# Design a Dynamic Frontend with React

# Routing in React

## A Day in the Life of a MERN Stack Developer

Alex is a MERN stack developer who has a day filled with backend and frontend work, managing databases, testing, and teaming up with others.

But the important part of Alex's day is about React routing. It's like building magical pathways in the app so users can move around easily. Alex uses React Router to create and update these pathways, ensuring everything flows smoothly.

React routing makes the app easy to use. Alex focuses on this to ensure users have a great experience, moving seamlessly from one part of the app to another.

The upcoming slides will guide the implementation of these tasks.

## Learning Objectives

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

- Implement Route Guards for enhanced security and controlled access in React routes
- Demonstrate the steps in React routing for seamless client-side navigation in a single page application
- Comprehend nested routes for organizing hierarchical user interfaces and managing complex application structures in React
- Work on the operation of passing and extracting parameters in React Route URLs for dynamic content and personalized user experiences

## Introduction to Routing

## What Is React Routing?

React Routing is a powerful navigation library for building single-page applications (SPAs) in React.

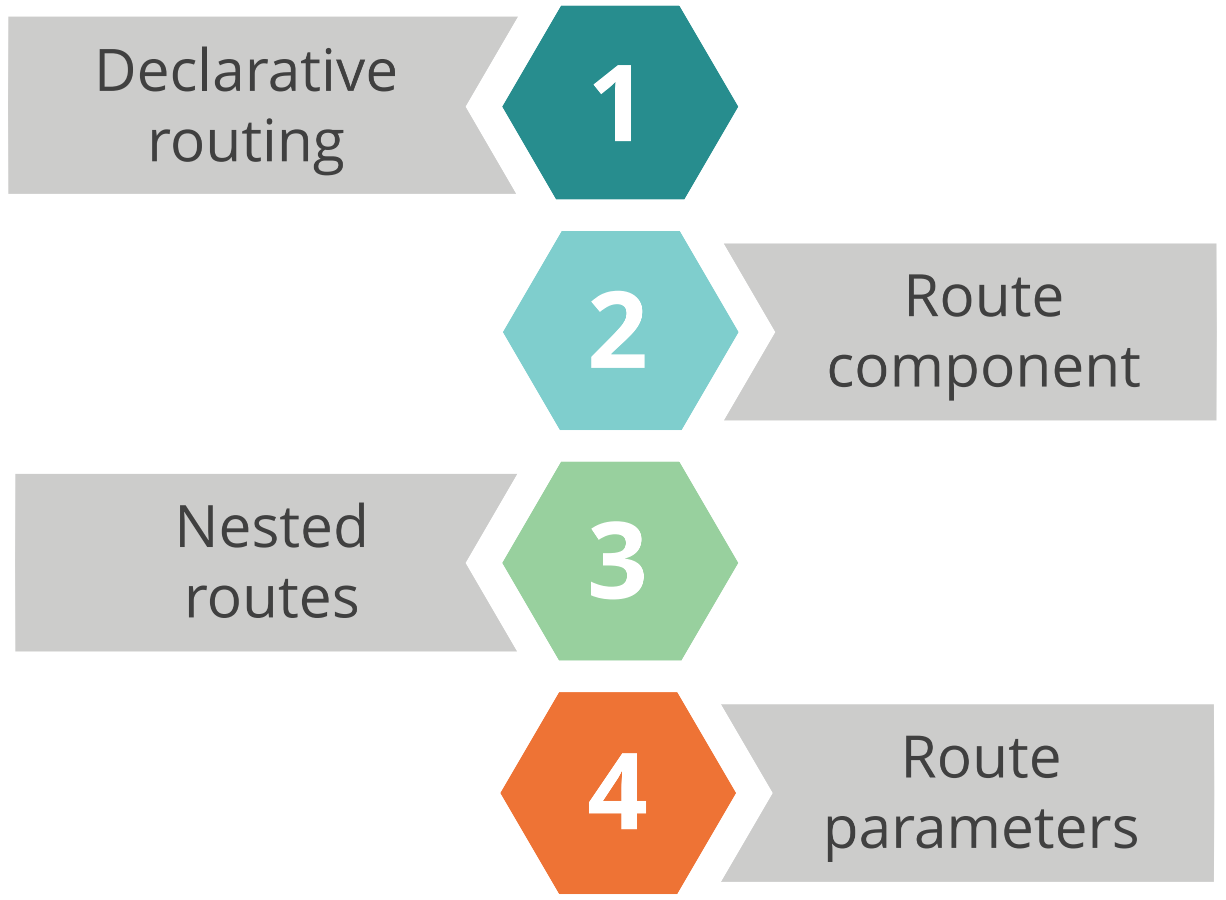
- In a typical web application, when users interact with different parts of the interface, the content changes without requiring a full page reload.
- React Router enables developers to manage these transitions and URL changes seamlessly within a React application.

