Single Page Application State Management

Maintaining State in React Applications with Redux and Routing

Introduction

A previous assignment used React to implement a Single Page Application (SPA) called WhiteBoard, an online Learning Management System (LMS). This assignment will expand on that assignment to allow faculty to add various content widgets such as Headings, Paragraphs, Images and Links.

Learning Objectives

The learning objectives of this assignment are

- Maintain state with Redux in React applications
- Use a store to keep track of a history of states
- Map application state to stateless React components
- Navigating with React Router DOM library

Features

The features implement it in this assignment are

- Navigating from Course List to Course Editor
- Navigating between Modules, Lessons, and Topics
- Maintaing state for current Course, Module, Lesson, and Topic

Install Redux in an existing React application

In the root directory of the React application created in an earlier assignment, install the Redux library and it's React integration library

npm install redux --save
npm install react-redux --save

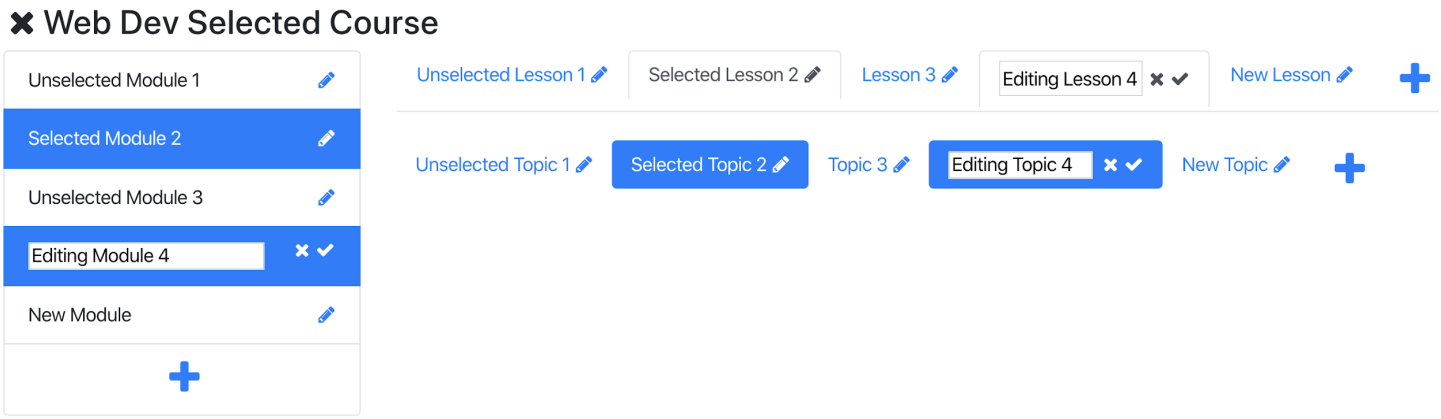
Implement navigation with routing

Refactor CourseTable and Grid components to navigate to the CourseEditor component by clicking on the title of course. Encode the course ID into the URL using the pattern: ***/courses/:layout/edit/:courseId*** where ***courseId*** is the ID of the course selected and layout is either ***table*** or ***grid***.

Implement a course editor component

In ***/src/components/course-editor/course-editor.js***, create a functional component called ***CourseEditor*** which displays the modules, lessons, and topics for a selected course. The ***CourseEditor*** is shown below

displaying the name of the currently selected course. The component should be mapped to ***/courses/:layout/edit/:courseId*** and display the modules, lessons, and topics for a course whose ID is ***courseId***. Clicking on the close button on the ***CourseEditor*** (the X next to the course title) navigates to the previous page.



Implementing the module list component

In ***/src/components/course-editor/module-list.js***, create a functional react component called ***ModuleList***. The component should render a list of modules from the currently selected course. At the bottom of the module list there's a button that allows adding new modules to the list. New modules appear at the end of the list with a default new title of "New Module". Each module is rendered using an ItemEditor component described later in this document. Each module has a label, an input field, edit button, save button, and delete button. By default each module item only displays the edit button and label with the module's title. Clicking on the edit button hides the label and edit button, and shows the other buttons, input field, and highlights the module. Clicking on the delete button removes the module from a remote server and the list of module updates. Clicking on the save button saves the changes to a remote server and updates the list of modules. Clicking on the title makes it currently selected module, and highlights the module.

