Welcome!

Agenda

- Node
- NPM
- Parcel
- Modules
- React

Review

Before Node

JavaScript Engines

- JavaScript Engines are pieces of software that execute JavaScript code
- They are typically created by Web Browser Vendors:
  - V8 is for Google Chrome
  - SpiderMonkey is for Firefox
  - JavaScriptCore is for Safari
  - Chakra is for Internet Explorer (and a fork of it was for Edge)

Why are we talking about this?

- Node.js is the JavaScript Engine (V8)
  - Taken out of the browser, with a little bit extra
- It's the same programming language as the JavaScript you know, it just has extra back-end related functionality
  - e.g. Work with file system, work with databases etc.

Node

What is Node?

- A back-end programming language
- Open-source and cross-platform
- Created in 2009 by Ryan Dahl while he was working at Joyent
- Can be run interactively (as a REPL) or as files
- Very popular (Uber, Netflix, LinkedIn, Twitter, Paypal, eBay etc.)

When we install Node:

We install command line tools, too:

- Node
- NPM

How to run it

To open up a REPL (CTRL + C to quit):

```
node
```

To run a file:

```
node index.js
```

NPM

What is NPM?

- A command line tool
- The Node Package Manager
- The largest software library (Package Registry)
  - With over 1.3 million packages
- A tool for managing software projects
  - It helps install things, manage dependencies and structure our apps - as well as making it discoverable (if we want)

`npm init`

Used to set up a new Node/NPM project

```
npm init
```

This will create a **`package.json`** file. This file will describe our project, its scripts and its dependencies

npm install

How we install packages into our projects

```
# Install all required packages
npm install

# Install and save a package as a dependency
npm install --save package_name

# Install and save a package as a dependency for development
npm install --save-dev package_name
```

npm run

How we run scripts defined in our `package.json`

```
npm run script_name

# Run the start script in package.json
npm run start
```

Modules

What are modules?

Modules allow us to build big JavaScript projects by allowing us to easily work in multiple files, and to bring in any dependencies that are necessary:

- We can export code from one file
- And we can require (essentially import) any files or dependencies that we need in another file

Exporting Code

```
function sayHello(name) {
  console.log(`Hello ${name}`);
}

module.exports = sayHello;
```

Exporting Code

```
function add(x, y) {
  return x + y;
}

function subtract(x, y) {
  return x - y;
}

module.exports = {
  add: add,
  subtract: subtract
};
```

Importing Code

```
const maths = require("./maths");

const auth = require("../auth/local");

const React = require("react");
```

If you require a file path, it will store the exported code in the variable

If you require a package or module name, it will do the same (note that it is not a file path)

```javascript
function hello(name) {
  let msg = `Hello ${name}`;
  console.log(msg);
}

module.exports = hello;
```

```javascript
const hello = require("./hello");

hello();
```

```javascript
function add(a, b) {
  return a + b;
}

function subtract(a, b) {
  return a - b;
}

module.exports = {
  add: add,
  subtract: subtract
};
```

```javascript
const maths = require("./maths");

maths.add();

maths.subtract();
```

Parcel

What is Parcel?

It is a Build System, a Bundler, a server and a Compiler

- **Build System**: It automates tasks for us
- **Bundler**: It will combine multiple files into one
- **Compiler**: It takes our code, transforms it and then returns a new version

It does a lot of other things too - things like minifying and optimizing our code, minifying images etc.

It is a command line that also mostly doesn't require configuration

Why do we need a compiler?

Because we are using a lot of new features, and soon, we will be using things that aren't a part of JavaScript itself (we will see this with React).

Some of the things it may translate for us:

- SCSS -> CSS
- New, fancy JavaScript -> Compatible JavaScript
- Large images -> Optimized Images

Are there any alternatives?

