```



<https://github.com/csev/dj4e-samples/blob/master/dj4e-samples/settings.py>

# Default – Store Sessions in the Database

```
$ python3 manage.py migrate
```

## Operations to perform:

**Apply all migrations:** admin, auth, contenttypes, sessions

## Running migrations:

Applying contenttypes.0001\_initial... **OK**

Applying auth.0001\_initial... **OK**

Applying admin.0001\_initial... **OK**

Applying admin.0002\_logentry\_remove\_auto\_add... **OK**

...

Applying auth.0009\_alter\_user\_last\_name\_max\_length... **OK**

Applying sessions.0001\_initial... **OK**





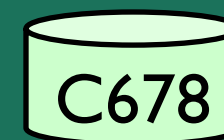
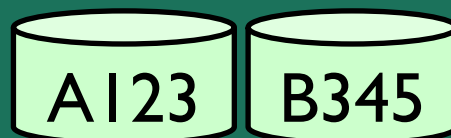
Browser  
S=A123

Browser  
S=B345

Browser  
S=C678



Django Session Middleware



Web Server

Time



Browser  
S=C123

Browser  
S=C123

Browser  
S=C123

Browser  
S=C123



request  
POST  
session

request  
GET  
session

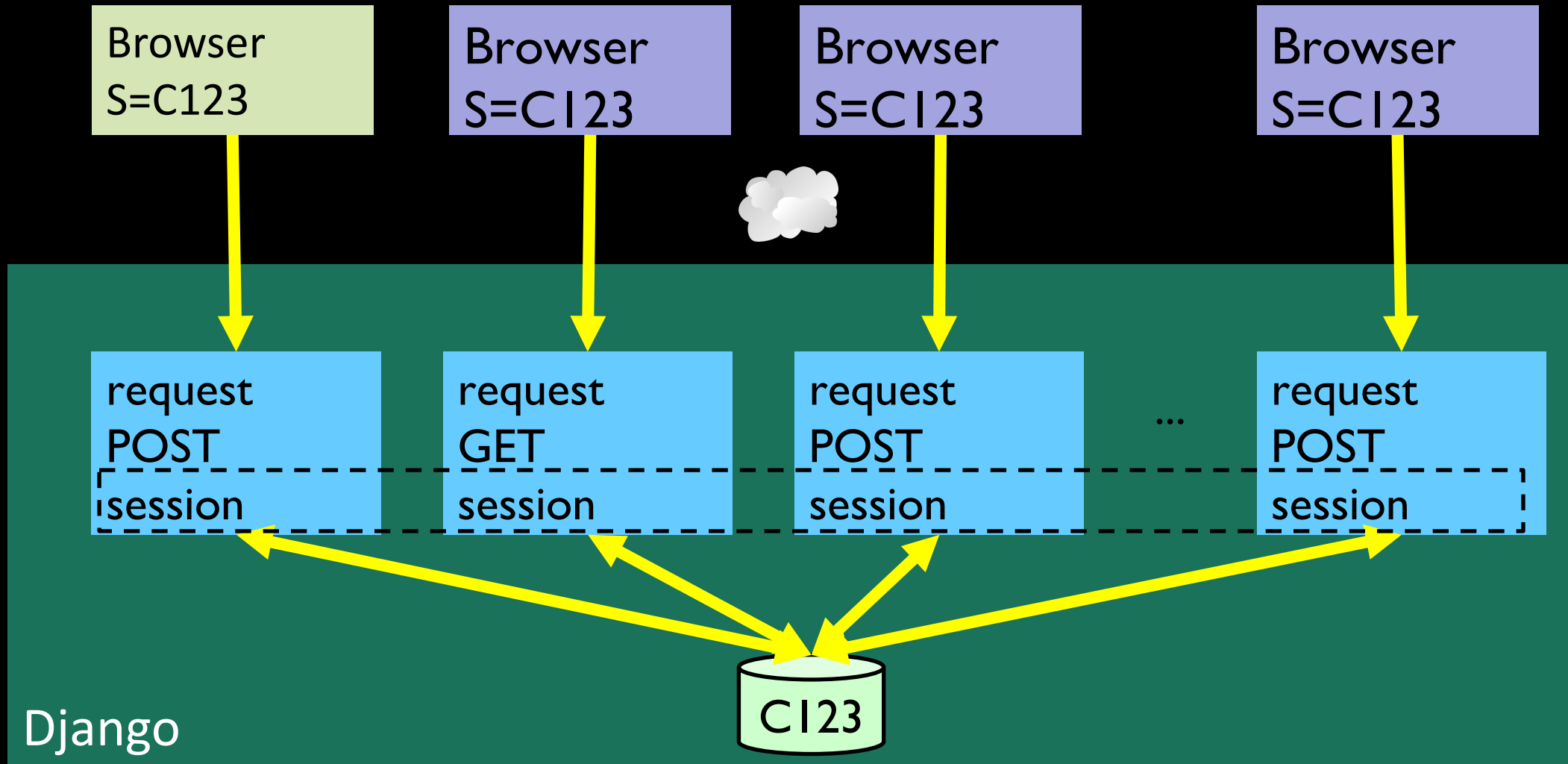
request  
POST  
session

...

request  
POST  
session

Django

C123



# Django Sessions

- The incoming `request` object has a `request.session` attribute that we can treat like a dictionary that persists from one request to the next request
- As long we have the session middleware enabled in `settings.py` and the database table, and the browser allows cookies, we just store and read `request.session` in our views and pretend it is "magic"

