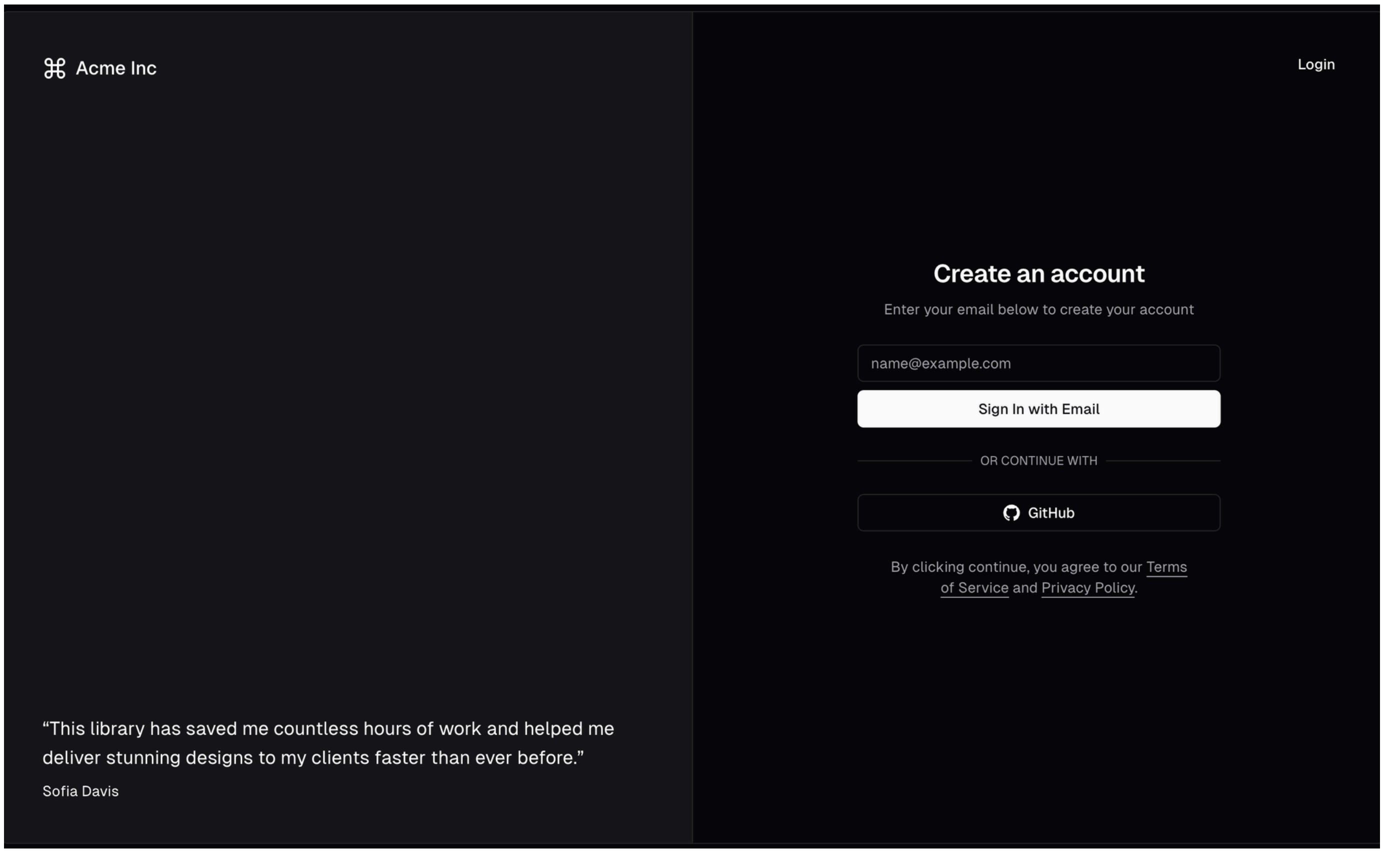
What is authentication?

Authentication is the process of letting users signup/signin into websites via `username` / `password` or using SSO (single sign on)



