React Router

Applications have more than one page…

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Outline

- Objective and problems
- A Solution, the React way: React Router

Full Stack React, chapter "Routing"

React Handbook, chapter "React Router"

Multi-page Single Page Applications

# OBJECTIVES AND PROBLEMS

Supporting Complex Web Applications

- Switching between many different page layouts
- Managing the flow of navigation across a set of "pages"
- Maintaining the default web navigation conventions (back, forward, bookmarks, …)
- Allowing URLs to convey information
- Allowing re-loading KBs of JavaScript at every page change
- Keeping the state across page changes
- …

Example
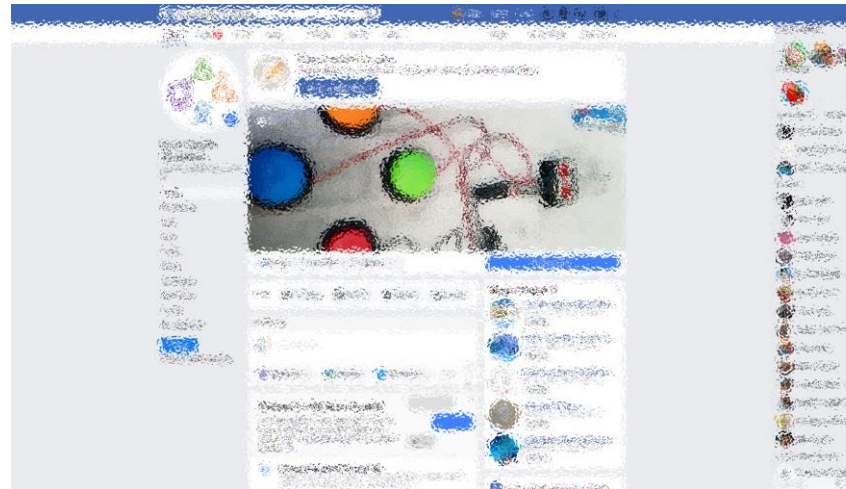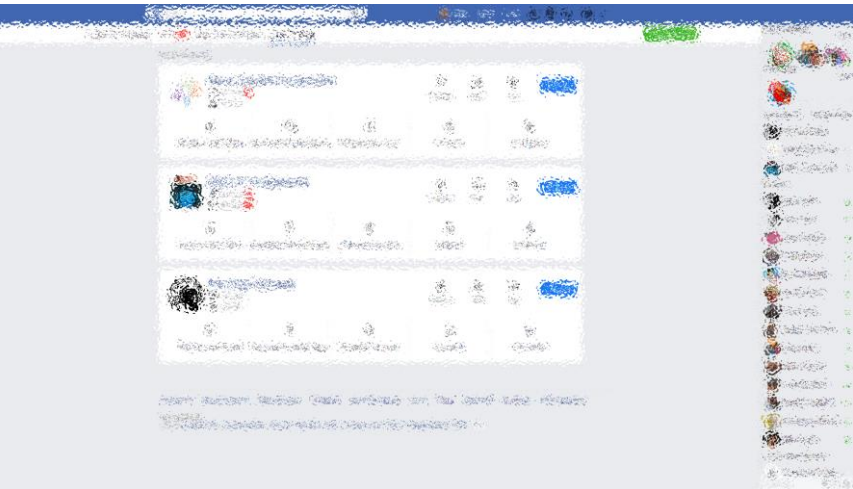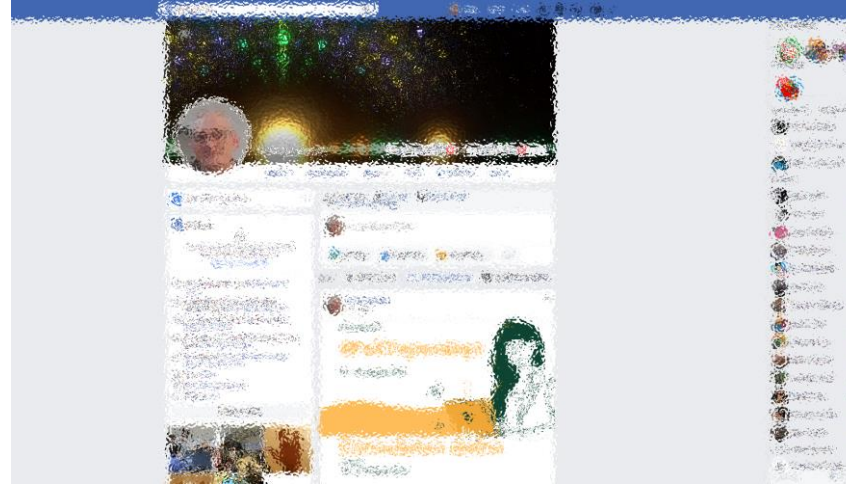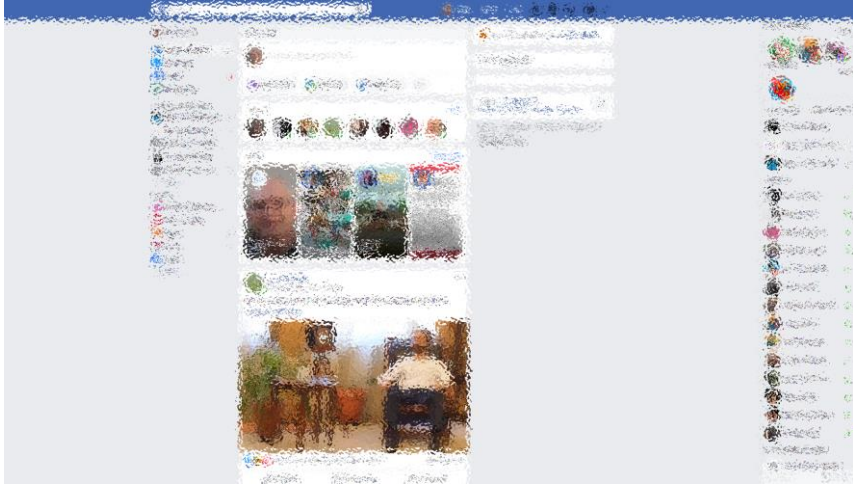
- Different layout and contents
- Some common parts
- No "page reload"
- URL changes accordingly

