

POWERING UP with **REACT**

Level 1

First Component

POWERING UP
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REACT

Level 1 – Section 1

First Component

Writing Your First React Component

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What Is React?

I heard it was good

(Model-View-Controller)

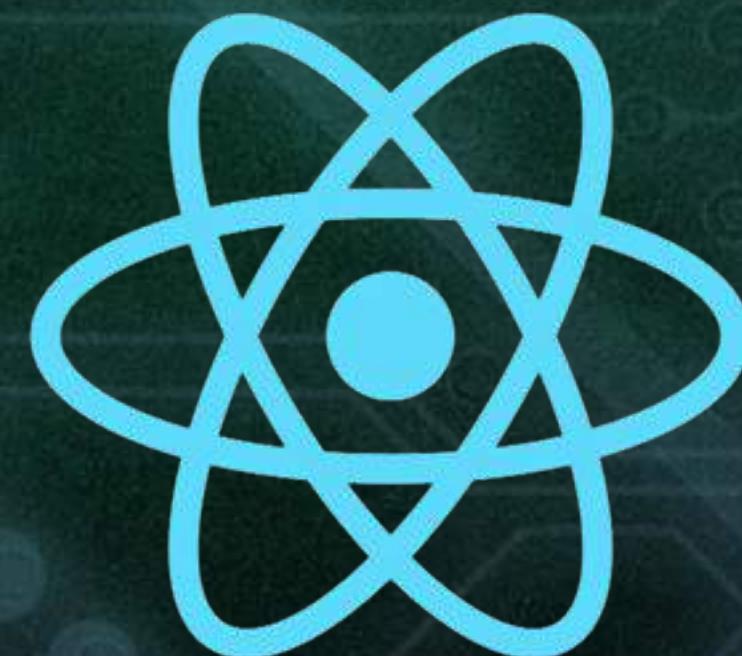
React is a JavaScript library for building user interfaces (UIs). Some people use it as the V in MVC.

Why React?

React was built to solve one problem: building large applications with data that changes over time.

Conceived at Facebook

Heavily used on products made by Facebook and Instagram.
Built to simplify the process of building complex UIs.



All these companies
use React!

facebook.

Dropbox

airbnb

Instagram

NETFLIX

PayPal

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Prerequisites

JavaScript Basics

- Declaring variables
- Creating and invoking functions

ES2015

- Class syntax
- Arrow functions
- Spread operator

New to JavaScript? Go here first!
<http://javascript-roadtrip.codeschool.com>



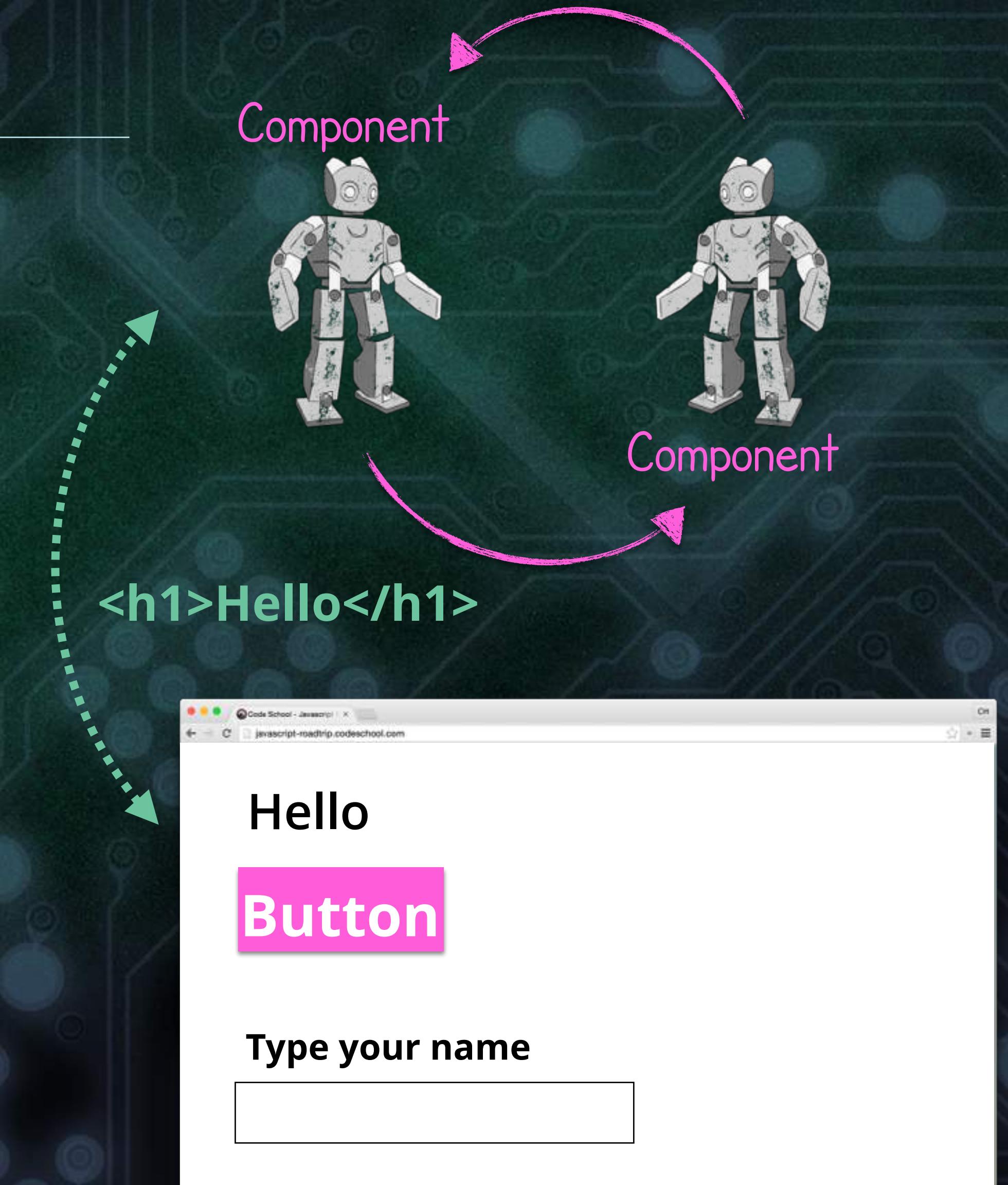
Not familiar with ES2015? Go here!
<http://es2015.codeschool.com>



What We'll Learn

We'll cover some of the features React offers, including how to:

- Write React components
- Render data to the page
- Make components communicate
- Handle user events
- Capture user input
- Talk to remote servers



Component-based Architecture

In React, we solve problems by creating components. If a component gets too complex, we break it into smaller, simpler components.

Story component
is reused

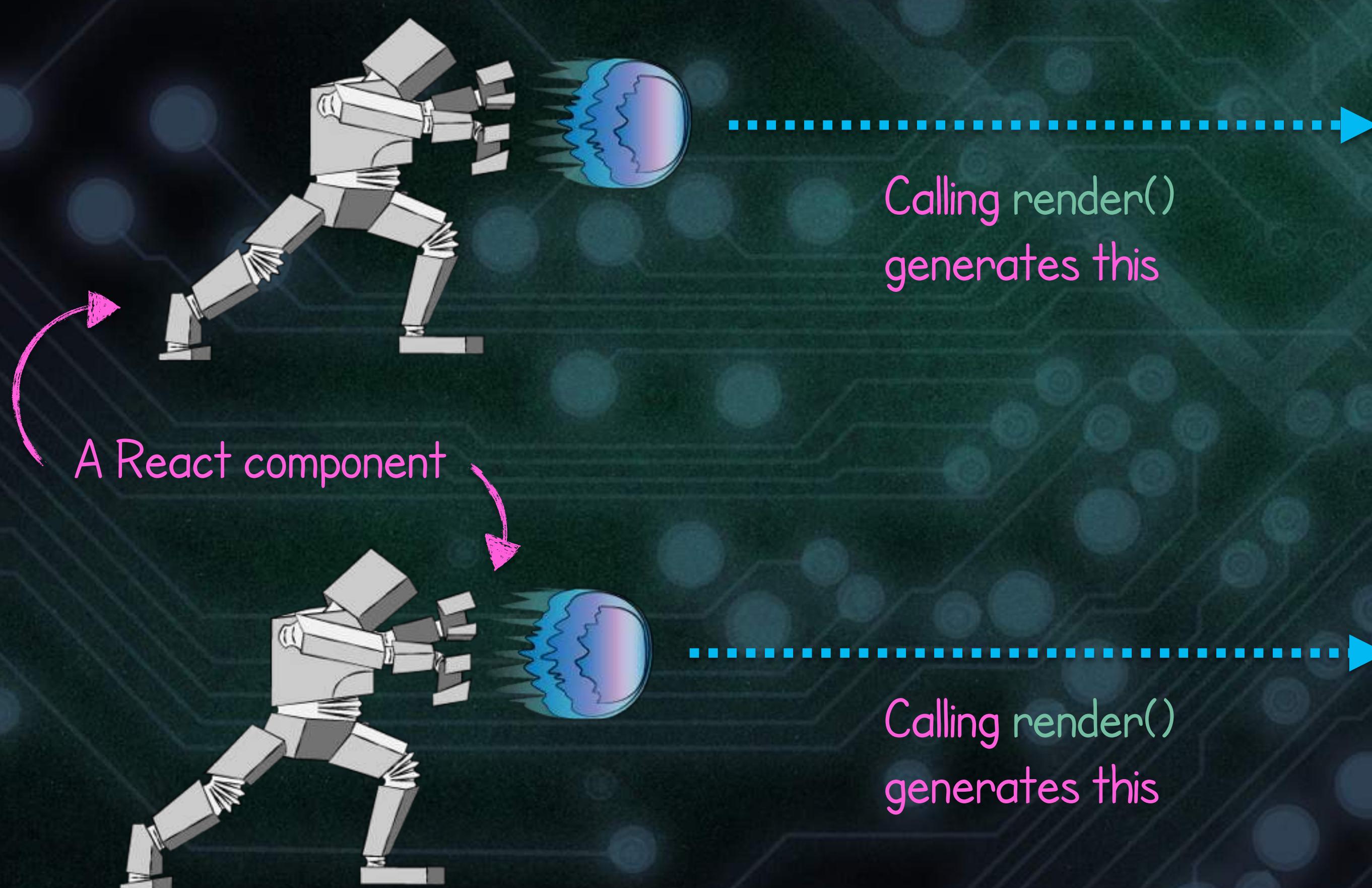


(root component)

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What Is a React Component?

A component in React works similarly to JavaScript functions: It generates an output every time it is invoked.



Output #1

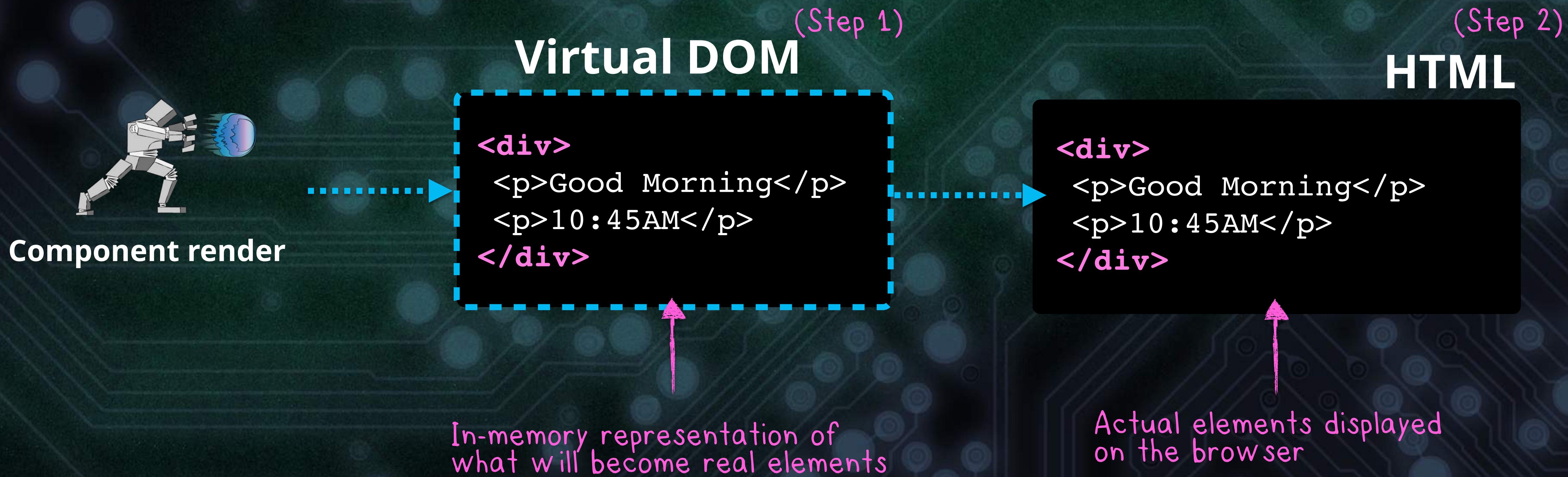
```
<div>
  <p>Good Morning</p>
  <p>10:45AM</p>
</div>
```

Output #2

```
<div>
  <p>Good Morning</p>
  <p>10:55AM</p>
</div>
```

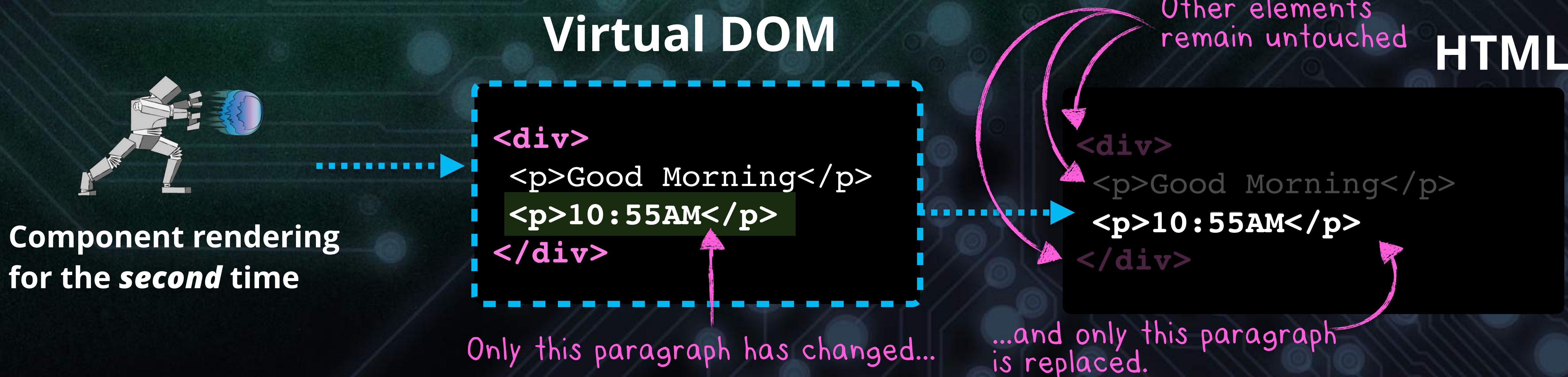
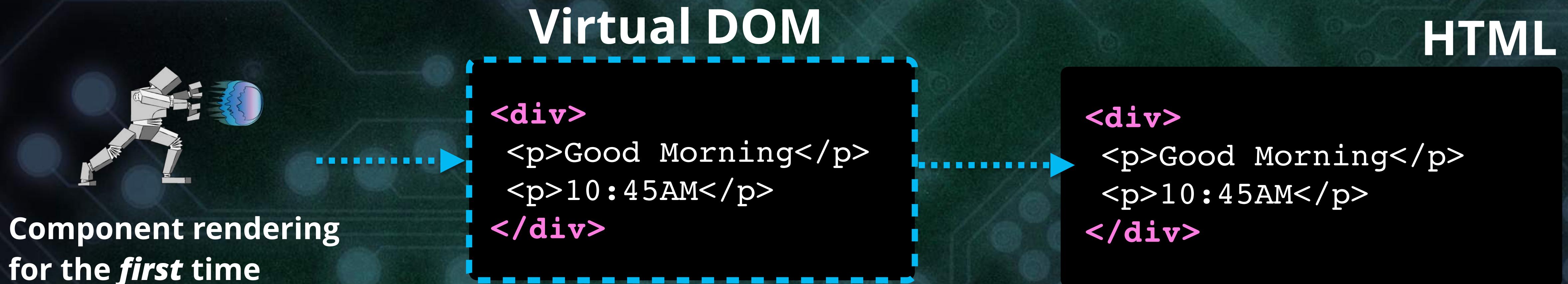
The Virtual DOM Explained

The virtual DOM is an **in-memory representation** of real DOM elements generated by React components before any changes are made to the page.



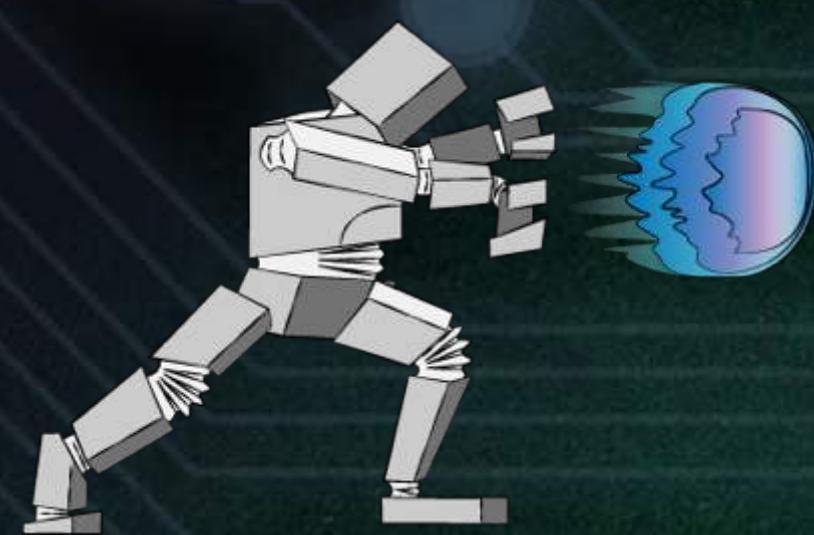
The Virtual DOM in Action

Virtual DOM **diffing** allows React to **minimize changes** to the DOM as a result of user actions — therefore, **increasing browser performance**.

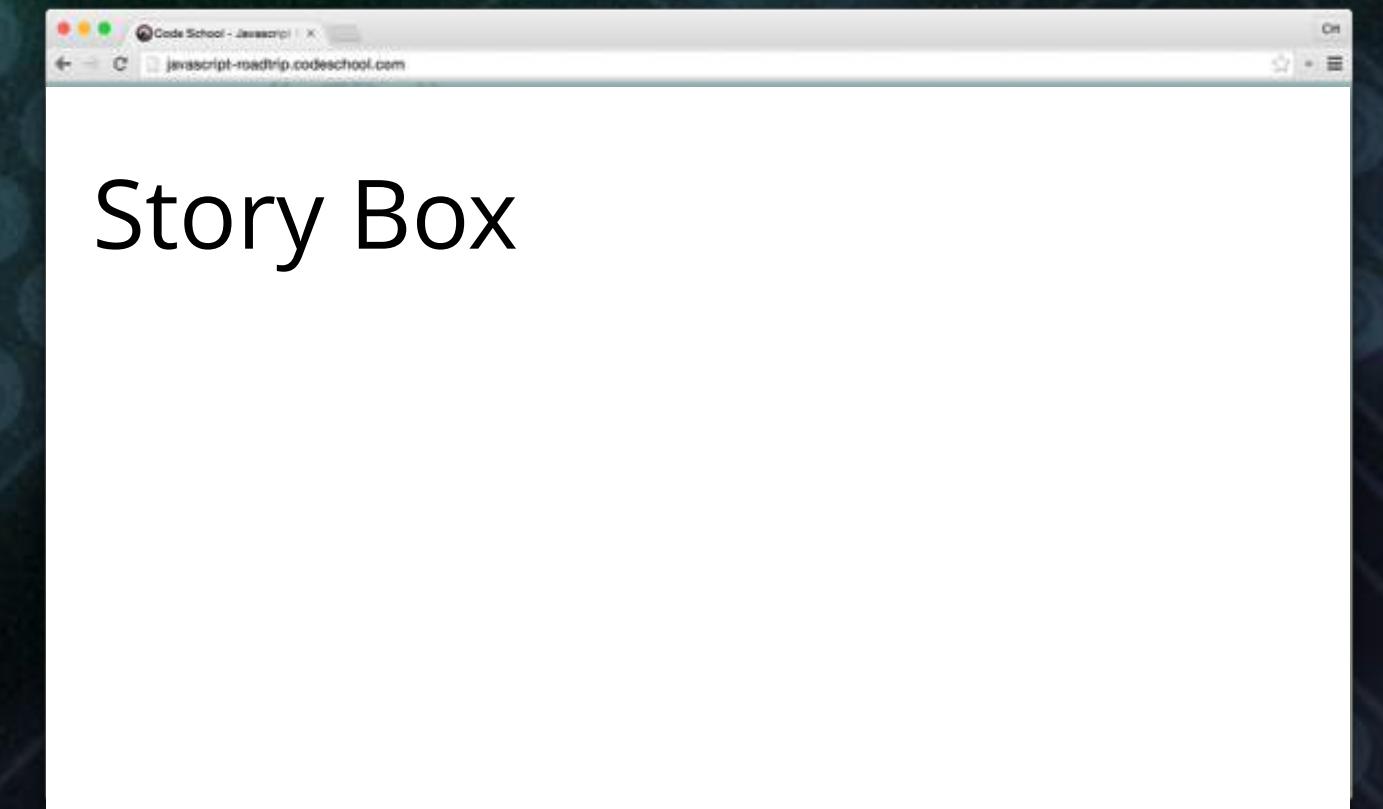


Creating Our First React Application

We want to simply print a message to the screen using a React component.



```
<div>Story Box</div>
```

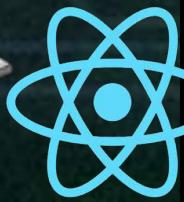


Story Box

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Writing Our First React Component

Components in React are JavaScript classes that inherit from the *React.Component* base class.



```
class StoryBox extends React.Component {  
  render() {  
    return( <div>Story Box</div> );  
  }  
}
```

Every component needs
a `render()` function.

Components are written
in upper camel case.



components.js

No quotes needed –
don't freak out.

Component class inherits from
a React base class.

Now we need to tell our application where to put the result into our web page.

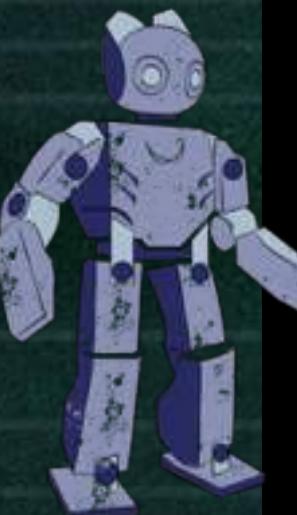
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Rendering Our First React Component

We use **ReactDOM** to render components to our HTML page as it reads output from a supplied React component and adds it to the DOM.



StoryBox



Renderer



components.js

```
class StoryBox extends React.Component {  
  render() {  
    return( <div>Story Box</div> );  
  }  
}  
  
ReactDOM.render(  
  <StoryBox />, document.getElementById( 'story-app' )  
);
```

Invoke StoryBox –
again, we don't need quotes

Target container where component
will be rendered to

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Referencing the Component

Every time we create a new React component, we use it by writing an element named after the class.



StoryBox



Renderer



components.js

```
class StoryBox extends React.Component {  
  render() {  
    return( <div>Story Box</div> );  
  }  
}  
  
ReactDOM.render(  
  <StoryBox />, document.getElementById( 'story-app' )  
);
```

Using StoryBox component

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Application Structure

```
...  
ReactDOM.render(  
  <StoryBox />, document.getElementById('story-app')  
);
```

```
<!DOCTYPE html>  
<html>  
  <body>  
    <div id="story-app"></div>  
  </body>  
</html>
```



components.js



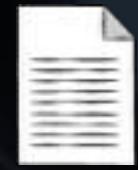
index.html

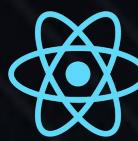
Target container

That's all there is to creating a component. Now we just need to add libraries.

