Design a Dynamic Frontend with React

React Hook, useReducer, useEffect, and Custom Hooks Management

A Day in the Life of a MERN Stack Developer

The manager of an online sports news channel reached out, expressing concerns about the inefficient operation of the site during peak hours, particularly in updating match details every half an hour.

To address this issue and ensure customers receive the value they are paying for, you were tasked with overseeing backend programming. This involves managing data fetching activities, providing subscription details, updating data, setting up timers, and ensuring the accurate updating of prices and quantities of the products.

By leveraging the key concepts of React Hooks and understanding their interrelationships, you can complete these tasks and provide an effective solution for the given scenario.

Learning Objectives

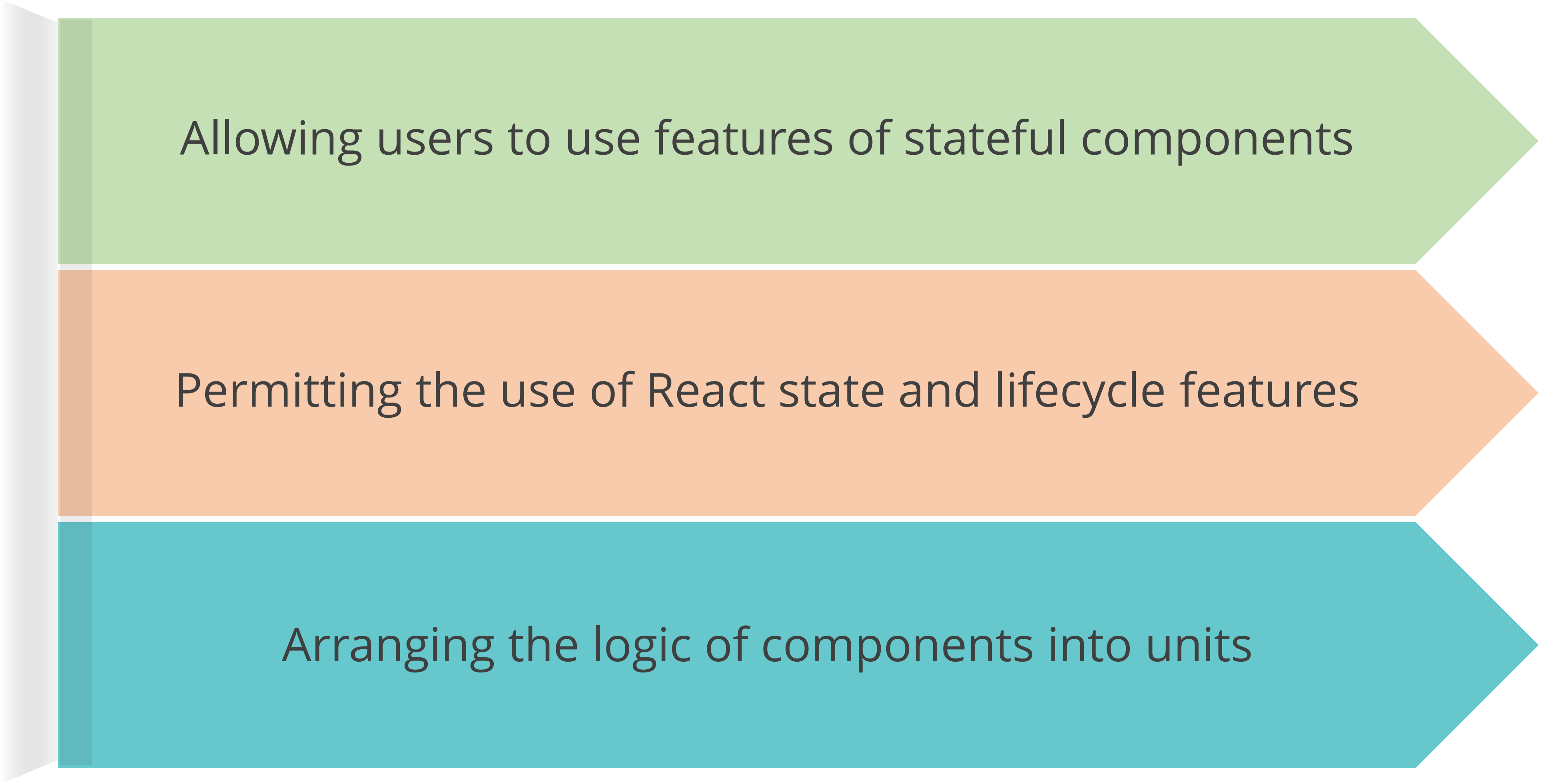
By the end of this lesson, you will be able to:

- Work with useContext Hook to simplify state management in React applications
- Compare the differences between useState and useReducer
- Demonstrate the steps to create custom Hooks in React to enhance modularity and code readability
- Create custom Hooks in React to enable easier testing and enhance the overall scalability of React applications

useReducer Hook

Overview of Hooks: A Recap

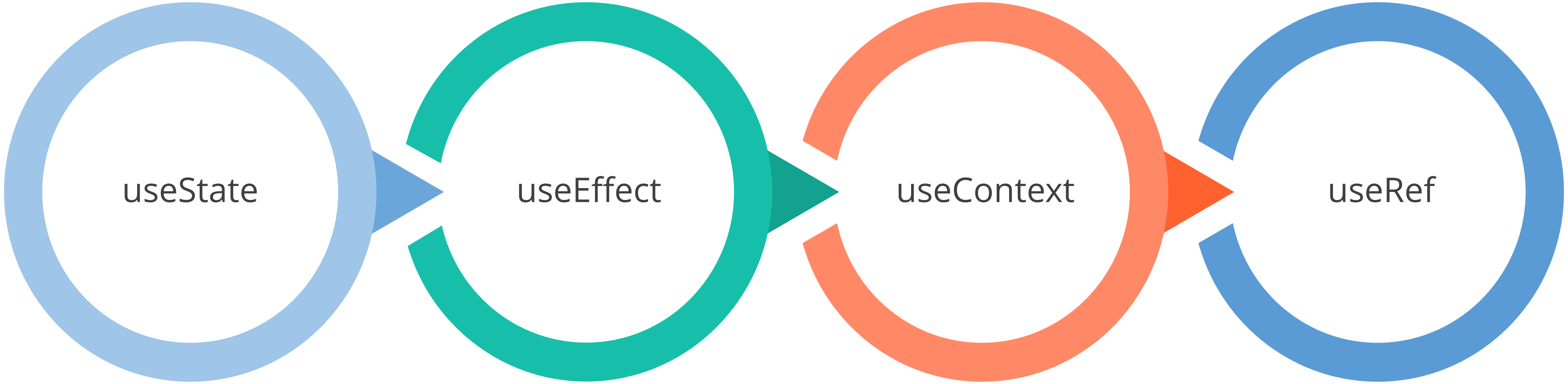
Hooks are replacing the class components. These JavaScript functions revolutionized the method of writing React components in the following ways:



- Allowing users to use features of stateful components
- Permitting the use of React state and lifecycle features
- Arranging the logic of components into units

Types of Hooks: A Recap

Here are some popular Hooks used in React:



useReducer Hook: An Overview

A **useReducer** Hook is a powerful tool for managing complex states and actions.

It is an alternative to using useState, where the state logic becomes advanced.

It is a built-in Hook that provides a way to manage complex states and actions.

It is the best solution to handle complicated and dynamic conditions.

useReducer Hook: Syntax

The syntax of the **useReducer** Hook in React is:

```
const [state, dispatch] = useReducer(reducer, initialState);
```

state	This is the current state value.
dispatch	This is a function that dispatches actions.
reducer	This is a function responsible for updating the state.
initialState	This is the initial value of the state.

useReducer Hook: Benefits and Limitations

Although a **useReducer** Hook is flexible in managing a complex state, coders often find it challenging to use. Here are some of the benefits and limitations of using useReducer:

Advantages of useReducer:

- Helps in easy execution of complex state logic
- Facilitates testing of state management and state transitions
- Works well with the **Context API**

Disadvantages of useReducer:

- Hard to maintain **useReducer** code due to boilerplate code and intricate logic
- Difficult to debug state updates

useReducer Hook: Arguments

useReducer takes two arguments:

- A reducer function
- An initial state

The dispatch function sends an action to the reducer function, which returns a new state.

The arguments in useReducer and dispatch help define the initial state, specify the action type, and pass any necessary data to update the state correctly.

Coding with useReducer: Example

This code demonstrates a simple counter implemented using React's **useReducer** Hook.

