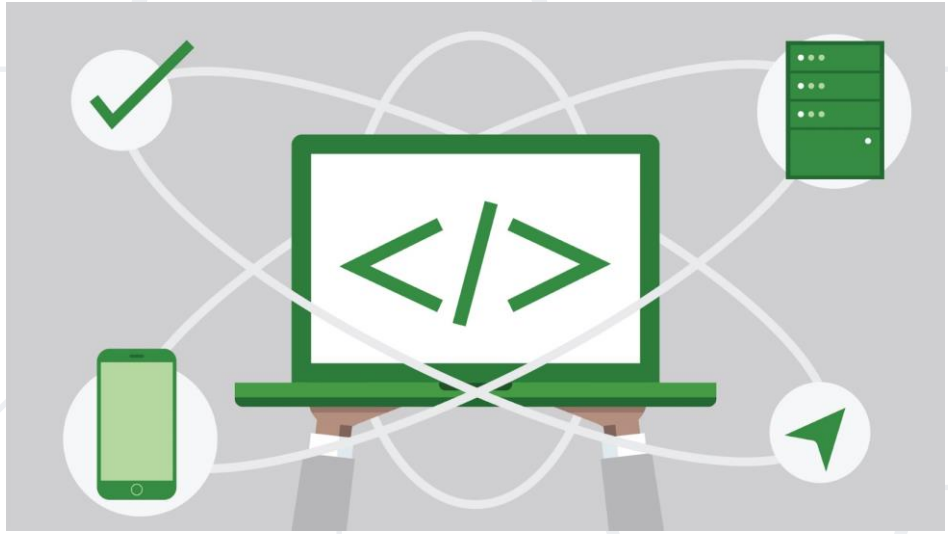
State Management

Cookies and Sessions



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Have a Question?

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sli.do

#java-web

HTTP Cookies

Usages and Control

What Are Cookies?

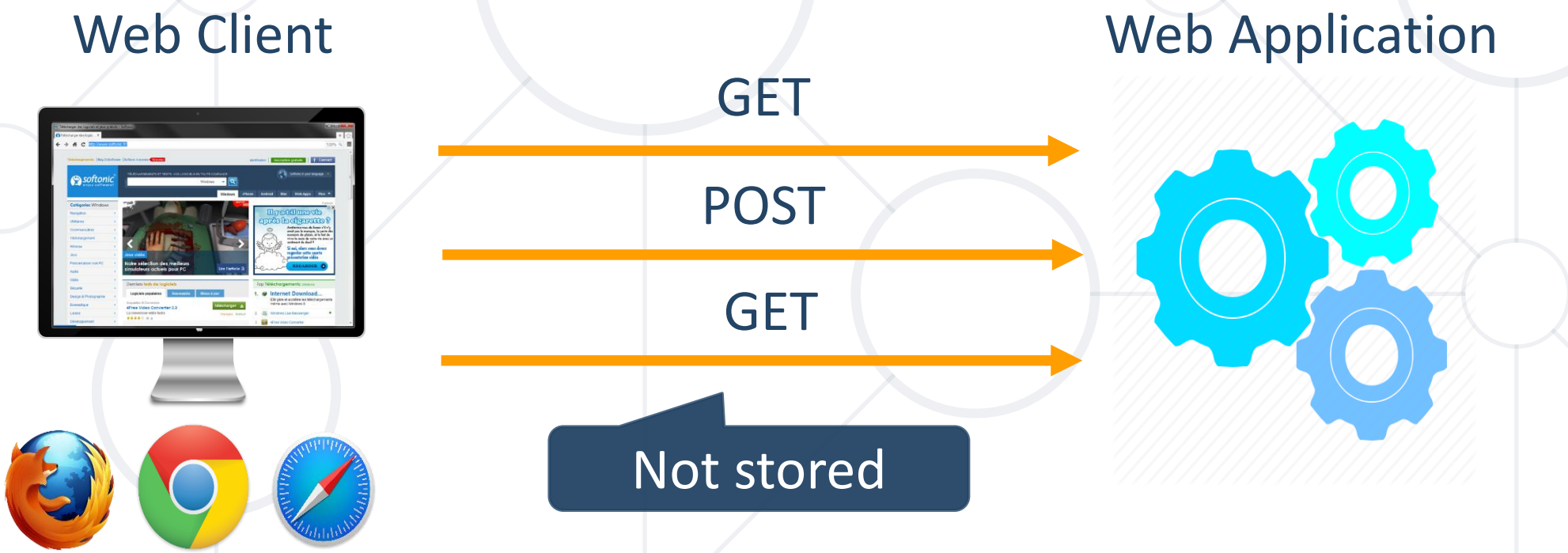
- A **small file** of **plain text** with no executable code
  - Sent by the server to the client's browser
  - Stored by the browser on the client's device (computer, tablet, etc.)
  - Hold small piece of data for a particular client and a website

What Are Cookies Used for?

- **Session management**
  - Logins, shopping carts, game scores, or anything else the server should remember
- **Personalization**
  - User preferences, themes, and other custom settings
- **Tracking**
  - Recording and analyzing user behavior
- Breakfast
  - But that's not what we are currently talking about

Session Management

- The HTTP object is **stateless**
  - It **doesn't store** information about the requests



Stateless HTTP – the Problem

- The **server does not know** if two requests come from the same client
- **State management** problems
  - Navigation through pages requires **authentication each time**
  - Information about the pages is lost **between the requests**
  - **Harder personalization** of page functionality

Stateless HTTP – the Cookie Solution

- A reliable **mechanism** for websites to **remember stateful information**
  - to know whether the user is **logged in or not**
  - to know **which account** the user is logged in with
  - to record the user's **browsing activity**
  - to remember pieces of information **previously entered** into form fields (usernames, passwords, etc.)

How Are Cookies Used?

