ReactJS

Springboard

Download Demo Code

Goals

- What is React? History & Goals
- Components
- JSX & Babel
- Properties & Default Properties
- Styling React
- Conditionals in React

Front End Frameworks

- Larger JS libraries
- Provide "blueprint" for apps
- "Opinionated"
  - "This is how you should design a JS app"
- Often: provide for code re-use
- Often: provide templating of HTML (like Jinja)

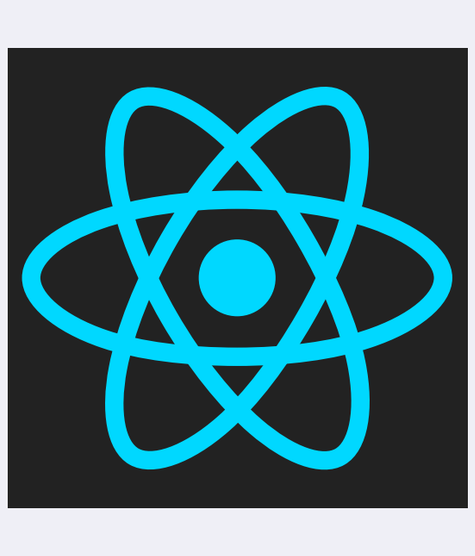
Popular Front End Frameworks

- Angular
- Ember
- Vue
- React

There are many others, but these are among the most popular.

There are differences between them but they largely share lots of common ideas and after learning one framework, you'll be in a better position to learn about others.

React

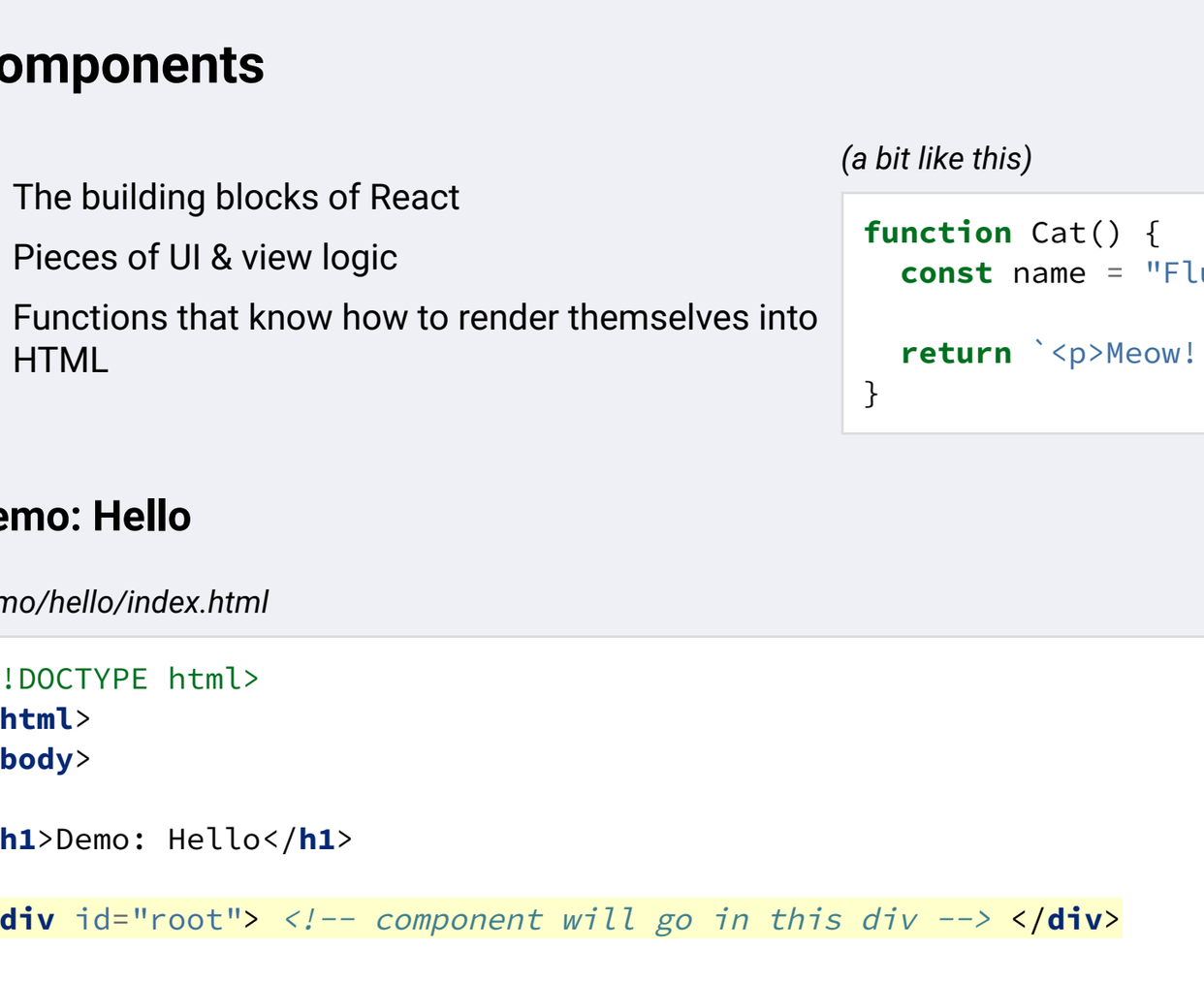


Popular, powerful front-end framework.