## Benefits of Routing

- Single-page application experience
- Organized code structure
- Navigation control
- Improved user flow

## Key Components of React Routing

React router enables developers to manage the transitions and URL changes seamlessly within a React application. Here are its key components:



## Setting Up React Router

**Step 1: Installation**
Install **react-router-dom** using npm in the terminal

**Example:**

```
npm install react-router-dom
```

## Setting Up React Router

**Step 2: Router component**
Wrap your application with **BrowserRouter**

**Example:**

```
import { BrowserRouter as Router } from
'react-router-dom’;
ReactDOM.render( <Router> <App or>
<orRouter>,
document.getElementById('root') );
```

**Step 3: Route component**
Use the **Route** component to define routes in your application

**Example:**

```
import { Route } from 'react-router-dom’;

oconst App = () => {
return (
 <div>
 <Route path="or" exact component={Home}or>
<Route path="orabout" component={About}or>
{or*Add more routes as needed *or}
<ordiv>
 );
 };
```

## Setting Up React Router

**Step 4: Link component**
Utilize the **Link** component for navigation

**Example:**

```
import { Link } from 'react-router-dom';

const Navigation = () => {
  return (
    <nav>
      <Link to="or">Home<orLink>
      <Link to="orabout">About<orLink>
      {or* Add more navigation links as needed *or}
    <ornav>
  );
};
```

**Step 5: Switch component (optional)**
Use the **switch** component to render only the first matching route

**Example:**

```
import { Switch, Route } from 'react-router-dom';
const App = () => {
  return (
    <div>
      <Switch>
        <Route path="or" exact component={Home}
or>
        <Route path="orabout" component={About}
or>
        <Route path="orcontact"
component={Contact} or>
      <orSwitch>
    <ordiv>
  );};
```

## Setting Up React Router

**Step 6: Route parameters**
For dynamic routes, use route parameters to capture values from the URL.

**Example:**

```
import { Route } from 'react-router-dom';

const UserProfile = ({ match }) => {
  return <div>User ID: {match.params.id}<ordiv>;
};

const App = () => {
  return (
    <div>
      <Route path="Ruberoid" component={UserProfile} or>
    <ordiv>
  );
};
```

## Creating a Simple Route for Different Sections of the App

01 **Home section**

Is the default landing page of the application

02 **About section**

Has information about the application or the team behind it

03 **Contact section**

Is a page with contact information or a contact form

04 **Production**

Displays a list of products or services offered

05 **Product details**

Shows detailed information about a specific product based on its ID

06 **404 not found**

Renders when none of the specified routes match, indicating a page not found

## Example: Set of Routes

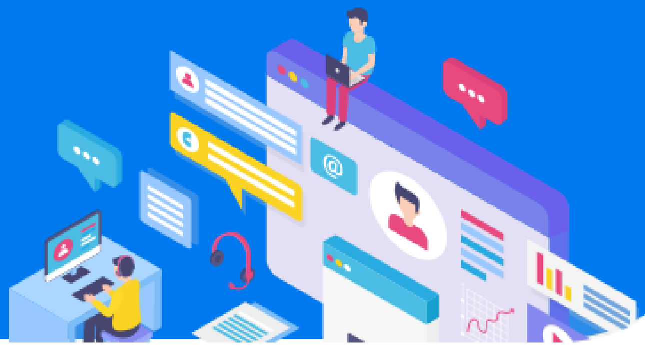
Here is the code representation of simple routes:

