

Introducing React

- Can feel daunting
- Benefits aren't immediate
 - But are real and helpful!
- Tried to use similar patterns

React makes render easier

- Closer to HTML
- Like how `render()` could embed other functions
 - No more functions in strings in functions

Common Points of Confusion

- Importing React
- Folder Structure
- State immutable
 - During Component function
- State Management
- Form Issues

No need to import React

- Not sure where this came from
 - I didn't show it!
 - A tutorial people looked up?
 - Tell me what I'm missing!
 - VSCode auto fill-in?

We are running React 18

- React 17 removed `import React from 'react';`
 - Unless you use `React.XXX` somewhere

Folder/Directory Structure

- I saw lots of `/components`, `/pages`, `/helpers`, etc
 - Not uncommon
 - Not the only way to do it
 - At this stage of learning
 - Don't overcomplicate
 - So much `../..!`
 - Personally not a fan of `/components`
 - Doesn't add value
 - When editing a feature, how many directories involved?

State is Constant

```
function Component() {
  const names = [ 'Jorts', 'Jean', 'Nyan', 'Floofa' ];
  const [name, setName] = useState('');

  return (
    <button
      onClick={ () => {
        // name = "bob" // Bad! No longer state!
        setName(
          names[Math.floor(Math.random*names.length)]
        );
        console.log( `name after click is ${name}` ); // Old!
      }
    >{name}</button>
  );
}
```

Key Lessons

- State should be IMMUTABLE
 - automatic with const primitives
 - NOT automatic with object/array
- Actual state is outside your function
 - useState() gives you a COPY
 - Calling the setter updates real state
 - Does not alter copy until next render
 - If you need altered state now
 - You have value you set it to!

Why didn't my state update?

Very Common confusion

- Misleading
- State did update
 - Just checking a stale copy

Calling setter queues a render

Render = component function will be called

- `useState()` will return NEW state

This is NOT so different than vanilla JS

- We never updated state variables in render
- We did update state variables in listeners
 - Rarely used new values before render
- React has explicit state variables and setters

state can "sprawl" and couple

```
function App() {
  const [username, setUsername] = useState('');
  const [isLoggedIn, setIsLoggedIn] = useState(false);
  const [error, setError] = useState('');

  return (
    <div>
      { isLoggedIn && <p>Stuff here</p>}
      { !isLoggedIn && <Login
        username={username}
        setUsername={setUsername}
        setIsLoggedIn={setIsLoggedIn}
        error={error}
        setError={setError}
      />}
    </div>
  );
}
```

What's undesirable there?

- Login is highly coupled to App state
- App has state it doesn't actually use
- Passing a log of variables feels tedious/heavy
 - Easy to pass too much/miss one

Separate state

- What state ISN'T a top level state
 - State should be at lowest common ancestor
- What state is actually different?
 - App username = logged in username
 - Login username = username as typing

Separated States

```
function App() {
  const [username, setUsername] = useState(''); // Logged in
  const [isLoggedIn, setIsLoggedIn] = useState(false);

  return (
    <div>
      { isLoggedIn && <p>Stuff here</p>}
      { !isLoggedIn && <Login
        setUsername={setUsername}
        setIsLoggedIn={setIsLoggedIn}
      />}
    </div>
  );
}
```

```
function Login({ setUsername, setIsLoggedIn }) {
  const [tempUsername, setTempUsername] = useState('');
  const [error, setError] = useState(''); // only used here
  // ...
}
```

Encapsulate changes

- Login has a few "actions"
 - Typing
 - Could be handled inside Component
 - Report error
 - Might be inside Component?
 - Depends which Component reports
 - Login
 - Sets App `username`
 - Sets App `isLoggedIn`

Passing actions reduces coupling

```
function App() {
  const [username, setUsername] = useState(''); // Logged in
  const [isLoggedIn, setIsLoggedIn] = useState(false);

  function onLogin (username) {
    setUsername(username); // username is the one passed in!
    setIsLoggedIn(true);
  }

  return (
    <div>
      { isLoggedIn && <p>Stuff here</p>}
      { !isLoggedIn && <Login onLogin={onLogin} /> }
    </div>
  );
}
```

```
function Login({ onLogin }) {
  const [tempUsername, setTempUsername] = useState('');
  const [error, setError] = useState(''); // only used here
  // ...
}
```

Decoupled

- Login no longer gets ANY state from App
- Login no longer gets ANY setters from App
- Login just gets an action function
 - App knows little of how Login works
 - Just the rules for `onLogin()`
 - App can change considerably
 - No/few changes needed to Login

