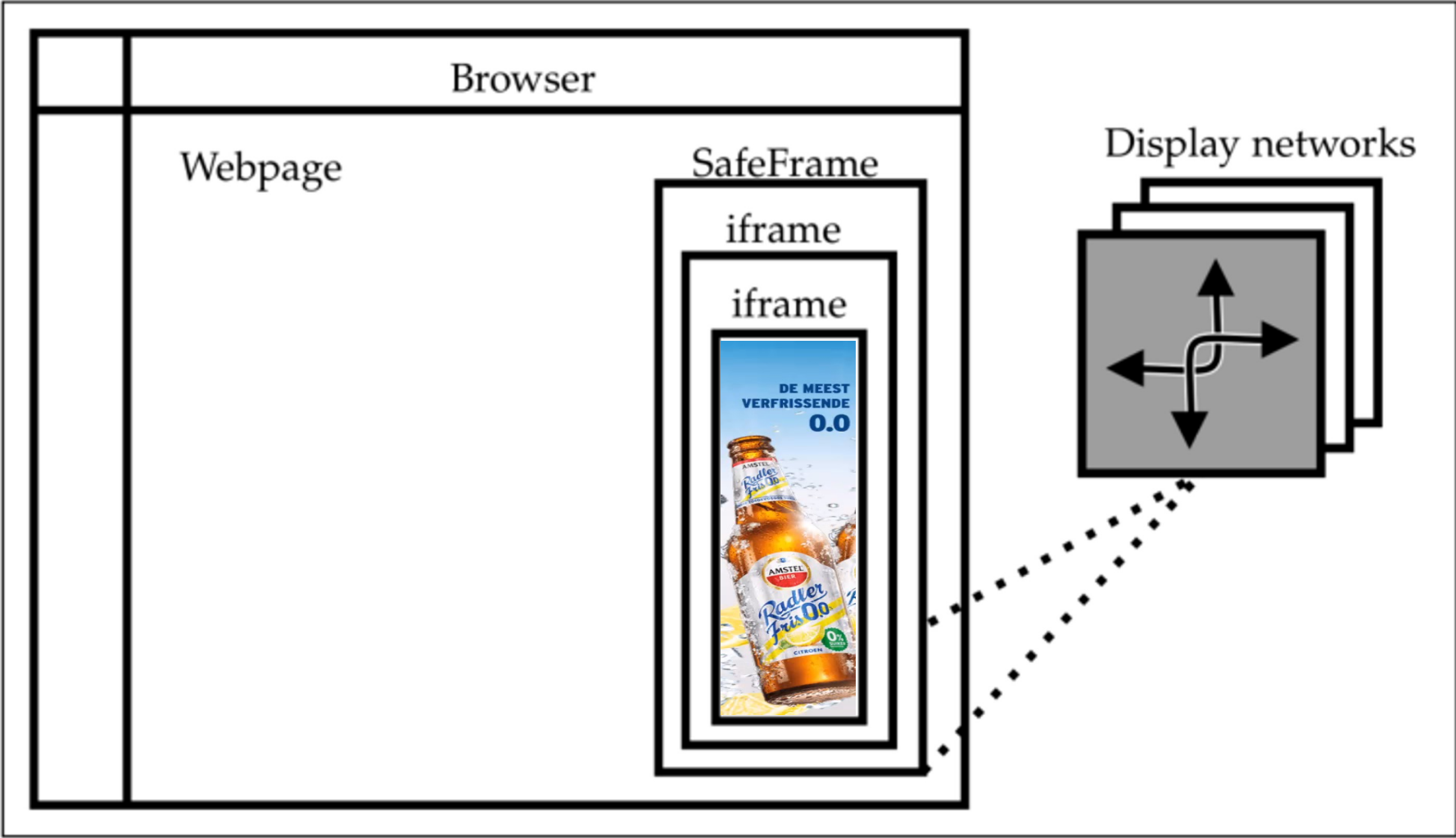
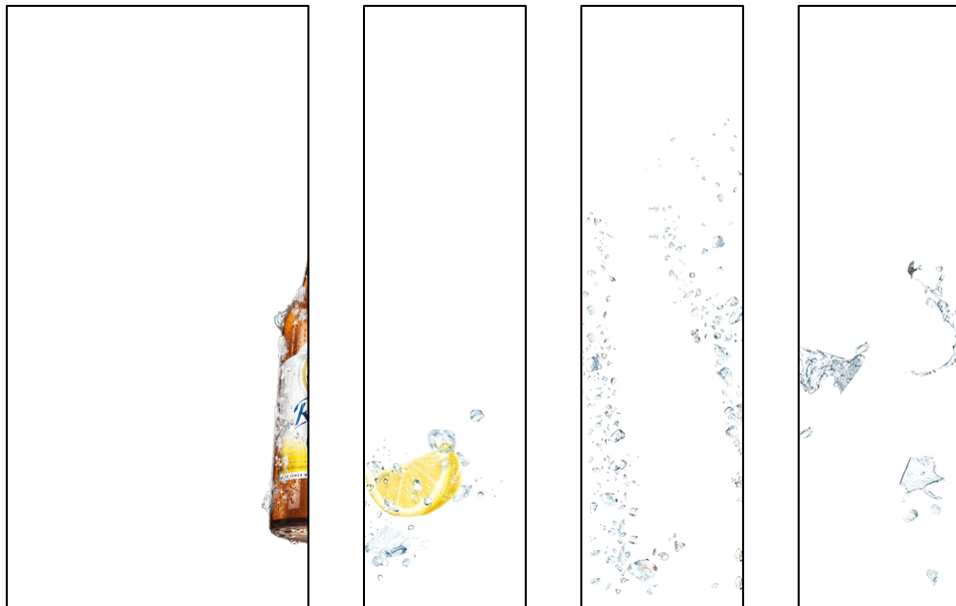


