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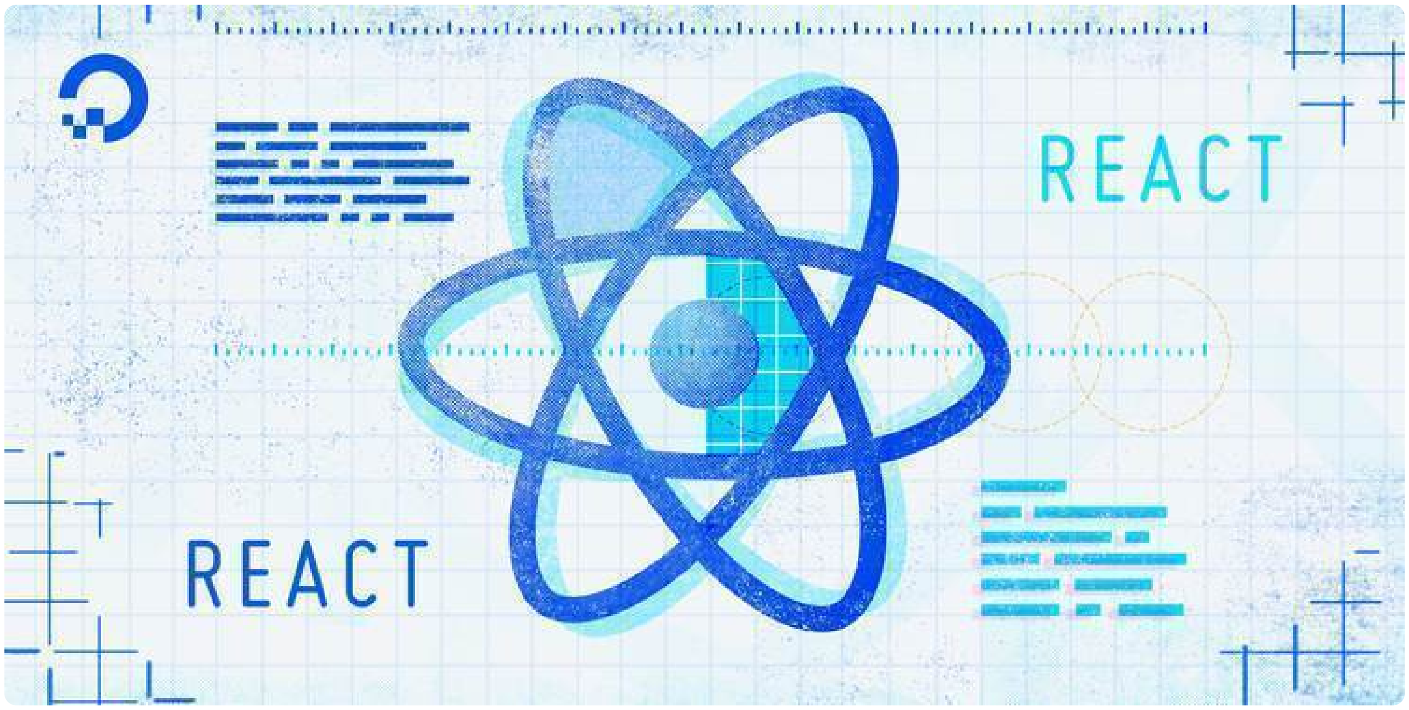

TUTORIAL

# How To Add Login Authentication to React Applications

Development JavaScript React

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## Introduction

Many web applications are a mix of public and private pages. Public pages are available to anyone, while a private page requires a user login. You can use *authentication* to manage which users have access to which pages. Your React application will need ʼ

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In this tutorial, you'll create a React application using a token-based authentication system. You'll create a mock API that will return a user token, build a login page that will fetch the token, and check for authentication without rerouting a user. If a user is not authenticated, you'll provide an opportunity for them to log in and then allow them to continue without navigating to a dedicated login page. As you build the application, you'll explore different methods for storing tokens and will learn the security and experience trade-offs for each approach. This tutorial will focus on storing tokens in `localStorage` and `sessionStorage`.

By the end of this tutorial, you'll be able to add authentication to a React application and integrate the login and token storage strategies into a complete user workflow.

## Prerequisites

- You will need a development environment running Node.js; this tutorial was tested on Node.js version 10.22.0 and npm version 6.14.6. To install this on macOS or Ubuntu 18.04, follow the steps in How to Install Node.js and Create a Local Development Environment on macOS or the **Installing Using a PPA** section of How To Install Node.js on Ubuntu 18.04.
- A React development environment set up with Create React App, with the non-essential boilerplate removed. To set this up, follow **Step 1 — Creating an Empty Project** of the How To Manage State on React Class Components tutorial. This tutorial will use `auth-tutorial` as the project name.
- You will be fetching data from APIs using React. You can learn about working with APIs in How To Call Web APIs with the useEffect Hook in React.
- You will also need a basic knowledge of JavaScript, HTML, and CSS, which you can find in our How To Build a Website With HTML series, How To Style HTML with CSS, and in How To Code in JavaScript.

## Step 1 — Building a Login Page

In this step, you'll create a login page for your application. You'll start by installing React Router and creating components to represent a full application. Then you'll render the login page on any route so that your users can login to the application without be

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a new page.

To begin, install react router with `npm`. There are two different versions: a web version and a native version for use with React Native. Install the web version:

```
$ npm install react-router-dom
```

The package will install and you'll receive a message when the installation is complete. Your message may vary slightly:

```
Output
...
+ react-router-dom@5.2.0
added 11 packages from 6 contributors, removed 10 packages and audited 1945 packages in 12.794
...
```

Next, create two components called `Dashboard` and `Preferences` to act as private pages. These will represent components that a user should not see until they have successfully logged into the application.

First, create the directories:

```
$ mkdir src/components/Dashboard
$ mkdir src/components/Preferences
```

Then open `Dashboard.js` in a text editor. This tutorial will use nano:

```
$ nano src/components/Dashboard/Dashboard.js
```

Inside of `Dashboard.js`, add an `<h2>` tag with the content of `Dashboard`:

auth-tutorial/src/components/Dashboard/Dashboard.js

```
import React from 'react';
```

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```
    );
  }
```

Save and close the file.

Repeat the same steps for `Preferences`. Open the component:

```
$ nano src/components/Preferences/Preferences.js
```

Add the content:

auth-tutorial/src/components/Preferences/Preferences.js

```
import React from 'react';

export default function Preferences() {
  return(
    <h2>Preferences</h2>
  );
}
```

Save and close the file.

Now that you have some components, you need to import the components and create routes inside of `App.js`. Check out the tutorial How To Handle Routing in React Apps with React Router for a full introduction to routing in React applications.

To begin, open `App.js`:

```
$ nano src/components/App/App.js
```

Then import `Dashboard` and `Preferences` by adding the following highlighted code:

auth-tutorial/src/components/App/App.js

```
import React from 'react';
import './App.css';
```

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```
function App() {
  return (
    <></>
  );
}

export default App;
```

Next, import `BrowserRouter`, `Switch`, and `Route` from `react-router-dom`:

auth-tutorial/src/components/App/App.js

```
import React from 'react';
import './App.css';
 import { BrowserRouter, Route, Switch } from 'react-router-dom';
import Dashboard from '../Dashboard/Dashboard';
import Preferences from '../Preferences/Preferences';

function App() {
  return (
    <></>
  );
}

export default App;
```

Add a surrounding `<div>` with a `className` of `wrapper` and an `<h1>` tag to serve as a template for the application. Be sure that you are importing `App.css` so that you can apply the styles.

Next, create routes for the `Dashboard` and `Preferences` components. Add `BrowserRouter`, then add a `Switch` component as a child. Inside of the `Switch`, add a `Route` with a `path` for each component:

tutorial/src/components/App/App.js

Copy

```
import React from 'react';
import './App.css';
import { BrowserRouter, Route, Switch } from 'react-router-dom';
import Dashboard from '../Dashboard/Dashboard';
import Preferences from '../Preferences/Preferences';
```

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```
      <div className="wrapper">
        <h1>Application</h1>
        <BrowserRouter>
          <Switch>
            <Route path="/dashboard">
              <Dashboard />
            </Route>
            <Route path="/preferences">
              <Preferences />
            </Route>
          </Switch>
        </BrowserRouter>
      </div>
    );
  }

  export default App;
```

Save and close the file.

The final step is to add some padding to the main `<div>` so your component is not directly at the edge of the browser. To do this, you will change the CSS.

Open `App.css`:

```
$ nano src/components/App/App.css
```

Replace the contents with a class of `.wrapper` with `padding` of `20px`:

auth-tutorial/src/components/App/App.css