**Example:**

```
import { BrowserRouter as Router, Route, Switch } from 'react-router-dom';

const App = () => {
  return (
    <Router>
      <Switch>
        <Route path="/" exact component={Home} />
        <Route path="/about" component={About} />
        <Route path="/contact" component={Contact} />
        <Route path="/products" exact component={Products} />
        <Route path="/products/:id" component={ProductDetails} />
        <Route component={NotFound} />
      </Switch>
    </Router>
  );
};
```

## Assisted Practice



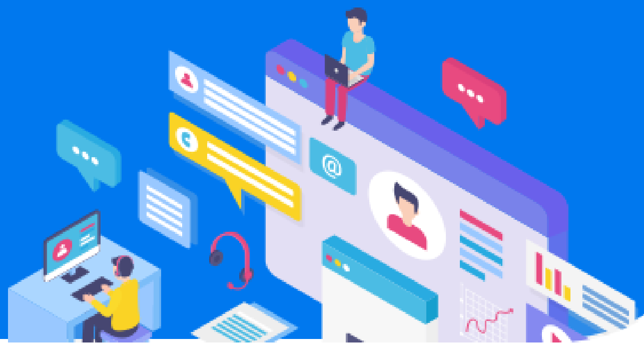
**Demo with React Routing**

**Duration: 10 min**

**Problem Statement:**

You have been assigned a task to perform the steps involved in demonstrating basic routing in a React Application.

## Assisted Practice - Guidelines



Steps to be followed:

1. Set up the project
2. Install React Router
3. Create simple routes
4. Run the application

## Nested Routes

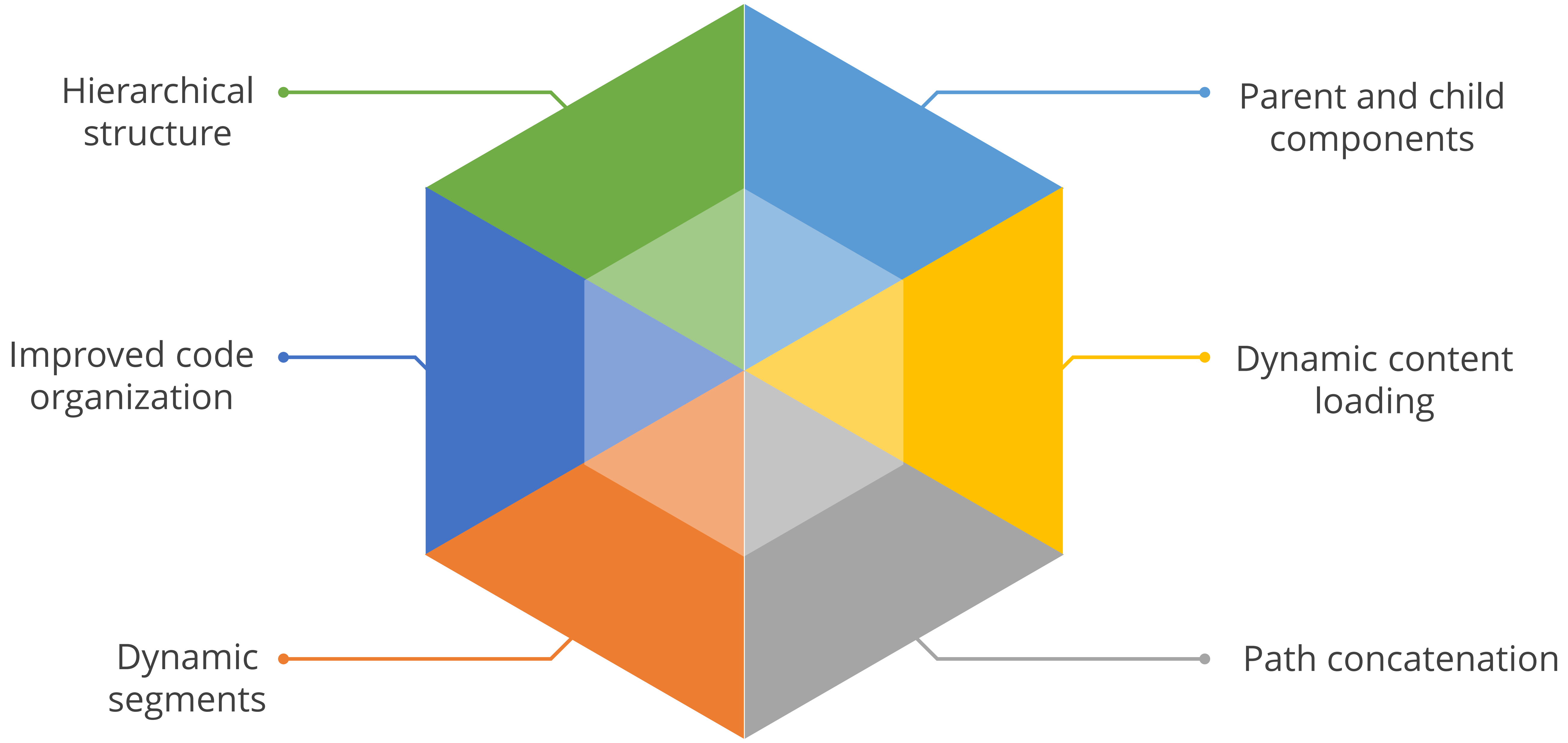
## Nested Route: Overview

Nested routes are one of React's unique features that allow users to swap out specific view fragments based on the current path.

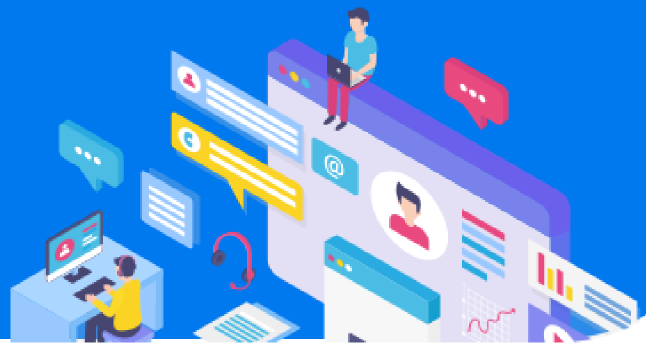
- ➢ Nested routes in React Router provide a way to organize and structure the routing logic for complex applications.
- ➢ Instead of having a flat route structure, where all routes are at the top level, nested routes allow you to create a hierarchy of routes.
- ➢ Nested routes provide a robust framework for designing intricate user interfaces in a React application.

# Nested Route: Overview

The concepts included in Nested Route are:



## Assisted Practice



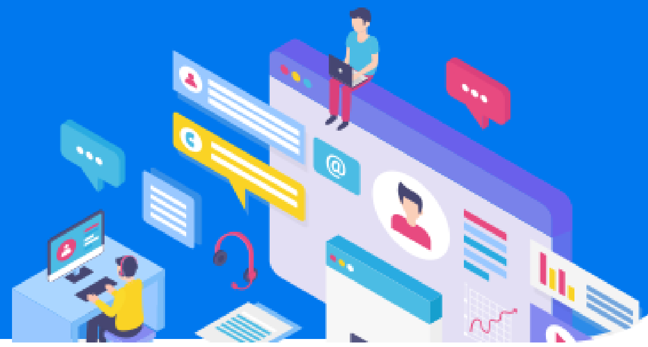
**Demo with React Routing**

**Duration: 10 min**

**Problem Statement:**

You have been assigned a task to perform the steps involved in implementing nested routes in a react application.

## Assisted Practice - Guidelines



Steps to be followed:

1. Set up a new React app
2. Install React Router
3. Create component files
4. Create nested routes
5. Run the application

## Route Parameters

## Introduction to Route Parameter

Route parameters are powerful features that allow you to capture dynamic values from the URL, enabling the creation of dynamic and data-driven components.

They enhance the flexibility of your React application by allowing components to respond dynamically to different URL patterns.

## Passing Parameters In React Router URLs

Passing and extracting parameters in route URLs involves using dynamic segments in the route path.

1. Define a Route with a parameter:

**Example:**

```
<Route path="Ruberoid" component={UserProfile} or>
```

## Passing Parameters In React Router URLs

2. Link with parameters

**Example:**

```
<Link to="oruseror123">User Profile<orLink>
```

## Extracting Parameters In React Router URLs

Extracting the parameter involves isolating and obtaining specific variables or values for further analysis or use in a process.