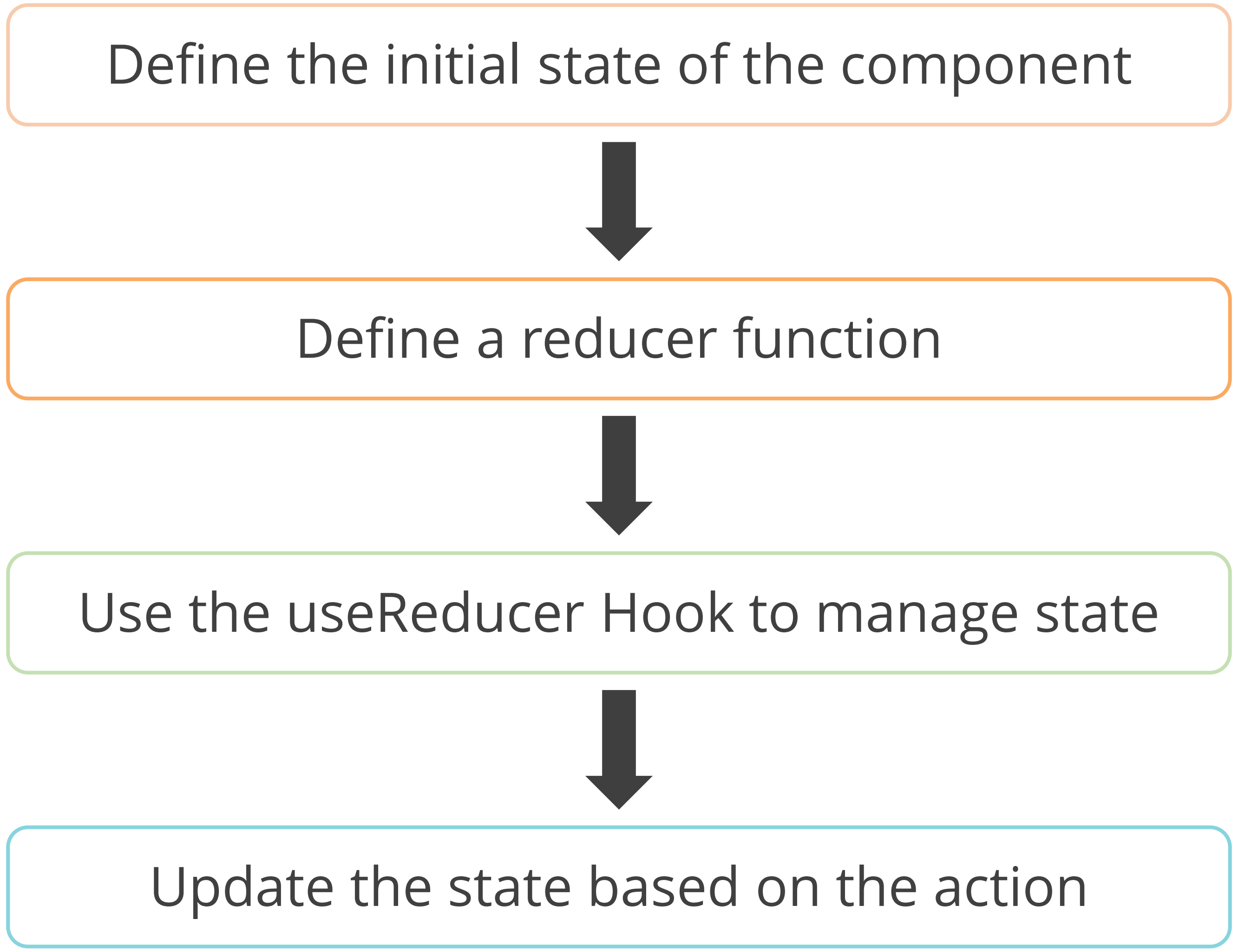
```
import React, { useReducer } from 'react';
const initialState = { count: 0 };
function reducer(state, action) {
  switch (action.type) {
    case 'increment':
      return { count: state.count + 1 };
    case 'decrement':
      return { count: state.count - 1 };
    default:
      throw new Error();
 }
```

Coding with useReducer: Example

```
}
function Counter() {
  const [state, dispatch] = useReducer(reducer, initialState);
  return (
    <div>
      <p>Count: {state.count}</p>
      <button onClick={() => dispatch({ type: 'increment' })}>+</button>
      <button onClick={() => dispatch({ type: 'decrement' })}>-</button>
    </div>
  );
}
```

useReducer Hook: Simple State and Action

The **useReducer** Hook manages the state using a simple state and action approach with the help of the following steps:



Define the initial state of the component

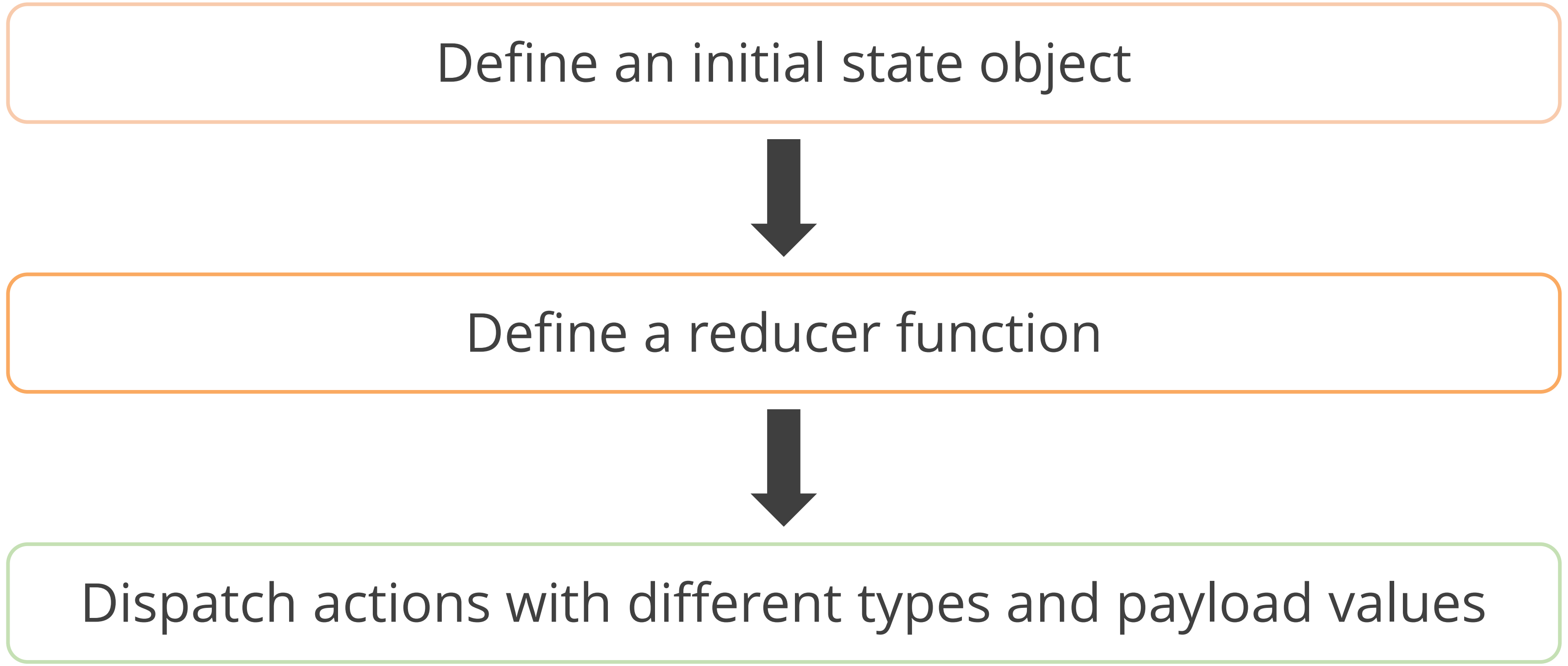
Define a reducer function

Use the useReducer Hook to manage state

Update the state based on the action

useReducer Hook: Simple State and Action

Here are the steps for managing the key properties of the state with **useReducer**:



Define an initial state object

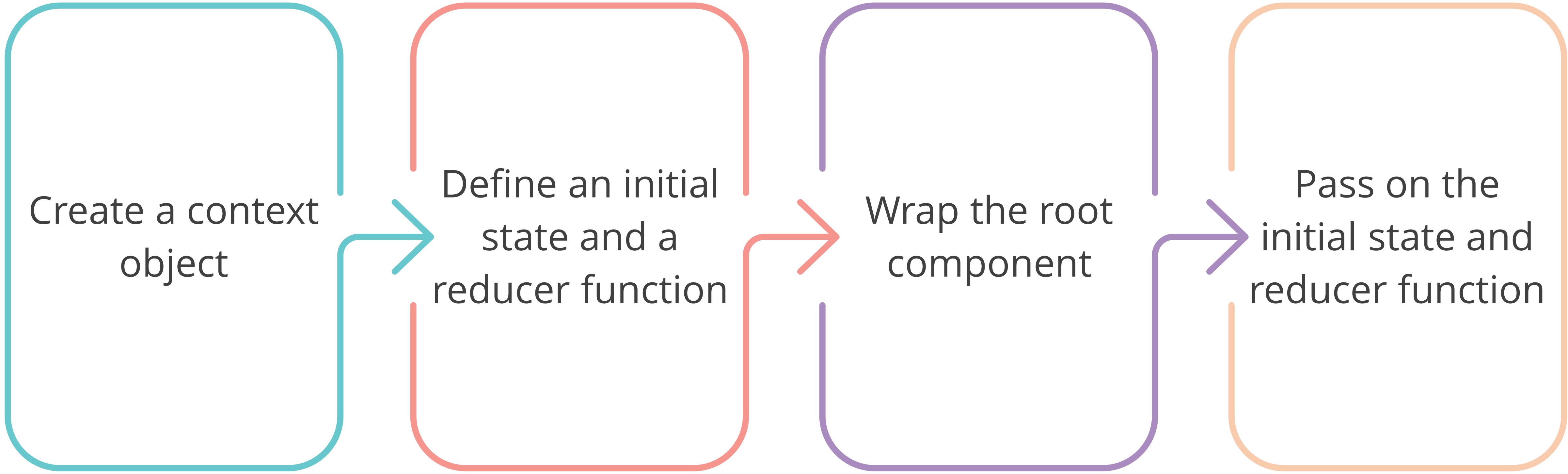
Define a reducer function

Dispatch actions with different types and payload values

The **useReducer** Hook returns the current state object and the dispatch function.

useReducer with useContext

The **useReducer** Hook is often used together with the **useContext** Hook to improve state management. Here are some of its uses:


Create a context object
Define an initial state and a reducer function
Wrap the root component
Pass on the initial state and reducer function

Combining the **useReducer** and **useContext** Hook allows for easy access and sharing of state across different components in an application.

Assisted Practice

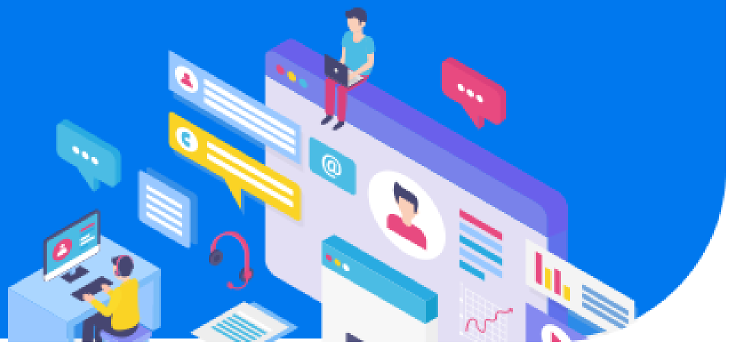
Creating a React Application using useReducer Hook

Duration: 10 Min.

Problem Statement:

You have been assigned a task to build a counter app employing the **useReducer** Hook.