Implementing the lesson tabs component

In ***/src/components/course-editor/lesson-tabs.js***, create a functional React component called LessonTabs. The component should render a list of lesson tabs from the currently selected module. Encode the selected module in the URL as ***/courses/:layout/edit/:courseId/modules/:moduleId***. At the end of the list of tabs there's a button that allows adding new lesson tabs. New lessons appear at the end of the list with a default title of "New Lesson". Each lesson is rendered using an ItemEditor component described later in this document. Each tab has a label, an input field, edit button, save button, and delete button. By default each tab item only displays the edit button and label with the lesson's title. Clicking on the edit button hides the label and edit button, and shows the other buttons and input field, and highlights the lesson. Clicking on the delete button removes the lesson from a remote server and the list of lessons updates. Clicking on the save button saves the changes to a remote server and updates the list of lessons. Clicking on the title makes it currently selected lesson, and highlights the lesson.

Implementing the topic pills component

In ***/src/components/course-editor/topic-pills.js***, create a functional React component called TopicPills. The component should render a list of topic pills from the currently selected lesson. Encode the selected lesson

in the URL as ***/courses/:layout/edit/:courseId/ modules/:moduleId/lessons/:lessonId***. At the end of the list of pills there's a button that allows adding new topic pills. New topics appear at the end of the list with a default title of "New Topic". Each topic is rendered using an ItemEditor component described later in this document. Each pill has a label, an input field, edit button, save button, and delete button. By default each pill item only displays the edit button and label with the topic's title. Clicking on the edit button hides the label and edit button, and shows the other buttons and input field, and highlights the topic. Clicking on the delete button removes the topic from a remote server and the list of topics updates. Clicking on the save button saves the changes to a remote server and updates the list of topics. Clicking on the title makes it currently selected topic, and highlights the topic. If needed encode the selected topic in the URL as /courses/:layout/edit/:courseId/modules/:moduleId/lessons/ :lessonId/topics/:topicId.

Implement item editor component

In ***/src/components/editable-item.js***, create a functional react component called ***EditableItem*** that can be used to render and edit modules, lessons, and topics as described earlier in this document. ***EditableItem*** has an input field, a hyperlink, an edit button, a save button, and a delete button. By default ***EditableItem*** displays the title of the module, lesson, or topic, as a link, as well as the edit button. Clicking the edit button replaces the title link with an input field with the value of title, the edit button is replaced with a save and delete buttons. Clicking the delete button removes the item from the list. Clicking the save button updates the title, hides the input field, shows the title link, and replaces the save and delete buttons with the edit button. Use the ItemEditor to implement each of the items rendered in the module list, lesson tabs, and topic pills.

Implement the services

In ***/src/services/*** implement the following services: module-service.js, lesson-service.js, and topic-service.js with the following functions

Module service

For the createModule() and findModulesForCourse() functions below, use the following URL pattern:
https://wbdv-generic-server.herokuapp.com/api/YOUR_NEUID/courses/COURSE_ID/modules

where YOUR_NEUID is your neuid, and COURSE_ID is the ID of the course the modules belong to. For all other functions use the following URL pattern:
https://wbdv-generic-server.herokuapp.com/api/YOUR_NEUID/modules/MODULE_ID

Function	Description
createModule(courseId, module)	creates a new module instance for the course whose ID is courseId
findModulesForCourse(courseId)	retrieves all modules for course whose ID is courseId
findModule(moduleId)	retrieves one module whose ID is moduleId (optional)
updateModule(moduleId, module)	updates one module whose ID is moduleId
deleteModule(moduleId)	removes module whose ID is moduleId

Lesson service

For the createLesson() and findLessonsForModule() functions below, use the following URL pattern:
https://wbdv-generic-server.herokuapp.com/api/YOUR_NEUID/modules/MODULE_ID/lessons

where YOUR_NEUID is your neuid, and MODULE_ID is the ID of the module the lessons belong to. For all other functions use the following URL pattern:
https://wbdv-generic-server.herokuapp.com/api/YOUR_NEUID/lessons/LESSON_ID

Function	Description
createLesson(moduleId, lesson)	creates a new lesson instance for the module whose ID is moduleId
findLessonsForModule(moduleId)	retrieves all lessons for course whose ID is moduleId
findLesson(lessonId)	retrieves one lesson whose ID is lessonId (optional)
updateLesson(lessonId, lesson)	updates one lesson whose ID is lessonId
deleteLesson(lessonId)	removes lesson whose ID is lessonId

