Web / BD

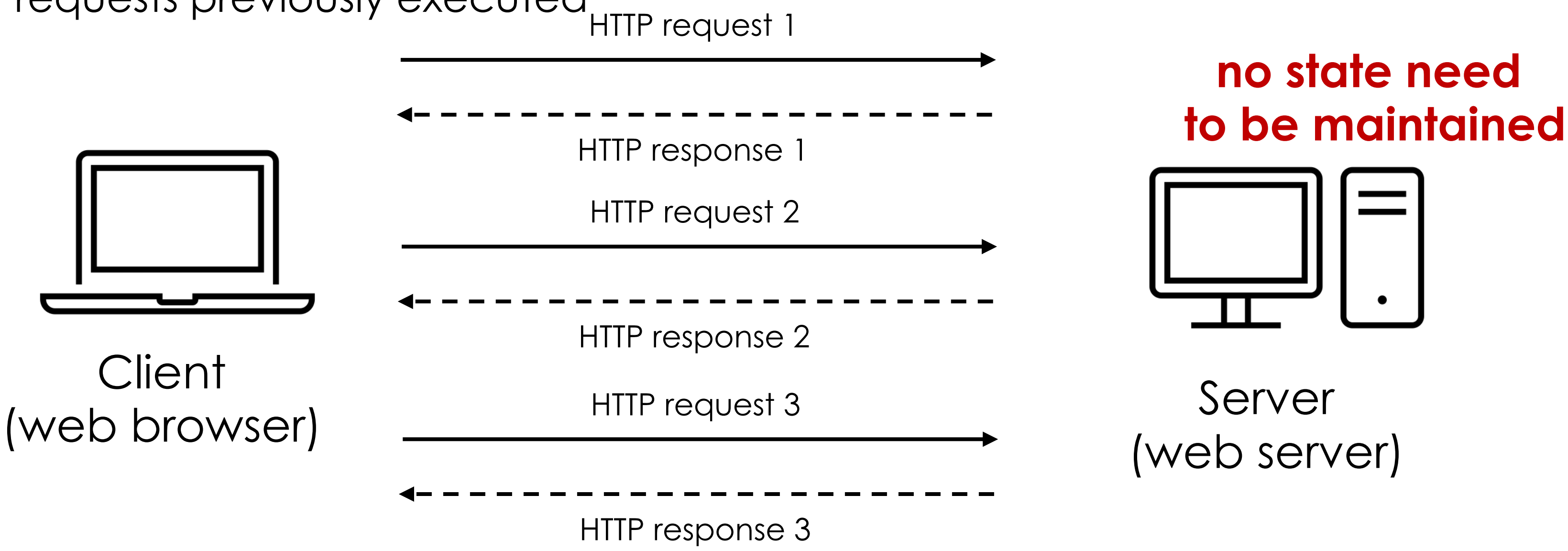
Introduction to Web Programming

2025-2026

Gérald Oster <gerald.oster@telecomnancy.eu>

HTTP/1: A stateless protocol

- Protocol does not require server to retain information over successive requests from the same client
- Each request is executed independently without any knowledge of the requests previously executed