Assisted Practice: Guidelines

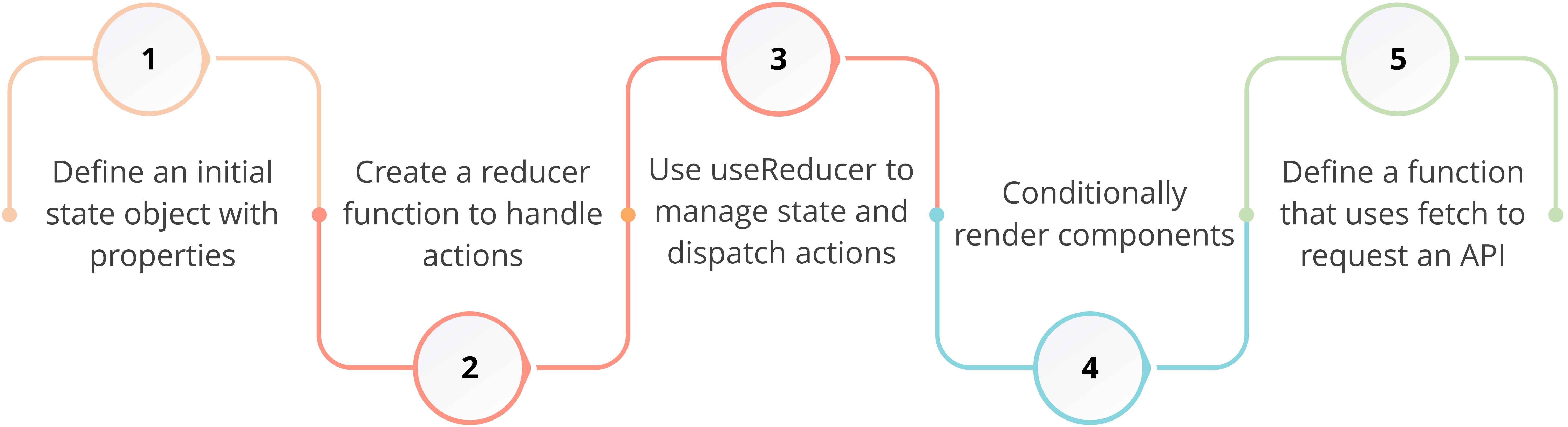


Steps to be followed:

1. Create a new React app using **create-react-app**
2. Run **cd-use-reducer-demo** and change to the new directory
3. Launch the project in the preferred code editor
4. Create a new reducer function that returns a new state
5. Create a simple counter that can be incremented or decremented for this example
6. Create a new state object
7. Run **npm start** in the terminal
8. Open **http://localhost:3000** in the browser

Fetching Data with useReducer

Fetching data with **useReducer** provides a structured and centralized approach for managing state updates with the help of the following processes:



1 Define an initial state object with properties

2 Create a reducer function to handle actions

3 Use useReducer to manage state and dispatch actions

4 Conditionally render components

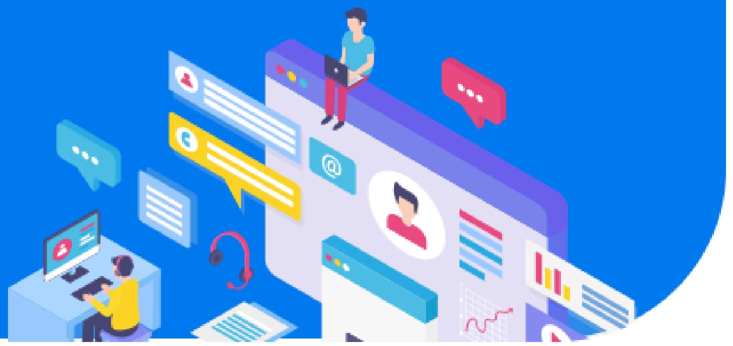
5 Define a function that uses fetch to request an API

useState vs. useReducer

useState and **useReducer** are Hooks in React that serve different purposes for managing state.

	useState	useReducer
Complexity	For simple state updates	For complex state and its transitions
State Update	Updates the state directly	Updates state via action dispatch and reducer function
State Shape	Manages simple states	Handles complex state with many properties
Performance	Faster for simple state updates	Inefficient for simple updates
Code Organization	May cause code duplication	Aids maintainable and organized codes

Assisted Practice



Demo with Fetching Data Using the useReducer Hook

Duration: 15 Min.

Problem Statement:

You have been assigned a task to build a counter app employing the **useReducer** Hook.

Assisted Practice: Guidelines

Steps to be followed:

1. Create a new React app using **create-react-app**
2. Change to the newly created directory
3. Open the project in a code editor
4. Import **useReducer** and **useEffect** from React
5. Run the app by running **npm start** in the terminal
6. Open **http://localhost:3000** in the browser

useEffect Hook

useEffect Hook: Introduction

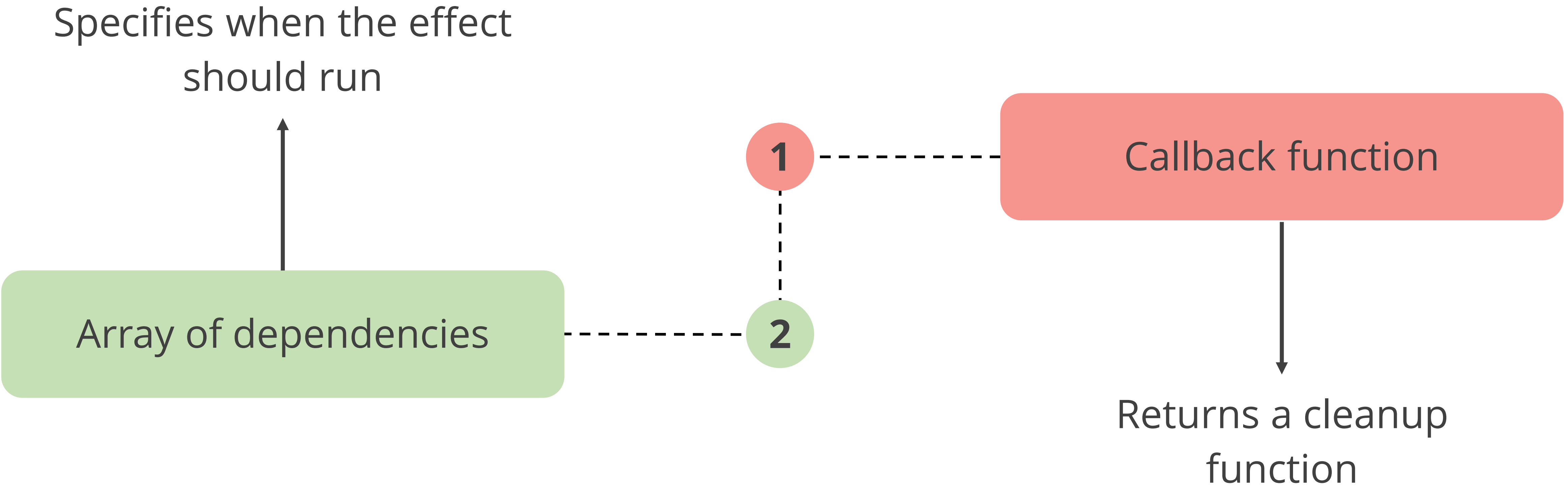
The **useEffect Hook** is a tool for managing side effects in functional components. A side effect is any operation that modifies the application's state or interacts with the external world.

useEffects can be used to:

- Manage subscriptions
- Define effects in functional components
- Run after the component has rendered
- Work on a single component many times

useEffect Hook: Arguments

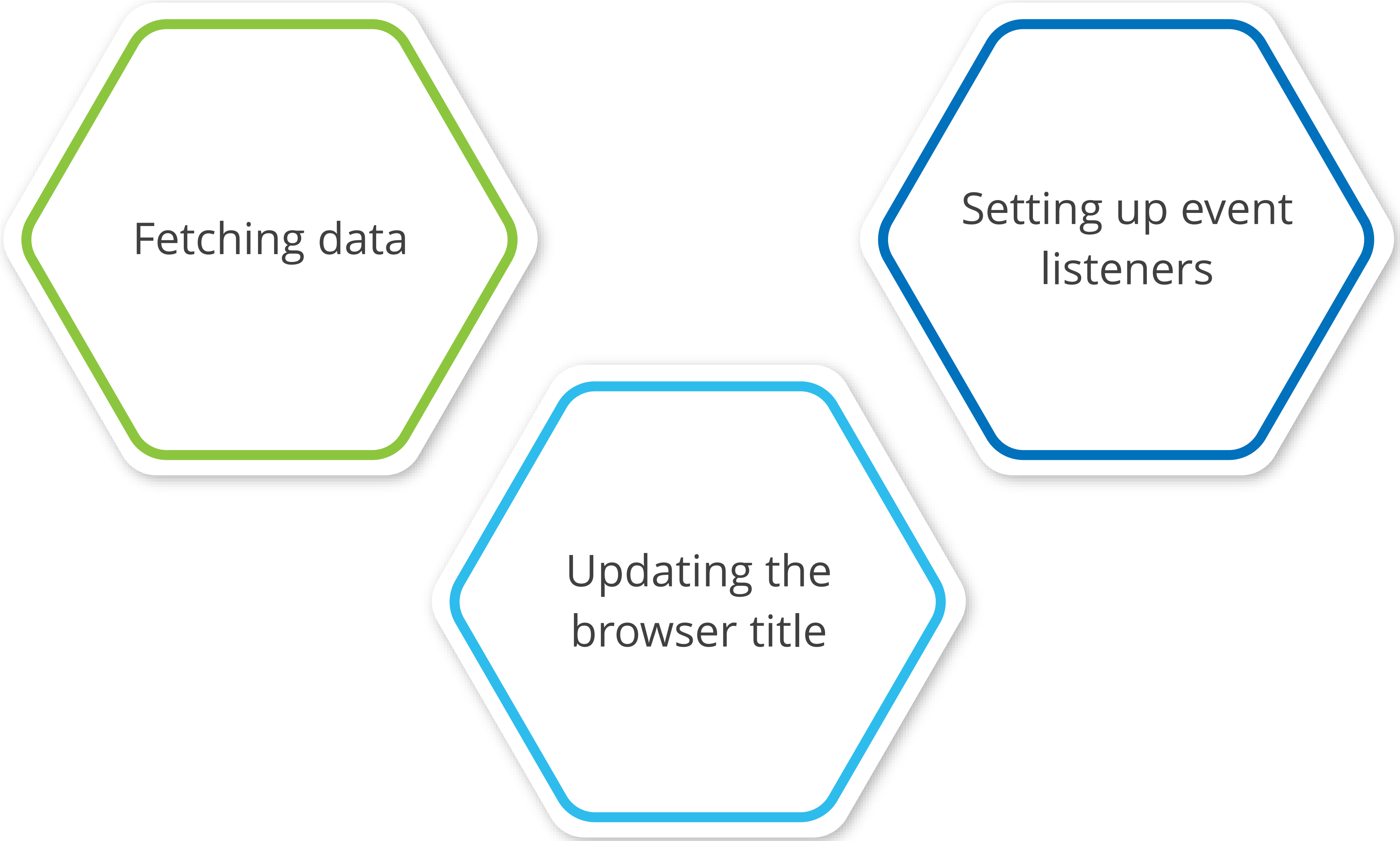
The **useEffect** Hook takes two arguments:


Specifies when the effect should run
1
Callback function
Array of dependencies
2
Returns a cleanup function

useEffect defines the effect's logic and specifies dependencies that trigger the effect's rerun.

useEffect Hook: Tasks

The **useEffect Hook** performs various tasks, such as:



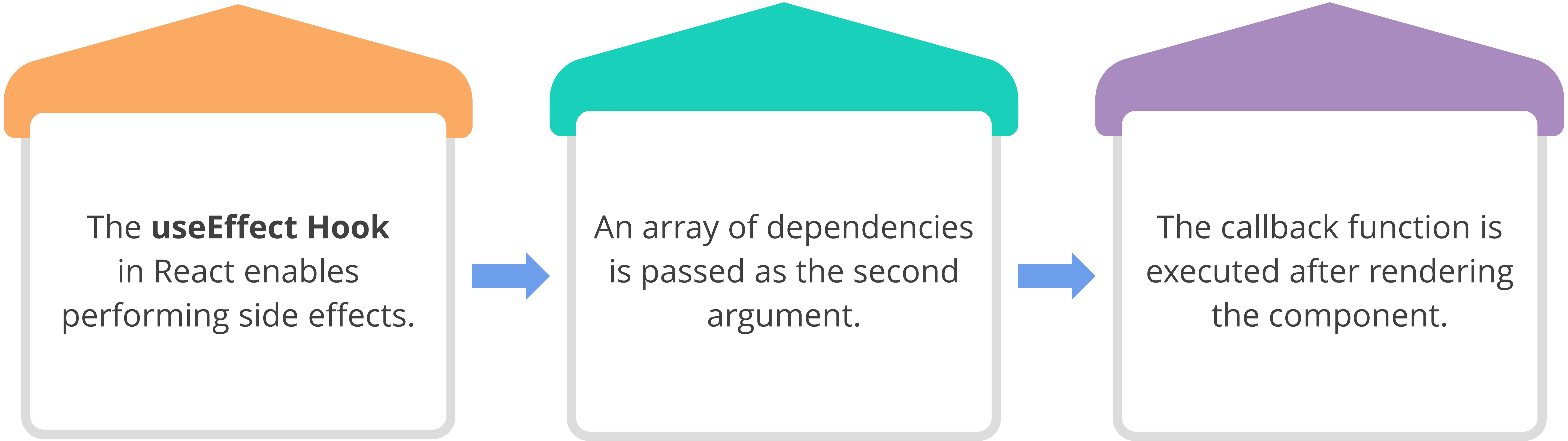
Fetching data

Updating the browser title

Setting up event listeners

useEffect After Render

The **useEffect Hook** after rendering can handle side effects resulting from component updates in the following way:



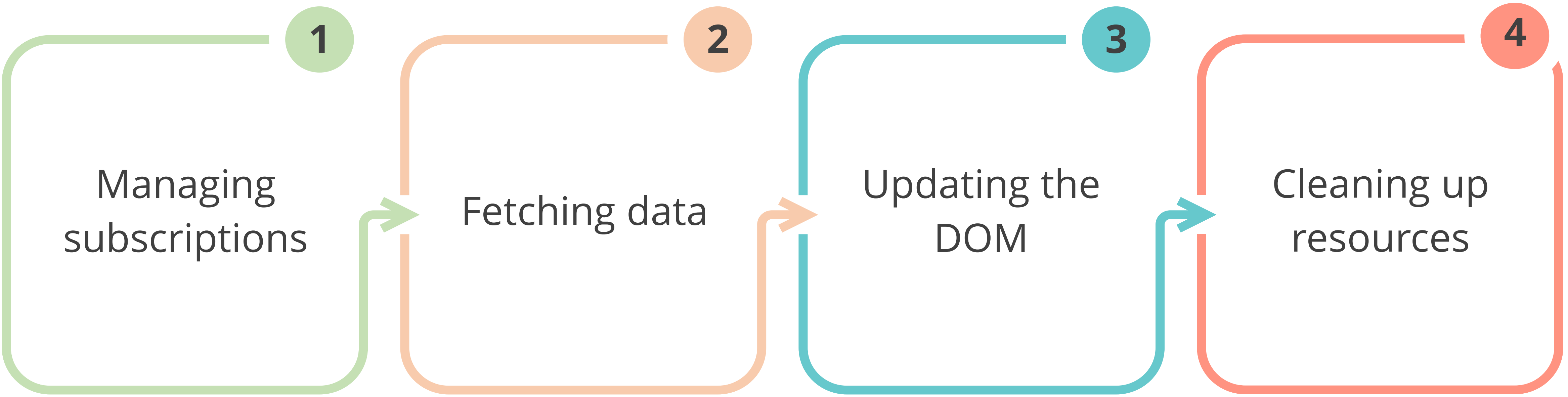
The **useEffect Hook** in React enables performing side effects.

An array of dependencies is passed as the second argument.

The callback function is executed after rendering the component.

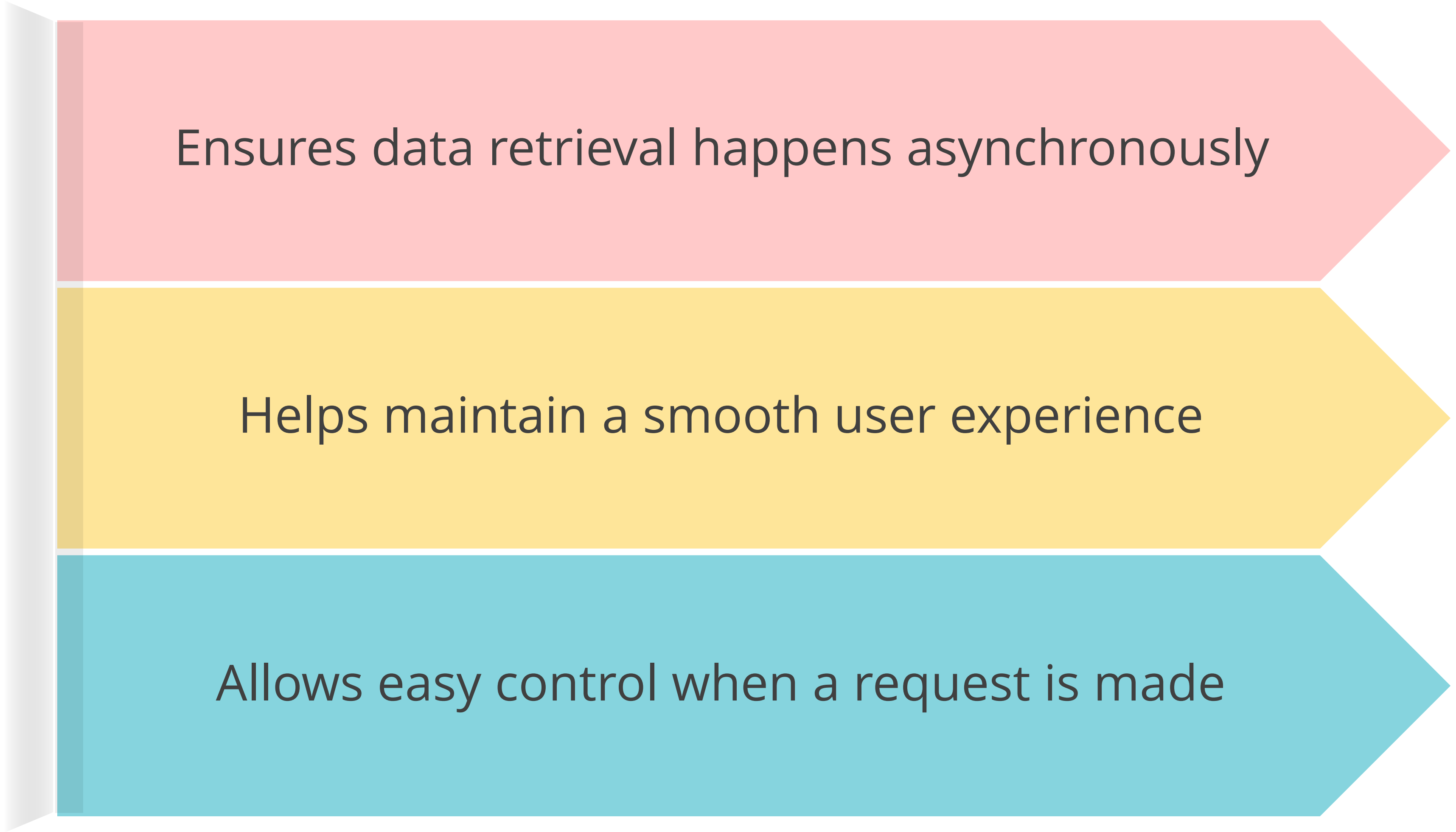
useEffect After Render

Tasks that can be achieved using the **useEffect Hook** are:



Fetching Data with useEffect

It is essential to fetch data with useEffect to asynchronously retrieve data from an API or server after the component has been rendered as it:



Ensures data retrieval happens asynchronously

Helps maintain a smooth user experience

Allows easy control when a request is made

Fetching Data with useEffect

Here is the code to fetch data:

```
import React, { useState, useEffect } from 'react’;

function App() {

  const [data, setData] = useState(null);

  useEffect(() => {

    fetch('https://api.example.com/data')

      .then(response => response.json())

      .then(data => setData(data))

      .catch(error => console.error(error));

}, []);
```

Fetching Data with useEffect

```
return (
    <div>
      {data ? (
        <ul>
          {data.map(item => (
            <li
key={item.id}>{item.name}</li>
          ))}
        </ul>
      ) : (
        <p>Loading...</p>
      )}
    </div>
  );
}
```

Render a list of data items if the data is not null or a **Loading..** message if the data is null.