Developed by and sponsored by Facebook.

- Make it easy to make reusable "view components"
  - These "encapsulate" logic and HTML into a class
- Often make it easier to build modular applications

Goal



Components

- The building blocks of React
- Pieces of UI & view logic
- Functions that know how to render themselves into HTML

(a bit like this)

```
function Cat() {
  const name = "Fluffy";

  return `<p>Meow! I'm ${name}!</p>`
}
```

Demo: Hello

demo/hello/index.html

```
<!DOCTYPE html>
<html>
<body>

<h1>Demo: Hello</h1>

<div id="root"> <!-- component will go in this div --> </div>

<script src=
  "https://unpkg.com/react/umd/react.development.js"></script>
<script src=
  "https://unpkg.com/react-dom/umd/react-dom.development.js">
</script>

<script src="https://unpkg.com/babel-standalone"></script>

<script src="index.js" type="text/jsx"></script>

</body>
</html>
```

A component is a React class with a ***render*** method:

demo/hello/index.js

```
function Hello() {
  return <p>Hi Rithm!</p>
}
```

We add our component to HTML with ***ReactDOM.render***:

demo/hello/index.js

```
ReactDOM.render(<Hello/>,
  document.getElementById("root"));
```

JSX

demo/hello/index.js

```
function Hello() {
  return <p>Hi Rithm!</p>
}

ReactDOM.render(<Hello/>,
  document.getElementById("root"));
```

What's this HTML in our JavaScript?

JSX is like HTML embedded in JavaScript:

```
if (score > 100) {
  return <b>You win!</b>
}
```

You can also "re-embed" JavaScript in JSX:

```
if (score > 100) {
  return <b>You win, { playerName }</b>
}
```

(looks for JavaScript variable ***playerName***)

Using JSX

- JSX isn't legal JavaScript
  - It has to be "transpiled" to JavaScript
- You can do this with Babel

Transpiling JSX in Browser

- Easy for getting started — nothing to install!
- Load ***Babel*** standalone library:

```
<script
  src="https://unpkg.com/babel-standalone"></script>
```

- Mark JSX files with `type="text/jsx"` :

```
<script src="index.js" type="text/jsx"></script>
```

- Read handouts to learn how to do on command line

Note: Use Babel on Command Line

While it's convenient to transpile JSX into JavaScript directly in the browser like this, it's not suitable for real-world deployment: it takes a second to do the conversion, leading to a poor experience for users.

Better for deployment is to convert JSX to JavaScript once, via the command line, and then save and use the converted JS directly.

To do this:

1. You need to install npm
2. Then use ***npm*** to install Babel and settings for React:

```
$ npm install @babel/core @babel/cli @babel/preset-react
```

3. To convert a file:

```
$ node_modules/@babel/cli/bin/babel.js --presets @babel/react
    file.jsx > file.js
```

Serving Demo

For security reasons, Babel won't work with ***file://*** scripts

Run files under a simple static server:

```
$ python3 -m http.server
```

Then can visit at *http://localhost:8000/yourfile.html*

JSX Rules

JSX is more strict than HTML — elements must either:

- Have an explicit closing tag: `<b> ... </b>`
- Be explicitly self-closed: `<input name="msg" />`
  - Cannot leave off that `/` or will get syntax error

What JSX looks like when transpiled

Let's take a look!

Layout

Our demo had ***Hello*** component in same ***index.js*** as placement code:

demo/hello/index.js

```
function Hello() {
  return <p>Hi Rithm!</p>
}

ReactDOM.render(<Hello/>,
  document.getElementById("root"));
```

You'll often have >1 component, it's good to keep in separate files.

index.js

```
ReactDOM.render(<Hello/>,
  document.getElementById("root"));
```

Convention: 1 component per file, with component name as filename:

App

It's conventional for the top-level component to be named ***App***.

This renders the other components:

App.js

```
function App() {
  return (
    <div>
      <h1>Greetings!</h1>
      <Hello to="you" from="me" />
      <Hello to="Paul" from="Ringo" />
    </div>
  );
}
```

- This way, readers of code know where to start
- This is usually the only thing rendered in ***index.js***

Order of Script Tags

demo/hello-2/index.html

```
<script src=
  "http://unpkg.com/react/umd/react.development.js"></script>
<script src=
  "http://unpkg.com/react-dom/umd/react-dom.development.js">
</script>

<script src="http://unpkg.com/babel-standalone"></script>

<script src="Hello.js" type="text/jsx"></script>
<script src="index.js" type="text/jsx"></script>
```

Make sure any components you need in a file are loaded by a previous ***script*** tag. (We'll learn about a better way to manage imports soon.)

