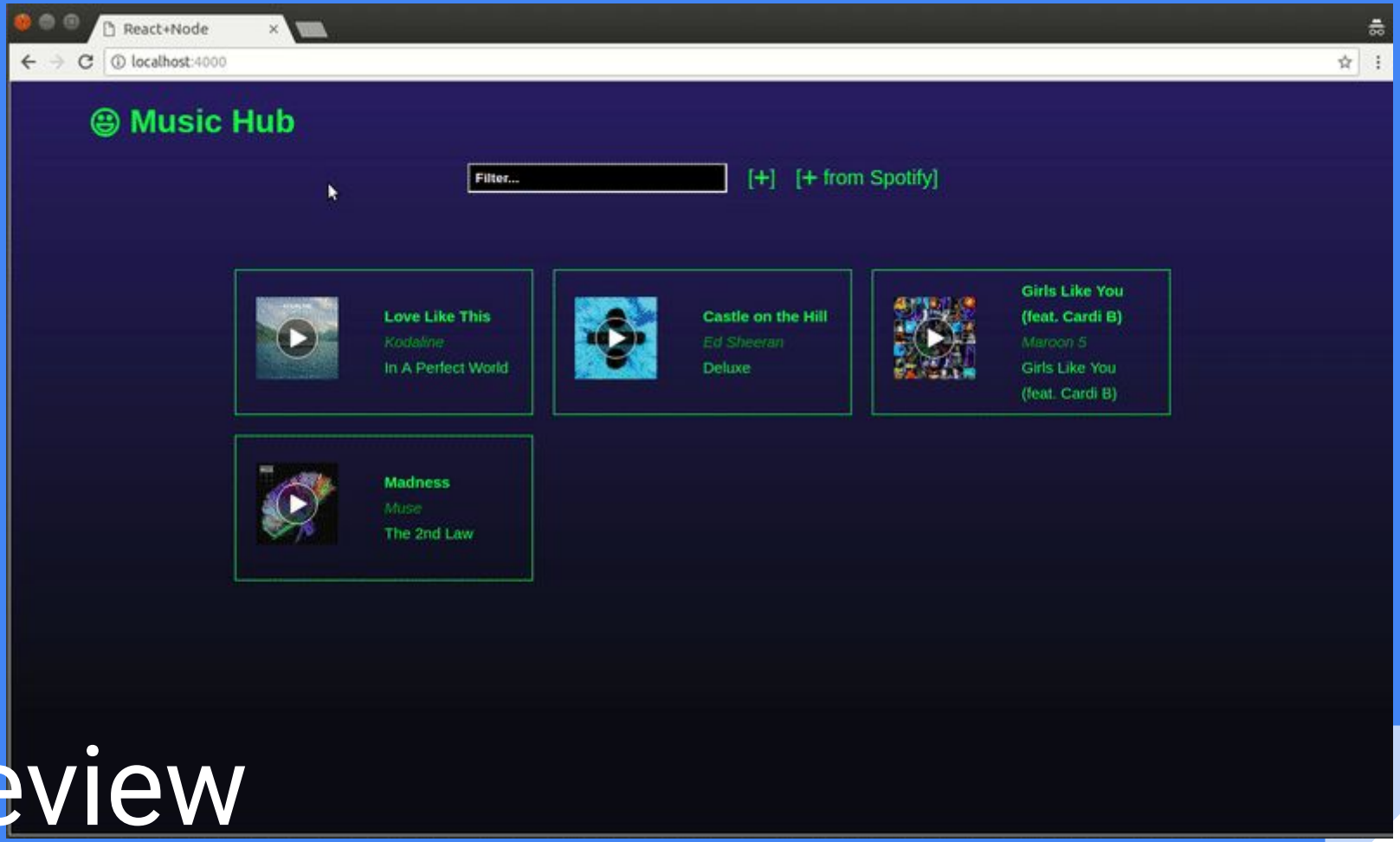
React workshop

Learn front-end web development with React 🎶 💻

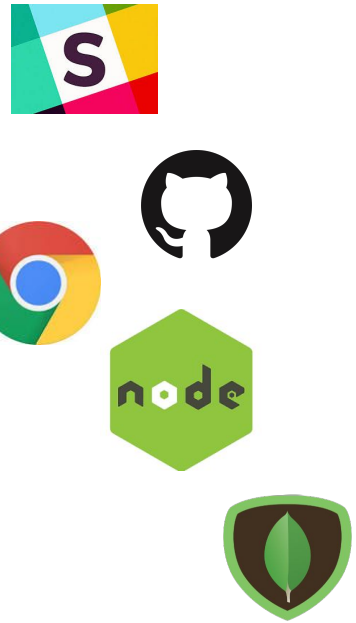

React+Node
localhost:4000
Music Hub
Filter...
[+]
[+ from Spotify]
Love Like This
Kodaline
In A Perfect World
Castle on the Hill
Ed Sheeran
Deluxe
Girls Like You (feat. Cardi B)
Maroon 5
Girls Like You (feat. Cardi B)
Madness
Muse
The 2nd Law

Preview

We need:

For Windows users:
Check out this doc if having problems with Node, npm installation
https://goo.gl/WN3LmA

1. Internet!
2. Join the **Slack**: https://goo.gl/wz8GG2
3. Install Git and Sign up to Github (if you don't have one yet)
   - You'll need this to fork the Github Repo
4. Install Chrome/Firefox
5. Code editor & terminal - pick your favorite
   - I use **VSCode**, which has multi terminals built-in
6. Install node - install **latest LTS version**
   - Download and install from https://nodejs.org/en/download/
   - To test: https://nodejs.org/en/docs/guides/getting-started-guide/
7. Open this page in new tab: https://codesandbox.io/u/lenmorld/sandboxes
8. Check out the cheat sheet https://goo.gl/m8i2gc for some quick info



Git setup Also in Slack #resources

1. Log-in to github
2. Go to https://github.com/lenmorld/react_workshop
3. In github, fork branch 

    - You'll be asked to login to your github account
4. On local terminal, clone the repo

    ```
    $ git clone https://github.com/<username>/react_workshop.git
    ```

    or use SSH if you'd like
5. Checkout dev branch (which should be an empty slate)

    ```
    $ cd react_workshop
    ```

    ```
    $ git checkout dev
    ```
6. Open code editor with **react_workshop** as the root directory
7. **We're ready!** 🚀

Git: exploring workshop code

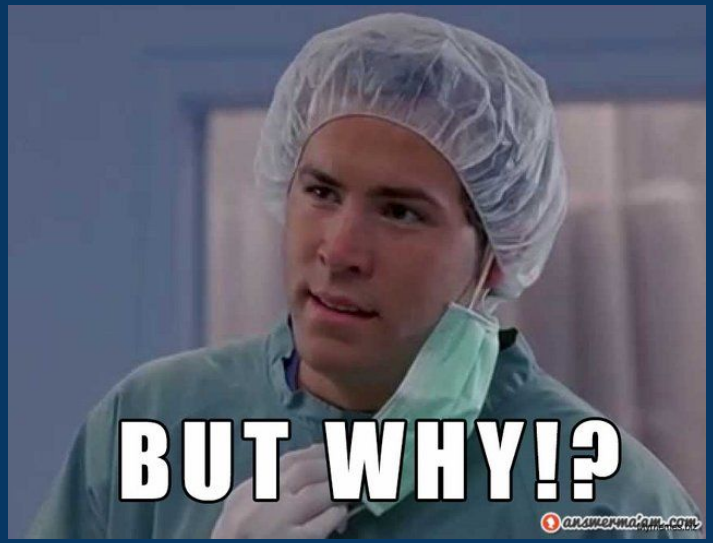
Also in Slack #resources

Comparing branches

1. Each chapter/step is numbered, corresponding to a github branch
2. See diff at any step, e.g. to see code in step c1.6
   https://github.com/<user_name>/react_workshop/compare/c1.5...c1.6
   Or use Github compare tool:

Checkout code at any step

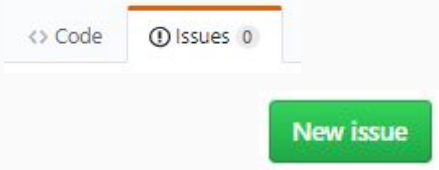
```
$ git stash                    // (or  git clean -fd ) (or push in a new branch)
$ git checkout <chapter>    // e.g.    git checkout c4.1
$ npm install                  // install deps to make code work
// if needed, restart terminal processes for npm run dev
```


BUT WHY!?
answermam.com

I need some help...

After the workshop/before you leave
Please answer a short survey about the workshop
https://goo.gl/M6Bdc3

Please go to the code repo, and give it a star
(if it deserves one, of course!)
https://github.com/lenmorld/react_workshop



Any mistakes or improvements, please submit an issue
or even better, contribute to open-source! (ping me in Slack for details)

React and webpack setup

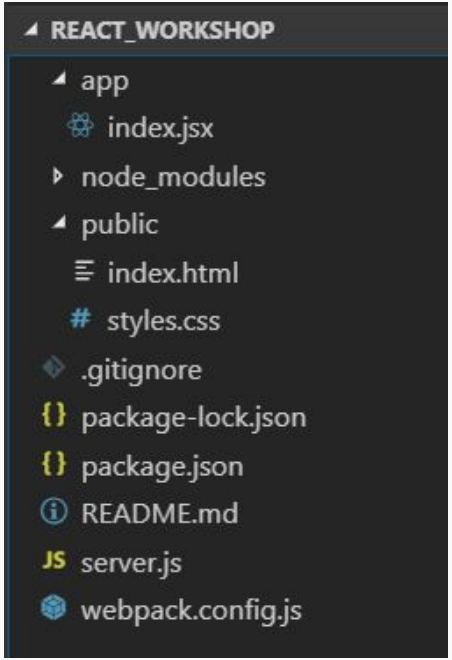
Our React boilerplate

- Checkout **/dev** branch

```
$ git checkout dev
$ npm install
$ npm run dev
```

Our React boilerplate

- These files and folders comprise a working React boilerplate running on a Node + webpack server
- Quick walkthrough:
  - webpack.config.js
  - public/
  - index.html
  - package.json
  - **app/index.jsx**
  - **app/data.js**



Our first React component

- What is a **component?**
  - reusable, self-contained code that contains rendering logic, JSX
- What is **JSX?**
  - HTML-like syntax representing UI elements to be rendered in a page
- How do you make React components appear in HTML?
  - **render** the root component to an HTML node

```
// app/index.jsx

import React from 'react';
import ReactDOM from 'react-dom';

class App extends React.Component {
 render() {
   return (
     <div>React: Hello World!</div>
   );
 }
};

ReactDOM.render(<App />, document.getElementById('app'));
```

1 React Basics

Codesandbox: Component Hierarchy

Codesandbox:

https://codesandbox.io/u/lenmorld/sandboxes/

sandbox name:

2A_components

or use direct link: https://codesandbox.io/s/p791r850r0

c1.1 UIManager.jsx

- Create a new file **app/UIManager.jsx**
- Import and render **UIManager** component inside **App** component

```jsx
// app/UIManager.jsx

import React from 'react';
import data from './data';

console.log(data);

class UIManager extends React.Component {
   render() {
       return(
           <div>List goes here...</div>
       );
   }
}

export default UIManager;
```

```jsx
// app/index.jsx

import React from 'react';
import ReactDOM from 'react-dom';
import UIManager from './UIManager';


...
  render() {
    return (
      <UIManager />
    );
...
```

c1.2 Header.jsx

- Create a new file **app/Header.jsx**
  - Copy from **Slack #react_snippets: Header.jsx**
- Import and render **Header** component inside **UIManager** component
  - *** Notice that we have to enclose return JSX in a ****

```
// app/UIManager.jsx
import Header from './Header';
...
      return(
          <div>
              <Header />
              <div>List goes here...</div>
          </div>
      );
...
```

Different ways to style your components:

- **Regular CSS stylesheets (we're using this), inline (used only in Header.jsx), etc**

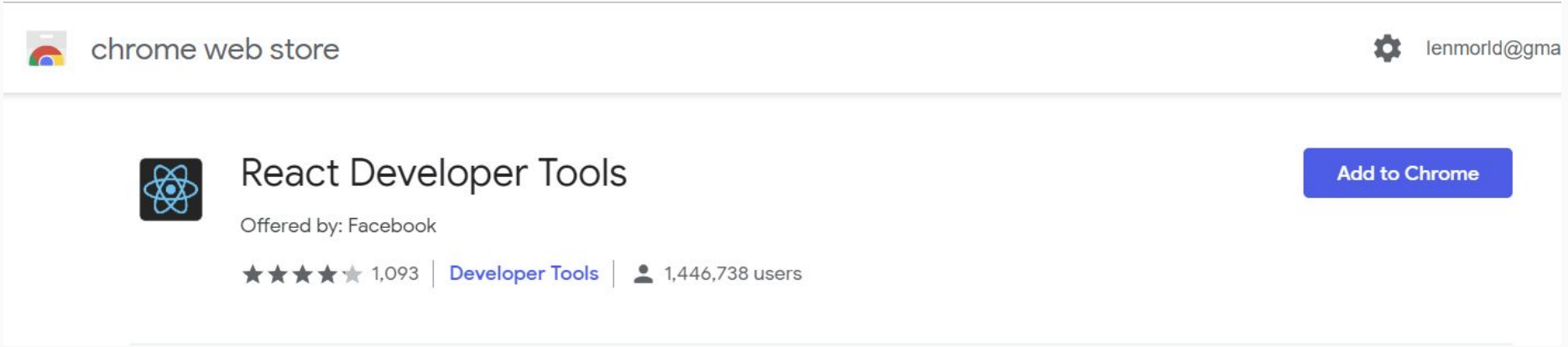
c1.3 List.jsx and Item.jsx

- Create new files
  - **app/**
    - **List.jsx**
    - **Item.jsx**
- Import and render **List** in **UIManager**
- Import and render **Item** in **List**

Component tree

App
  UIManager
    Header
    List
      Item
    ...

```jsx
// app/Item.jsx
import React from "react";
class Item extends React.Component {
   render() {
      return <div>...item...</div>;
   }
}
export default Item;

// app/List.jsx
import React from "react";
import Item from "./Item";

class List extends React.Component {
   render() {
      return (
         <div><Item /></div>
      );
   }
}
export default List;

// app/UIManager.jsx
import List from './List';
...
            <Header />
            <List />
```


chrome web store
lenmorld@gma
React Developer Tools
Offered by: Facebook
1,093
Developer Tools
1,446,738 users
Add to Chrome

Props

What?

