

Introduction to React

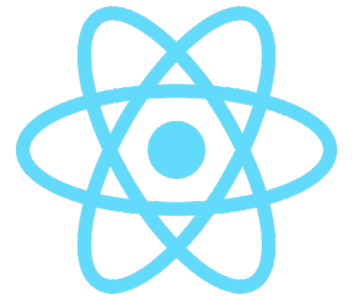
A workshop for COMP 523

Aaron Smith

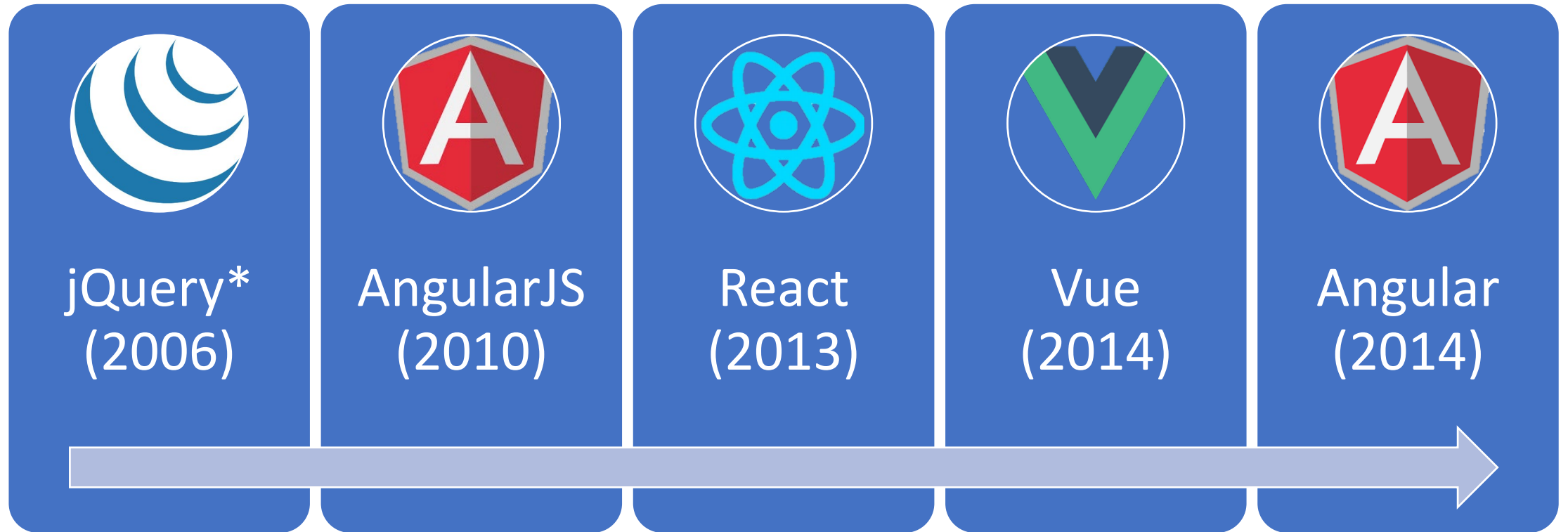
Monday, Feb. 10, 2020

What is React?

- React is a **JavaScript framework**
- Used for **front end web development**
- Think of jQuery, but more structured
- Created and used by **Facebook**
- Famous for implementing a **virtual dom**



Timeline of front-end JavaScript frameworks



* jQuery is more often considered a **library** than a **framework**

Common tasks in front-end development

App state

Data definition, organization, and storage

User actions

Event handlers respond to user actions

Templates

Design and render HTML templates

Routing

Resolve URLs

Data fetching

Interact with server(s) through APIs and AJAX

Fundamentals of React

1. JavaScript and HTML in the same file (JSX)
2. Embrace functional programming
3. Components everywhere

JavaScript and HTML *in the same file*



Traditional
approach



React
approach

JSX: the React programming language

```
const first = "Aaron";  
const last  = "Smith";  
  
const name = <span>{first} {last}</span>;
```

```
const list = (  
  <ul>  
    <li>Dr. David Stotts</li>  
    <li>{name}</li>  
  </ul>  
>);
```

```
const listWithTitle = (  
  <>  
    <h1>COMP 523</h1>  
    <ul>  
      <li>Dr. David Stotts</li>  
      <li>{name}</li>  
    </ul>  
  </>  
>);
```

“React is just JavaScript”

Functional programming

1. Functions are “first class citizens”
2. Variables are immutable
3. Functions have no side effects

Functional programming

Functions are “**first class citizens**”

This means functions can be...