- Webpack (one of the most popular)
- Grunt
- Gulp
- Snowpack
- FuseBox
- RollUp
- Browserify
- Plus many more

Installing

Installing Parcel

```
# Set up the NPM project
npm init

# Add parcel as a development dependency
npm install --save-dev parcel
```

Starting your Build System

Add a script in your `package.json`

```
1  {
2    "name": "parcel-install",
3    "version": "0.0.0",
4    "description": "",
5    "main": "index.js",
6    "scripts": {
7      "start": "parcel app/index.html"
8    },
9    "keywords": [],
10   "author": "",
11   "license": "ISC"
12 }
```

Now, execute `npm run dev` in your terminal

Building for Production

Add a script in your `package.json`

```
1  {
2    "name": "parcel-install",
3    "version": "0.0.0",
4    "description": "",
5    "main": "index.js",
6    "scripts": {
7      "start": "parcel app/index.html",
8      "build": "parcel build app/index.html"
9    },
10   "keywords": [],
11   "author": "",
12   "license": "ISC"
13 }
```

Now, execute **`npm run build`** in your terminal

JSX

What is JSX?

- A syntax extension of JavaScript
  - It's not part of the normal language!
- Something made popular by React
  - It provides us with shortcuts to create elements
- JSX looks like HTML, and we can mostly treat it is as such
  - But it is turned into JavaScript before it reaches the browser
- It's an easy way to describe UI

What does it look like?

```
const element = <h1>Hello, world!</h1>;
```

This data isn't a string or HTML

It is an extension of JavaScript, that is eventually turned into regular JS. It is turned into something like this:

```
const element = React.createElement("h1", {}, "Hello World");
```

Just a shortcut - something that tries to make everything a little clearer

JSX

```
<h1 id="hello">Hello World</h1>

// Compiles to...

React.createElement(
  "h1",
  { id: "hello" },
  "Hello World"
);
```

JSX

```
<img src="http://fillmurray.com/400/400" id="bill">

// Compiles to...

React.createElement(
  "img",
  { src: "http://fillmurray.com/400/400", id: "bill" },
  null
);
```

Single Page Applications

What are Single Page Applications?

- Apps that don't require reloading
- The page is loaded, then JavaScript takes control
- SPAs typically rely heavily on APIs and AJAX
  - As well as frameworks to organise the code, because they are very JS-heavy

Pros of SPAs

- They often have a very nice user experience
- They tend to promote the use of APIs
  - Meaning apps are decoupled and back-ends can be used in multiple environments (e.g. web and mobile apps)
- Interactions happen very quickly and updates seem instantaneous
- Loading screens and page transitions are much more possible
- There is much less load on the server

Cons of SPAs

- They require lots of JavaScript and only work if JavaScript is enabled
- Search Engine Optimisation is much more difficult
- The initial load, if not managed correctly, can take much longer
- They tend to be less secure
- They tend to mean developers have to take control of things they wouldn't otherwise have to (e.g. browser history etc.)
- They are resource-heavy for the browser which can slow performance and put load on devices

React

What is React?

What is React?

- An open-source JavaScript library/framework for building applications (particularly Single Page Applications)
  - It was created by Facebook
- It is declarative - we describe patterns and React does the heavy-lifting
- It is component-based - React makes it easy to break applications down into lots of pieces then compose them
- Learn once, write anywhere

What can it do?

What can it do?

Anything! Lots of companies use it - Facebook, Instagram, Uber, AirBnB, Netflix, Pinterest, Shopify, Twitter, Atlassian, Codecademy, Khan Academy as well as many, many more.

It's used in every context, for every type of app

It is certainly the most popular front-end framework - but it does take time to get used to!

React Alternatives

React Alternatives

- Vue
- Svelte
- Angular
- Ember
- Meteor
- Backbone
- Plus many more

Advantages of React

- Really easy to see the structure of your app
- Very good at managing state
- Performant
- Virtual DOM
- Data Binding
- Easy to test
- Isomorphic (can be rendered server-side)
- Agnostic (you can use it with all sorts of other libraries as React is just the view layer)
- Learn once, write everywhere

Disadvantages of React

- A big library
- Lots of magic
- It is just the view layer
- Typically requires a transformation step
- A steep learning curve
- It changes incredibly regularly

Installing

Installing React

```
npm init

npm install --save react react-dom
```

Breaking Pages Down

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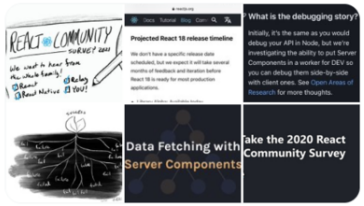

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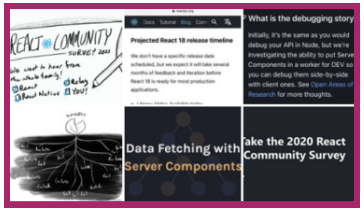

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Pages broken down into components

When thinking about apps through a React lens, we want to break them down into lots of individual components.