HTTP request 1

HTTP response 1

HTTP request 2

HTTP response 2

HTTP request 3

HTTP response 3

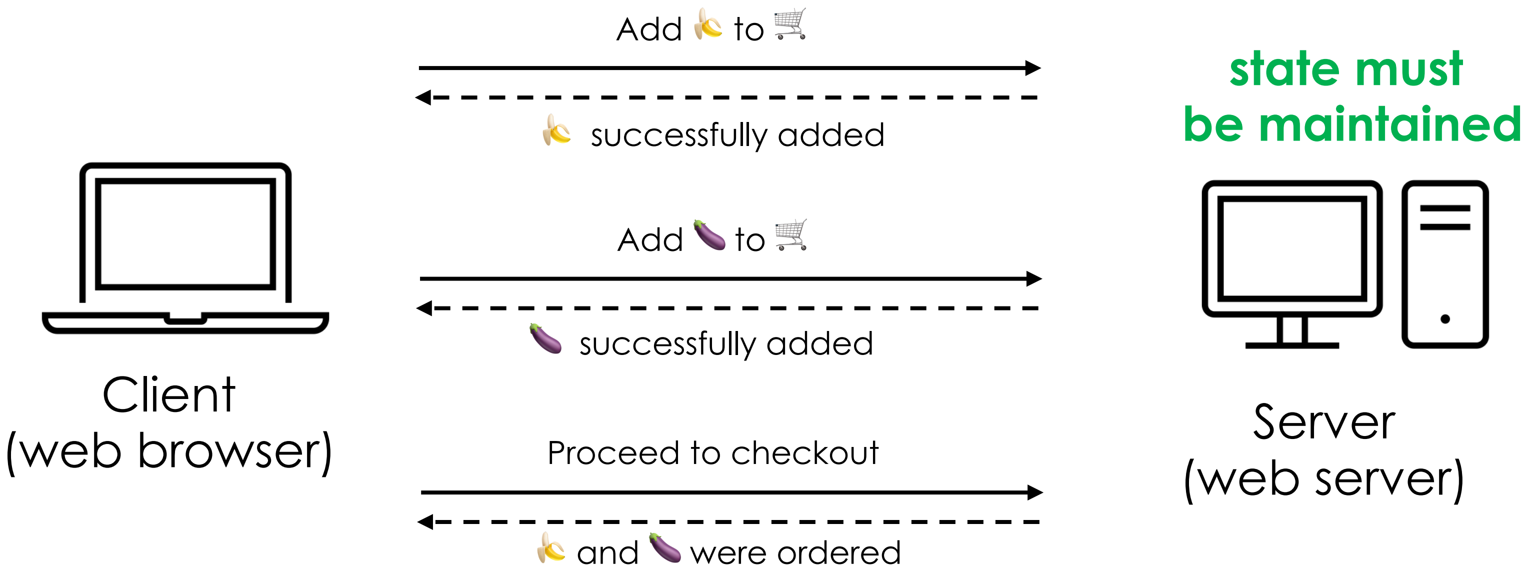
Client
(web browser)

Server
(web server)

no state need to be maintained

Web Application are often stateful

- An application must often track user’s progress from page to page over successive requests
- i.e. shopping cart, user logged in or not, user preferences, etc



Add 🍌 to 🛒

🍌 successfully added

Add 🍆 to 🛒

🍆 successfully added

Proceed to checkout

🍌 and 🍆 were ordered

Client
(web browser)

state must be maintained

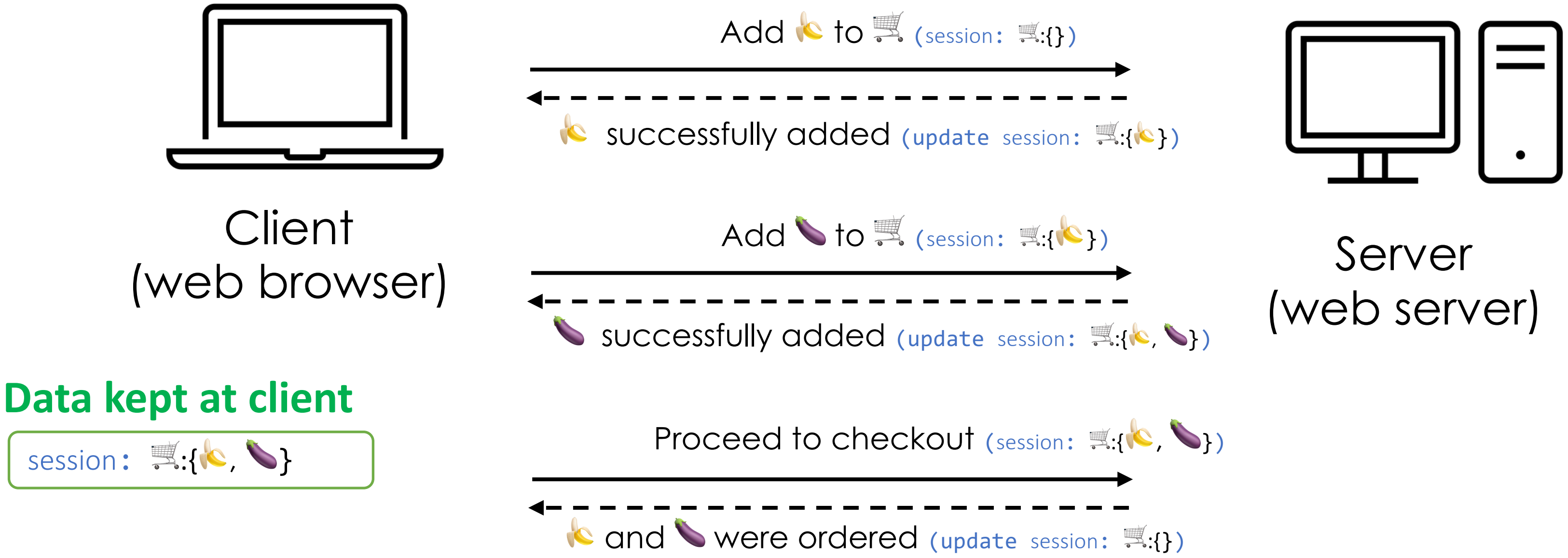
Server
(web server)