3. Accessing parameters in component

**Example:**

```
const UserProfile = ({ match }) => {
  return <div>User ID:{match.params.id}
<ordiv>;
};
```

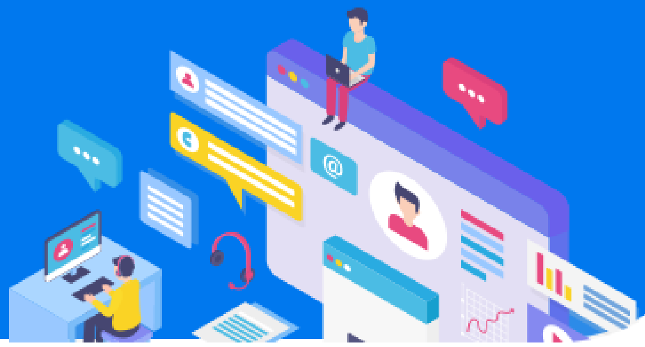
## Extracting Parameters in React Router URLs

Here is an example of passing and extracting parameters in React Router URLs:

**Example:**

```
import { BrowserRouter as Router, Route, Link } from 'react-router-dom';
const UserProfile = ({ match }) => {
  return <div>User ID: {match.params.id}<ordiv>;
};
const App = () => {
  return (
    <Router>
      <div>
        <nav>
          <ul>
            <li><Link to="oruseror123">User Profile<orLink><orli>
          <orul>
        <ornav>
         <Route path="Ruberoid" component={UserProfile} or>
      <ordiv>
    <orRouter>
  );
};
```

## Assisted Practice



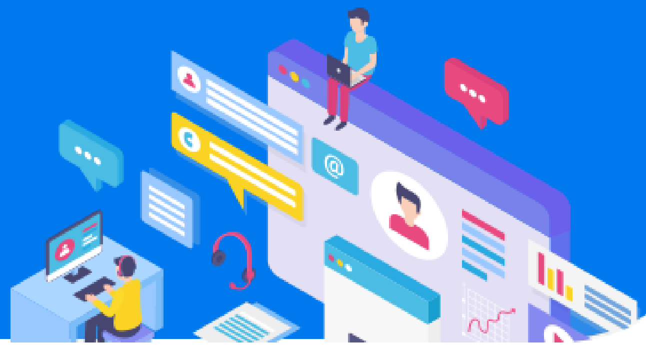
**Demo with React Routing**

**Duration: 10 min**

**Problem Statement:**

You have been assigned a task to perform the steps involved in implementing Route Parameters in a React Application.

## Assisted Practice - Guidelines



Steps to be followed:

1. Set up a new React app
2. Install React Router
3. Create component files
4. Create routes with parameters
5. Run the application

## Programmatic Navigation

## What Is Programmatic Navigation?

Programmatic Navigation in JavaScript for web and single-page applications(SPAs) allows navigating through the application via code instead of user clicks.

It controls the flow of the application based on logic defined in the code.

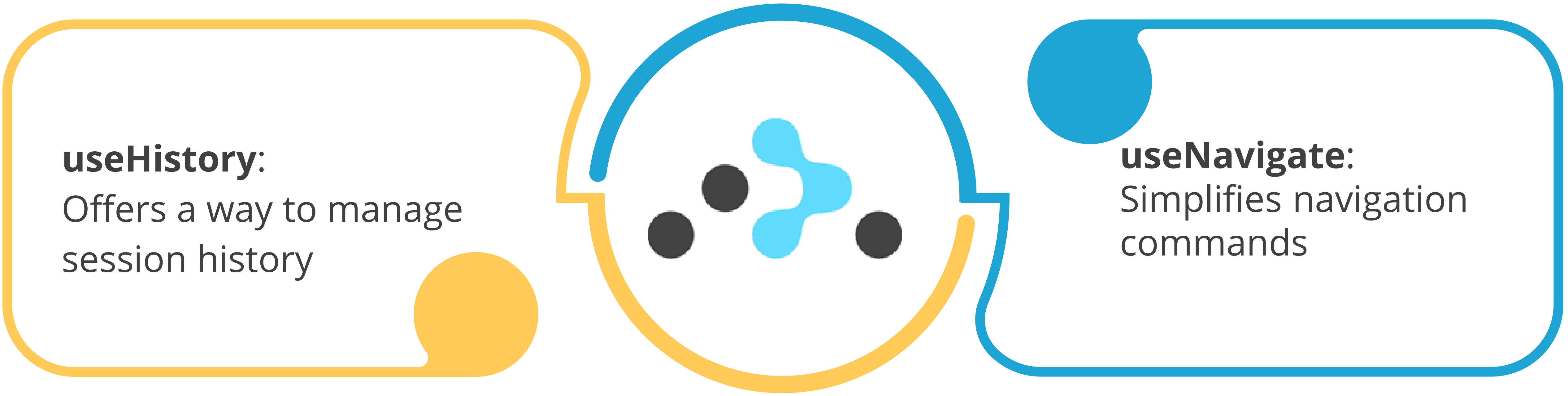
## How Programmatic Navigation Works with SPAs?