Ideally, those components should follow FIRST principles, meaning they should be:

- Focused
- Independent
- Reusable
- Small
- Testable

So, what are components?

- They can be written in two different ways:
  - They can be a function that returns JSX (essentially markup to render)
  - Or they can be a class with a render method that returns JSX
- We will be focussing on the function approach

Our First Component

Our First Component

```
function Hello() {
  return <h1>Hello</h1>;
}
```

Rendering

Rendering

```
import React from "react";
import ReactDOM from "react-dom";

function Hello() {
  return <h1>Hello</h1>;
}

ReactDOM.render(<Hello />, document.body);
```

Interpolation

Interpolation with JSX

```
1 function Hello() {
2   let name = "Jacques Cousteau";
3   return (
4     <div>
5       <h1>Hello {name}</h1>
6       <h2>Hello (in capitals) {name.toUpperCase()}</h2>
7     </div>
8   );
9 }
```

Curly brackets mean interpolation in JSX (very similar to `${}` in template literals)

Props

What are Props?

- Props are very similar to parameters in functions
  - They are a way for us to provide data to a component
- They are immutable (meaning they can't change)
- From a parent component, we can pass data down using props
- They look very similar to HTML attributes

Props

```
1  const React = require("react");
2  const ReactDOM = require("react-dom");
3
4  function Hello(props) {
5    let name = props.name;
6    return (
7      <div>
8        <h1>Hello {name}</h1>
9      </div>
10   );
11 }
12
13 ReactDOM.render(
14   <Hello name="Jacques Cousteau" />,
15   document.body
16 );
```

Events

Event Handlers

```
function MyComponent() {
  function onButtonClick() {
    console.log("The button was clicked");
  }

  return (
    <div>
      <h1>Hello World</h1>
      <button onClick={onButtonClick}>Click Me</button>
    </div>
  )
}
```

State

What is State?

- State is the way we work with data that can change within individual components
  - It is mutable (meaning it can change) data that is local to a component - it can't be accessed by parent components by detail
- It's the way we make our components interactive

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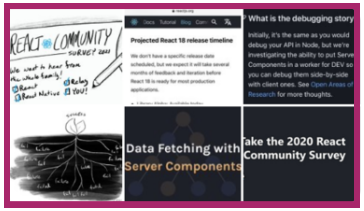

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Hooks

What are hooks?

- They are the way that we will manage state in our application (that mutable data that is local to each component)
- Hooks are functions that React defines for us*
- They are run inside a function component
- They maintain their value even when the component re-renders (meaning updates)
- A lot of errors can arise from creating or running hooks within conditionals or loops (so don't do this)

What hooks does React provide?

- useState
- useEffect
- useContext
- useReducer
- useCallback
- useMemo
- useRef
- useImperativeHandle
- useLayoutEffect
- useDebugValue

But we will likely only be using:

- useState
- useEffect

Destructuring Assignment

What is Destructuring Assignment

- It is a new feature of JavaScript that provides us with a shorthand for accessing data within objects and arrays
  - For the moment, it needs to be translated into something that is compatible in browsers (we have Parcel doing that for us)

Object Destructuring

```
let person = {
  firstName: "Jacques",
  lastName: "Cousteau"
};

let firstName = person.firstName;
let lastName = person.lastName;

// That's a bit repetitive, isn't it?
// We could replace it with Destructuring Assignment

let { firstName, lastName } = person;
```

Array Destructuring

```
let alphabet = ["A", "B"];

let letterA = alphabet[0];
let letterB = alphabet[1];

// That's a bit repetitive, isn't it?
// We could replace it with Destructuring Assignment

let [letterA, letterB] = alphabet;
```

useState

`useState`

- A function that React provides for us
- We need to import it before we can use it
- It receives an initial value
- It returns an array with two pieces of data
  1. The current value
  2. A function to update the current value

useState

```
1  import React, { useState } from "react";
2
3  function ClickCounter() {
4    // Set the starting value to be 0
5    const [count, setCount] = useState(0);
6
7    function onButtonClick() {
8      setCount(count + 1);
9    }
10
11   return (
12     <div>
13       <h1>You have clicked {count} times</h1>
14       <button onClick={onButtonClick}>Click Me</button>
15     </div>
16   );
17 }
```

useState

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9    }
10
11   return (
12     <div>
13       <h1>You have clicked {count} times</h1>
14       <button onClick={onButtonClick}>Click Me</button>
15     </div>
16   );
17 }
```

Handling User Input

useState