```
.wrapper {
    padding: 20px;
}
```

Save and close the file. When you do, the browser will reload and you'll find your basic components:

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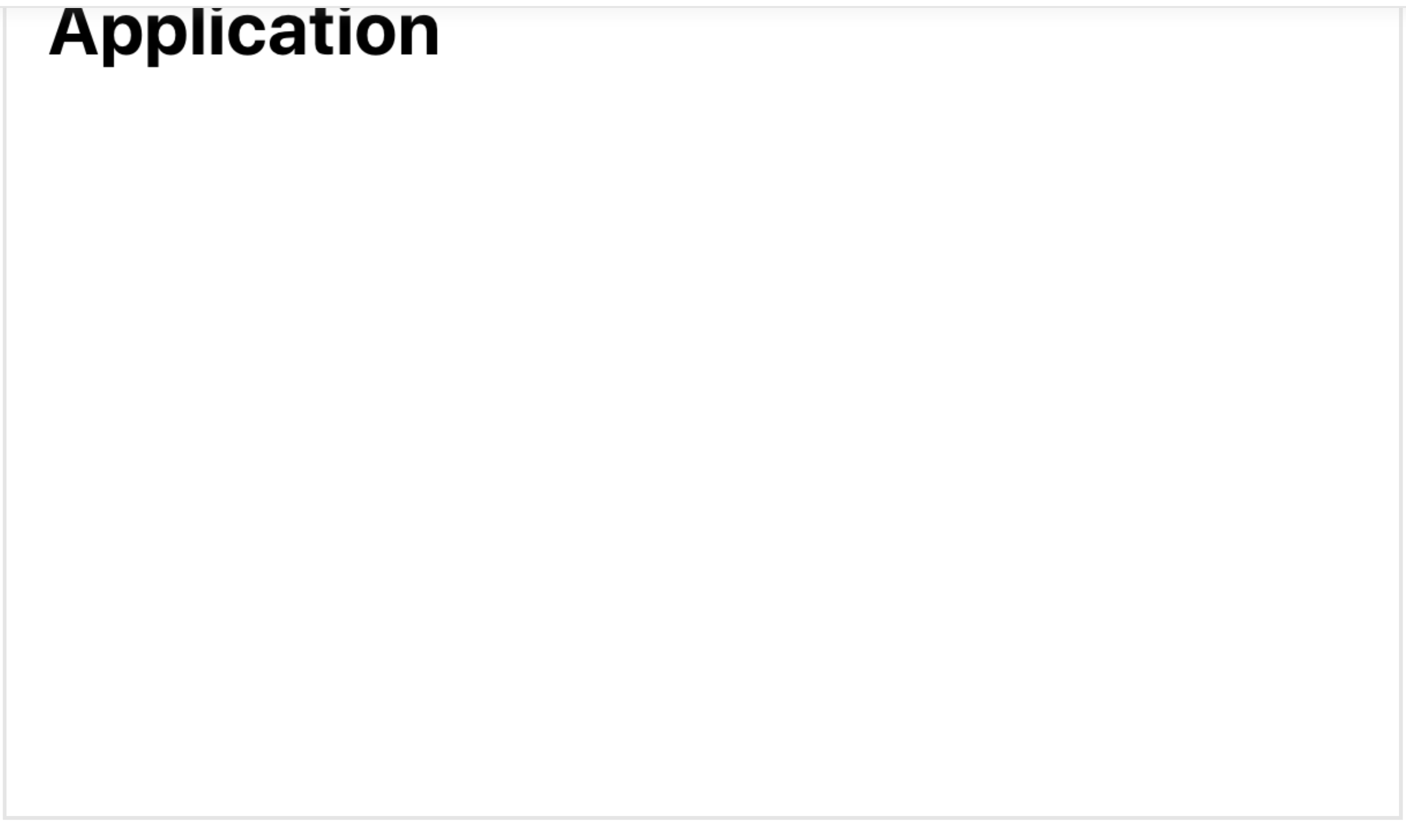

Check each of the routes. If you visit `http://localhost:3000/dashboard`, you'll find the dashboard page:

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Your routes are working as expected, but there is a slight problem. The route `/dashboard` should be a protected page and should not be viewable by an unauthenticated user. There are different ways to handle a private page. For example, you can create a new route for a login page and use React Router to redirect if the user is not logged in. This is a fine approach, but the user would lose their route and have to navigate back to the page they originally wanted to view.

A less intrusive option is to generate the login page regardless of the route. With this approach, you'll render a login page if there is not a stored user token and when the user logs in, they'll be on the same route that they initially visited. That means if a user visits `/dashboard`, they will still be on the `/dashboard` route after login.

To begin, make a new directory for the `Login` component:

```
$ mkdir src/components/Login
```

Next, open `Login.js` in a text editor:

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Create a basic form with a submit `<button>` and an `<input>` for the username and the password. Be sure to set the input type for the password to `password`:

auth-tutorial/src/components/Login/Login.js

```
import React from 'react';

export default function Login() {
  return(
    <form>
      <label>
        <p>Username</p>
        <input type="text" />
      </label>
      <label>
        <p>Password</p>
        <input type="password" />
      </label>
      <div>
        <button type="submit">Submit</button>
      </div>
    </form>
  )
}
```

For more on forms in React, check out the tutorial How To Build Forms in React.

Next, add an `<h1>` tag asking the user to log in. Wrap the `<form>` and the `<h1>` in a `<div>` with a `className` of `login-wrapper`. Finally, import `Login.css`:

auth-tutorial/src/components/Login/Login.js

```
import React from 'react';
import './Login.css';

export default function Login() {
  return(
    <div className="login-wrapper">
      <h1>Please Log In</h1>
      <form>
        <label>
          <p>Username</p>
          <input type="text" />
```

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```
          <input type="password" />
        </label>
        <div>
          <button type="submit">Submit</button>
        </div>
      </form>
    </div>
  )
}
```

Save and close the file.

Now that you have a basic `Login` component, you'll need to add some styling. Open `Login.css`:

```
$ nano src/components/Login/Login.css
```

Center the component on the page by adding a `display` of `flex`, then setting the `flex-direction` to `column` to align the elements vertically and adding `align-items` to `center` to make the component centered in the browser:

auth-tutorial/src/components/Login/Login.css

```
.login-wrapper {
    display: flex;
    flex-direction: column;
    align-items: center;
}
```

For more information on using Flexbox, see our CSS Flexbox Cheatsheet

Save and close the file.

Finally, you'll need to render it inside of `App.js` if there is no user token. Open `App.js`:

```
$ nano src/components/App/App.js
```

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Import `useState` from `react`, then call `useState` and set return values to `token` and `setToken`:

auth-tutorial/src/components/App/App.js

```
import React, { useState } from 'react';
import { BrowserRouter, Route, Switch } from 'react-router-dom';
import './App.css';
import Dashboard from '../Dashboard/Dashboard';
import Preferences from '../Preferences/Preferences';

function App() {
  const [token, setToken] = useState();
  return (
    <div className="wrapper">
      <h1>Application</h1>
      <BrowserRouter>
        <Switch>
          <Route path="/dashboard">
            <Dashboard />
          </Route>
          <Route path="/preferences">
            <Preferences />
          </Route>
        </Switch>
      </BrowserRouter>
    </div>
  );
}

export default App;
```

Import the `Login` component. Add a conditional statement to display `Login` if the `token` is falsy.

Pass the `setToken` function to the `Login` component:

auth-tutorial/src/components/App/App.js

```
import React, { useState } from 'react';
import { BrowserRouter, Route, Switch } from 'react-router-dom';
```

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```
import Preferences from '../Preferences/Preferences';

function App() {
  const [token, setToken] = useState();

  if(!token) {
    return <Login setToken={setToken} />
  }

  return (
    <div className="wrapper">
      <h1>Application</h1>
      <BrowserRouter>
        <Switch>
          <Route path="/dashboard">
            <Dashboard />
          </Route>
          <Route path="/preferences">
            <Preferences />
          </Route>
        </Switch>
      </BrowserRouter>
    </div>
  );
}

export default App;
```

For now, there is no token; in the next step, you'll call an API and set the token with the return value.

Save and close the file. When you do, the browser will reload and you'll see the login page. Notice that if you visit `http://localhost:3000/dashboard`, you'll still find the login page since the token has not yet been set:

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In this step, you created an application with private components and a login component that will display until you set a token. You also configured routes to display the pages and added a check to display the `Login` component on every route if the user is not yet logged into the application.

In the next step, you'll create a local API that will return a user token. You'll call the API from the `Login` component and save the token to memory on success.

## Step 2 — Creating a Token API

In this step, you'll create a local API to fetch a user token. You'll build a mock API using Node.js that will return a user token. You'll then call that API from your login page and render the component after you successfully retrieve the token. By the end of this step, you'll have an application with a working login page and protected pages that will only be accessible after login.

You are going to need a server to act as a backend that will return the token. You can create a server quickly using Node.js and the Express web framework. For a detailed introduction to creating an Express server, see the tutorial Basic Express Server in Node

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You'll also need to install `cors`. This library will enable cross origin resource sharing for all routes.

> **Warning:** Do not enable CORS for all routes in a production application. This can lead to security vulnerabilities.

```
$ npm install --save-dev express cors
```

When the installation is complete, you'll receive a success message:

```
Output
...
+ cors@2.8.5
+ express@4.17.1
removed 10 packages, updated 2 packages and audited 2059 packages in 12.597s
...
```

Next, open a new file called `server.js` in the root of your application. Do not add this file to the `/src` directory since you do not want it to be part of the final build.