Behind the Scenes of an Online Ad





alle	cookie	CSS	afb.	media	script	XHR	frame	overig
Huidige domein								
2mdn.net								
s0.2mdn.net		1	14		5			
ajax.googleapis.com					1			

Google Doubleclick Frame:

https://s0.2mdn.net/9026094/1559035272353/amnet_160x600/index.html

PRIVACY
LAW

CALIFORNIA
LAWYERS
ASSOCIATION

FUTURE OF
PRIVACY
FORUM

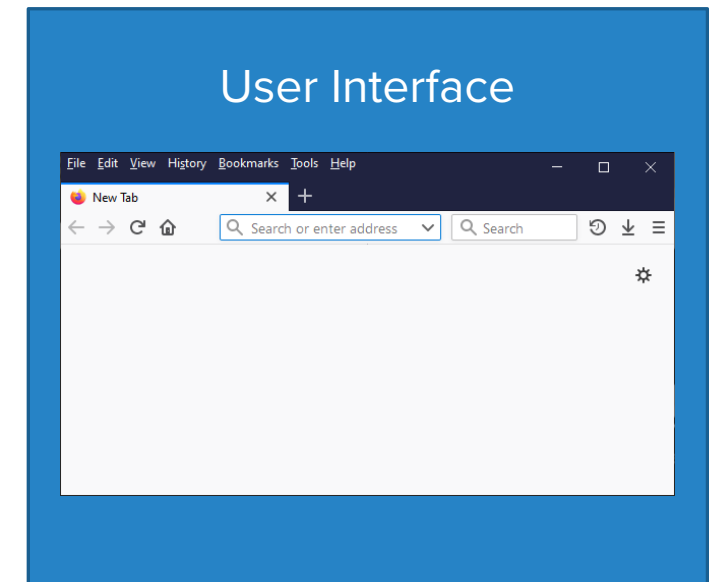
How Does A Browser Work?

Six main components inside a web browser:

1. User interface
2. Rendering engine
3. Browser engine
4. JavaScript interpreter
5. Networking
6. Data storage

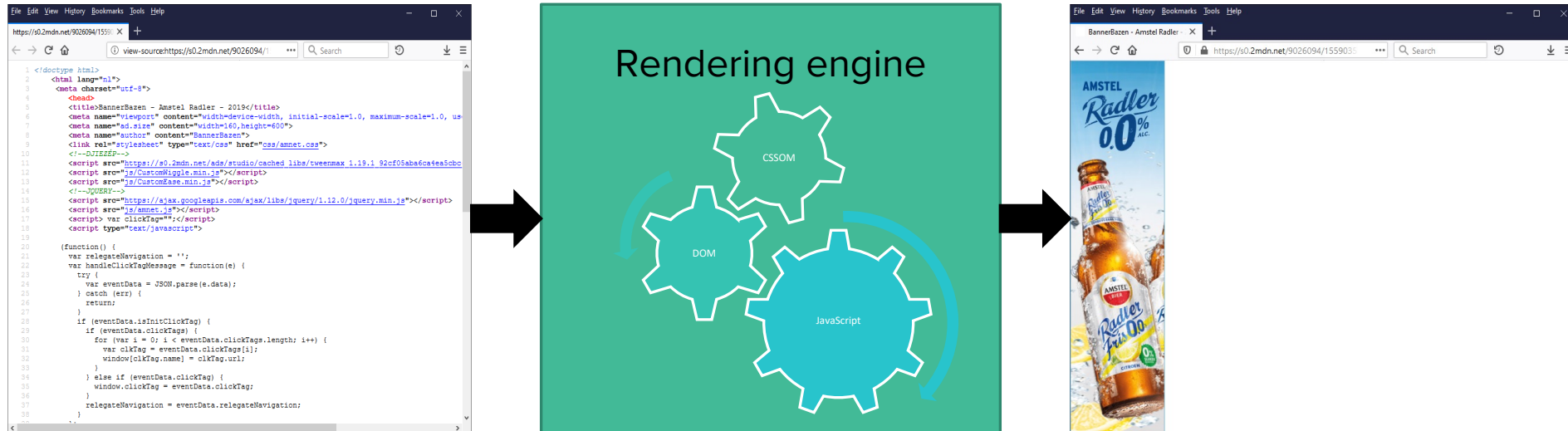
1. User Interface

- The main window that displays the web page and
- The navigation elements, e.g.,:
 - address bar,
 - forward & back button,
 - toolbar,
 - search bar, etc.
- The backend of the user interface connects to the operating system.



