

Refactoring React

Patterns and practices

Who am I



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Workshop

- <https://github.com/Rukia3d/IntroToJS-Marvel-2/>
- clone project
- branches:
 - **master** - initial state
 - **fixed** - final state

The Project

- Marvel Universe API
- The team selection part of a fighting game
- Created with TDD
- Needs Refactoring

The Project

- Created with create-react-app
- Runs on localhost:3000
- You will need node.js
- if you didn't do npm install - do it now

The Project

- Open browser
- Open terminal and project folder in the terminal (2 windows)
- **npm run start** to start the project
- **npm run test** to run tests

Use case

- User searches for their favourite characters
- Adds them to the team
- Original characters can be highlighted
- Characters can be deleted
- Search panel can be hidden
- When the team is formed - game starts

The Project (API)

- originally had API requests
- replaced by captain.json for this workshop
- will read captain.json for any search
- API calls and vars are commented out
- Images were replaced by local images
- you will need your own API key if you want to try it

The Project

- **App.js** Entry point. Creates Characters and Search
- **Search.js** Search form
- **Item.js** Shows the search items
- **Characters.js** Displays NoCharacters or ShowCharacters
- **ShowCharacters.js** Displays and paginates Characters

Refactoring

- Do you have tests?
- If no - WRITE TESTS FIRST
- If yes - check the coverage
- If it's not good enough - write more tests

App.test.js

- No characters selected
- Enters “Captain”. Search results are in
- Adds Captain America. No pages. Pic + Details are in.
- Adds 5 more Captains. Pagination test.
- Deletion test.
- Collapse Search test.

App.test.js

- What's missing?
- No toggle test.
- Decision: Ignore it (bad decision!)
- You need to know what you decided to ignore.
- And how it can affect the result.

General Refactoring

- Separate classes
- Rename variables (use let and const!)
- Make functions more readable
- Add PropTypes
- etc...

React Refactoring

- Anonymous functions
- When do we re-render?

Anonymous functions

- Will create a copy for every render.
- Not a problem on a small project.
- What if you're making a Stadium seat booking system?
With a function generated for every seat on every render?

Anonymous functions

- The easiest way to fix anonymous functions is to pass data via events.
- Be specific. Only transfer data you need, not whole objects.

Use Pure Component

Controllable re-rendering - React.PureComponent

PureComponent changes the life-cycle method `shouldComponentUpdate` and adds some logic to automatically check whether a re-render is required for the component. This allows a PureComponent to call method `render` only if it detects changes in `state` or `props`, hence, one can change the state in many components without having to write extra checks like:

<https://60devs.com/pure-component-in-react.html>

Search.js -> Item

Controllable re-rendering - React.PureComponent

```
class Item extends React.PureComponent {
```

General takeaway

- Change variable names
- Split logic into smaller functions
- Use destructuring to make props readable
- Use Prop.Types

General takeaway

- Check your anonymous functions. Use events.
- Give references instead of objects where possible.
- Re-render only when you need to.

React Patterns

- Nested components
- Render props
- High order components
- Hooks

- Problem: We have collapsed component on the Search, it's not strictly related to Search functionality and later we want it on ShowCharacters.
- Solution: **nested components**

Nested components

- No dependancy between the parent and the child
- Parent doesn't control the data passed to the child

Nested components

- Collapser component doesn't care what's in Search
- Can be separated
- Search can be rendered inside
- Can use the same approach in ShowCharacter

Nested components

- Step 1: Separate Search and Collapser inside of the Search
- Step 2: Move Collapser into a separate component
- Step 3: Add Collapser to App and make Search it's child
- Step 4: Apply the same approach to ShowCharacter

Search.js

- Step 1: Separate Search and Collapser inside of the Search

Search.js

```
render() {
  return (
    <div className={this.state.collapse? "open": "closed"} data-testid="collapse-block">
      <button type="button"
        className="btn btn-danger"
        onClick={this.collapseBlock}
        data-testid="collapse-button">
      </button>
      <div className="row">
        <div className="col-lg-12">
          <form className="bs-component" onSubmit={this.search}>...
            {this.state.loading...
          </div>
        </div>
      );
    }
}
```