Props is a data object passed from a parent component to a child component. It uses attribute syntax like in HTML

How?

Inside the JSX of a parent component, declare the child component, passing the data in this format:

```
<Child propname=propvalue>
e.g. <Person name="Lenny">
```

Codesandbox: Props

Codesandbox:

https://codesandbox.io/u/lenmorld/sandboxes/

sandbox name:

2B_react_props

or use direct link: https://codesandbox.io/s/7joom0lp6x

State
aka Data

state change → re-render UI

What and why?

- State is where data lives.
- Any change of a piece of data in state results to a re-render.
    - React is smart enough to only render what changed (virtual DOM)
- The “data-driven” behavior is the reason why we use frontend frameworks
- i.e. instead of writing logic to manipulate HTML elements (e.g. in vanilla JS/ jQuery), you write reusable data-driven UI components

Implementing **State**

How?

Inside a component declaration:

1. add a ***constructor() { }***
2. Call **super()**
3. define ***this.state***
    a. State is initialized when an instance of this component is created

To read data, use ***this.state.<obj>***

```
class App extends React.Component {
   constructor() {
       super();
       this.state = {
            artistName: "the dev"
       };
   }
   render() {
     return (
      <div>
        <Artist name={this.state.artistName} />
      </div>
     );
```

Codesandbox: State

Codesandbox:

https://codesandbox.io/u/lenmorld/sandboxes/

sandbox name:

2C_react_state

or use direct link: https://codesandbox.io/s/0x3y5vj61l

State and Props gotchas! 🙈

Props

- Props can only be passed downwards: parent → child
  - One hierarchy at a time: cannot pass grandparent to child without passing parent
- Functions can also be passed (discussed later) as **function props**

State

- Only the component has access to its own state, but it can pass **props** downwards for child components to render or modify the data
- A component can also be ***stateless***

State and Props analogy
- Parent and Child

Codesandbox: **4A_state_props_analogy**

https://codesandbox.io/s/xp7zv30934

Please fork before editing

Component_tree:
Parent
    Child

Props passing:
Parent → $100 → Child

c1.4 Add state to UIManager, pass list object as props to List

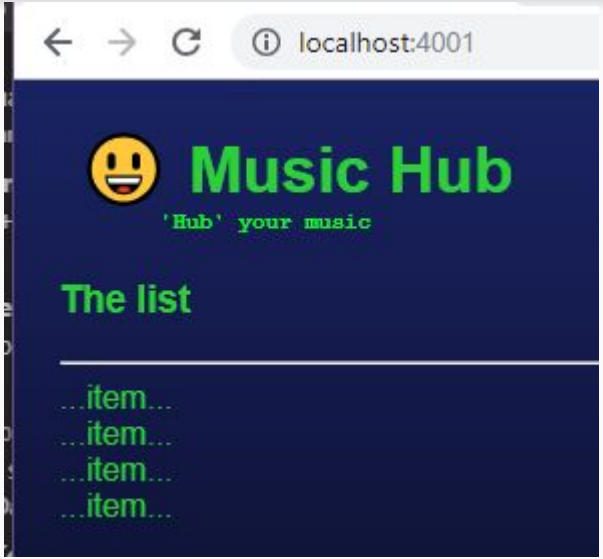
```
// app/UIManager.jsx
...
class UIManager extends React.Component {

   constructor() {
      super();
      this.state = {
         listName: "The list",
         list: data.music
      }
   }

 render() {
   ...
<List name={this.state.listName}
list={this.state.list} />

   ...
```

```
// app/List.jsx
...
class List extends React.Component {
   render() {
      return (
         <div>
            <h3>{this.props.name}</h3>
            <div>List: {this.props.list}</div>
            <hr/>
            <Item />
         </div>
```

```
▸Uncaught Error: Objects are not valid as a React child (found: object with keys {id, artist, title, album}). If you meant to render a collection of children, use an array instead.
    in div (created by List)
    in div (created by List)
    in List (created by UIManager)
    in div (created by UIManager)
```

c1.5 Using map() to render list

```
// app/List.jsx
   render() {
      var list = this.props.list;
      return (
         <div>
            <h3>{this.props.name}</h3>
            <hr />
            {
               list.map(function (item) {
                  return (
                     <Item item={item}
                           key={item.id} />
                  )
               })
            }
         </div>
      );
   }
```



📝 NOTE: always include a **key** to help React optimize rendering

Map, filter, reduce

Codesandbox:

https://codesandbox.io/u/lenmorld/sandboxes/

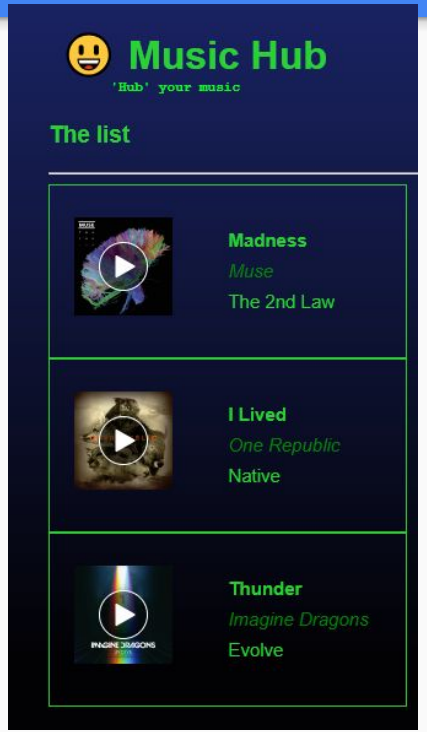
sandbox name: **js_map_filter_reduce**

or use direct link: https://codesandbox.io/s/4z684jjzxw

c1.6 rendering Item

Copy from **Slack #react_snippets: Item.jsx**

```
// app/Item.jsx
...
class Item extends React.Component {
   render() {
      var item = this.props.item;
...

            <div className="right">
               <div className="title">{item.title}</div>
               <div className="artist">{item.artist}</div>
               <div className="album">{item.album}</div>
            </div>
```



Presentational components

- **Item** can be called a **dumb / presentation component**
  - in contrast to **UIManager** that has data, **Item** has no logic at all
- Since it’s only job is to render the `item` object into JSX / HTML elements
- **Dumb components** can be transformed into a *stateless/functional components*

c1.7 Stateless/functional components

```
// CLASS Component
import React from "react";
class Item extends React.Component {
   render() {
      var item = this.props.item;
      return (
       <div>
         <div className="title">{item.title}</div>
         <div className="artist">{item.artist}</div>
         <div className="album">{item.album}</div>
       </div>
      );
   }
}
export default Item;
```

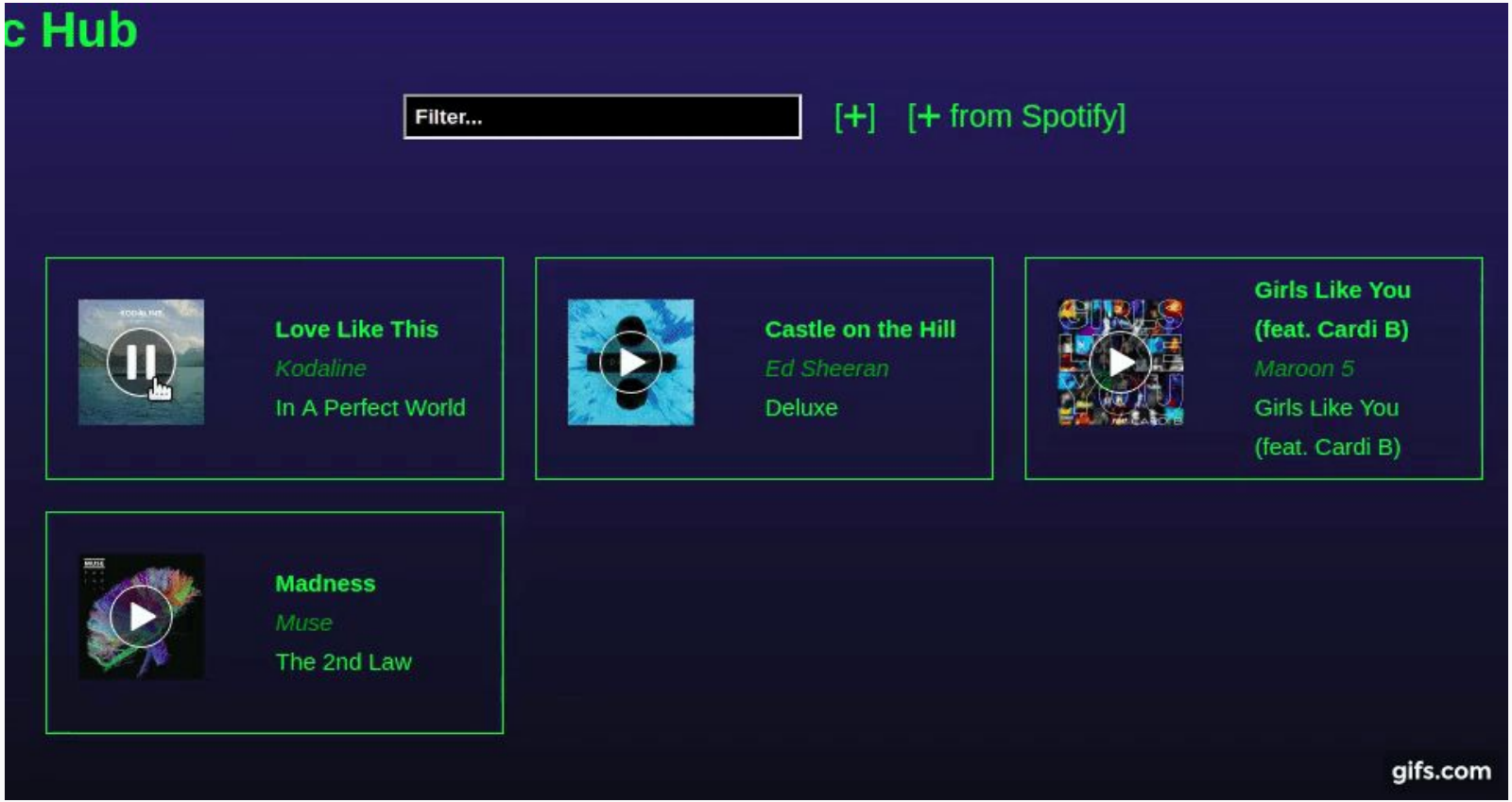
```
// STATELESS (functional) Component
const Item = (props) => (
       <div>
         <div className="title">{props.item.title}</div>
         <div className="artist">{props.item.artist}</div>
         <div className="album">{props.item.album}</div>
       </div>
);

export default Item;
```

succinct, slight increase in performance

*required when using **state**, constructor(), and other lifecycle methods

2 Forms and event handlers

Searching


c Hub
Filter...
[+]
[+ from Spotify]
Love Like This
Kodaline
In A Perfect World
Castle on the Hill
Ed Sheeran
Deluxe
Girls Like You
(feat. Cardi B)
Maroon 5
Girls Like You
(feat. Cardi B)
Madness
Muse
The 2nd Law
gifs.com

Events and event handlers

HTML elements (e.g. inputs, buttons) generate events (onClick, onChange, etc), which is processed by an **event handler** function. This is where we can define what to do when the event happens