```
def sessfun(request) :  
    num_visits = request.session.get('num_visits', 0) + 1  
    request.session['num_visits'] = num_visits  
    if num_visits > 4 : del(request.session['num_visits'])  
    return HttpResponse('view count='+str(num_visits))
```

<https://github.com/csev/dj4e-samples/blob/master/session/views.py>



The screenshot shows a web browser window with the address bar displaying `https://samples.dj4e.com/session/`. The page content includes the text "This is the sessions sample code" and "This page is coming from a file in templates/session/main.html", followed by a bulleted list of links: "If you give a browser a cookie..." and "Fun with sessions".

The browser's developer tools are open, specifically the "Storage" tab. The "Cookies" section is expanded, showing a table of cookies for the domain `https://samples.dj4e.com`. The table has columns for Name, Domain, Path, and Expires. One cookie is listed: `__cfduid` with domain `.dj4e.com` and path `/`. The "Data" panel on the right shows the details for the `__cfduid` cookie, including its value, creation time, domain, expiration time, and other attributes.

Name	Domain	Path	Expires
<code>__cfduid</code>	<code>.dj4e.com</code>	<code>/</code>	Mon, 28 Sep 2020...

Filter values:

- `__cfduid`: "d15bb58c09d...1569796218"
- `CreationTime`: "Sun, 29 S...30:18 GMT"
- `Domain`: ".dj4e.com"
- `Expires`: "Mon, 28 Sep ...22:30:18 GMT"
- `HostOnly`: false
- `HttpOnly`: true
- `LastAccessed`: "Sun, 29 S...0:46 GMT"
- `Path`: "/"
- `SameSite`: "Unset"

<https://github.com/csev/dj4e-samples/blob/master/session/views.py>

The image shows a web browser window with two tabs. The active tab is titled "samples.dj4e.com/session/sessf" and displays a page with the text "view count=1". Below the text, there are two bullet points: "• [If you give a bro](#)" and "• [Fun with session](#)".

The browser's developer tools are open, showing the "Storage" tab. The left sidebar lists the storage types: Cache Storage, Cookies, Indexed DB, Local Storage, and Session Storage. The "Cookies" section is expanded, showing a list of cookies for the domain "https://samples.dj4e.com".

Name	Domain	Path	Expires
__cfduid	.dj4e.com	/	Mon, 28 Sep 2020...
sessionid	samples.dj...	/	Sun, 13 Oct 2019 ...

The right pane of the developer tools shows the details for the selected "sessionid" cookie. The "Data" section displays the following information:

- sessionid:** "gj2233cwnot...uw0u4f3h6u"
- CreationTime:** "Sun, 29 S...08:28 GMT"
- Domain:** "samples.dj4e.com"
- Expires:** "Sun, 13 Oct ...23:08:28 GMT"
- HostOnly:** true
- HttpOnly:** true
- LastAccessed:** "Sun, 29 S...8:28 GMT"
- Path:** "/"
- SameSite:** "Lax"

Three overlapping browser windows showing the development of a session management application on `samples.dj4e.com`. The windows show the progression of session creation and storage.

**Window 1 (Left):** Shows the initial page with the text "This is the sessions sample" and "This page is coming from". It includes a list of links: "If you give a browser" and "Fun with session". The "view count=1" is displayed.

**Window 2 (Middle):** Shows the page after the first session creation. The "view count=2" is displayed.

**Window 3 (Right):** Shows the page with the "view count=2" and the "Storage" panel open. The "Storage" panel displays the session data for the current page.

**Storage Panel Data:**

Name	Domain	Path	Expires
__cfduid	.dj4e.com	/	Mon, 28 Sep 2020...
sessionId	samples.dj...	/	Sun, 13 Oct 2019 ...

The "Data" section shows the session details:

- sessionId:** "gj2233cwnot...uw0u4f3h6u"
- CreationTime:** "Sun, 29 S...08:28 GMT"
- Domain:** "samples.dj4e.com"
- Expires:** "Sun, 13 Oct ...23:08:28 GMT"
- HostOnly:** true
- HttpOnly:** true
- LastAccessed:** "Sun, 29 S...8:28 GMT"
- Path:** "/"
- SameSite:** "Lax"