Session

- A **session** is used to store information related to a user, across different requests, as they interact with a web app
- The data stored for a session are generally considered **temporary data**, ass the session will **eventually expire**
- Two kinds of session in web development:
  - Client-side: sessions are stored client-side:
    data are (re)sent with every requests
  - Server-side: sessions are stored server-side:
    an identifier is usually attached to every requests

Client-side Session

- Client-side: sessions are stored client-side
- data are *usually* (re)sent with every requests



Client (web browser)

Server (web server)

Add 🍌 to 🛒 (session: 🛒:{})

🍌 successfully added (update session: 🛒:{🍌})

Add 🍆 to 🛒 (session: 🛒:{🍌})

🍆 successfully added (update session: 🛒:{🍌, 🍆})

Proceed to checkout (session: 🛒:{🍌, 🍆})

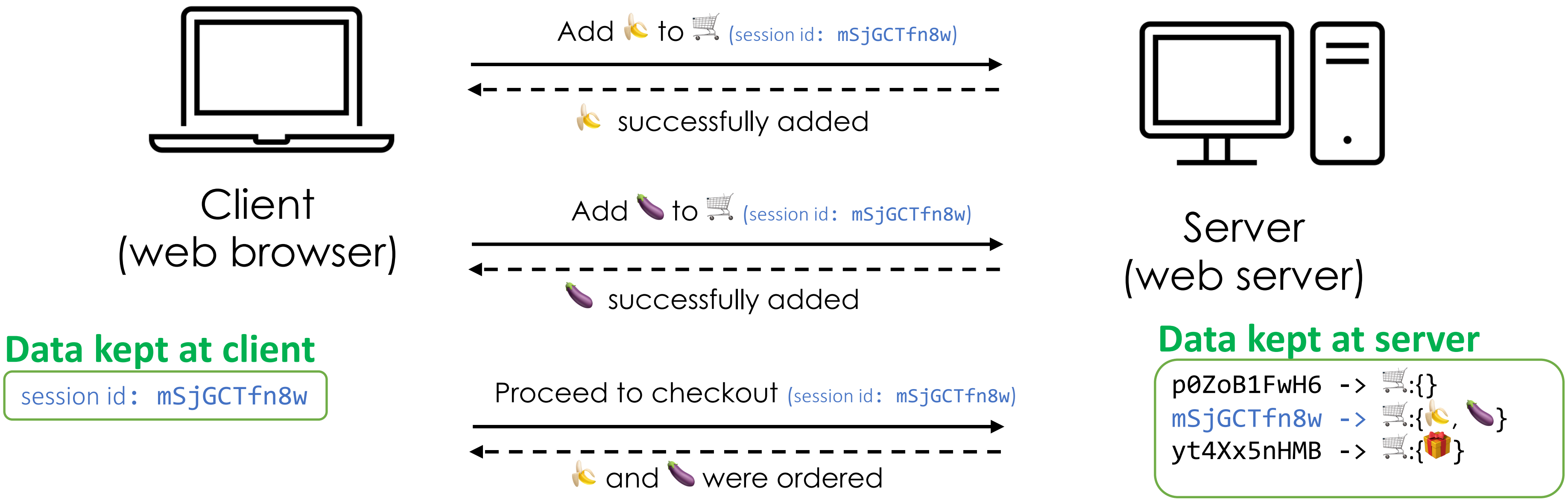
🍌 and 🍆 were ordered (update session: 🛒:{})

Data kept at client

session: 🛒:{🍌, 🍆}

Server-side Session

- Sessions are stored server-side
- an identifier is *usually* attached to every requests to retrieve the session data at server side



Add 🍌 to 🛒 (session id: `mSjGCTfn8w`)

🍌 successfully added

Add 🍆 to 🛒 (session id: `mSjGCTfn8w`)

🍆 successfully added

Proceed to checkout (session id: `mSjGCTfn8w`)

🍌 and 🍆 were ordered

Client
(web browser)

Server
(web server)

Data kept at client

session id: `mSjGCTfn8w`

Data kept at server

```
p0ZoB1FwH6 -> 🛒:{}
mSjGCTfn8w -> 🛒:{🍌, 🍆}
yt4Xx5nHMB -> 🛒:{🎁}
```

How to send some data with every requests?
Using parameter(s)

```
GET /add_article?session_id=mSjGCTfn8w&article=🍌 HTTP/1.1
Host: www.nozama.com

GET /add_article?session_id=mSjGCTfn8w&article=🍆 HTTP/1.1
Host: www.nozama.com
…
```

- Tedious but it works!