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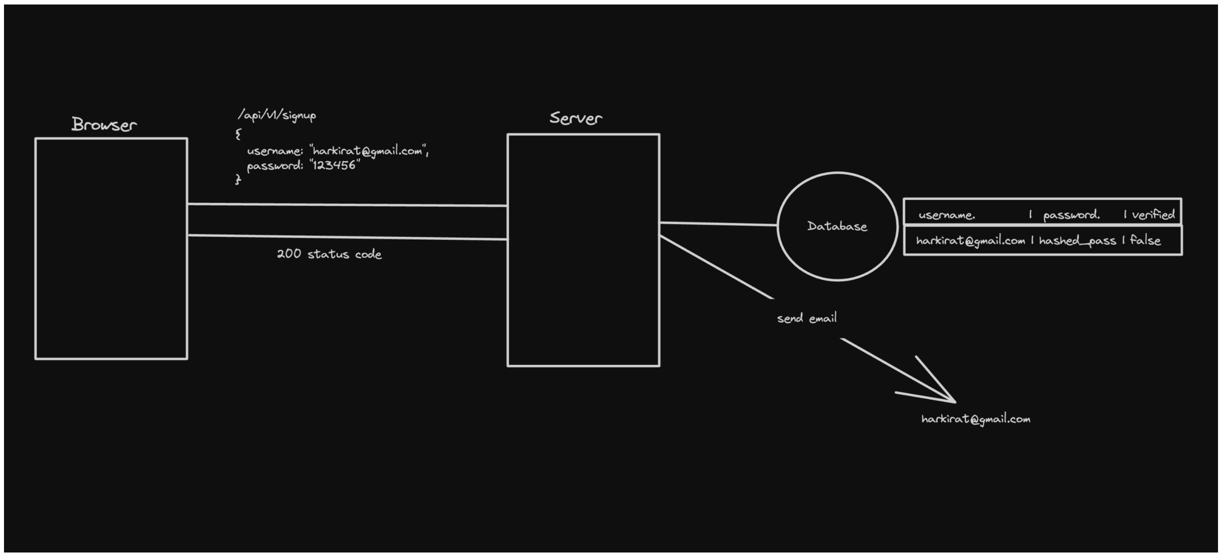
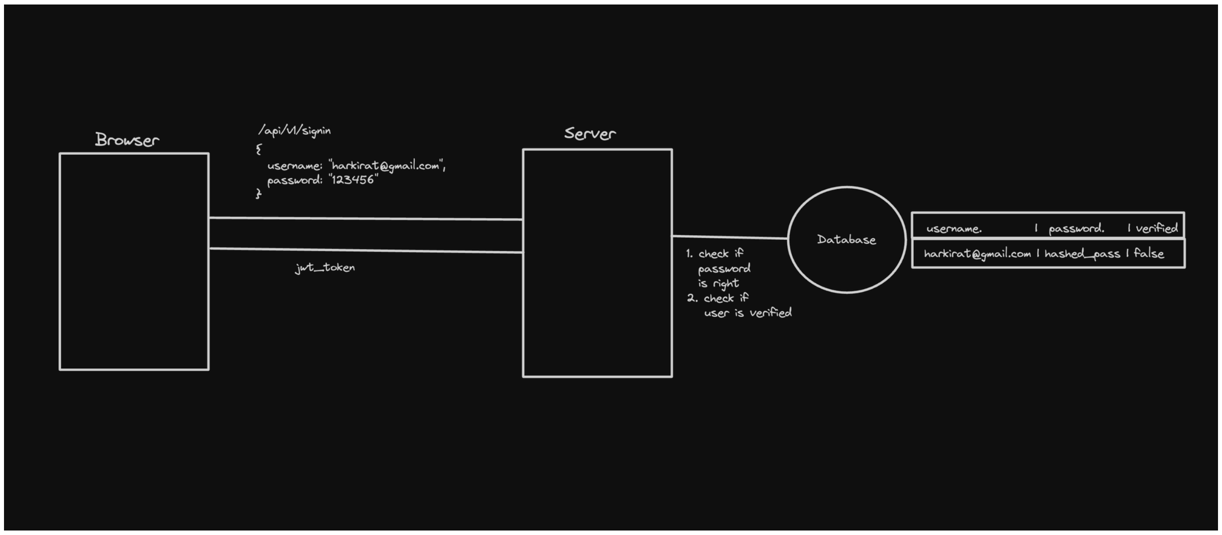
“This library has saved me countless hours of work and helped me deliver stunning designs to my clients faster than ever before.”
Sofia Davis