```
$ sqlite3 db.sqlite3
```

```
SQLite version 3.24.0 2018-06-04 14:10:15
```

```
Enter ".help" for usage hints.
```

```
sqlite> .tables
```

auth_group	auth_user_user_permissions
auth_group_permissions	django_admin_log
auth_permission	django_content_type
auth_user	django_migrations
auth_user_groups	django_session

```
sqlite> .mode column
```

```
sqlite> select * from django_session;
```

```
vosaoain2dzw0o8bzlgsmovdbkp574us
```

```
YThiZWRjMjQ1NzZhMzYzMTBhZjYxNWI2ZDgyODI1Y2ExODI2MTJjNzp7Im51bV92aXNpdHMiOjF9  
2019-02-21 15:18:34.995362
```

```
vii016kh2vzqpm0uw3or4qrqxddmwisx
```

```
OWNkOGQxYjg4NzlkN2ZhOTc2NmU1ODY0NWMzMmQ4YjdhMzM4OTJhNjp7Im51bV92aXNpdHMiOjJ9  
2019-02-21 15:32:52.555061
```

```
sqlite> .quit
```

# What is in the Django Session Table?

```
$ python3
>>> import base64
>>> x = base64.b64decode(
... 'OWNkOGQxYjg4NzlkN2ZhOTc2NmU1ODY0NWMzZmQ4YjdhMzM4OTJhNjp7Im51bV92aXNpdHMiOjJ9')
>>> print(x)
b'9cd8d1b8879d7fa9766e58645c3fd8b7a33892a6:{"num_visits":2}'
>>> import json
>>> data = json.loads(x[41:])
>>> print(data)
{'num_visits': 2}
>>>
```

# Summary

- HTTP Cookies
- Sessions
- Using Sessions in Django

# Acknowledgements / Contributions



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Initial Development: Charles Severance, University of Michigan  
School of Information

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Continue new Contributors and Translators here

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