1. Saved as **variables**
2. Passed as **arguments**
3. **Returned** from functions

```
let add = function() {  
  console.log('Now adding numbers');  
  const five = 3 + 2;  
};
```

```
function performTask(task) {  
  task();  
  console.log('Task performed!');  
}  
  
performTask(add);
```

```
function foo() {  
  return function() {  
    console.log('What gets printed?');  
  };  
}  
  
foo  
foo();  
foo()();
```

Functional programming

Variables are **immutable**

Tip: Use **const** instead of **let** to declare variables!

```
let a = 4;  
a = 2; // Mutates `a`
```

```
let b = [1, 2, 3];  
b.push(4); // Mutates `b`  
let c = [...b, 4]; // Does not mutate `b`
```

Functional programming

Functions have **no side effects**

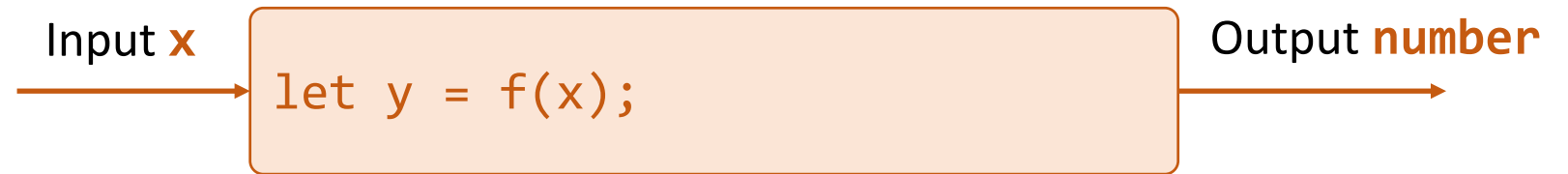
```
const b = [];  
  
function hasSideEffects() {  
  b = [0];  
}
```

Components

Functions help break your code into small, reusable pieces

Components are **functions** for **user interfaces**

Math function:



Component function:



Anatomy of a React **component**

The component is just a function

Inputs are passed through a single argument called "props"

```
export default function MyComponent(props) {  
  return <div>Hello, world! My name is {props.name}</div>;  
}
```

The function outputs HTML

```
const html = <MyComponent name="aaron" />;
```

The function is **executed** as if it was an HTML tag

Parameters are passed in as HTML attributes

Component **rendering**

- When a component function **executes**, we say it “**renders**”
- Assume components may re-render at any time

Our job is to ensure that
every time the component re-renders,
the correct output is produced

“In React, everything is a component”

