REACT
REDUX

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Agenda

- Why Redux?
- Core Concepts
- Q & A

Why Redux?

- What is Redux?
  - A predictable state container for JavaScript apps
  - A JavaScript library used to manage an application's front-end state
  - Created by Dan Abramov
  - Inspired by Flux architecture
- Goal of Redux
  - Make state management in an app more predictable and manageable
- Benefits
  - Shared state – share same piece of state with 2 or more components
  - Caching – API calls or expensive operations, better user experience

Why Redux?

- How Redux Improves Predictability?
  - Data is consolidated to one centralized location: the store
  - Components must request access to data for writing/updating data in the store
  - Strict rules are set on how the store can be updated
  - Redux believes in unidirectional data flow. Data only ever flows one way through the application

- Redux Store vs React Component State
  - React Component State
    - short lived state
    - does not matter to the app globally
    - does not mutate in complex ways
    - localized data, state that does not affect other components
  - Redux Store
    - state that matters globally
    - is mutated in complex ways
    - shared state, accessible through the whole app

Why Redux?

- Pure Functions
  - State in Redux applications is updated using pure functions:
    - Return one and the same result if the same arguments are passed in
    - Depend solely on the arguments passed into them
    - Do not produce side effects

```
// `square()` is a pure function

const square = x => x * x;
```

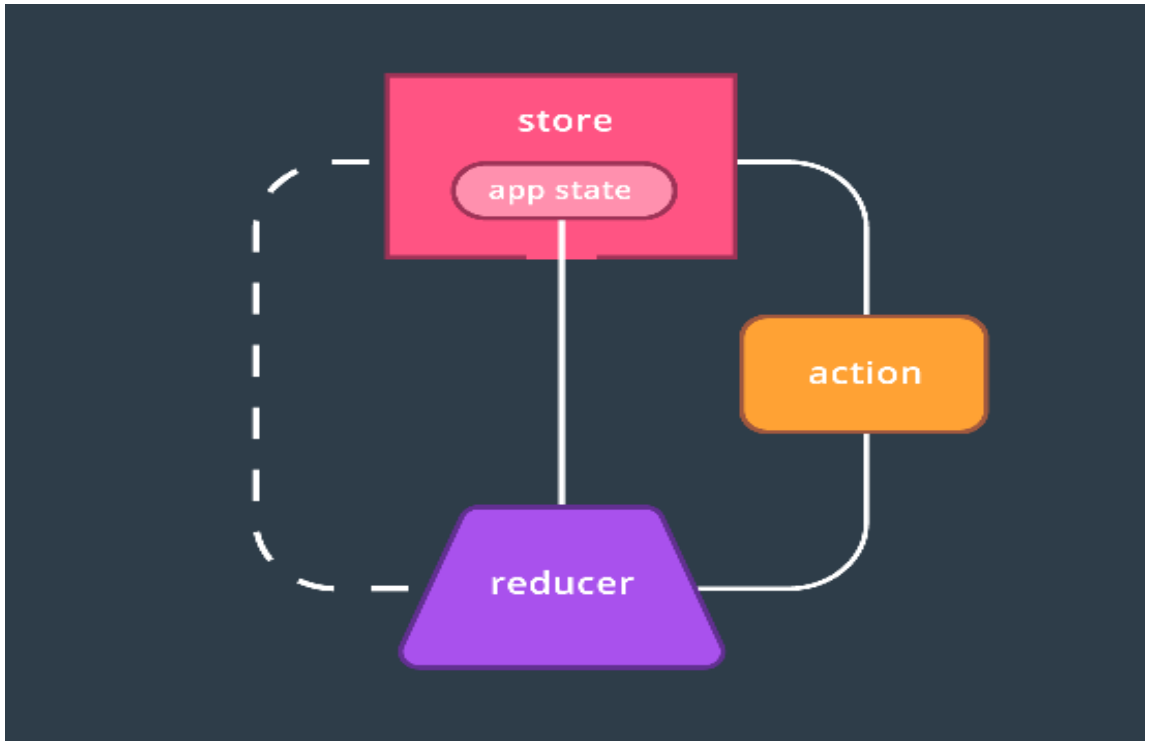
```
// `calculateTax()` is an impure function

const taxPercentage = 0.10;
const calculateTax = amount => amount * taxPercentage;
```

Why Redux?