Authentication using jwt + localstorage

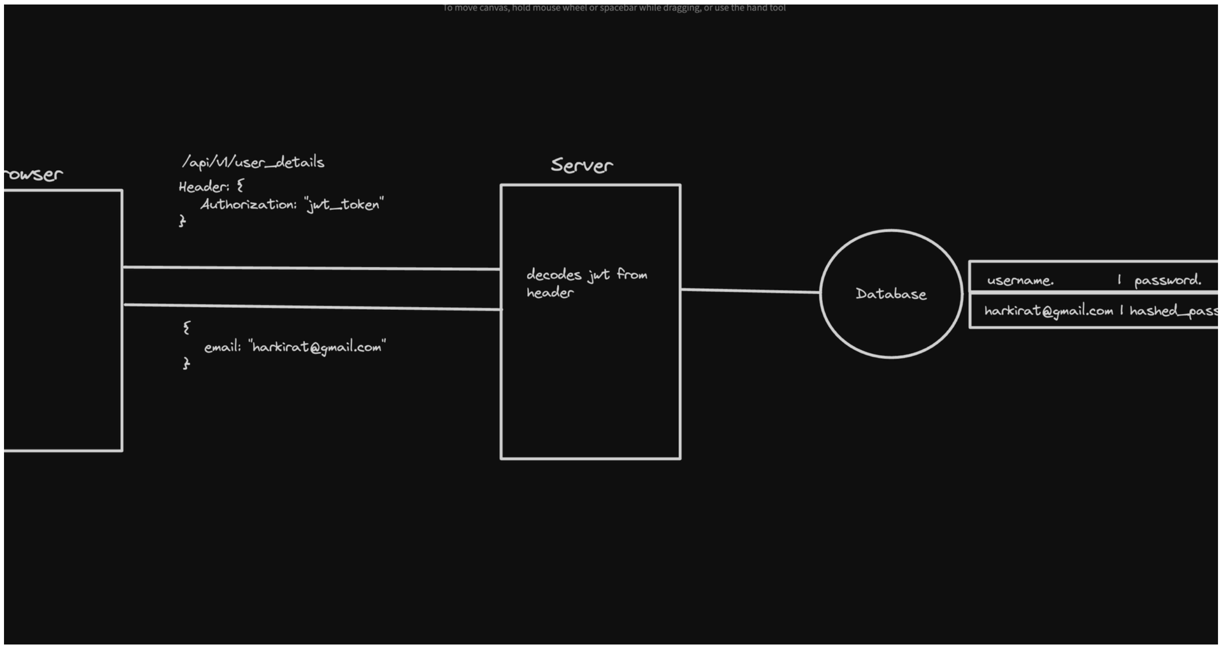
Signup


Browser
/api/v1/signup
{
username: "harkirat@gmail.com",
password: "123456"
}
200 status code
Server
Database
username. | password. | verified
harkirat@gmail.com | hashed_pass | false
send email
harkirat@gmail.com

Signin


Browser
/api/v1/signin
{
username: "harkirat@gmail.com",
password: "123456"
}
jwt_token
Server
1. check if password is right
2. check if user is verified
Database
username. | password. | verified
harkirat@gmail.com | hashed_pass | false

Auth requests


To move canvas, hold mouse wheel or spacebar while dragging, or use the hand tool
rowser
/api/v1/user_details
Header: {
Authorization: "jwt_token"
}
Server
decodes jwt from header
{
email: "harkirat@gmail.com"
}
Database
username. | password.
harkirat@gmail.com | hashed_pass

Authentication using cookies (Part 1)

What are cookies

Cookies in web development are small pieces of data sent from a website and stored on the user's computer by the user's web browser while the user is browsing. They are designed to be a reliable mechanism for websites to remember things (very similar to local storage)

1. **Session Management:** Cookies allow websites to identify users and track their individual session states across multiple pages or visits.
2. **Personalization:** Websites use cookies to personalize content and ads. For instance, cookies might store information about a user's preferences, allowing the site to tailor content or advertisements to those interests.
3. **Tracking:** Cookies can track users across websites, providing insights into browsing behavior. This information can be used for analytics purposes, to improve website functionality, or for advertising targeting.
4. **Security:** Secure cookies can be used to enhance the security of a website by ensuring that the transmission of information is only done over an encrypted connection, helping to prevent unauthorized access to user data.

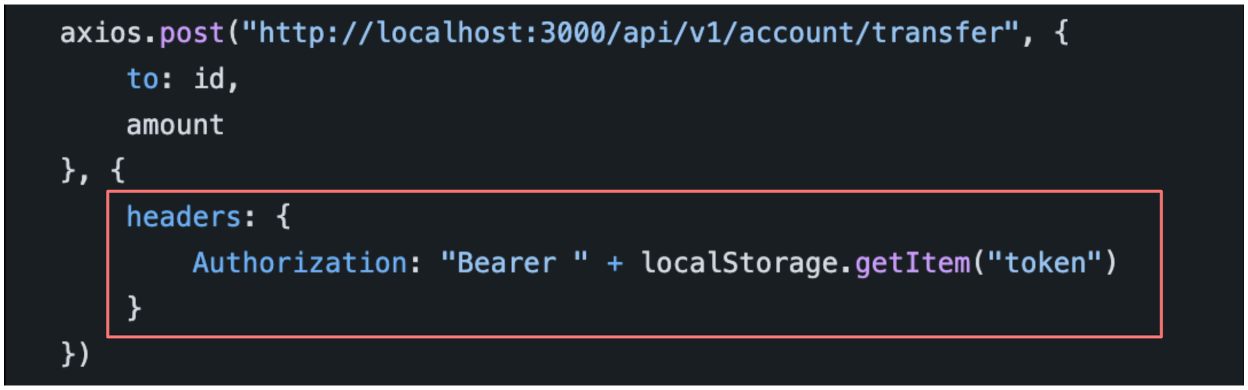
We will be focussing on point `4`

Why not local storage?

Cookies and LocalStorage both provide ways to store data on the client-side, but they serve different purposes and have different characteristics.