- The response holds the cookies to be saved within the **Set-Cookie** header

```
HTTP/1.1 200 OK
Set-Cookie: lang=en
```

- The request holds the specific web site cookie within the **Cookie** header

```
GET /index HTTP/1.1
Cookie: lang=en
```

Server-Client Cookies Exchange

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http://www.example.bg/

Web Client

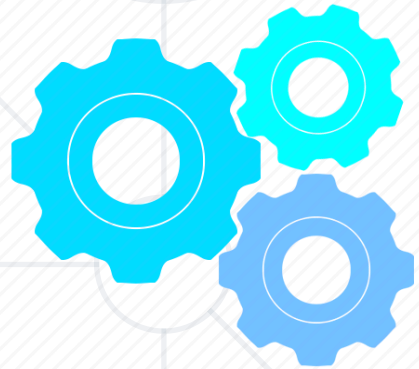
GET /index HTTP/1.1

HTTP/1.1 200 OK Set-Cookie: lang=en

GET /index HTTP/1.1

Cookie: lang=en

Web Application



Cookie Structure

- The cookie consists of **Name**, **Value** and **Attributes** (optional)
- The attributes are **key-value pairs** with additional information
- Attributes are not included in the requests
- Attributes are used by the client to control the cookies

Scope

- Defined by the attributes **Domain** and **Path**
- **Domain** – defines the website that the cookie belongs to
- **Path** – Indicates a **URL** path that must exist in the requested resource before sending the **Cookie** header

```
Set-Cookie: SSID=Ap4P…GTEq; Domain=foo.com; Path=/;
Expires=Wed, 13 Jan 2021 22:23:01 GMT; Secure; HttpOnly
```

Lifetime

- Defined by the attributes `Expires` and `Max-Age`
- `Expires` – defines the date that the browser should delete the cookie
- By default the cookies are deleted after the end of the session
- `Max-Age` – interval of seconds before the cookie is deleted

```
Set-Cookie: SSID=Ap4P…GTEq; Domain=foo.com; Path=/;
Expires=Wed, 13 Jan 2021 22:23:01 GMT; Secure; HttpOnly
```

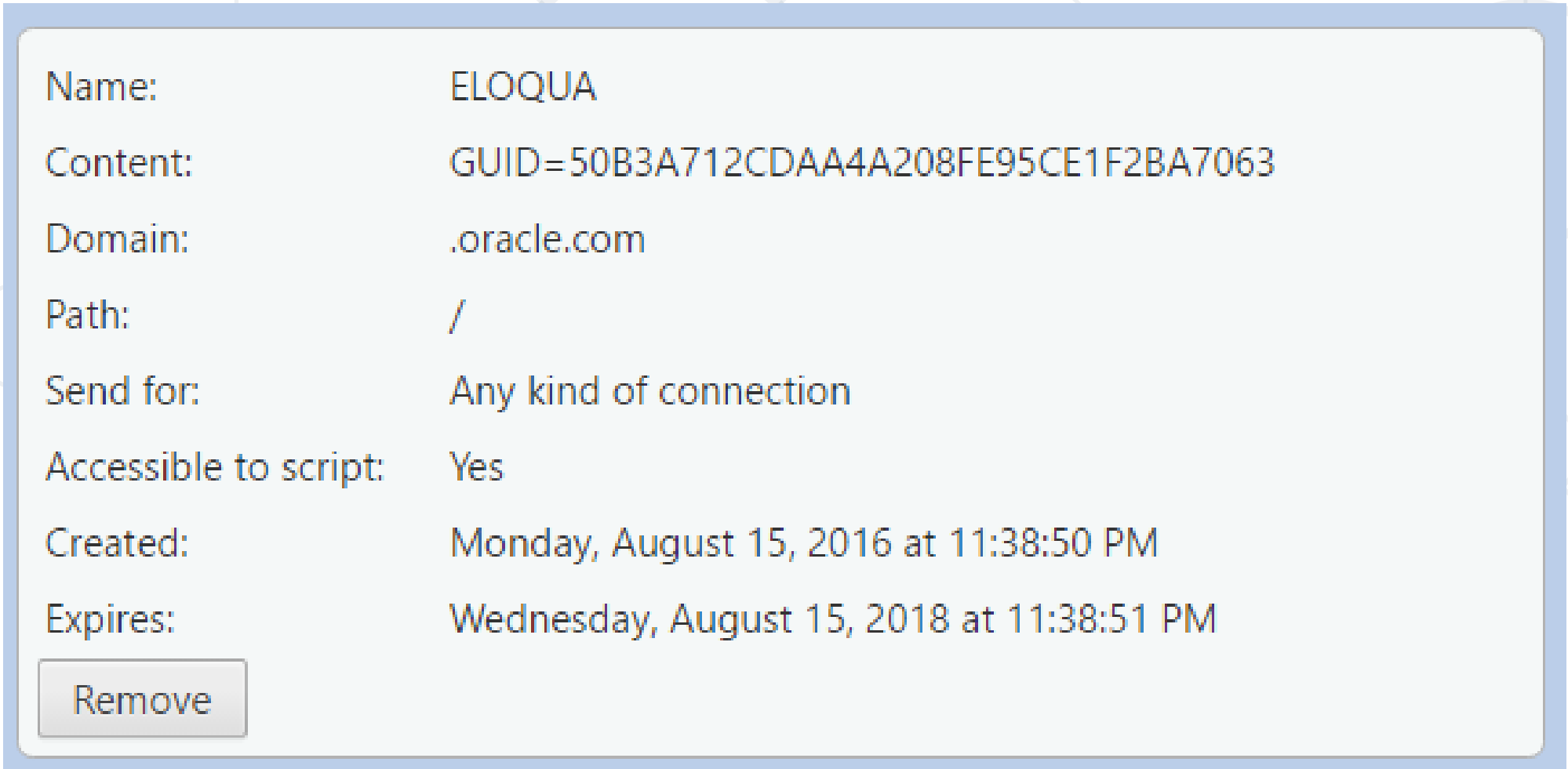
Security

- Security flags do not have associated values
- **`Security`** - tells the browser to use cookies only via **secure/encrypted** connections
- **`HttpOnly`** – defines that the cookie cannot be accessed via client-side scripting languages

```
Set-Cookie: SSID=Ap4P…GTEq; Domain=foo.com; Path=/;
Expires=Wed, 13 Jan 2021 22:23:01 GMT; Secure; HttpOnly
```

What is in the Cookie?