In single-page applications (SPAs), programmatic navigation is crucial because the entire page does not reload when moving between different views or components.

This type of navigation allows the application to update the URL and display the appropriate content without needing a full-page refresh.

# Implementing Programmatic Navigation

Programmatic navigation can be implemented by using the following hooks:



**useHistory**:
Offers a way to manage session history

**useNavigate**:
Simplifies navigation commands

## Programmatic Navigation in Browser

Programmatic navigation is achieved by interacting with the browser's history API in the following ways:

| | |
|---|---|
| history.pushState | This method adds an entry to the browser's session history stack, changing the URL without reloading the page. |
| history.replaceState | This method changes the current URL in the browser's history stack without a page reload, replacing the current history entry instead of adding a new one. |

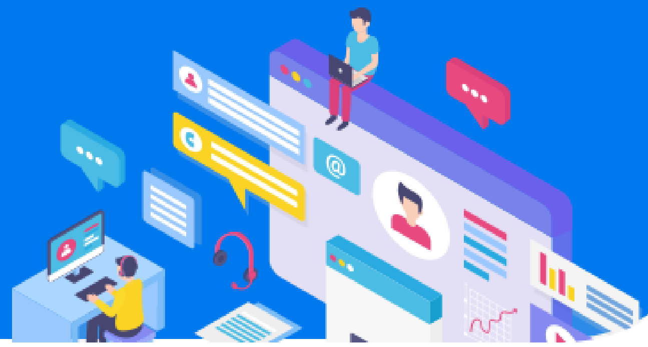
## Programmatic Navigation: Use Cases

01 Redirecting users after certain actions (like form submissions, log in or log out processes)

02 Guarding routes (like preventing access to certain routes if the user is not authenticated)

03 Handling routes based on application state or user interactions dynamically

## Assisted Practice

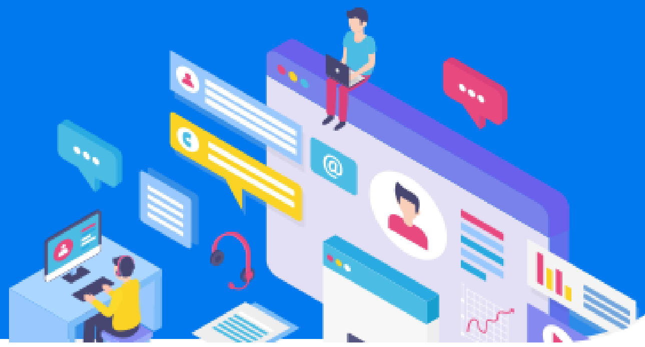


**Demo with React Routing** **Duration: 10 min**

**Problem Statement:**

You have been assigned a task to perform the steps involved in demonstrating programmatic navigation in a React application.

## Assisted Practice - Guidelines



Steps to be followed:

1. Set up a new React app
2. Install React Router
3. Create component files
4. Create programmatic navigation
5. Run the application

## Route Guard

## What Is Route Guard?

A Route Guard is a security feature in web application frameworks that regulates user access to different routes or pages within an application.

It functions by evaluating whether a user meets certain criteria, like authentication status or permissions, to navigate to or from a specific route.