```
$ nano server.js
```

Import `express`, then initialize a new app by calling `express()` and saving the result to a variable called `app`:

auth-tutorial/server.js

```
const express = require('express');
const app = express();
```

After creating the `app`, add `cors` as a middleware. First, import `cors`, then add it to the application by calling the `use` method on `app`:

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```
const express = require('express');
const cors = require('cors');
const app = express();

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

Next, listen to a specific route with `app.use`. The first argument is the path the application will listen to and the second argument is a callback function that will run when the application serves the path. The callback takes a `req` argument, which contains the request data and a `res` argument that handles the result.

Add in a handler for the `/login` path. Call `res.send` with a JavaScript object containing a token:

auth-tutorial/server.js

```
const express = require('express');
const cors = require('cors')
const app = express();

app.use(cors());

app.use('/login', (req, res) => {
  res.send({
    token: 'test123'
  });
});
```

Finally, run the server on port `8080` using `app.listen`:

auth-tutorial/server.js

```
const express = require('express');
const cors = require('cors')
const app = express();

app.use(cors());

app.use('/login', (req, res) => {
  res.send({
    token: 'test123'
```

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```
app.listen(8080, () => console.log('API is running on http://localhost:8080/login'));
```

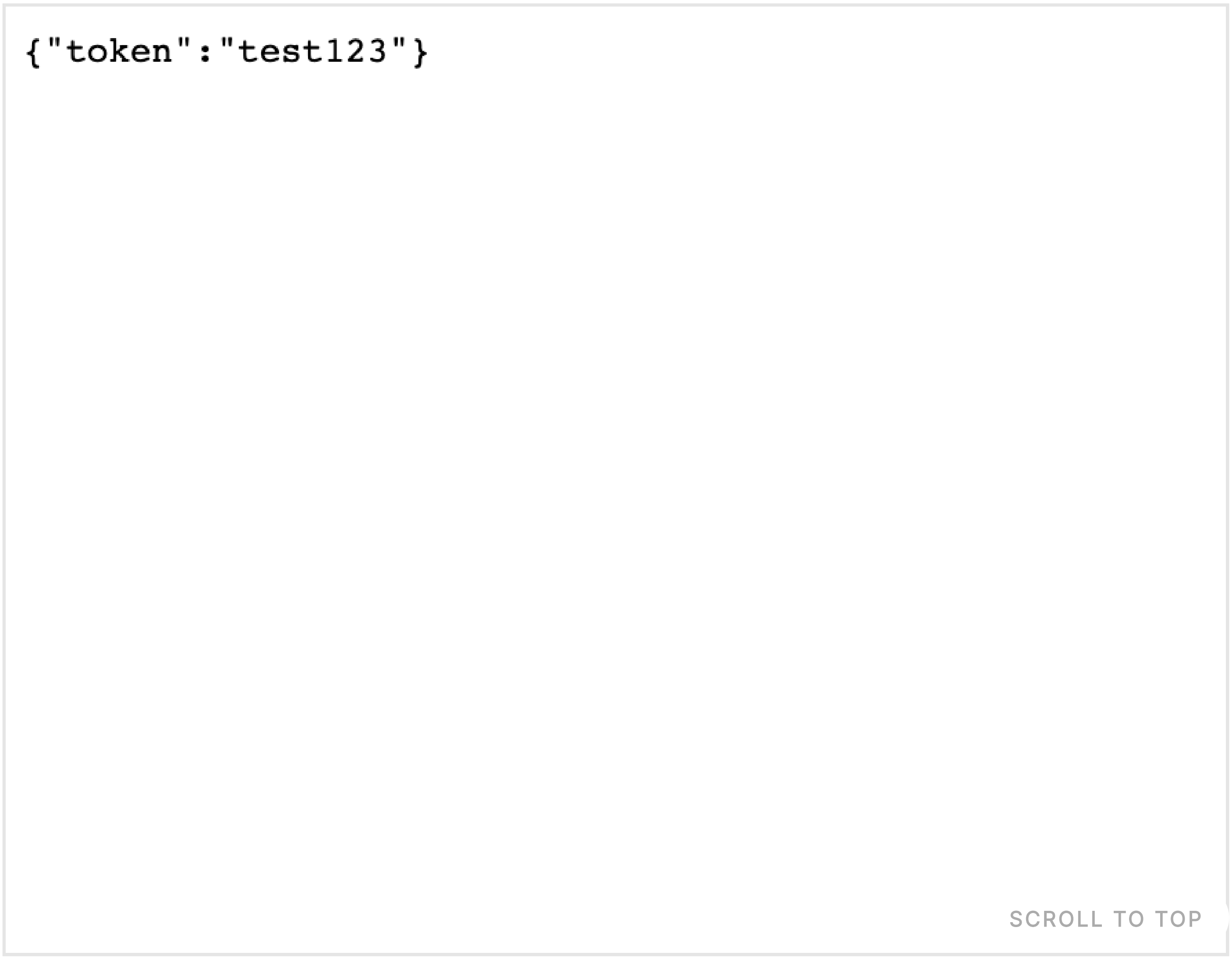
Save and close the file. In a new terminal window or tab, start the server:

```
$ node server.js
```

You will receive a response indicating that the server is starting:

```
Output
API is running on http://localhost:8080/login
```

Visit `http://localhost:8080/login` and you'll find your JSON object.



```
{"token":"test123"}
```

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up your route with `app.use`, Express will handle all requests the same. In a production application, you should be more specific and only allow certain request methods for each route.

Now that you have a running API server, you need to make a request from your login page. Open `Login.js`:

```
$ nano src/components/Login/Login.js
```

In the previous step, you passed a new prop called `setToken` to the `Login` component. Add in the `PropType` from the new prop and destructure the props object to pull out the `setToken` prop.

auth-tutorial/src/components/Login/Login.js

```
import React from 'react';
import PropTypes from 'prop-types';

import './Login.css';

export default function Login({ setToken }) {
  return(
    <div className="login-wrapper">
      <h1>Please Log In</h1>
      <form>
        <label>
          <p>Username</p>
          <input type="text" />
        </label>
        <label>
          <p>Password</p>
          <input type="password" />
        </label>
        <div>
          <button type="submit">Submit</button>
        </div>
      </form>
    </div>
  )
}

Login.propTypes = {
```

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Next, create a local state to capture the `Username` and `Password`. Since you do not need to manually set data, make the `<inputs>` uncontrolled components. You can find detailed information about uncontrolled components in How To Build Forms in React.

auth-tutorial/src/components/Login/Login.js

```
import React, { useState } from 'react';
import PropTypes from 'prop-types';

import './Login.css';

export default function Login({ setToken }) {
  const [username, setUserName] = useState();
  const [password, setPassword] = useState();
  return(
    <div className="login-wrapper">
      <h1>Please Log In</h1>
      <form>
        <label>
          <p>Username</p>
          <input type="text" onChange={e => setUserName(e.target.value)} />
        </label>
        <label>
          <p>Password</p>
          <input type="password" onChange={e => setPassword(e.target.value)} />
        </label>
        <div>
          <button type="submit">Submit</button>
        </div>
      </form>
    </div>
  )
}

Login.propTypes = {
  setToken: PropTypes.func.isRequired
};
```

Next, create a function to make a `POST` request to the server. In a large application, you would add these to a separate directory. In this example, you'll add the service directly to the component. Check out the tutorial How To Call Web APIs with the useE SCROLL TO TOP React for a detailed look at calling APIs in React components.

auth-tutorial/src/components/Login/Login.js

```
import React, { useState } from 'react';
import PropTypes from 'prop-types';
import './Login.css';

async function loginUser(credentials) {
 return fetch('http://localhost:8080/login', {
   method: 'POST',
   headers: {
     'Content-Type': 'application/json'
   },
   body: JSON.stringify(credentials)
 })
   .then(data => data.json())
}

export default function Login({ setToken }) {
...
```

Finally, create a form submit handler called `handleSubmit` that will call `loginUser` with the `username` and `password`. Call `setToken` with a successful result. Call `handleSubmit` using the `onSubmit` event handler on the `<form>`:

auth-tutorial/src/components/Login/Login.js

```
import React, { useState } from 'react';
import PropTypes from 'prop-types';
import './Login.css';

async function loginUser(credentials) {
 return fetch('http://localhost:8080/login', {
   method: 'POST',
   headers: {
     'Content-Type': 'application/json'
   },
   body: JSON.stringify(credentials)
 })
   .then(data => data.json())
}

export default function Login({ setToken }) {
```