Some use cases

- Master list / detail view

- Logged / Unlogged pages

- Sidebar navigation

- Modal content

- Main Contents vs User Profile vs Setting vs …

Example

Using URLs for Navigation state

- URLs determine the *type* of the page or the *section* of the website
  - Changing page ⇆ Changing the URL
- URLs also *embed information* about the item IDs, referrers, categories, filters, etc
- URLs can be shared/saved/bookmarked, and they are sufficient for rebuilding the whole exact page
  - Deep Linking
- Back and Forward buttons navigate the URL history

Example URLs on facebook.com:

`/`

`/profile.name`

`/profile.name /posts/1234123212422123`

`/pagename`

`/pages/?category=your_pages`

Using URLs for Navigation state

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  sufficient

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- Back and

> With any URL, the React application will always return the same page (`index.html/index.js`) that will load and mount the same App

> The URL can be queried by the App to customize the render

Example URLs on facebook.com:

/

/profile.name

/profile.name /posts/12341232124 22123

/pagename

/pages/?category=y our_pages

(Wrong) approaches

Server-side navigation

- Embed <a> links in the page

- The browser requests a new URL to the server

- Server returns a copy of the *same* application

- Application mounts, queries the URL, and decides what to render

(Wrong) approaches

Server-side navigation

- Embed <a> links in the page

- The browser requests a new URL to the server

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- Application mounts, queries the URL, and decides what to render

- Pros
  - Simple
  - Perfectly integrates in browser navigation
- Cons
  - At every click, the application re-mounts
  - The state must be re-built (with fetch+REST)
  - Must maintain consistency of links and URL analysis

(Wrong) approaches

Server-side navigation

- Embed <a> links in the page
- The browser requests a new URL to the server
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- Application mounts, queries the URL, and decides what to render

In-React Navigation

- Do not embed any link, just use event handlers
- Remember the page type using state variables (e.g., 'mode')
- Push fake URLs in the browser history

(Wrong) approaches

In-React Navigation

- Pros
  - No reloads are necessary
  - State is maintained
- Cons
  - Navigation state mixed with application state
  - Error-prone history mangling
  - Needs separate "rebuild from URL" logic

- Do not embed any link, just use event handlers

- Remember the page type using state variables (e.g., 'mode')