- The cookie file contains a table with **key-value** pairs



Examine Your Cookies (1)

- Most cookies are stored in a **RDBMS**, usually **SQLite**
- Download **SQLite browser** from **here**
- Location of Mozilla cookies

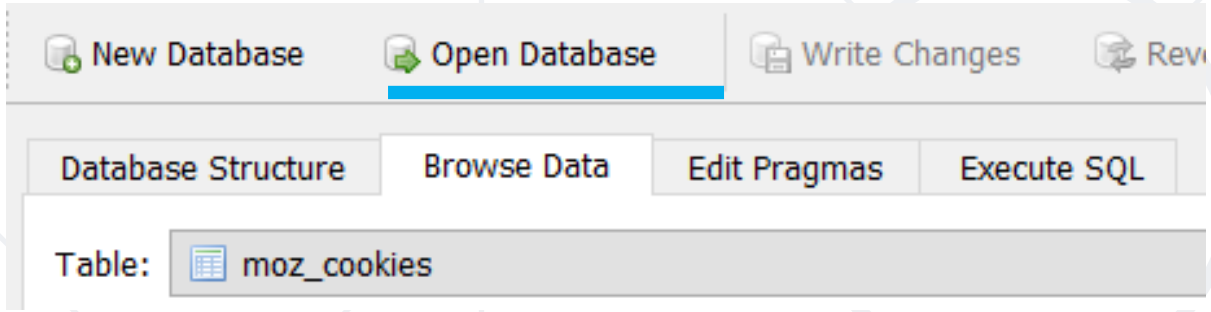
```
C:\Users\{username}\AppData\Roaming\Mozilla\Firefox\Profiles\{name}.default\cookies.sqlite
```

- Location of Chrome cookies

```
C:\Users\{username}\AppData\Local\Google\Chrome\User Data\Default\Cookies
```

Examine Your Cookies (2)

- Open the file with the **SQLite browser**



- Browse the cookies table

Table: moz_cookies

	baseDomain	originAttributes	name	value	host	path	expiry	lastAccessed	creationTime
	Filter	Filter	Filter	Filter	softuni	Filter	Filter	Filter	Filter
1	softuni.bg		_ga	GA1.2.14749...	.softuni.bg	/	1548331112	1485259173536000	1472458246652000
2	softuni.bg		cb-enabled	enabled	platform.soft...	/	1512124532	1485213524987000	1480588532898000
3	softuni.bg		cookies-notifi...	ok	judge.softuni....	/	1787818276	1485259172447000	1472458276862000
4	softuni.bg		cb-enabled	accepted	softuni.bg	/	1503994248	1485214353890000	1472458248921000

Name

Host

Expiration date

Created on

Value

Paths

Last accessed on

Control Your Cookies – Firefox Browser (1)

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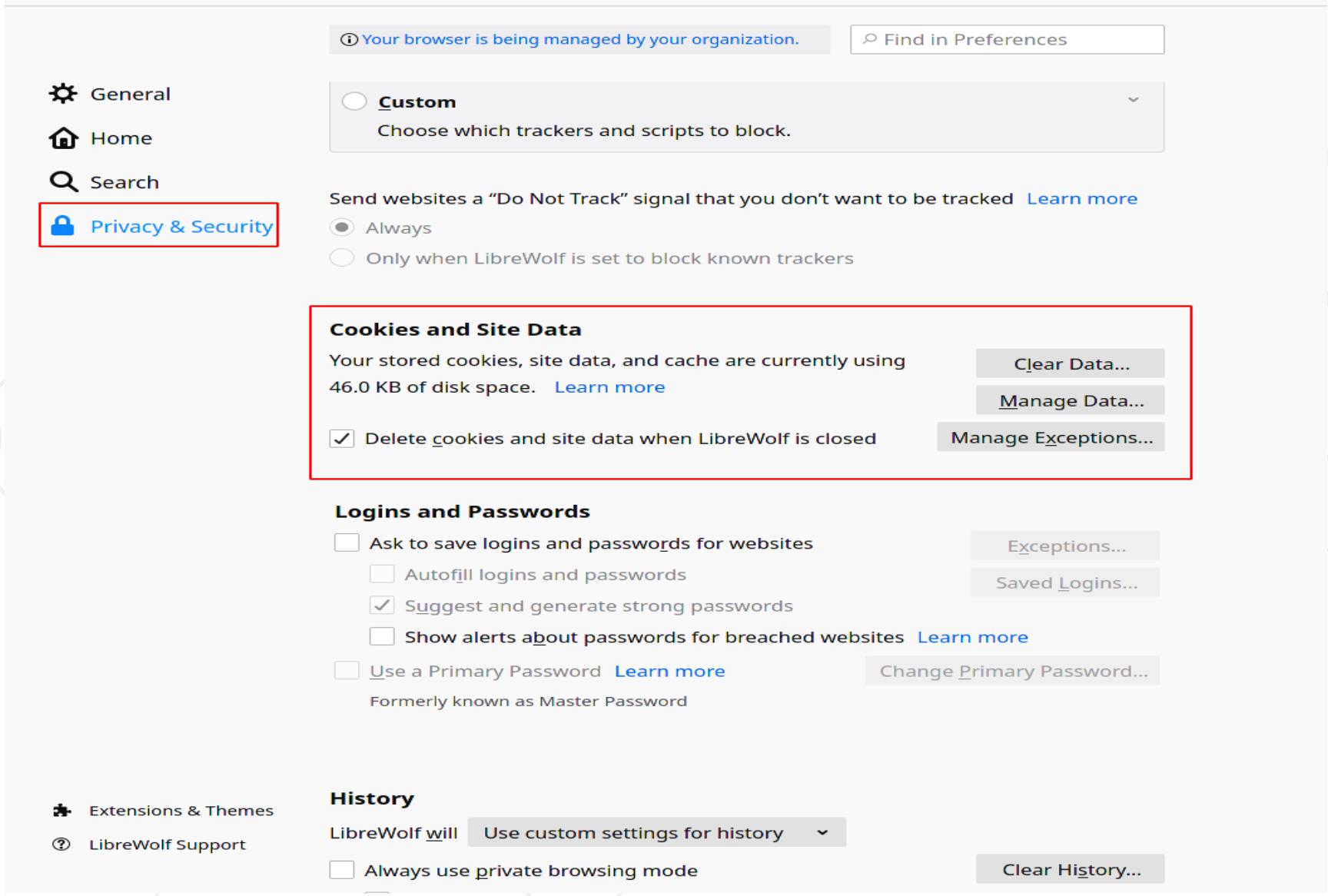
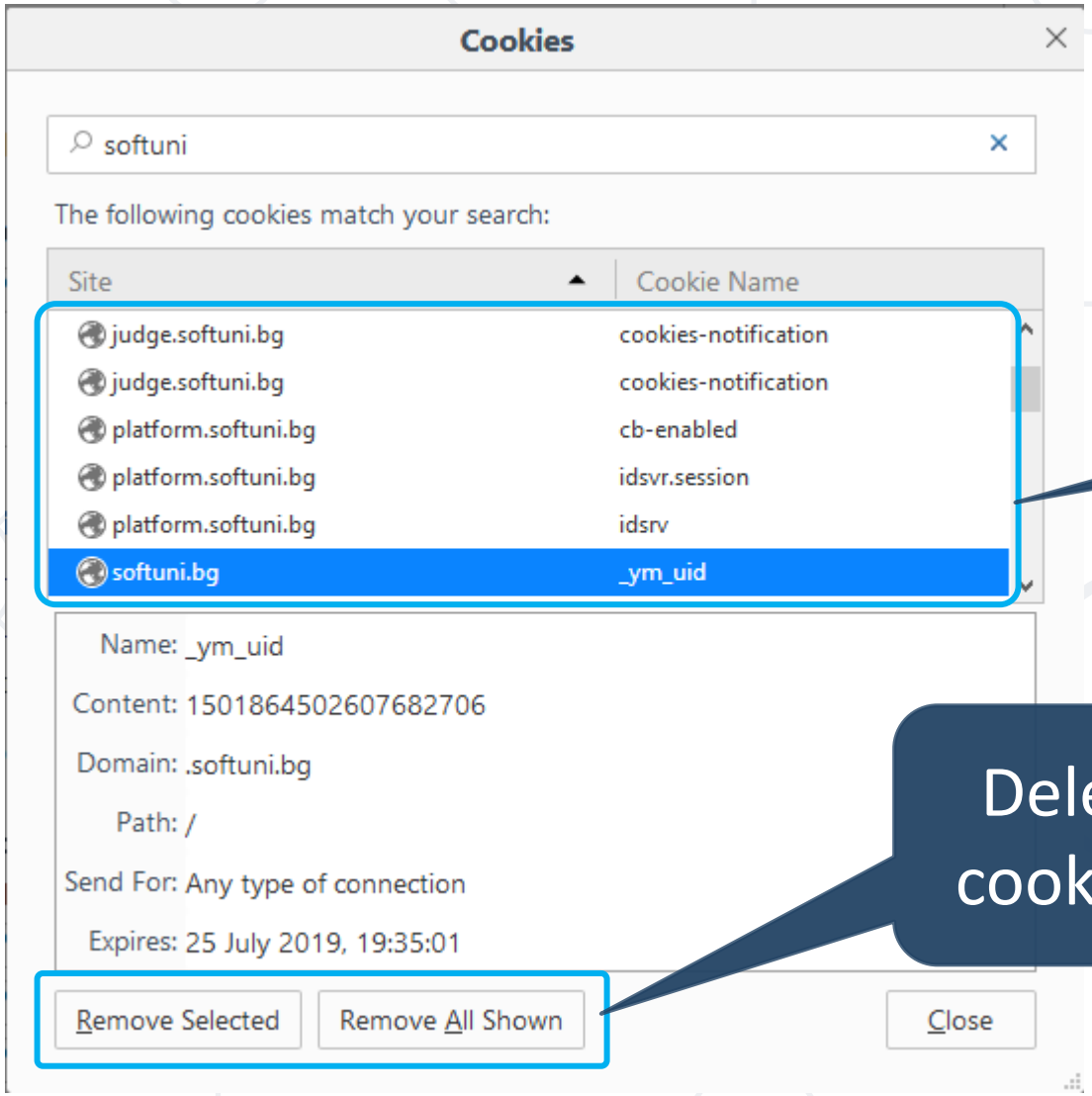