1. Cookies are send with every request to the website (by the browser) (you don't have to explicitly add a header to the fetch call)
   This point becomes super important in Next.js, we'll see later why

💡 Ref - https://github.com/100xdevs-cohort-2/paytm/blob/complete-solution/frontend/src/pages/SendMoney.jsx#L45

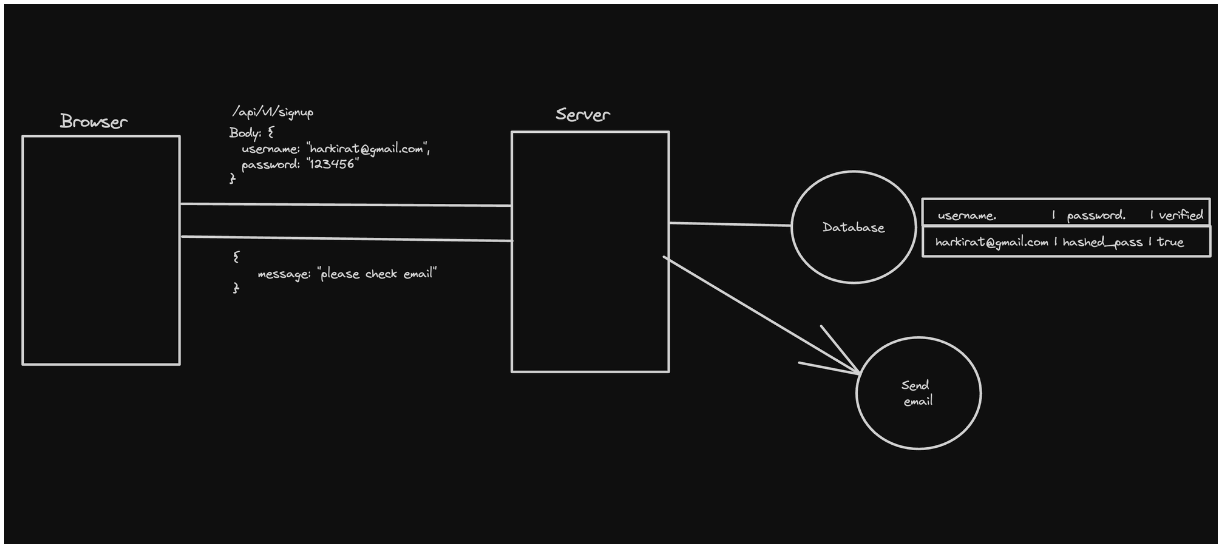


```
axios.post("http://localhost:3000/api/v1/account/transfer", {
    to: id,
    amount
}, {
    headers: {
        Authorization: "Bearer " + localStorage.getItem("token")
    }
})
```

1. Cookies can have an expiry attached to them
2. Cookies can be be restricted to only `https` and to certain `domains`

Authentication with cookies (Part 2)

Signup

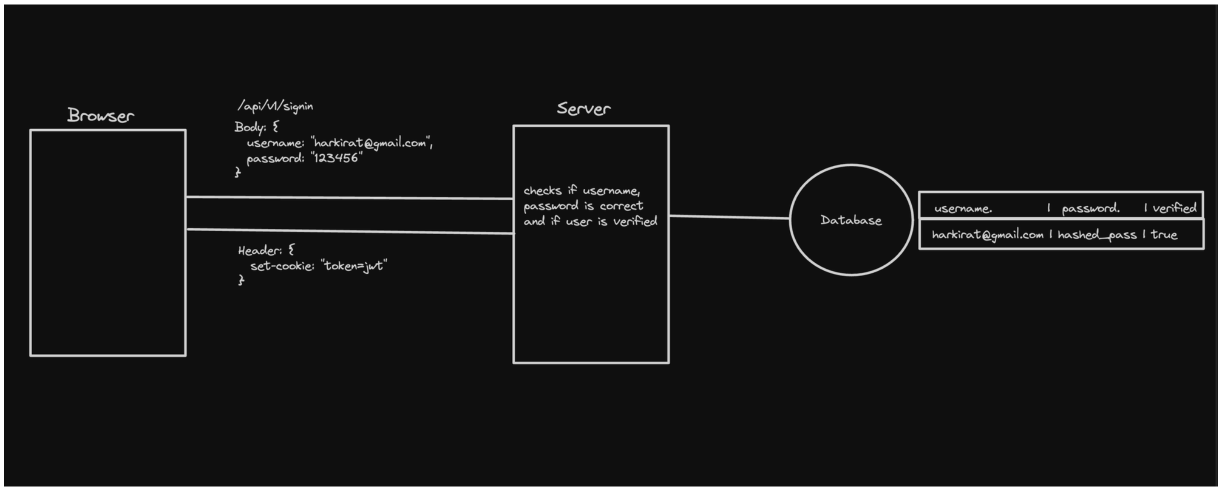


```
/api/v1/signup
Body: {
  username: "harkirat@gmail.com",
  password: "123456"
}
```

```
{
    message: "please check email"
}
```