Using HTTP Cookies!

https://datatracker.ietf.org/doc/html/rfc6265

```
GET /browse_article HTTP/1.1
Host: www.nozama.com

HTTP/1.1 200
Content-type: text/html
Set-Cookie: session_id=mSjGCTfn8w
…

GET /add_article?article=🍌 HTTP/1.1
Host: www.nozama.com
Cookie: session_id=mSjGCTfn8w

HTTP/1.1 200
Content-type: text/html
…

GET /add_article?article=🍆 HTTP/1.1
Host: www.nozama.com
Cookie: session_id=mSjGCTfn8w

HTTP/1.1 200
Content-type: text/html
```

- Client request #1
- Server response #1
- Client request #2
- Server response #2
- Client request #3
- Server response #3

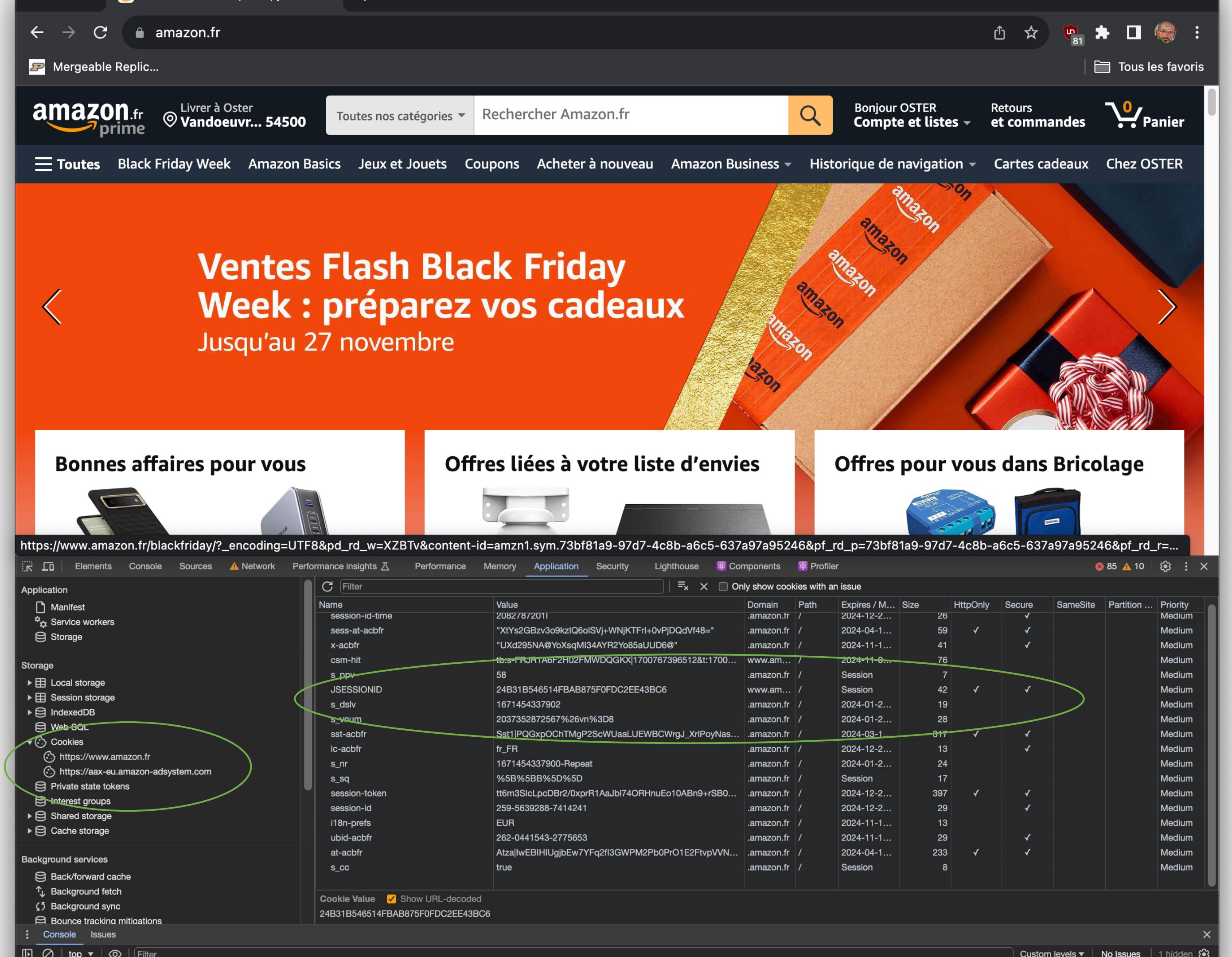
HTTP Cookies

https://developer.mozilla.org/fr/docs/Web/HTTP/Cookies

- Cookie:
  - Set of key/value pairs exchanged between HTTP client and HTTP server
  - Stored at client side (by the web browser)
  - Sent with every request (according to the domain/path attributes)
- Cookie Attributes:
  - Expiration date
  - Path
  - Domain
  - `Secure; HttpOnly;`

```
Set-Cookie: session_id=
mSjGCTfn8w;expires=Sun, 17-Jan-2038
23:08:01 GMT;path=/;domain=.nozama.com
```

- Expiration:
  - When expiration date has passed
  - When removed by client or update to old date by server
  - Browser is closed and cookie is not persistent



amazon.fr

Mergeable Replic...