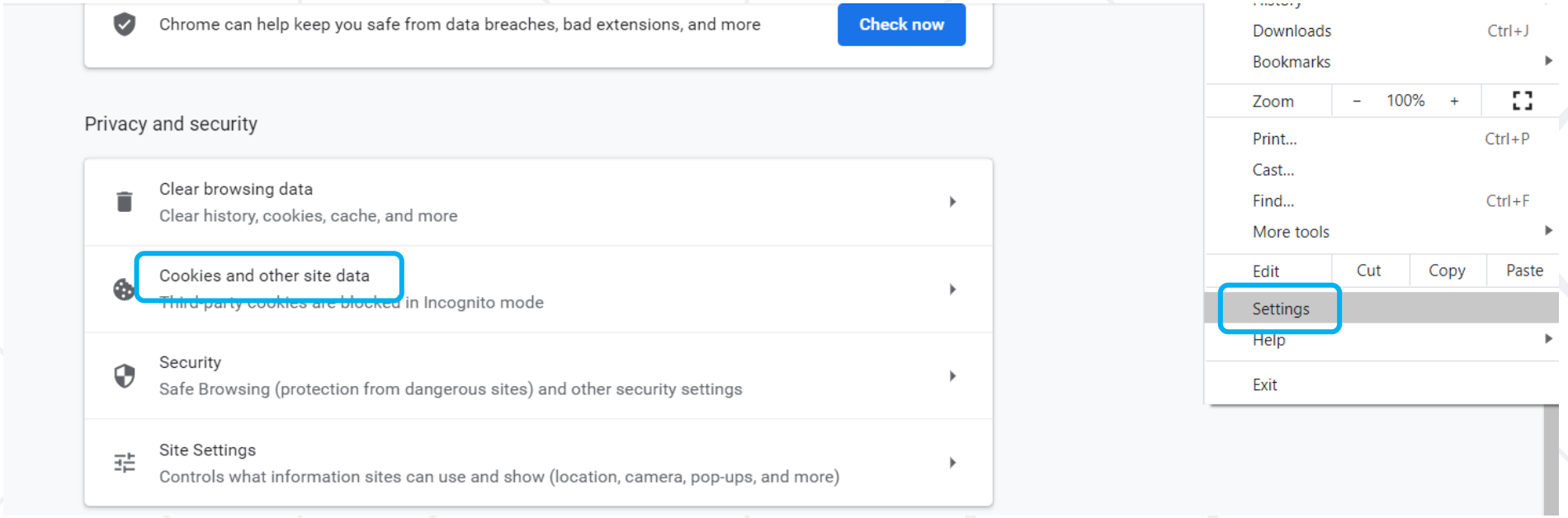
Control Your Cookies – Firefox Browser (2)