username.	password.	verified
harkirat@gmail.com	hashed_pass	true

Signin



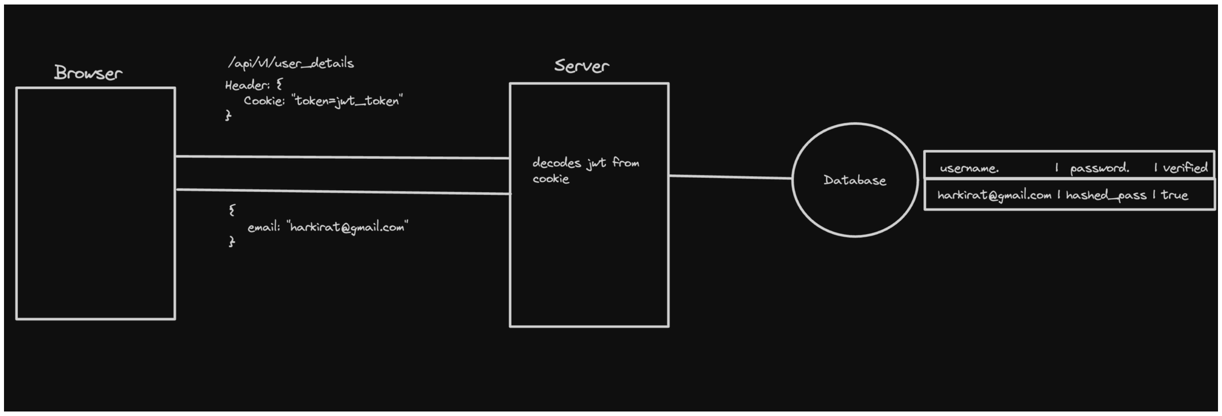
```
/api/v1/signin
Body: {
  username: "harkirat@gmail.com",
  password: "123456"
}
```

checks if username, password is correct and if user is verified

```
Header: {
  set-cookie: "token=jwt"
}
```

username.	password.	verified
harkirat@gmail.com	hashed_pass	true

Auth endpoints


Browser
/api/v1/user_details
Header: {
Cookie: "token=jwt_token"
}
Server
decodes jwt from cookie
Database
username. | password. | verified
harkirat@gmail.com | hashed_pass | true
{
email: "harkirat@gmail.com"
}

You don't need to explicitly set the `cookie` header in the browser. It's automatically set by the browser in every request

Properties of cookies

Types of cookies

1. Persistent - Stay even if u close the window
2. Session - Go away after the window closes
3. **Secure - S**ent only over secure, encrypted connections (HTTPS).

Properties of cookies

- HttpOnly - Can not be accessed by client side scripts
- **SameSite - Ensures cookies are not send on cross origin requests**

1. Strict
2. Lax - Only GET requests and on `top level navigation`
3. None

Ref - https://portswigger.net/web-security/csrf/bypassing-samesite-restrictions#:~:text=SameSite is a browser security,leaks%2C and some CORS exploits.

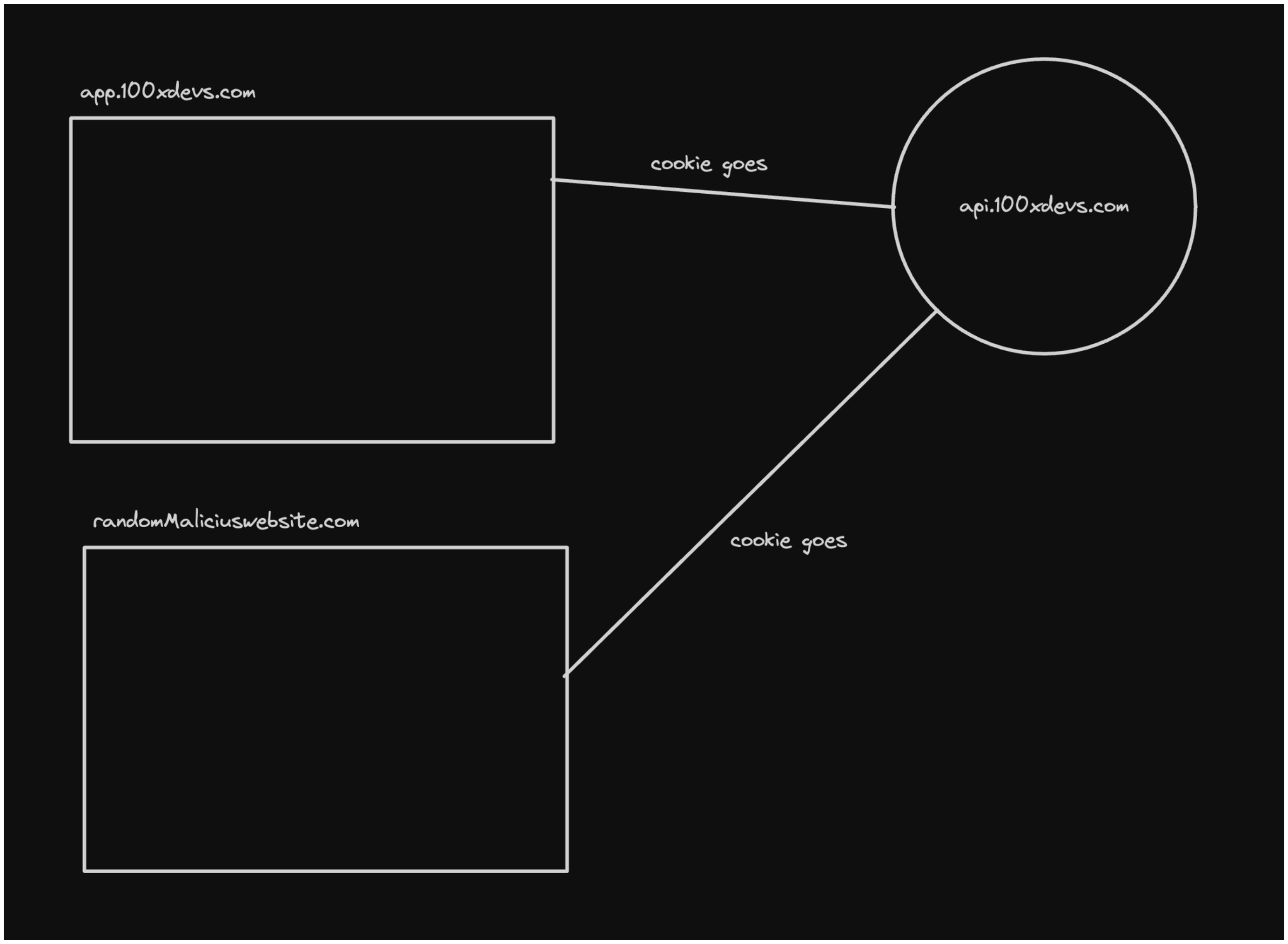
- **Domains** - You can also specify what all domains should the cookie be sent from