Tous les favoris

Livrer à Oster
Vandoeuvr... 54500

Toutes nos catégories

Rechercher Amazon.fr

Bonjour OSTER
Compte et listes

Retours
et commandes

0 Panier

Toutes | Black Friday Week | Amazon Basics | Jeux et Jouets | Coupons | Acheter à nouveau | Amazon Business | Historique de navigation | Cartes cadeaux | Chez OSTER

Ventes Flash Black Friday
Week : préparez vos cadeaux
Jusqu'au 27 novembre

Bonnes affaires pour vous

Offres liées à votre liste d'envies

Offres pour vous dans Bricolage

https://www.amazon.fr/blackfriday/?_encoding=UTF8&pd_rd_w=XZBTv&content-id=amzn1.sym.73bf81a9-97d7-4c8b-a6c5-637a97a95246&pf_rd_p=73bf81a9-97d7-4c8b-a6c5-637a97a95246&pf_rd_r=...

Elements | Console | Sources | Network | Performance insights | Performance | Memory | Application | Security | Lighthouse | Components | Profiler | 85 | 10

Application
- Manifest
- Service workers
- Storage

Storage
- Local storage
- Session storage
- IndexedDB
- Web SQL
- Cookies
  - https://www.amazon.fr
  - https://aax-eu.amazon-adsystem.com
- Private state tokens
- Interest groups
- Shared storage
- Cache storage

Background services
- Back/forward cache
- Background fetch
- Background sync
- Bounce tracking mitigations

Filter | □ Only show cookies with an issue

Name	Value	Domain	Path	Expires / M...	Size	HttpOnly	Secure	SameSite	Partition ...	Priority
session-id-time	2082787201l	.amazon.fr	/	2024-12-2...	26		✓			Medium
sess-at-acbfr	"XtYs2GBzv3o9kzIQ6olSVj+WNjKTFrl+0vPjDQdVf48="	.amazon.fr	/	2024-04-1...	59	✓	✓			Medium
x-acbfr	"UXd295NA@YoXsqMI34AYR2Yo85aUUD6@"	.amazon.fr	/	2024-11-1...	41		✓			Medium
csm-hit	tb:s-FRJR1A6F2H02FMWDQGKX|1700767396512&t:1700...	www.am...	/	2024-11-0...	76					Medium
s_ppv	58	.amazon.fr	/	Session	7					Medium
JSESSIONID	24B31B546514FBAB875F0FDC2EE43BC6	www.am...	/	Session	42	✓	✓			Medium
s_dslv	1671454337902	.amazon.fr	/	2024-01-2...	19					Medium
s_vnum	2037352872567%26vn%3D8	.amazon.fr	/	2024-01-2...	28					Medium
sst-acbfr	Sst1|PQGxpOChTMgP2ScWUaaLUEWBCWrgJ_XrlPoyNas...	.amazon.fr	/	2024-03-1...	317	✓	✓			Medium
lc-acbfr	fr_FR	.amazon.fr	/	2024-12-2...	13		✓			Medium
s_nr	1671454337900-Repeat	.amazon.fr	/	2024-01-2...	24					Medium
s_sq	%5B%5BB%5D%5D	.amazon.fr	/	Session	17					Medium
session-token	tt6m3SlcLpcDBr2/0xprR1AaJbl74ORHnuEo10ABn9+rSB0...	.amazon.fr	/	2024-12-2...	397	✓	✓			Medium
session-id	259-5639288-7414241	.amazon.fr	/	2024-12-2...	29		✓			Medium
i18n-prefs	EUR	.amazon.fr	/	2024-11-1...	13					Medium
ubid-acbfr	262-0441543-2775653	.amazon.fr	/	2024-11-1...	29		✓			Medium
at-acbfr	Atza|IwEBIHIUgjbEw7YFq2fl3GWPM2Pb0PrO1E2FtvpVVN...	.amazon.fr	/	2024-04-1...	233	✓	✓			Medium
s_cc	true	.amazon.fr	/	Session	8					Medium