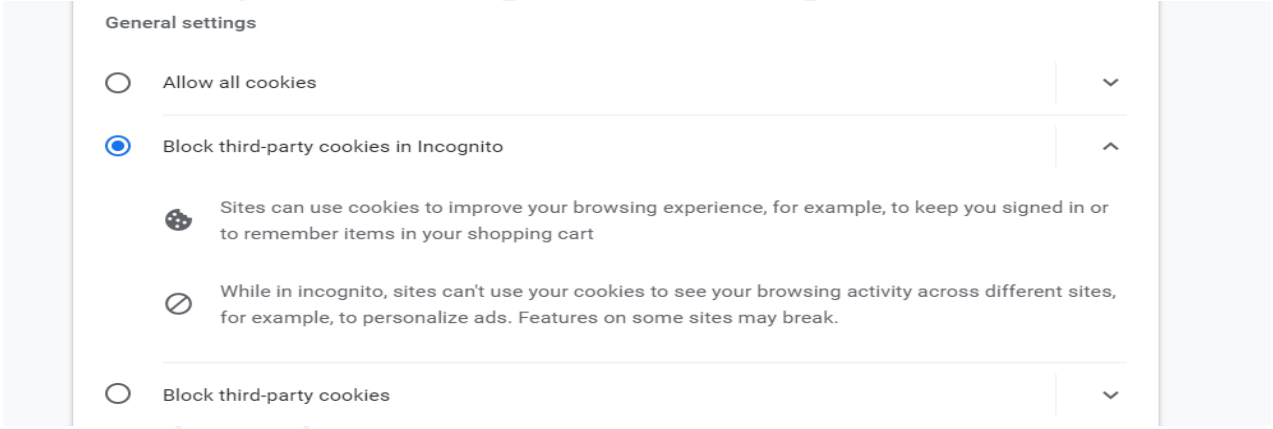


Browse cookies from a selected website

Delete a particular cookie or all cookies

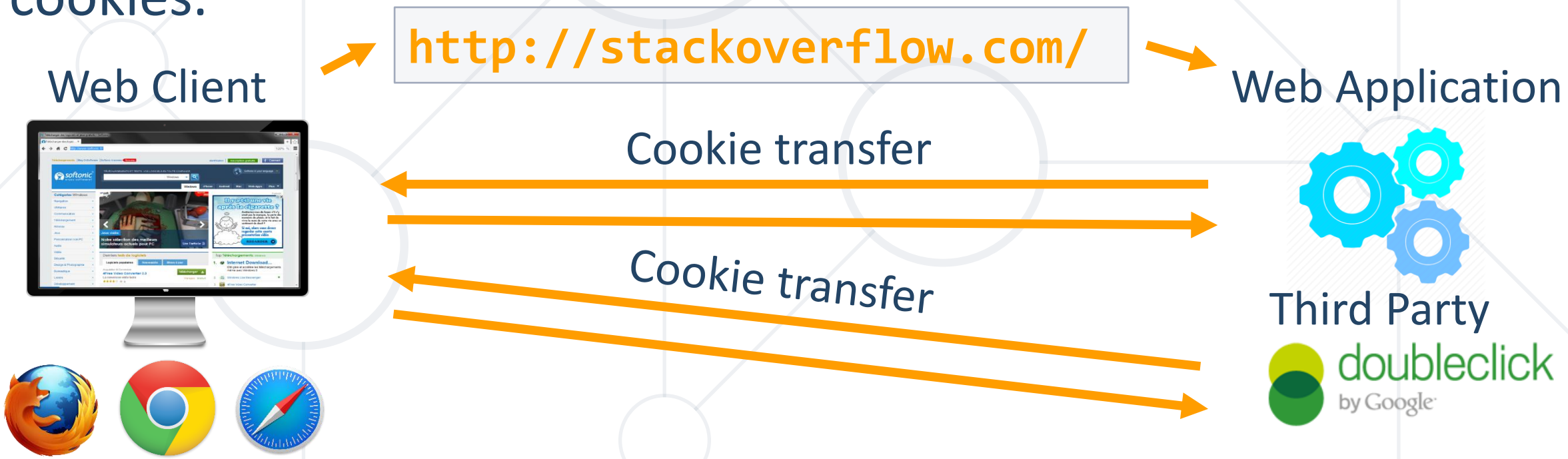
Control Your Cookies – Chrome Browser





Third Party Cookies

- Cookies stored by an **external party** (different **domain**)
- Mainly used for advertising and tracking across the web
- By the end of 2023, Google will stop the use of third-party cookies.