CSRF attacks

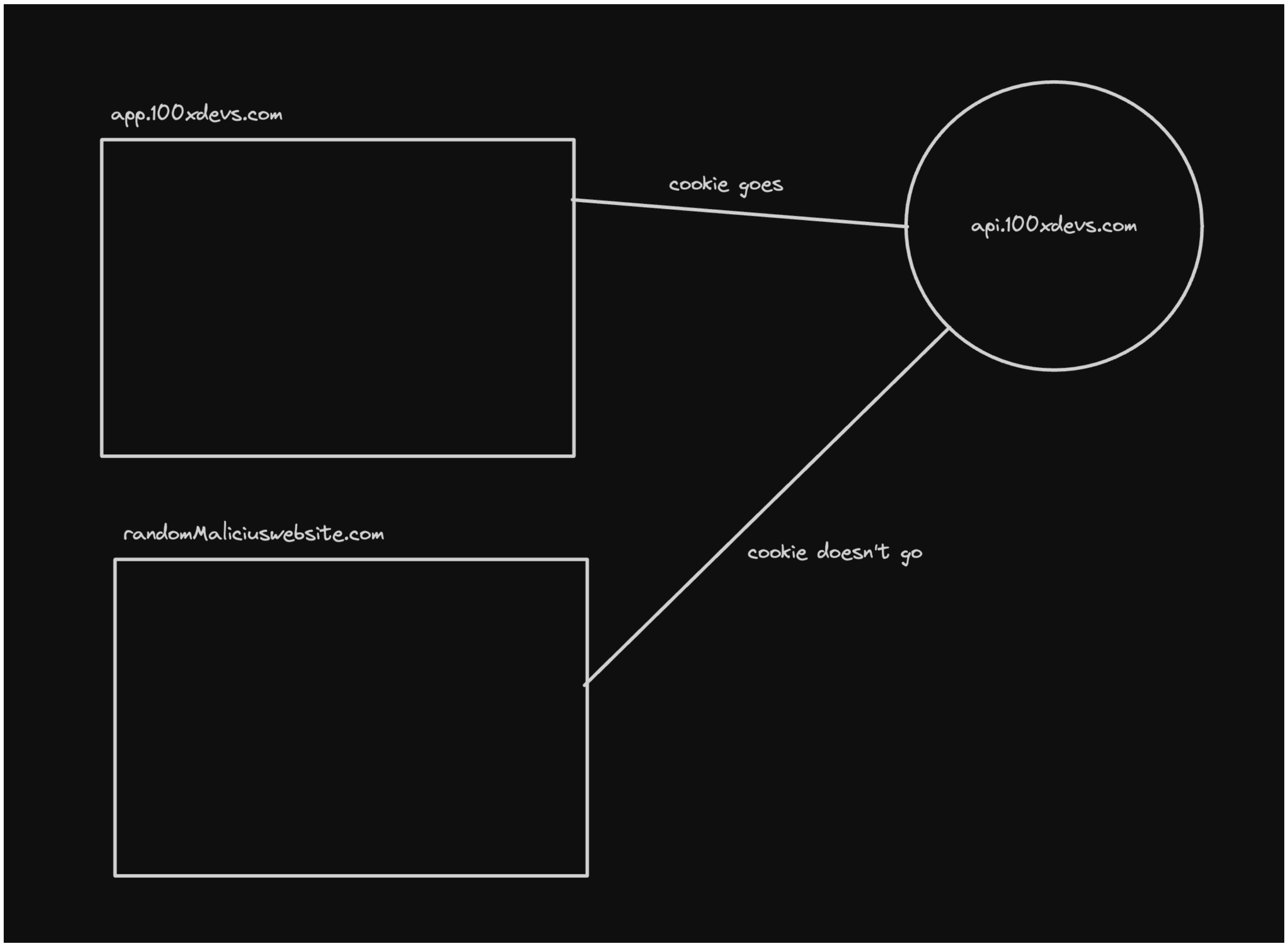
Cross site request forgery attacks were super common because of cookies and hence the `SameSite` attribute was introduced