Cookie Value ☑ Show URL-decoded
24B31B546514FBAB875F0FDC2EE43BC6

Console | Issues

top | Filter | Custom levels | No Issues | 1 hidden

Cookies using Flask

https://flask.palletsprojects.com/en/3.0.x/quickstart/#cookies

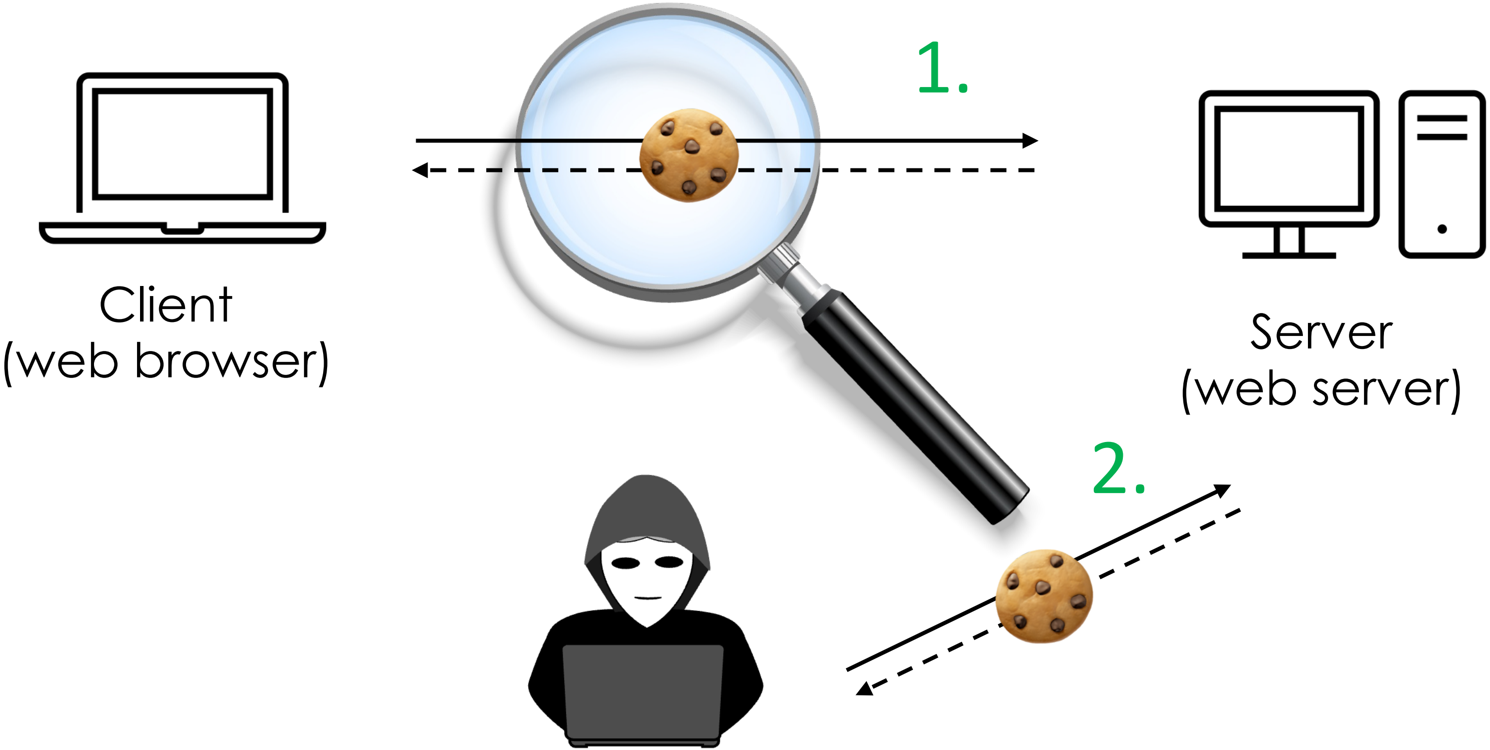
```
@app.route('/some_route')
def route_that_set_a_cookie():
  # do something

  some_data = 'somevalue'
  resp = make_response(render_template('mynice.html', …)

  resp.set_cookie('mycookie', some_data)
  return resp



@app.route('/some_other_route')
def route_that_read_a_cookie():
  # do something

  some_data = request.cookies.get('mycookie')
  return …
```

Server-side Session using Flask

https://flask.palletsprojects.com/en/3.0.x/quickstart/#sessions

```
from flask import Flask, session
app = Flask(__name__)
app.secret_key = 'SOME_SECRET'
app.config['PERMANENT_SESSION_LIFETIME'] = timedelta(minutes=1)

@app.route('/')
def route_that_store_a_value_in_a_session():
   session['email'] = 'johndoe@telecomnancy.eu'
   return 'Hello CS54'


@app.route('/another')
def route_that_read_a_value_from_a_session():

      return session['email']
```