- Push fake URLs in the browser history

https://reacttraining.com/react-router/

https://flaviocopes.com/react-router/

Full Stack React, chapter "Routing"

React Handbook, chapter "React Router"

React as a REST Client

THE REACT ROUTER

React-Router

- The problems associated with multi-page navigation and URL management are usually handled by *router* libraries

- A JavaScript Router manages:
  - Modifying the location of the app (the URL)
  - Determining what React components to render at a given location

- In principle, whenever the user clicks on a new URL
  - We prevent the browser from fetching the next page
  - We instruct the React app to switch in&out components

React-Router

- React does not contain a specific router functionality
  - Different router libraries are available
  - The most frequently adopted is **react-router**
  - npm install **react-router-dom**

Package	Version	Docs	Description
react-router	npm v5.2.0	API Docs site API Docs markdown	The core of React Router
react-router-dom	npm v5.2.0	API Docs site API Docs markdown	DOM bindings for React Router
react-router-native	npm v5.2.0	API Docs site API Docs markdown	React Native bindings for React Router
react-router-config	npm v5.1.1	API Docs readme	Static route config helpers

Features

- Connects React app navigation with Browser's native navigation features
- Selectively shows components according to the current routes
  - Rules matching URL fragments
- Easy to integrate and understand: it uses normal React components («it's just React»)
- Links to new pages are handled by `<Link>`, `<NavLink>` and `<Redirect>`
- For determining that to render we use `<Route>` and `<Switch>`
- The whole application is wrapped in a `<Router>` container

Overview of React-Router

<Router>

```
<Link to='/'>Home</Link>
<Link to='/about'>About</Link>
<Link to='/dash'>Dashboard</Link>
```

</Router>

'/about'

<Router>

```
<Switch>
    <Route exact path="/">
        <Home />
    </Route>
    <Route path="/about">
        <About />
    </Route>
    <Route path="/dashboard">
        <Dashboard />
    </Route>
</Switch>
```

</Router>

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<Router>

- Different routers are available: <BrowserRouter>, <HashRouter>, <MemoryRouter>, <NativeRouter>, <StaticRouter>

- BrowserRouter uses normal URLs and the HTML5 Location API
  - Recommended for modern browsers
  - Requires *some server configuration*
  - `import { BrowserRouter as Router } from 'react-router-dom' ;`

- HashRouter uses '#' in the URL
  - Compatible with older browsers
  - Requires no config on the server

- Must wrap the entire App

\<Router>

- Different routers are available: \<BrowserRouter>, \<HashRouter>, \<MemoryRouter>, \<NativeRouter>, \<StaticRouter>

- BrowserRouter uses normal URLs and the HTML5 Location API
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  - Compatible with older browsers
  - Requires no config on the server

- Must wrap the entire App

Not needed with the React Development Server.

When served as a static bundle, all paths must be mapped to `index.html`:

```
app.use(express.static('build'));

app.get('/*', function (req, res) {
  res.sendFile('build/index.html');
});
```

https://create-react-app.dev/docs/deployment/#serving-apps-with-client-side-routing

Selective render

- Content wrapped in `<Route>` will be rendered only if the URL path matches the specification
  - `path = '/fragment'` uses regexp to check if the URL matches
  - `component = {MyComponent}` renders the specified component if the path matches

```
<Router>
  <div>
    <Route exact path="/" component={Home} />
    <Route path="/news" component={NewsFeed} />
  </div>
</Router>
```

Route **matching** methods

- `path` = regular expression matched against the URL
  - If `path` is missing, then the URL always matches
- Options
  - `exact`: revert to exact string comparison (no regexp)
  - `strict`: if the pattern has a trailing / , then the URL must have a trailing /
  - `sensitive`: the match becomes case-sensitive (default: insensitive)

Route **render** methods

- `<Route component={MyComponent}/>`
  - If path matches, render MyComponent
  - May also specify <MyComponent> by *nesting* it inside <Route>
- `<Route render={ () => <C1><C2/></C1> } />`
  - If path matches, render the result of the function (e.g., JSX expression)
- `<Route children={ (match) => <C1><C2/></C1> } />`
  - Always, render the result of the function (e.g., JSX expression)
  - Useful if the expression internally self-customizes according to match status
- In all cases, the component or the function receives 3 props
  - `match`: the matching status of the route
  - `location`: the current browser location
  - `history`: a reference to a history object wrapping browser's history