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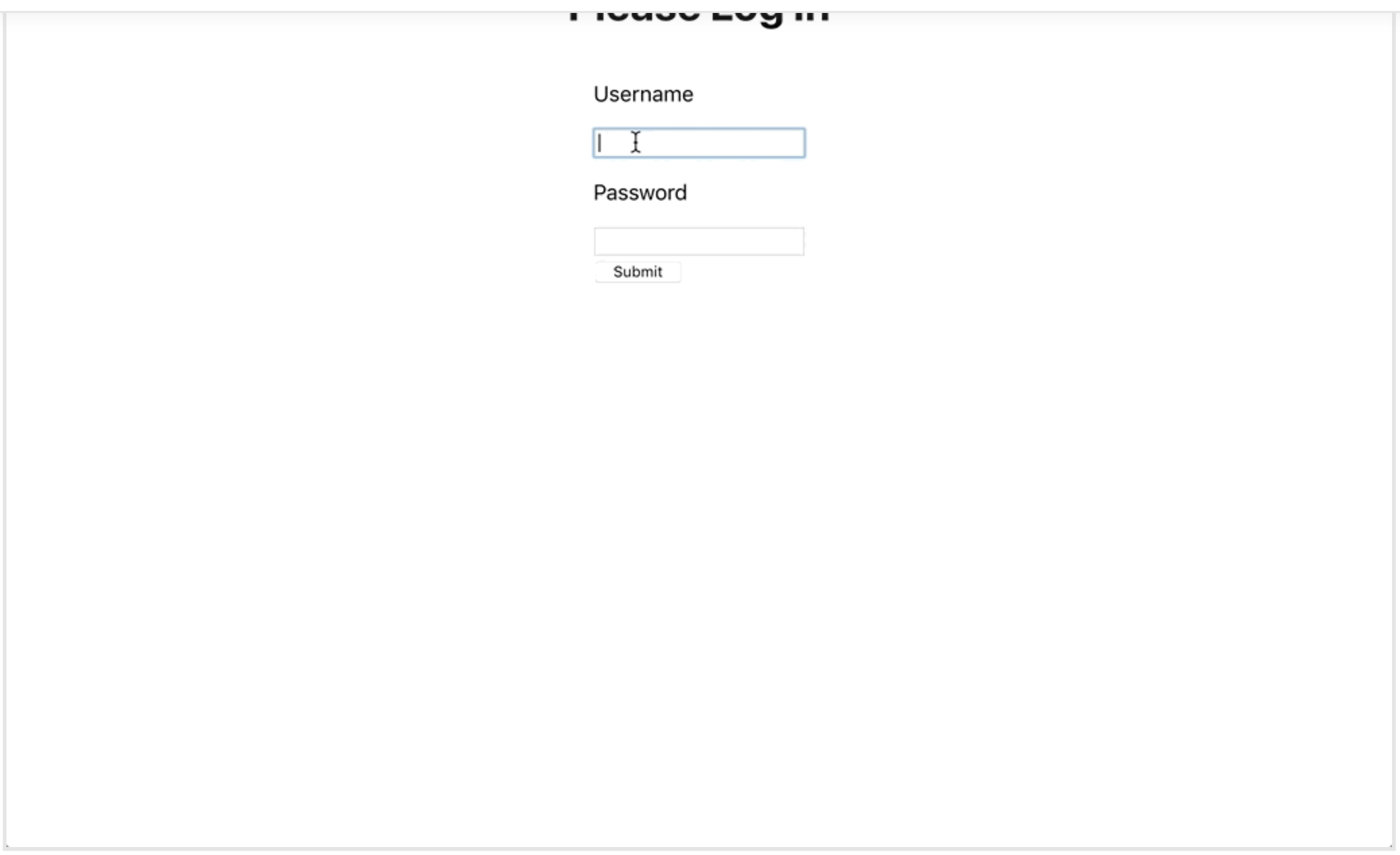
```
    const handleSubmit = async e => {
      e.preventDefault();
      const token = await loginUser({
        username,
        password
      });
      setToken(token);
    }

    return(
      <div className="login-wrapper">
        <h1>Please Log In</h1>
        <form onSubmit={handleSubmit}>
          <label>
            <p>Username</p>
            <input type="text" onChange={e => setUserName(e.target.value)} />
          </label>
          <label>
            <p>Password</p>
            <input type="password" onChange={e => setPassword(e.target.value)} />
          </label>
          <div>
            <button type="submit">Submit</button>
          </div>
        </form>
      </div>
    )
  }

  Login.propTypes = {
    setToken: PropTypes.func.isRequired
  };
```

**Note:** In a full application, you'll need to handle situations where the component unmounts before a Promise resolves. Check out the tutorial How To Call Web APIs with the useEffect Hook in React for more information.

Save and close the file. Make sure that your local API is still running, then open a browser to `http://localhost:3000/dashboard`.

You will see the login page instead of the dashboard. Fill out and submit th SCROLL TO TOP will receive a web token then redirect to the page for the dashboard.



You now have a working local API and an application that requests a token using a username and password. But there is still a problem. The token is currently stored using a local state, which means that it is stored in JavaScript memory. If you open a new window, tab, or even just refresh the page, you will lose the token and the user will need to login again. This will be addressed in the next step.

In this step you created a local API and a login page for your application. You learned how to create a Node server to send a token and how to call the server and store the token from a login component. In the next step, you'll learn how to store the user token so that a session will persist across page refreshes or tabs.

## Step 3 — Storing a User Token with `sessionStorage` and `localStorage`

In this step, you'll store the user token. You'll implement different token storage options and learn the security implications of each approach. Finally, you'll learn how different approaches will change the user experience as the user opens new tabs or closes a session.

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There are several options for storing tokens. Every option has costs and benefits. In brief the options are: storing in JavaScript memory, storing in `sessionStorage`, storing in `localStorage`, and storing in a cookie. The primary trade-off is security. Any information that is stored outside of the memory of the current application is vulnerable to Cross-Site Scripting (XSS) attacks. The danger is that if a malicious user is able to load code into your application, it can access `localStorage`, `sessionStorage`, and any cookie that is also accessible to your application. The benefit of the non-memory storage methods is that you can reduce the number of times a user will need to log in to create a better user experience.

This tutorial will cover `sessionStorage` and `localStorage`, since these are more modern than using cookies.

## Session Storage

To test the benefits of storing outside of memory, convert the in-memory storage to `sessionStorage`. Open `App.js`:

```
$ nano src/components/App/App.js
```

Remove the call to `useState` and create two new functions called `setToken` and `getToken`. Then call `getToken` and assign the results to a variable called `token`:

auth-tutorial/src/components/App/App.js

```
import React from 'react';
import { BrowserRouter, Route, Switch } from 'react-router-dom';

import './App.css';
import Dashboard from '../Dashboard/Dashboard';
import Login from '../Login/Login';
import Preferences from '../Preferences/Preferences';

function setToken(userToken) {
}

function getToken() {
}
```

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```
    if(!token) {
      return <Login setToken={setToken} />
    }

    return (
      <div className="wrapper">
       ...
      </div>
    );
  }

  export default App;
```

Since you are using the same function and variable names, you will not need to change any code in the `Login` component or the rest of the `App` component.

Inside of `setToken`, save the `userToken` argument to `sessionStorage` using the `setItem` method. This method takes a key as a first argument and a string as the second argument. That means you'll need to convert the `userToken` from an object to a string using the `JSON.stringify` function. Call `setItem` with a key of `token` and the converted object.

auth-tutorial/src/components/App/App.js

```
import React from 'react';
import { BrowserRouter, Route, Switch } from 'react-router-dom';

import './App.css';
import Dashboard from '../Dashboard/Dashboard';
import Login from '../Login/Login';
import Preferences from '../Preferences/Preferences';

function setToken(userToken) {
  sessionStorage.setItem('token', JSON.stringify(userToken));
}

function getToken() {
}

function App() {
  const token = getToken();

  if(!token) {
    return <Login setToken={setToken} />
  }
```

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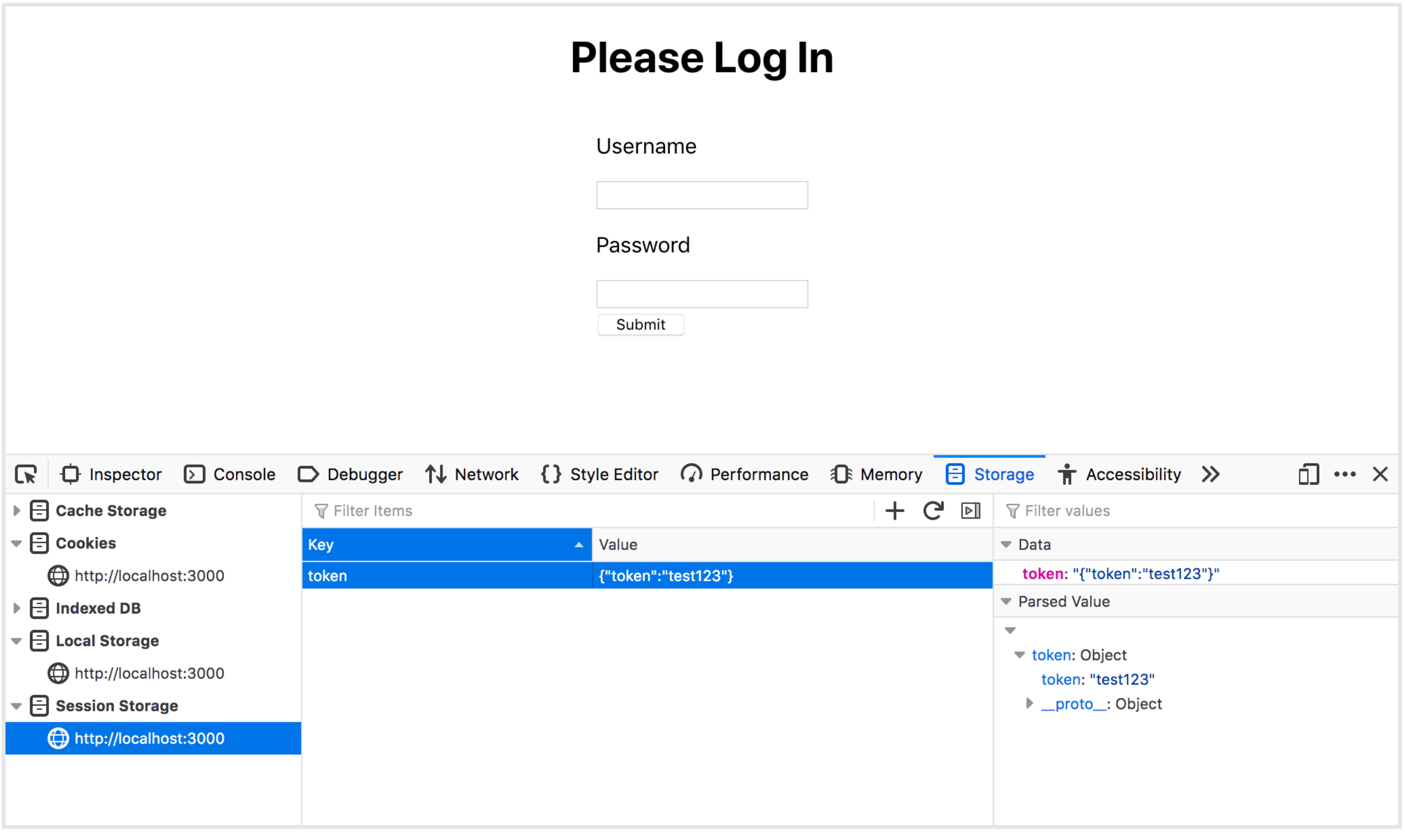
```
      ...
    </div>
  );
}