Let's see a few cases

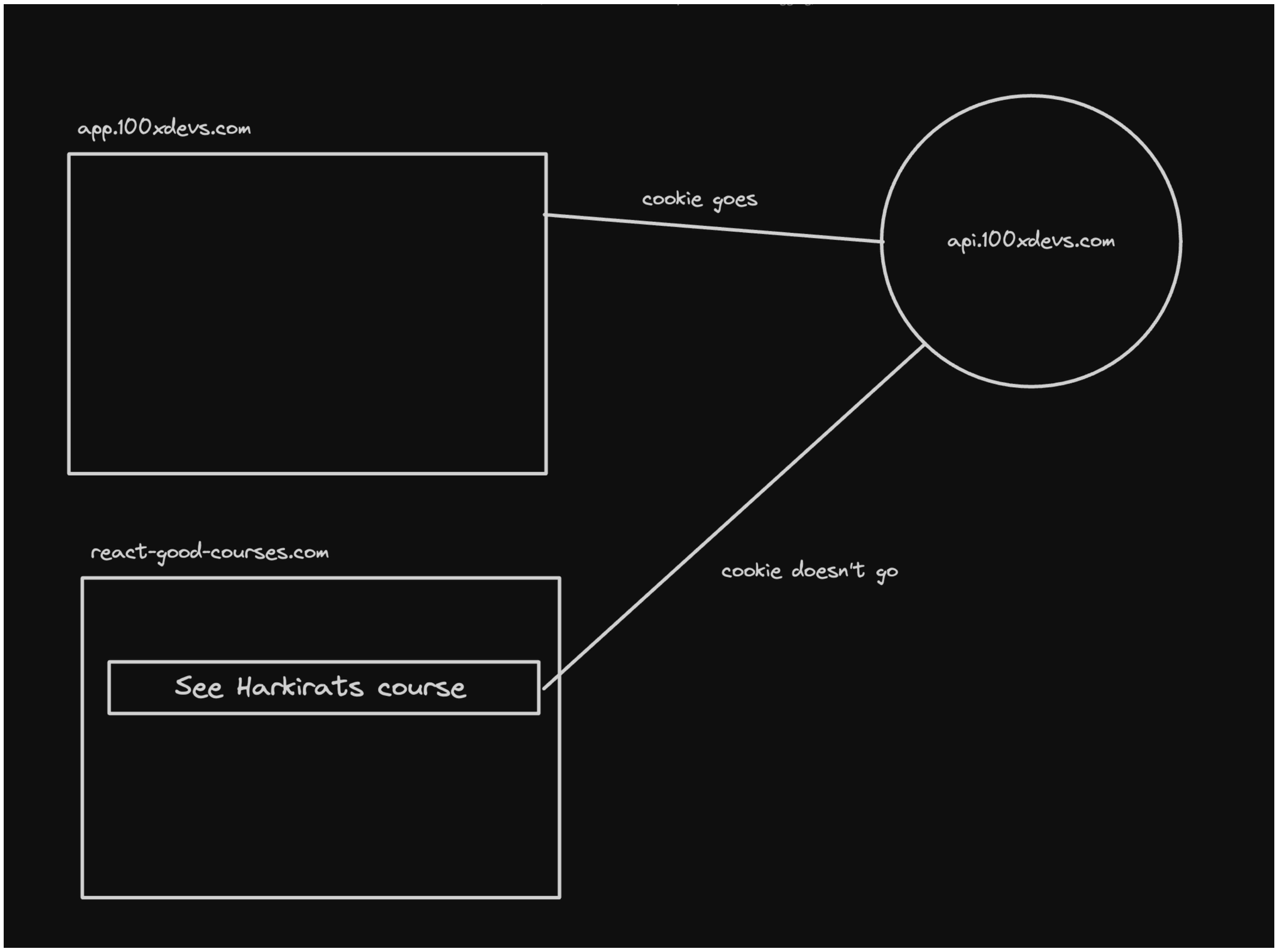
SameSite: none



SameSite: Strict



But there's a problem -



SameSite: Lax

Example in express (Backend)

1. Initialize an empty TS project

```
npm init -y
npx tsc --init
```

1. Update rootDir and outDir

```
"roodDir": "./src"
"outDir": "./dist"
```

1. Add required libraries

```
import express from "express";
import cookieParser from "cookie-parser";
import cors from "cors";
import jwt, { JwtPayload } from "jsonwebtoken";
import path from "path";
```