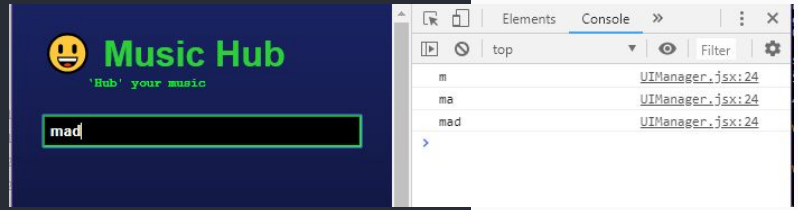
Codesandbox: **js_event_handler**

https://codesandbox.io/s/l2mw8wrj5z

c2.1 **event handler**

```
// app/UIManager.jsx
...
    searchList(event) {
        var search_term = event.target.value;
        console.log(search_term);
    }

    render() {
        return(
            <div>
                <Header />
                <div className="options">
                    <input type="text"
                           placeholder="Filter..."
                           onChange={this.searchList} />
                </div>
                <List list={this.state.list}/>
            </div>
        );
    }
...
```

*`event` parameter is automatically passed here as the default argument of a HTML element event handler



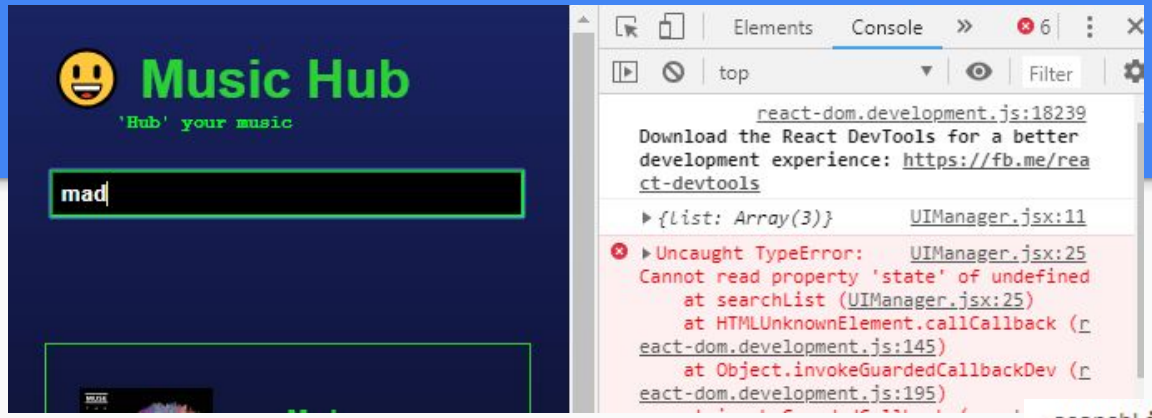
c2.2 **setState()** to modify state

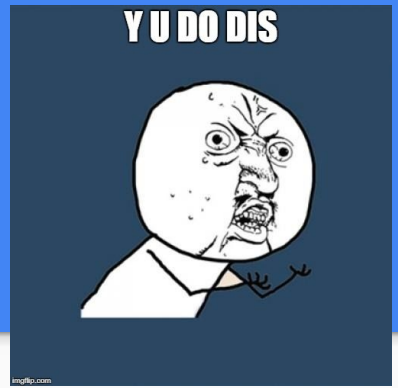
For us to filter the list based on current input:

- We have to track user's input by putting it in state
  - **this.state.search_term**
- To modify state, we use **setState()**
  - **Never do: *this.state.obj = new_obj***
  - **Why? Setting state must be async**

```
class UIManager extends React.Component {
...
      this.state = {
         listName: "The list",
         list: data.music,
         searchTerm: '',
      }
   }

   searchList(event) {
      var searchTerm = event.target.value;
      console.log(`${this.state.searchTerm} ->
${searchTerm}`);

      this.setState({
         searchTerm: searchTerm
      });
```

But we're getting an error!






```
searchList(event) {   event = SyntheticEvent {dispatchConf
  var search_term = event.target.value; // console.log(se
                                        undefined
  debugger;
  console.log("current search term: ", this.state.search_
  this.setState({
```

- **Cannot read 'state' of undefined! why?**
- **'This'** is undefined inside the event handler
- We don't have access to **`this.state, this.setState`**
- We need to bind the function to the object instance, to make sure **this** is defined inside a nested function (i.e. a function inside a function)

c2.3 using an arrow function to bind *this*

```
// app/UIManager.jsx
...
                <div className="options">
                    <input type="text"
                           placeholder="Filter..."
                           onChange={ (event) => this.searchList(event)} />
                </div>

...
```

Alternatives:

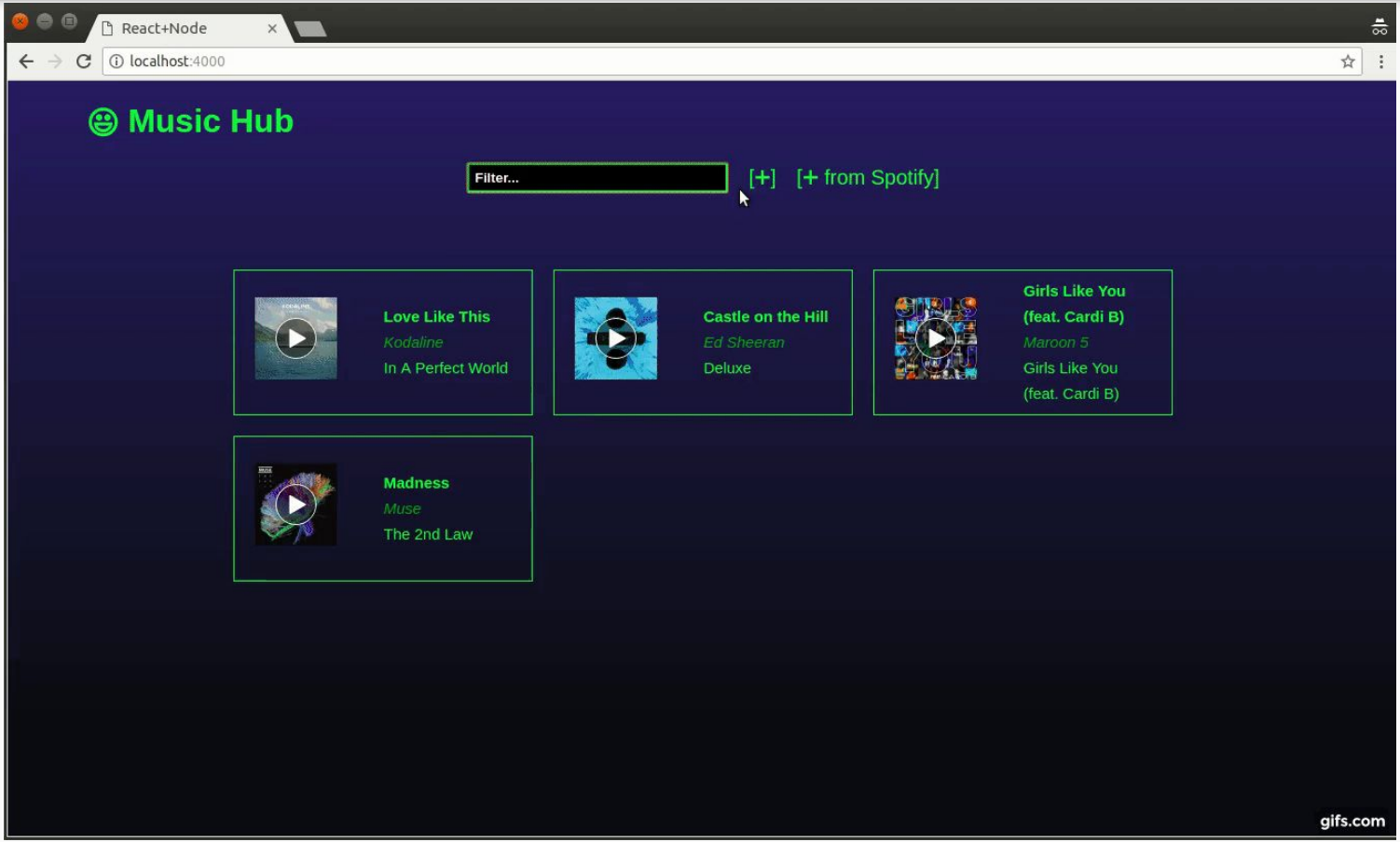
- Bind in constructor (better performance)
- Class properties (need ES6 stage 3 features enabled)

Codesandbox: **3A_binding_event_handlers_this**
https://codesandbox.io/s/3x3z1rm365
Explore the issue and solutions here

c2.4 filtering list based on *state.search_term*

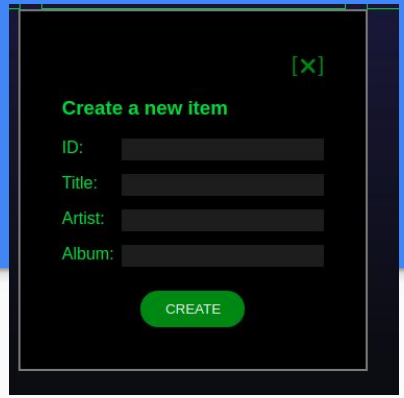

```
  render() {
    // filter list based on current user input -> searchTerm
    var list = this.state.list;
    var searchTerm = this.state.searchTerm;
    var filteredList;

    if (!searchTerm) {
      filteredList = list;
    } else {
      filteredList = list.filter(function (item) {
        return item.title.toLowerCase().includes(searchTerm.toLowerCase());
      });
    }

    return (
...
          <List name={this.state.listName} list={filteredList} />
```

Create / Add new Item



** from this chapter onwards,
see full code change on Github

c2.5 ItemForm.jsx



We'll create a component that has an HTML form

1. Create new file **app/ItemForm.jsx**
   a. Copy from **Slack #react_snippets: ItemForm.jsx**
2. In **UIManager**
   a. add `this.state.formFields` as an object, initializing item fields to empty string
   b. Import and render <**ItemForm ... /**> same level, and after <**List ... /**>
   c. And pass `this.state.formFields` as props
      i. `<ItemForm item={this.state.formFields} />`

```
searchTerm: '',
formFields: {
  id: '',
  title: '',
  artist: '',
  album: '',
},
```

NOTES:

- You can have an **object** data type in state

Function props

Remember that **Child** component cannot modify **Parent** state directly.
However, **Parent** can pass a function to **Child** that it can call whenever it wants to change Parent's state. e.g:
In Parent render():

```
<Child earnMoney={(money) => this.increaseMoney(money)}>
```

In Child render():

```
<button  onClick={() => this.props.earnMoney(100)}>
```

Codesandbox: **4B_state_props_analogy**
https://codesandbox.io/s/6jormxo65n

c2.6 **Function props**

<UIManager>
    <ItemForm>

Props passing:
<UIManager> ---- onChangeFormInput(event) ---> <ItemForm>

UIManager.jsx

UIManager renders ItemForm, passing a **function prop** that allows ItemForm to change data (state) in UIManager

```
class UIManager extends React.Component {
...
   onChangeFormInput(event) {
      console.log("input changed");
   }
...
          <ItemForm item={this.state.formFields}
                    onChangeFormInput={(event) => this.onChangeFormInput(event)} />
```

c2.6 **Function props**

<UIManager>
<ItemForm>

Props passing:
<UIManager> ---- onChangeFormInput(event) ---> <ItemForm>

ItemForm.jsx

ItemForm then calls the function prop given by UIManager, whenever there is a change in input (onChange event).

```
class ItemForm extends React.Component {
...
                <p>
                   <label>ID:</label>
                   <input name="id"
                      onChange={(event) => this.props.onChangeFormInput(event)}
                      value={item.id} />
```

We do this for the 4 inputs (id, item, artist, album)

c2.7 Other event handlers of ItemForm

ItemForm.jsx

1. When hiding the form ([X])
   a. onClick → this.hideForm

2. When submitting form (CREATE)
   a. onClick → *this.onSubmitForm(event)*

```
class ItemForm extends React.Component {
   hideForm() {
      console.log("hide form");
   }

   onSubmitForm(event) {
      event.preventDefault(); // prevent reload of page
      console.log("form submitted");
   }
...
               <div className="close_form">
                  <span onClick={this.hideForm}>[□]</span>
               </div>
...
               <div className="create">
                  <button onClick={(event) =>
this.onSubmitForm(event) }>
                     CREATE
                  </button>
```

c2.8 onChangeFormInput

Once **UIManager** receives the event from **ItemForm** (through function prop)

- The event input can now be processed and reflected in state

```
class UIManager extends React.Component {
...
   onChangeFormInput(event) {
      // copy values (not reference) using ES6 spread
      var currentListFields = { ...this.state.formFields };
      // e.g. current_list_fields['artist'] = 'Artist1'
      currentListFields[event.target.name] = event.target.value;
      // apply new value to state
      this.setState({
         formFields: currentListFields
      });
   }
```

c2.9 createItem()

<UIManager>
    <ItemForm>

Props passing:
<UIManager> → createItem(item) → <ItemForm>

In **UIManager**

- define ***createItem()***
  1. Get Item data from state
  2. Copy List values (not reference), using ES6 spread
  3. Add new item to copy
  4. Apply changes to state using *this.setState*
  5. Empty form fields
- Pass as function props to **ItemForm**

```
<ItemForm item={this.state.formFields}
          onChangeFormInput={(event) => this.onChangeFormInput(event)}
          createItem={() => this.createItem() } />
```

```
class UIManager extends React.Component {
...
   // data API - CRUD methods
   createItem() {
      // get Item data from state
      var item = this.state.formFields;
      // copy list values, not reference, using ES6 spread
operator
      var currentListItems = [...this.state.list];
      // add new item
      currentListItems.push(item);
      // apply change to state
      this.setState({
         list: currentListItems
      });
      // empty fields for next round
      this.setState({
         formFields: {
            id: '',
            title: '',
            artist: '',
            album: ''
         }
      });
   }
```

c2.9 createItem()

ItemForm

- Forward request to function props, when form is submitted

```
class ItemForm extends React.Component {
   ...
   onSubmitForm(event) {
      event.preventDefault(); // prevent reload of page
      // console.log("form submitted");
      this.props.createItem();
   }
```

c2.10 show and hide ItemForm

UIManager:

Add [+] button beside search box, add *onClick* and set to *showForm()*

showForm()

Invoke when clicking [+] -> set style to ‘block’

ItemForm:

Set CSS class to “modal”

hideForm()

Invoke when clicking [X] on modal -> set style to ‘hidden’

Optional: invoke after adding a new item

View code changes:

https://github.com/lenmorld/react_workshop/compare/c2.9...c2.10

TEST IT!