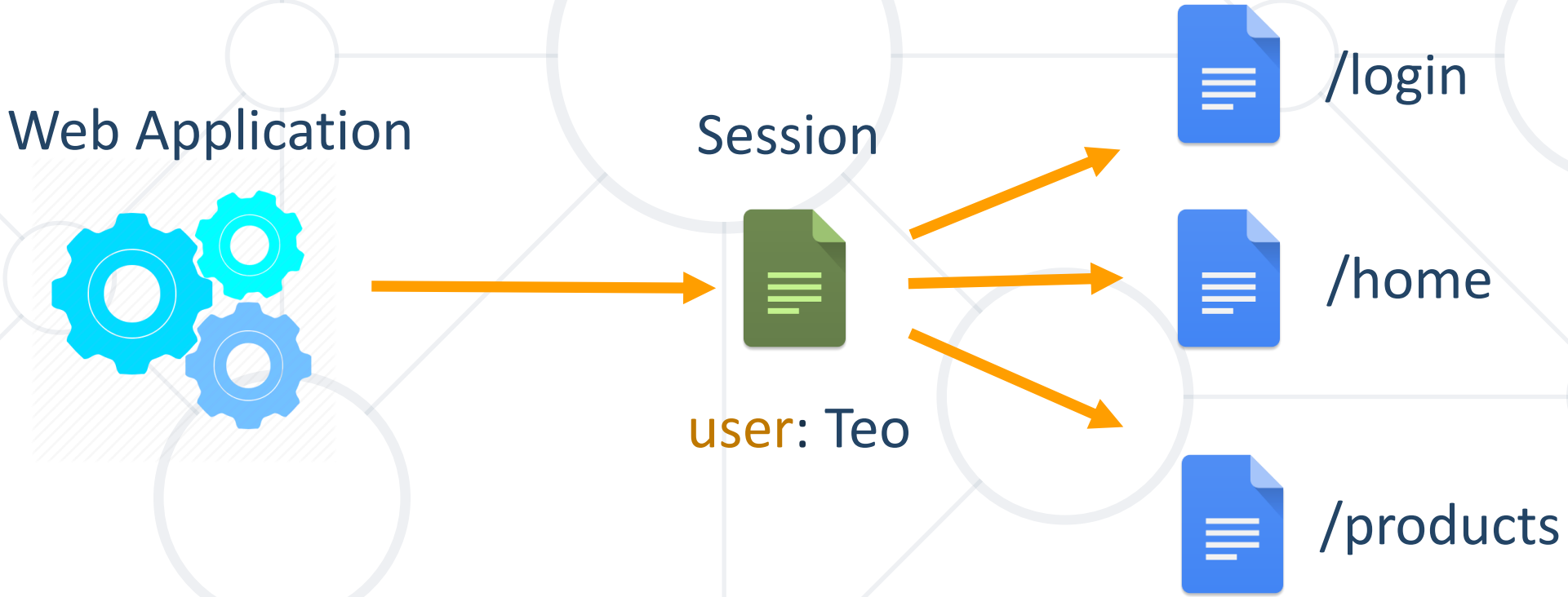
Cookies

Live Demo

HTTP Sessions

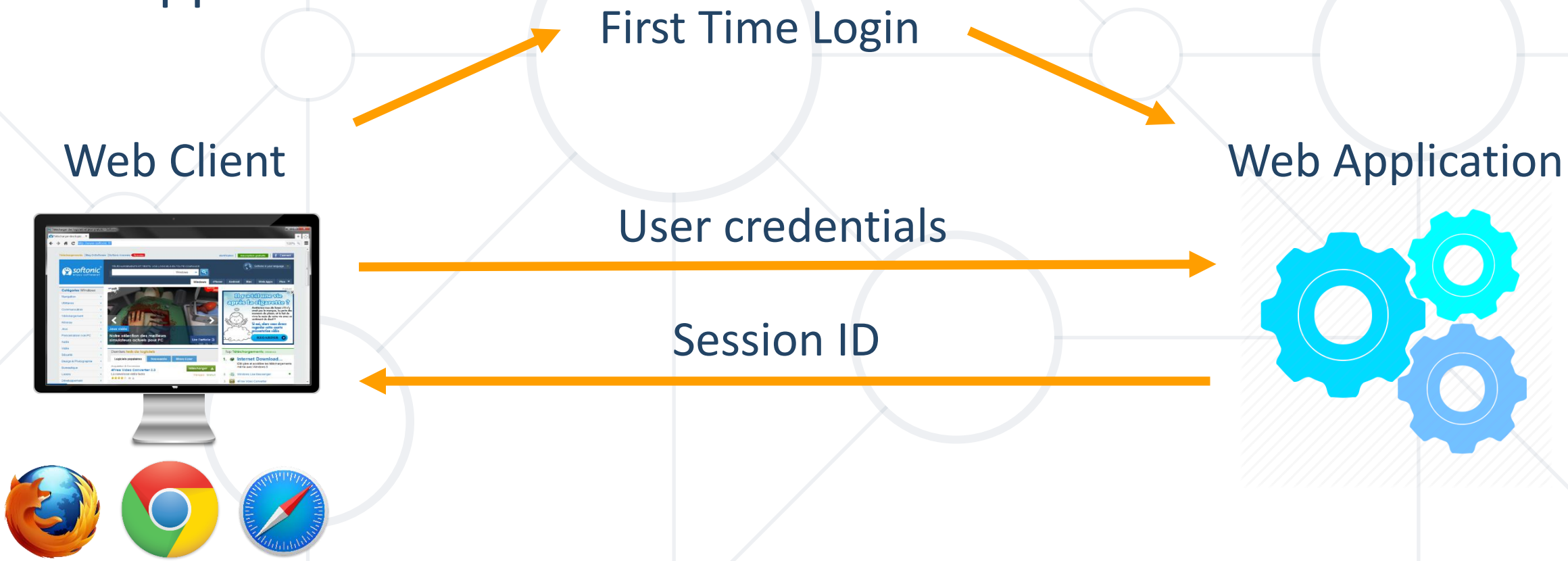
What Are Sessions?

- A way to store information about a user to be used across **multiple pages**



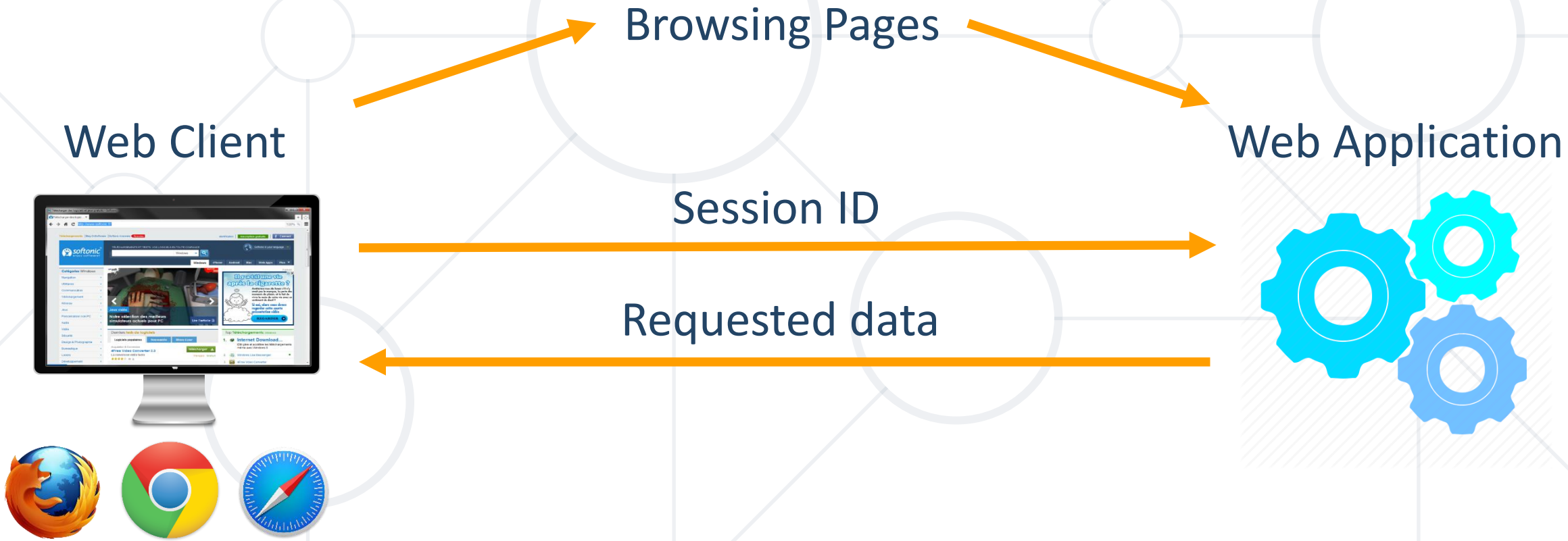
Session Management (1)