1. Initialize express app, add middlewares

```
const app = express();
app.use(cookieParser());
app.use(express.json());
app.use(cors({
    credentials: true,
    origin: "http://localhost:5173"
}));
```

1. Add a dummy signin endpoint

```
app.post("/signin", (req, res) => {
    const email = req.body.email;
    const password = req.body.password;
    // do db validations, fetch id of user from db
    const token = jwt.sign({
        id: 1
    }, JWT_SECRET);
    res.cookie("token", token);
    res.send("Logged in!");
});
```

1. Add a protected backend route

```
app.get("/user", (req, res) => {
    const token = req.cookies.token;
    const decoded = jwt.verify(token, JWT_SECRET) as JwtPayload;
    // Get email of the user from the database
    res.send({
        userId: decoded.id
    })
});
```

1. Add a logout route

```
app.post("/logout", (req, res) => {
    res.cookie("token", "ads");
    res.json({
        message: "Logged out!"
    })
});
```

1. Listen on port 3000

```
app.listen(3000);
```

Code - https://github.com/100xdevs-cohort-2/week-16-auth-1

Frontend in React

- Initialize an empty react project
- Add a `signin` page

```
import { useState } from "react"
import { BACKEND_URL } from "../config"
import axios from "axios"

export const Signin = () => {
    const [username, setUsername] = useState("")
    const [password, setPassword] = useState("")

    return <div>
        <input onChange={(e) => {
            setUsername(e.target.value);
        }} type="text" placeholder="username" />
        <input onChange={(e) => {
            setPassword(e.target.value);
        }} type="password" placeholder="password" />
        <button onClick={async () => {
            await axios.post(`${BACKEND_URL}/signin`, {
                username,
                password
            }, {
                withCredentials: true,
            });
            alert("you are logged in")
        }}>Submit</button>
    </div>
}
```

- Add a `user` page

```
import axios from "axios";
import { useEffect, useState } from "react"
import { BACKEND_URL } from "../config";
```

```
export const User = () => {
    const [userData, setUserData] = useState();

    useEffect(() => {
        axios.get(`${BACKEND_URL}/user`, {
            withCredentials: true,
          })
            .then(res => {
                setUserData(res.data);
            })
    }, []);

    return <div>
        You're id is {userData?.userId}
        <br /><br />
        <button onClick={() => {
            axios.post(`${BACKEND_URL}/logout`, {}, {
                withCredentials: true,
            })
        }}>Logout</button>
    </div>
}
```

- Add routing

```
import './App.css'

import { BrowserRouter, Route, Routes } from "react-router-dom";
import { Signup } from './components/Signup';
import { Signin } from './components/Signin';
import { User } from './components/User';

function App() {
  return (
    <BrowserRouter>
      <Routes>
        <Route path={"/signup"} element={<Signup />} />
        <Route path={"/signin"} element={<Signin />} />
        <Route path={"/user"} element={<User />} />
      </Routes>
    </BrowserRouter>
  )
}

export default App
```

Code - https://github.com/100xdevs-cohort-2/week-16-auth-1

Frontend from express

1. Add an index.html file in src folder of backend

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
    <title>Login Page</title>
    <script src="https://cdn.jsdelivr.net/npm/axios/dist/axios.min.js"></script>
</head>
<body>

<input id="username" type="text" placeholder="username" />
<input id="password" type="password" placeholder="password" />
<button id="loginButton">Submit</button>
<button id="logoutButton">Logout</button>
<div id="userData"></div>


<script>

    document.getElementById('loginButton').addEventListener('click', async () =>
        const username = document.getElementById('username').value;
        const password = document.getElementById('password').value;

        try {
            await axios.post(`/signin`, {
                username,
                password
            });
            alert("You are logged in");
        } catch (error) {
            console.error('Login failed:', error);
            alert("Login failed");
        }
    });
    document.getElementById('logoutButton').addEventListener('click', () => {
        axios.post(`/logout`, {}, {
            withCredentials: true,
        }).then(() => {
            console.log('Logged out successfully.');
        }).catch(error => {
            console.error('Logout failed:', error);
        });
    });

    function fetchUserData() {
        axios.get(`/user`, {
            withCredentials: true,
        }).then(response => {
            const userData = response.data;
            displayUserData(userData);
        }).catch(error => {
            console.error('Failed to fetch user data:', error);
        });
    }

    function displayUserData(userData) {
        const userDataDiv = document.getElementById('userData');
        // Example: Assumes userData contains a 'name' and 'email'. Adapt based
        userDataDiv.innerHTML = `<p>Your id is: ${userData.userId}</p>`;
    }
    fetchUserData();
</script>

</body>
</html>
```

1. Add a route that sends this html file

```
app.get("/", (req, res) => {
    res.sendFile(path.join(__dirname, "../src/index.html"))
})
```

1. Remove `credentials` from cors

```
app.use(cors());
```

Link - https://github.com/100xdevs-cohort-2/week-16-auth-1