

React so far

- React function-based components
- State-per-component from `useState` hook
- Passing state as props
- Altering state in children via callback props
- Per-render/init effects from `useEffect` hooks
- Structural changes w/conditional rendering
- Non-structural changes w/CSS classes

Complex application state

`useState` is normally fine, but state can be complex

- Complex state changes multiple fields at once
- Creates chances for bugs
 - Easy to overlook a field in one place
- A set of changes can have multiple triggers

Answer: `useReducer` hook

My view: Most important abstraction in webdev

State as an object

Imagine our todo state as a single object

```
const todoState = {
  isLoading: false,
  isLoggedIn: true,
  username: 'cat',
  todos: {
    asdf: {
      id: 'asdf',
      task: 'Nap',
      done: false,
    },
    hjkl: {
      id: 'hjkl',
      task: 'Knock things off shelves',
      done: true,
    },
  },
};
```

Pros and Cons

- Changes can be made **atomically**
 - One setter call
 - No risk of partial re-render
- Easy to pass around
 - Can pass all as prop or parts as props
- Will trigger large rerender if anything changes
 - But that's mostly true anyway
 - React will only change DOM when needed

Actions on the state

With state as a single object

- Can perform named actions on the state
 - "login", "logout", "toggleTodo", etc
 - Named for the action/event happening
 - **The event happening to the state**
- These actions can be code themselves

```
function logout(state) {  
  return {  
    ...state,  
    isLoggedIn: false,  
    username: '',  
    todos: {},  
  };  
}
```

Many action functions

- Each takes state
 - And any params needed for new state
- Each returns a new state object

Notice that we aren't CHANGING the state object

- We return a NEW one
- Avoids side-effects
- Also don't mutate any state values!

A reducer combines these action types

All those action functions are the same pattern:

- Accept state
- Accept any necessary params
- Return new state

You can make one function

- Pass state + action "type" (name)
- It can `switch` that type
- Return the new state

Reducer Example (simplified)

```
function reducer( state, action ) {  
  switch(action.type) {  
    case 'login':  
      return { ...state, isLoggedIn: true,  
        username: action.username };  
    case 'toggleTodo':  
      return {  
        ...state,  
        todos: {  
          ...state.todos,  
          [action.id]: {  
            ...state.todos[action.id],  
            done: !state.todos[action.id].done,  
          }  
        },  
      };  
    default:  
      return state;  
  }  
}
```


A lot there

- But the concept isn't involved:
 - Pass the current state
 - Pass an action object (below is example)
 - `action.type` is the name of the action
 - `action.(anything else)` are needed data
 - Return a new state object
 - Often filled with the old values
 - Except for parts that change
- Notice there is NO JSX, no React
 - Just bland JS - easy to test!

Dispatch function uses the reducer

Imagine a function that has the reducer

- React aware
 - Has an object for state
 - Knows the setter for that state
- Is passed the action object
 - Calls the reducer
 - passing reducer the state
 - passing reducer the action object
 - Sets the new state to result from reducer

useReducer hook

```
useReducer(reducer, initialState);
```

- `initialState` is a default value
 - Like with `useState()`
- Returns `[state, dispatch]`
 - `state` is the current state
 - `dispatch` is the `dispatcher` function

Updates the state (and triggers any re-renders):

- ```
dispatch({ type: 'setTheme', theme: 'dark' });
```
- You can pass `dispatch` as a prop to descendants
- They can dispatch actions without other callbacks

# React Example

Assume `initState` and `reducer` are imported:

```
const App = () => {
 const [state, dispatch] = useReducer(reducer, initState);
 const setTheme = (e) => dispatch({
 type: 'setTheme',
 theme: e.target.value
 });
 return (
 <div className={state.theme}>
 <select value={state.theme} onChange={setTheme}/>
 <option value="light">Light</option>
 <option value="dark">Dark</option>
 </select>
 </div>
);
};
```

# When to useReducer?

`useState` is **not wrong**

use `useReducer` when you:

- Need to change many related state values
- Want to abstract complicated state changes
- State-changing logic that you want
  - To reuse
  - To have testable outside of components

# Summary - reducer

A reducer function

- Takes the current state + an action object
- Returns a new state object
- Is a **pure** JS function
  - No React
  - No JSX
  - No outside values
- Can be written in a .js file
  - And imported

# Summary - dispatcher

## Dispatcher function

- Is passed the action object
- "knows" the state
- Updates the app state
  - Triggers render

## Summary - useReducer

- Hook takes reducer + initial state
- returns state + dispatch function

### Dispatch function

- Can be passed to children
- Can be wrapped
  - Wrapper passed to children
  - Children can only "dispatch" via wrapper
    - Decouples children from state
    - Like `<Login onLogin={} />`



## Summary - when to use a reducer

- `useState` is perfectly valid
- `useReducer` when you want
  - Abstracted sets of state changes
  - Reusable actions

(Internally, `useState` is just a simple `useReducer`!)