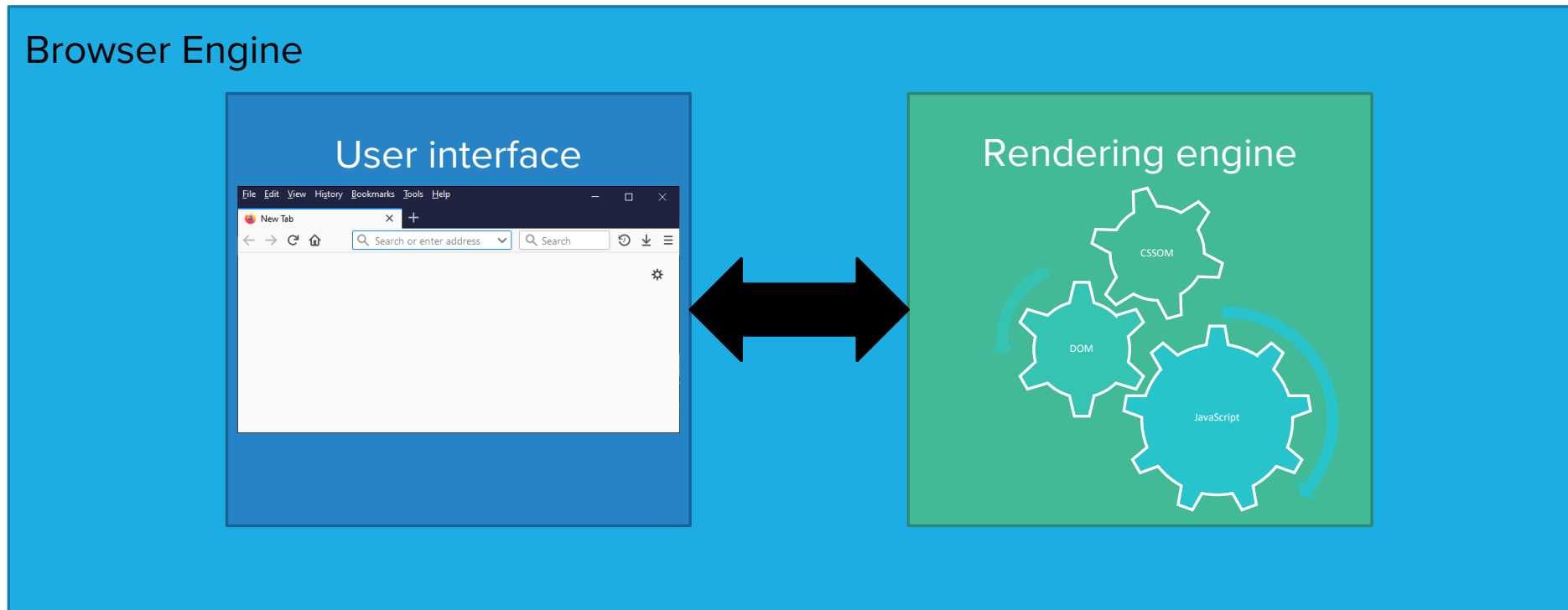
2. Rendering Engine

- The rendering engine displays the web page.
- It does so by parsing HTML code and CSS code.
- When the content is parsed, it is displayed on the screen.



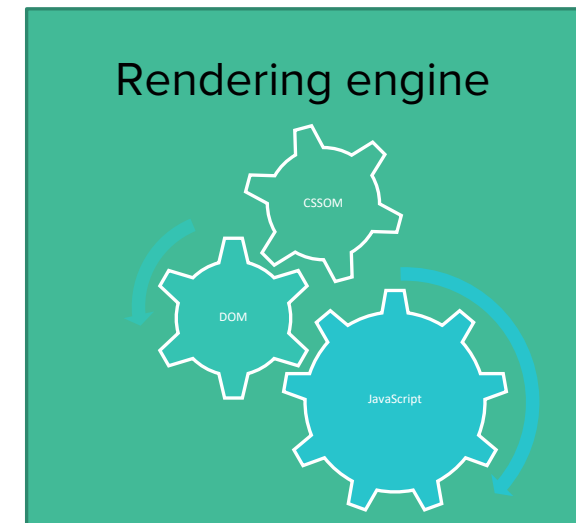
3. Browser Engine

The browser engine **links** the **user interface** with the **rendering engine**.



4. JavaScript Interpreter [1]

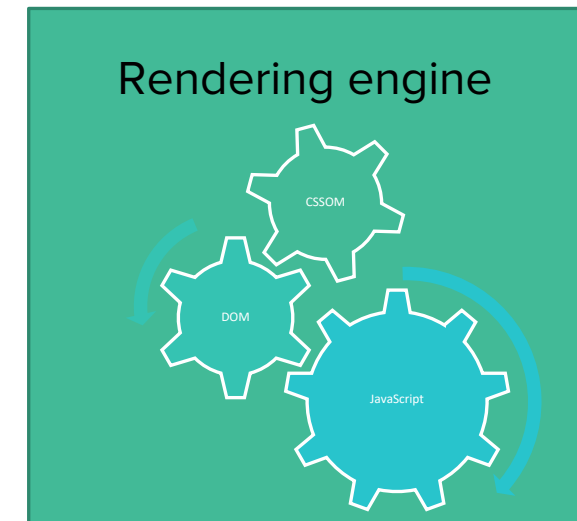
- The JavaScript interpreter parses and executes the scripts on a web page.
- When a web page is loaded, the browser creates the Document Object Model (DOM) and the CSS Object Model (CSSOM) of the web page.