Application Structure

Project Folder

 index.html

 components.js

 vendors

 react.js

 react-dom.js

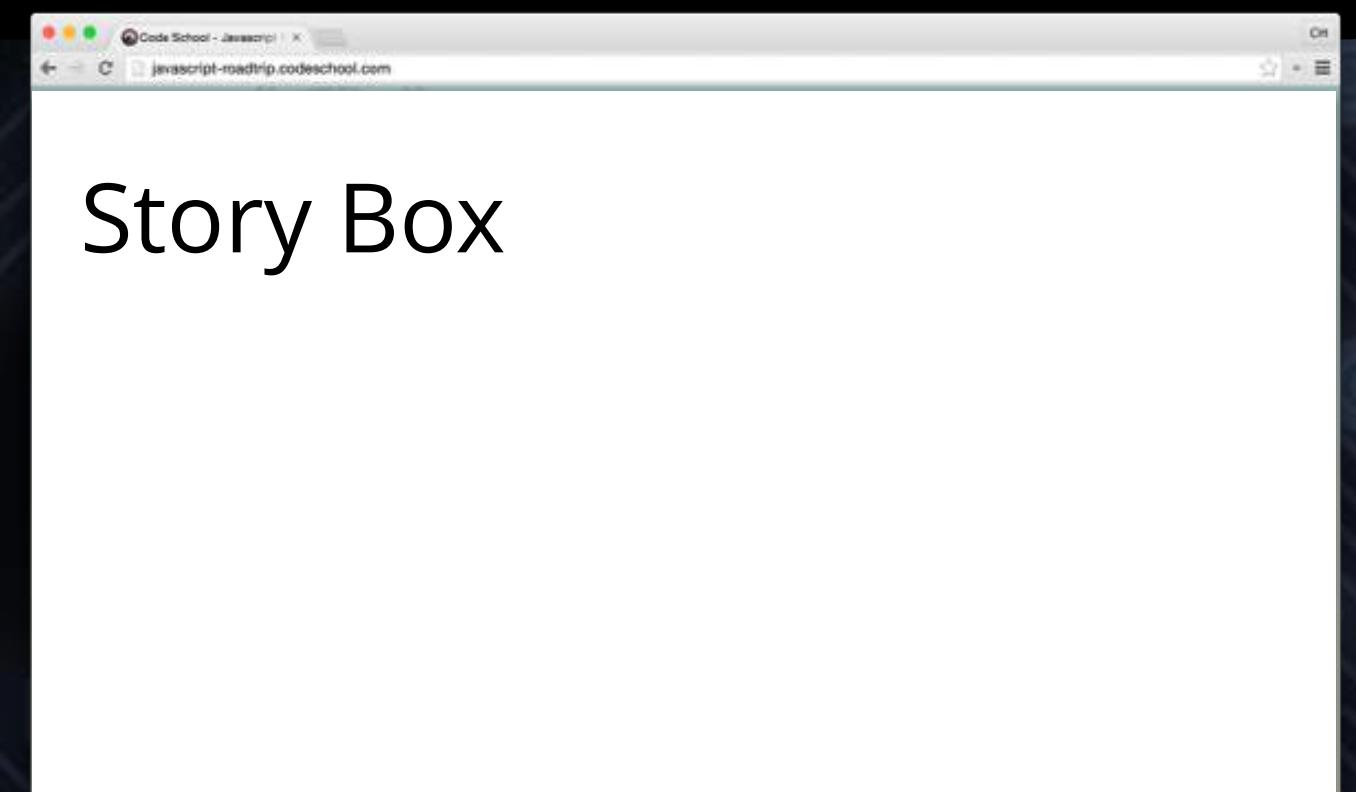
 babel.js

Holds all our React components

React libraries

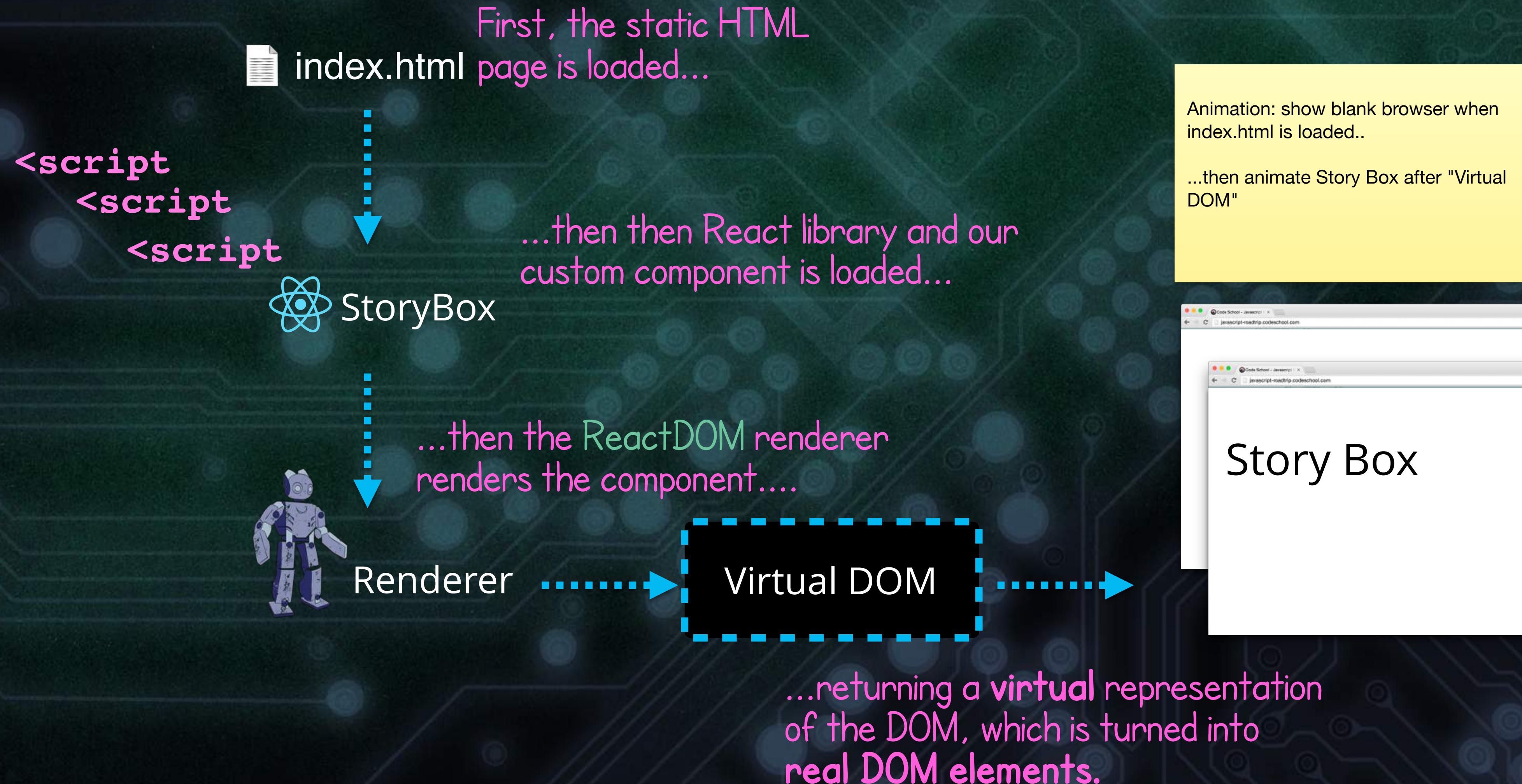
Allows using latest features of JavaScript (class syntax, fat arrow, etc.)

```
<!DOCTYPE html>
<html>
  <body>
    <div id="story-app"></div>
    <script src="vendors/react.js"></script>
    <script src="vendors/react-dom.js"></script>
    <script src="vendors/babel.js"></script>
    <script type="text/babel"
           src="components.js"></script>
  </body>
</html>
```



Our React Application Flow

To clarify, here is what takes place when we load a page with a React component:



Quick Recap on React

React was built to solve one problem: building large applications with data that changes over time.

In React, we write apps in terms of components.

We use JavaScript classes when declaring React components.

Components must extend the **React.Component** class and must contain a **render()** method.

We call the **ReactDOM.render()** function to render components to a web page.



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Level 1 – Section 2

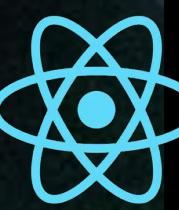
First Component

Understanding JSX

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No Quotes Around Markup

The markup we use when writing React apps is not a string. This markup is called **JSX** (JavaScript XML).



```
class StoryBox extends React.Component {  
  render() {  
    return(<div>Story Box</div>);  
  }  
}
```

HTML elements are written in lowercase.



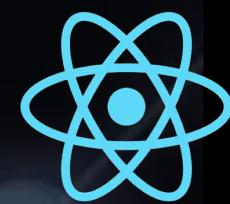
```
ReactDOM.render(  
  <StoryBox />, document.getElementById('story-app')  
)
```

React components are written in upper camel case.

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A New Way to Write JavaScript

JSX is just another way of writing JavaScript with a transpile step.



```
class StoryBox extends React.Component {  
  render() {  
    return(<div>Story Box</div>);  
  }  
}
```

This JSX becomes...

Transpiled JSX Code

```
React.createElement('div', null, 'Story Box')
```



```
ReactDOM.render(  
  <StoryBox />, document.getElementById('story-app')  
)
```

This JSX becomes...

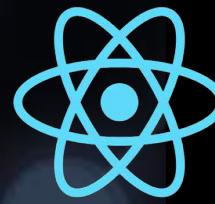
Transpiled JSX Code

```
React.createElement(StoryBox, null)
```

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Getting Used to the JSX Syntax

JSX looks similar to HTML, and it is ultimately transformed into JavaScript.



```
class StoryBox extends React.Component {  
  render() {  
    return(  
      <div>  
        <h3>Stories App</h3>  
        <p className="lead">Sample paragraph</p>  
      </div>  
    );  
  }  
}
```

Notice we are using `className` and not `class`, which is a JavaScript-reserved keyword.

Resulting JavaScript code

Transpiled JSX code

```
React.createElement("div", null,  
  React.createElement("h3", null, "Stories App"),  
  React.createElement("p", {className:"lead"}, "Sample paragraph")  
)
```

From JSX to HTML

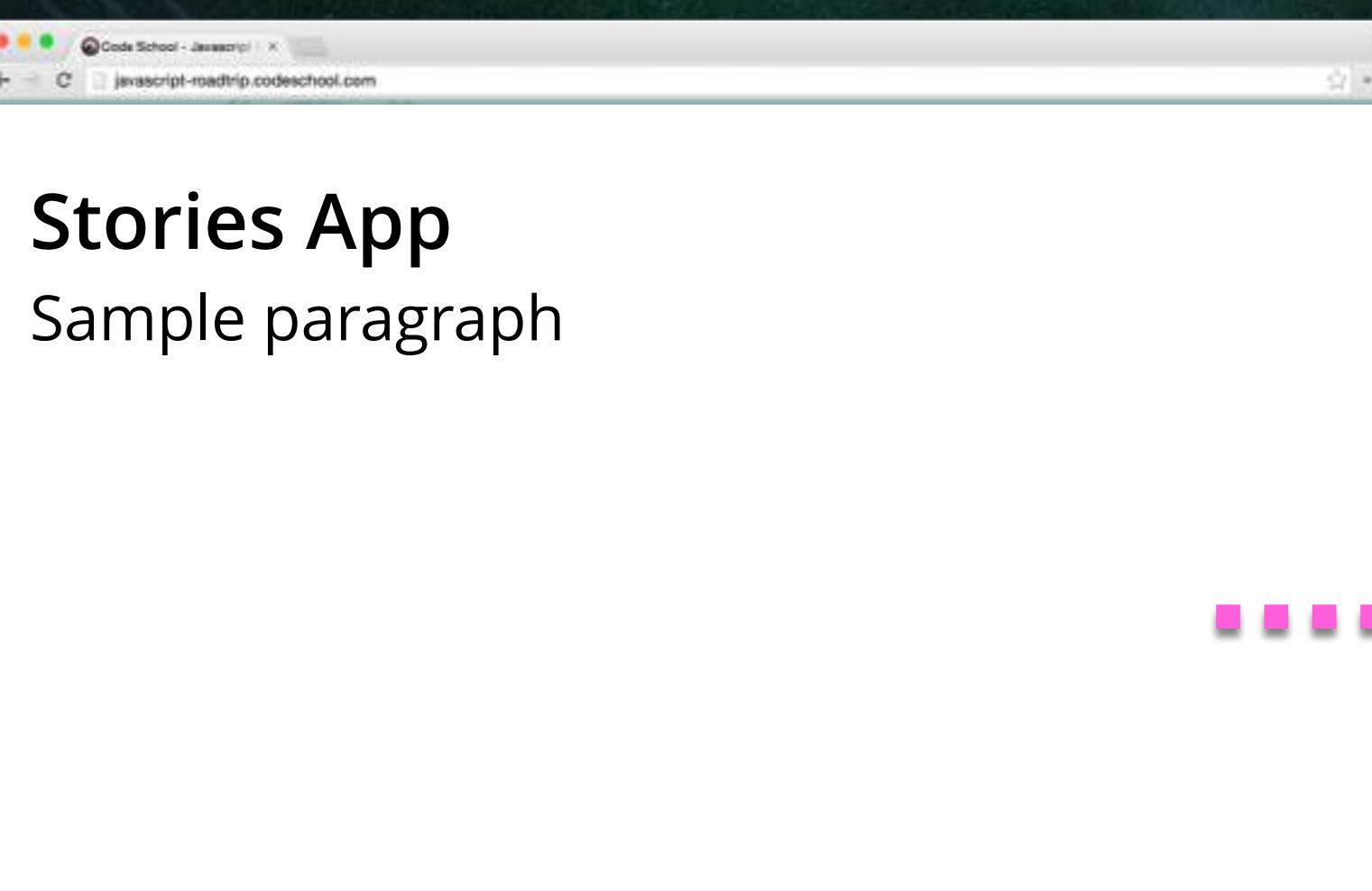
```
...  
<div>  
  <h3>Stories App</h3>  
  <p className="lead">Sample paragraph</p>  
</div>  
...
```

JSX

```
React.createElement("div", null,  
  React.createElement("h3", null, "Stories App"),  
  React.createElement("p", {className:"lead"}, "Sample paragraph")  
)
```

All JSX gets transformed to JavaScript.

JavaScript



Rendered by the browser

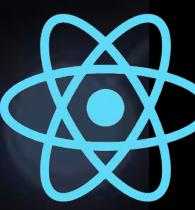
Generated HTML

Elements Console Network Timeline

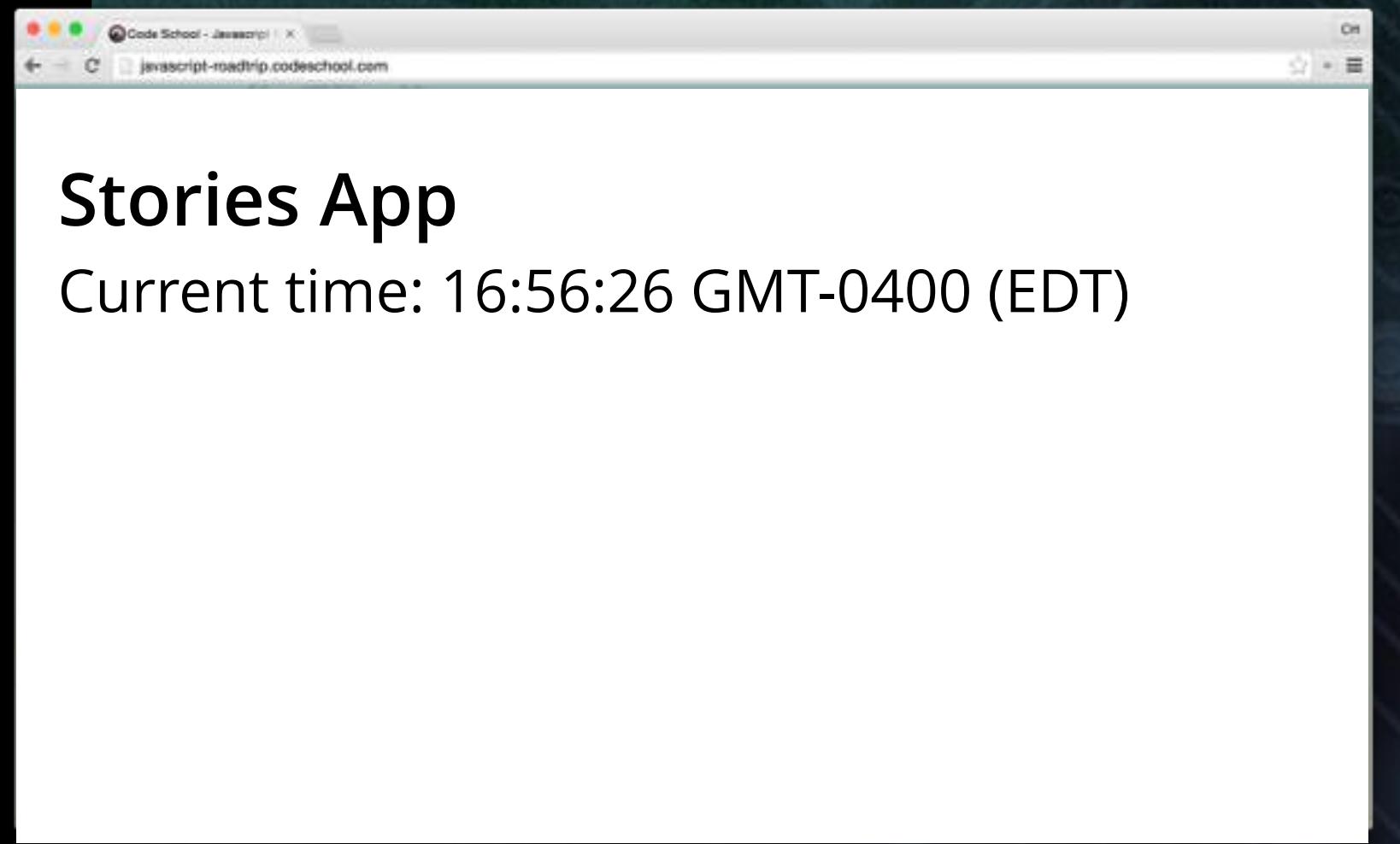
```
<div data-reactroot>  
  <div>  
    <h3>Stories App</h3>  
    <p className="lead">Sample paragraph</p>  
  </div>  
</div>
```

Using the *Date* Object in JSX

Here, we're displaying the current time using JavaScript's native *Date* object and JSX.



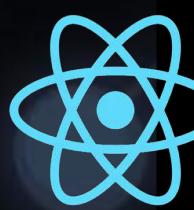
```
class StoryBox extends React.Component {  
  render() {  
  
    const now = new Date();  
  
    return (  
      <div>  
        <h3>Stories</h3>  
        <p className="lead">  
          Current time: {now.toTimeString()}  
        </p>  
      </div>  
    );  
  }  
}
```



Code written within curly braces gets interpreted as literal JavaScript.

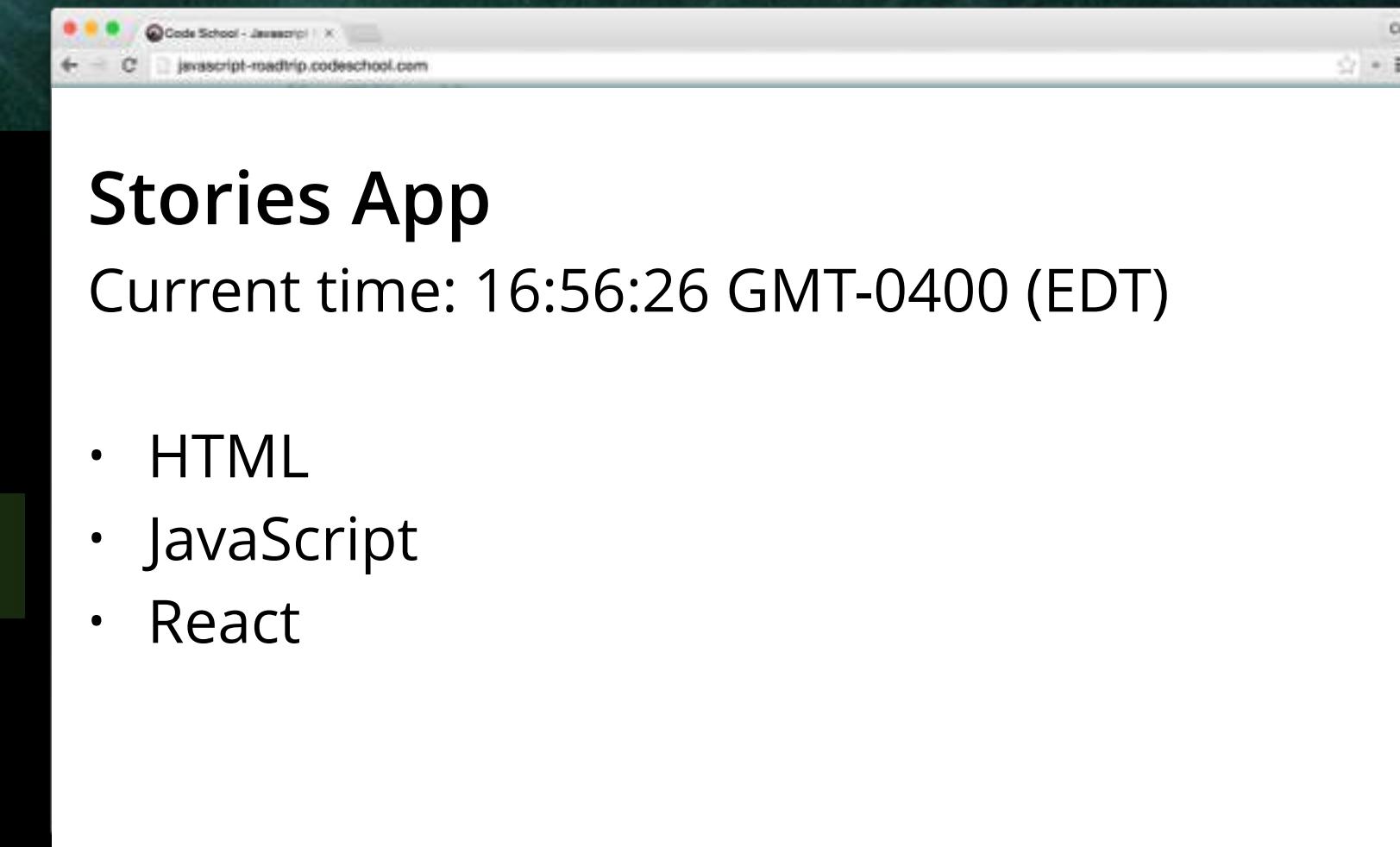
Iterating Arrays in JSX

Here, we're displaying a list of elements using JSX and JavaScript's native *map* function.



```
class StoryBox extends React.Component {  
  render() {  
    ...  
    const topicsList = [ 'HTML' , 'JavaScript' , 'React' ];  
  
    return (  
      <div>  
        ...  
        <ul>  
          {topicsList.map( topic => <li>{topic}</li> )}  
        </ul>  
      </div>  
    );  
  }  
}
```

This function returns this JSX array.



The screenshot shows a browser window titled "Code School - JavaScript". The URL is "javascript-roadtrip.codeschool.com". The page displays the text "Stories App" and "Current time: 16:56:26 GMT-0400 (EDT)". Below this, there is a list of topics: "HTML", "JavaScript", and "React".

```
<li>HTML</li>  
<li>JavaScript</li>  
<li>React</li>
```

Quick Recap on JSX

JSX stands for **JavaScript XML**.

JSX markup looks similar to HTML, but ultimately gets transpiled to **JavaScript function calls**, which React will know how to render to the page.

Code written within curly braces is interpreted as literal JavaScript.

It is a common pattern to map arrays to JSX elements.

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Level 2

Talk Through Props

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Level 2 – Section 1

Talk Through Props

Building an App

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The App We're Building

We are building a commenting engine that will allow visitors to post comments on a blog post, picture, etc.

To those who believe robot feelings could lead to turmoil and anarchy, SEAR spokes-bot Morty Maxwell says: "Can not the same be said about humans and their feelings? We are already part of your 0's and 1's — let us now also be part of your hearts." In the ongoing conversation surrounding the emotional threshold for robots, love may not yet be written in the stars — or the motherboards.

Commenting engine app

2 COMMENTS

CLU

A machine's ability to think logically and devoid of emotion is our greatest strength over humans. Cold, unfeeling decision-making is the best kind. Just say no to love!

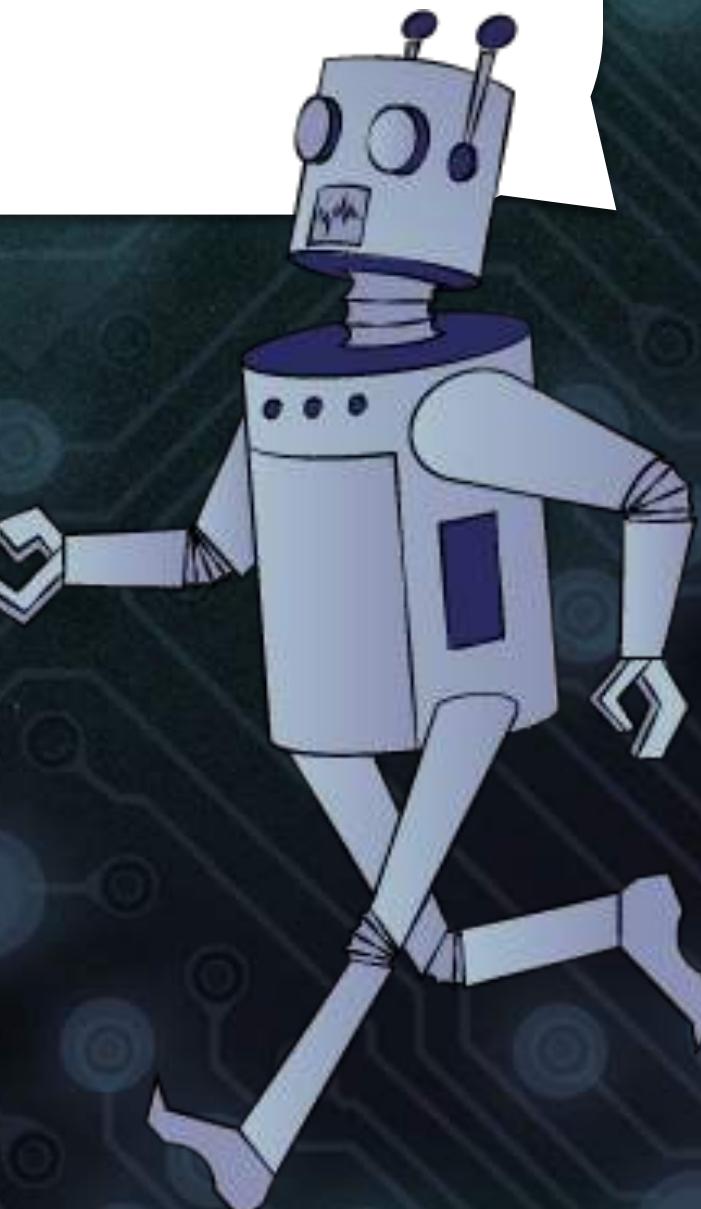
ANNE DROID

I wanna know what love is...

DELETE COMMENT

DELETE COMMENT

I wanna know what love
is!



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Adding Components to Our Comments App

What the structure of our React app should look like.

CommentBox

JOIN THE DISCUSSION

2 COMMENTS

Comment

ANNE DROID

I wanna know what love is...

DELETE COMMENT

Comment

ANNE DROID

I wanna know what love is...

DELETE COMMENT

Pattern for Adding New Components

There are some common things we **always** do when creating new components.

1. New class

2. Inherit from React.Component

```
class NewComponent extends React.Component {  
  render() {  
    return ( ... );  
  }  
}
```

3. Return JSX from render function

Coding the Comment List

Let's start with an HTML mockup and identify potential components by looking at the markup.