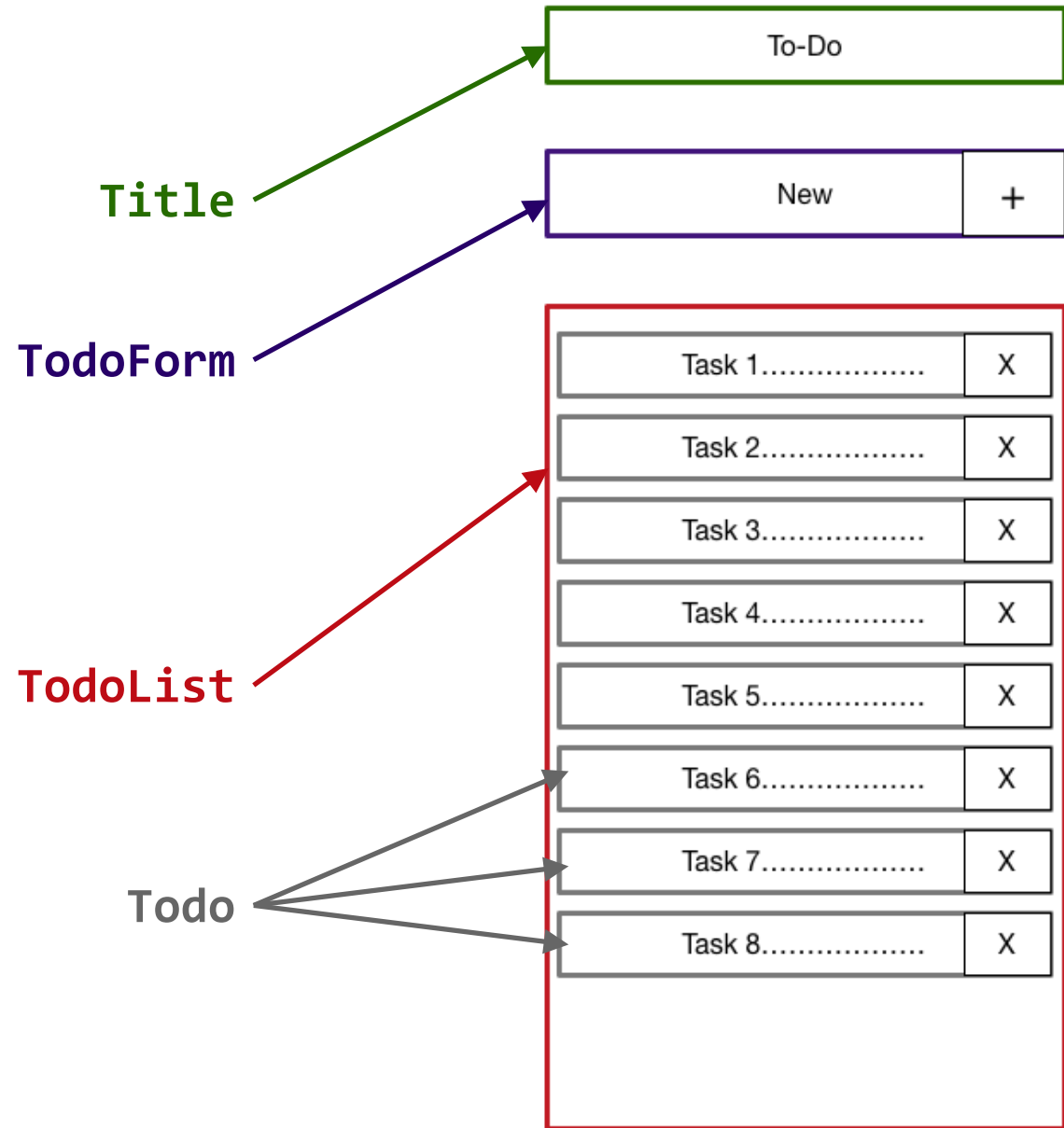
Todo application

Big idea:

- A digital to-do list

First step:

- mockup / wireframe



Creating a new React app

Creating a new React app is simple!