Session Cookie Hijacking



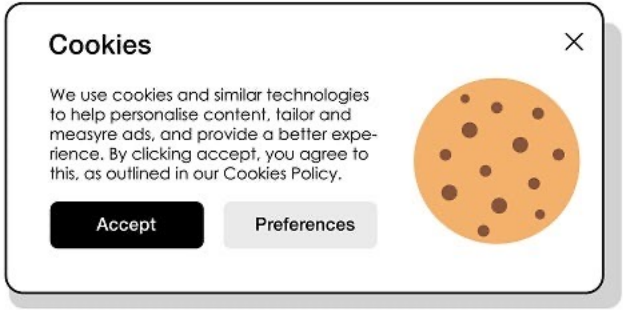
Flask-Session

https://flask-session.readthedocs.io/en/latest/

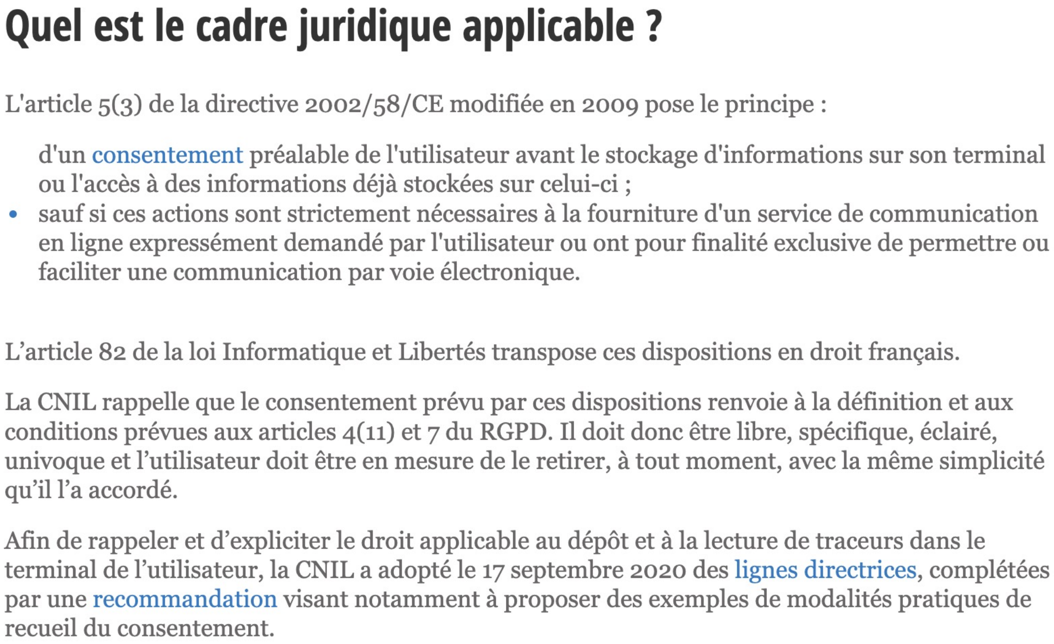
```
from flask import Flask, session

from flask_session import Session


app = Flask(__name__)

SESSION_TYPE = 'filesystem'

app.config.from_object(__name__)

Session(app)


@app.route('/set/')

def set():

  session['somekey'] = 'somevalue'

  return 'ok'


@app.route('/get/')

def get():

   return session.get(‘somekey', 'value if not set')
```

Server-side Session with Storage

Cookies Policy – Do you know why?



We use cookies and similar technologies to help personalise content, tailor and measyre ads, and provide a better experience. By clicking accept, you agree to this, as outlined in our Cookies Policy.



Quel est le cadre juridique applicable ?

L'article 5(3) de la directive 2002/58/CE modifiée en 2009 pose le principe :

d'un consentement préalable de l'utilisateur avant le stockage d'informations sur son terminal ou l'accès à des informations déjà stockées sur celui-ci ;

