<WA1/>
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2021

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. …

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`

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  sufficient
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- 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 is queried by the App to customize the render

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

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

Full Stack React, chapter “Routing”

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React as a REST Client

THE REACT ROUTER

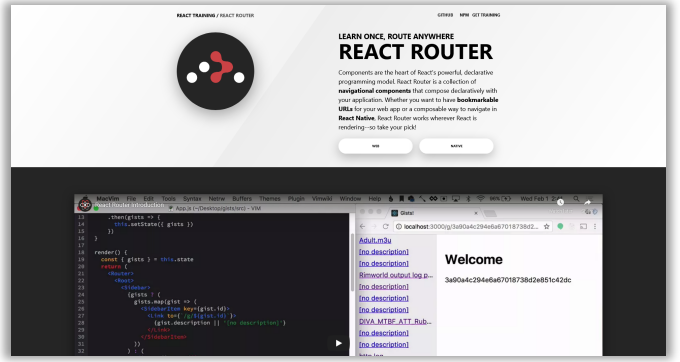
React-Router

- 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

https://reactrouter.com/
https://github.com/ReactTraining/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 the 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>
```

<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>

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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');
});
```

More on this -> next weeks!

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)

Dynamic Routes

- Routes may have parametric segments, with the `:name` syntax in the path specification
  - `<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)} />
)} />
```

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 (URL)
  - `history`: a reference to a history object wrapping browser's history

Route **match** object

- With `component={}` you have `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

Hooks

- The three routing props, together with the route's parametric segment, are available as **hooks**
  - `useHistory()`
  - `useLocation()`
  - `useParams()`
  - `useRouteMatch(url)`
- `useRouteMatch` is useful for accessing the `match` data without actually rendering a <Route>

```
const history = useHistory();
history.push('/home');
// navigate to '/home'

const location = useLocation();
console.log(location.pathname);
// e.g., /blog

const { slug } = useParams();
console.log(slug);
// if <Route path="/blog/:slug">
// and the URL is "/blog/3"
// it will print "3"

let match = useRouteMatch("/blog/:slug");
// Do whatever you want with the match...
```

https://reactrouter.com/web/api/Hooks

<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
  - Don't use <a> links
- 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)

Passing State Among Pages

- If you need to pass information that will be available whenever the app returns to a specific location, you can include it in `to={object}`
- Alternative to pass information as param in the URL
- Available as `location.state` in the target `<Route>`

```
<Link to={{
      pathname: "/update",
      state: { examCode: code }
    }}>Update</Link>
```

```
<Route path="/update"
   render={({location}) =>
 <ExamForm
  examCode={location.state.examCode}/>
}/>
```

Tips

- `location.state` can be accessed also via `useLocation()` hook
- `location.state` may not be set if the URL is erroneously invocated or directly loaded: double check it is correctly set before use

```
<Route path="/update"
        render={() => <ExamForm … /> }/>
```

```
function ExamForm(props) => {
    const location = useLocation();
    const examCode = location.state ?
                     location.state.examCode : ''
}
```

```
<Route path="/update"
   render={({location}) =>
 <ExamForm
  examCode={location.state ?
  location.state.examCode : ''}/>
}/>
```

<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 `history.push`
  - Easier way: set a state property that will cause a render of a `<Redirect>`

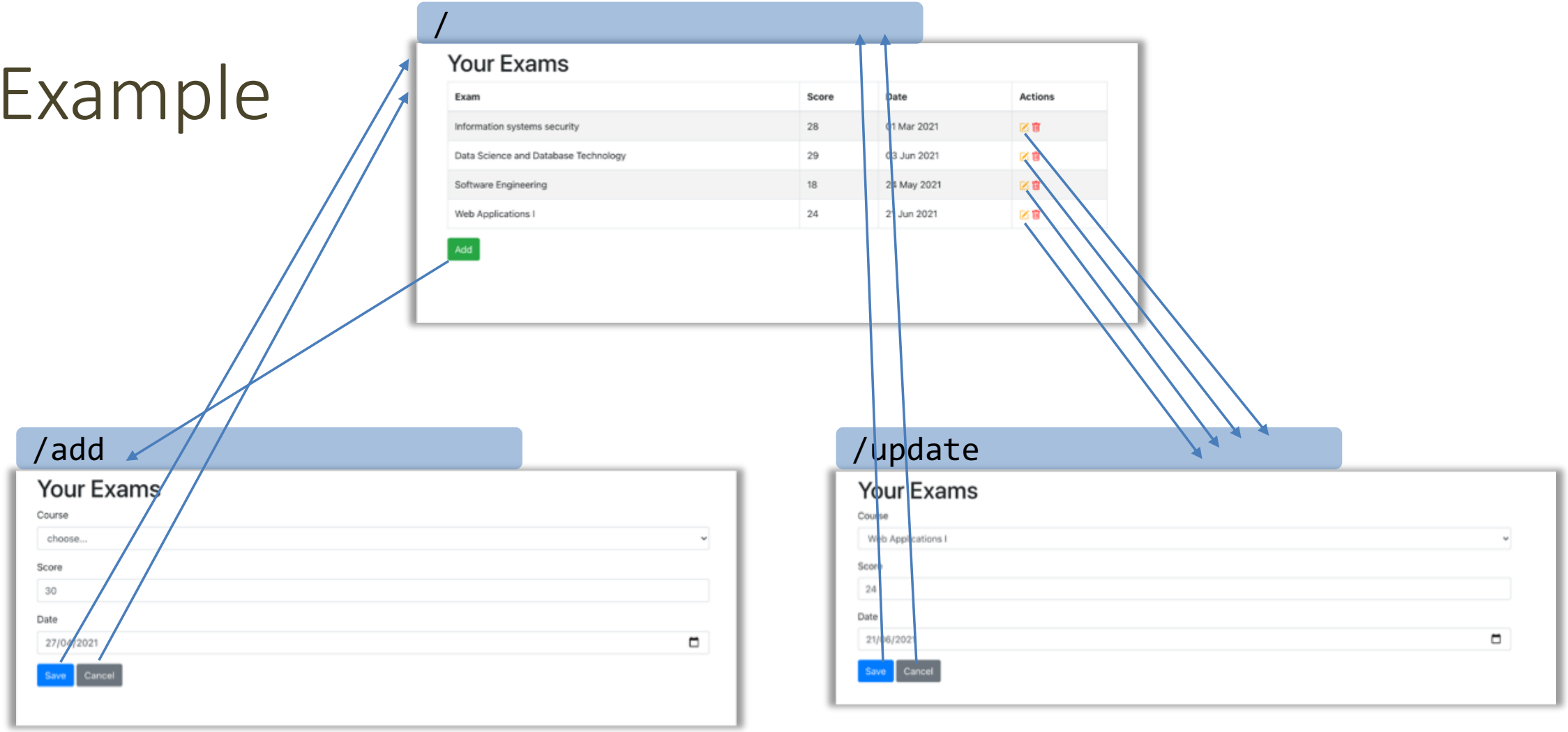
```
const [submitted, setSubmitted] =
useState(false) ;

handleSubmit = (ev) => {
  ev.preventDefault();
  setSubmitted(true);
}

if (submitted)
    return <Redirect to='/' />;
else
    return ...
```

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

Example



https://github.com/polito-WA1-AW1-2021/react-scores/tree/with_router

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