1. Install Node.js
2. Run: **npx create-react-app app-name**
3. New app created in folder: **./app-name**

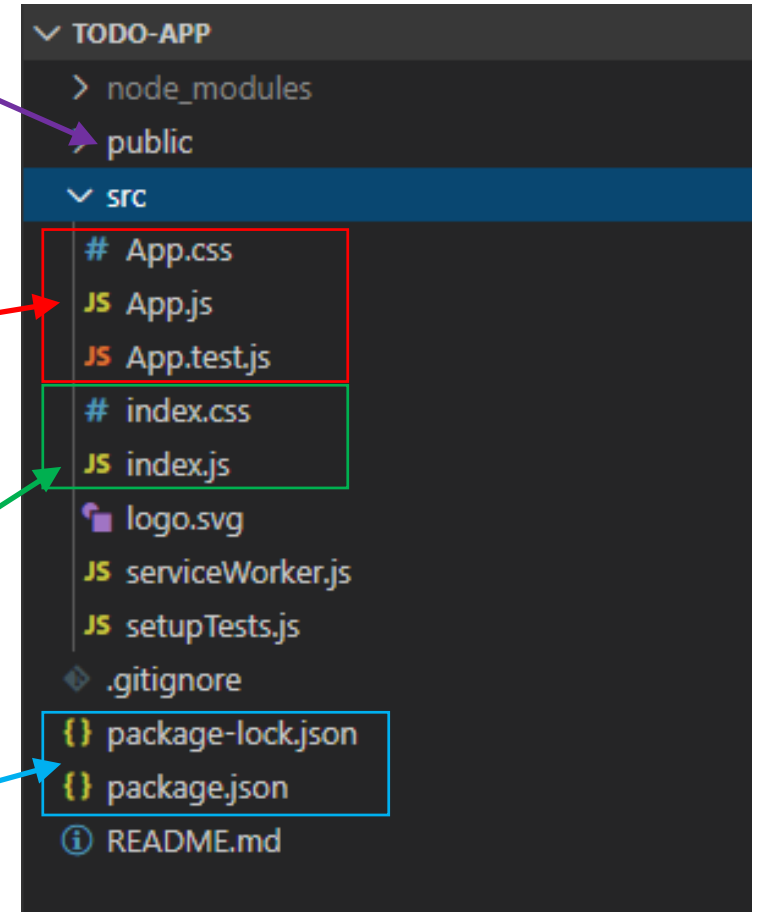
Anatomy of a new React app

public holds the initial html document and other static assets

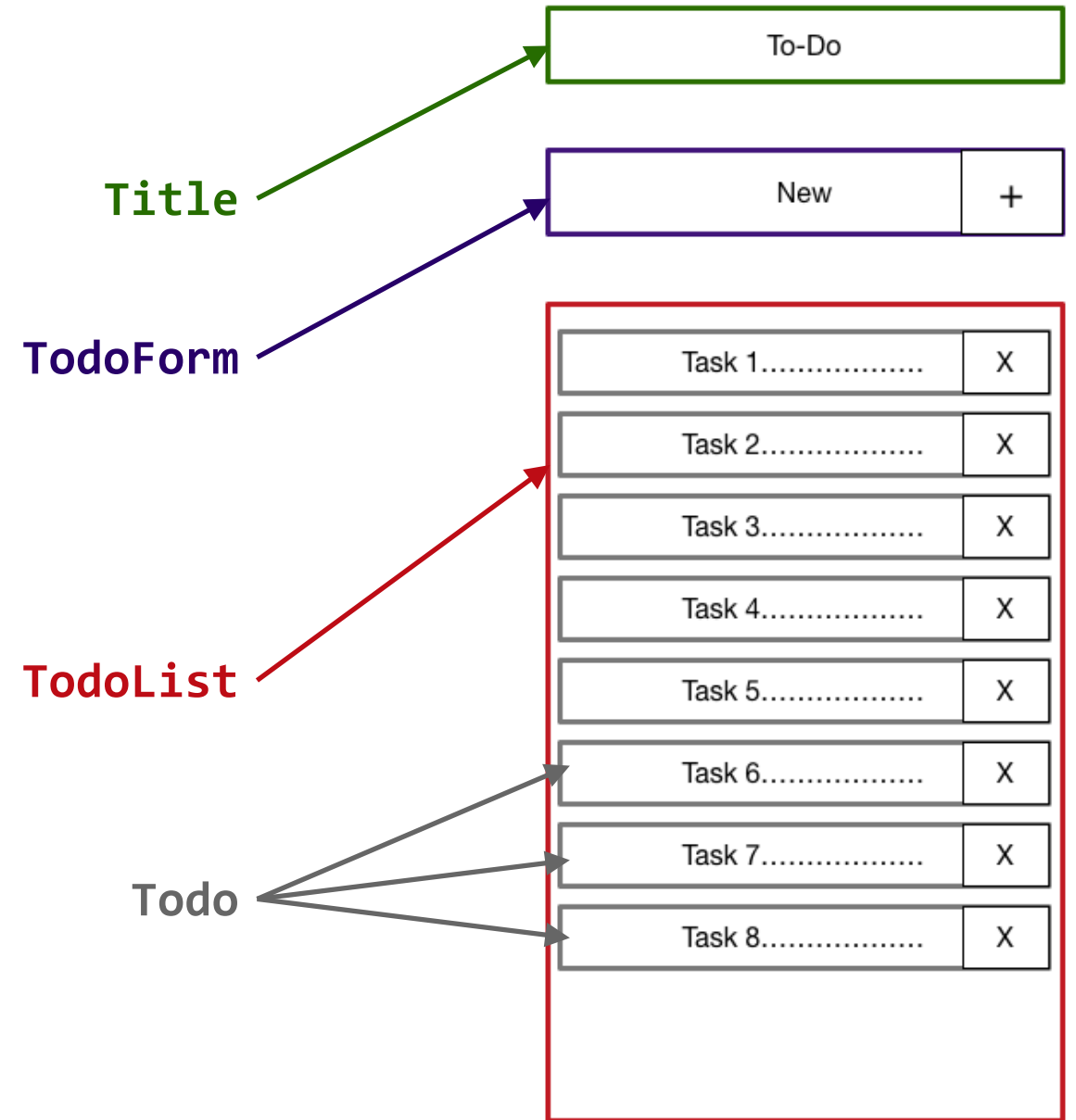
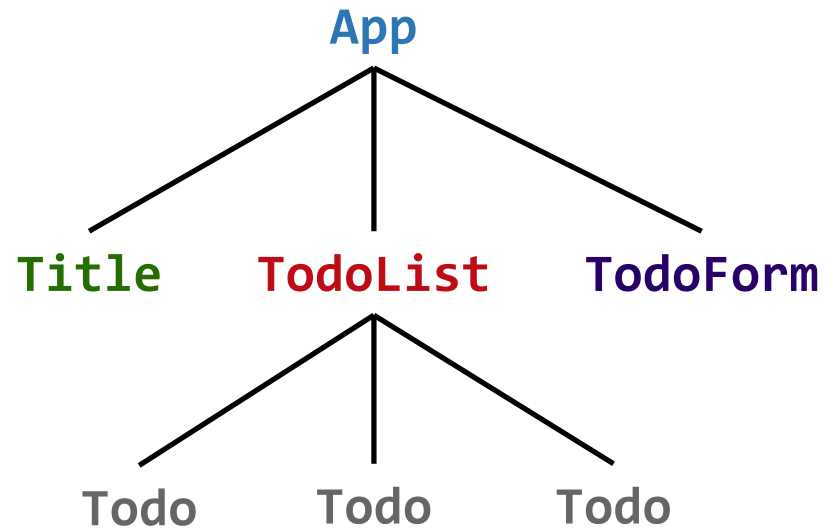
App is a boilerplate starter component