- The exchange mechanism be used between the user and the web application



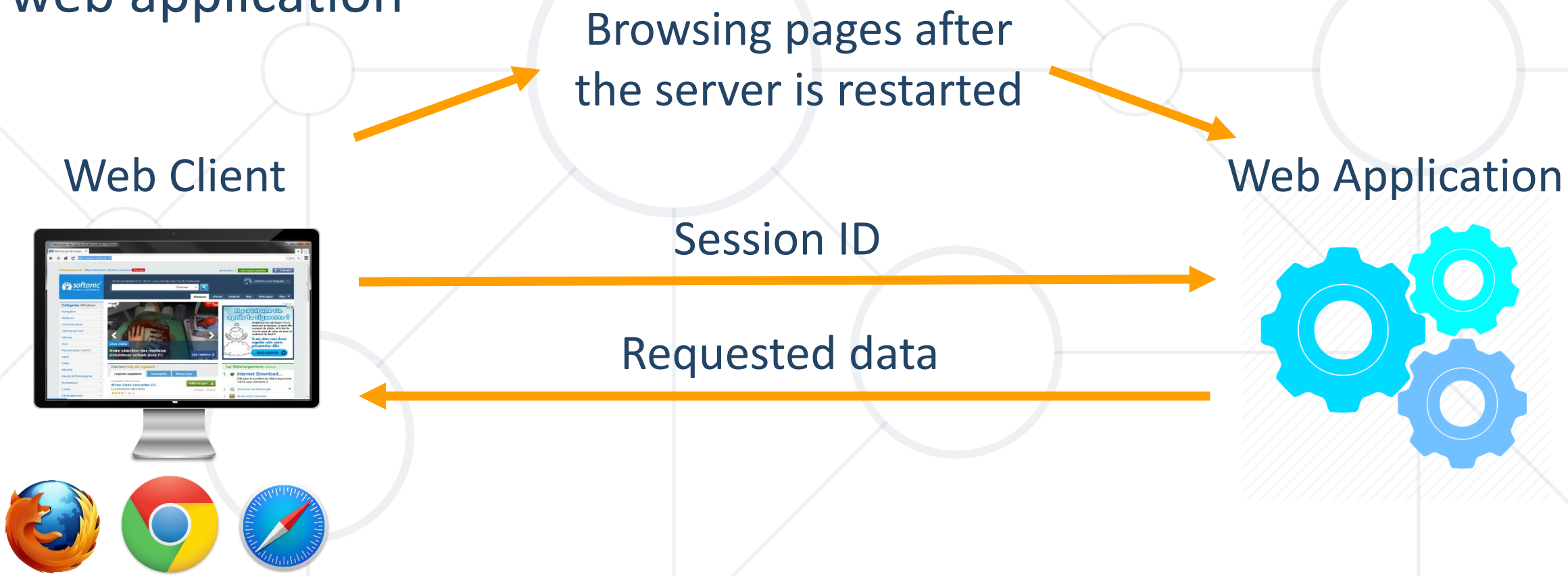
Session Management (2)