Collapser.js

- Step 2: Move Collapser into a separate component

Collapser.js

```
class Collapser extends Component {  
  
  constructor(props){  
    super(props);  
    this.state = {  
      collapse: true,  
    }  
    this.collapseBlock = this.collapseBlock.bind(this);  
  }  
  
  collapseBlock(){  
    this.setState((oldState) => ({collapse: !oldState.collapse}));  
  }  
  
  render(){  
    return(  
      <div className={this.state.collapse? "open": "closed"} data-testid="collapse-block">  
        <button type="button"  
          className="btn btn-danger"  
          onClick={this.collapseBlock}  
          data-testid="collapse-button">  
        </button>  
      </div>  
    )  
  }  
}  
  
export default Collapser;
```

Search.js

- Step 2b: Remove the collapser state and collapser code from Search.js

Search.js

```
render() {
  return (
    <div className="row">
      <div className="col-lg-12">
        <form className="bs-component" onSubmit={this.search}>...
          {this.state.loading...
            </div>|
      );
    }
}

export default Search;
```

App.js

- Step 3: Add Collapser to App and make Search it's child

App.js

```
render() {
  return (
    <div className="App">
      <Nav/>
      <div className="container">
        <Characters chars={this.state.characters} removeCharacter={this.removeCharacter}/>
        <Collapser>
          <Search add={this.addCharacter} />
        </Collapser>
      </div>
    </div>
  );
}
```

App.js

- Step 3b: Render Search as a child of Collapser

Collapser.js

```
render(){
  return(
    <div className={this.state.collapse? "open": "closed"} data-testid="collapse-block">
      <button type="button"
        className="btn btn-danger"
        onClick={this.collapseBlock}
        data-testid="collapse-button">
      </button>
      {this.props.children}
    </div>
  )
}

export default Collapser;
```

Homework

- Step 4: Apply the same approach to ShowCharacter

- Problem: Collapser needs to directly control the Search to show summary of the hidden component
- Solution: **render props**

Render props

- Parent directly controls the child
- Parent passes the data to the child

Render props

- Example: react router

```
// wrapping/composing
// You can spread routeProps to make them available to your rendered Component
const FadingRoute = ({ component: Component, ...rest }) => (
  <Route {...rest} render={routeProps => (
    <FadeIn>
      <Component {...routeProps}/>
    </FadeIn>
  )}/>
)

<FadingRoute path="/cool" component={Something}/>
```

Render props

- Step1: Change the App.js so Collapser can render Search
- Step2: Change Collapser so it renders the Search
- Step3: Add collapsed as props from Collapser to Search
- Step4: Render Search based on the collapsed prop

Render props

- Step1: Change the App.js so Collapser can render Search

App.js

```
render() {
  return (
    <div className="App">
      <Nav/>
      <div className="container">
        <Characters chars={this.state.characters} removeCharacter={this.removeCharacter}/>
        <Collapser render={() => (<Search add={this.addCharacter} />)}/>
      </div>
    </div>
  );
}

export default App;
```

Render props

- Step2: Change Collapser so it renders the Search

Collapser.js

```
render(){
  return(
    <div className={this.state.collapse? "closed": "open"} data-testid="collapse-block">
      <button type="button"
        className="btn btn-danger"
        onClick={this.collapseBlock}
        data-testid="collapse-button">
        </button>
        {this.props.render()}
      </div>
    )
  }
}

export default Collapser;
```

Render props

- Step3: Add collapsed as props from Collapser to Search

App.js

```
render() {
  return (
    <div className="App">
      <Nav/>
      <div className="container">
        <Characters chars={this.state.characters} removeCharacter={this.removeCharacter}/>
        <Collapser render={({collapsed}) => (<Search add={this.addCharacter} collapsed={collapsed} />)}/>
      </div>
    </div>
  );
}

export default App;
```

Collapser.js

```
render(){
  return(
    <div className={this.state.collapse? "closed": "open"} data-testid="collapse-block">
      <button type="button"
        className="btn btn-danger"
        onClick={this.collapseBlock}
        data-testid="collapse-button">
      </button>
      {this.props.render(this.state.collapse)}
    </div>
  )
}

export default Collapser;
```