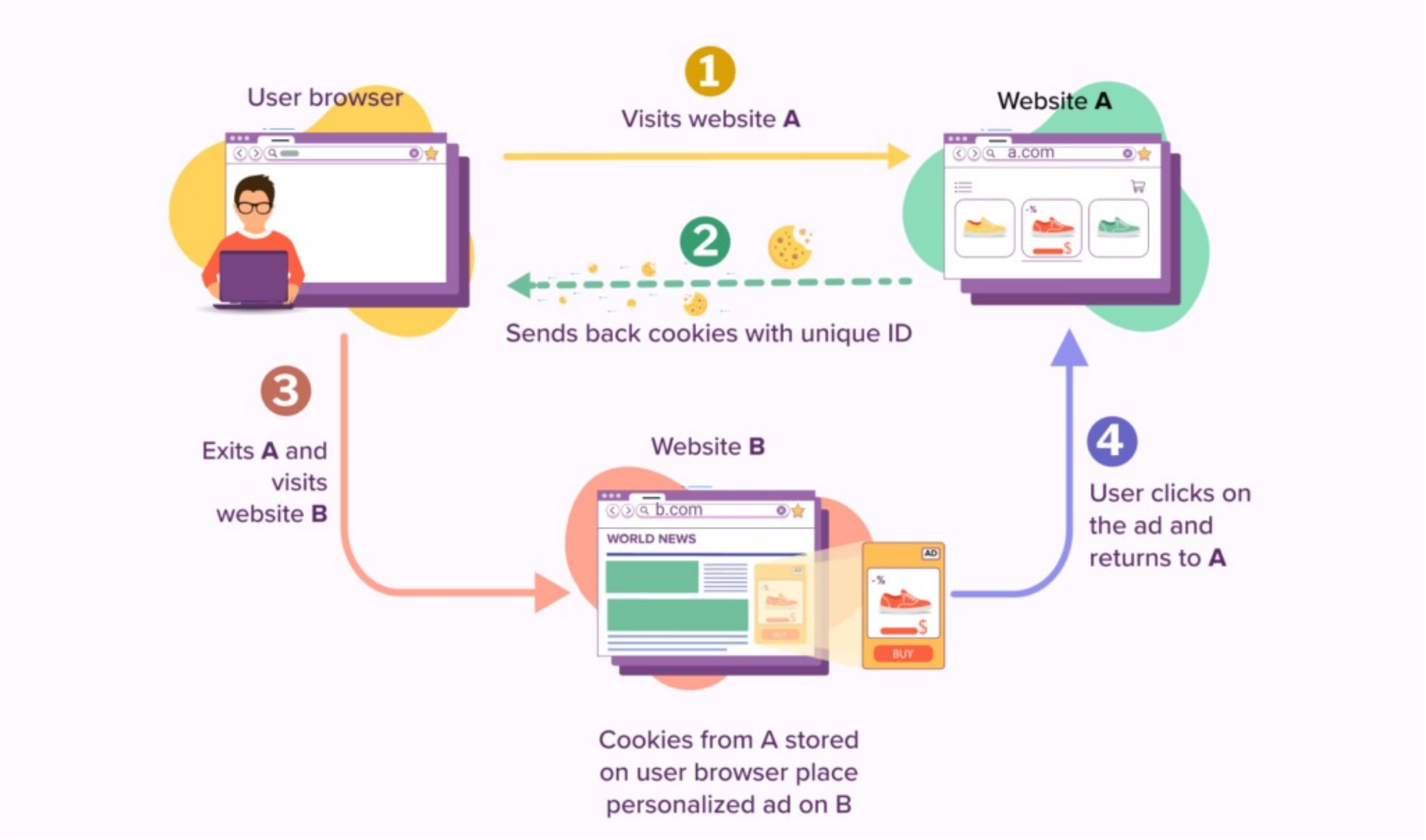
- sauf si ces actions sont strictement nécessaires à la fourniture d'un service de communication en ligne expressément demandé par l'utilisateur ou ont pour finalité exclusive de permettre ou faciliter une communication par voie électronique.

L'article 82 de la loi Informatique et Libertés transpose ces dispositions en droit français.

La CNIL rappelle que le consentement prévu par ces dispositions renvoie à la définition et aux conditions prévues aux articles 4(11) et 7 du RGPD. Il doit donc être libre, spécifique, éclairé, univoque et l'utilisateur doit être en mesure de le retirer, à tout moment, avec la même simplicité qu'il l'a accordé.

Afin de rappeler et d'expliciter le droit applicable au dépôt et à la lecture de traceurs dans le terminal de l'utilisateur, la CNIL a adopté le 17 septembre 2020 des lignes directrices, complétées par une recommandation visant notamment à proposer des exemples de modalités pratiques de recueil du consentement.

Third-Party Cookie Retargeting


User browser
1
Visits website A
Website A
a.com
2
Sends back cookies with unique ID
3
Exits A and visits website B
Website B
b.com
WORLD NEWS
AD
BUY
4
User clicks on the ad and returns to A
Cookies from A stored on user browser place personalized ad on B

To go further…

- Views and Blueprints
- SQLAlchemy (Python ORM)
- REST API (Marshmallow)
- Forms (WTF)
- Security (Authentication)
- Deployment (WSGI)
- …