Add a song or two to your playlist
(Not a lot since it will be gone on page refresh!)

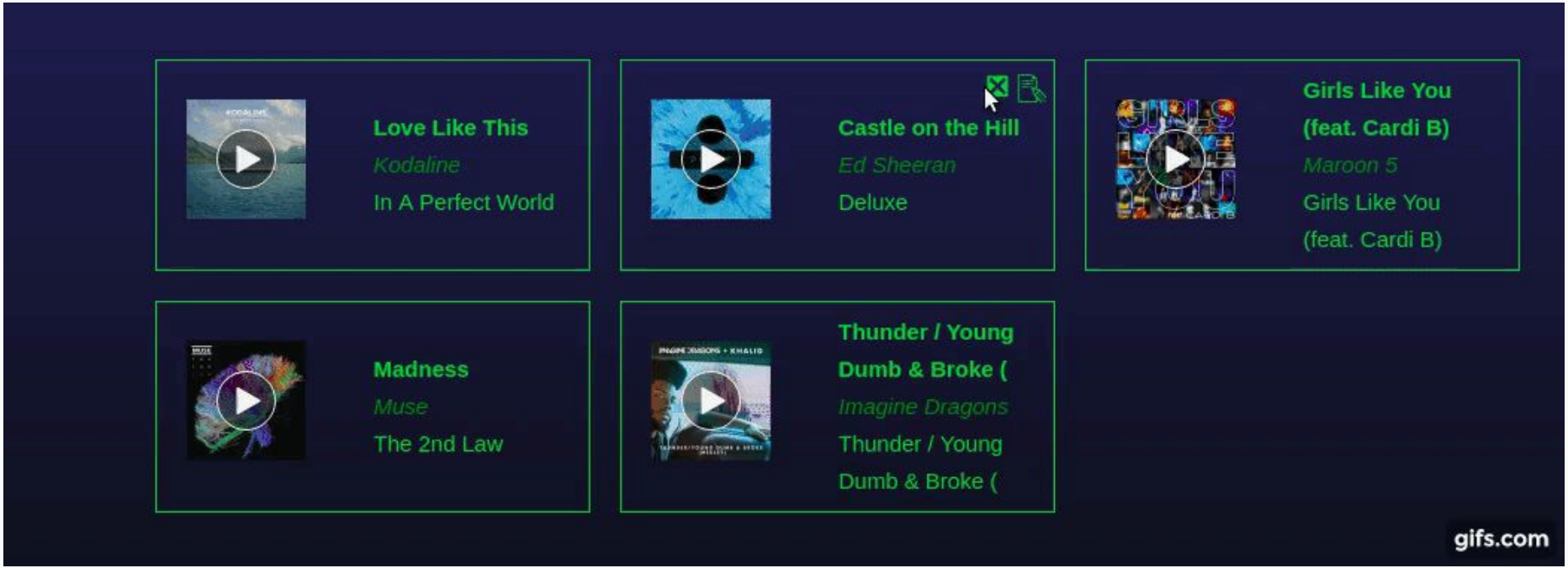
- Google “<Artist> <song> spotify”
- Get the ID in `track/ID`
- Use ID to Create new Item

Recap of React forms

questions?

3 Forms and CRUD

Delete and Update item



c3.1 Delete ☒ and Edit 

```
<UIManager>
        <List>
                <Item>
Props passing:
            <UIManager> --  deleteItem() --->  <List> -- deleteItem() ---> <Item>
                                editItem()                      editItem()
```

Delete and Update button icons will be inside **Item** as icons that appear on hover

1. **UIManager.jsx** - define *deleteItem* and *editItem* and pass down to List as function props
2. **List.jsx** - pass function props down to Item as a middleman
3. **Item.jsx** - invoke function props with required parameter on onClick event handler

NOTE: the use of **arrow functions to be able to use this**

c3.2 implementing deleteItem()

1. Copy list values, not reference
2. Filter copy using *filter()*, by excluding item to delete
3. *setState()*

NOTE: notice the current pattern in CRUD methods

1) Copy list 2) do operation on copy 3) setState

c3.3 editItem() - form **mode**

When user clicks edit, we have to show ItemForm, but let it know that we want to EDIT, not CREATE. We do this by adding a **mode** in state, and passing the item to be edited so the form fields would be populated.

UIManager.jsx

- add `this.state.form_mode`, init to 'CREATE'
- pass to **ItemForm** as props, alias **mode**
  - This is to show props is just a name

```
<ItemForm ...
          mode={this.state.form_mode} />
```

ItemForm.jsx

- use **this.props.mode** to set labels correctly

c3.4 editItem() - show ItemForm on edit mode

UIManager must get correct item to be edited, before passing to **ItemForm**

In **editItem()**

1. Copy list values, not reference
2. Filter copy using filter(), get the one matching item
3. setState() - set mode to ‘EDIT’, set form_fields to the item
4. Show **ItemForm**

Now, we are getting the item values in the form fields

c3.5 editItem() - saveUpdatedItem

When form is saved, we need a CRUD method that will apply changes to our data UIManager ***saveUpdatedItem()*:**

1. Copy list values, not reference
2. Init a new empty array and copy all values here, except the updated item
3. setState()
4. Hide **ItemForm**

Pass ***saveUpdatedItem*** to **ItemForm** as function props

ItemForm:

- Based on `this.props.mode`, invoke either `this.props.create` or `this.props.saveUpdatedItem`

c3.6 set ItemForm fields on [+] too

🐞 **BUG** 🐞: Notice that after Edit, clicking Create [+] sets the item fields to previous item incorrectly in **ItemForm**

UIManager:

1. Define **onAddItem()** function that will set mode to ‘CREATE’ and fields to empty
2. Replace event handler on [+] with `onAddItem()`
    - Note the use of arrow function

TEST IT!

Create, Edit, Delete, Filter (Search)

4 Integrating with Giphy API

Fetching data
Lifecycle methods
Refs

```
# axios is a promise-based HTTP library
$ npm install axios
```

c4.1Component setup

1. install axios - a fetching library
2. create a file **app/Giphy.jsx**

Giphy.jsx

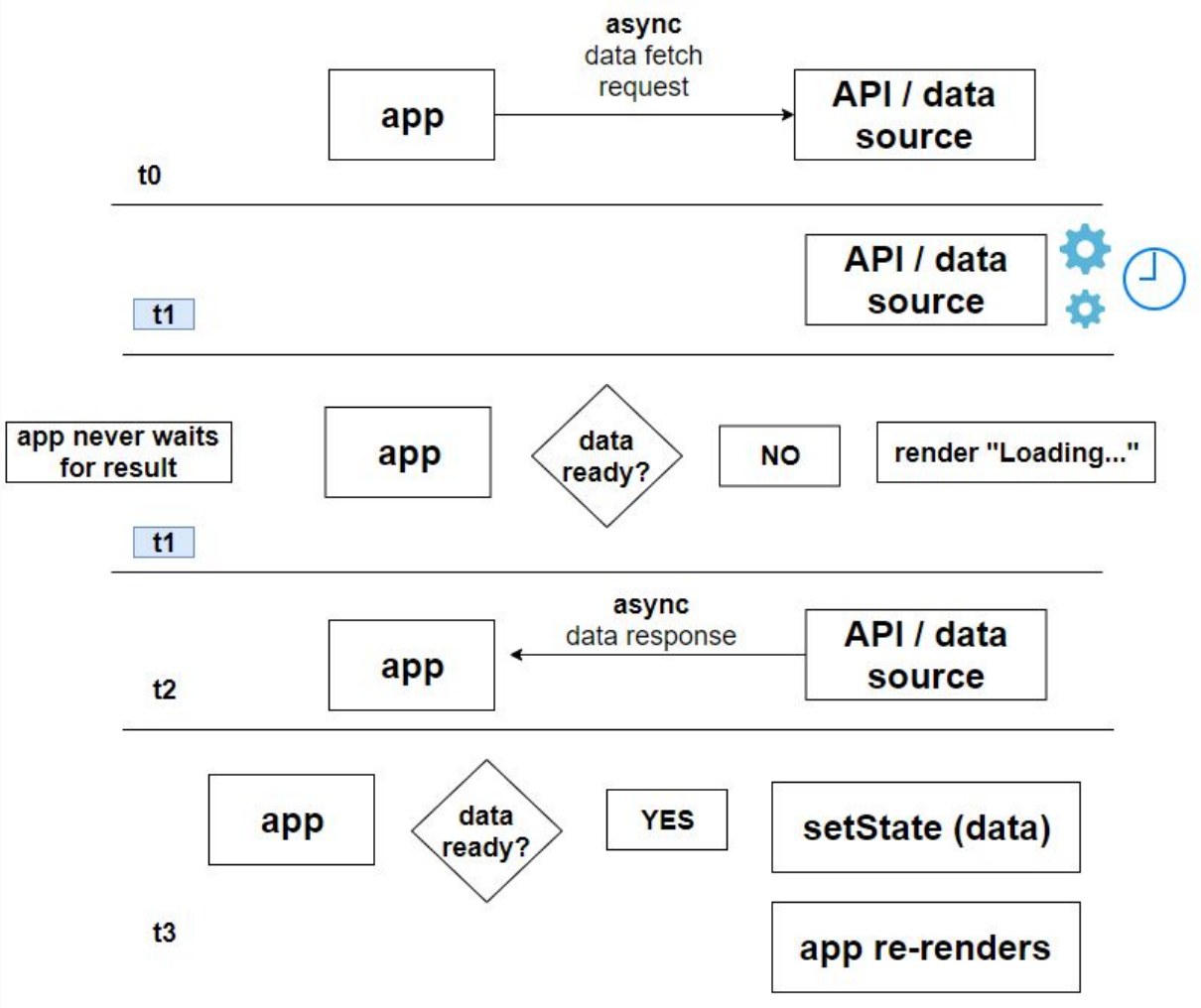
- **constructor()** with state
    - init **this.state.memes** to empty array

index.jsx

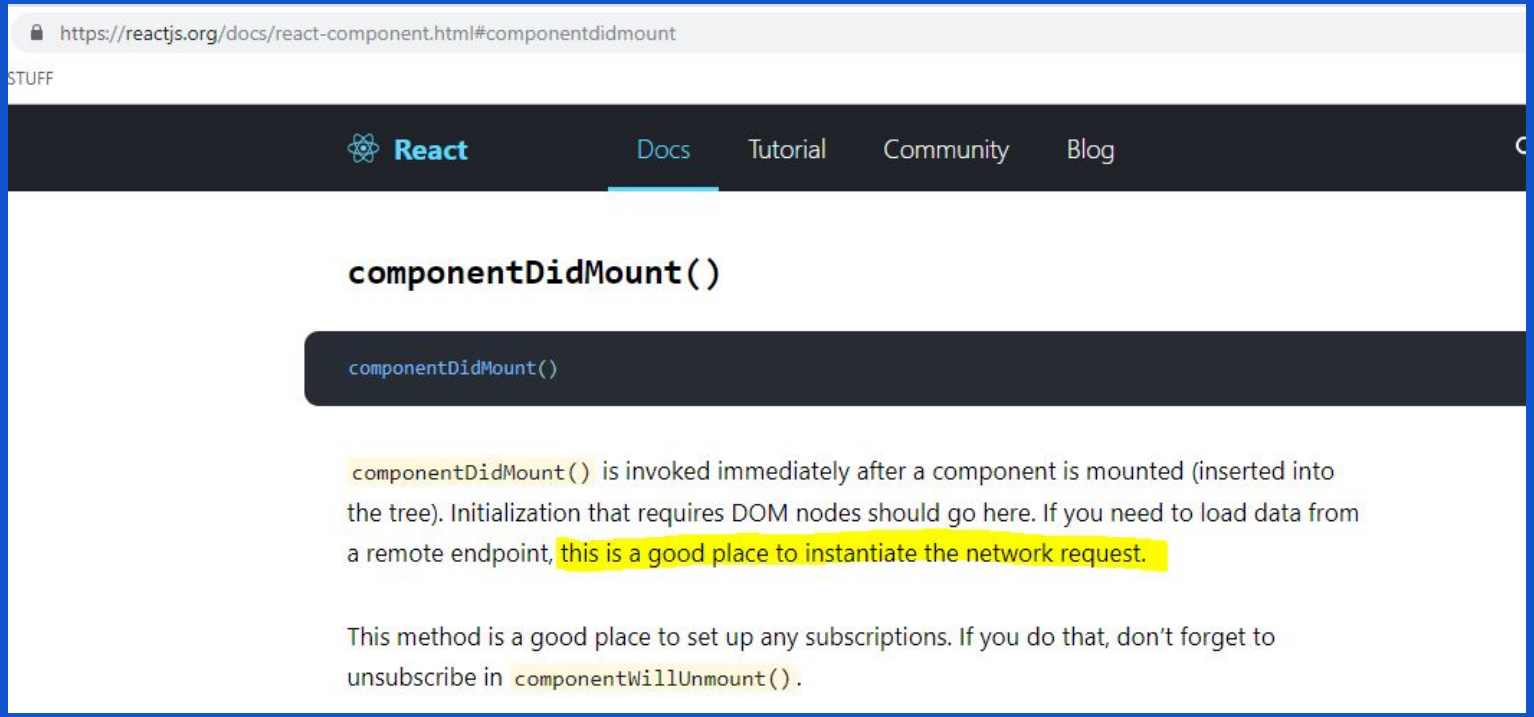
- replace <UIManager /> with <Giphy /> temporarily
    - *we'll fix this later in Chapter 5: Routing*

how do we fetch data in JS?