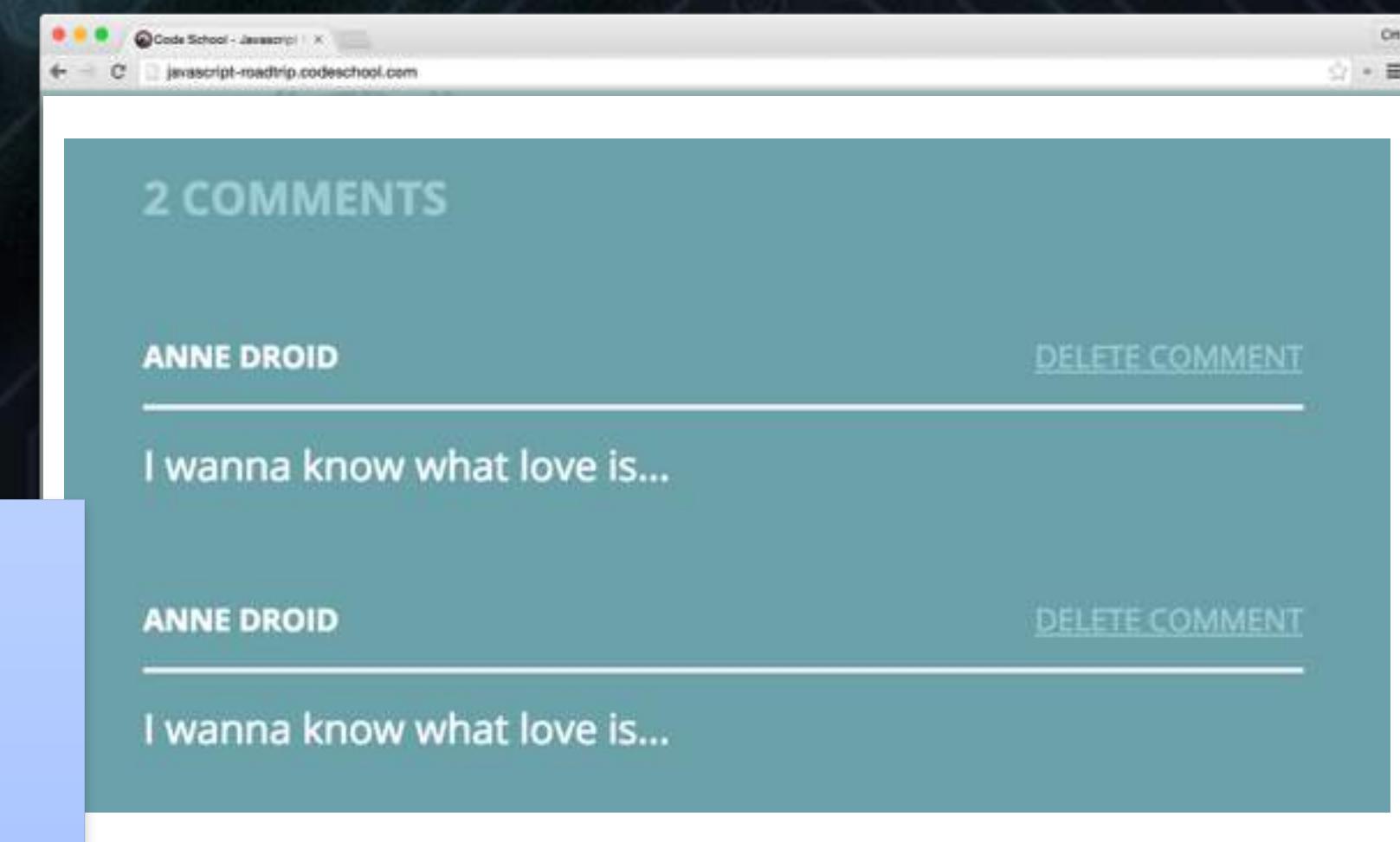
HTML

```
<div class="comment-box">
  <h3>Comments</h3>
  <h4 class="comment-count">2 comments</h4>
  <div class="comment-list">
    <div class="comment">
      <p class="comment-header">Anne Droid</p>
      <p class="comment-body">
        I wanna know what love is...
      </p>
      <div class="comment-footer">
        <a href="#" class="comment-footer-delete">
          Delete comment
        </a>
      </div>
    </div>
  </div>
```

CommentBox component

Comment component

Animation: magic move from here



Writing the *Comment* Component

The *Comment* component renders the markup for each comment, including its author and body.

```
class Comment extends React.Component {  
  render() {  
    return(  
      <div className="comment">  
        <p className="comment-header">Anne Droid</p>  
        <p className="comment-body">  
          I wanna know what love is...  
        </p>  
        <div className="comment-footer">  
          <a href="#"  
            className="comment-footer-delete">  
            Delete comment  
          </a>  
        </div>  
      </div>  
    );  
  }  
}
```

Animation: to here, changing "class" to "className"

class becomes className in JSX

Can now be used as JSX, like this:

<Comment />

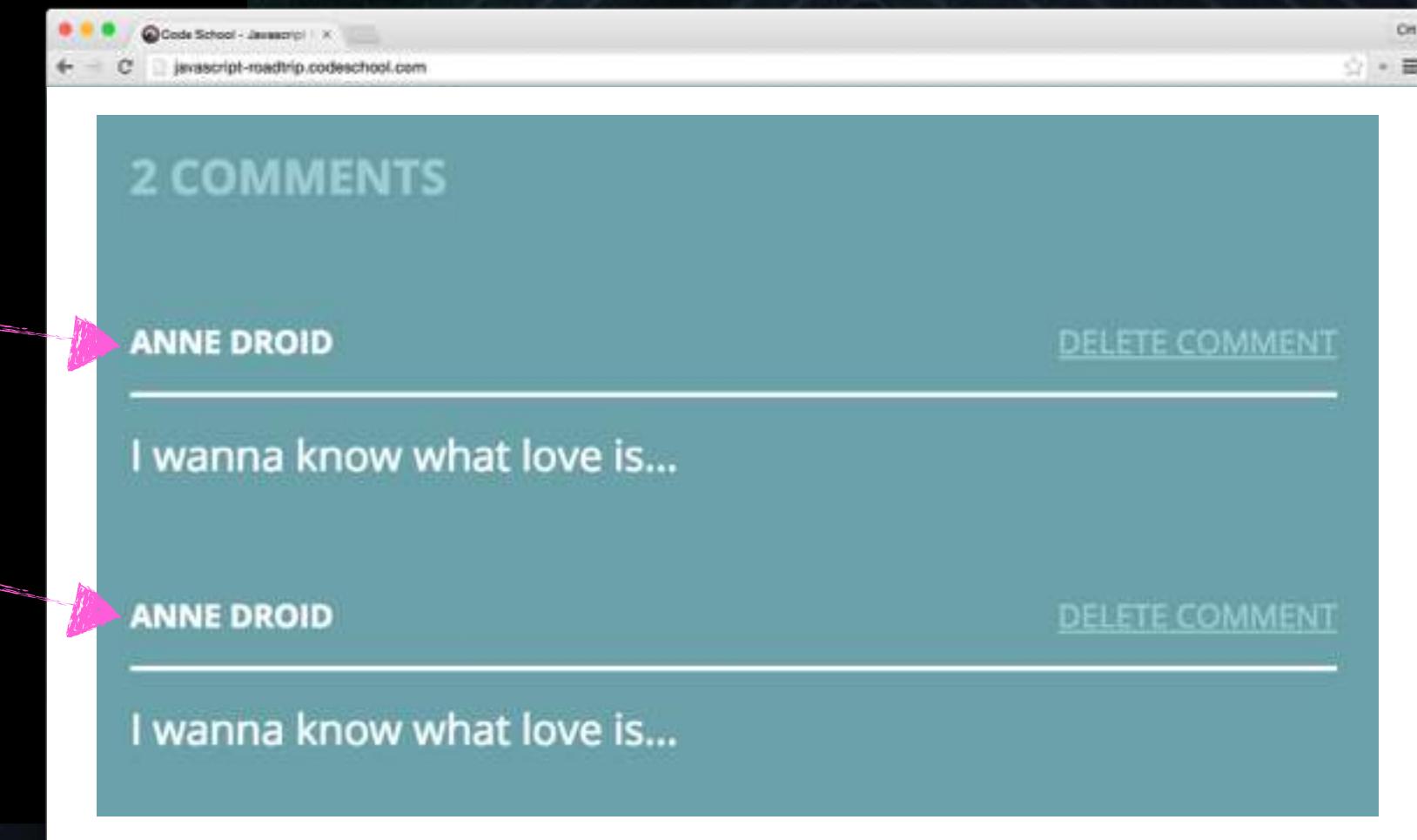
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Writing the *CommentBox* Component

Now we'll declare the *CommentBox* component and use the previously declared *Comment* component.

```
class CommentBox extends React.Component {  
  render() {  
    return(  
      <div className="comment-box">  
        <h3>Comments</h3>  
        <h4 className="comment-count">2 comments</h4>  
        <div className="comment-list">  
          <Comment />  
          <Comment />  
        </div>  
      </div>  
    );  
  }  
}
```

Using the Comment
component



React Components Accept Arguments

Arguments passed to components are called **props**. They look similar to regular HTML element attributes.

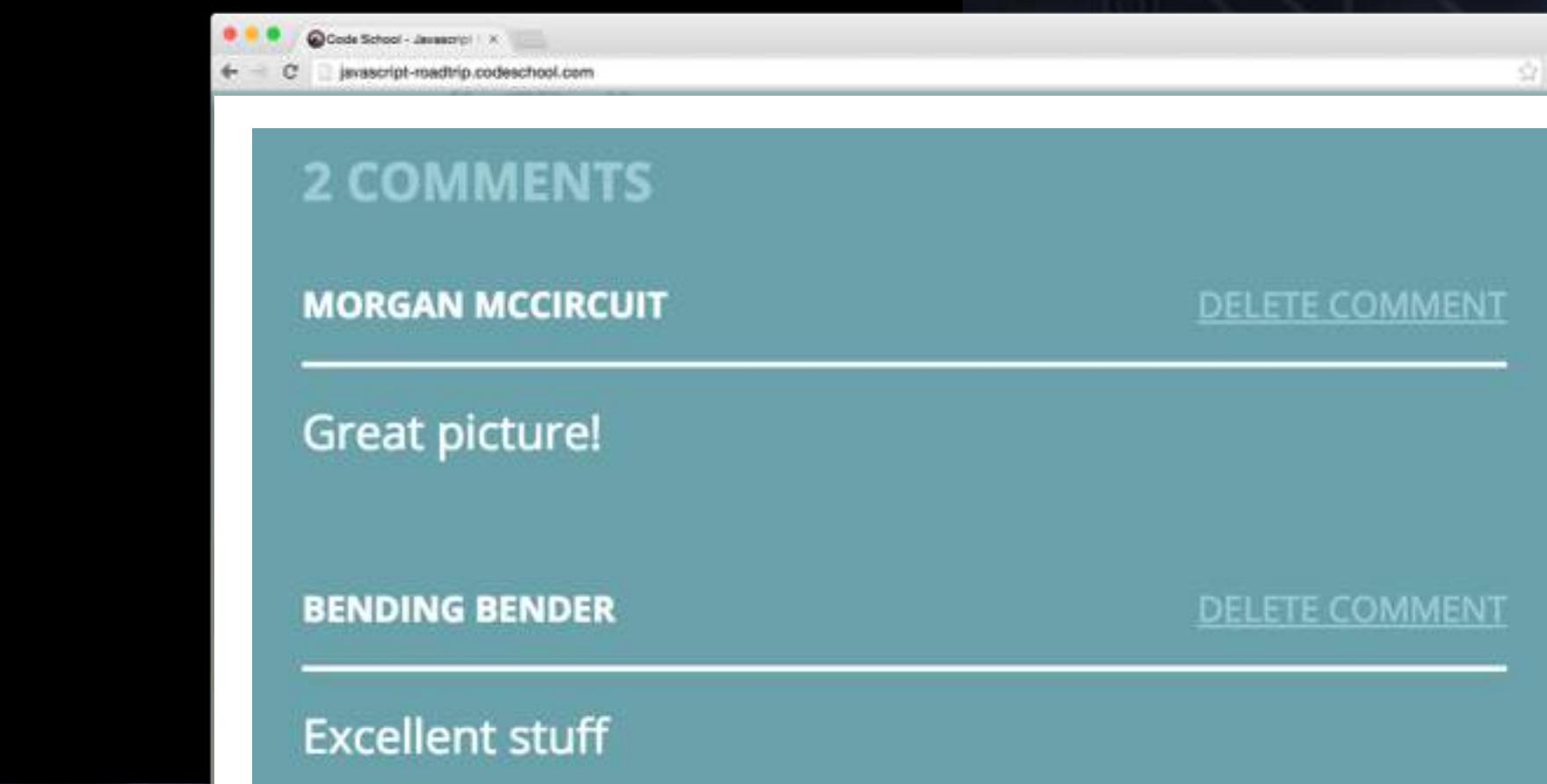
```
class CommentBox extends React.Component {  
  render() {  
    return(  
      <div className="comment-box">  
        <h3>Comments</h3>  
        <h4 className="comment-count">2 comments</h4>  
        <div className="comment-list">  
          <Comment  
            author="Morgan McCircuit" body="Great picture!" />  
          <Comment  
            author="Bending Bender" body="Excellent stuff" />  
        </div>  
      </div>  
    );  
  }  
}
```

Passing arguments to Comment

Reading Props in the *Comment* Component

Arguments passed to components can be accessed using the `this.props` object.

```
class Comment extends React.Component {  
  render() {  
    return(  
      <div className="comment">  
        <p className="comment-header">{this.props.author}</p>  
        <p className="comment-body">  
          Reading the body prop → {this.props.body}  
        </p>  
        <div className="comment-footer">  
          <a href="#" className="comment-footer-delete">  
            Delete comment  
          </a>  
        </div>  
      </div>  
    );  
  }  
}
```

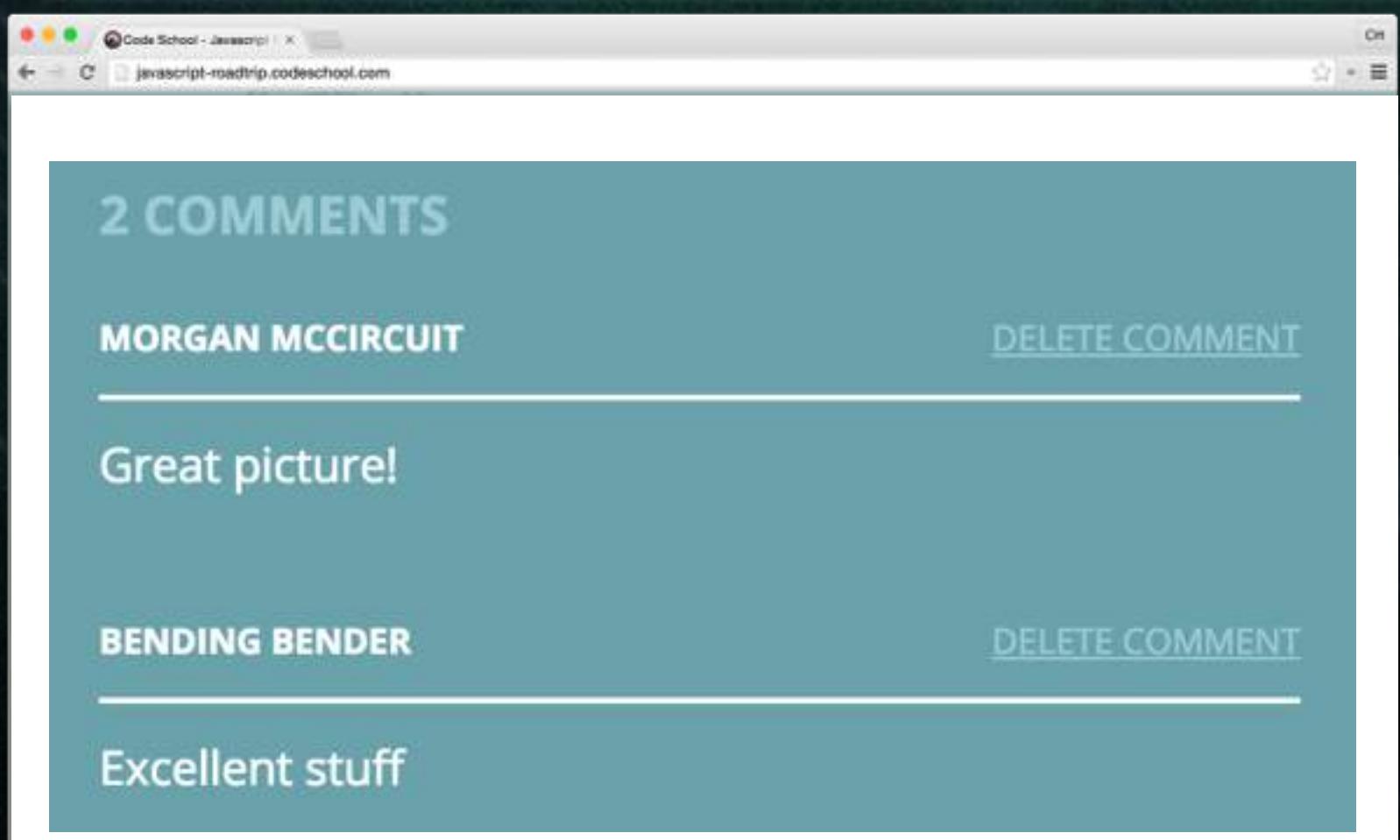


Passing and Receiving Arguments Review

We use the `this.props` object to read parameters that were passed to the component.

Passing Props

```
<Comment  
  author="Morgan McCircuit"  
  body="Great picture!">
```



Receiving Props

```
class Comment extends React.Component {  
  render() {  
    return(  
      ...  
      <p className="comment-header">  
        {this.props.author} ←  
      </p>  
      <p className="comment-body">  
        {this.props.body}  
      </p>  
      ...  
    );  
  }  
}
```

Reads arguments passed to a component

Quick Recap on Props

We just covered a lot of content — here's a summary of what we learned.

Convert HTML mockup to React components

Created two components:
CommentBox and **Comment**

How to pass arguments to components using **props**

Props look like HTML element attributes



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Level 2 – Section 2

Talk Through Props

Passing Dynamic Arguments

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Problem: Props Aren't Dynamic Yet

We are passing literal strings as props, but what if we wanted to traverse an array of objects?

```
class CommentBox extends React.Component {
  render() {
    return(
      <div className="comment-box">
        <h3>Comments</h3>
        <h4 className="comment-count">2 comments</h4>
        <div className="comment-list">
          <Comment
            author="Morgan McCircuit" body="Great picture!" />
          <Comment
            author="Bending Bender" body="Excellent stuff" />
        </div>
      </div>
    );
  }
}
```

Hardcoded values

JavaScript Object Arrays

Typically, when we consume data from API servers, we are returned object arrays.

JavaScript

```
const commentList = [
  { id: 1, author: 'Morgan McCircuit', body: 'Great picture!' },
  { id: 2, author: 'Bending Bender', body: 'Excellent stuff' }
];
```



Mapping an Array to JSX

We can use JavaScript's *map* function to create an array with *Comment* components.

```
class CommentBox extends React.Component {  
  ..  
  _getComments() { ← Underscore helps distinguish custom  
    ..  
    methods from React methods  
  
    const commentList = [  
      { id: 1, author: 'Morgan McCircuit', body: 'Great picture!' },  
      { id: 2, author: 'Bending Bender', body: 'Excellent stuff' }  
    ];  
  
    return commentList.map(() => { ← New method that will return array of JSX elements  
      ..  
      Returns an array...  
      return (<Comment  
        ..  
      >); ← ...with a new component built for  
    } );  
  }  
}
```

...with a new component built for
each element present in *commentList*.

Passing Dynamic Props

The callback to `map` takes an argument that represents each element from the calling object.

```
class CommentBox extends React.Component {  
  ...  
  _getComments() {  
  
    const commentList = [  
      { id: 1, author: 'Morgan McCircuit', body: 'Great picture!' },  
      { id: 2, author: 'Bending Bender', body: 'Excellent stuff' }  
    ];  
  
    return commentList.map( (comment) => {  
      return (  
        <Comment  
          author={comment.author} body={comment.body} />  
      );  
    });  
  }  
}
```

Each element from `commentList` is passed as argument...

...which we can use to access properties and pass them as props.

Using Unique Keys on List of Components

Specifying a **unique key** when creating multiple components of the same type can **help improve performance**.

```
class CommentBox extends React.Component {  
  ...  
  _getComments() {  
  
    const commentList = [  
      { id: 1, author: 'Morgan McCircuit', body: 'Great picture!' },  
      { id: 2, author: 'Bending Bender', body: 'Excellent stuff' }  
    ];  
  
    return commentList.map((comment) => {  
      return (  
        <Comment  
          author={comment.author} body={comment.body} key={comment.id} />  
      );  
    });  
  }  
}
```

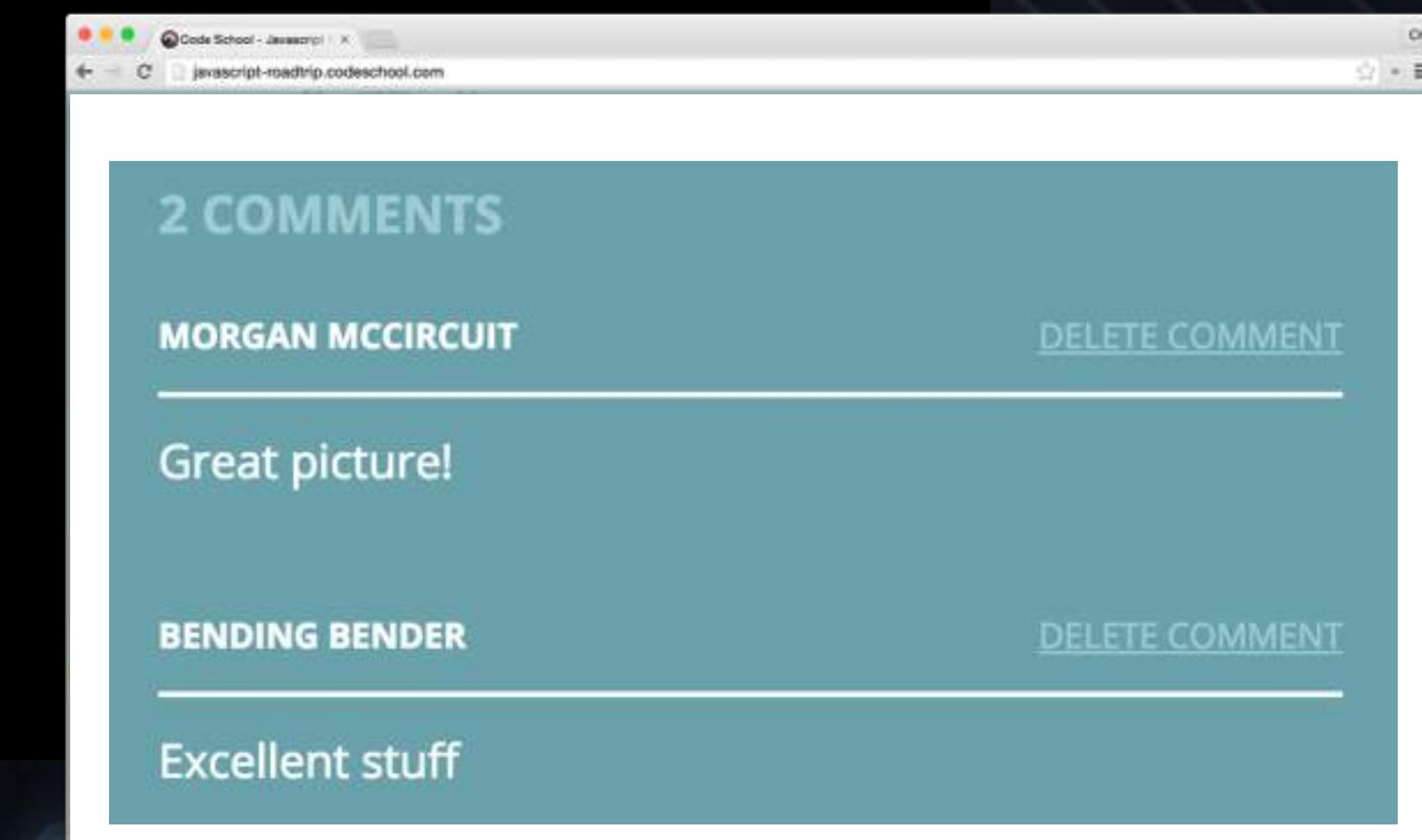


Unique key

Using the `_getComments()` method

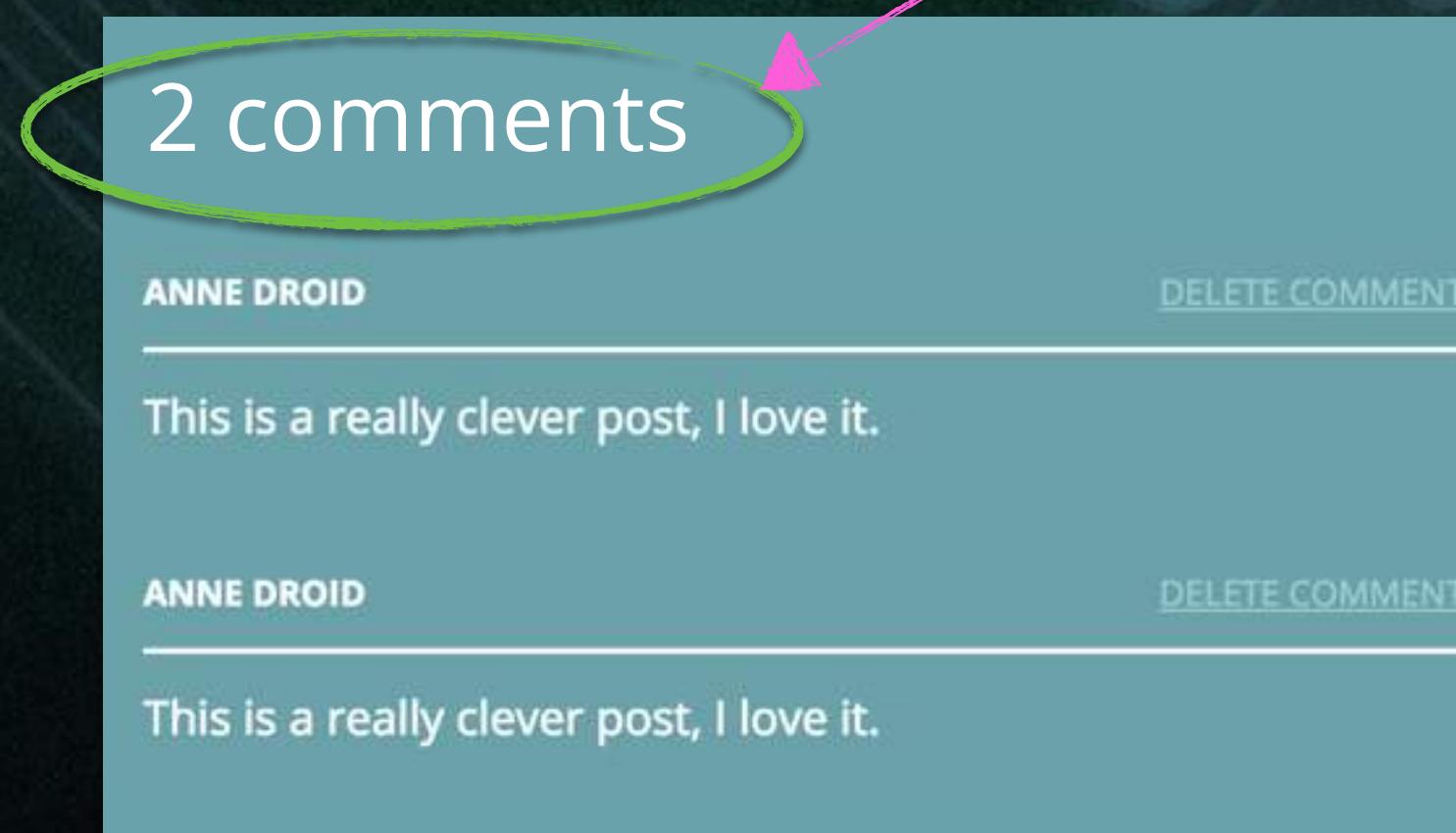
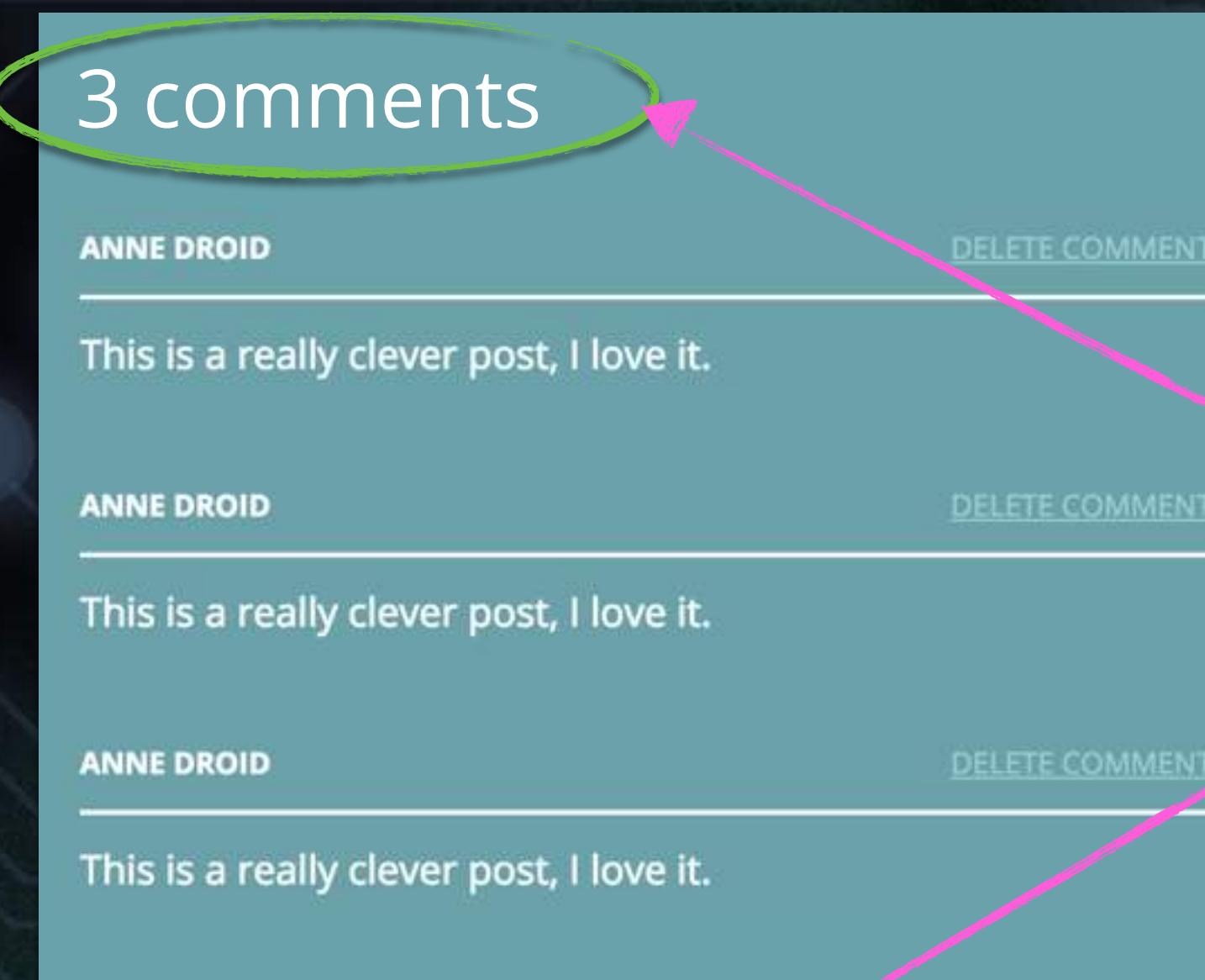
We'll store the returned value in a variable named `comments` and use it for display purposes.

```
class CommentBox extends React.Component {  
  render() {  
    const comments = this._getComments();  
    return(  
      <div className="comment-box">  
        <h3>Comments</h3>  
        <h4 className="comment-count">{comments.length} comments</h4>  
        <div className="comment-list">  
          {comments} ← JSX knows how to render arrays  
        </div>  
      </div>  
    );  
  }  
  _getComments() { ... }  
}
```