Topic service

For the createTopic() and findTopicsForLesson() functions below, use the following URL pattern:
https://wbdv-generic-server.herokuapp.com/api/YOUR_NEUID/lessons/LESSON_ID/topics

where YOUR_NEUID is your neuid, and LESSON_ID is the ID of the lesson the topics belong to. For all other functions use the following URL pattern:
https://wbdv-generic-server.herokuapp.com/api/YOUR_NEUID/topics/TOPIC_ID

Function	Description
createTopic(lessonId, topic)	creates a new topic instance for the lesson whose ID is lessonId
findTopicsForLesson(lessonId)	retrieves all topics for lesson whose ID is lessonId
findTopic(topicId)	retrieves one topic whose ID is topicId (optional)
updateTopic(topicId, topic)	updates one topic whose ID is topicId
deleteTopic(topicId)	removes topic whose ID is topicId

Implement the reducers

In /src/reducers, implement the following reducers with the corresponding actions. Combine the reducers to maintain state across ModuleList, LessonTabs, and TopicPills components. Use useState() and useEffect() hooks to maintain or share state within components.

module-reducer.js

Function	Description
CREATE_MODULE	updates state variable modules by appending a new module at the end of the list of modules
FIND_MODULES_FOR_COURSE	retrieves all modules for course whose ID is courseId
FIND_MODULE	retrieves one module whose ID is moduleId (optional)
UPDATE_MODULE	updates one module whose ID is moduleId
DELETE_MODULE	removes module whose ID is moduleId

lesson-reducer.js

Function	Description
CREATE_LESSON	creates a new lesson instance for the module whose ID is moduleId
FIND_LESSONS_FOR_MODULE	retrieves all lessons for course whose ID is moduleId
FIND_LESSON	retrieves one lesson whose ID is lessonId (optional)
UPDATE_LESSON	updates one lesson whose ID is lessonId
DELETE_LESSON	removes lesson whose ID is lessonId

topic-reducer.js

Function	Description
CREATE_TOPIC	creates a new topic instance for the lesson whose ID is lessonId
FIND_TOPICS_FOR_LESSON	retrieves all topics for lesson whose ID is lessonId
FIND_TOPIC	retrieves one topic whose ID is topicId (optional)
UPDATE_TOPIC	updates one topic whose ID is topicId
DELETE_TOPIC	removes topic whose ID is topicId

Deliverables

As a deliverable, check in all your work into a github source control repository. Deploy your project to a remote public server on Heroku or AWS. Submit the URL of the repository and the remote server in blackboard. Tag the commit you want graded as assignment4. TAs will clone your repository and grade the tagged commit.

1. Create Module Reducer
    a. Create trivial reducer with static state: moduleReducer = () => ({modules: […] })
    b. Create store
    c. Create provider
    d. Connect ModuleList with state mapper
2. Add Module
    a. Create add button onClick={createModule}
    b. Map to dispatcher
    c. Handle in moduleReducer -- use an if(action.type)
3. Delete Module
    a. Create delete button onClick={() => deleteModule(module._id)}
    b. Map to dispatcher
    c. Handle in moduleReducer -- change to switch
4. Update Module
    a. Create input field onChange
    b. Create update button
    c. Map to dispatcher
    d. Handle in moduleReducer
5. Cleanup
    a. Move reducer to moduleReducers.js
    b. Move constants and actions to moduleActions.js
6. Load Modules from server
    a. componentDidMount () { this.props.findAllModules() }
    b. refactor mapper and dispatcher
7. Add module to server
    a. refactor mapper and dispatcher
8. Delete module from server
    a. refactor mapper and dispatcher
9. Load Modules for CourseId
    a. Course_Module URL
    b. Refactor componentDidMount to use findModulesForCourse
10. Create Module for Course
    a. refactor createModule to use Course_Module URL

Navigation
Installing
Route to Page1 and back
Move Course Grid and Table into Course List - Pass all properties to Course List to pass to Course Table
Route to Course List and Course Editor with render
Navigating with the back and forward buttons - <Link to="/">Back</Link>
Passing all properties from parent component with {...props}
Navigating programmatically with history.push
Encoding and passing URL parameters - encode course ID in URL and use match.params to retrieve

Redux

Installing redux and react-redux
Create a reducer

Create a store
Create a Provider
Creating Modules
Add new module title input field and add new module button
    Handle state and events within module list component, no need to propagate
        input field state managed within module list component, no need to propagate state elsewhere
        add module event handled within component, no need to propagate
Navigation
https://reacttraining.com/react-router/web/guides/quick-start
npm install react-router-dom

encoding in the url

move course table and grid into a separate component called course list component
we can do abastraction