common pattern in Async data fetch



componentDidMount, and other React lifecycle methods



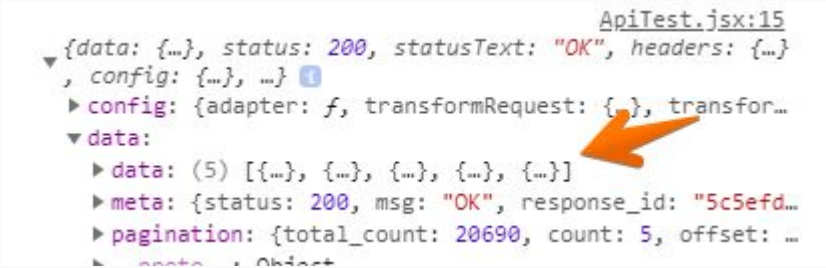
c4.2 componentDidMount()

```
class Giphy extends React.Component {
   componentDidMount() {
      axios.get(`<REQUEST_URL>`)
         .then((res) => {
            console.log(res);
         });
   }
...
```

Fetch data from backend before component is rendered. How?

`componentDidMount()`

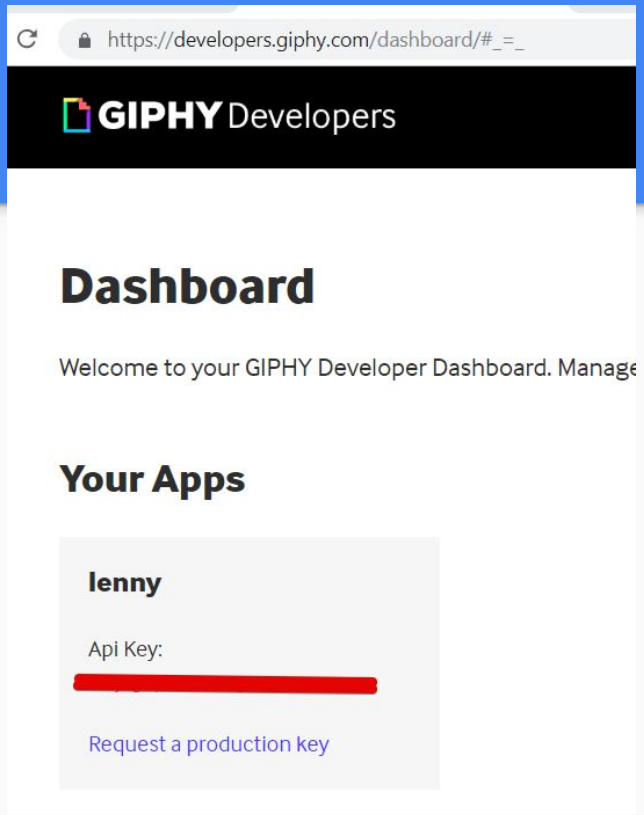
- React lifecycle method that runs after component **mounted**
- good place to put data fetch requests, then load data to the component state



Using the Giphy API

1. Login to https://developers.giphy.com/
2. Create an app
3. Get API key

NOTE: different APIs have varying degree of authentication (no auth, API key, Oauth, etc) Check out the docs of the API you need to use.



c4.3 setState and rendering

componentDidMount()

When response is received, set current state data to response data

render()

Render array into JSX items using *map()*, following API formats and desired styling, layout, etc

```
class ApiTest extends React.Component {
   componentDidMount() {
     ...
         .then((res) => {
            const memes = res.data.data;
            this.setState({
               memes: memes,
            })
         });
   }

   render() {
      return (
         <div>
            {this.state.memes.map((item) =>
               <div key={item.id}>
                  <iframe src={item.embed_url} ... />
               </div>
            )}
         </div>
      );
   }
...
```

c4.4 Show loading when data not ready

Initialize **state.list** to [ ], to show a Loading page if results are not back yet

- Why? **in cases of slow network**, we would show Loading instead of a blank page

```
class ApiTest extends React.Component {
...
   render() {
      if (this.state.memes.length === 0) {
         return <div>Loading...</div>;
      }
      return (
         <div>
            {this.state.memes.map((item) =>

...
```

Searching meme and adjusting count

Instead of hard-coding `SEARCH_QUERY` and `RESULTS_LIMIT`, we can use our knowledge of forms to include a search!

Similar to Chapters 2 and 3, we can setup *searchQuery and resultsLimit* in the state and wire and event handler to them (**DO THIS AS A PRACTICE**).

But since this is a smaller example, we'll explore a simpler way of using inputs in React, called **refs.**

Controlled vs Uncontrolled inputs

Controlled inputs:

- form data sync'ed with state
- event handler for each input binding

Uncontrolled input:

- form data is handled by DOM
- no event handler needed to bind input

Codesandbox: **3B_controlled_inputs**
https://codesandbox.io/s/vvpvr721l7

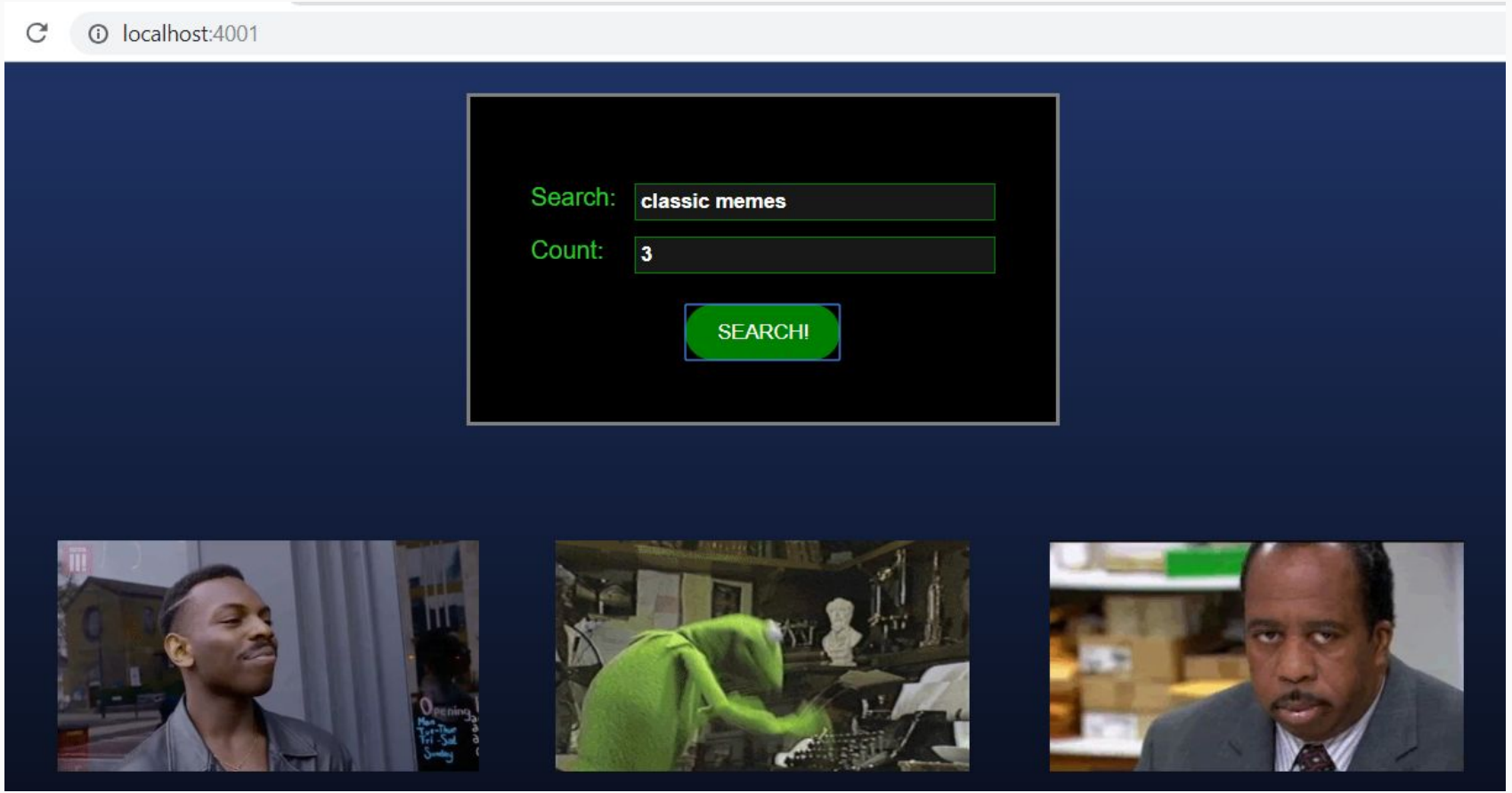
Codesandbox: **3C_uncontrolled_inputs**
https://codesandbox.io/s/0yw2xy86vv

c4.5 **refs**

- Setup the refs in *constructor()* using **React.createRef()**
- Connect the refs to the inputs using ***ref={this.ref}***
- Access **ref'ed** input element through **ref.current**

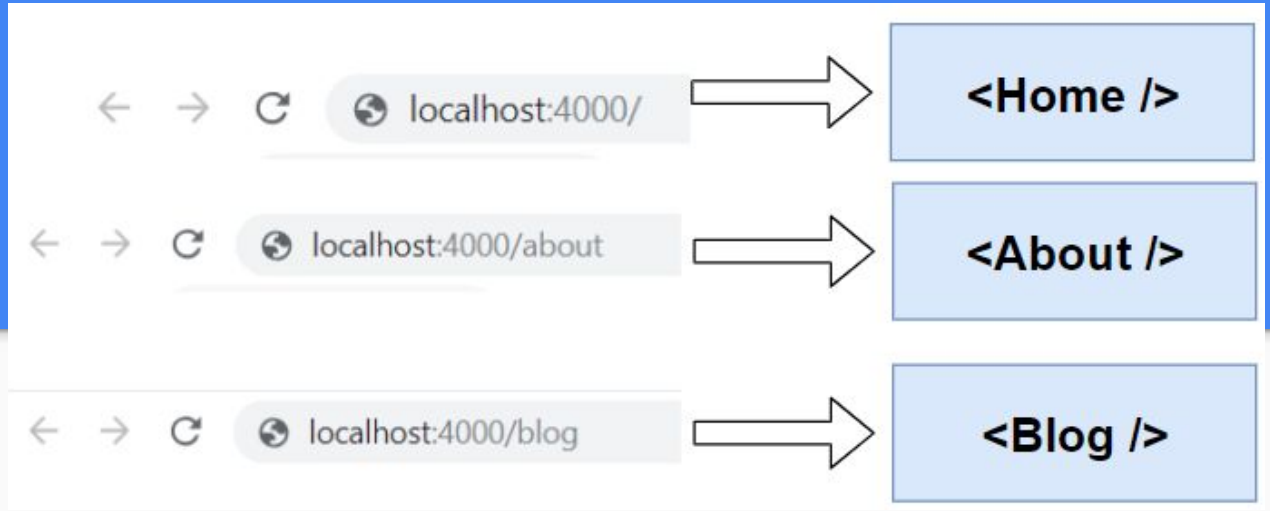
```
class ApiTest extends React.Component {
   constructor() {
   ...
      // React refs for searchQuery and resultsLimit
      this.searchQueryInput = React.createRef();
      this.resultsLimitInput = React.createRef();
   }
...
 submitSearch(event) {
   const searchQuery = this.searchQueryInput.current.value;
   const resultsLimit = this.resultsLimitInput.current.value;
   // execute request
   axios.get() {...}
...
render() {
...
<form>
   <p>Search: <input type="text" ref={this.searchQueryInput} /></p>
   <p>Num. results: <input type="number" ref={this.resultsLimitInput}/></p>
   <button onClick={(event) => {this.submitSearch(event)}}>Search memes!</button>
</form>
```