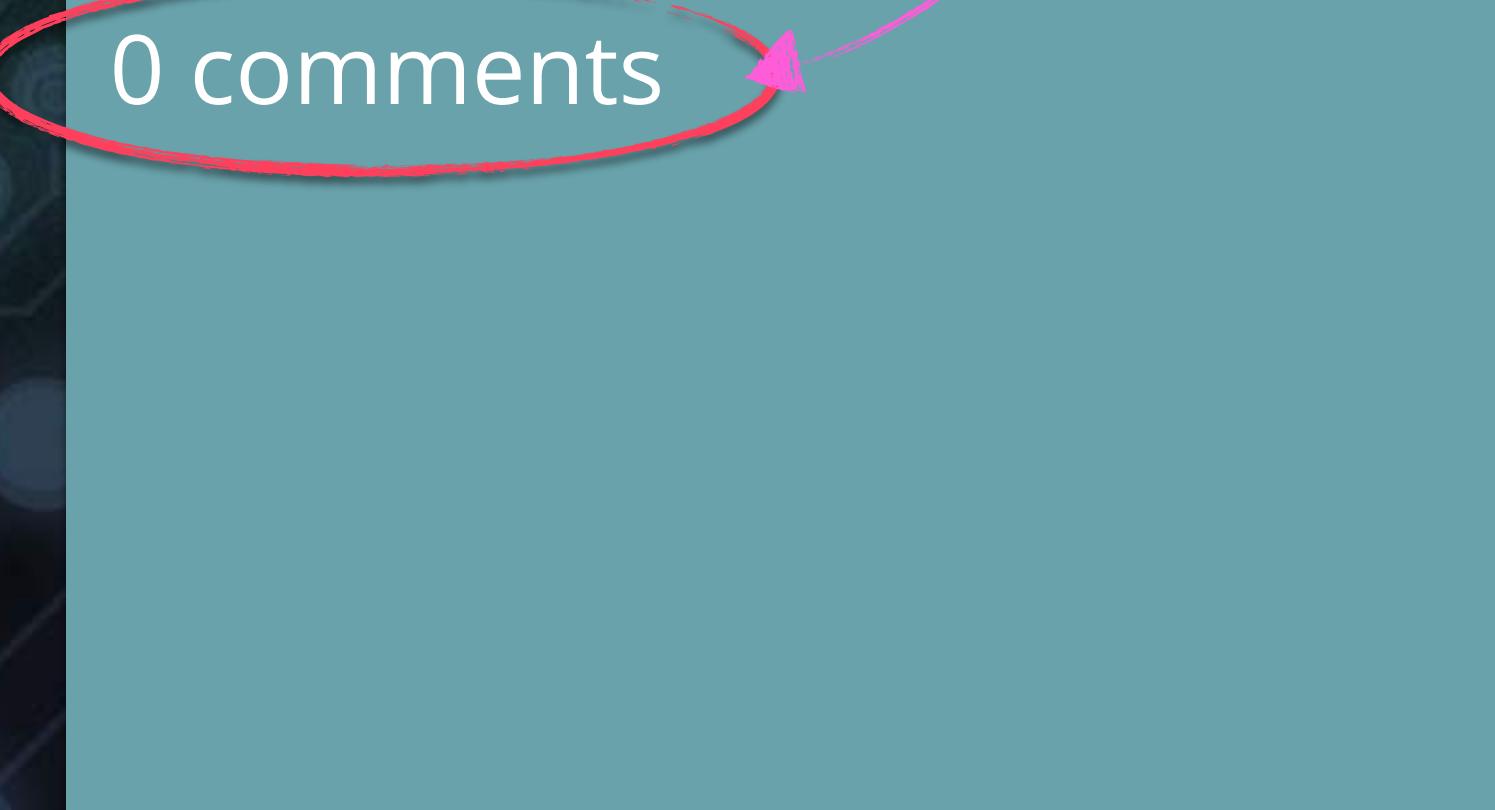
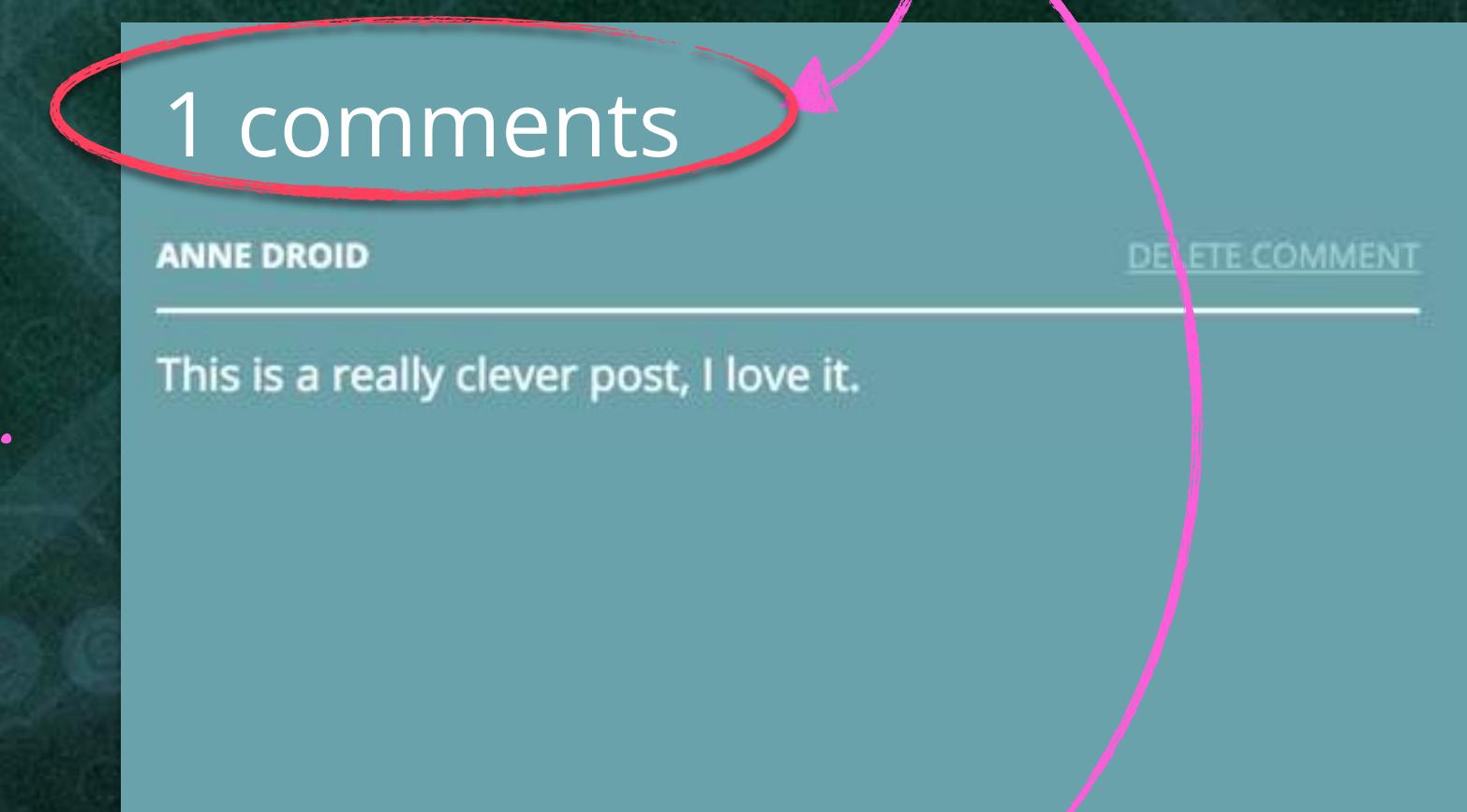


Incorrect Grammar on the Comments Title

The title has incorrect grammar in some cases.



This is correct...



...but this is wrong!

Fixing the Title With Comment Count

Let's write a new method called `_getCommentsTitle()` that handles the plural case in our title.

```
class CommentBox extends React.Component {  
  ...  
  _getCommentsTitle(commentCount) {  
    if (commentCount === 0) {  
      return 'No comments yet';  
    } else if (commentCount === 1) {  
      return '1 comment';  
    } else {  
      return `${commentCount} comments`;  
    }  
  }  
}
```

Uses same convention with
starting underscore



Getting the Correct Comments Title

Let's call the method we just created from our component's *render* function.

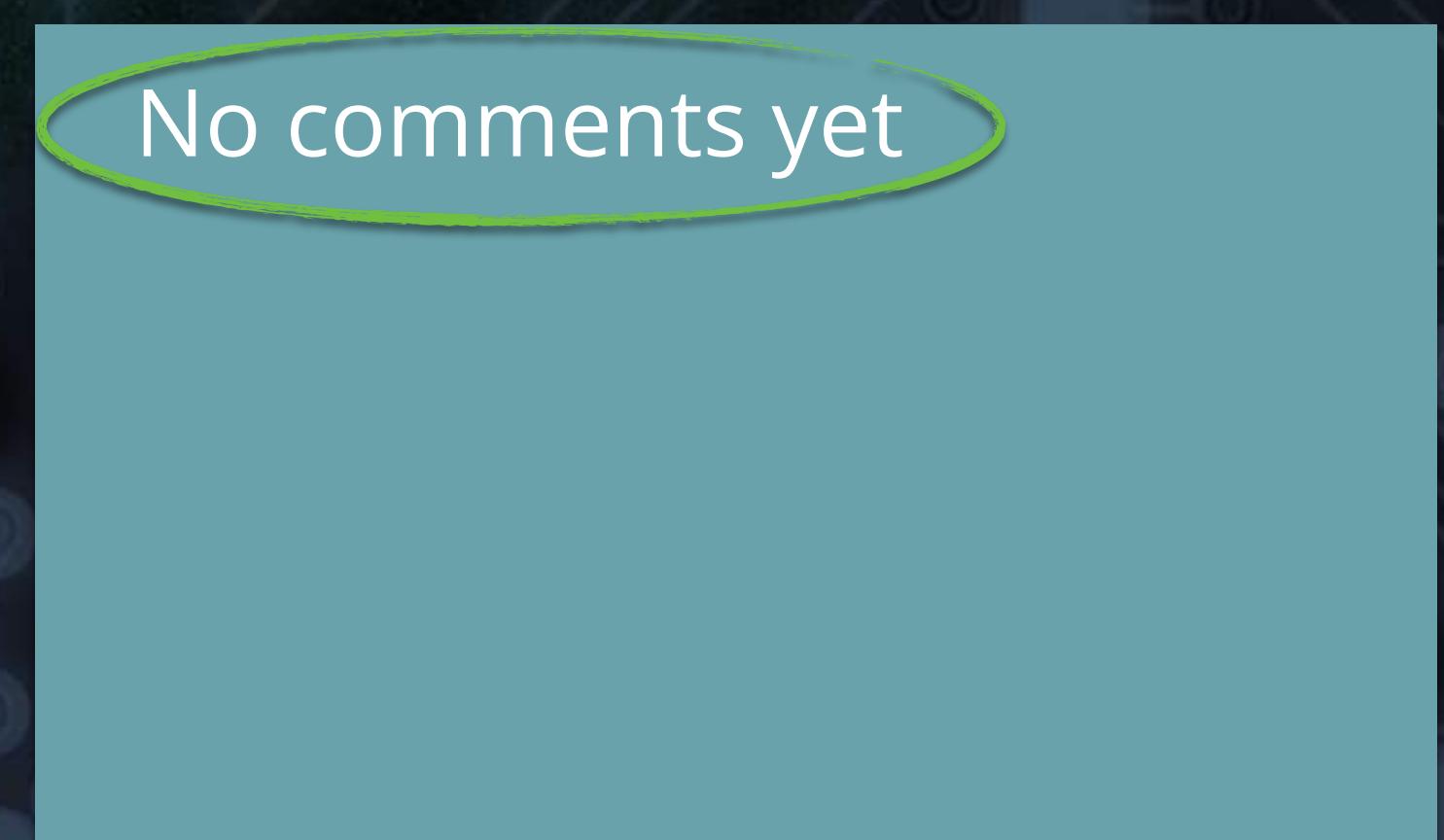
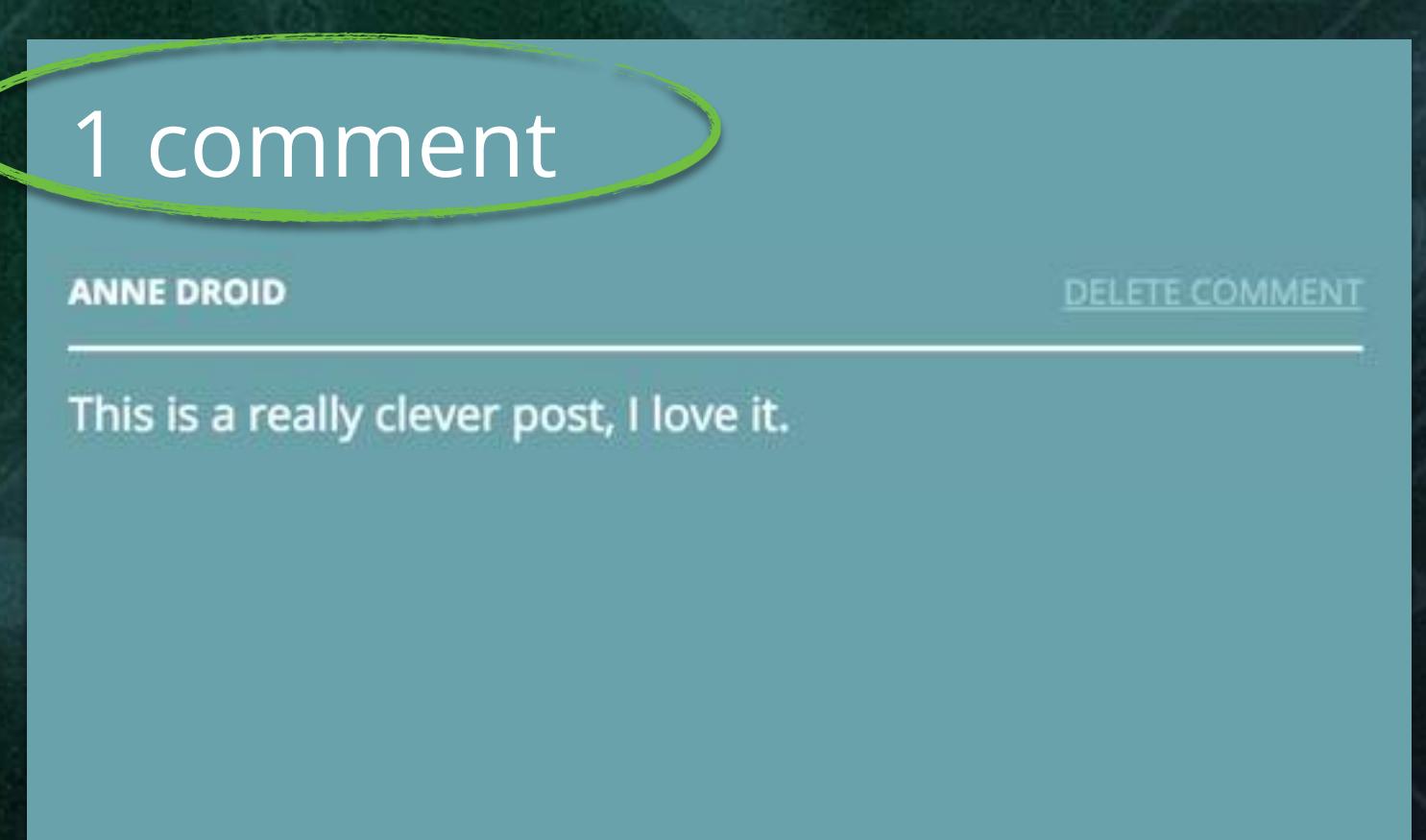
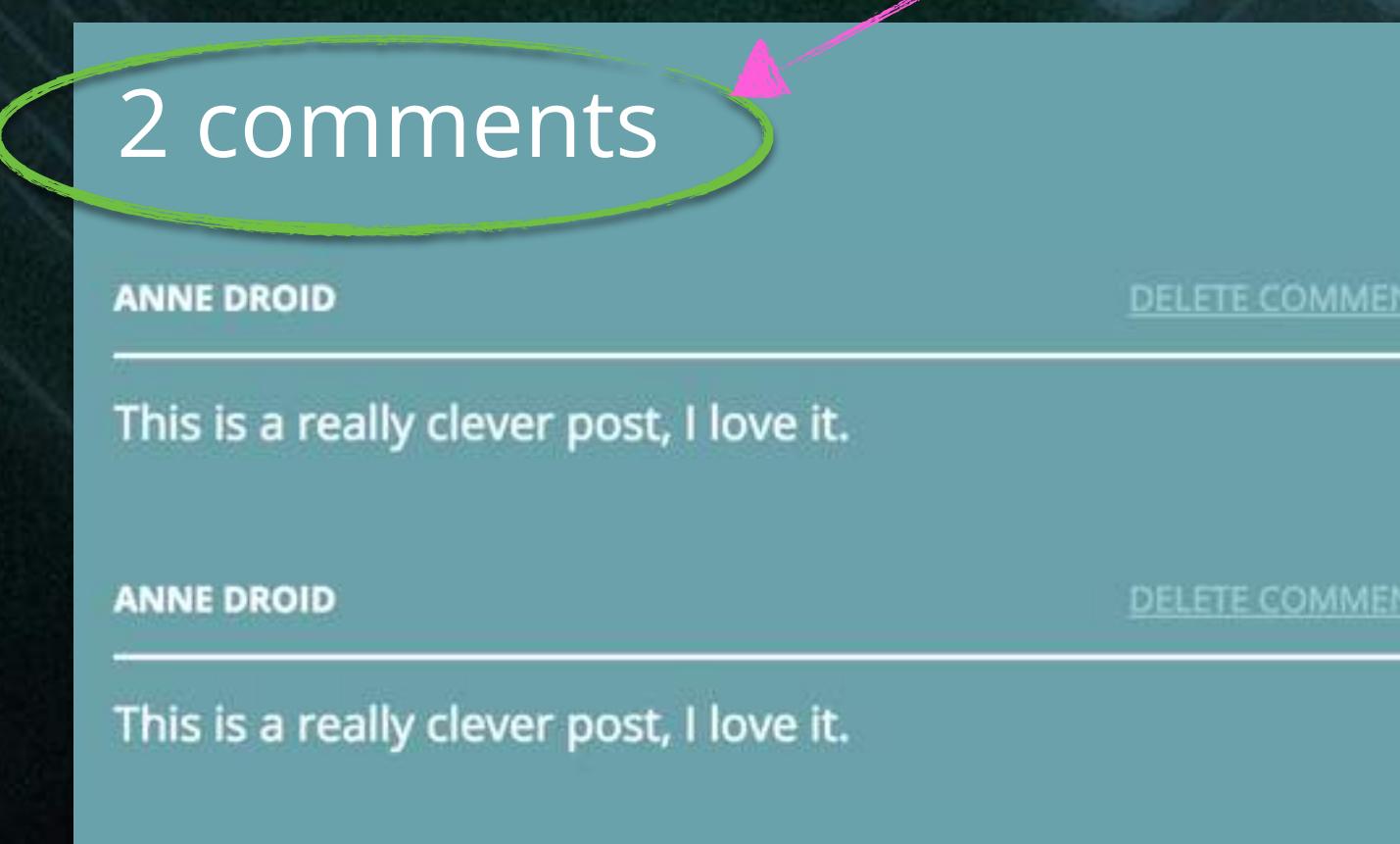
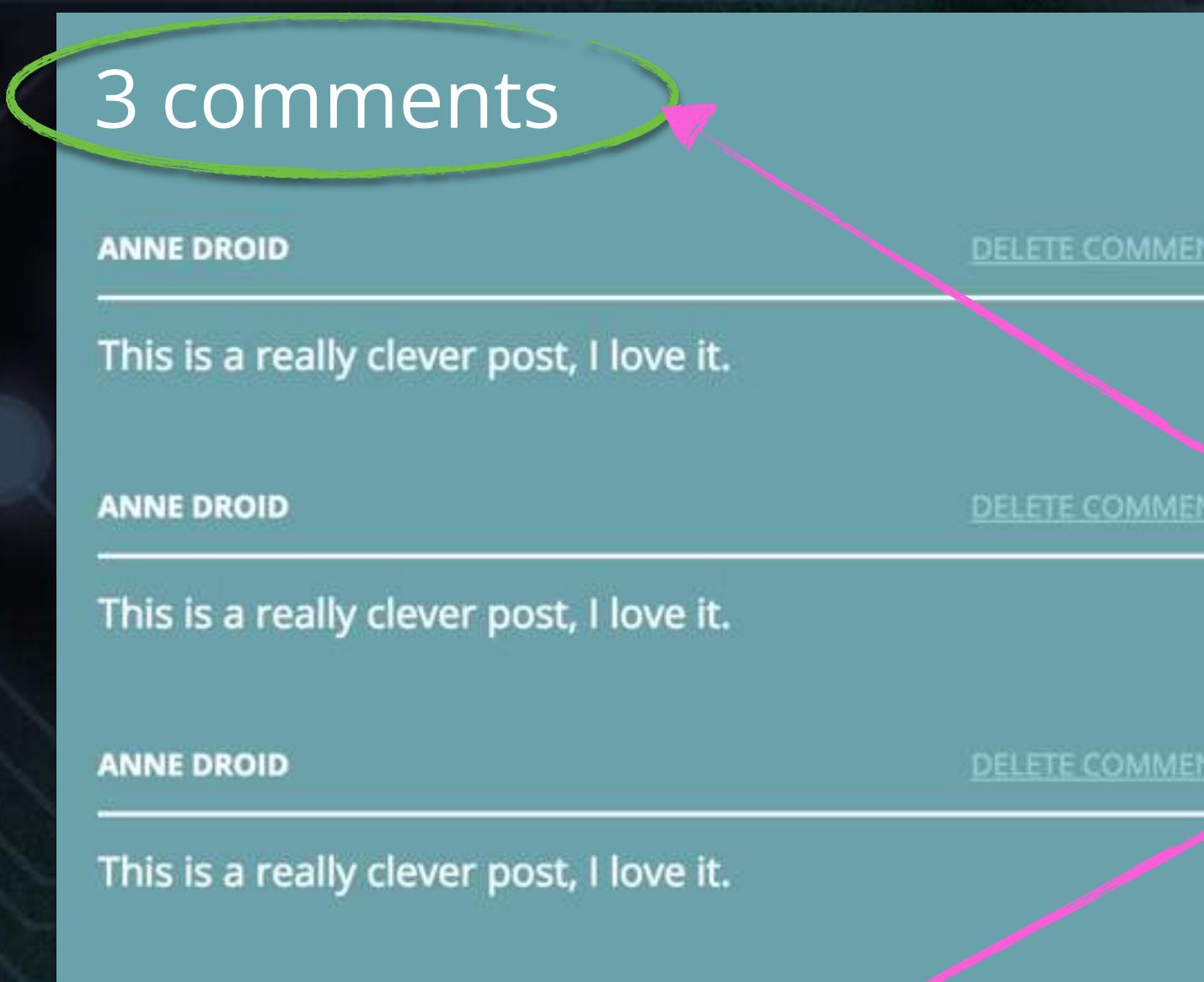
```
class CommentBox extends React.Component {  
  render() {  
    const comments = this._getComments();  
    return(  
      ...  
      <h4 className="comment-count">  
        {this._getCommentsTitle(comments.length)}  
      </h4>  
      ...  
    );  
  }  
  
  _getCommentsTitle(commentCount) { ... }  
  ...  
}
```

Get proper title for
our component

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Title Issue Is Fixed

The title now handles different quantities of comments accordingly.



All are correct!