Properties

aka. Props

A useful component is a reusable one.

This often means making it configurable or customizable.

It would be better if we could *configure* our greeting.

Our greeting will be *Hi* ______ *from* ______.

Let's make two "properties":

to
  Who we are greeting

from
  Who our greeting is from

Demo: Hello-2

demo/hello-2/index.js

```
ReactDOM.render(
  <Hello to="me" from="you" />,
  document.getElementById("root")
);
```

Set properties on element; get using ***props.propName***, where ***props*** is the first argument to our component function.

demo/hello-2/Hello.js

```
function Hello(props) {
  return (
    <div>
      <p>Secret Message: </p>
      <p>
        Hi {props.to} from {props.from}
      </p>
    </div>
  );
}
```

Reusing Component

You can use a component many times:

index.js

```
ReactDOM.render(
  <div>
    <Hello to="Kay" from="Kim" />
    <Hello to="me" from="you" />
  </div>,
  document.getElementById("root")
);
```

Note ***div*** wrapper — JSX often renders a *single top-level element.*

Note: Rendering Multiple Top-Level Elements

Prior to React 16, every component had to render a single top-level element. In newer versions of React, it's possible to render siblings at the top level, but the syntax isn't quite as clean. You're welcome to look into this if you're curious, but all of our Component files will render a single element at the top of their hierarchy.

Properties Requirements

- Properties are for *configuring* your component
- Properties are immutable
- Properties can be strings:

```
<User name="Jane" title="CEO" />
```

- For other types, embed JS expression using the curly braces:

```
<User name="Jane" salary={ 100000 }
    hobbies={ ["bridge", "reading", "tea"] } />
```

In Summary

- Get to properties inside function with ***props.propertyName***
- Properties are immutable — cannot change!

Conditionals in JSX

A function component can return either:

- a **single valid** DOM object (`return <div>...</div>`)
- an array of DOM objects (but don't do this yet!)
- ***null*** (***undefined*** is not ok!)

You can put whatever logic you want in your function for this:

```
function Lottery(props) {
  if (props.winner)
    return <b>You win!</b>;
  else
    return <b>You lose!</b>;
}
```

Ternary

It's very common to use ternary operators:

```
function Lottery(props) {
  return (
    <b>You {props.winner ? "win" : "lose"}!</b>
  )
}
```

Demo: Slots!

demo/slots/Machine.js

```
function Machine(props) {
  const { s1, s2, s3 } = props;
  const winner = s1 === s2 && s2 === s3;

  return (
    <div className="Machine">
      <b>{s1}</b> <b>{s2}</b> <b>{s3}</b>
      <p>You {winner ? "win!" : "lose!"}</p>
    </div>
  );
}
```

demo/slots/index.js

```
ReactDOM.render(
  <Machine s1="🍇" s2="🍇" s3="🍇" />,
  document.getElementById("root")
);
```

Looping in JSX

It's common to use ***array.map(fn)*** to output loops in JSX:

```
function Messages() {
  const msgs = [
    {id: 1, text: "Greetings!"},
    {id: 2, text: "Goodbye!"},
  ];

  return (
    <ul>
      { msgs.map(m => <li>{m.text}</li>) }
    </ul>
  );
}
```

Demo: Friends!

demo/friends/Friend.js

```
function Friend(props) {
  const { name, hobbies } = props;
  return (
    <div>
      <h1>{name}</h1>
      <ul>
        {hobbies.map(h => <li>{h}</li>)}
      </ul>
    </div>
  );
}
```

demo/friends/index.js

```
ReactDOM.render(
  <div>
    <Friend name="Jessica" hobbies={["Tea", "Frisbee"]} />
    <Friend name="Jake" hobbies={["Chess", "Cats"]} />
  </div>,
  document.getElementById("root")
);
```

Note: Warnings about key props

If you look in the console, you'll see that React is mad at you for not adding something called a "key" prop when you map over an array and render components. You don't need to worry about this for now; later on, we'll talk more about what's happening here.

Default Props

Components can specify default values for missing props

Demo: Hello-3

demo/hello-3/Hello.js

```
function Hello(props) {
  return <p>Hi {props.to} from {props.from}</p>;
}

Hello.defaultProps = {
  from: "Joel"
};
```

Set properties on element; get using ***props.propName***.

demo/hello-3/index.js

```
ReactDOM.render(
  <div>
    <Hello to="Students" from="Elie" />
    <Hello to="World" />
  </div>,
  document.getElementById("root")
);
```

Styling React

You can add CSS classes in JSX.

However: since ***class*** is a reserved keyword in JS, spell it ***className*** in JSX:

```
function Message() {
  return <div className="urgent">Emergency!</div>
}
```

You can inline CSS styles, but now ***style*** takes a JS object:

```
function Box(props) {
  const colors = {
    color: props.favoriteColor,
    backgroundColor: props.otherColor,
  };

  return <b style={colors}>{props.message}</b>;
}
```

Debugging React

Install React Developer Tools