- Pure Functions
  - What are side effects?
    - Interactions between a function and the world outside of it.
    - Examples:
      - Making HTTP calls
      - Retrieving today's date
      - Math.random()
      - Adding to a database
  - Pure functions
    - are core elements in functional programming
    - are inherently modular, making them easy to test
      - always produce the same result given the same arguments
    - make maintaining code much simpler
      - do not produce side effects
    - lend themselves to better quality code

Core Concepts

- Major parts of Redux
  - The Store
    - is the source of truth for the state in your app
  - Reducers
    - specify the shape of and update the store
  - Actions
    - are payloads of information which tell reducers which type of events have occurred in the application



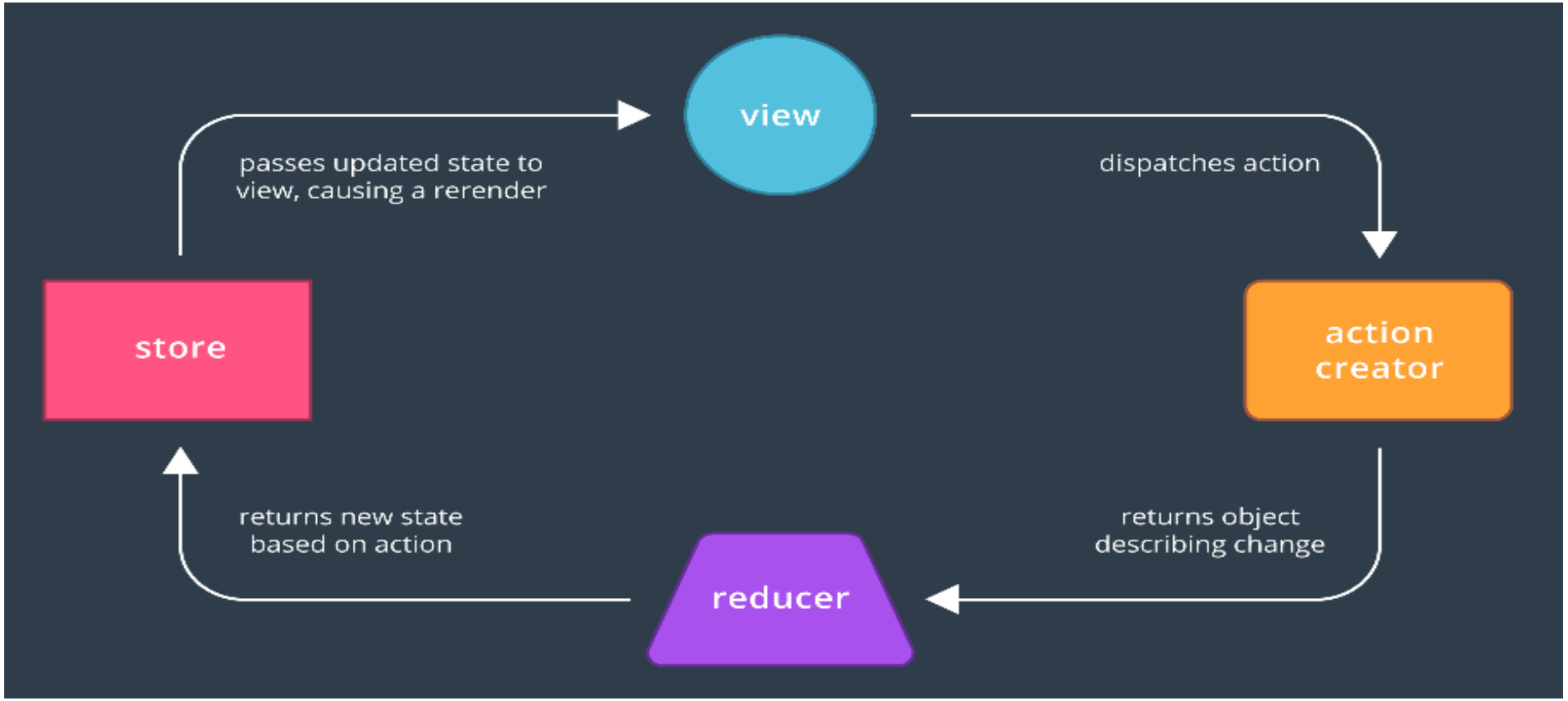
Core Concepts

- Major parts of Redux
  - Most of the application's data or state lives in the store
  - The store's data is populated by reducers. There can be multiple reducers
  - An action is "dispatched" by the store. It is used by reducers to determine what data they should output
  - There can (and will) be more than just one action in a Redux app

- Data flow in a Redux app
  - The store dispatches an action to its reducer
  - The reducer
    - processes the current state with the action
    - returns new state of the app

Core Concepts

- Redux app data flow



Core Concepts

- Actions
  - Similar to browser's native events
  - Can be thought as custom events within Redux apps
  - Represent various types of events or actions that happen in an app
  - Indicate that some event occurred within the app and state should be updated
  - JavaScript objects that describe any event that should update the app's state

```
const LOAD_PROFILE = 'LOAD_PROFILE';

const myAction = {
  type: LOAD_PROFILE
};
```

  - ***Type***