Meme search using Giphy API and React refs



5 Frontend Routing

Routing



When doing a SPA (Single Page Application) in React, we need a **routing** library to:

- match React components with URLs
- manage browser navigation and history

We use **react-router**

```
# React routing library
$ npm install react-router-dom
```

c5.1 setup routes

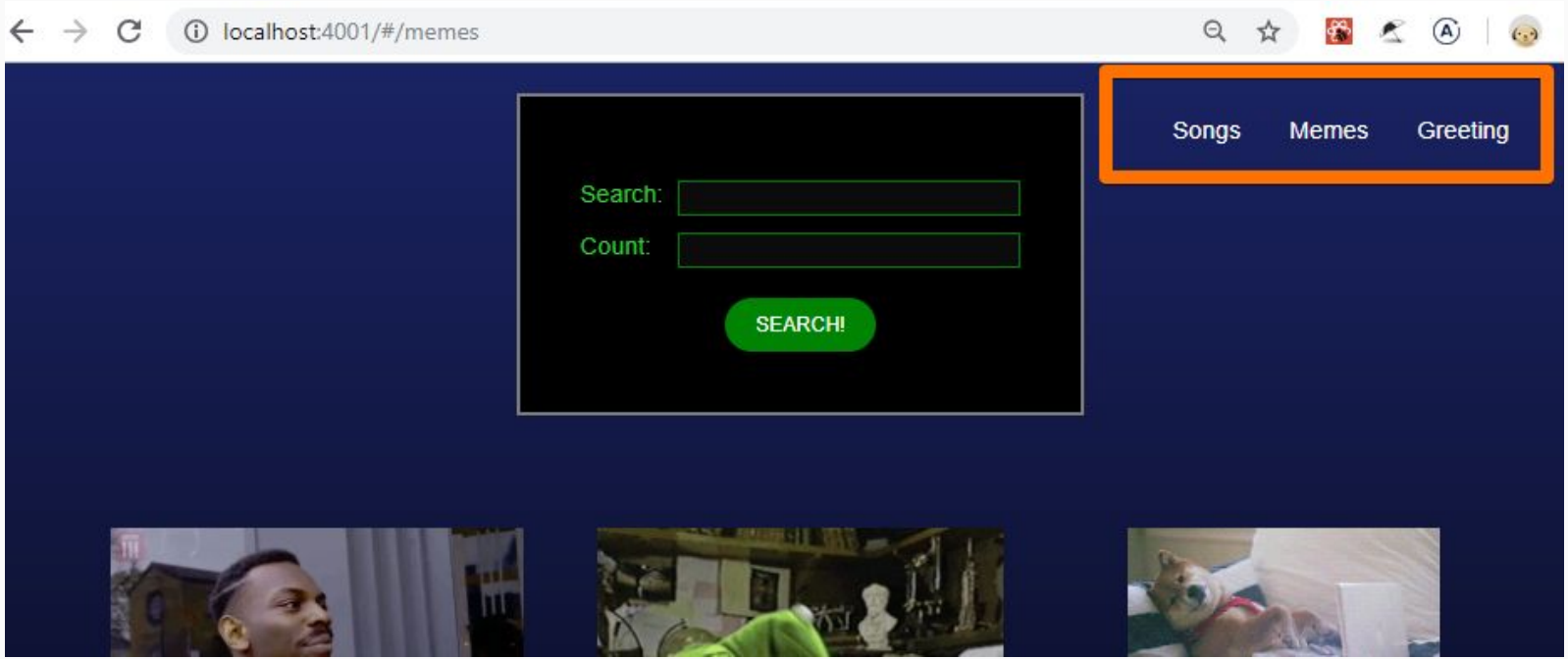
```
// index.jsx

import { HashRouter, Route, Link } from 'react-router-dom';

class App extends React.Component {
   render() {
      return <BrowserRouter>
         <div>
            {/* nav links to take us to the route */}
            <nav>
               <ul>
                  <li><Link to="/">Songs</Link></li>
                  <li><Link to="/memes">Memes</Link></li>
               </ul>
            </nav>
            {/* match route to React component */}
            <Route exact path="/" component={UIManager} />
            <Route exact path="/memes" component={Giphy} />
         </div>
      </HashRouter>
...
```

c5.2 passing URL params to components

```jsx
// index.jsx
...
<li><Link to="/greeting/en">Greeting</Link></li>
...
<Route exact path="/greeting/:lang" render={(props) => <Greeting text="Hello, " {...props} /> }
```

```jsx
// Greeting.jsx
...
import qs from "qs";
...
class Greeting extends React.Component {
   render() {
      // debugger;
      const { text, location, match } = this.props;
      const lang = match.params.lang;
      const name = qs.parse(location.search, { ignoreQueryPrefix: true }).name;
...
```

Simple routing with react-router



6 Integrating with Spotify API

Spotify search API

c6.0 Server setup

```
$ git checkout c6.0
$ npm install qs      # query parser
$ npm run dev
```

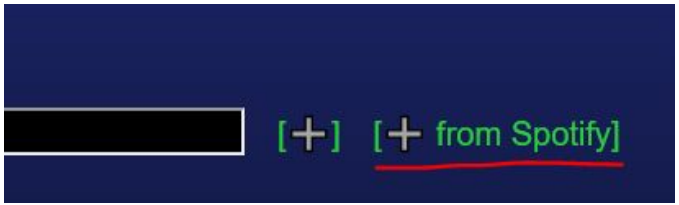
This branch contains code for:

- Spotify API connection
- Routes and controllers for Auth and searching songs
- Server routes

c6.1 Spotify.jsx

Create **app/Spotify.jsx**

Copy from **Slack #react_snippets: Spotify.jsx**



UIManager.jsx

- Import Spotify.jsx
- Add ***showSpotify() and hideSpotify()*** event handlers , similar to what we have before for show|hideForm() but use `.spotify_modal` as the selector
- Add button **[+ from Spotify]** and its event handler ***showSpotify()***
- Render **<Spotify />** component and pass ***hideSpotify*** as function props

c6.2 Controlled inputs

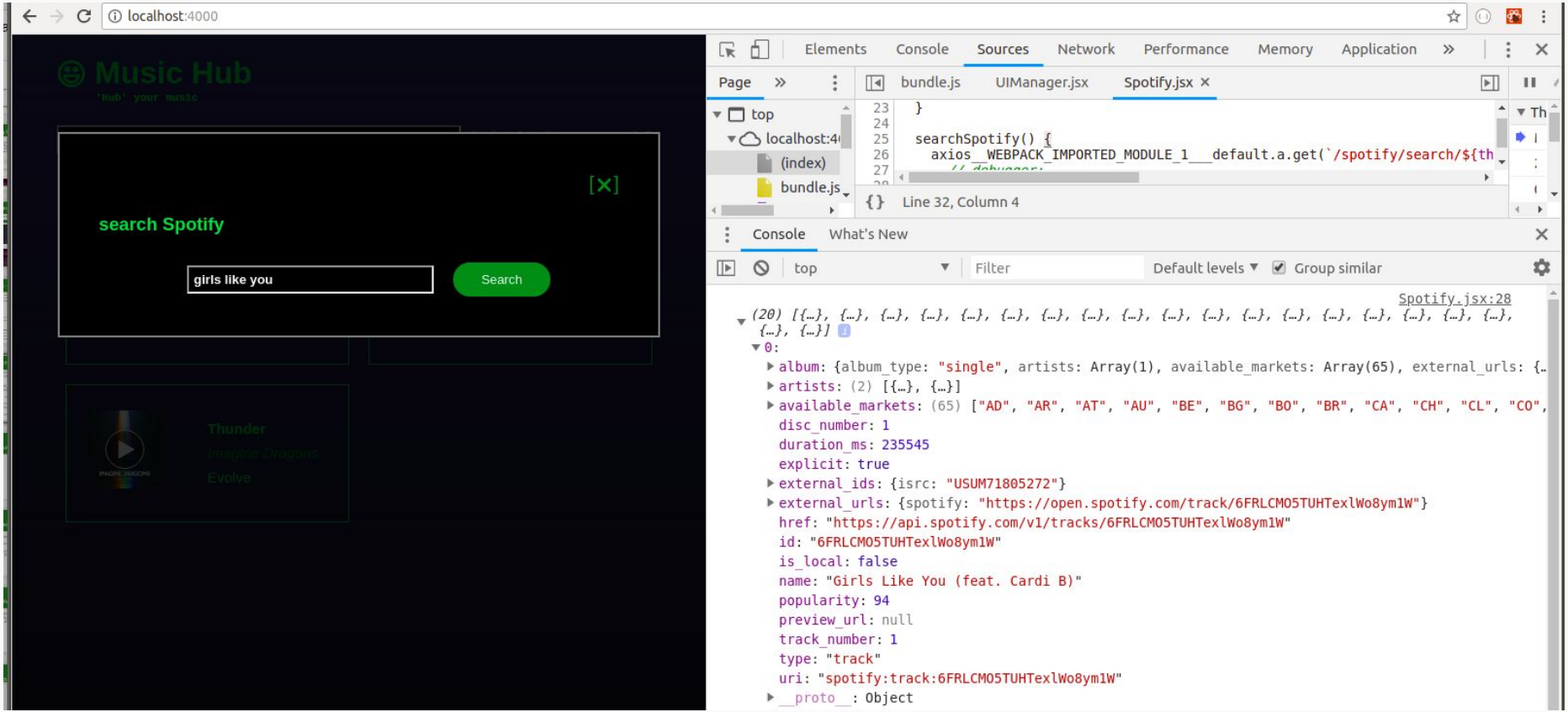
Setup **Spotify.jsx** form inputs as controlled inputs, similar to chapters 2 and 3, by defining:

- **constructor()**
- **trackSearchTerm()**
- **searchSpotify()**

also import axios for the fetch request

```
import axios from 'axios';

class Spotify extends React.Component {
  constructor(props) {
    super(props);
    this.state = {
      searchTerm: ''
    }
  }
  trackSearchTerm(event) {
    var searchTerm = event.target.value;
    this.setState({searchTerm: searchTerm});
  }
  searchSpotify() {
    axios.get(`/api/songs?search=${this.state.searchTerm}`)
      .then((res) => {console.log(res.data);})
      .catch((err) => {
        console.log(`[Spotify.jsx] search error: ${err}`);
      });
  }
...
```

Search results in the debugger console



c6.3 transforming API's response data into UI data

```
    {
      "id": "0c4IEciLCDdXEhhKxj4ThA"
      "artist": "Muse",
      "title": "Madness",
      "album": "The 2nd Law",
    }
```

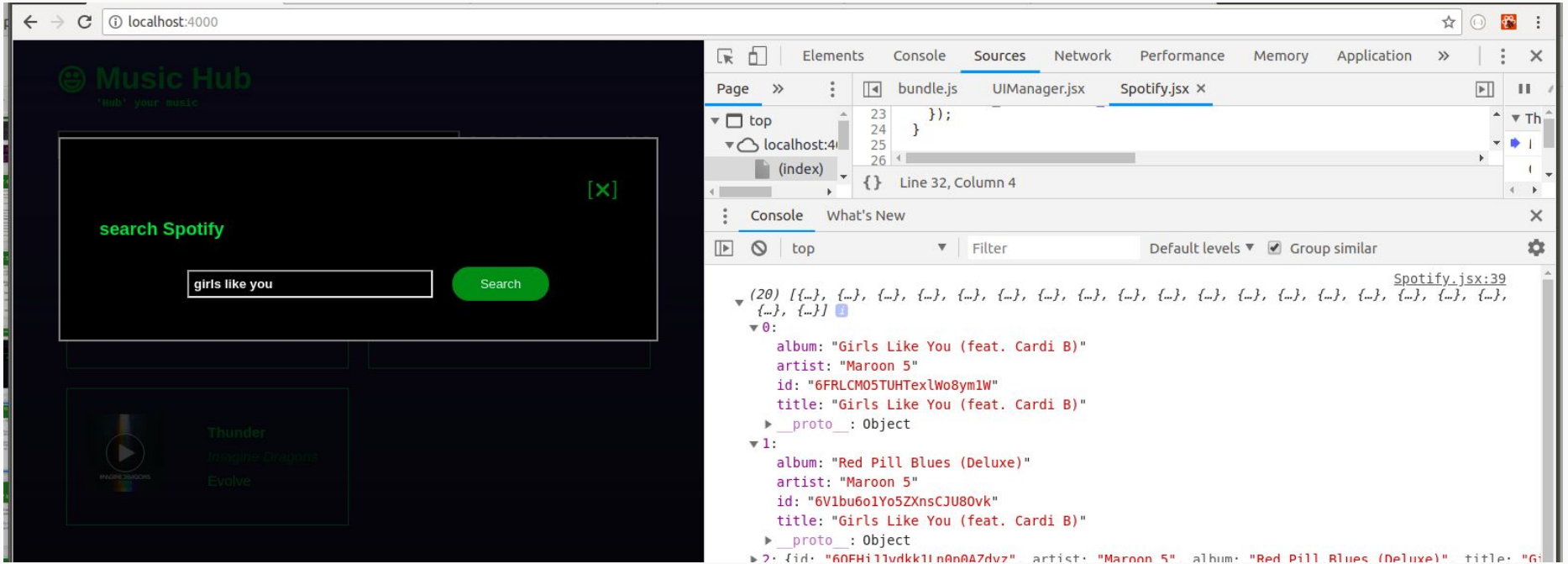
So far, this is the item format we have been using:

The object returned by Spotify is too big. We only need: **id, artist, title, album**.

res.data array can be mapped into a new array that contains only the track attributes we need.

```
class Spotify extends React.Component {
...
   searchSpotify() {
   ...
          .then((res) => {
             const searchResults = res.data;
             const squashedResults =
searchResults.map((track) => {
                return {
                   id: track.id,
                   artist: track.artists[0].name,
                   album: track.album.name,
                   title: track.name
                };
             });
             console.log(squashedResults);
```

That’s more like it! Now we have to put it in our UI



c6.4 We need a List and Item component...