export default App;
```

Save the file. When you do the browser will reload. If you type in a username and password and submit, the browser will still render the login page, but if you look inside your browser console tools, you'll find the token is stored in `sessionStorage`. This image is from Firefox, but you'll find the same results in Chrome or other modern browsers.



| Key | Value |
|---|---|
| token | {"token":"test123"} |

```
Data
token: "{"token":"test123"}"
Parsed Value
  token: Object
    token: "test123"
    __proto__: Object
```

Now you need to retrieve the token to render the correct page. Inside the `getToken` function, call `sessionStorage.getItem`. This method takes a `key` as an argument and returns the string value. Convert the string to an object using `JSON.parse`, then return the value of `token`:

auth-tutorial/src/components/App/App.js

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```
import './App.css';
import Dashboard from '../Dashboard/Dashboard';
import Login from '../Login/Login';
import Preferences from '../Preferences/Preferences';

function setToken(userToken) {
  sessionStorage.setItem('token', JSON.stringify(userToken));
}

function getToken() {
   const tokenString = sessionStorage.getItem('token');
   const userToken = JSON.parse(tokenString);
   return userToken?.token
}

function App() {
  const token = getToken();

  if(!token) {
    return <Login setToken={setToken} />
  }

  return (
    <div className="wrapper">
      ...
    </div>
  );
}

export default App;
```

You need to use the optional chaining operator— `?.` —when accessing the `token` property because when you first access the application, the value of `sessionStorage.getItem('token')` will be `undefined`. If you try to access a property, you will generate an error.

Save and close the file. In this case, you already have a token stored, so when the browser refreshes, you will navigate to the private pages:

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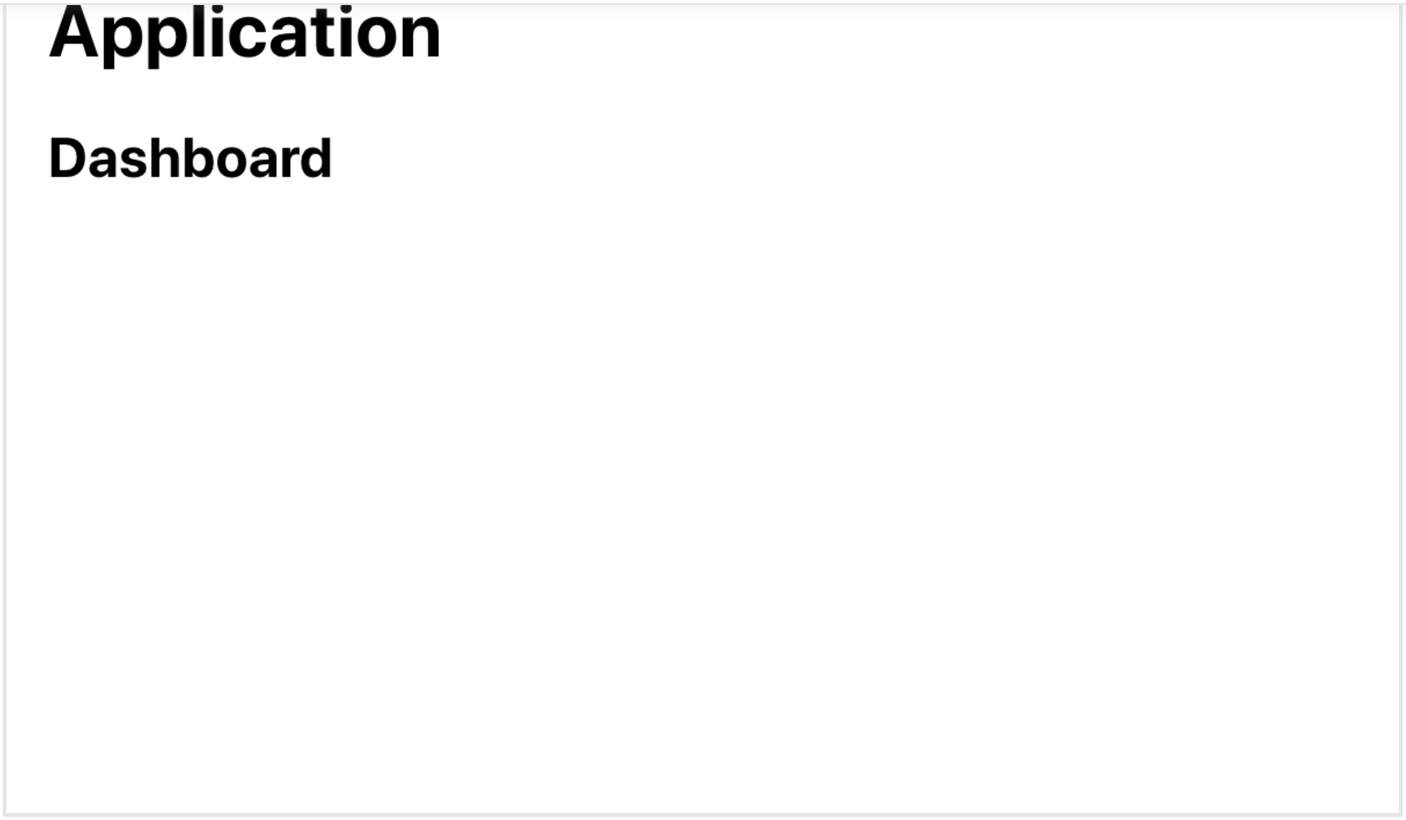
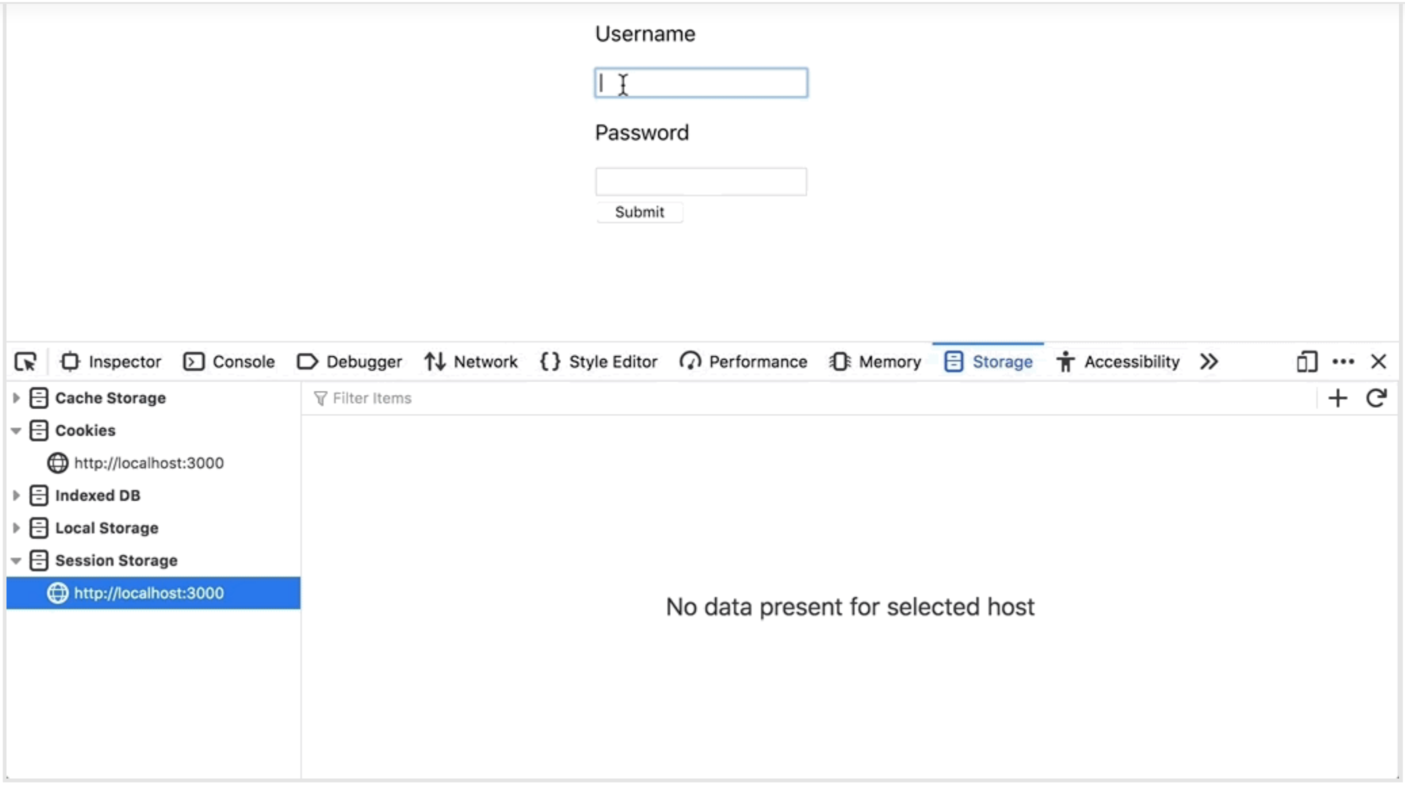