    - 'type' property distinguishes the specific type of action that occurred within the app
    - prefer constants rather than strings as the value of 'type' property
  - ***Payload***
    - can contain any other data needed to represent the type of action that occurred as properties
    - keep the payload as small as possible, include only necessary data

Core Concepts

- Action Creators
  - Are JavaScript functions
  - Wrap actions in functions and make actions more portable and easier to test

```
const ADD_PRODUCT = 'ADD_PRODUCT';

function addProduct(product) {
    return {
      type: ADD_PRODUCT,
      product
    };
}
```

  - whenever we need a ADD_PRODUCT action, we can just call the addProduct() function, pass it a product, and it will generate the action!

Core Concepts

- Reducer
  - is a JavaScript function
  - receives the current state and an action that was dispatched
  - decides how to transform the current state into a brand new state based on the action it received
  - must be a pure function
    - it should take in the current state, an action and return a new state
    - it should not
      - change its arguments
      - have side-effects
      - use other impure functions

```
function appReducer(state, action) {
  switch(action.type) {
    case 'DELETE_FLAVOR':
      let newState = state.filter(iceCream =>
        iceCream.flavor !== action.flavor);
      return newState;
    default:
      return state;
  }
}
```

Core Concepts

- Reducer
  - Specifies the shape of the application's state and decides how the state should change based off specific actions
  - What is returned from the reducer will be the new state of the application
  - You need to make sure you always return either the new state or the previous state
  - The way you decide how to change the state is based on the type of action that was dispatched

  - Store your state in Redux if two components rely on the same piece of state, or if the operation to get that state was expensive.