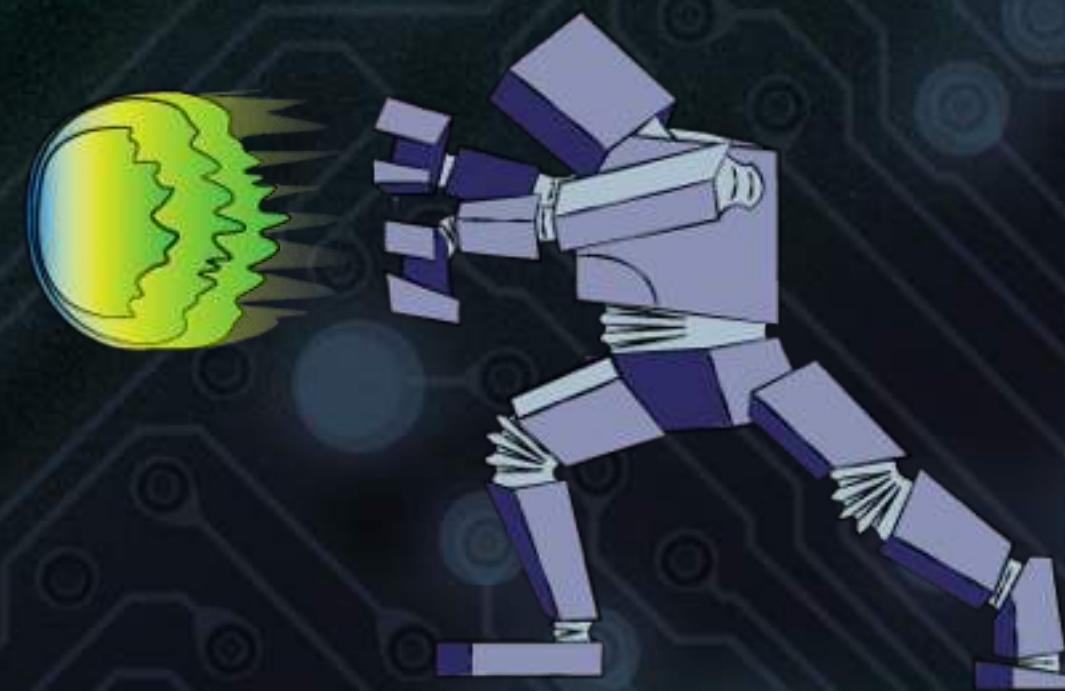
Quick Recap on Dynamic Props

Dynamic props can be a bit mind boggling. Here's a summary of what we learned.

How to pass dynamic props using variables

Used JavaScript to handle plural case on the title

How to map object arrays to JSX arrays for display purposes



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Level 3

Component State

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Level 3

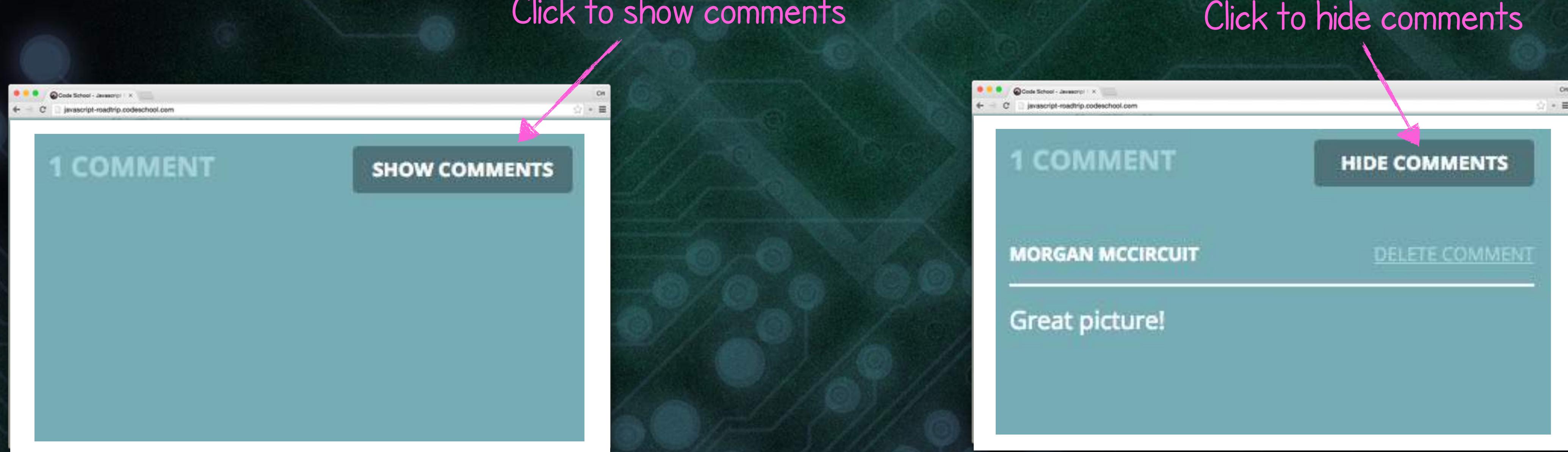
Component State

Handling Data Changes With State

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Show and Hide Comments

We'd like to add a button to the page that will let users toggle the comments.



How can we show and hide comments
based on button clicks?

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Different Ways to Manipulate the DOM

1. Direct DOM Manipulation

jQuery, Backbone, etc.

2. Indirect DOM Manipulation

React

Direct DOM Manipulation

One way to manipulate the DOM API is by modifying it **directly** via JavaScript in response to browser events.

Events → DOM updates

User code does this.

Example using jQuery:

```
$('.show-btn').on('click', function() {
  $('.comment-list').show();
})

$('.hide-btn').on('click', function() {
  $('.comment-list').hide();
})
```

Manually manipulating the DOM

Indirect DOM Manipulation

In React, we **don't modify the DOM directly**. Instead, we modify a component state object in response to user events and let React handle updates to the DOM.

Events → Update state → DOM updates

User code does this.

React does this.

Example using React:

```
render() {  
  if (this.state.showComments) {  
    // code displaying comments  
  } else {  
    // code hiding comments  
  }  
}
```

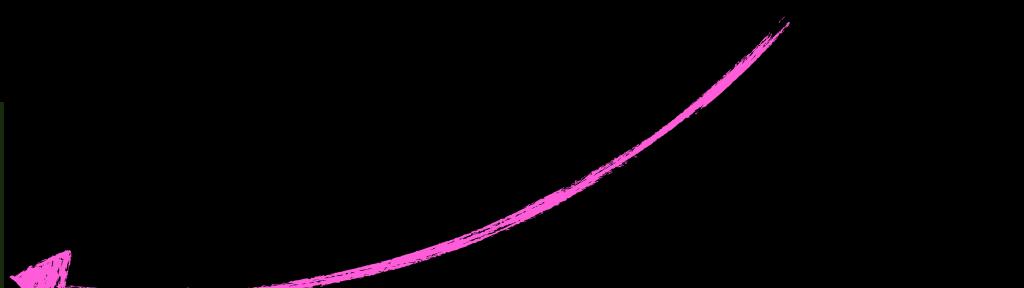
Display logic based on state

How to Use State in a Component

The **state** is a JavaScript object that lives inside each component. We can access it via *this.state*.

```
class CommentBox extends React.Component {  
  ...  
  render() {  
    const comments = this._getComments();  
    if (this.state.showComments) {  
      // add code for displaying comments  
    }  
    return(  
      <div className="comment-box">  
        <h4 className="h4">{this._getCommentsTitle(comments.length)}</h4>  
        <div className="comment-list">{comments}</div>  
      </div>  
    );  
  }  
  ...  
}
```

Create list of comments if state is true.



We also need to move these comments into the conditional.



Showing Comments Only if State Is *true*



```
class CommentBox extends React.Component {  
  ...  
  render() {  
    const comments = this._getComments();  
    let commentNodes;  
    if (this.state.showComments) {  
      commentNodes = <div className="comment-list">{comments}</div>;  
    }  
    return (  
      <div className="comment-box">  
        <h4 className="h4">{this._getCommentsTitle(comments.length)}</h4>  
        {commentNodes}  
      </div>  
    );  
  }  
  ...  
}
```

Now being displayed based on component's state!

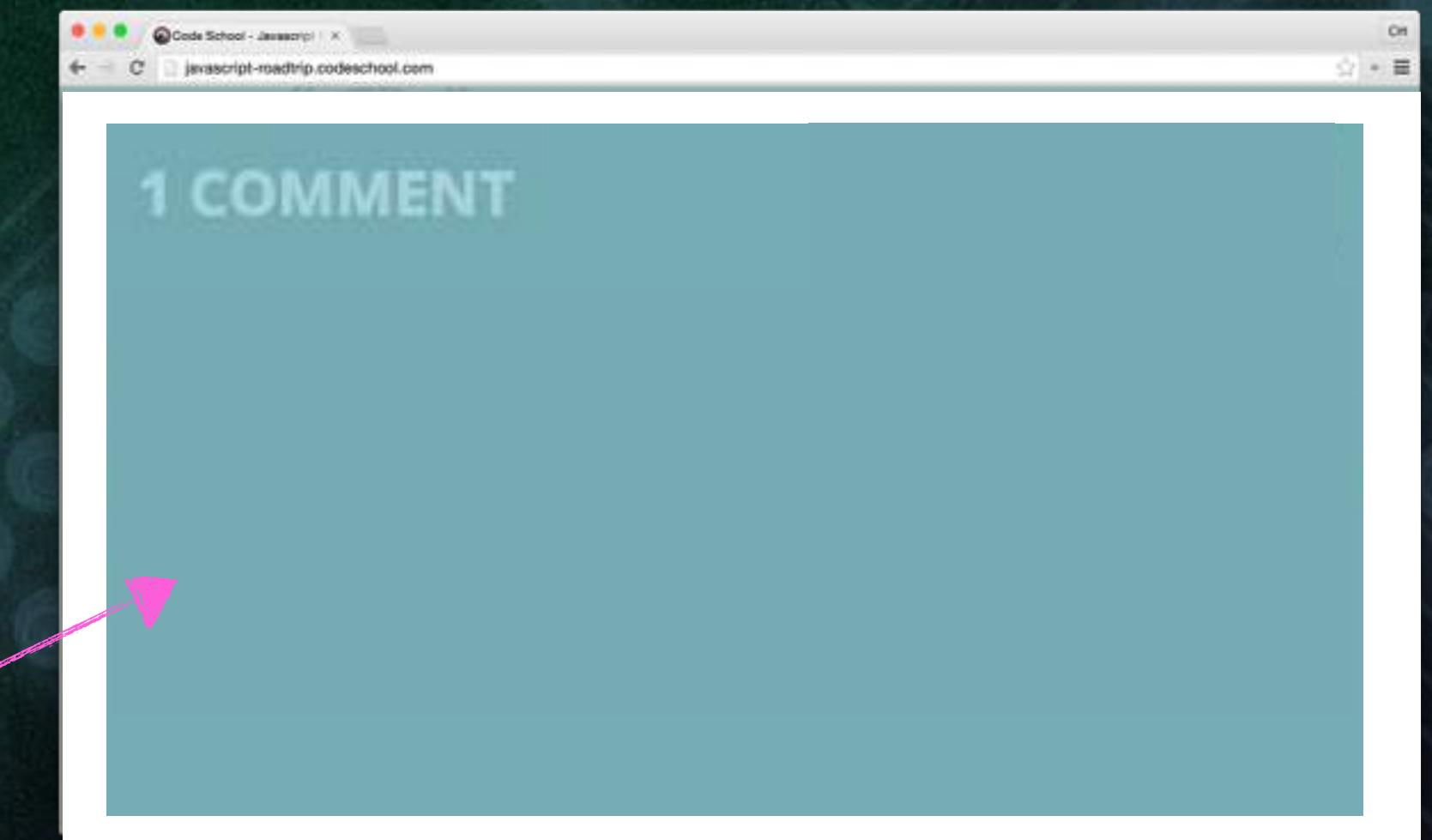
A pink arrow points from the explanatory text "Now being displayed based on component's state!" down towards the highlighted code block.

Hiding Comments on the Initial State

We set the initial state of our component in the class constructor.

```
class CommentBox extends React.Component {  
  
  constructor() {  
    super(); ←  
  
    this.state = {  
      showComments: false  
    };  
  }  
  
  render() {  
    ...  
  }  
  ...  
}  
  
Initial state hides comments.
```

super() must be called in our constructor.



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How to Update a Component's State

We don't assign to the state object directly — instead, we call `setState` by passing it an object.

Setting state this way won't work.

```
this.state.showComments = true
```



Updates the `showComments` property
and re-renders component

```
this.setState({ showComments: true })
```



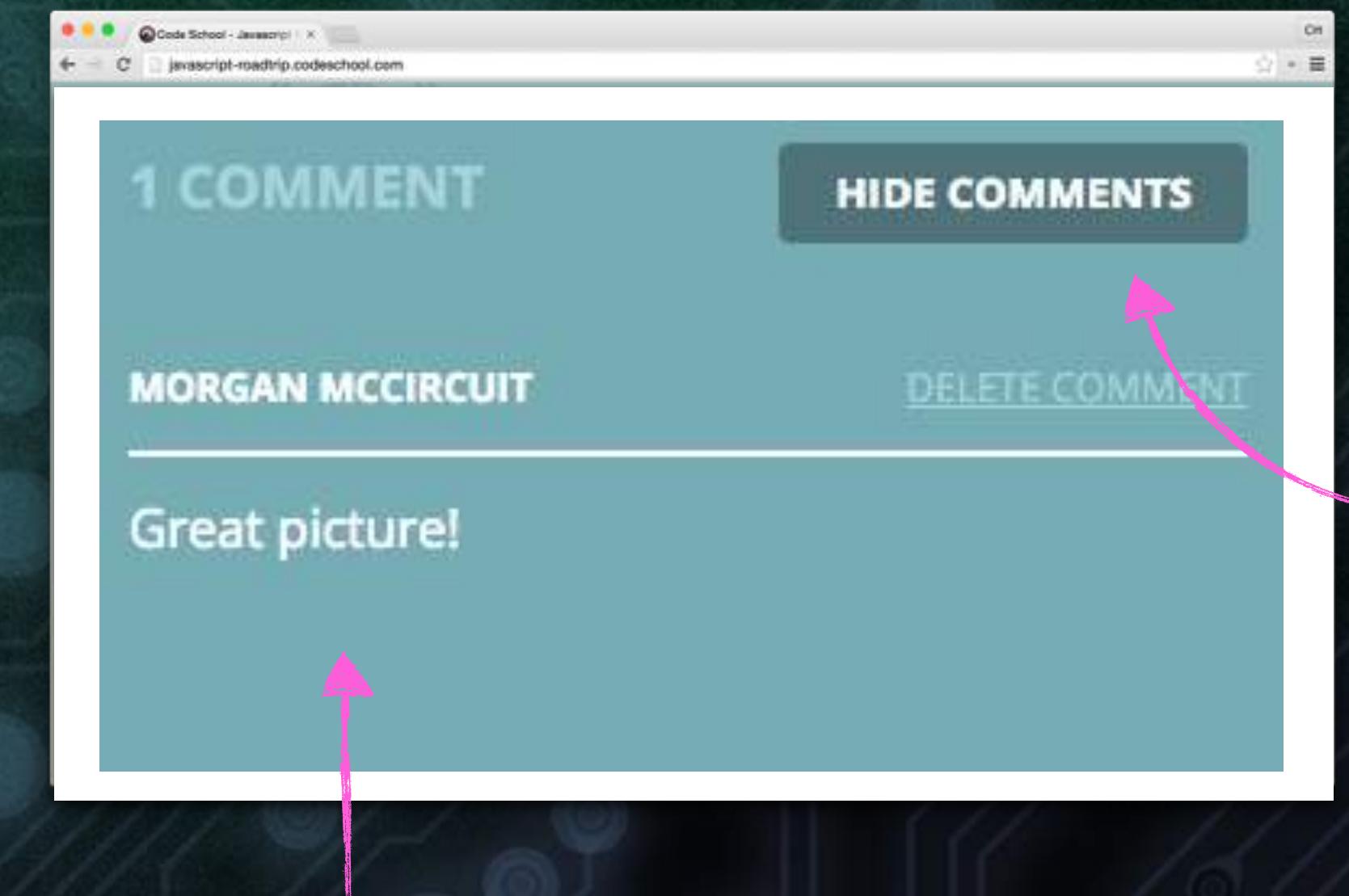
Calling `setState` **will only update** the properties passed as an argument, not replace the entire `state` object.

Causing State Change

State changes are usually triggered by user interactions with our app.

Things that could cause state change:

- Button clicks
- Link clicks
- Form submissions
- AJAX requests
- And more!



Loading comments from a remote server can also cause a change of state.

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Button clicks can cause a change of state.

Handling Click Events

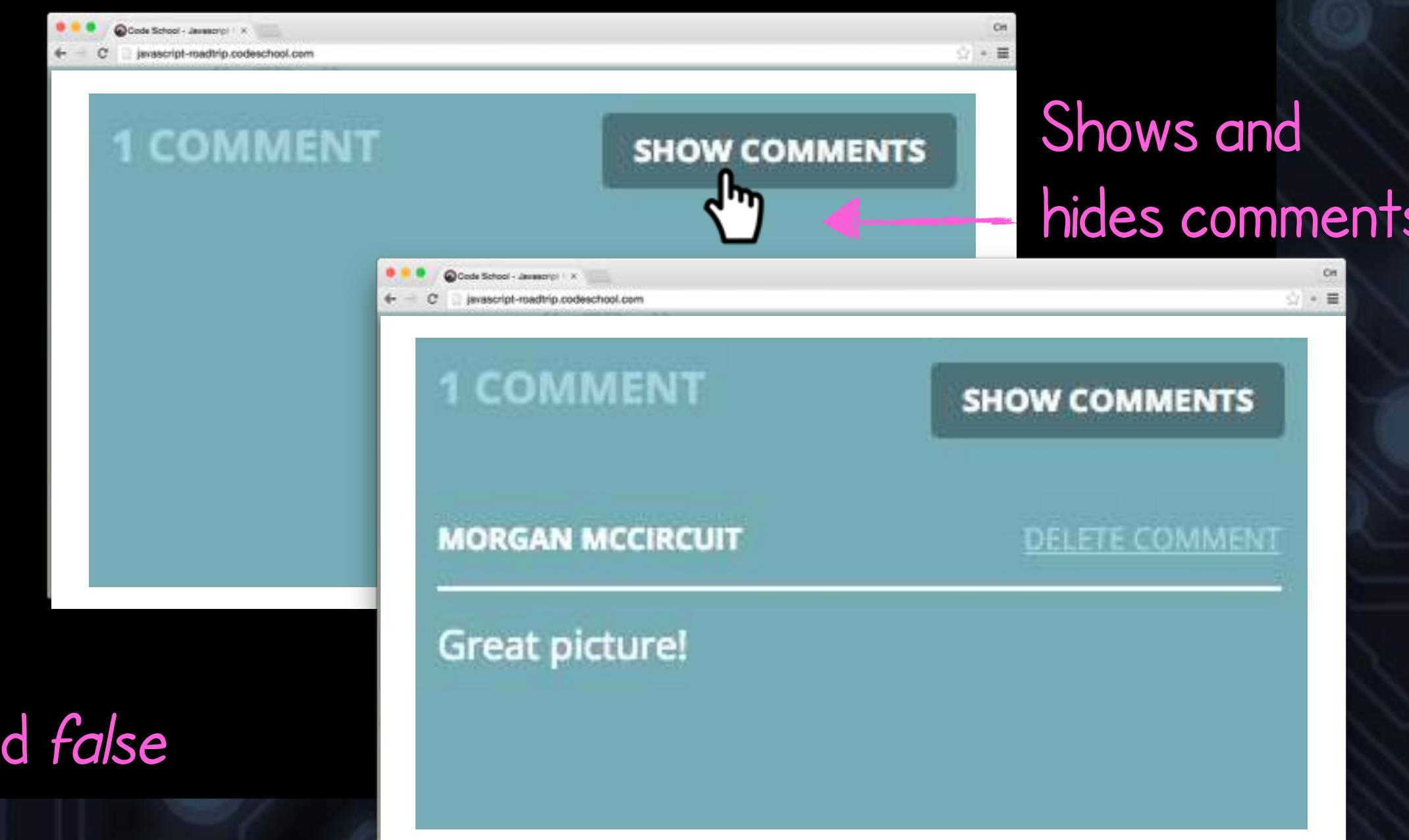
Let's add a button that will toggle the `showComments` state when a click event is fired.

```
class CommentBox extends React.Component { ...  
render() {  
  ...  
  return(  
    ...  
    <button onClick={this._handleClick.bind(this)}>Show comments</button>  
    ...  
  );  
}  
  
_handleClick() {  
  this.setState({  
    showComments: !this.state.showComments  
  });  
}  
}
```

Button that will toggle state on click event

Button click calls `_handleClick()`

Toggles state of `showComments` between `true` and `false`



Button Text Logic Based on State

We can switch the button text based on the component's state.

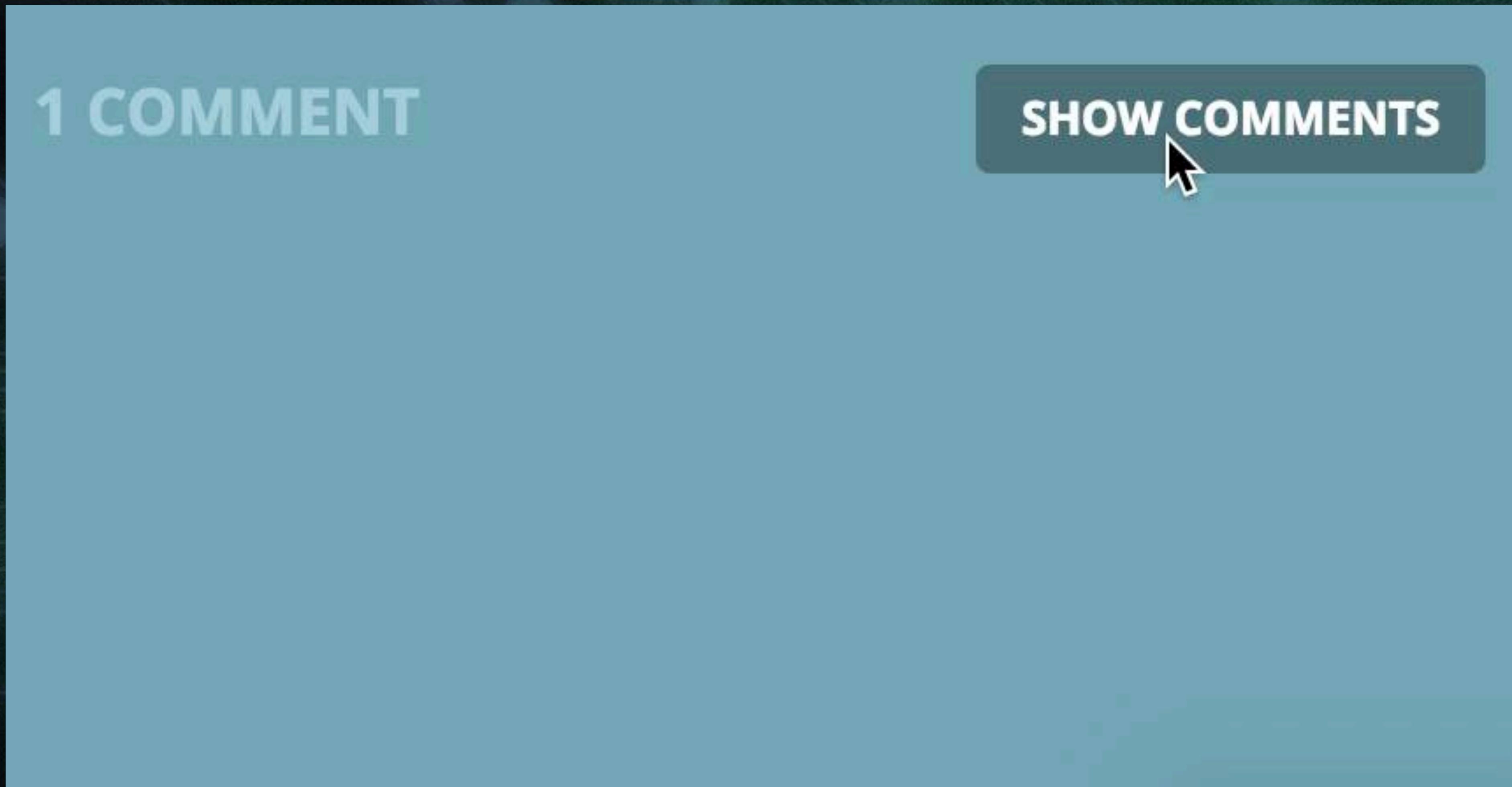
```
class CommentBox extends React.Component { ...  
render() {  
  ...  
  let buttonText = 'Show comments';  
  
  if (this.state.showComments) {  
    buttonText = 'Hide comments'; ←  
    ...  
  }  
  
  return(  
    ...  
    <button onClick={this._handleClick.bind(this)}>{buttonText}</button>  
    ...  
  );  
}  
...  
}
```

Switch button text based on current state

Renders button with according text

Demo: Hide and Show Comments

Our app shows and hides comments when the button is clicked.



Quick Recap on State

The state is a vital part of React apps, making user interfaces interactive.

State represents data that changes over time.

We declare an **initial state** in the component's constructor.

We update state by calling *this.setState()*.

Calling *this.setState()* causes our component to re-render.



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Level 4

Synthetic Events

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Level 4

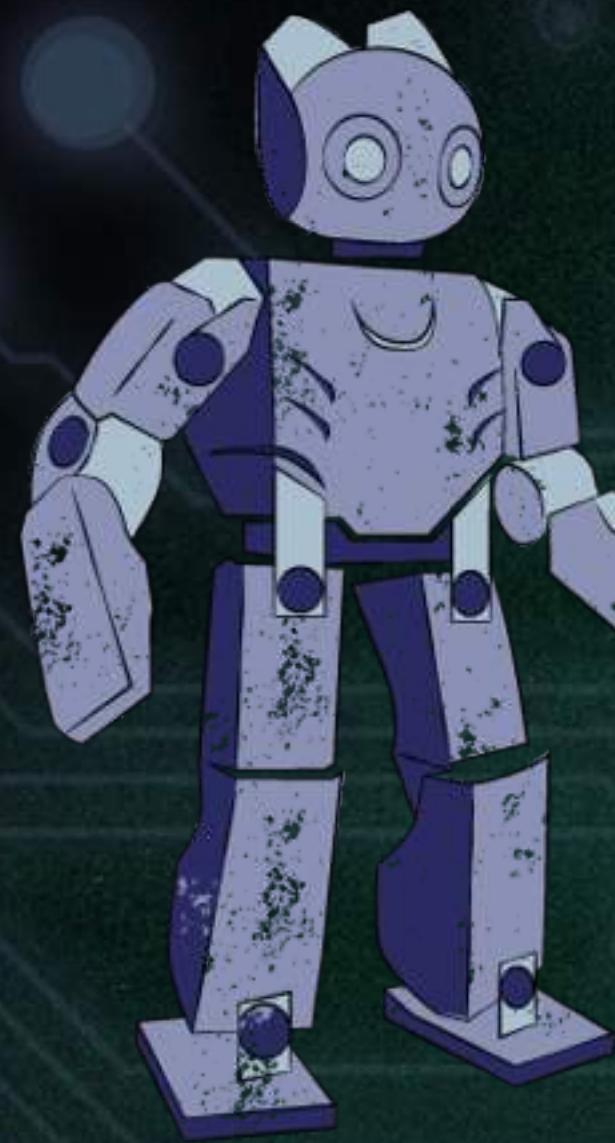
Synthetic Events

Capturing User Actions

POWERING UP
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REACT

Adding New Comments

We want to let users add new comments to our app.