- The exchange mechanism be used between the user and the web application

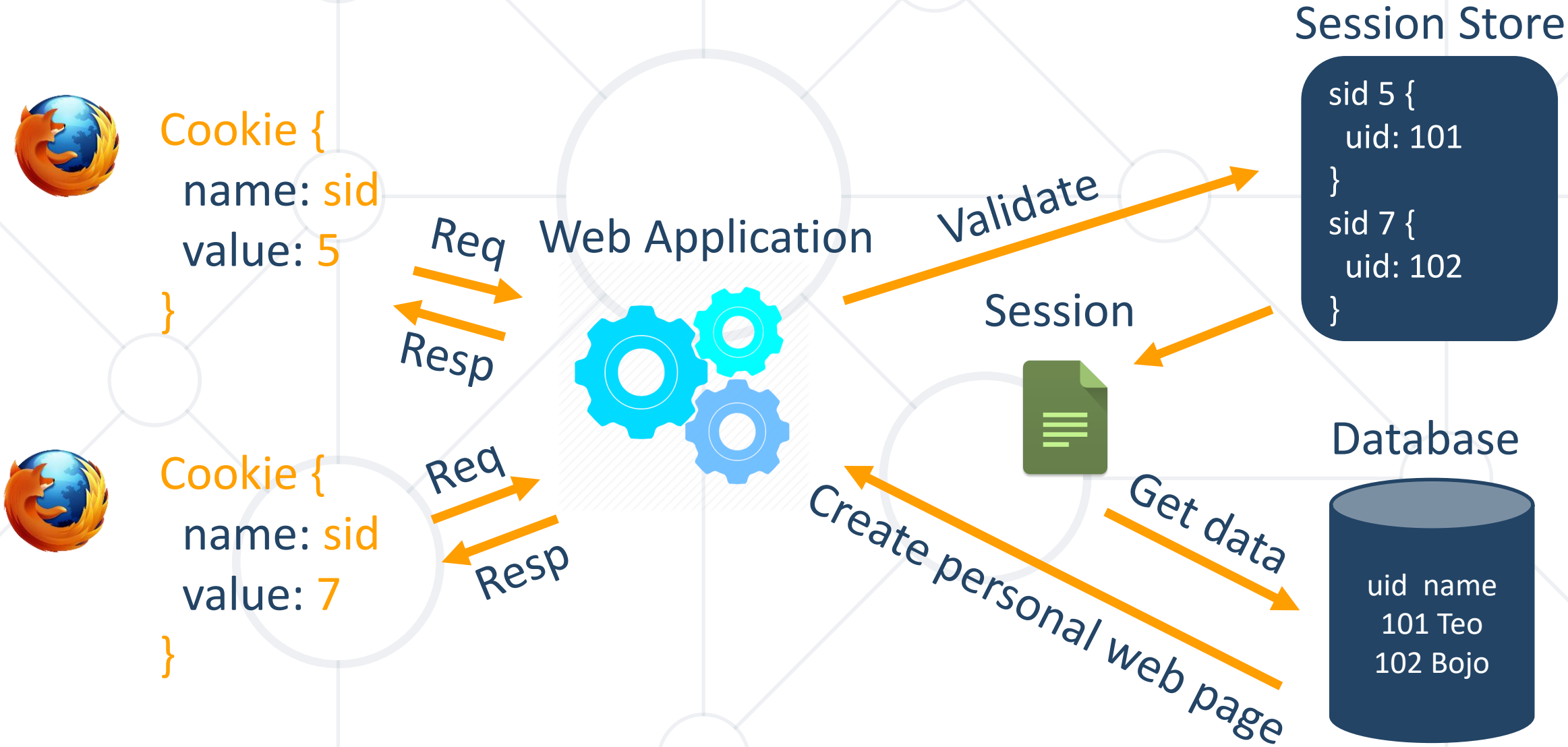


Session Management (3)

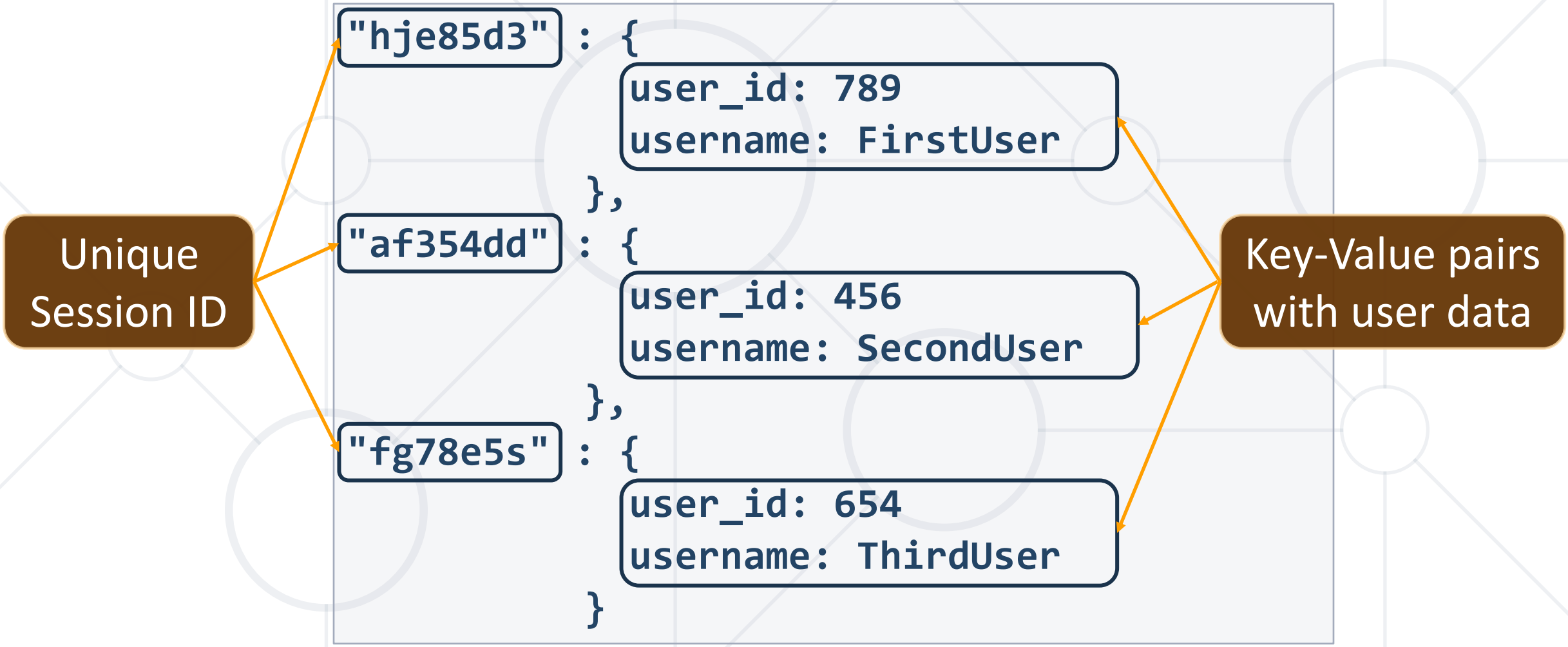
- The exchange mechanism be used between the user and the web application



Relation with Cookies



Session Structure



Sessions

Live Demo

Summary

- **Cookies** are client based stored information
  - They are created by web applications
  - Browser sends them back to the application
- **Sessions** are server based information
  - They are used across multiple pages
  - Stores important info about the client

Questions?

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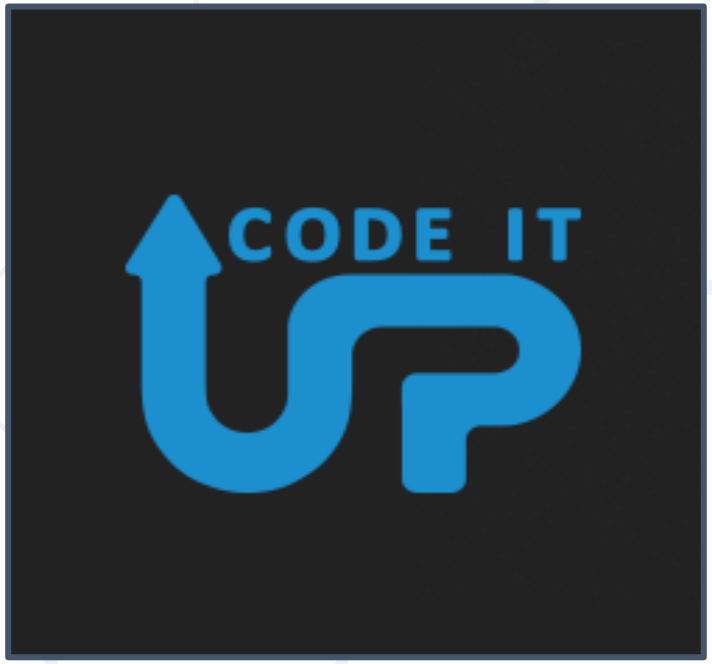

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