```
1  function LogInForm() {
2    const [email, setEmail] = useState("");
3    function updateEmail(event) {
4      setEmail(event.target.value);
5    }
6    return (
7      <form>
8        <p>Your email is {email}</p>
9        <input
10         type="text"
11         value={email}
12         placeholder="Email"
13         onChange={updateEmail}
14       />
15     </form>
16   );
17 }
```

useState

```
1  function LogInForm() {
2    const [email, setEmail] = useState("");
3    function updateEmail(event) {
4      setEmail(event.target.value);
5    }
6    return (
7      <form>
8        <p>Your email is {email}</p>
9        <input
10         type="text"
11         value={email}
12         placeholder="Email"
13         onChange={updateEmail}
14       />
15     </form>
16   );
17 }
```

useState

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1  function LogInForm() {
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5    }
6    return (
7      <form>
8        <p>Your email is {email}</p>
9        <input
10         type="text"
11         value={email}
12         placeholder="Email"
13         onChange={updateEmail}
14       />
15     </form>
16   );
17 }
```

useState

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1  function LogInForm() {
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3    function updateEmail(event) {
4      setEmail(event.target.value);
5    }
6    return (
7      <form>
8        <p>Your email is {email}</p>
9        <input
10         type="text"
11         value={email}
12         placeholder="Email"
13         onChange={updateEmail}
14       />
15     </form>
16   );
17 }
```

Working with APIs

```
function MovieSearch() {
  const [title, setTitle] = useState("");
  const [data, setData] = useState(null);
  console.log(data);
  function updateTitle(event) {
    setTitle(event.target.value);
  }
  function searchForMovie(e) {
    e.preventDefault();
    fetch(`http://www.omdbapi.com/?apikey=88e15bed&t=${title}`)
      .then(function (r) {
        return r.json();
      })
      .then(function (data) {
        setData(data);
      });
  }
  return (
    <form onSubmit={searchForMovie}>
      <input type="text" value={title} onChange={updateTitle} />
      <button>Search</button>
    </form>
  );
}
```

```
function MovieSearch() {
  const [title, setTitle] = useState("");
  const [data, setData] = useState(null);
  console.log(data);
  function updateTitle(event) {
    setTitle(event.target.value);
  }
  function searchForMovie(e) {
    e.preventDefault();
    fetch(`http://www.omdbapi.com/?apikey=88e15bed&t=${title}`)
      .then(function (r) {
        return r.json();
      })
      .then(function (data) {
        setData(data);
      });
  }
  return (
    <form onSubmit={searchForMovie}>
      <input type="text" value={title} onChange={updateTitle} />
      <button>Search</button>
    </form>
  );
}
```

```
function MovieSearch() {
  const [title, setTitle] = useState("");
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      .then(function (r) {
        return r.json();
      })
      .then(function (data) {
        setData(data);
      });
  }
  return (
    <form onSubmit={searchForMovie}>
      <input type="text" value={title} onChange={updateTitle} />
      <button>Search</button>
    </form>
  );
}
```

useEffect

`useEffect`

- This hook allows us to perform "side effects" in our components (meaning things outside of the component itself)
  - Side effects include data fetching, manually changing the DOM and setting up subscriptions
- It is a function that React provides for us, and that we need to import into our projects
  - It receives a callback function and a dependencies array

`useEffect`

The useEffect callback function is executed based upon on the dependencies array (the second parameter)

- If there is no dependencies array, it will run after the component renders every time
- If there is an empty array as the dependencies array, it will run only once when the component is first rendered
- If the dependencies array contains things, the useEffect callback will run whenever items in that array change

React Router

Class Components

Homework

- Learn about Destructuring Assignment
- Learn about Arrow Functions
- Read about JSX
- Go through this Video Series
- Go through the React Tutorial
  - It will do things slightly differently to how we do it, but it will still cover the concepts
- Read Tinselcity whys:packers

What's next?

- React
- More React
- More React
- THREE.js

Thank you!