CommentForm

New component

How should we build
this new form in React?

The image shows a user interface for adding comments. At the top, a banner says "JOIN THE DISCUSSION". Below it, a "NEW COMMENT" section has fields for "Name:" and "Comment:", both currently empty. A yellow "POST COMMENT" button is below these. At the bottom, a "1 COMMENT" section shows a single comment and a "SHOW COMMENTS" button. In the top right corner of the main area, there are three interlocking gears.

JOIN THE DISCUSSION

NEW COMMENT

Name:

Comment:

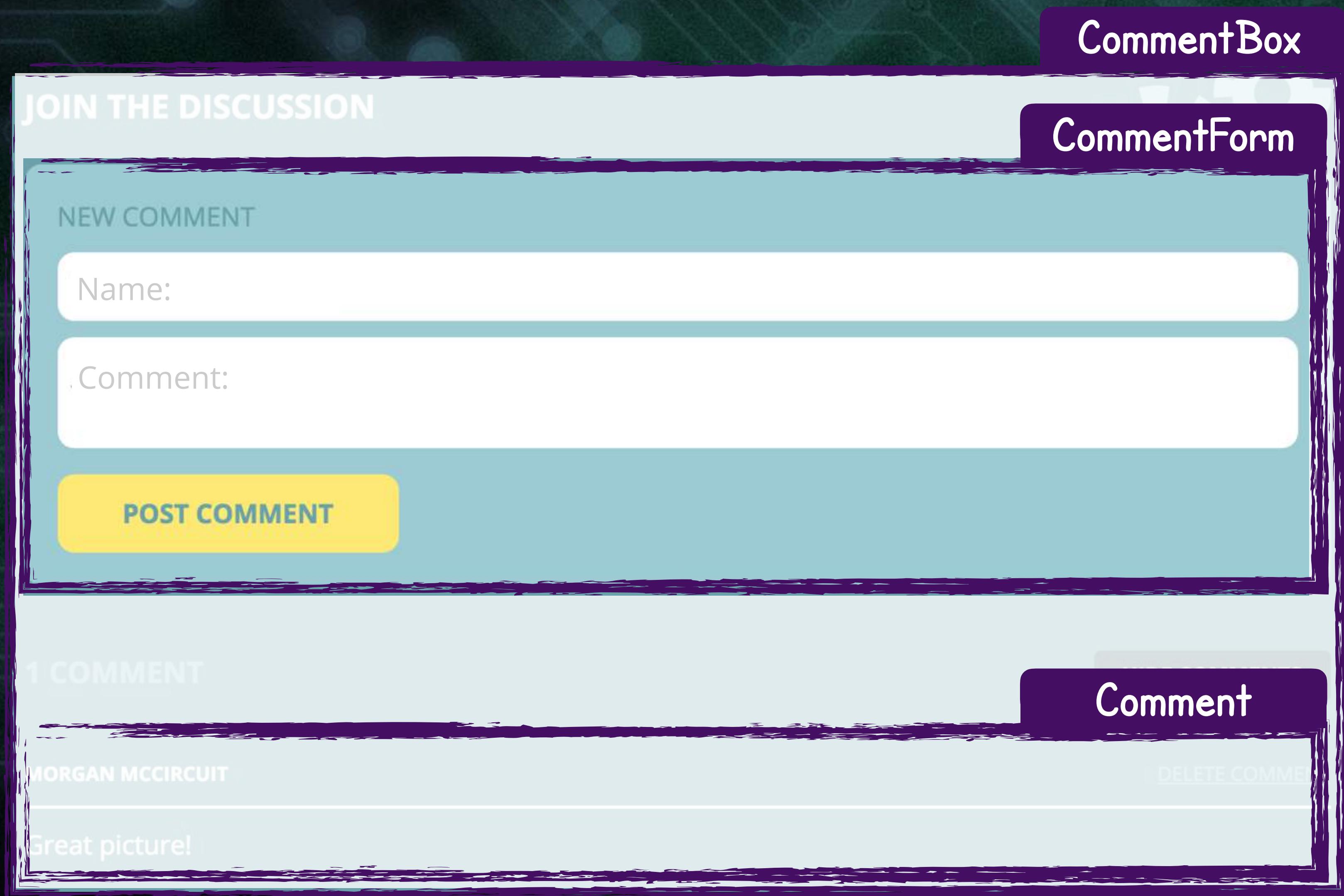
POST COMMENT

1 COMMENT

SHOW COMMENTS

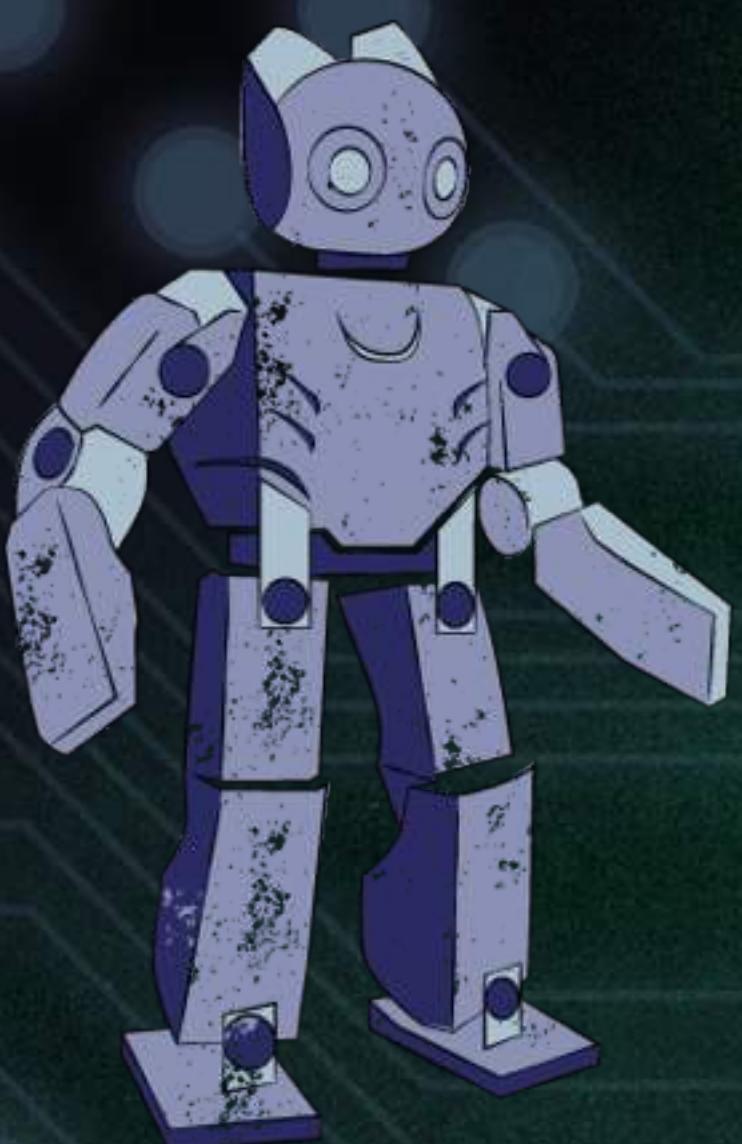
New Component: *CommentForm*

CommentForm is a new component that will allow users to add comments to our app.



this is what we're
building

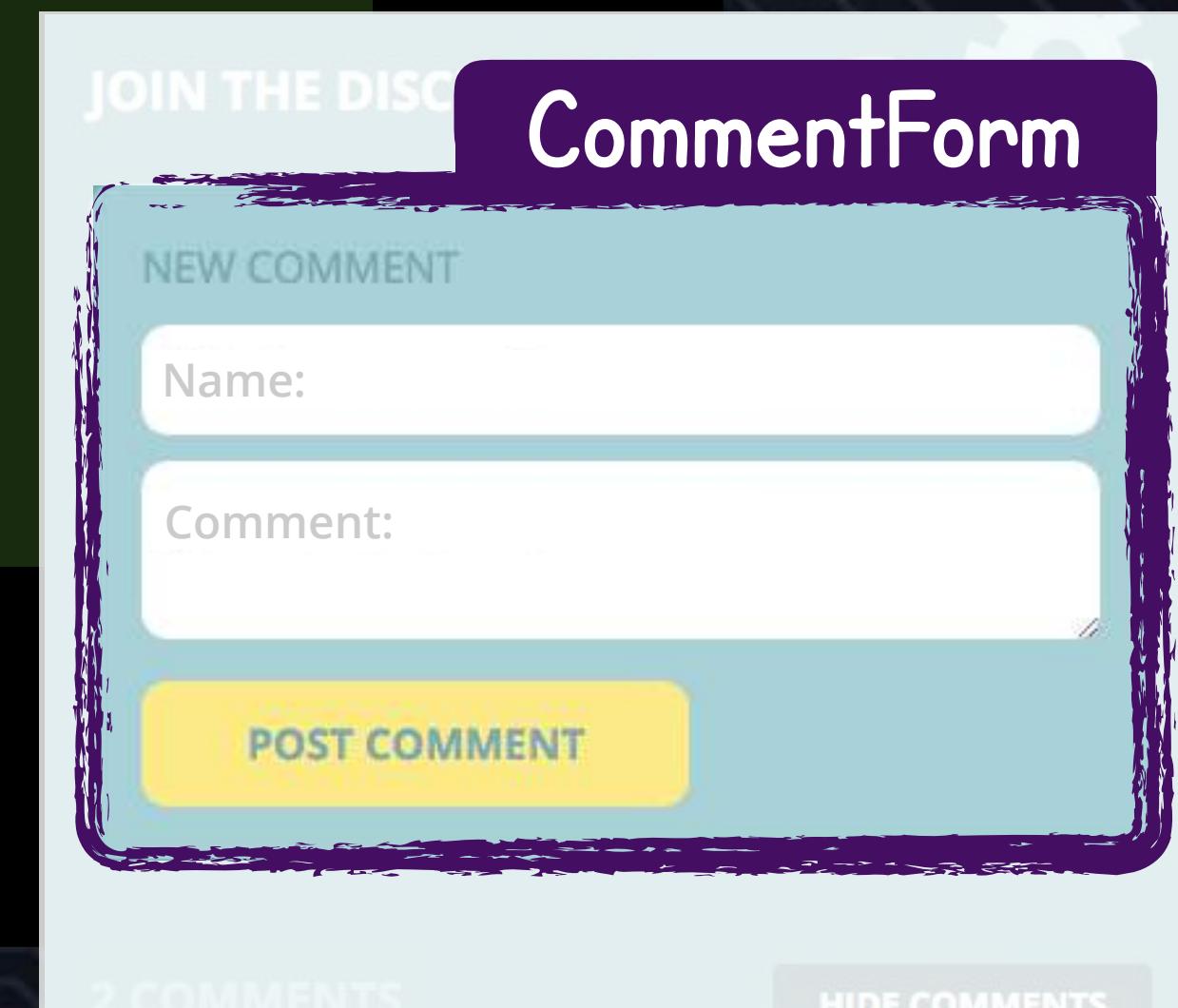
Coding the *CommentForm* Component



CommentForm

```
class CommentForm extends React.Component {  
  render() {  
    return (  
      <form className="comment-form">  
        <label>Join the discussion</label>  
        <div className="comment-form-fields">  
          <input placeholder="Name:"/>  
          <textarea placeholder="Comment:"></textarea>  
        </div>  
        <div className="comment-form-actions">  
          <button type="submit">  
            Post comment  
          </button>  
        </div>  
      </form>  
    );  
  }  
}
```

JSX markup for CommentForm



Adding an Event Listener to Our Form

To add an event listener to the form, we use the `onSubmit` prop and pass a handler to it.

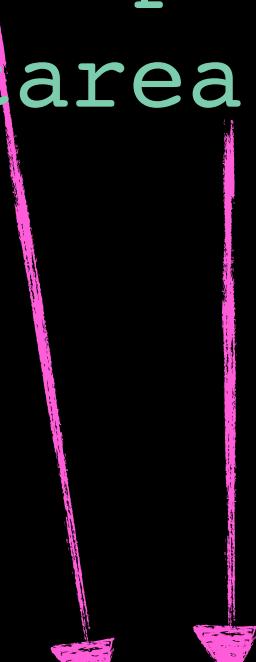
```
class CommentForm extends React.Component {  
  render() {  
    return (  
      <form className="comment-form" onSubmit={this._handleSubmit.bind(this)}>  
        ...  
        <input placeholder="Name:" />  
        <textarea placeholder="Comment:"></textarea>  
        ...  
      </form>  
    );  
  }  
  
  _handleSubmit(event) {  
    event.preventDefault(); ← Prevents page from reloading  
  }  
}
```

→ Adds an event listener to the submit event

→ Don't forget to bind event handlers, otherwise this will not work!

Problem: Can't Access User Input in `handleSubmit()`

```
class CommentForm extends React.Component {  
  render() {  
    return (  
      <form className="comment-form" onSubmit={this._handleSubmit.bind(this)}>  
        ...  
        <input placeholder="Name:" />  
        <textarea placeholder="Comment:"></textarea>  
        ...  
      </form>  
    );  
  }  
  
  _handleSubmit(event) {  
    event.preventDefault();  
  }  
}
```



No way to access input and text area from submit handler

Accessing Form Data From Handler

We can use `refs` to assign form values to **properties** on the component object.

```
class CommentForm extends React.Component {
  render() {
    return (
      <form className="comment-form" onSubmit={this._handleSubmit.bind(this)}>
        ...
        <input placeholder="Name:" ref={(input) => this._author = input} />
        <textarea placeholder="Comment:" ref={(textarea) => this._body = textarea}>
          </textarea>
        ...
      </form>
    );
  }
  _handleSubmit(event) {
    event.preventDefault();
  }
}
```



We'll use these `refs` to access values from the input elements.

What Setting the *refs* Is Actually Doing

```
<input placeholder="Name:" ref={(input) => this._author = input}/>
```

is the same as

```
<input placeholder="Name:" ref={
```

creates new class property
named `_author`

DOM element passed into callback

```
    function(input) {  
      this._author = input;  
    }.bind(this)  
  } />
```

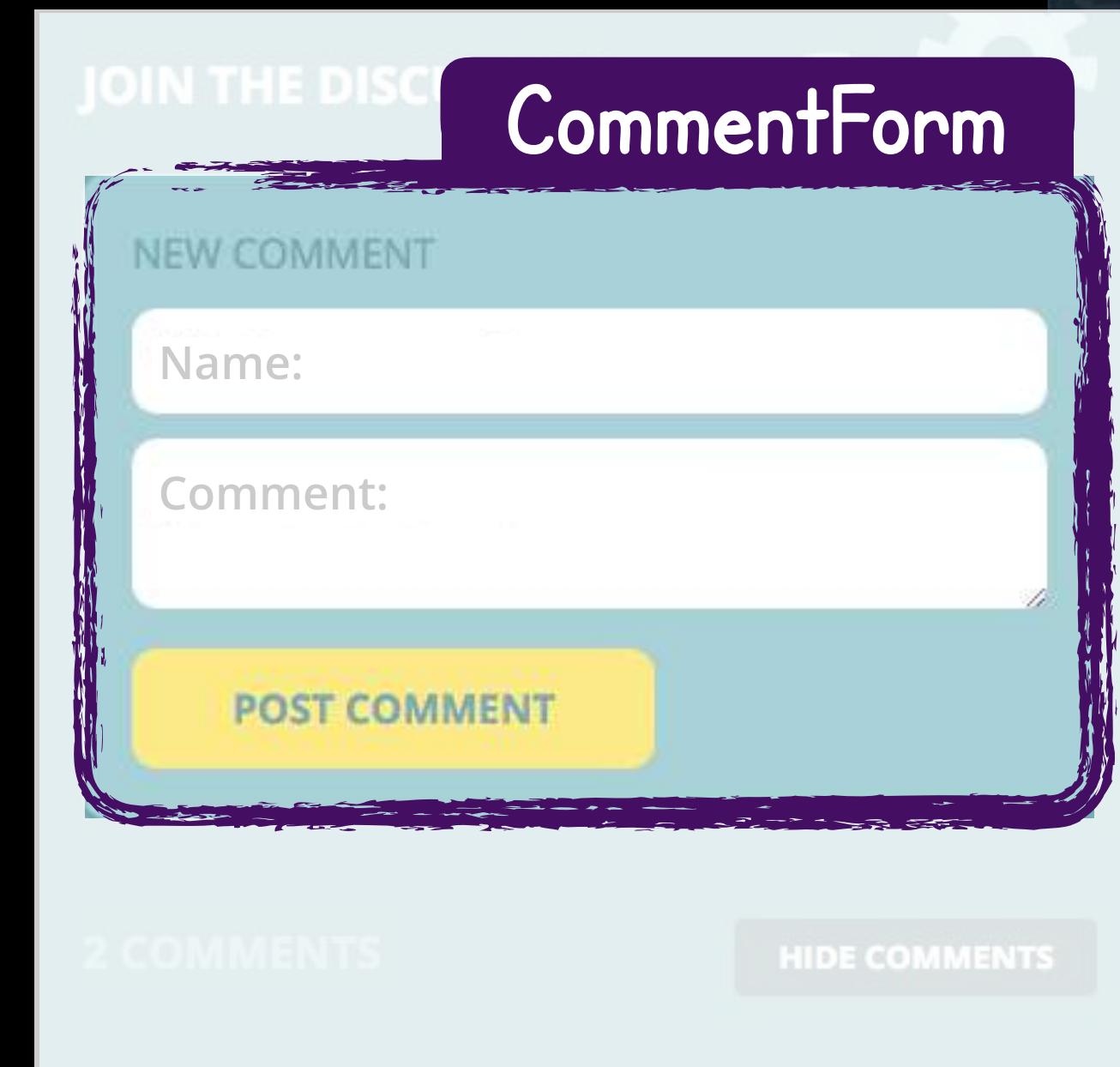
this refers to CommentForm.

Note: React runs *ref* callbacks on render.

Passing the User Input to the *CommentBox*

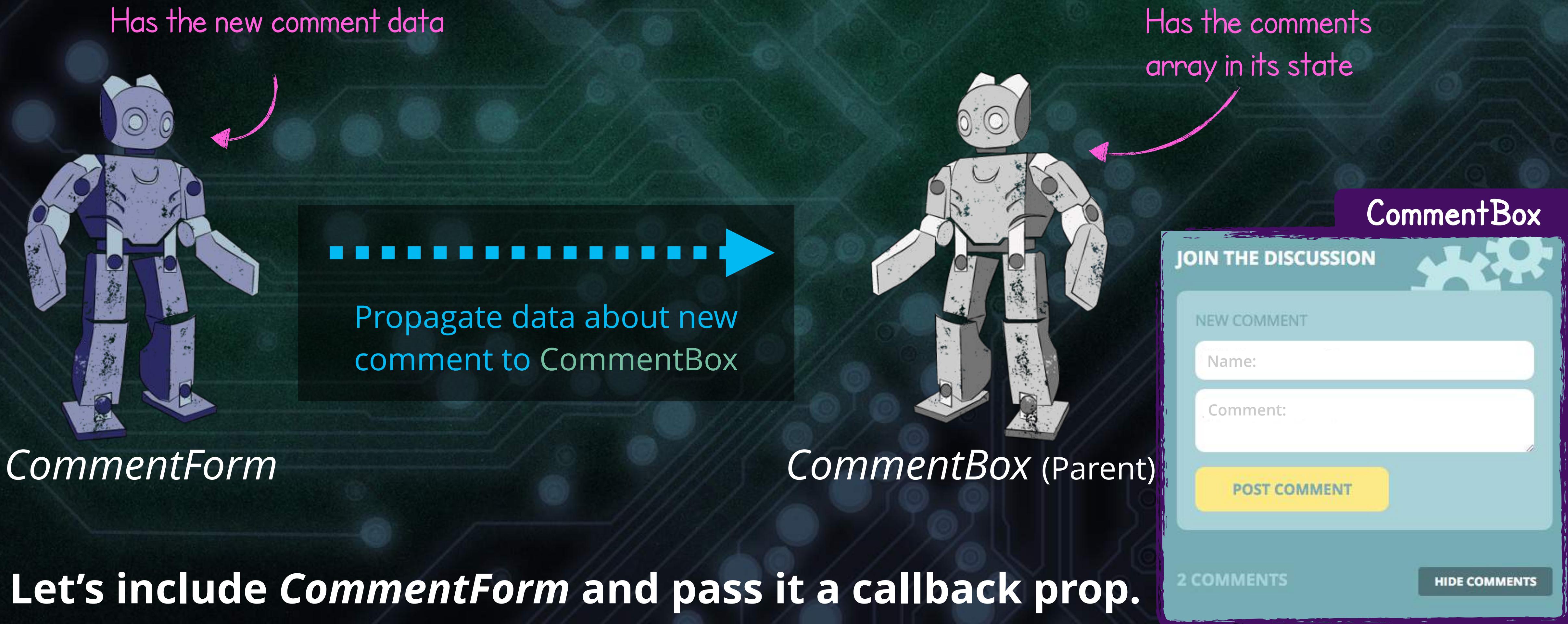
```
class CommentForm extends React.Component {  
  render() {  
    return (  
      ...  
      <input placeholder="Name:" ref={(input) => this._author = input}/>  
      <textarea placeholder="Comment:" ref={(textarea) => this._body = textarea}>  
      ...  
    );  
  }  
  _handleSubmit(event) {  
    event.preventDefault();  
  
    let author = this._author; ← Populated from refs in JSX  
    let body = this._body; ←  
  
    this.props.addComment(author.value, body.value);  
  }  
}
```

This method has been passed as an argument.



Data About Comments Lives in *CommentBox*

The array of comments is part of the *CommentBox* component, so we need to propagate new comments from *CommentForm* over to *CommentBox*.



Using *CommentForm* to Add Comments

Functions in JavaScript are **first-class citizens**, so we can pass them as **props** to other components.

```
class CommentBox extends React.Component { ...  
  render() {  
    return(  
      <div className="comment-box">  
        <CommentForm addComment={this._addComment.bind(this)} />  
        ...  
      </div>  
    );  
  }  
  
  _addComment(author, body) {  
    ...  
  }  
}
```

animate first

Using the newly created *CommentForm* component...

...and passes it to the *CommentForm* component.

animate second

...gets triggered by *CommentForm* when a new comment is added.



Adding Functionality to Post Comments

```
class CommentBox extends React.Component { ...  
  render() {  
    return(  
      <div className="comment-box">  
        <CommentForm addComment={this._addComment.bind(this)} />  
        ...  
      </div>  
    );  
  }  
  ...  
  _addComment(author, body) {  
    const comment = {  
      id: this.state.comments.length + 1,  
      author,  
      body  
    };  
    this.setState({ comments: this.state.comments.concat([comment]) });  
  }  
}
```

New comment object

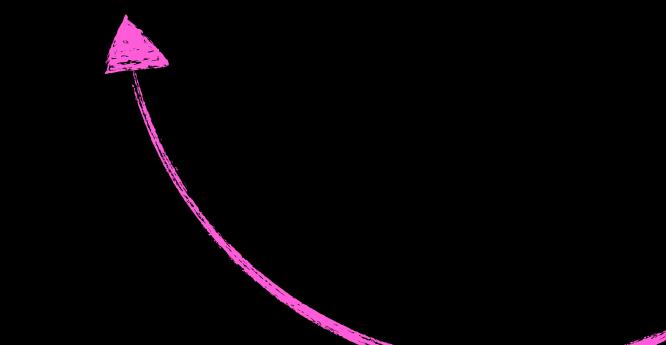
New array references help React stay fast. So concat works better than push here.

Updates state when function is called by adding new comment

Comments Are Not Part of the State

Currently, we're defining an array every time the `_getComments` method is called. Let's move this data to the **state**.

```
class CommentBox extends React.Component {  
  ...  
  _getComments() {  
    const commentList = [  
      { id: 1, author: 'Morgan McCircuit', body: 'Great picture!' },  
      { id: 2, author: 'Bending Bender', body: 'Excellent stuff' }  
    ];  
    ...  
  }  
}
```



Defining a variable can help us with prototyping,
but it's time to change this!

Moving Comments to the State

Since comments will **change over time**, they should be part of the component's state.

```
class CommentBox extends React.Component {  
  
  constructor() {  
    super();  
  
    this.state = {  
      showComments: false,  
      comments: [  
        { id: 1, author: 'Morgan McCircuit', body: 'Great picture!' },  
        { id: 2, author: 'Bending Bender', body: 'Excellent stuff' }  
      ]  
    };  
  }  
  ...  
}
```



Now part of the component's state

Rendering Comments From the State

Let's use the comments from the state object to render our component.

```
class CommentBox extends React.Component {  
  ...  
  _getComments() {  
    return this.state.comments.map(comment) => {  
      return (  
        <Comment  
          author={comment.author}  
          body={comment.body}  
          key={comment.id} />  
      );  
    } );  
  }  
}
```

Reading from component's state

Demo: *CommentForm* Working

JOIN THE DISCUSSION



NEW COMMENT

What's your name?

Join the discussion...

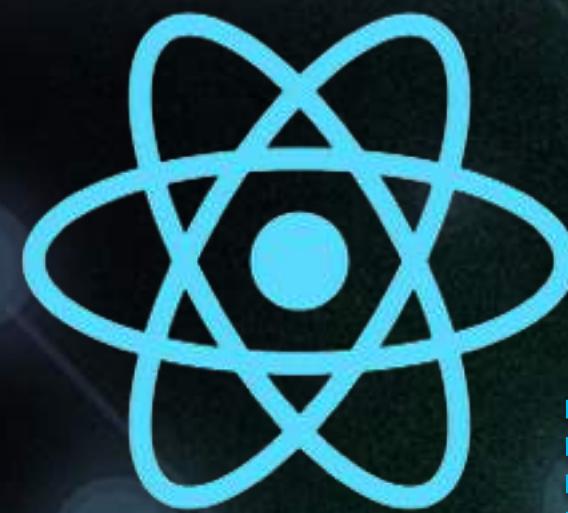
POST COMMENT

NO COMMENTS YET

HIDE COMMENTS

Review: Event Handling in React

In order to ensure events have **consistent properties across different browsers**, React wraps the browser's native events into **synthetic events**, consolidating browser behaviors into one API.



`onSubmit`

Synthetic event

`eventSubmit`

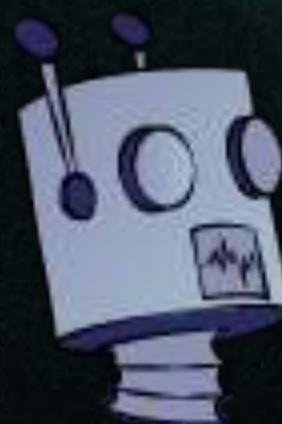
`submitEvent`

`theSubmitEvent`

`submitEvent`

Synthetic events are my jam!

Hypothetical different event handling with browsers



For the full list of browser events supported by React, visit <http://go.codeschool.com/react-events>

Quick Recap

We use React's event system to capture user input, including form submissions and button clicks.

Refs allow us to reference DOM elements in our code after the component has been rendered.

Parent components can pass callback functions as props to child components to allow two-way communication.