LAW

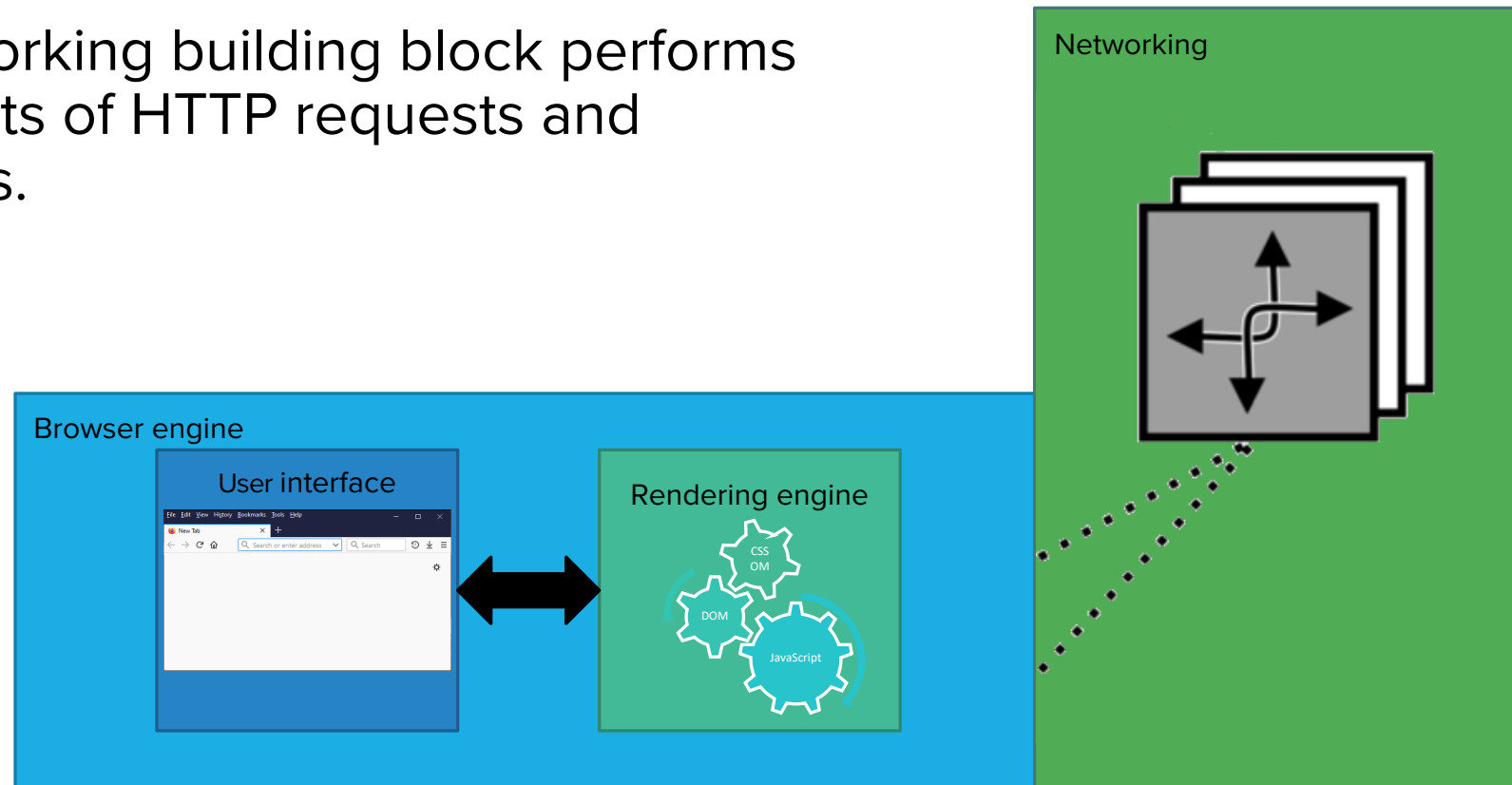
4. JavaScript Interpreter [2]

- The nodes of every document are organized in a tree structure, called the DOM tree and the CSSOM tree.
- JavaScript can add, change, and remove any of the elements and attributes in the trees.
- JavaScript makes elements interactive by reacting to existing events and create new events.



5. Networking

The networking building block performs implements of HTTP requests and responses.