Assisted Practice

Demo with useEffect Hook **Duration: 20 Min.**

Problem Statement:

You have been assigned a task to demonstrate how to use the **useEffect Hook** to fetch data from the **JSONPlaceholder API** and manage the state in the app

Assisted Practice: Guidelines

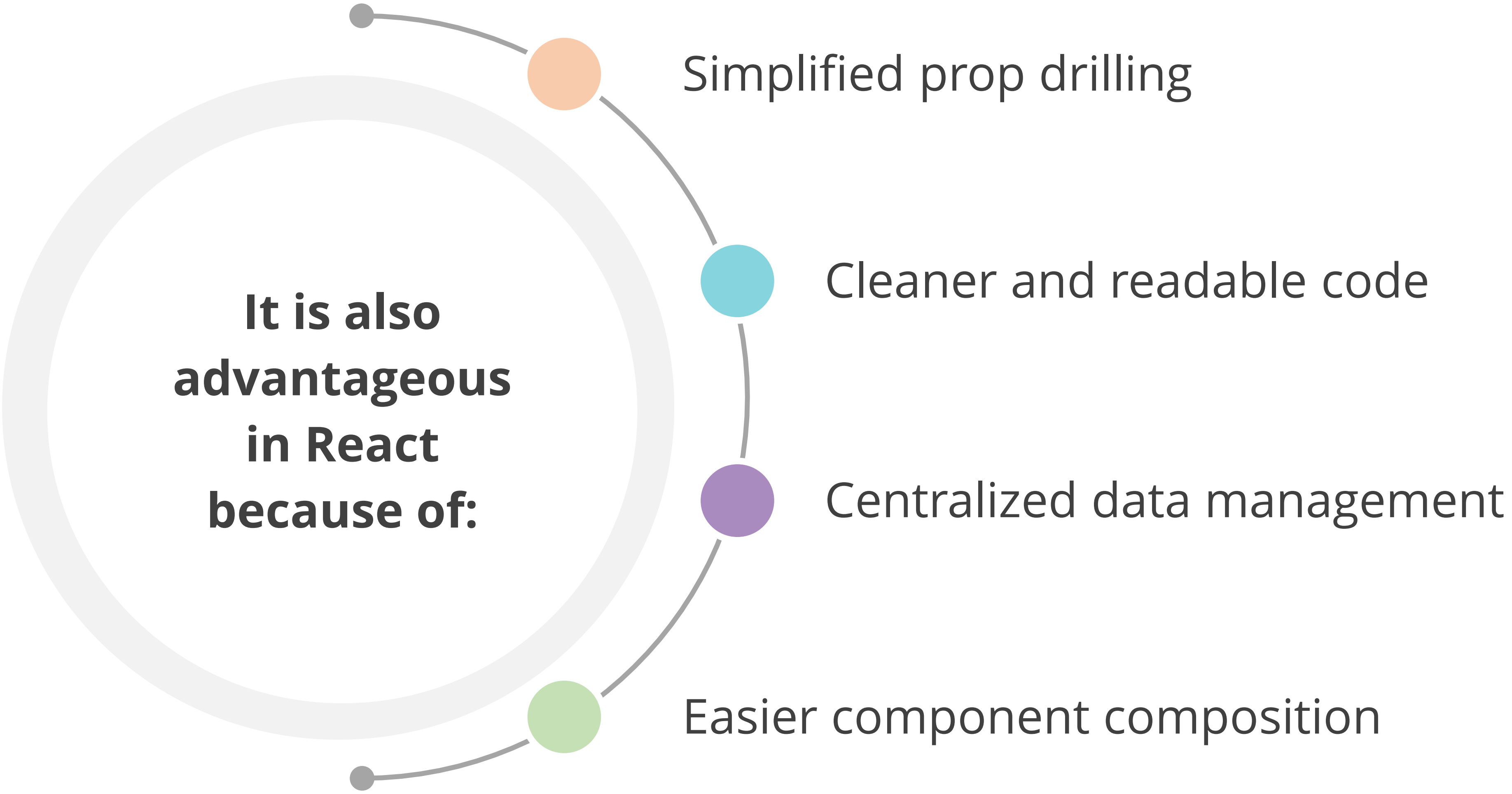
Steps to be followed:

1. Create a new React app using **create-react-app**
2. Run **cd-use-reducer-demo**
3. Launch the project in the preferred code editor
4. Import **useReducer** and **useEffect** from React app
5. Run **npm start** in the terminal
6. Open **http://localhost:3000** in the browser

useContext Hook

useContext Hook

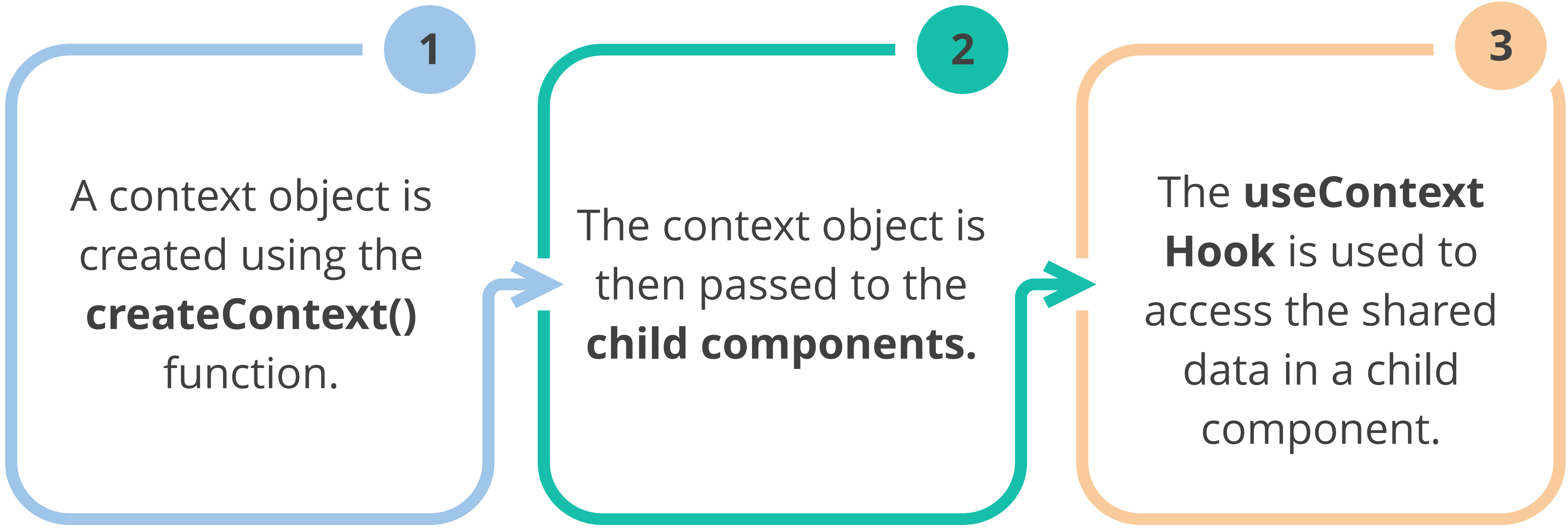
The **useContext Hook** provides a way to share state and other data between components without passing it down through multiple levels of props.



It is also advantageous in React because of:
Simplified prop drilling
Cleaner and readable code
Centralized data management
Easier component composition

useContext Hook

The **useContext Hook** is used in the following way:



1

A context object is created using the **createContext()** function.

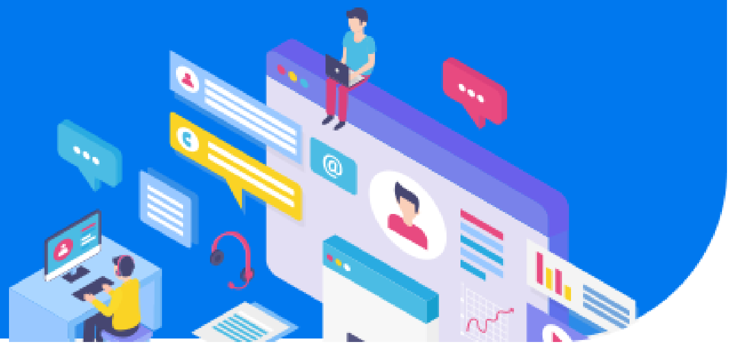
2

The context object is then passed to the **child components.**

3

The **useContext Hook** is used to access the shared data in a child component.

Assisted Practice



Demo with useContext Hook

Duration: 10 Min.

Problem Statement:

You have been assigned a task to create a simple app with a button that toggles the theme between light and dark and a child component that displays the current theme using the **useContext Hook**.

Assisted Practice: Guidelines

Steps to be followed:

1. Create a new React app using **create-react-app**
2. Change to the newly created directory
3. Open the project in the code editor
4. Create a new file called **ThemeContext.js** in the src directory
5. In **App.js**, import **useState**, **useContext**, and **ThemeContext**
6. Run the app by running **npm start** in the terminal
7. Open **http://localhost:3000** in the browser

Custom Hooks and Its State Management

What Are Custom Hooks in React?

Custom Hooks are functions that use built-in Hooks and/or other custom Hooks to provide reusable functionality.

Here are the following functions of custom Hooks:

- Allow developers to extract logic from components and reuse it
- Help make the code more modular, reusable, and maintainable