But wait! We already have one! 😱

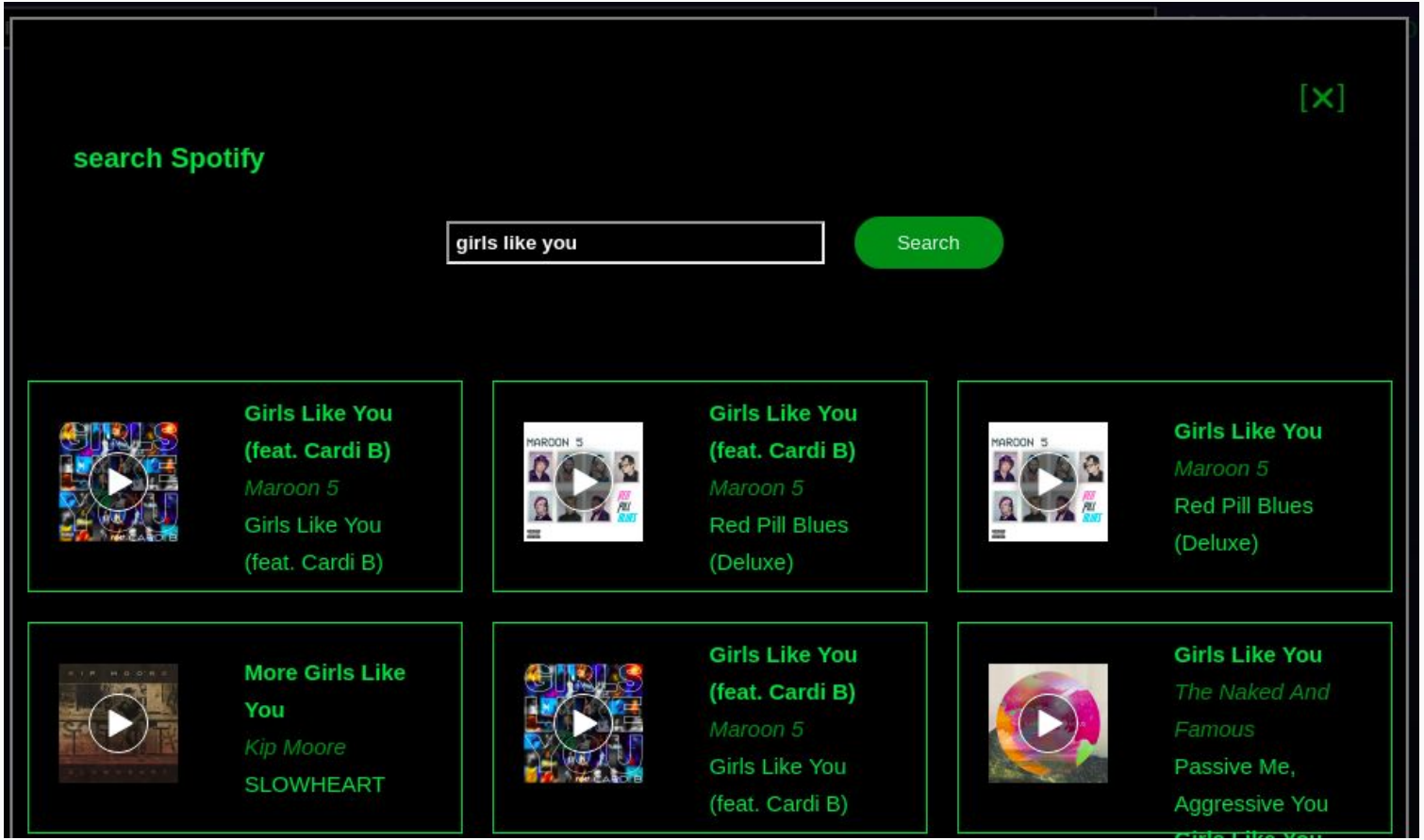
Hooray for reusable components! 🎉

Only thing we have to do here is import and use them in **Spotify.jsx**

**** Now we have two instances of List, one is Spotify's List and the old one is UIManager's List*

```
import List from './List';

class Spotify extends React.Component {
...
      this.state = {
         searchTerm: '',
         searchResults: [],
      }
   }
...
   searchSpotify() {
...
            // update state with search results
            this.setState({
               searchResults: squashedResults
            });
         })
...
   render() {
...
<List list={this.state.searchResults} />
```

Nice! Last thing is to add the controls in each Item to add them to our playlist



c6.5 [X] and [+] buttons on Item

To implement adding/removing items from Spotify List, we introduce the following props:

```
<UIManager>
    <Spotify>
        <List>
            <Item>

Props passing:

 <UIManager> toggleItemFromSpotify() ---> <Spotify> ---display_type--->  <List> ---display_type---> <Item>
                                                          toggleItem()                 toggleItem()
```

display_type - allows us to customize Item to have [+] instead of [X] and [Edit] (home list)
toggleItem… - when Item's [+] is clicked, item object will be passed upwards all the way to UIManager, who can add the item to our state

c6.6 implement toggleItemFromSpotify()

When an Item is clicked, UIManager can either add the item if it doesn't exist yet, or delete it if it exists already.

UIManager.jsx

- toggleItemFromSpotify()
  - use list.`some()` to determine if list contains item already
  - createItem(item) if exists, else deleteItem()
- createItem(item)
  - add item parameter, and change logic such that if null, it would get it from `state.formFields` instead
  - I.e. the item that will be added to **state** could be either from Spotify's toggleItem, OR (if null), it means the call is from ItemForm and get item from `form_fields` instead

c6.7 Denote Item X instead of + if already in playlist

```
<UIManager>
    <Spotify>
        <List>
            <Item>
```

Props passing:
<UIManager> --isInStateList()---> <Spotify> --isInStateList()---> <List> --isInStateList---> <Item>

UIManager.jsx

isInStateList() - checks if passed *item_id* is already in UIManager's *this.state.list*
Implementation using some(), similar to logic in toggleItemFromSpotify()

Item.jsx

display [X] instead of [+]
if ***isInStateList()*** returns true

```
...
<div className="add_remove">
    <span onClick={() => this.props.toggleItem(item)}>
        { this.props.isInStateList(item.id) ? '✖' : '✚' }
    </span>
</div>
...
```

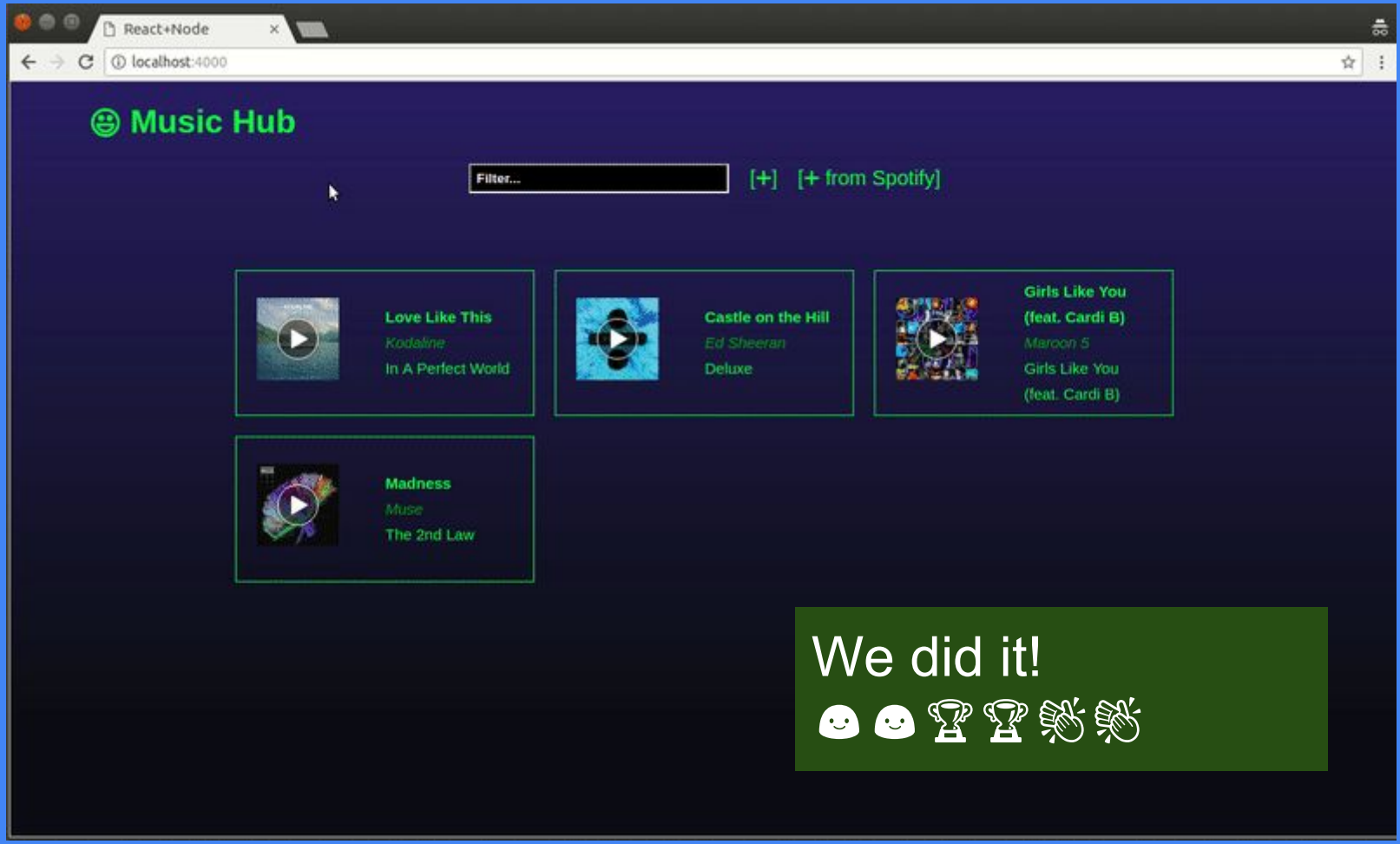
Some final testing:

Test [+]. Here’s a few sample songs

4uLU6hMCjMI75M1A2tKUQC
7GhIk7Il098yCjg4BQjzvb
0FutrWIUM5Mg3434asiwkp

Test [+ from Spotify].

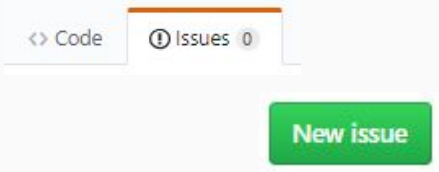
Try searching and adding; removing already added items in Spotify List


React+Node
localhost:4000
Music Hub
Filter...
[+]
[+ from Spotify]
Love Like This
Kodaline
In A Perfect World
Castle on the Hill
Ed Sheeran
Deluxe
Girls Like You (feat. Cardi B)
Maroon 5
Girls Like You (feat. Cardi B)
Madness
Muse
The 2nd Law
We did it!

I need some help...

After the workshop/before you leave
Please answer a short survey about the workshop
https://goo.gl/M6Bdc3

Please go to the code repo, and give it a star
(if it deserves one, of course!)
https://github.com/lenmorld/node_workshop



Any mistakes or improvements, please submit an issue
or even better, contribute to open-source! (ping me in Slack for details)

Appendix A: FAQs and tips

- Why use a frontend framework (React, Angular, Vue) ?
- Why React?
- Why learn any/all of these JS frameworks?
- Why ES6?
- Any recommended resources to improve React skills?

Final tip: Beef up your CV with different technologies and projects. A great chance one/many of them would help you get yan internship/job you'll like!

Done! 🦌🦌🦌 🎉🎉🎉

Q & A session!

Or i’ll just keep talking about web 🕸

Appendix B: Intro to Advanced React Concepts

Server stuff
Lifecyle Methods
Children props
Context
Render props
HoC (Higher Order Components)
Hooks
Surprise
Portals

Server stuff

...To learn more about backend/server/API, attend my **Node workshop !..**

Server setup used:

- *Node + Express* on the backend
- *webpack-dev-server* in the frontend.