Clear out the token by either deleting the token in the **Storage** tab in your developer tools or by typing `sessionStorage.clear()` in your developer console.

There's a little problem now. When you log in, the browser saves the token, but you still see the login page.



The problem is your code never alerts React that the token retrieval was successful. You'll still need to set some state that will trigger a re-render when the data changes. Like most problems in React, there are multiple ways to solve it. One of the most elegant and reusable is to create a custom Hook.

## Creating a Custom Token Hook

A custom Hook is a function that wraps custom logic. A custom Hook usually wraps one or more built-in React Hooks along with custom implementations. The primary advantage of a custom Hook is that you can remove the implementation logic from the component and you can reuse it across multiple components.

By convention, custom Hooks start with the keyword `use*`.

Open a new file in the `App` directory called `useToken.js`:

```
$ nano src/components/App/useToken.js
```

SCROLL TO TOP

start to reuse this Hook across multiple components, you might also want to move it to a separate directory.

Inside `useToken.js`, import `useState` from `react`. Notice that you do not need to import `React` since you will have no JSX in the file. Create and export a function called `useToken`. Inside this function, use the `useState` Hook to create a `token` state and a `setToken` function:

auth-tutorial/src/components/App/useToken.js

```
import { useState } from 'react';

export default function useToken() {
  const [token, setToken] = useState();

}
```

Next, copy the `getToken` function to `useHook` and convert it to an arrow function, since you placed it inside `useToken`. You could leave the function as a standard, named function, but it can be easier to read when top-level functions are standard and internal functions are arrow functions. However, each team will be different. Choose one style and stick with it.

Place `getToken` before the state declaration, then initialize `useState` with `getToken`. This will fetch the token and set it as the initial state:

auth-tutorial/src/components/App/useToken.js

```
import { useState } from 'react';

export default function useToken() {
  const getToken = () => {
    const tokenString = sessionStorage.getItem('token');
    const userToken = JSON.parse(tokenString);
    return userToken?.token
  };
  const [token, setToken] = useState(getToken());

}
```

SCROLL TO TOP

to state by calling `setToken`:

auth-tutorial/src/components/App/useToken.js

```
import { useState } from 'react';

export default function useToken() {
  const getToken = () => {
    const tokenString = sessionStorage.getItem('token');
    const userToken = JSON.parse(tokenString);
    return userToken?.token
  };

  const [token, setToken] = useState(getToken());

  const saveToken = userToken => {
    sessionStorage.setItem('token', JSON.stringify(userToken));
    setToken(userToken.token);
  };
}
```

Finally, return an object that contains the `token` and `saveToken` set to the `setToken` property name. This will give the component the same interface. You can also return the values as an array, but an object will give users a chance to destructure only the values they want if you reuse this in another component.

auth-tutorial/src/components/App/useToken.js

```
import { useState } from 'react';

export default function useToken() {
  const getToken = () => {
    const tokenString = sessionStorage.getItem('token');
    const userToken = JSON.parse(tokenString);
    return userToken?.token
  };

  const [token, setToken] = useState(getToken());

  const saveToken = userToken => {
    sessionStorage.setItem('token', JSON.stringify(userToken));
    setToken(userToken.token);
  };
```

SCROLL TO TOP

```
      token
    }
  }
```

Save and close the file.

Next, open `App.js`:

```
$ nano src/components/App/App.js
```

Remove the `getToken` and `setToken` functions. Then import `useToken` and call the function destructuring the `setToken` and `token` values. You can also remove the import of `useState` since you are no longer using the Hook:

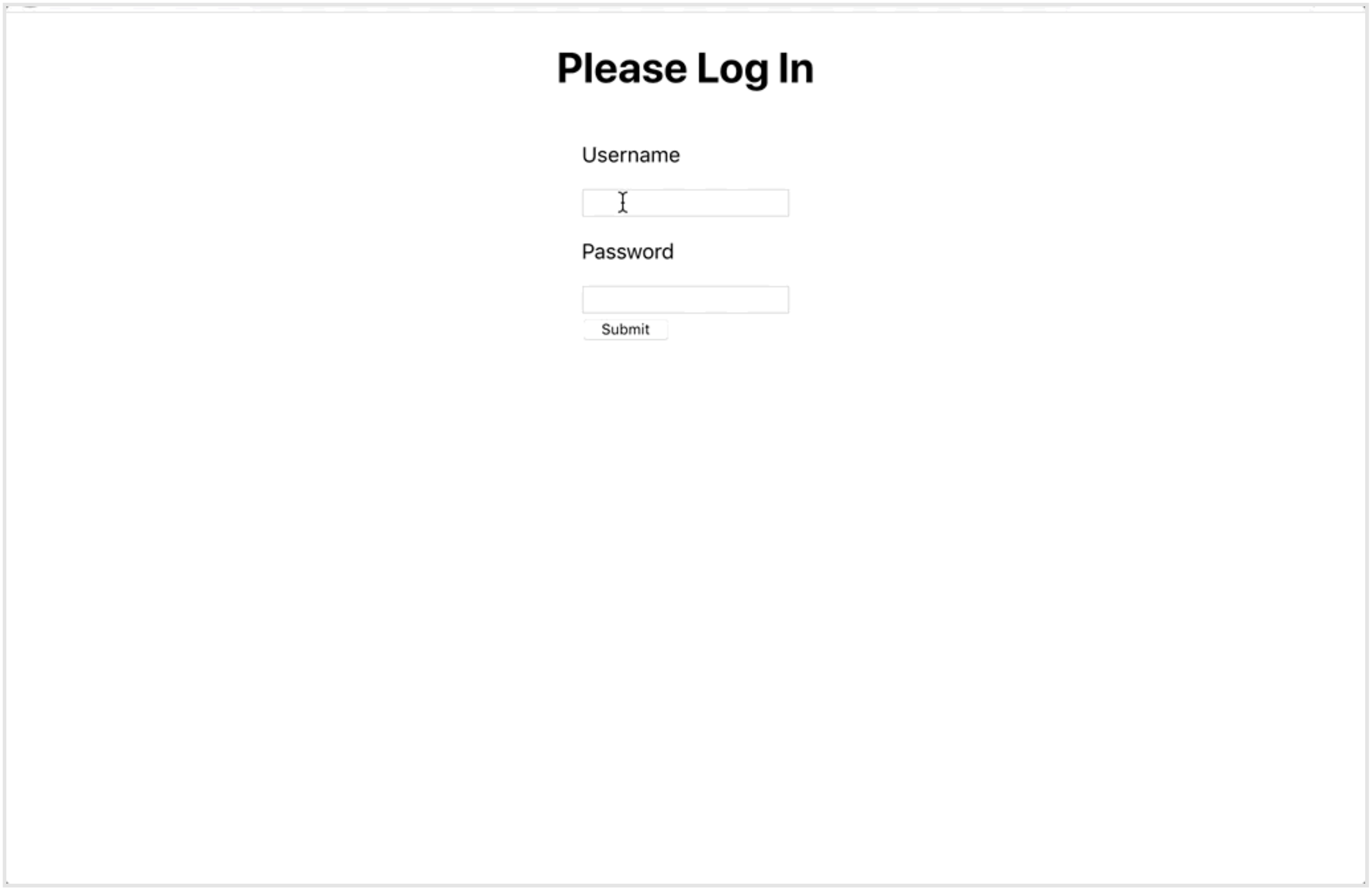
auth-tutorial/src/components/App/App.js

```
import React from 'react';
import { BrowserRouter, Route, Switch } from 'react-router-dom';
import './App.css';
import Dashboard from '../Dashboard/Dashboard';
import Login from '../Login/Login';
import Preferences from '../Preferences/Preferences';
import useToken from './useToken';

function App() {

  const { token, setToken } = useToken();

  if(!token) {
    return <Login setToken={setToken} />
  }

  return (
    <div className="wrapper">
      <h1>Application</h1>
      <BrowserRouter>
        <Switch>
          <Route path="/dashboard">
            <Dashboard />
          </Route>
          <Route path="/preferences">
            <Preferences />
```

SCROLL TO TOP

```
      </div>
    );
  }

  export default App;
```

Save and close the file. When you do, the browser will refresh, and when you log in, you will immediately go to the page. This is happening because you are calling `useState` in your custom Hook, which will trigger a component re-render:



You now have a custom Hook to store your token in `sessionStorage`. Now you can refresh your page and the user will remain logged in. But if you try to open the application in another tab, the user will be logged out. `sessionStorage` belongs only to the specific window session. Any data will not be available in a new tab and will be lost when the active tab is closed. If you want to save the token across tabs, you'll need to convert to `localStorage`.