Route `match` object

- With `component={}` you have `this.props.match` inside the component
- With `render={}` or `children={}`, you have `(match) => ()` in the function
- `match` is composed by
  - `params` - (object) Key/value pairs corresponding to the dynamic segments of the path
  - `isExact` - (boolean) true if the entire URL was matched (no trailing characters)
  - `path` - (string) The path pattern used to match. Useful for building nested <Route>s
  - `url` - (string) The matched portion of the URL. Useful for building nested <Link>s
- Note: with `children`, `match` may be **null** (**null** will be passed to the render function)

https://reacttraining.com/react-router/web/api/match

Dynamic Routes

- Routes may have parametric segments, with the :name syntax
  - <Route exact path="/post/:id" component={Post} />
  - The 'id' part will be available as match.params.id

```
<Route exact path="/post/:id" render={({match}) => (
  <Post post={posts.find(
     p => p.id === match.params.id)} />
)} />
```

`<Switch>`

- General rule: all <Route>s whose path matches the URL are rendered
  - By default, Route is *inclusive*
- Sometimes, we want to render only one, of a group of Routes
- `<Switch>` may include many <Route> (or <Redirect>), and will render only the first child that matches
  - Routes included in `Switch` are *exclusive*
  - Always start with the most restrictive rules

```
<Switch>
  <Route exact path="/">
    <Home />
  </Route>
  <Route path="/about">
    <About />
  </Route>
  <Route path="/:user">
            would also match /about
    <User />
  </Route>
  <Route> no path: always matches
    <NoMatch />
  </Route>
</Switch>
```

`<Link>`

- The `Link` component is used to trigger new routes
- Attribute `to={}` specifies the target URL
  - As a string
  - As an object `{pathname, search, hash, state}`
  - As a function returning one of the above
- `replace` overwrites (rather than adding) the URL in the history
- Will generate a DOM `<a>` component
  - Extra attributes are forwarded to the `<a>`

```
<Link to={`/dashboard`}>Dashboard</Link>
<Link to={`/about`}>About</Link>
```

Link destination object

- `<Link to={object}/>`, with the `object` composed of:
  - `pathname`: A string representing the path to link to
  - `search`: A string representation of query parameters (useful for dynamically generated parameters)
  - `hash`: A hash to put in the URL, e.g. #a-hash (not used with BrowserRouter)
  - `state`: State to persist to the location (useful to initialize the state after the route has been followed)

`<NavLink>`

- A special version of the <Link> that will add styling attributes to the rendered element *when it matches the current URL*