index.js binds React to the DOM

package.json configures npm dependencies



Component Hierarchy



Special list **key** property

- **Situation:** Display a **dynamic array of elements**
- Must specify a special “**key**” property for each element
- The key of an item **uniquely identifies it**
- Used by React internally for **render optimization**
- Can be any unique value (string or number)

What are **hooks**?

Hooks: Special functions that allow developers to hook into **state** and **lifecycle** of React components.

State: One or more data values associated with a React component instance.

Lifecycle: The events associated with a React component instance (create, render, destroy, etc).

Built-in hooks:

We will cover
these today

{
useState
useEffect

We will **not** cover
these today

{
useReducer
useMemo
useRef
useCallback

First React hook: `useState`

Purpose:


1. Remember values internally when the component re-renders
2. Tell React to re-render the component when the value changes

Syntax:


```
const [val, setVal] = useState(100);
```



The current value



A setter function to
change the value



The initial
value to use

Predicting component re-rendering

A component will only re-render when...

1. A value inside **props** changes

– or –

2. A **useState** setter is called

This means all data values displayed in the HTML should depend on either **props** or **useState**


Second React hook: **useEffect**

Purpose:

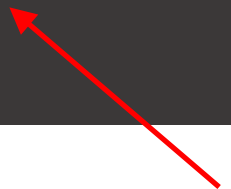
Act as an **observer**, running code in response to value changes

Syntax:

```
useEffect(() => {  
  console.log(`myValue was changed! New value: ${myValue}`);  
}, [myValue]);
```



A list of values such that changes
should trigger this code to run



The code to run when
values change

Building a React project

- When you're ready to launch your app, run this command:

npm run build

- This bundles your app into CSS/JS/HTML files and puts them in the **/build** folder
- These files can be served from an AWS S3 bucket

3rd party components and libraries

- React-Router
- Redux
- Material-UI
- Bootstrap
- Font-Awesome
- SWR