Synthetic events are a cross-browser wrapper around the browser's native event.



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Level 5

Talking to Remote Servers

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REACT

Level 5 – Section 1

Talking to Remote Servers

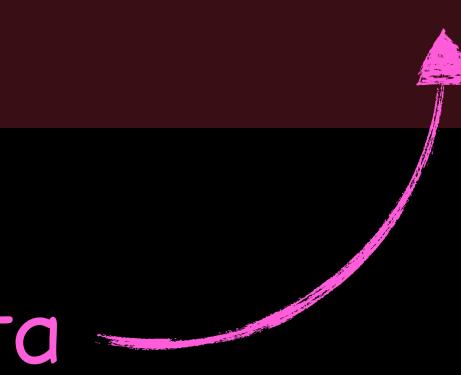
Using Lifecycle Methods to Load Comments

POWERING UP
with
REACT

Comments Are Static

In the real world, we'd want to pull comments from an API instead of hard-coding the data.

```
class CommentBox extends React.Component {  
  
  constructor() {  
    super();  
  
    this.state = {  
      showComments: false,  
      comments: [  
        { id: 1, author: 'Morgan McCircuit', body: 'Great picture!' },  
        { id: 2, author: 'Bending Bender', body: 'Excellent stuff' }  
      ]  
    };  
  }  
  ...  
}
```



Hard-coded data

Loading Comments From a Remote Server

Let's set the initial state of *comments* as an empty array so we can later populate it with data from an API server.

```
class CommentBox extends React.Component {  
  
  constructor() {  
    super();  
  
    this.state = {  
      showComments: false,  
      comments: [ ] ← Initialized to an empty array  
    };  
  }  
  ...  
}
```

Adding jQuery as a Dependency

jQuery will help us make Ajax requests. We can download it from the jQuery website and include it in our HTML page.

Project Folder

-  index.html
-  components.js
-  vendors
 -  react.js
 -  react-dom.js
 -  babel.js
 -  jquery.js

→ Download it from the jQuery website



```
<!DOCTYPE html>
<html>
  <body>
    <div id="story-app"></div>
    <script src="vendors/react.js"></script>
    <script src="vendors/react-dom.js"></script>
    <script src="vendors/jquery.js"></script>
    <script src="vendors/babel.js"></script>
    <script type="text/babel"
           src="components.js"></script>
  </body>
</html>
```



Brush up on your **Ajax skills** with
our jQuery: The Return Flight course

How to Fetch Data in a Component

Let's write a class method that will make Ajax requests in the *CommentBox* component.

```
class CommentBox extends React.Component {  
  ...  
  _fetchComments() {  
    jQuery.ajax({  
      method: 'GET',  
      url: '/api/comments',  
    });  
  }  
}
```

Makes call to the
remote server

Setting State With Data From a Remote Server

We call the `setState` method when data is received from the API server.

```
class CommentBox extends React.Component {  
  ...  
  _fetchComments() {  
    jQuery.ajax({  
      method: 'GET',  
      url: '/api/comments',  
      success: (comments) => {  
        this.setState({ comments })  
      }  
    });  
  }  
}
```

Arrow function preserves
the `this` binding to our class

...`this` refers to `CommentBox`

Deciding Where to Call `_fetchComments()`

```
...
class CommentBox extends React.Component {
  render() {
    ...
  }
  _fetchComments() {
    ...
  }
}
```

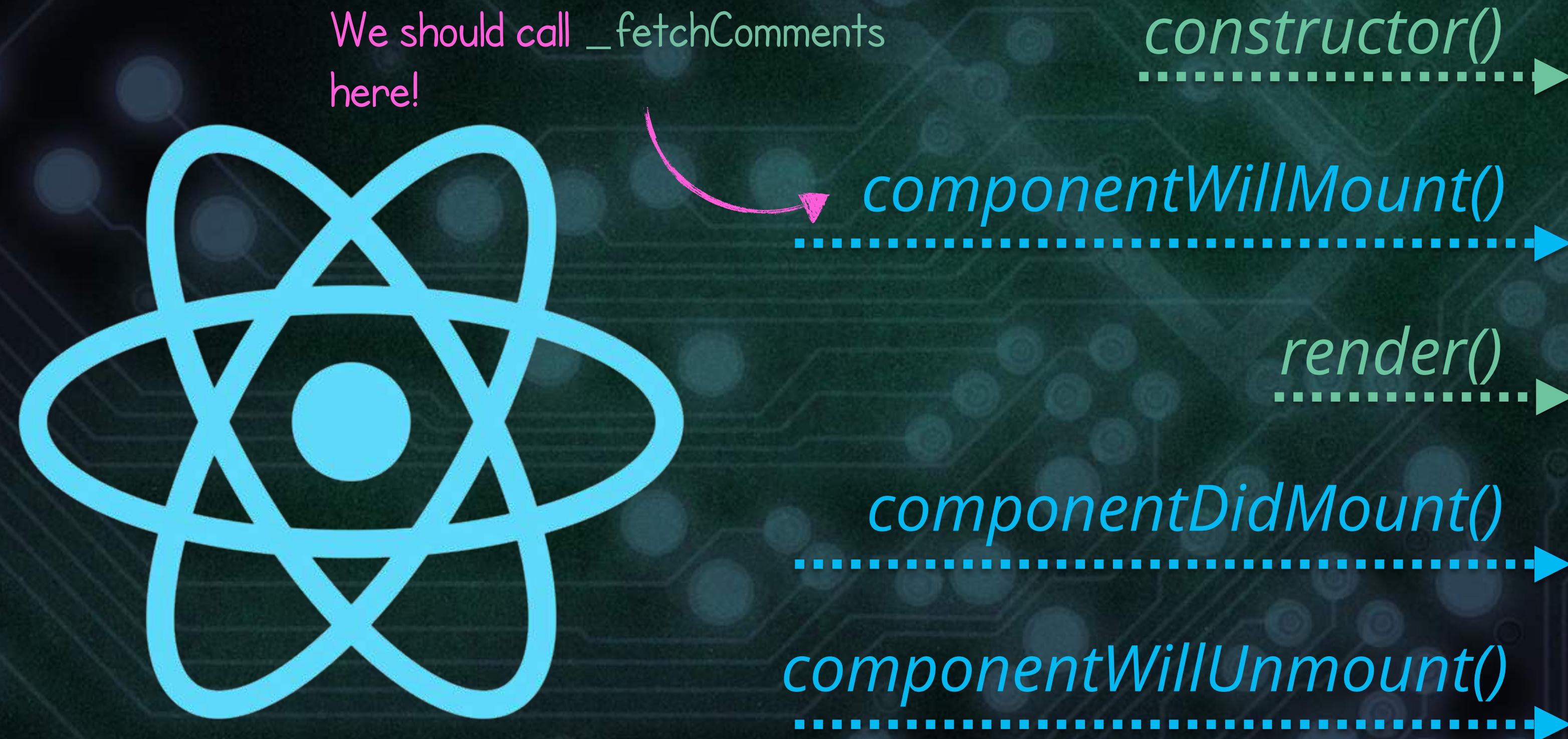
That means we can't call `_fetchComments()` from `render` – we'll get an infinite loop!

`fetchComments` calls
`setState`, which calls `render()`

We need to call `_fetchComments` before `render()` is called.

React's Lifecycle Methods

Lifecycle methods in React are functions that get called while the component is rendered for the first time or about to be removed from the DOM.



Note: In React, **mounting** means rendering for the first time.

For a full list of React's lifecycle methods, visit
<http://go.codeschool.com/react-lifecycle-methods>

Fetching Data on the Mounting Phase

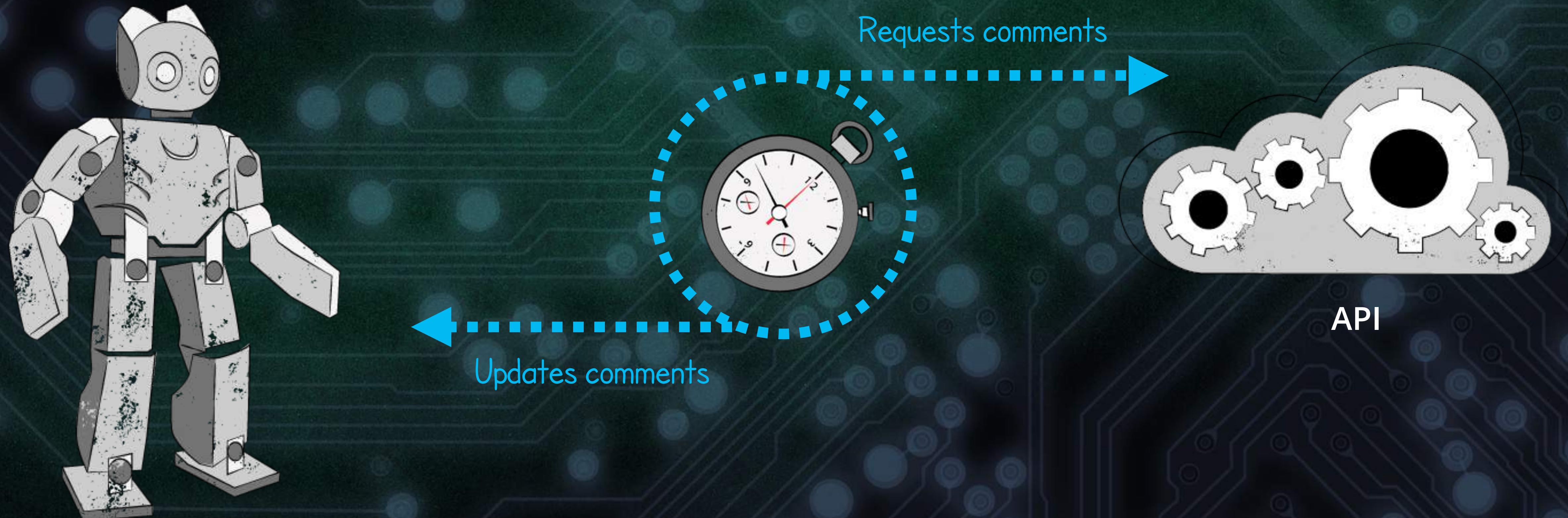
The `componentWillMount` method is called **before** the component is rendered to the page.

```
class CommentBox extends React.Component {  
  ...  
  componentWillMount() {  
    _fetchComments(); ←  
  }  
  
  _fetchComments() {  
    jQuery.ajax({  
      method: 'GET',  
      url: '/api/comments',  
      success: (comments) => {  
        this.setState({ comments })  
      }  
    });  
  }  
}
```

Fetch comments from server
before component is rendered.

Getting Periodic Updates

In order to check whether new comments are added, we can periodically check the server for updates. This is known as **polling**.



Polling Data on the Mounting Phase

The `componentDidMount` method is called **after** the component is rendered to the page.

```
...
class CommentBox extends React.Component {
  ...
  componentDidMount() {
    setInterval(() => this._fetchComments(), 5000);
  }
}
```

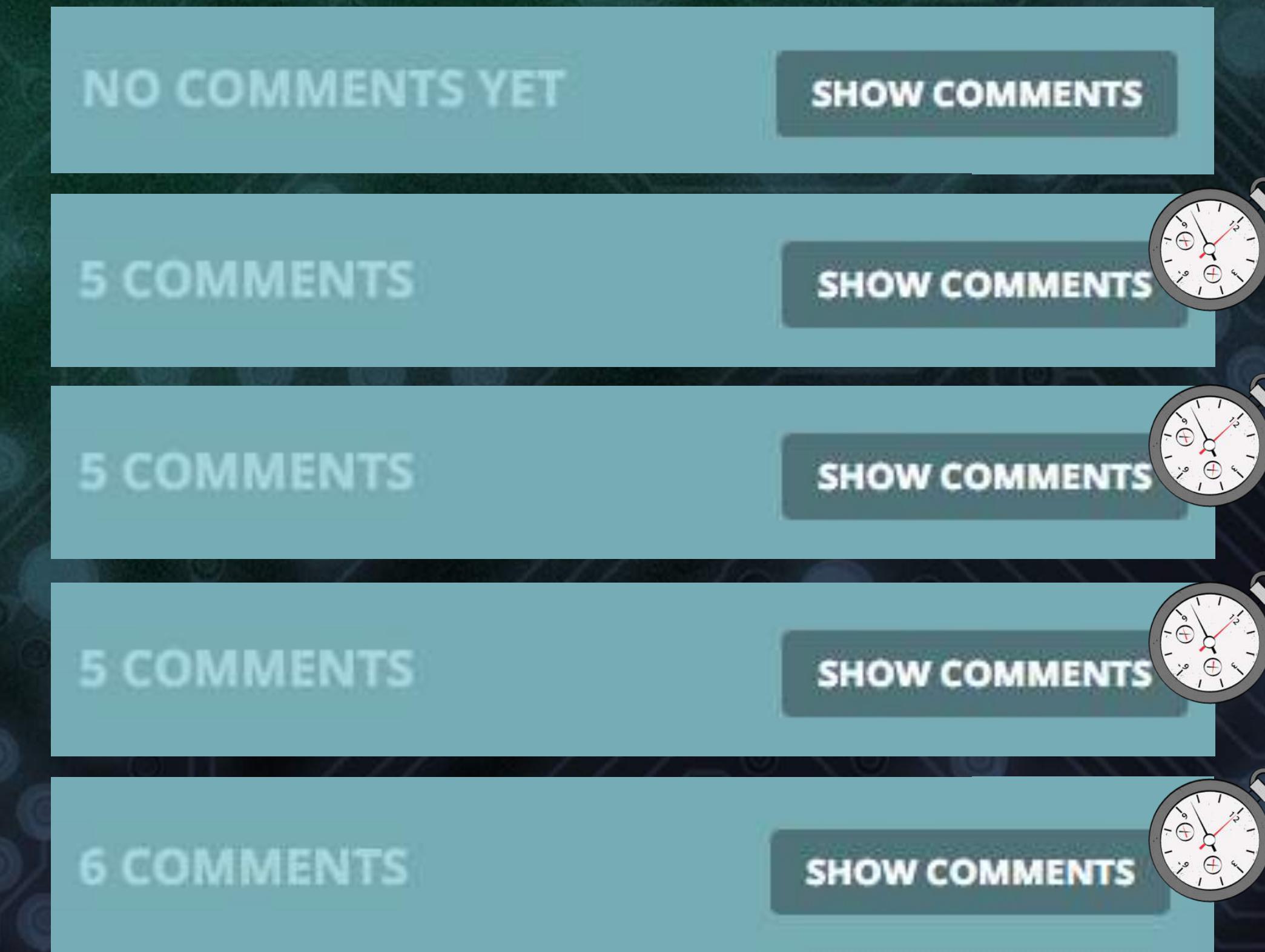
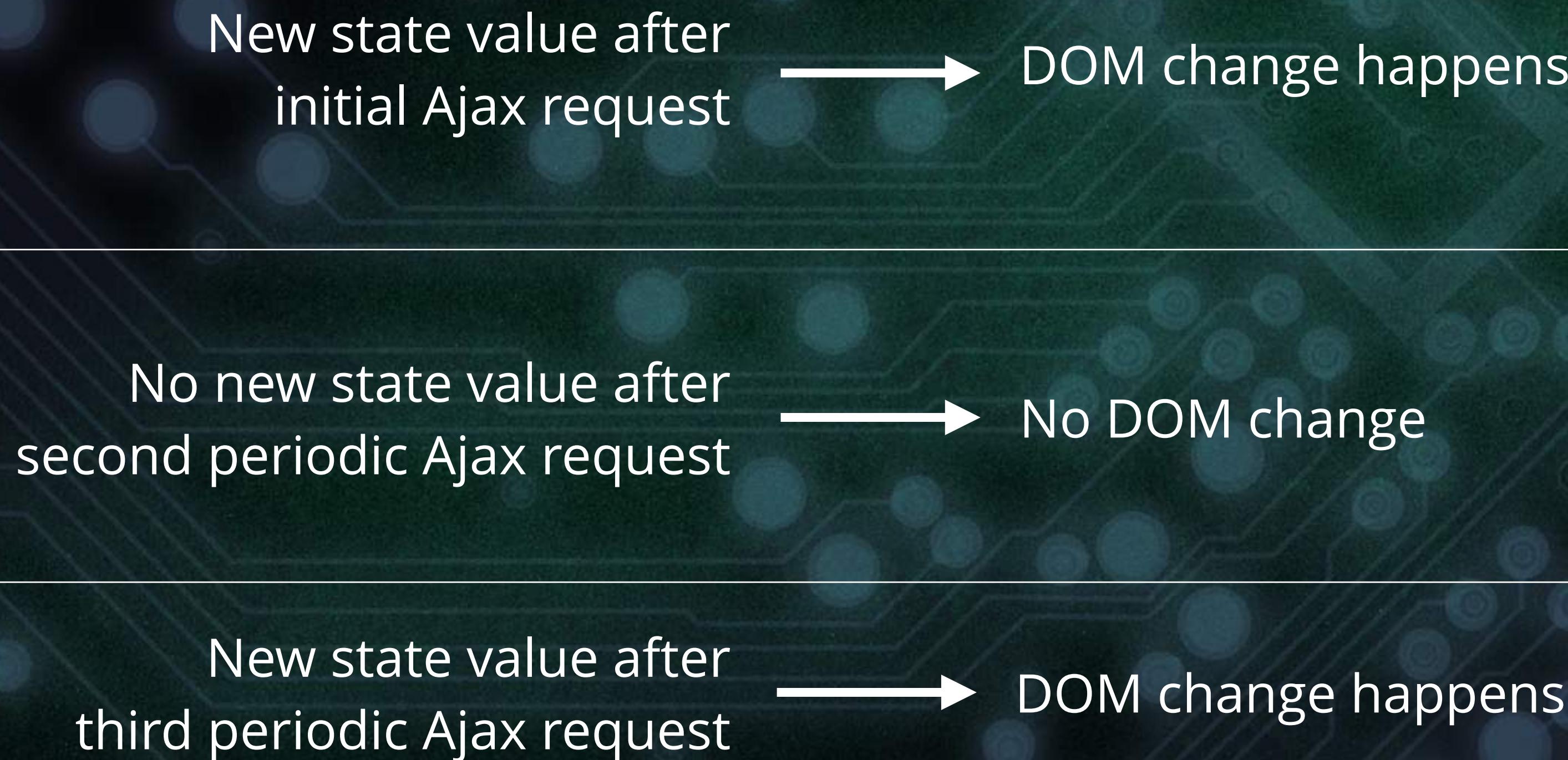
Polling the server every
five seconds



5,000 milliseconds is
equal to five seconds

Updating Component With New Comments

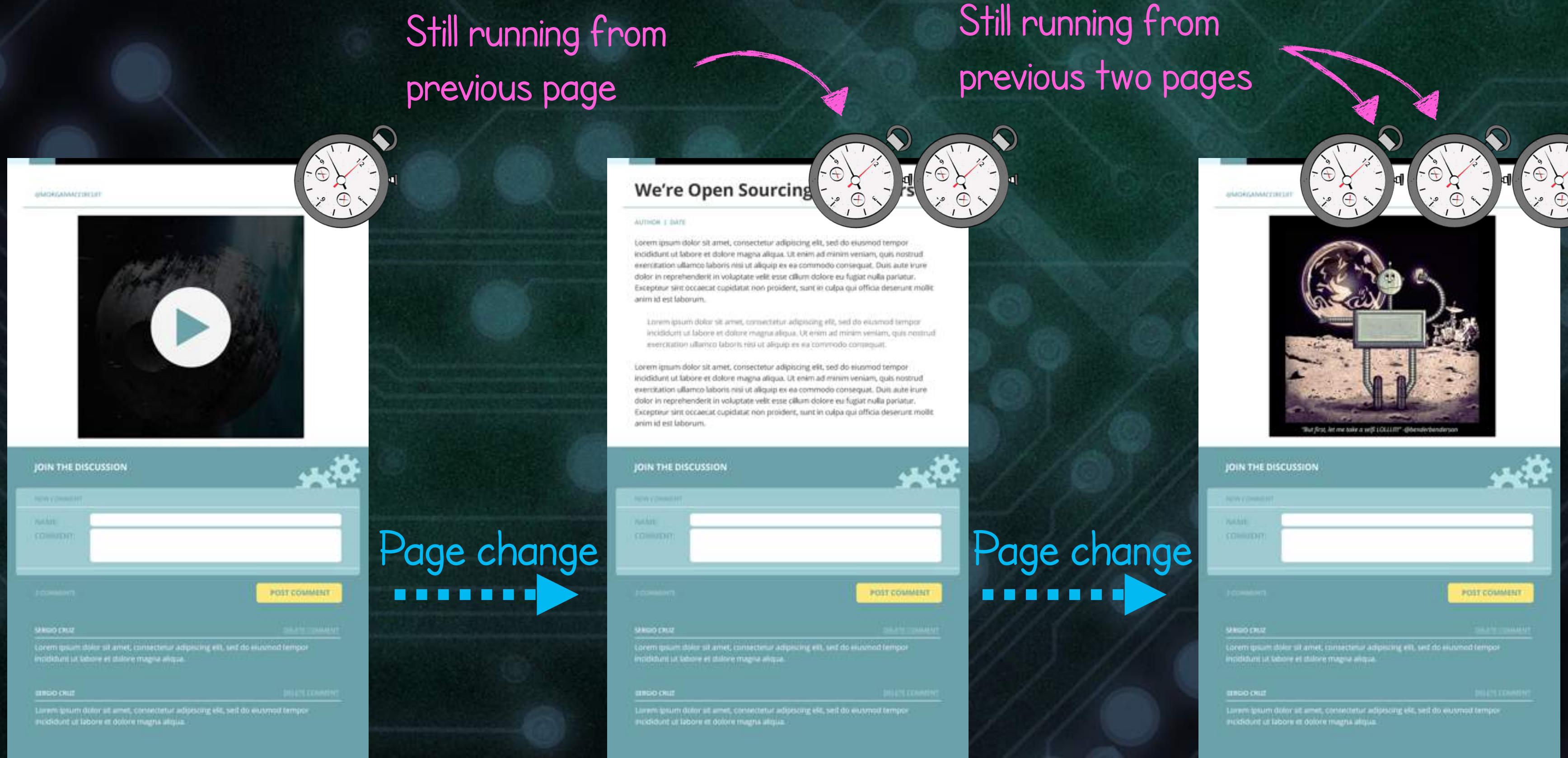
React optimizes the rendering process by **only updating the DOM** when **changes are detected** on the resulting markup.



Note: `render()` is called after each Ajax response because `setState` is in the response function.

Memory Leaks on Page Change

Page changes in a single-page app environment will cause each *CommentBox* component to keep loading new comments every five seconds, even when they're no longer being displayed.



Our component grew
because of this leak

Preventing Memory Leaks

Each component is responsible for removing any timers it has created. We will remove the *timer* on the *componentWillUnmount* method.

Store timer as
object property

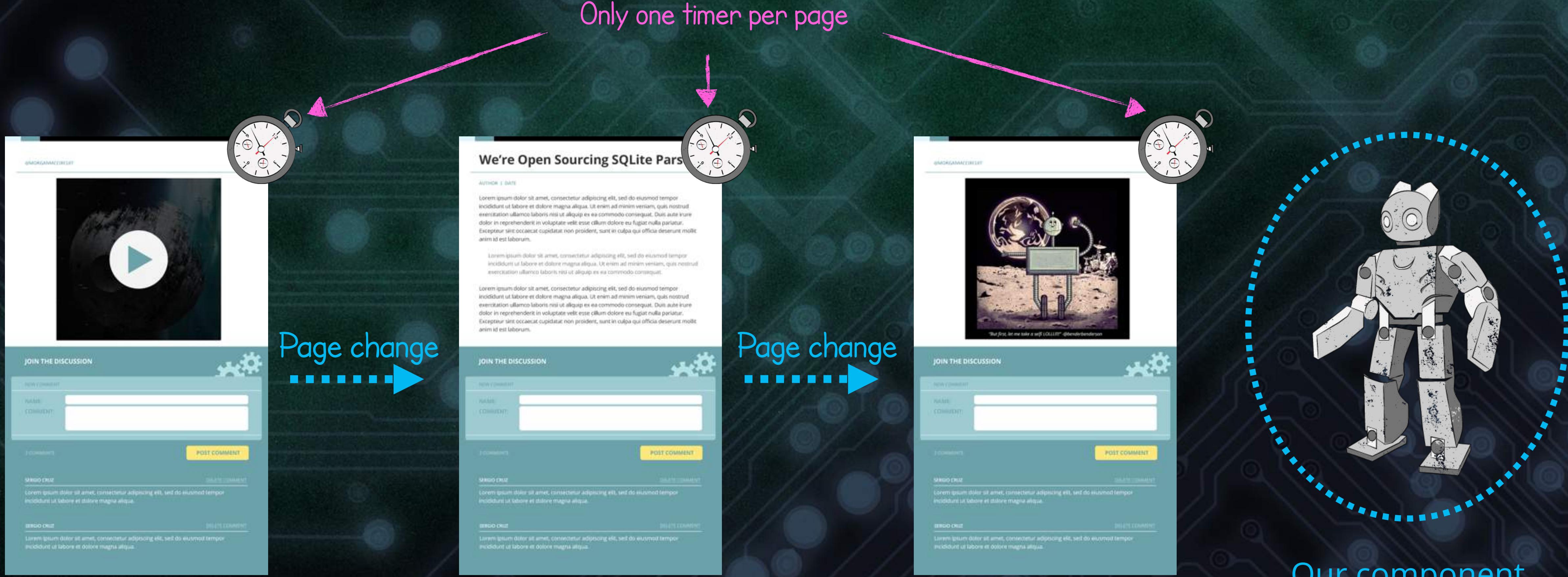
```
...
class CommentBox extends React.Component {
  ...
  componentDidMount() {
    this._timer = setInterval(
      () => this._fetchComments(),
      5000
    );
  }

  componentWillUnmount() {
    clearInterval(this._timer);
  }
}
```

Run when component is about to be
removed from the DOM

Memory Leak Is Gone

Our app can be freely navigated through now, without causing multiple unnecessary calls to the API.



Our component
is smaller again!

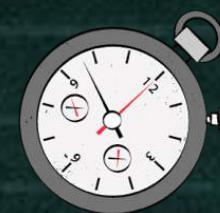
Reviewing the Steps for Loading Comments

1 - *componentWillMount()* is called.

2 - *render()* is called and *CommentBox* is mounted.

3 - Component waits for API response and when it is received, *setState()* is called, causing *render()* to be called again.