Core Concepts

- The Store
  - holds the app's state
  - dispatches actions
  - calls reducers
  - receives/stores new state

- Install Redux package

```
npm install --save redux
```

- Redux.createStore(reducer)
  - creates and returns Redux store
  - takes reducer function as first parameter

Core Concepts

- store.getState()
  - will return the current state of the store
  - does not take any arguments

- store.dispatch(action)
  - takes in an action object
  - will call the reducer function, passing it the current state and the action that was dispatched

React Redux

- react-redux
  - a better abstraction for using Redux with React
  - made by creators of Redux
  - offers Provider component and connect() method
    - connect() allows you to specify which components should receive which data from the store
    - Provider makes connect() work properly
  - Setting up react-redux

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

React Redux

- Provider
  - makes it possible for Redux to pass data from the store to any React components that need it
  - uses React's context feature to make this work
- Currying
  - process of partially providing the input to a function that requires additional data
  - also called partial application

```
function plate(vegetables) {
  return function fruitFunc (fruit) {
    return `I ate a plate of ${vegetables} and ${fruit}!`;
  }
}

const sentence = plate('corn')('apples');
const fruitFunc = plate('carrots');
const anotherSentence = fruitFunc('bananas');
```

React Redux

- Using connect()
  - connect() makes it possible for a component to get both state and dispatch from the Redux store

```
connect(mapStateToProps, mapDispatchToProps)(MyComponent)
```

    - MyComponent is the component you want to receive store state, dispatch, or both
    - mapStateToProps() is a function that receives the current store, current props, and what it returns will be available to MyComponent as props
    - mapDispatchToProps() allows you wrap action creators inside of dispatch

React Redux

- mapStateToProps
  - allows you to specify which data from the store you want passed to your React component
  - a function that lets connect() know how to map specific parts of the store's state into usable props

```
mapStateToProps(state, [ownProps])
```

  - if this argument is specified, the new component will subscribe to Redux store updates. This means that any time the store is updated, mapStateToProps will be called. The results of mapStateToProps must be a plain object, which will be merged into the component's props
  - the optional argument, ownProps, gives us access to props passed into a connected component

React Redux

- mapDispatchToProps
  - you can bind dispatch() to your action creators before they ever hit your component
  - is optional, makes the code cleaner

```
mapDispatchToProps(dispatch)
```

Reducer Composition

- Process of separating reducers to handle distinct, independent slices of state
- As an application grows, so will the need for multiple reducers to manage different aspects of the Redux store.
- A reducer will receive a section of state and an action, and return a new, modified section of that state

  - Create more than on reducer
  - Use Redux.combineReducers() method

```
{
  users: {},
  posts: {},
  replies: {}
}
```

Reducer Composition

- combineReducers()
  - A helper function provided by Redux that turns an object whose values are different reducing functions into a single reducing function
  - We then pass this single "root reducer" into createStore() to create the application's store

```
// reducers/root_reducer.js
import { combineReducers } from 'redux';

function users (state = {}, action) {
  // ...
}

function books (state = {}, action) {
  // ...
}

export default combineReducers({
  users,
  books,
});
```

```
// store/store.js

import rootReducer from '../reducers/root_reducer';

const store = createStore(rootReducer);
console.log(store.getState());
```

Normalization

- Do not duplicate data
  - Favor creating references
- Keep your store as shallow as possible
  - Increases performance and minimizes complexity

- Normalizing your Redux store will lead to more efficient and consistent queries

Middleware

- Software between the dispatching of actions and the reducer
- Intercepts the action before it reaches the reducer
- Can carry out a number of operations, like
  - Producing a side effect (e.g., logging)
  - Processing the action (e.g., making an asynchronous HTTP request)
  - Redirecting the action
  - Dispatching supplementary actions

- How to apply middleware?
  - createStore() takes in an optional enhancer argument

```
createStore(reducer, [preloadedState], [enhancer])
```

Middleware

- applyMiddleware()
  - can be used as the enhancer argument
  - can accept multiple arguments, so if needed, we can apply more than one middleware to an app

Thunks

- Out of the box, the Redux store can only support the synchronous flow of data
- Thunk
  - Middleware that helps support asynchronicity in a Redux app
  - A wrapper for the store's dispatch() method
  - Thunk Action Creators are used to dispatch functions or Promises

- Setup

```
npm install --save redux-thunk
```

Q & A

- Thank you!