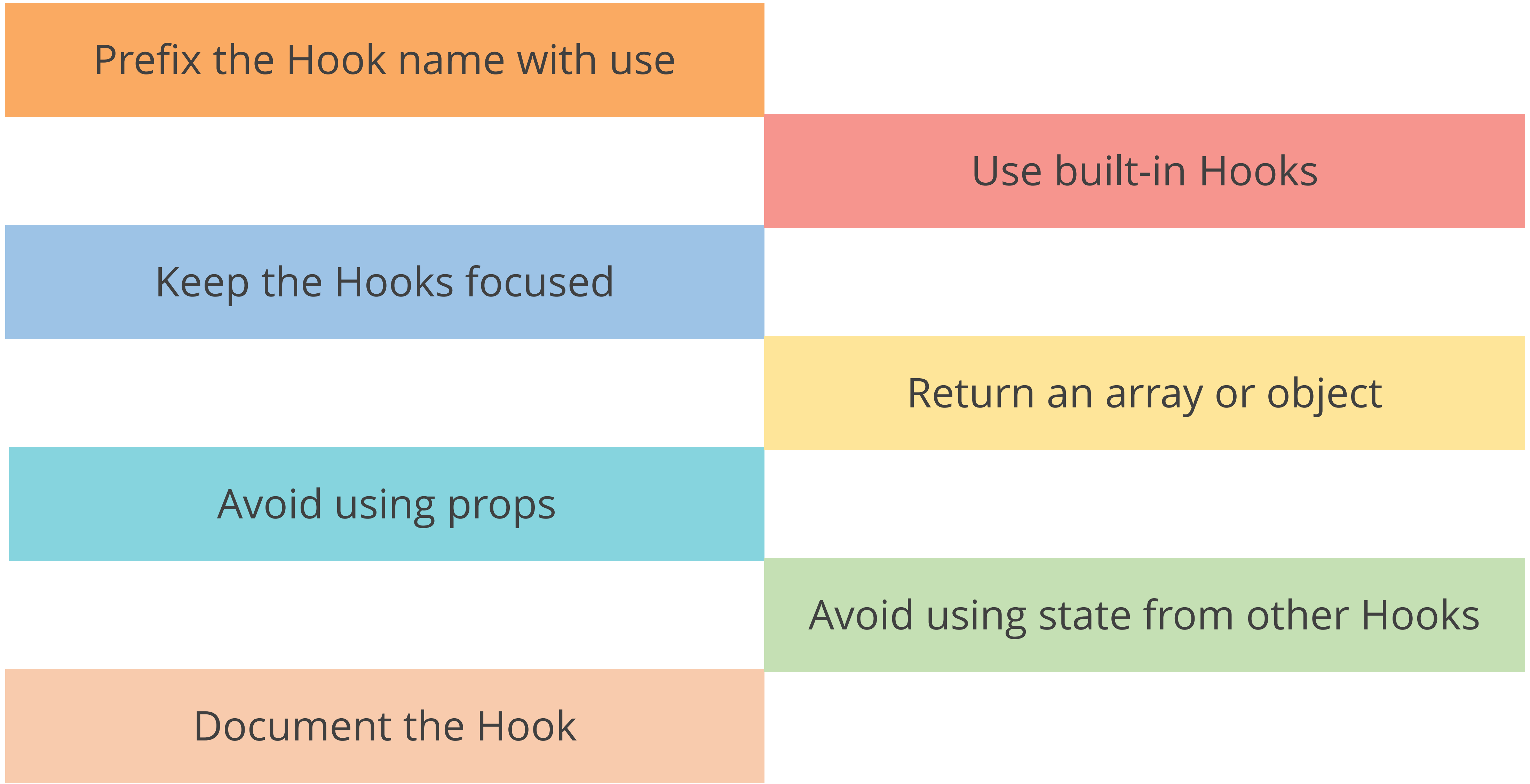
What Are Custom Hooks in React?

When using custom Hooks, ensure the following conditions are considered:

- Build a function that uses one or more built-in Hooks
- Follow the same rules for custom Hooks as for built-in Hooks
- Keep the custom Hooks small and focused on a single functionality

Rules for Creating Custom Hooks

Checklist for developing custom Hooks:



Prefix the Hook name with use

Use built-in Hooks

Keep the Hooks focused

Return an array or object

Avoid using props

Avoid using state from other Hooks

Document the Hook

Creating a Custom Hook

Follow the steps below to create custom Hooks in React:

Create a new file, starting with use

Import the necessary Hooks

Create a function that returns the state

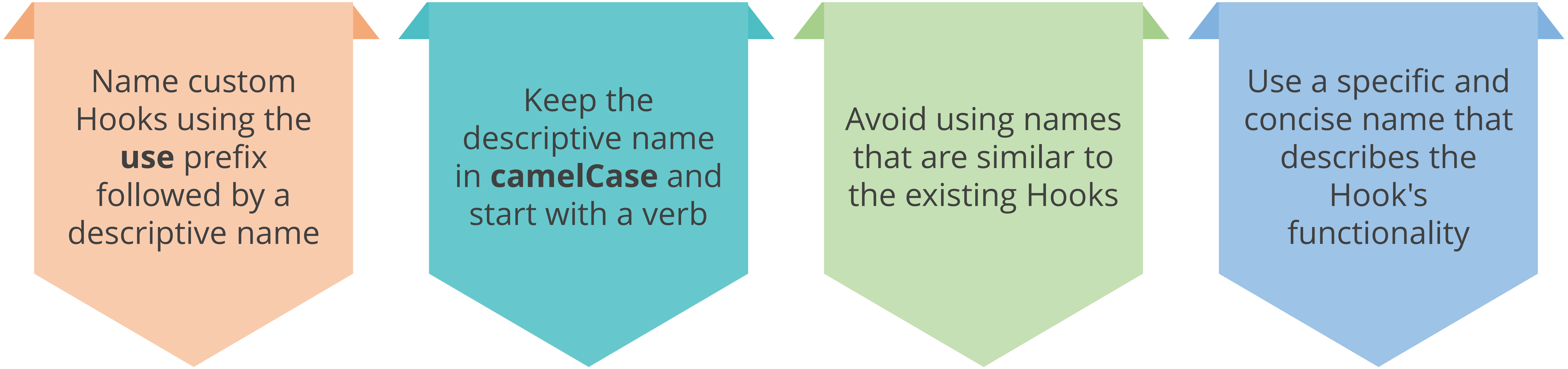
Use built-in Hooks to manage the state

Add the necessary logic to the function

Export the custom Hook function

Best Practices for Naming Custom Hooks

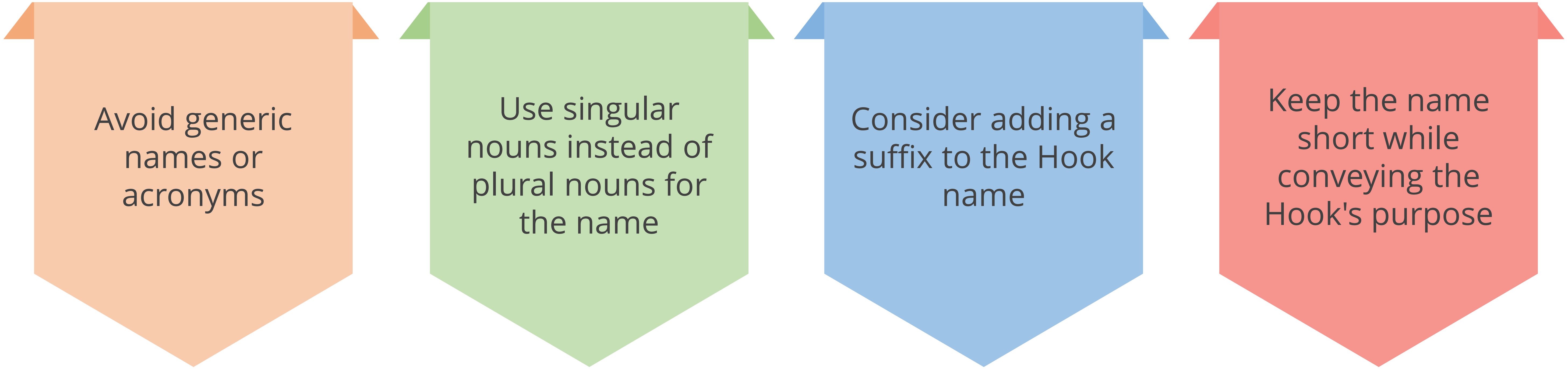
Follow the best practices given below while naming custom Hooks in React:



- Name custom Hooks using the **use** prefix followed by a descriptive name
- Keep the descriptive name in **camelCase** and start with a verb
- Avoid using names that are similar to the existing Hooks
- Use a specific and concise name that describes the Hook's functionality

Best Practices for Naming Custom Hooks

Here are a few more tips on the best practices for naming custom Hooks in React:



Avoid generic names or acronyms

Use singular nouns instead of plural nouns for the name

Consider adding a suffix to the Hook name

Keep the name short while conveying the Hook's purpose

Assisted Practice

Demo with a Custom Hook

Duration: 10 Min.

Problem Statement:

You have been assigned a task to build a simple app with a count displayed and two buttons that increment and decrement the count using the custom **useCounter Hook**.

Assisted Practice: Guidelines

Steps to be followed:

1. Develop a new React app using **create-react-app**
2. Change to the newly created directory
3. Open the project in the selected code editor
4. Create a new file called **useCounter.js** in the src directory
5. In **App.js**, import **useCounter** from the **useCounter.js** file that was just created
6. Run the app by running **npm start** in the terminal
7. Open **http://localhost:3000** in the browser

Sharing Stateful Logic with Custom Hooks

Custom Hooks can share stateful logic between the components, which is a common pattern in React.

Custom Hooks allow coders to:

- Extract reusable logic into a separate function
- Use built-in Hooks or other custom Hooks
- Encapsulate complex logic
- Promote code reusability
- Accept arguments and return values

Sharing Stateful Logic with Custom Hooks: Advantages

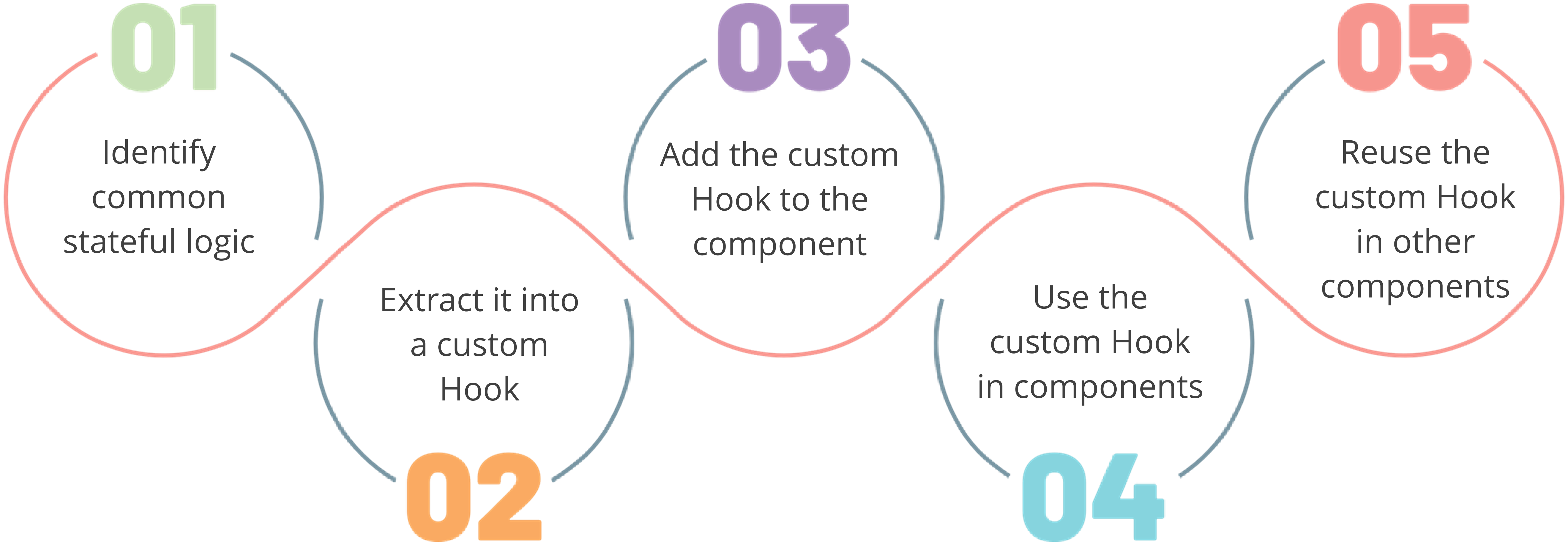
Here are some reasons why coders use Sharing Stateful Logic with custom Hooks when programming in React:

Captures all the stateful logic that multiple components can use

Extracts common logic from components and reuses it in multiple components

Steps to Create Custom Hooks for Sharing Stateful Logic

Steps to create a custom Hook for Sharing Stateful Logic:



01 Identify common stateful logic

02 Extract it into a custom Hook

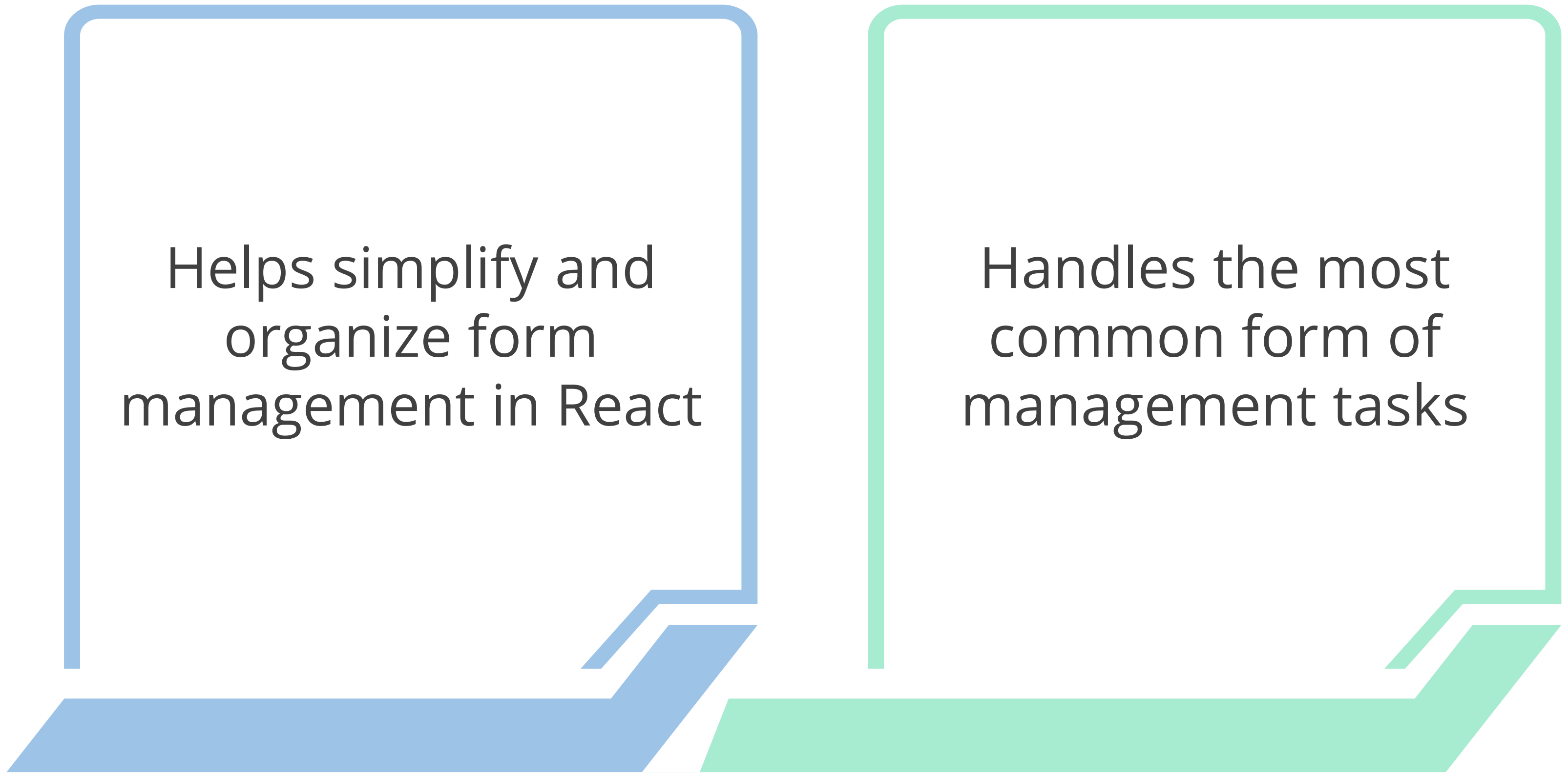
03 Add the custom Hook to the component

04 Use the custom Hook in components

05 Reuse the custom Hook in other components

Custom Hooks for Managing Form State: Advantages

Custom Hooks can manage Form States in React, such as useState or useReducer. Here are some advantages of using a custom Hook:

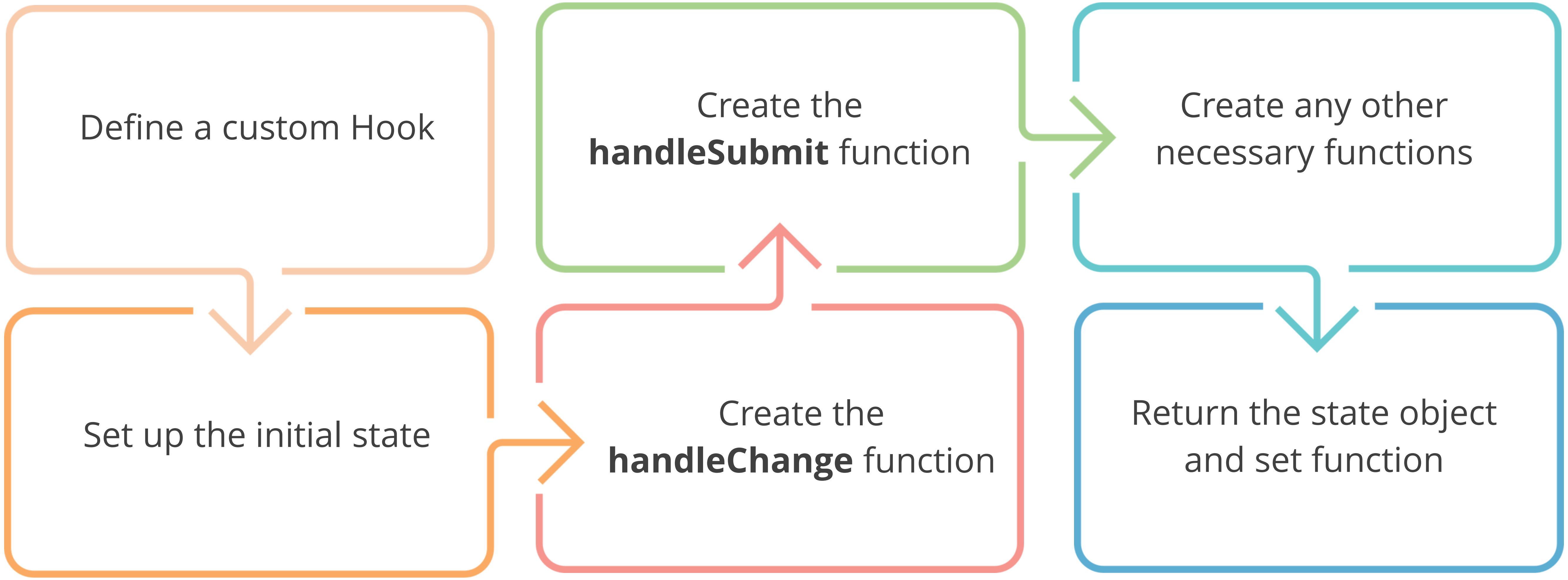


Helps simplify and organize form management in React

Handles the most common form of management tasks

Steps to Create Custom Hooks for Managing Form State

A custom Hook for managing form state can be developed with the help of the following steps:



Define a custom Hook

Set up the initial state

Create the **handleChange** function

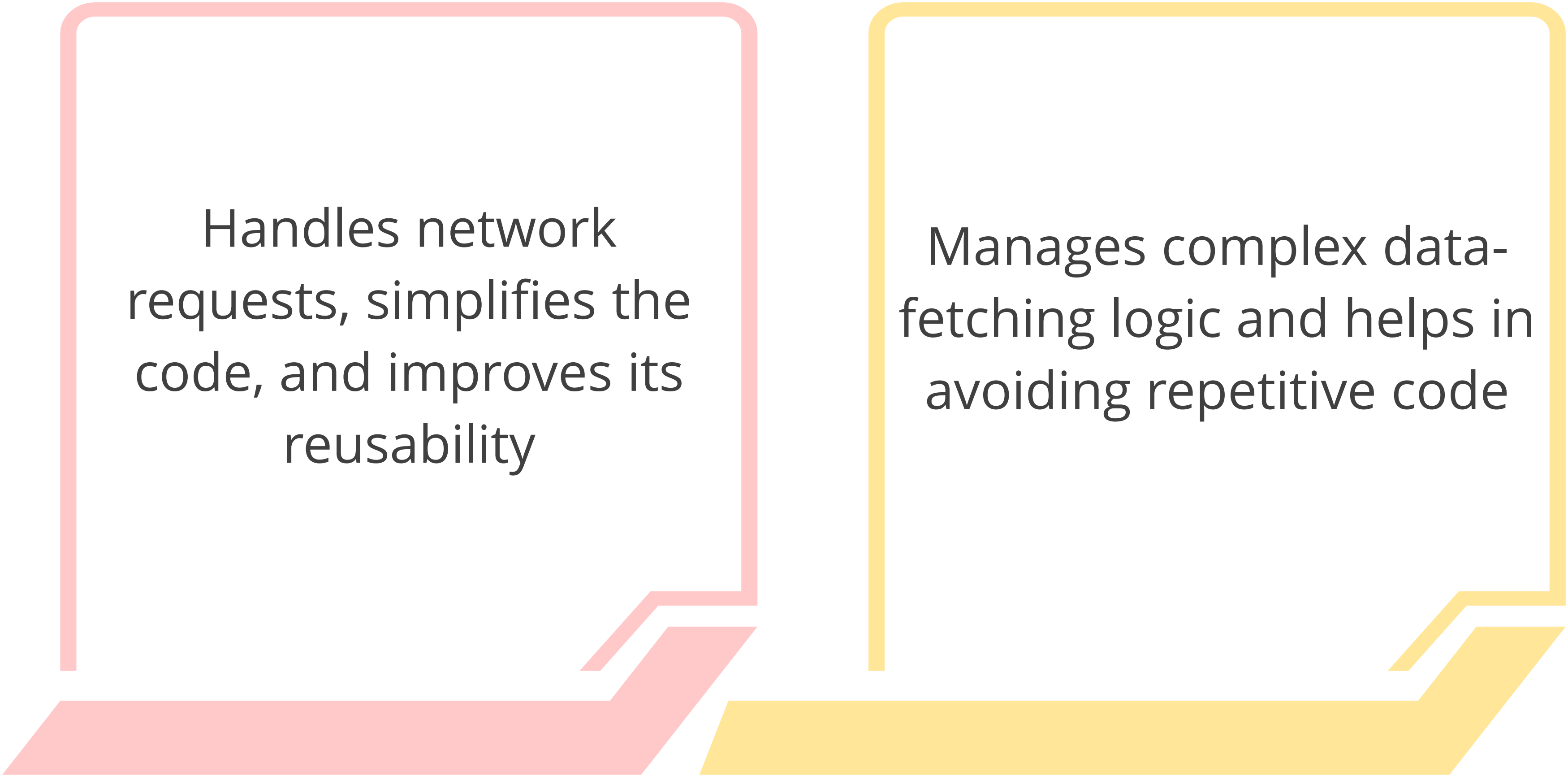
Create the **handleSubmit** function

Create any other necessary functions

Return the state object and set function

Custom Hooks for Fetching Data

Custom Hooks can also fetch data from APIs, simplifying data management and reusability across components. The advantages of custom Hook creation for fetching data from APIs are as follows:

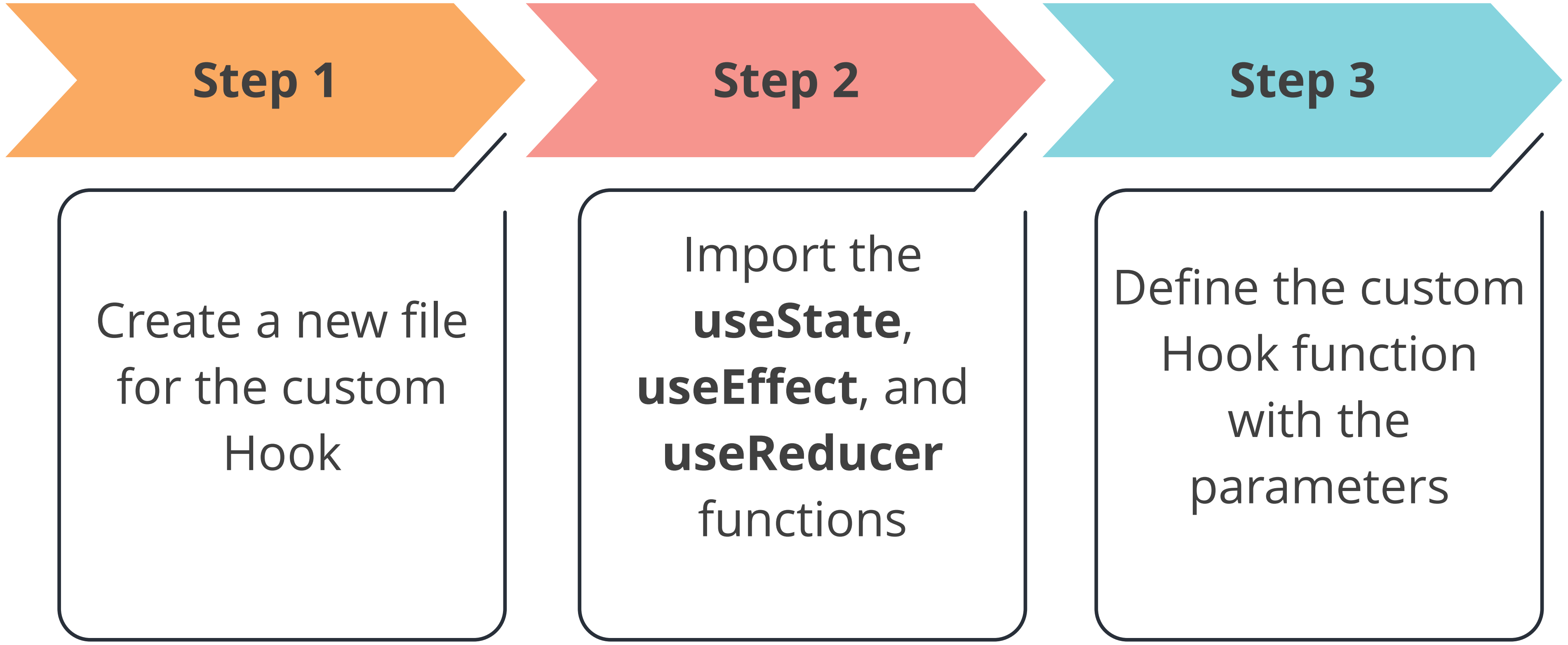


Handles network requests, simplifies the code, and improves its reusability

Manages complex data-fetching logic and helps in avoiding repetitive code

Custom Hooks for Fetching Data

Steps to create a custom Hook for fetching data from APIs:



Step 1

Create a new file for the custom Hook

Step 2

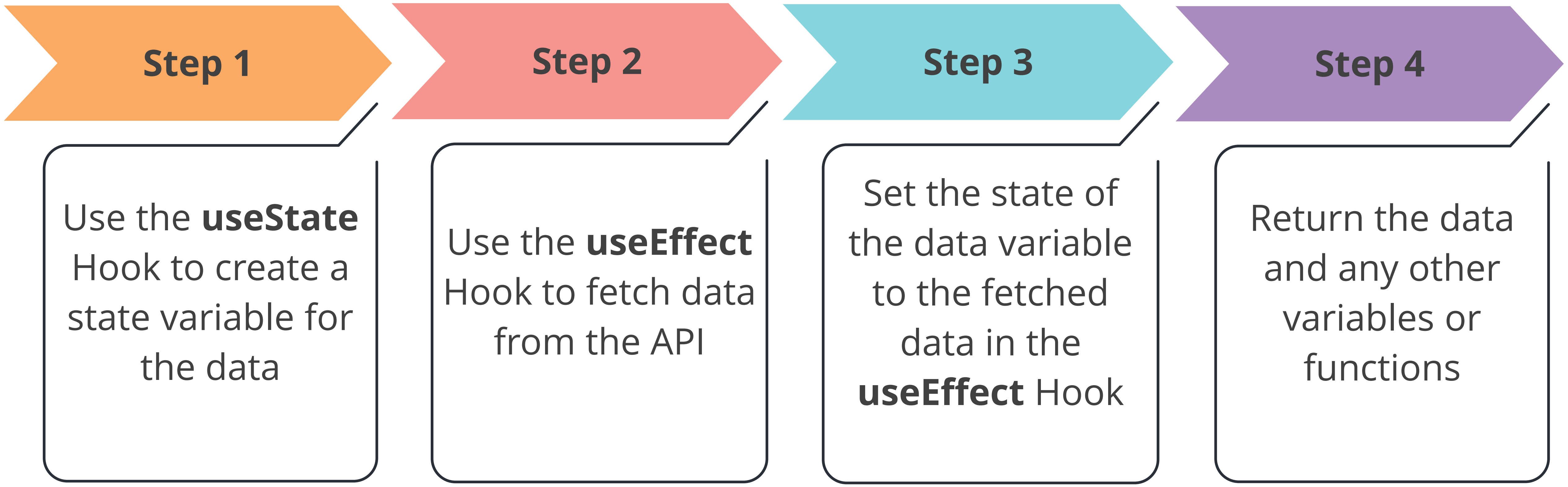
Import the **useState**, **useEffect**, and **useReducer** functions

Step 3

Define the custom Hook function with the parameters

Custom Hooks for Fetching Data

The remaining steps to create a custom Hook for fetching data from APIs are:



Step 1

Use the **useState** Hook to create a state variable for the data

Step 2

Use the **useEffect** Hook to fetch data from the API

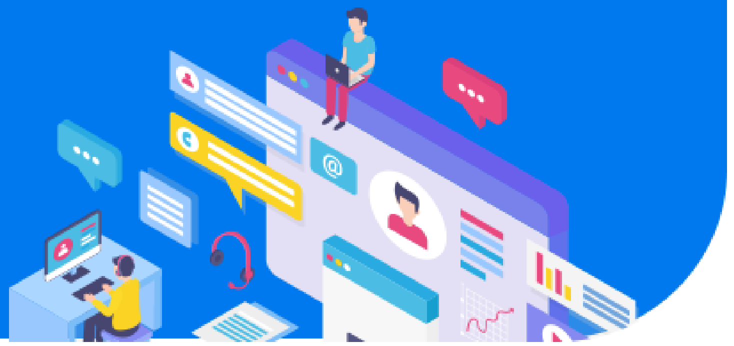
Step 3

Set the state of the data variable to the fetched data in the **useEffect** Hook

Step 4

Return the data and any other variables or functions

Assisted Practice



Demo with a Custom Hook for Fetching Data

Duration: 15 Min.

Problem Statement:

You have been assigned a task to build a simple app that fetches and displays data from the **JSONPlaceholder API** using the custom **useFetch** Hook.

Assisted Practice: Guidelines

Steps to be followed:

1. Create a new React app using **create-react-app**
2. Change to the newly created directory
3. Open the project in the preferred code editor
4. Create a new file called **useFetch.js** in the src directory
5. Import **useFetch** from the **useFetch.js** file that was just created
6. Run the app by running **npm start** in the terminal
7. Open **http://localhost:3000** in the browser

ASSISTED PRACTICE

Key Takeaways

- The useReducer Hook helps manage complex states and actions in a more organized and efficient way compared to useState.
- The useContext Hook helps pass data to the component tree without manually passing props at every level.
- The useEffect Hook helps perform side effects such as fetching data, subscribing to events, and updating the DOM in a functional component.
- Custom Hooks can help share logic between components, manage form states, and fetch data in a more reusable and clean way.

Thank You