Can't always get complete separation/decoupling

- Reduced coupling is still better

Derived State

- Values based solely on state and constants
 - **derived state**
- Tempting to add to state!
 - But problematic!
 - What is the source of truth?
 - Need to remember to redetermine
 - Every time origin state changes
- Instead calculate every render

Example Derived State

Bad Temporary Username Message

- IF Login has username-as-typed state
 - Separate from App username-logged-in state

```
import { validateUsername } from './validations';

function Login({ onLogin }) {
  const [username, setUsername] = useState(''); // as typed
  // REMOVED error message state!
  // const [error, setError] = useState('');
  const error = validateUsername(username); // Still renders
  // No more setError(...) anywhere

  // ...
}
```

Derived State Notes

- NOT Derived State when
 - Based on more than state and constants
- If calculation is "expensive"
 - Still calculate vs storing in state
 - "memoize" function return
- May need new state values
 - Such as "have they ever typed?"
 - To avoid immediate error message
 - Reduced complexity of managing state
 - Usually worth extra state values

State Can Be/Have Collections

```
function App() {  
  const [userInfo, setUserInfo] = useState({  
    username: '',  
    isLoggedIn: false,  
  });  
  
  function onLogin (username) {  
    setUserInfo({  
      username,  
      isLoggedIn: true;  
    });  
  }  
  
  return (  
    <div>  
      { userInfo.isLoggedIn && <p>Stuff here</p>}  
      { !userInfo.isLoggedIn && <Login onLogin={onLogin} /> }  
    </div>  
  );  
}
```

Login.jsx has no changes!

When to Have State as Collection

Pros:

- Easy to pass if you have related state fields
- Easier to see all of "state"
 - Easier to know which variables are "state"

Cons:

- Remember no mutation of state objects!
 - More involved to change only part of state

Next week: More options for state management

Forms Involve Common Mistakes

```
function Form() {
  const [name, setName] = useState('');
  const [tempName, setTempName] = useState('');
  return (
    <form>
      <p>Hello {name}</p>
      <label>New Name:
        <input
          value={tempName}
          onChange={ e => {
            setTempName(e.target.value);
          }}
        />
      </label>
      <button
        onClick={ () => {
          setTempName('');
          setName(tempName);
        }}
      >Replace</button>
    </form>
  );
}
```

Why does the page reset?

- Check the URL
 - The page is reloading
 - We navigated on form submit
 - `<form>` defaults to same page
 - button defaults to type 'submit'
- We need to stop the form from submitting
 - We could set the button to `type="button"...`

Changing the button to not submit

```
function Form() {
  const [name, setName] = useState('');
  const [tempName, setTempName] = useState('');
  return (
    <form>
      <p>Hello {name}</p>
      <label>New Name:
        <input value={tempName}
          onChange={e => {
            setTempName(e.target.value);
          }}
        />
      </label>
      <button
        type="button"
        onClick={ () => {
          setTempName('');
          setName(tempName);
        }}
      >Replace</button>
    </form>
  );
}
```


That works...until

- Button click no longer submits
- But "Enter" in sole input field still submits

We can put `onSubmit` on form to `e.preventDefault`

- A better option is to do everything onSubmit
 - Button is type "submit"
 - Enter OR click will trigger submit event
 - `onSubmit` stops actual navigation
 - `onSubmit` processes instead of `onClick`

onSubmit version

```
function Form() {
  const [name, setName] = useState('');
  const [tempName, setTempName] = useState('');
  return (
    <form
      onSubmit={e => {
        e.preventDefault();
        setTempName('');
        setName(tempName);
      }}
    >
      <p>Hello {name}</p>
      <label>New Name:
        <input value={tempName}
          onChange={e => {
            setTempName(e.target.value);
          }}
        />
      </label>
      <button type="submit" >Replace</button>
    </form>
  );
}
```

Key Submit Lessons

- These were HTML issues, not React!
- Navigation resets page state
 - Can look like state changes!
 - Waste time working wrong problem
- UX important
 - Consider all interactions
 - Ex: Enter vs Click, keyboard vs mouse
- Not all interactions are the same
 - Forms for data submit
 - Buttons controls for state
 - Small forms vs big forms

Labels and for

- HTML `<label for="">` attribute
 - Needs to be `htmlFor` prop in JSX
 - Same reason as `className`
 - `for` is reserved word in JS
 - `htmlFor` is the DOM Node property
- Not needed if `<label>` around labeled element
 - Then browser automatically knows
- **Value must be id of labeled element**
 - not `name`, `class`, or `className`
- Labels are important (a11y)
 - But only count if you get them right