## Using `localStorage` to Save Data Across Windows

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but it does have some security problems. If the user shares their computer, they will remain logged in to the application even though they close the browser. It will be the user's responsibility to explicitly log out. The next user would have immediate access to the application without a login. It's a risk, but the convenience may be worth it for some applications.

To convert to `localStorage`, open `useToken.js`:

```
$ nano src/components/App/useToken.js
```

Then change every reference of `sessionStorage` to `localStorage`. The methods you call will be the same:

auth-tutorial/src/components/App/useToken.js

```
import { useState } from 'react';

export default function useToken() {
  const getToken = () => {
    const tokenString = localStorage.getItem('token');
    const userToken = JSON.parse(tokenString);
    return userToken?.token
  };

  const [token, setToken] = useState(getToken());

  const saveToken = userToken => {
    localStorage.setItem('token', JSON.stringify(userToken));
    setToken(userToken.token);
  };

  return {
    setToken: saveToken,
    token
  }
}
```

Save the file. When you do, the browser will refresh. You will need to log in again since there is no token yet in `localStorage`, but after you do, you will remain logged in new tab.

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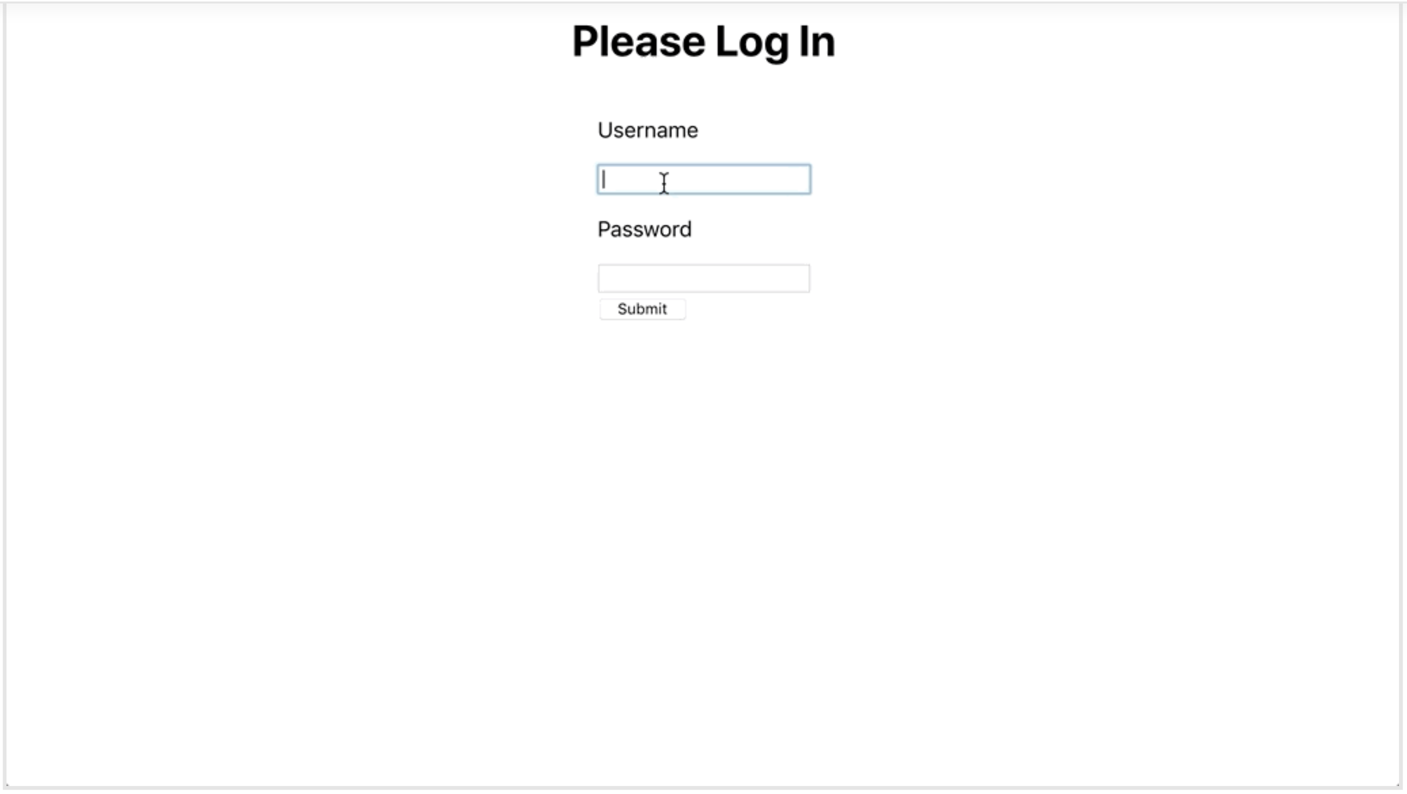
Please Log In

Username

Password

Submit

In this step, you saved tokens with `sessionStorage` and `localStorage`. You also created a custom Hook to trigger a component re-render and to move component logic to a separate function. You also learned about how `sessionStorage` and `localStorage` affect the user's ability to start new sessions without login.

## Conclusion

Authentication is a crucial requirement of many applications. The mixture of security concerns and user experience can be intimidating, but if you focus on validating data and rendering components at the correct time, it can become a lightweight process.

Each storage solution offers distinct advantages and disadvantages. Your choice may change as your application evolves. By moving your component logic into an abstract custom Hook, you give yourself the ability to refactor without disrupting existing components.

If you would like to read more React tutorials, check out our React Topic page, or return to the How To Code in React.js series page.

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How To Code in React.js

How To Add Login Authenticatio...

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45

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## About the authors

Joe Morgan

Author of Simplifying JavaScript. Writing featured in Slate, FreeCodeCamp, and here! I like to break things and put them back together. 🛠

Timothy Nolan

Editor

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0 **gakis41** December 7, 2020

Gr8 stuff in here!!!1 thanks a lot really helpful article! I still have to go through docs for some parts!!!Happy to stumble upon this guide!

Reply Report

> 0 **JoeMorgan** December 8, 2020
>
> Great. Glad it helps!
>
> Reply Report

0 **nickisyourfan** December 8, 2020

Awesome little tutorial. Why is express a Dev-dependency? Wouldn't we need the server if the app was launched on heroku or something similar?

Do ya'll plan on extending the tutorial to the backend logic? I'd love to see how to set unique tokens per user and authenticate the validity of the tokens after the user logs in. Right now it seems as long as the user's token is set, they can access the restricted content... so any user can just set any value through the local or the session storage and get instant access.

Is this where you would use something like PassportJS to authenticate the validity of the token?

Thanks for the great work! I look forward to reading more!

Reply Report

> 1 **JoeMorgan** December 8, 2020
>
> These are great questions. As you noted express is a dev dependency because this assumes that there is a backend service somewhere that is handling the token generation and validation. I don't know if there are any plans to create that tutorial.

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request. Since all of the data would need to come from API (since it's a single page application), if there was an invalid token, the user would not receive the data.

You could add in a standard function or a wrapper or an axios intercepter to logout the user if an API returns unauthorized.

Reply Report

0 karatesoon December 28, 2020

Pretty easy to understand, thanks!

Reply Report

0 ckwagaba December 31, 2020

Awesome 🙏

Reply Report

0 ahmadfadlydziljalal January 3, 2021

You do a great job.
Please continue to logout Authentication.
God Bless You.

Reply Report

0 liamgsmith January 16, 2021

Thanks Joe.

Is there some error handling missing for the async function loginUser in Login.js?

I already had a jwt token being generated from a backend server and I'm getting an invalid credential error from the backend (expected - I'm deliberately entering the wrong data) but this system still logs me in anyway due to what I'm assuming is the assigning of setToken(token) in the Login function.

Reply Report

1 JoeMorgan January 18, 2021

Hi,

To keep things short, I did need to simplify things a bit. It's correct that if you return any result, then the `setToken` function will set data and the application would log you in. Similarly, you could manually set a token and bypass the log in which wc SCROLL TO TOP security flaw.

data by checking the response status.

In a real application, you would need to validate the authorization code along with any request and logout the user if the code is bad.