Render props

- Step4: Render Search based on the collapsed prop

Search.js

```
renderSearch(){  
  return (  
    <div className="row">  
      <div className="col-lg-12">  
        <form className="bs-component" onSubmit={this.search}>=br/>          {this.state.loading=br/>        </div>  
      )  
    }  
  
  render() {  
    return (  
      this.props.collapsed  
      ? <div className="row"> <h3>Here's the summary</h3></div>  
      : this.renderSearch()  
    );|  
  }  
  
  export default Search;
```

- Problem: Show a placeholder while the image loads
- Solution: **higher order component**

Higher-order component

- Additional functionality for the component

Higher-order component

- Step 1: Separate IMG component
- Step 2: Wrap image in the function. This function will render the original component with additional functionality
- Step 3: Add placeholder functionality
- Step 4: Replace the image with the function

Higher-order component

- Step 1: Separate IMG component

ShowCharacters.js

```
const Img = ({name, src}) => (
  <img
    style={{maxWidth: "18rem"}}
    data-testid="picture"
    alt={name}
    src={src}
  />
)

const Character = (props) => (
  <div className="card text-white bg-primary mb-3"
    style={{maxWidth: "20rem"}}
    data-testid="character">
    <div className="card-body">
      <h4 className="card-title" data-testid="name">{props.character.name}</h4>
      <Img
        name={props.character.name}
        src={props.character.thumbnail.path+"."+props.character.thumbnail.extension}
      />
      <p className="card-text" data-testid="descr">{props.character.description}</p>
      <button>=>
      </div>
    </div>
);
```

Higher-order component

- Step 2: Wrap image in the function. This function will render the original component with additional functionality

ShowCharacters.js

```
function withPlaceholder(Image) {
  return class extends Component{
    render(){
      return <Image {...this.props} />
    }
  }
}

const Img = ({name, src}) => (
<img
  style={{maxWidth: "18rem"}}
  data-testid="picture"
  alt={name}
  src={src}
/>
)

const ImgWithPlaceholder = withPlaceholder(Img);
```

Higher-order component

- Step 3: Add placeholder functionality (Does it fail your test?)

```
import React, { Component } from 'react';
import logo from './logo.svg';
const groupSize = 3;

function withPlaceholder(ImageComp) {
  return class extends Component{
    constructor(props){
      super(props);
      this.state = {
        loaded: false,
      }
    }

    componentDidMount(){
      const img = new Image();
      img.src = this.props.src;
      img.onload = () => {
        this.setState({
          loaded: true,
        })
      }
    }

    render(){
      const { src, ...other} = this.props;
      let url = this.state.loaded ? src : logo;
      return <ImageComp src={url} {...other} />
    }
  }
}
```

Higher-order component

- Step 4: Replace the image with the function

ShowCharacters.js

```
const Character = (props) => (
  <div className="card text-white bg-primary mb-3"
    style={{maxWidth: "20rem"}}
    data-testid="character">
    <div className="card-body">
      <h4 className="card-title" data-testid="name">{props.character.name}</h4>
      <ImgWithPlaceholder
        name={props.character.name}
        src={props.character.thumbnail.path+"."+props.character.thumbnail.extension}>
      </ImgWithPlaceholder>
      <p className="card-text" data-testid="descr">{props.character.description}</p>
      <button>...
      </button>
    </div>
  </div>
);
```

- Problem: We want to model different behaviours in one component.
 - Render props lead to increased nesting
 - Higher-order components are not obvious to read
- Solution: **Hooks because we can**

React hooks

- They are hipstery!

React hooks

- Step 1: Decide what hooks you need for what component. Img in this case
- Step 2: Return Img render, clean up the withPlaceholder ref.
- Step 3: Use useState to set the url
- Step 4: Use useEffect for the functionality of componentDidMount
- Step 5: Make it reusable

React hooks

- Step 1: Decide what hooks you need for what component. Img in this case

ShowCharacters.js

```
import React, { Component, useState, useEffect } from 'react';
import logo from './logo.svg';
const groupSize = 3;
```

React hooks

- Step 2: Return Img render, clean up the withPlaceholder ref.