SSR (Server-side Rendering)

This is our current SPA (Single Page Application) setup:

- There is only one page (index.html) served in / (localhost:4001/)
- All of the JS, React stuff is handled client-side, routes handled by **react-router**

Although SPA saves on network requests, you might want to consider SSR when

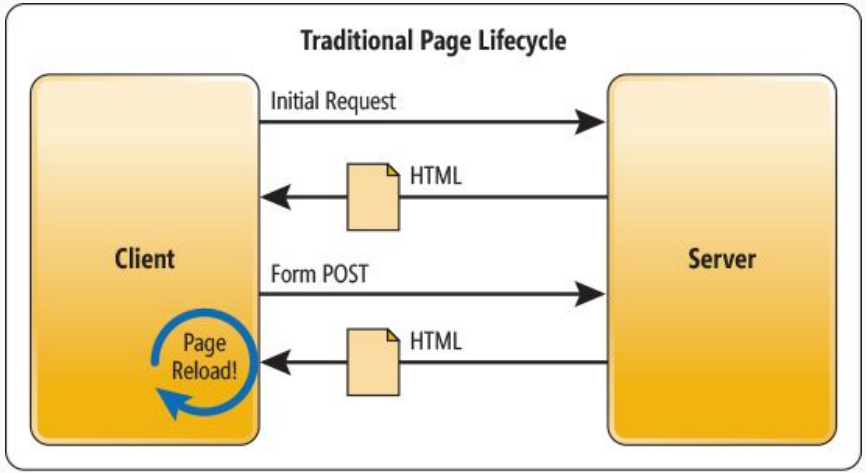
- You need SEO (e.g public-facing websites like blogs, markets, portfolio)

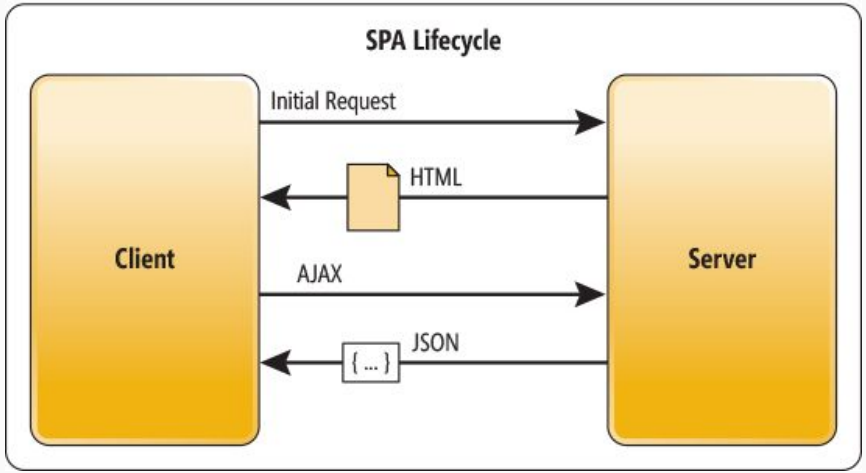
There are ways to combine SPA + SSR:

- in React: https://goo.gl/9uAD1M
- separate SSR pages from SPA page through routing
    - e.g: SSR on **website.com (/blog,/about,...),** SPA on **app.website.com**

There are frameworks that provide SSR, routing, and so much more out of the box:

- Next.js, Gatsby





SSR:

- initial and subsequent page loads same time and data
- less load on client, more load on server
- good for low-processor devices

SPA:

- initial page load takes a lot of time (and data), but subsequent is fast
- most of the routing is done in the frontend, so server only takes care of data requests
- good for high-processor devices

image from https://codeburst.io/using-google-analytics-with-angular-25c93bffaa18+

Lifecycle methods

Full reference here: https://reactjs.org/docs/react-component.html

- **constructor()**
  - initialize state here
- **render()**
  - return JSX here, using *this.state* and *this.props*
- **componentDidMount()**
  - fetch data here, then use *this.setState({ data })*
- shouldComponentUpdate() - let React know if component should re-render
- componentDidUpdate() - called after re-renders (but not on initial render)
- componentWillUnmount() -called after component is unmounted and destroyed; put garbage collection here, when necessary

Codesandbox: **A_Lifecycle_1** https://codesandbox.io/s/5z1rk9776p

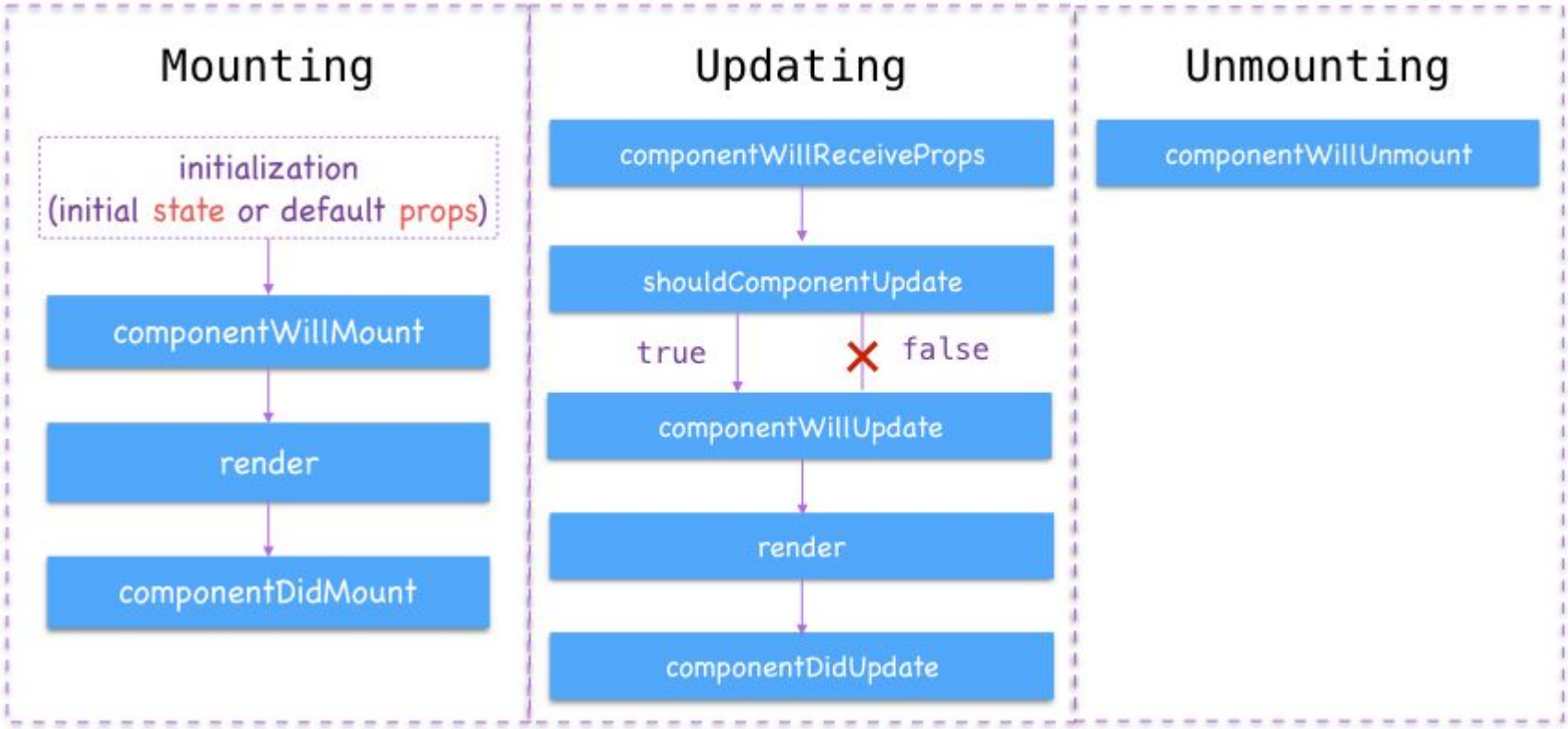


image from: https://rangle.github.io/react-training/react-lifecycles/

Prop-drilling and some alternatives

codesandbox: A_prop-drilling https://codesandbox.io/s/w2xyprw937

Prop-drilling - passing down data from ancestor to a child, when the middle ones don't need it

There are alternatives but they add some complexity to a React app. Thus, **complexity vs verbosity.** These are ordered in least complex to the most.

1. Children Props
2. Context
3. Redux

Children props

codesandbox: A_children_props https://codesandbox.io/s/rllz7rx2n

Instead of using the **<Component />** syntax, we can do

```
<Component>
   <Stuff />
</Component>
```

where <Stuff /> can be any valid JSX

then inside **Component** render(), we can access <Stuff /> via ***this.props.children***

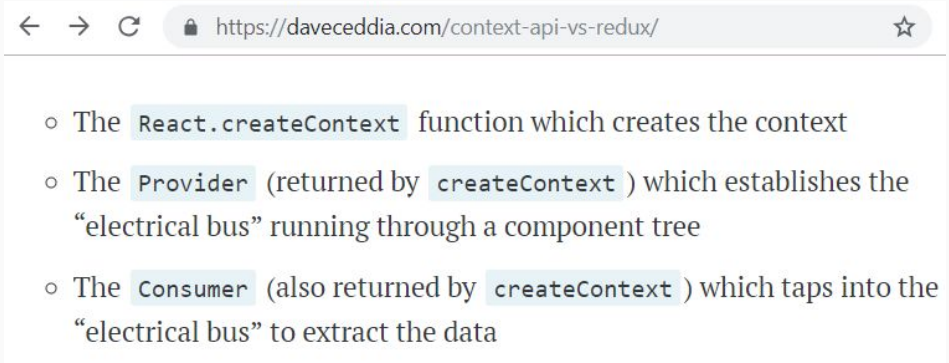
Perfect for “generic placeholders”, which could be dumb components that just renders whatever the parent passes
e.g. **Nav, Body, Container, Sidebar, Card** components

Context

codesandbox: A_context_1 https://codesandbox.io/s/q7o3096p5w

```
render() {
  return (
    <div>
      <UserContext.Provider value={this.state.username}>
        <Nav />
        <Body />
      </UserContext.Provider>
    </div>
  );
}
```

React Context API involves the use of a




```
// Card is a stateless component,
//      using render props syntax
const Card = () => (
    <UserContext.Consumer>
      {username => <div>{username}</div>}
    </UserContext.Consumer>
);
```

another example of using Context: **advanced_react_context**
https://codesandbox.io/s/21w12jj4y

Redux

- A complete **state management** solution with a **data store**
- Based on concepts of **immutability** and **functional programming**
- Makes state predictable; *time travel through state*
- Testing and debugging
- simplifies read/write on entire state to local storage/Server-side rendering
- Adds significant complexity and boilerplate to an application
- Not an “addon” library; entire app needs to be restructured
- Discourages OOP, since it’s built around FP

HoC and render props

codesandbox: A_hoc-and-render-props https://codesandbox.io/s/0y09y8m14p

These two patterns emerged from the need to effectively reuse code and share data between reusable components.

HoC (Higher Order Components) - a function that takes a component and returns a new component

Render props - a **function prop** that a (reusable) child component uses to know ***what*** to render. The parent component expresses the ***how***.

Portals

codesandbox: A_portals https://codesandbox.io/s/7ylx55z0zx

Allow a parent to render children outside its hierarchy,
i.e. into a DOM node that exists outside the DOM hierarchy of the parent component
Perfect for modals, tooltips, dialogs

Another example: rendering into a different browser window
https://hackernoon.com/using-a-react-16-portal-to-do-something-cool-2a2d627b0202

Suspense

For async fethc requests, we used to do:

```
if (this.state.memes.length === 0) {
    return <div>Loading…</div>
}
```

But for more complex data fetching and more elegant UX, it is better to use **React Suspense**. It allows you to defer rendering part of your application tree until some condition is met (e.g. data from an endpoint or a resource is loaded)

An advanced example: https://codesandbox.io/s/k2m12p8nqr

Hooks

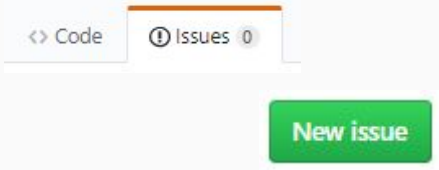
Hooks let you use state, lifecycle methods and other class features, with functional/stateless components, i.e. without writing a class

Really good intro here:
https://scotch.io/tutorials/getting-started-with-react-hooks

I need some help...

After the workshop/before you leave
Please answer a short survey about the workshop
https://goo.gl/M6Bdc3

Please go to the code repo, and give it a star
(if it deserves one, of course!)
https://github.com/lenmorld/react_workshop



Any mistakes or improvements, please submit an issue
or even better, contribute to open-source! (ping me in Slack for details)

Final words...

This is just the beginning of your React learning…

A few tips:

1. Get comfortable with the foundation first (state, props, event handlers) before moving to the advanced stuff, so you don’t get overwhelmed
2. Fork the repo, modify it, break it, add some stuff, make it your own
3. Message me in Slack anytime

Thank you!!!