Reply Report

0 **toihirhalim** January 21, 2021

Awesome !!! really got me to understand much more about react

thank you !

Reply Report

1 **illyayushchenko** January 23, 2021

If user will manually write anything as "token" to localstorage he will get access to website, if I understand correctly?

Reply Report

0 **illyayushchenko** January 23, 2021

and another thing, setting state is asynchronous, does it mean that on refresh first route will be rendered for some milliseconds as (!token) will be true while setState is in process?

Reply Report

1 **JoeMorgan** January 25, 2021

Hi,

Due to space constraints, I had to leave a little out. In this case, you are correct a user can set anything and bypass the login.

In a full application, you'll need to verify that the token is correct before loading the application. You can do this in the root application as part of the initialization. You can also possibly handle it in the `useToken` custom Hook.

Regardless, your API should *always* validate the token when the user hits the API. If the token is invalid, return an **unauthorized** response code (401). Then handle that in your application by deleting the locally stored token. You can either handle this in the service or if you use a 3rd party library such as axios, you can add a global script to handle a `401` code.

Reply Report

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Reply Report

robertbracco1 February 8, 2021

0

“Due to space constraints, I had to leave a little out. In this case, you are correct a user can set anything and bypass the login.”

Great tutorial but I think this is a HUGE gap. You’re writing an auth tutorial for auth novices that if they follow step by step will allow an unauthorized user to access data on their app. In my (very novice opinion) this is way more important than how to use SessionStorage.

Reply Report

lewandowskiseth January 24, 2021

0

Hey Joe,

I’m trying to decide on how to store a jwt token for a user. I’ve read that using http only cookies are better than local or session storage. But you mention:
“

This tutorial will cover sessionStorage and localStorage, since these are more modern than using cookies.
”

How do you advise developers to choose where to store their users JWT tokens (LS, SS, Cookie). At this point, I’m not interesting in any kind of Server side session based auth, so really just struggling to find any kind of consistent advice on best practice for storing tokens on the client side.

The reason I ask is because many sites have mentioned that Local Storage is a big ‘no no’ when it comes to having a production ready secure web app. But every other website I read says something different.

Reply Report

JoeMorgan January 25, 2021

0

Hi, Token storage is a tough one. Http Only cookies are the most secure because they are not vulnerable to a cross site scripting attach (XSS). The problem is the reason they are not vulnerable is because they are not accessible to JavaScript at all. That means your own code wouldn’t be able to access it.

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sessionStorage in situations where you cannot use an http only cookie.

OWASP is an industry leader in web security so I always go for them when I'm in doubt. The worst thing about localStorage is that it stores it after you leave, so it will persist for long after the user stops using the page. However, if you want you user to be able to open a new tab, it's the easiest method.

Again, it comes down to your personal need and your code reality.

Reply Report

0 LakmalPremaratne January 26, 2021

My application runs in a restrictive environment so that I can ask the User to stick to a particular browser. I managed to copy the session information from one window/tab to the other using BroadcastChannel so that I was able to use sessionStorage instead of localStorage. I do not have to keep the session when the user closes the window. So I do not have to persist the token.

Reply Report

0 LakmalPremaratne January 26, 2021

Nicely laid out and very descriptive. You have put all the links to be referred for further information and I found it is beneficial. I learned a lot. Thank you once again!!!

Reply Report

0 muqriafif14 February 2, 2021

i have a question, where can i know the password of login

Reply Report

0 rubensantana February 7, 2021

Hi Joe, it's 4 am around here. 4th tutorial I read from you in a row. Very well written. I look forward to a continuation of this topic.

Reply Report

0 kripakova4 February 17, 2021

I don't understand how the PropTypes property works? Why wasn't the code from 'prop-types' shown?

Reply Report

JoeMorgan February 22, 2021

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c0d3henry February 20, 2021

0

This comment has been marked as resolved by **c0d3henry**. SHOW COMMENT

Miky February 23, 2021

0

Hi Joe:

Thanks for this thorough tutorial. I am following along this but I am getting an error.
“Unhandled Rejection (TypeError): setToken is not a function”
This is in Login.js where you have setToken(token)

Do you know why?

Reply Report

JoeMorgan February 24, 2021

0

It’s hard to debug without seeing where you are at.

My best guess is you forgot to export `setToken` from the `useToken` function like this:

```
return {
  setToken: saveToken,
  token
}
```

It’s also possible that you did not import it from the Hook correctly. What section of the tutorial where you on when you encountered the problem?

Reply Report

Miky February 24, 2021

0

I have a few extra components and the construction of my proj is not the same.

I replaced ({setToken}) with (props) in ...function Login(props) and then using props.setToken(token) in Login.js I eliminated the error regarding setToken not being a function. Not sure about the cons of doing so down the road.

Thank you for the insights.

Reply Report

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approach.. replacing setToken with props and changing setToken to props.setToken.. i was facing the same issue, which is “setToken is not a function” in Login.js.. any lead on this is highly appreciable.

Reply Report

0 MaLoH123 August 11, 2021

Hi! Having the same issue. Have you been able to get this resolved?

Reply Report

0 jnhemant February 26, 2021

Thanks for such an informative article. I am trying to use both public and protected routes in my SPA. Can you give a little hint on how I can get around that?

Reply Report

0 c0d3henry March 2, 2021

I have a quick question - any chance you can write a post about handling refresh tokens? or if you have one can you post a link here? Thank you!

Reply Report

0 prattd March 5, 2021

In Step two there seems to be a contradiction with components/App/App.js. In one step you show adding a Login function to App.js and using this as the default export. But in the next step you have the function App() as the default export. Since they both can’t be the default export which one is correct?

Reply Report

0 andrejgajdos March 28, 2021

It’s strange this tutorial doesn’t mention authenticated routes.

Reply Report

0 rohitsingh4137 April 2, 2021

Thanks for the great tutorial. I was following the steps upto step 2 and then I got this error: Error: Element type is invalid: expected a string (for built-in components) or a class/function (for composite components) but got: object. You likely forgot to export your component from the file it’s defined in, or you might have mixed up default and named imports.

Check the render method of `App`.
▶ 22 stack frames were collapsed.

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26 | username,

27 | password

28 | });

> 29 | setToken(token);
> | ^ 30 | }
> 31 |
> 32 | return(

can you please help me resolve this error?

Reply Report

JoeMorgan April 2, 2021

0

That’s hard because it’s a pretty generic error. Assuming you are exporting your component, there could be a syntax error. Or an unclosed object. It’s really hard to say without seeing the full source.

Reply Report

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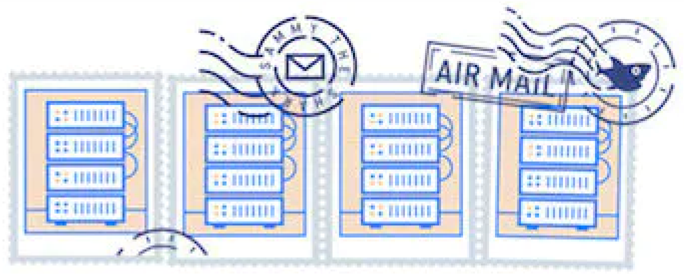

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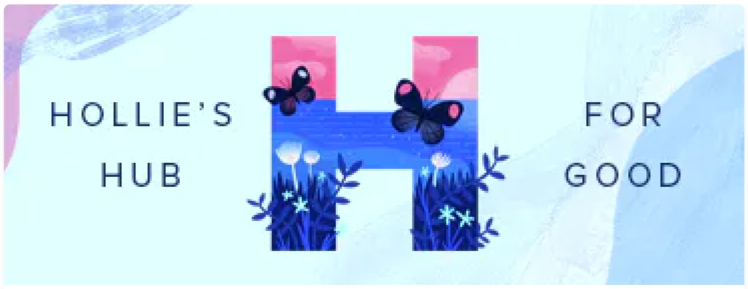

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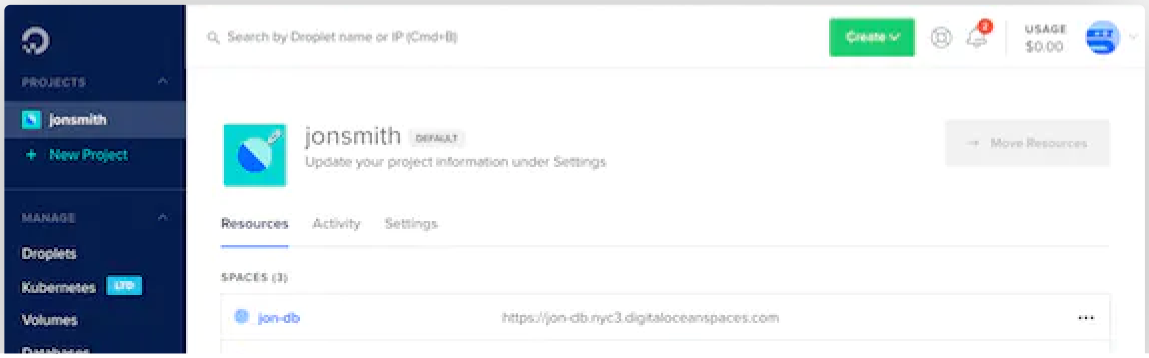

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