ShowCharacters.js

```
const Character = (props) => (
  <div className="card text-white bg-primary mb-3"
    style={{maxWidth: "20rem"}}
    data-testid="character">
    <div className="card-body">
      <h4 className="card-title" data-testid="name">{props.character.name}</h4>
      <Img|
        name={props.character.name}
        src={props.character.thumbnail.path+"."+props.character.thumbnail.extension}
      />
      <p className="card-text" data-testid="descr">{props.character.description}</p>
      <button>
      >
    </div>
```

React hooks

- Step 3: Use useState to set the url

ShowCharacters.js

```
● import React, { Component, useState, useEffect } from 'react';
  import logo from './logo.svg';
  const groupSize = 3;

  const Img = ({name, src}) => {
●   const [url, setUrl] = useState(logo);

    return (
      <img
        style={{maxWidth: "18rem"}}
        data-testid="picture"
        alt={name}
        src={url}
      />
    )
}

const Character = (props) => (
  <div className="card text-white bg-primary mb-3"
    style={{maxWidth: "20rem"}}
    data-testid="character">
    <div className="card-body">
      <h4 className="card-title" data-testid="name">{props.character.name}</h4>
      <Img
```

React hooks

- Step 4: Use useEffect for the functionality of componentDidMount

ShowCharacters.js

```
const Img = ({name, src}) => {
  const [url, setUrl] = useState(logo);

  useEffect(() => {
    const img = new Image();
    img.src = src;
    img.onload = () => setUrl(src);
  });
}

return (
<img
  style={{maxWidth: "18rem"}}
  data-testid="picture"
  alt={name}
  src={url}
/>
)
}
```

useEffect()

- There's a GOTCHA and we will come back to it in a sec!



React hooks

- Step 5: Make it reusable
 - We want to use a hook to render a placeholder or the correct loaded data **ANYWHERE**
 - Let's make our own hook!

usePlaceholder.js

- Make a new file with a hook name and move functionality there

usePlaceholder.js

```
Search.js | Collapser.js | App.js | App.css | ShowCharacters.js | usePlaceholder.js | bc

import { useState, useEffect } from 'react';
import logo from './logo.svg';

const usePlaceholder = (src) => {
  const [url, setUrl] = useState(logo);

  useEffect(() => {
    const img = new Image();
    img.src = src;
    img.onload = () => setUrl(src);
  });

  return url;
}

export default usePlaceholder;
```

usePlaceholder.js

- Make Img use the new hook.

ShowCharacters.js

```
Search.js Collapser.js App.js App.css ShowCharacters.js usePlaceholder.js
import React, { Component } from 'react';
import usePlaceholder from './usePlaceholder';
const groupSize = 3;

const Img = ({name, src}) => {
  const url = usePlaceholder(src);

  return (
    <img
      style={{maxWidth: "18rem"}}
      data-testid="picture"
      alt={name}
      src={url}
    />
  )
}
```

usePlaceholder.js

- You can refactor it further, remove Img and use hook inside of Img in Character

usePlaceholder.js

- GOTCHA!

```
const usePlaceholder = (src) => {
  const [url, setUrl] = useState(null);

  useEffect(() => {
    const img = new Image();
    img.src = src;
    img.onload = () => setUrl(src);
    console.log("I AM USEEFFECT");
  });

  return url;
}
```

- Find characters and check your console to see how many time it re-renders.

useEffect.js

- GOTCHA!
- UseEffect executes twice
 - When component mounts
 - When state changes (call setUrl)

useEffect.js

- GOTCHA!
- To remedy this useEffect takes an optional second argument - “only re-render if this changes”

useEffect.js

- GOTCHA!

```
const usePlaceholder = (src) => {
  const [url, setUrl] = useState(logo);

  useEffect(() => {
    const img = new Image();
    img.src = src;
    img.onload = () => setUrl(src);
    console.log("I AM USEEFFECT");
  }, [setUrl, src]);

  return url;
}
```

Thank you!

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