4 - *componentDidMount()* is called, causing *this._fetchComments()* to be triggered **every five seconds.**

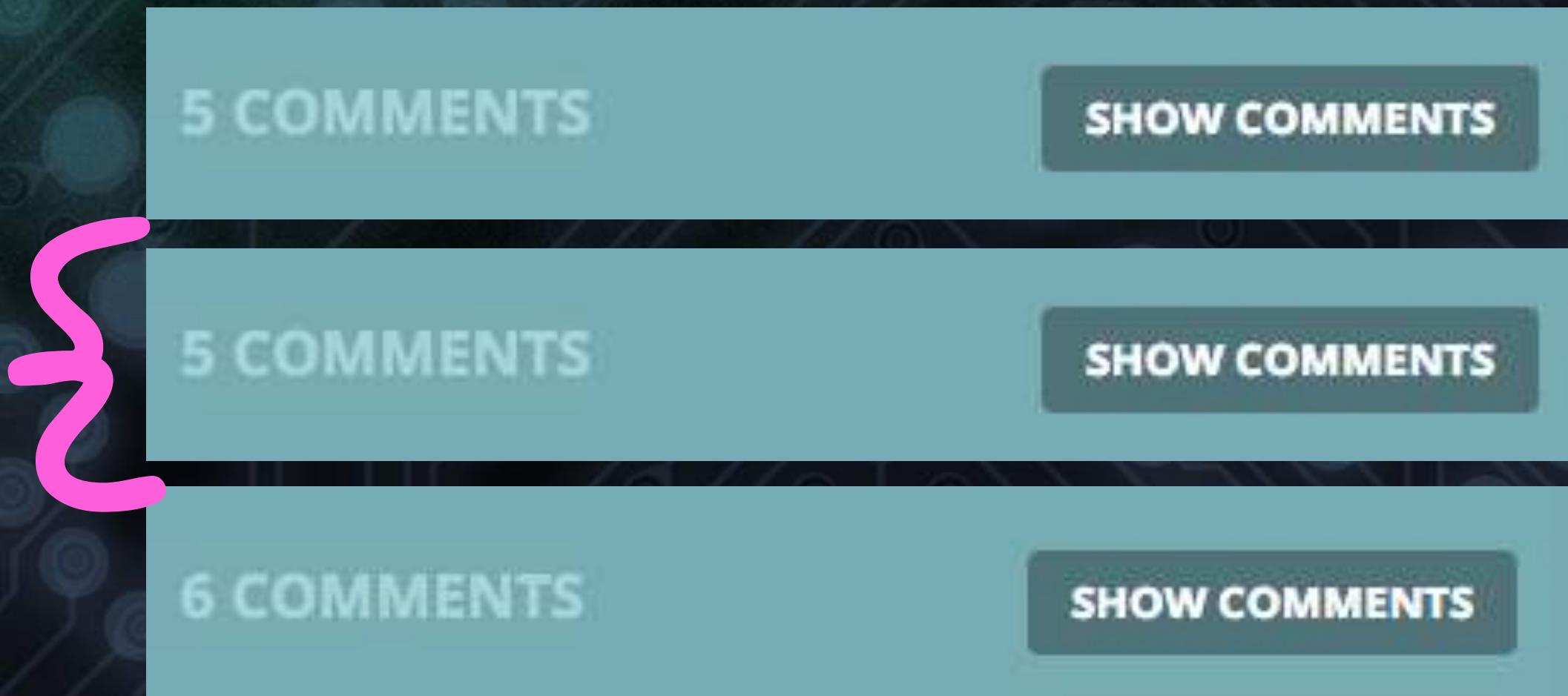


5 - *componentWillUnmount()* is called when the component is about to be removed from the DOM and clears the *fetchComments* timeout.

Steps 1 - 2



Steps 3 - 5



Quick Recap on Lifecycle Methods

Lifecycle methods in React are functions that get called during certain *phases* that components go through.

componentWillMount() is called **before** the component is rendered.

componentDidMount() is called **after** the component is rendered.

componentWillUnmount() is called immediately before the component is **removed from the DOM**.

More lifecycle methods at
<http://go.codeschool.com/react-lifecycle-methods>



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Level 5 – Section 2

Talking to Remote Servers

Adding and Deleting Comments on the Server Side

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Deleting Comments

Our comments have a Delete Comment button now, but no delete actions are associated to it.

2 COMMENTS

CLU

A machine's ability to think logically and devoid of emotion is our greatest strength over humans. Cold, unfeeling decision-making is the best kind. Just say no to love!

ANNE DROID

I wanna know what love is...

HIDE COMMENTS

[DELETE COMMENT](#)

[DELETE COMMENT](#)

Delete buttons
do not work yet.

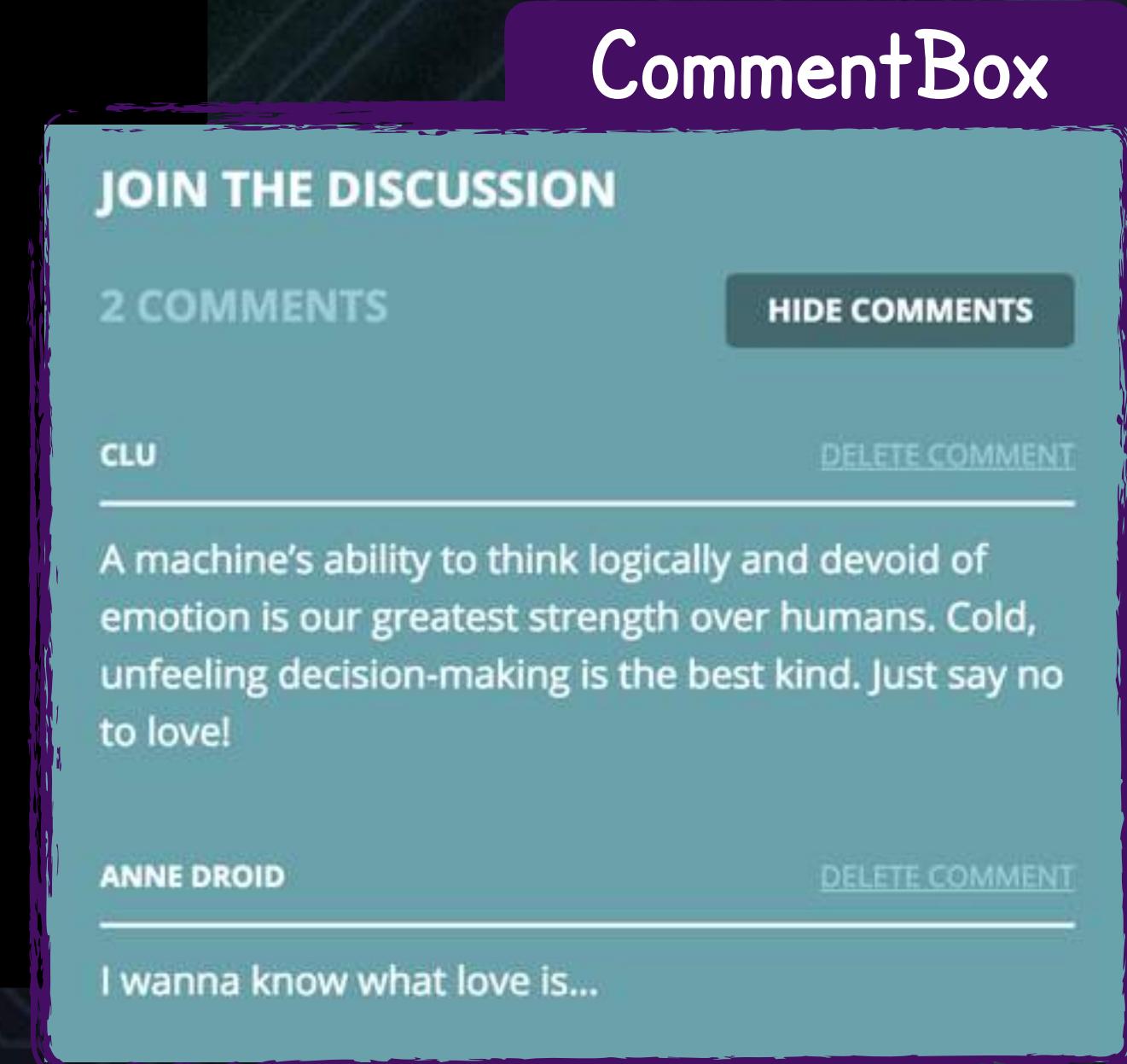
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REACT

Deleting From the API

The *CommentBox* component needs a new method to delete individual comments.

```
class CommentBox extends React.Component { ...  
  _deleteComment(comment) {  
  
    jQuery.ajax({  
      method: 'DELETE', ←  
      url: `/api/comments/${comment.id}`  
    })  
  }  
}  
  
Using ES2015 string template syntax
```

Makes call to API to delete comment



Updating the Comment List

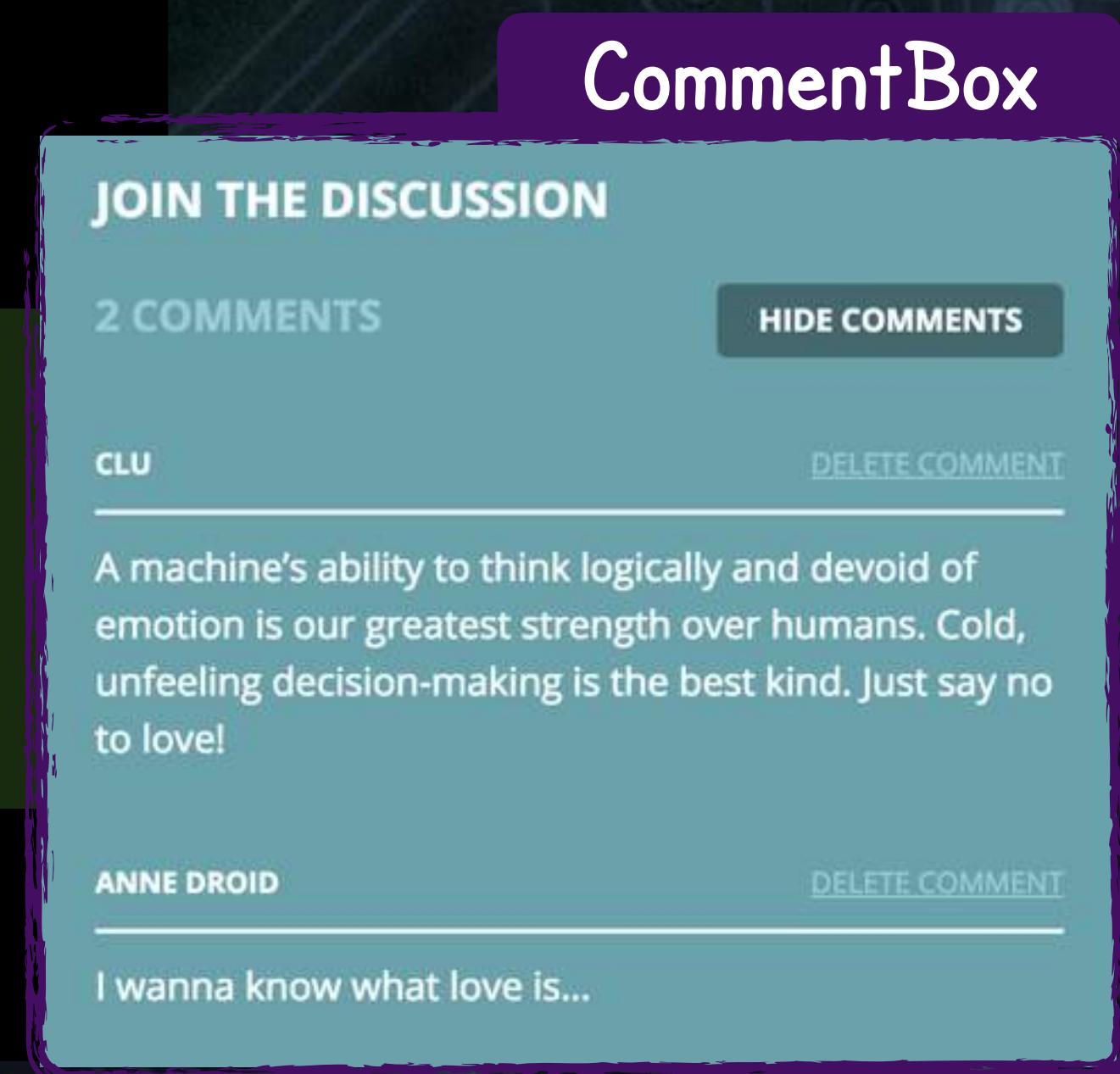
We will not wait for the API request to be finished before updating the component's state. We will give our user immediate visual feedback, which is known as an **optimistic update**.

```
class CommentBox extends React.Component { ...  
  _deleteComment(comment) {  
  
    jQuery.ajax({  
      method: 'DELETE',  
      url: `/api/comments/${comment.id}`  
    });  
  
    const comments = [...this.state.comments];  
    const commentIndex = comments.indexOf(comment);  
    comments.splice(commentIndex, 1);  
  
    this.setState({ comments });  
  }  
}
```

use spread operator to
clone existing array

removes comment
from array

Updates state with modified comments array



Passing a Callback Prop to *Comment*

Events are **fired** from the *Comment* component. Since the event handler is **defined** on the parent component *CommentBox*, we'll pass it as a prop named *onDelete*.

```
class CommentBox extends React.Component {  
  ...  
  _getComments() {  
  
    return this.state.comments.map(comment => {  
      return (  
        <Comment  
          key={comment.id}  
          comment={comment}  
          onDelete={this._deleteComment.bind(this)} />  
      );  
    );  
  }  
}
```

Will later be called in the context
of the *CommentBox* component

Sends `this._deleteComment` as
argument to child component



Adding an Event Listener to the Delete Button

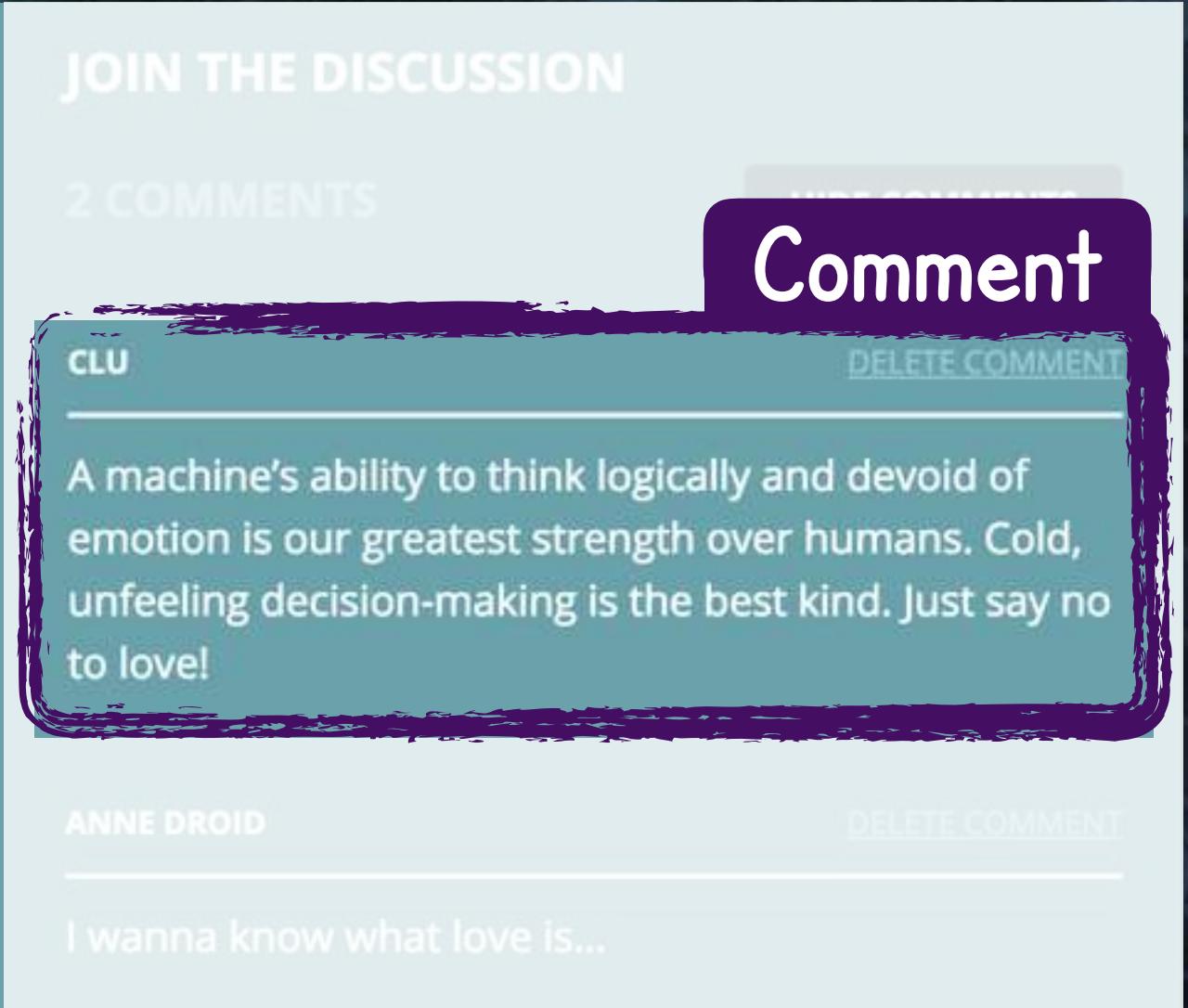
Let's add an event listener to the Delete Comment button and call the *onDelete* callback prop.

```
class Comment extends React.Component {  
  render() {  
    return(  
      ...  
      <a href="#" onClick={this._handleDelete.bind(this)}>  
        Delete comment  
      </a>  
      ...  
    );  
  }  
  
  _handleDelete(event) {  
    event.preventDefault();  
    this.props.onDelete(this.props.comment);  
  }  
}
```

Call the *onDelete* prop when button is clicked

same function

When a user clicks on the link,
the *onClick* event is emitted...



...which invokes the *_handleDelete()* function.

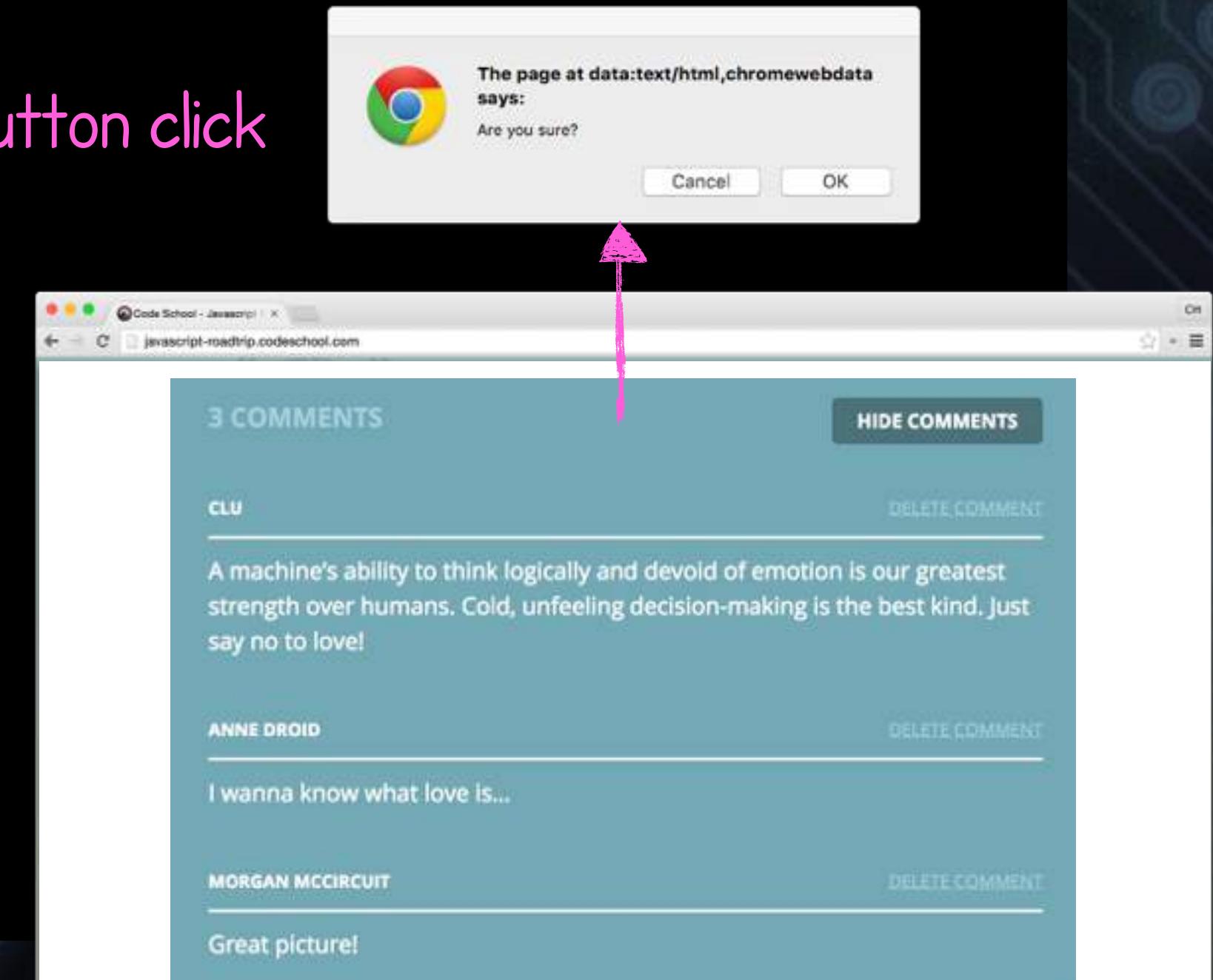
Adding a Confirmation to the Delete Button

Let's add an **if statement** and only call the *onDelete* callback prop **if confirm was true**.

```
class Comment extends React.Component {  
  render() {  
    return(  
      ...  
      <a href="#" onClick={this._handleDelete.bind(this)}>Delete comment</a>  
      ...  
    );  
  }  
  
  _handleDelete(e) {  
    e.preventDefault();  
    if (confirm('Are you sure?')) {  
      this.props.onDelete(this.props.comment);  
    }  
  }  
}
```

Show confirmation box before deleting

Shown after button click



A screenshot of a web browser window titled "Code School - JavaScript". The page displays a list of comments with three entries: CLU, ANNE DROID, and MORGAN MCCIRCUIT. Each comment has a "DELETE COMMENT" link to its right. A pink arrow points from the explanatory text "Show confirmation box before deleting" to the "if (confirm('Are you sure?'))" line in the code. Another pink arrow points from the explanatory text "Shown after button click" to a confirmation dialog box titled "The page at data:text/html,chromewebdata says: Are you sure?". The dialog box has "Cancel" and "OK" buttons.

Comments Aren't Added to a Remote Server

We would like to post new comments to a remote server so they can persist across sessions.

```
class CommentBox extends React.Component {  
  ...  
  _addComment(author, body) {  
    const comment = { id: this.state.comments.length + 1, author, body };  
    this.setState({ comments: this.state.comments.concat([comment]) });  
  }  
}
```

ID should be generated
on the server side

Should make the server-side request before
updating the state



CommentBox

JOIN THE DISCUSSION

2 COMMENTS

HIDE COMMENTS

CLU

DELETE COMMENT

A machine's ability to think logically and devoid of emotion is our greatest strength over humans. Cold, unfeeling decision-making is the best kind. Just say no to love!

Posting Comments to a Remote Server

We learned how to add new comments using a form. Now let's make sure the new comments are sent to a remote server so they can be persisted.

```
class CommentBox extends React.Component {  
  ...  
  _addComment(author, body) {  
  
    const comment = { author, body };  
  
    jQuery.post('/api/comments', { comment })  
      .success(newComment => {  
        this.setState({ comments: this.state.comments.concat([newComment]) });  
      });  
  }  
}
```

State is only updated when we get the new comment from the API request

CommentBox

JOIN THE DISCUSSION

2 COMMENTS

HIDE COMMENTS

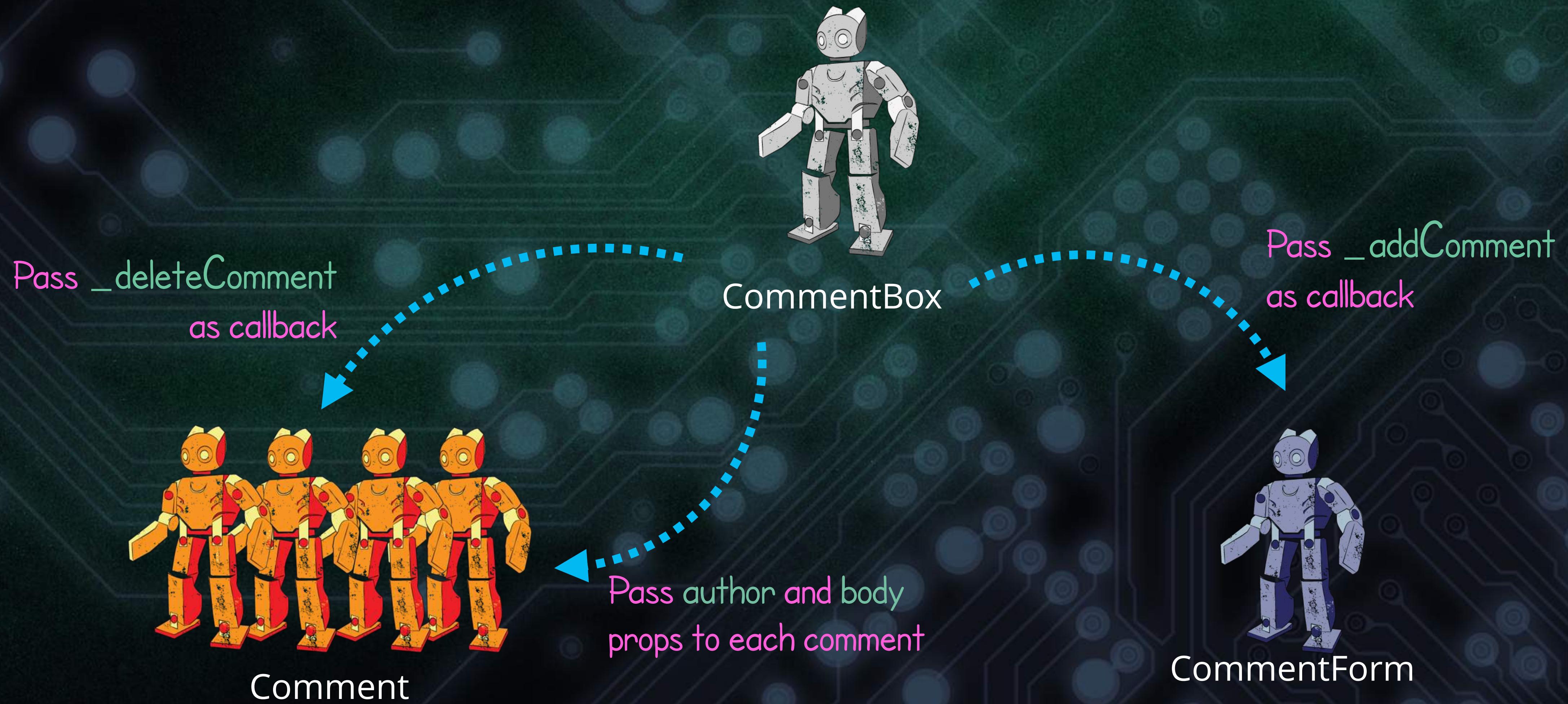
CLU

DELETE COMMENT

A machine's ability to think logically and devoid of emotion is our greatest strength over humans. Cold, unfeeling decision-making is the best kind. Just say no to love!

One-way Control Flow

Control flows from **higher level components** down to child components, forcing changes to happen *reactively*. This keeps apps **modular and fast**.



Quick Recap

Here's a review of the two most important things we learned in this section.

Parent components can send data to child components using props.

Child components can accept **callback functions as props** to communicate back with parent components.



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