- Useful for automatically highlighting *the current item* in a menu
  - activeClassName (string): the class to give the element when it is active (default: `'active'`). Added to className
  - activeStyle (object): the styles to apply to the element when it is active

```
<NavLink
  to={`${albumsPathname}/${album.id}`}
  activeClassName='active'
  className='item'
  key={album.id}
>${album.name}</NavLink>
```
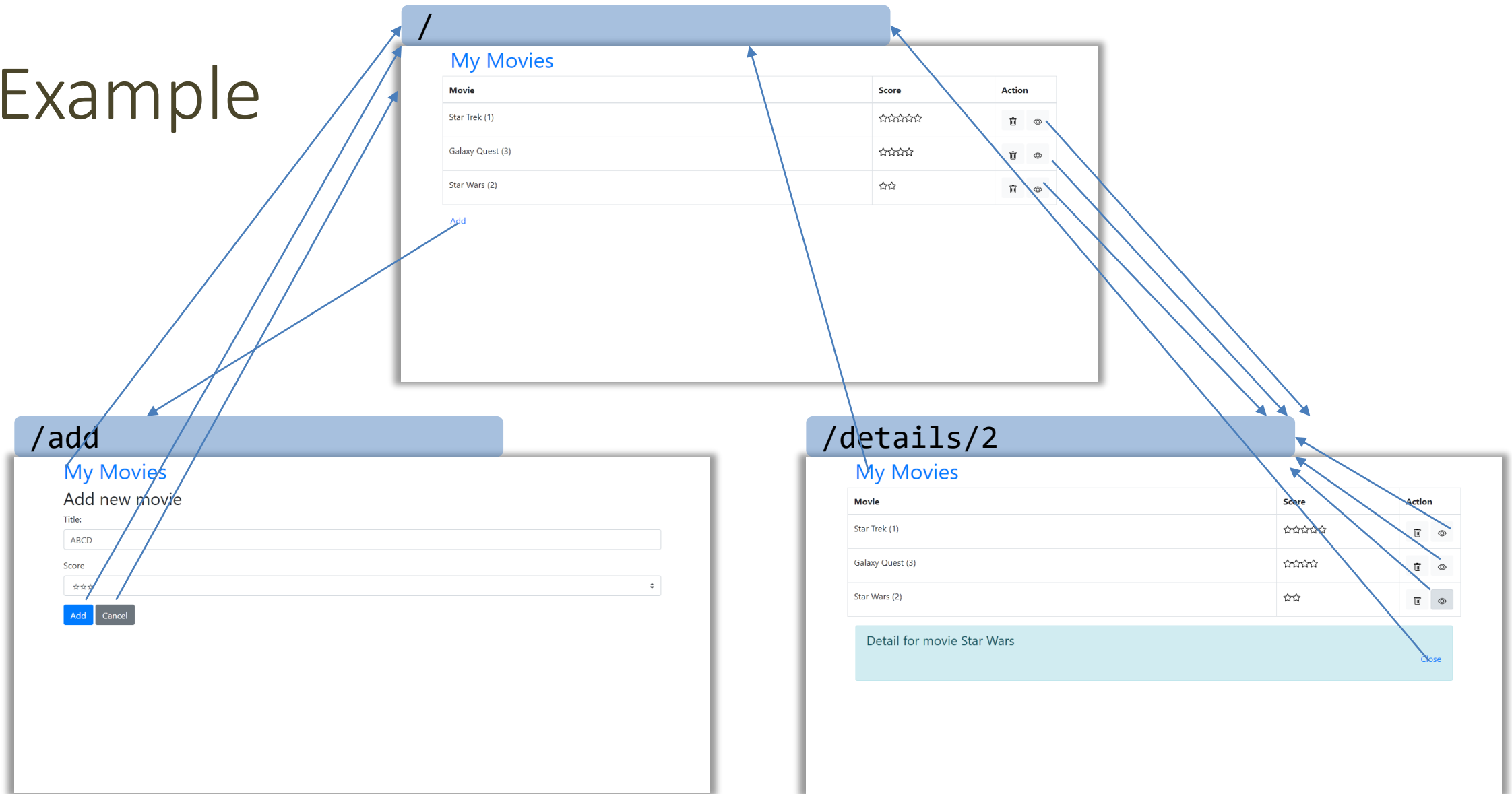
\<Redirect\>

- When rendered, forces the navigation to a new location
- Used to "programmatically" force a location change
  - In event handlers, you often need to "jump" to a given page
  - Might use `location.push`
  - Easier way: set a state property that will cause a render of a \<Redirect\>
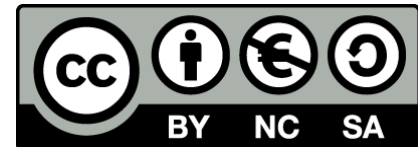
```
constructor(props) {
  super(props);
  this.state = { submitted: false };
}

render() {
  if (this.state.submitted)
    return <Redirect to='/' />;
...}

handleSubmit = (ev) => {
  ev.preventDefault();
  this.setState((state) =>
    {submitted:true }));
}
```

https://tylermcginnis.com/react-router-programmatically-navigate/

Example

/

My Movies

Movie	Score	Action
Star Trek (1)	☆☆☆☆☆	🗑 👁
Galaxy Quest (3)	☆☆☆☆☆	🗑 👁
Star Wars (2)	☆☆	🗑 👁

Add

/add

My Movies

Add new movie

Title:

ABCD

Score

☆☆☆

Add Cancel

/details/2

My Movies

Movie	Score	Action
Star Trek (1)	☆☆☆☆☆	🗑 👁
Galaxy Quest (3)	☆☆☆☆☆	🗑 👁
Star Wars (2)	☆☆	🗑 👁

Detail for movie Star Wars

Close

https://github.com/polito-WA1-2020/client-server-example/tree/**with_router**

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