

State Management

Cookies and Sessions

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1. HTTP Cookies - Usage 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 in the server should remember
- Personalization
 - User preferences, themes, and other custom settings
- Tracking (Third Party Cookies - till end of year 2023)
 - Recording and analyzing user behaviour

Session Management

- The HTTP protocol 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

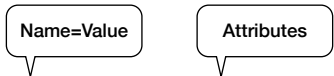
```
GET /index HTTP/1.1
Cookie: lang=en
```

Server-Client Cookies Exchange

Web Client \longrightarrow `http://www.example.bg/` \longrightarrow Web Application
 \longrightarrow `GET /index HTTP/1.1` \longrightarrow
 \longleftarrow `HTTP/1.1 200 OK Set-Cookie: lang=en` \longleftarrow

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


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

The browser will send only:

Set-Cookie: SSID=Ap4P...GTEq;

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

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

What is in the Cookie?

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

Name: ELOQUA
Content: GUID=50B3A712CDAA4A208FE95CE1F2BA7063
Domain: .oracle.com
Path: /
Send for: Any kind of connection
Accessible to script: Yes
Created: Monday, August 15, 2016 at 11:38:50 PM
Expires: Wednesday, August 15, 2018 at 11:38:51 PM

Examine Your Cookies

- 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
MacOS:

/Users/{username}/Library/Application\ Support/Firefox/Profiles/#####.default/
cookies.sqlite

- Location of Chrome cookies
C:\Users\{username}\AppData\Local\Google\Chrome\UserData\Default\Cookies

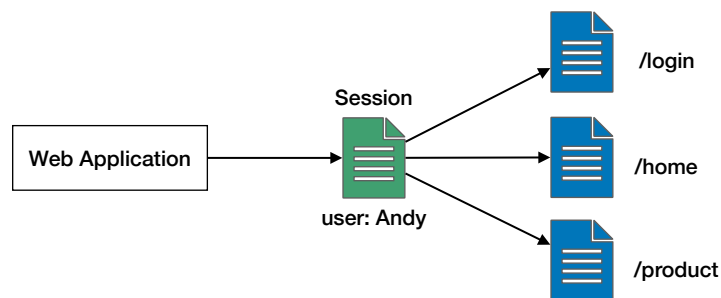
Third Party Cookies

- 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

2. HTTP Sessions

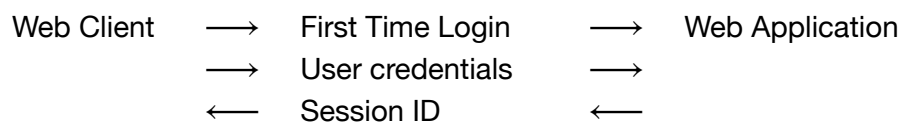
What Are Sessions?

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

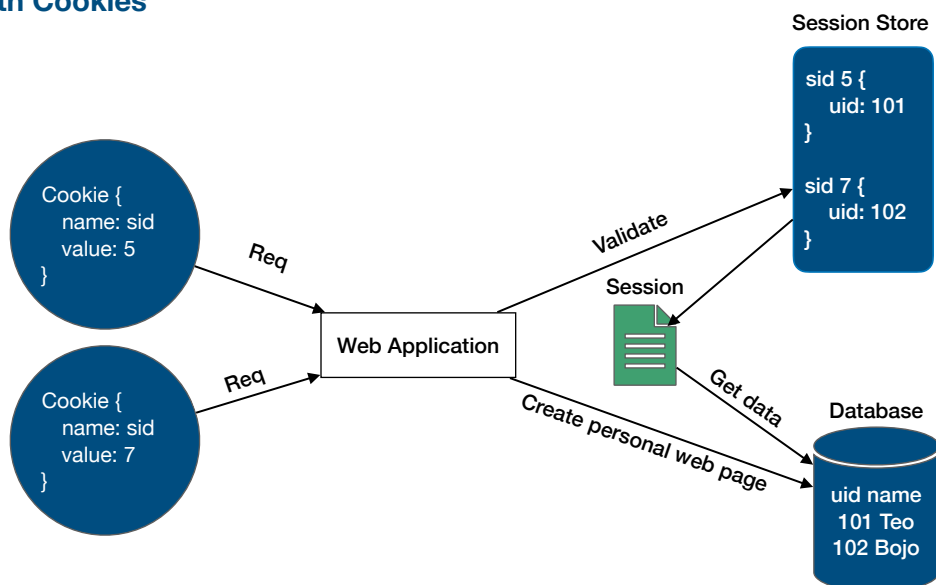


Session Management

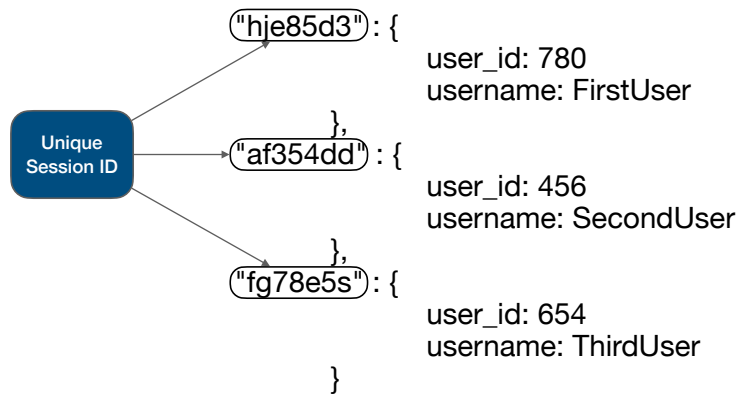
- The exchange mechanism is used between the user and the web application



Relation with Cookies



Session Structure



Summary

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