PRIVACY
LAW

CALIFORNIA
LAWYERS
ASSOCIATION

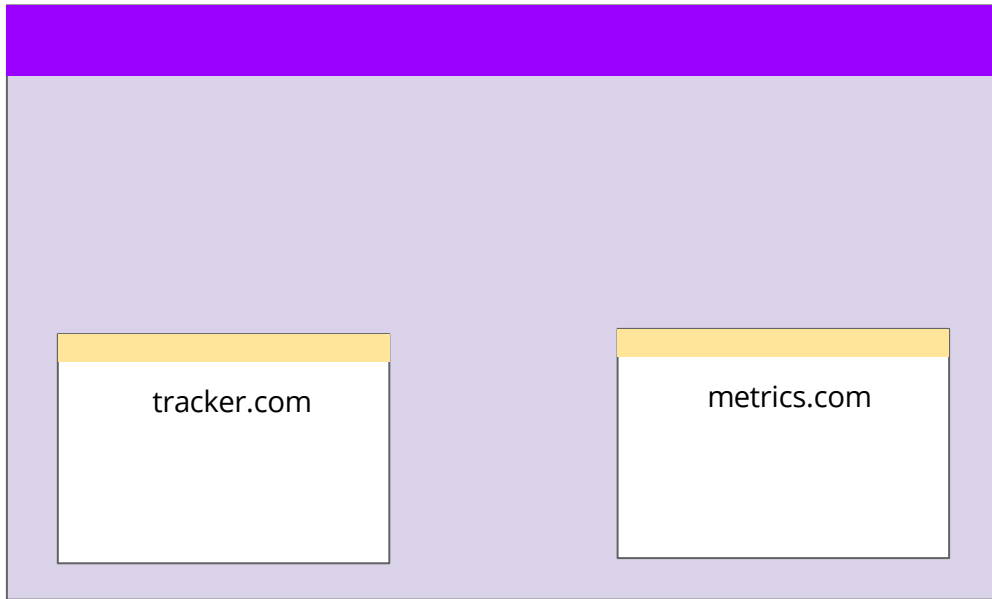
FUTURE OF
PRIVACY
FORUM

6. Data Storage

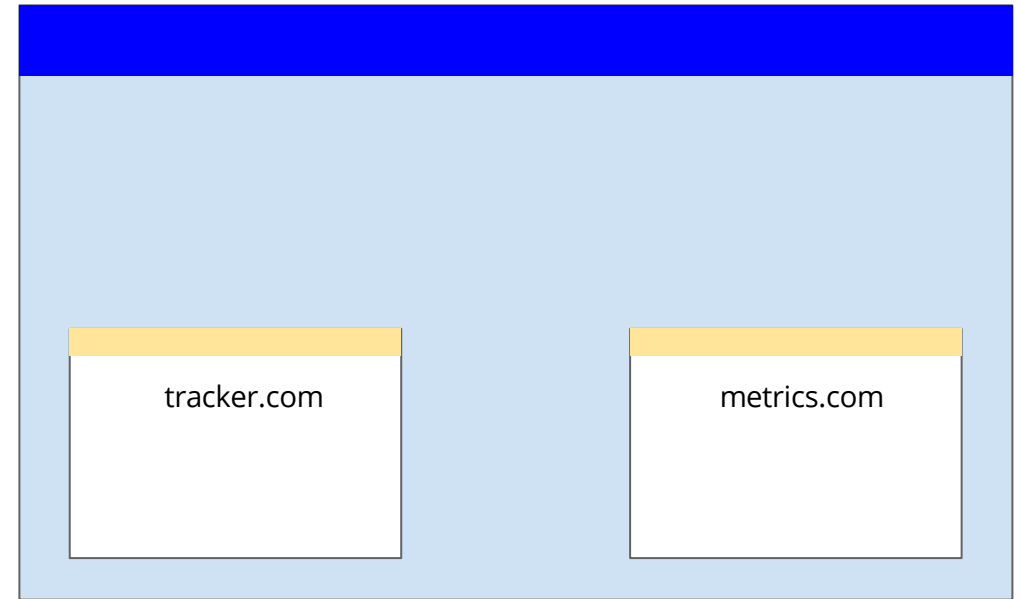
- JavaScript has access to **Web APIs**.
- When writing code for the Web, there are a large number of **Web APIs** available for the development of a **web page** or a **web app**.
- Example **Web APIs**:
 - DOM https://developer.mozilla.org/en-US/docs/Web/API/Document_Object_Model
 - CSSOM https://developer.mozilla.org/en-US/docs/Web/API/CSS_Object_Model
 - **Storage API** https://developer.mozilla.org/en-US/docs/Web/API/Storage_API
- **Storage (API)** mechanisms in browsers:
 - Cache Storage
 - Indexed DB
 - Service Worker registrations
 - Cookies
 - Local Storage
 - Session Storage

First Party and Third Party Definition

example-publisher.com



example-store.com



Publisher and store are first party contexts, while tracker and metrics are in the third party context.

Cookie Differences By Browser

	Chrome	Firefox	Safari
Cookies in a third-party context	No restrictions*	Access restricted for known trackers*	All access restricted, except with Storage Access API
	* Google Chrome will no longer support 3 rd party cookies in late 2023 .	* Firefox to add SmartBlock to preserve functionality while blocking tracking mechanisms	
Protection mechanism	N/A	Enhanced Tracking Protection (+SmartBlock)	Intelligent Tracking Prevention (ITP)
Default protection mode	N/A	By Default	By Default
Classification of “known trackers”	N/A	Disconnect.me	Algorithmic