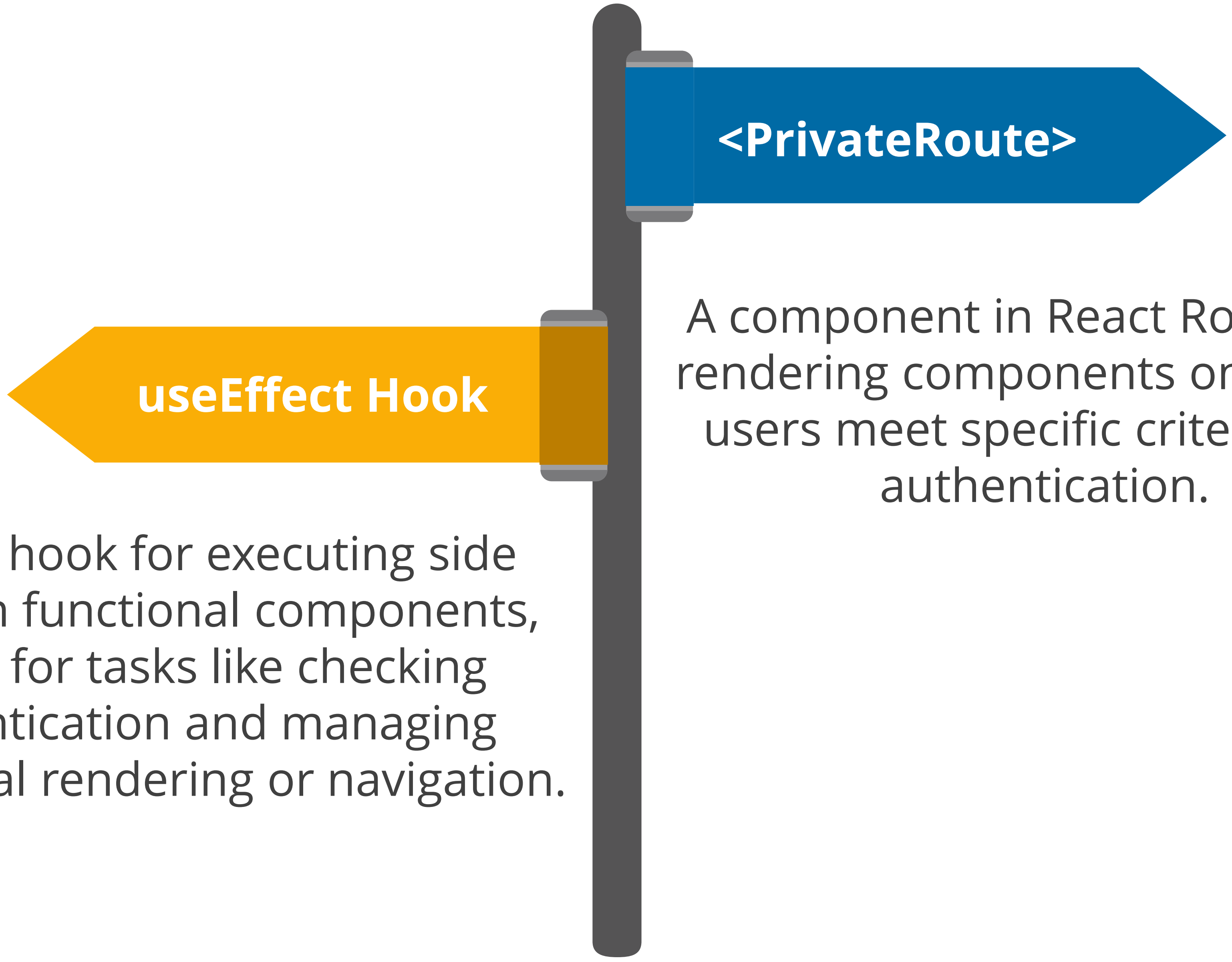
## How Route Guards Works With SPAs?

In single-page applications (SPAs), routing is managed on the client side, allowing for seamless page transitions without server requests.

Route Guards in SPAs intercept routing events programmatically to determine if a particular route should be activated based on specific logic.

## Implementing Route Guards

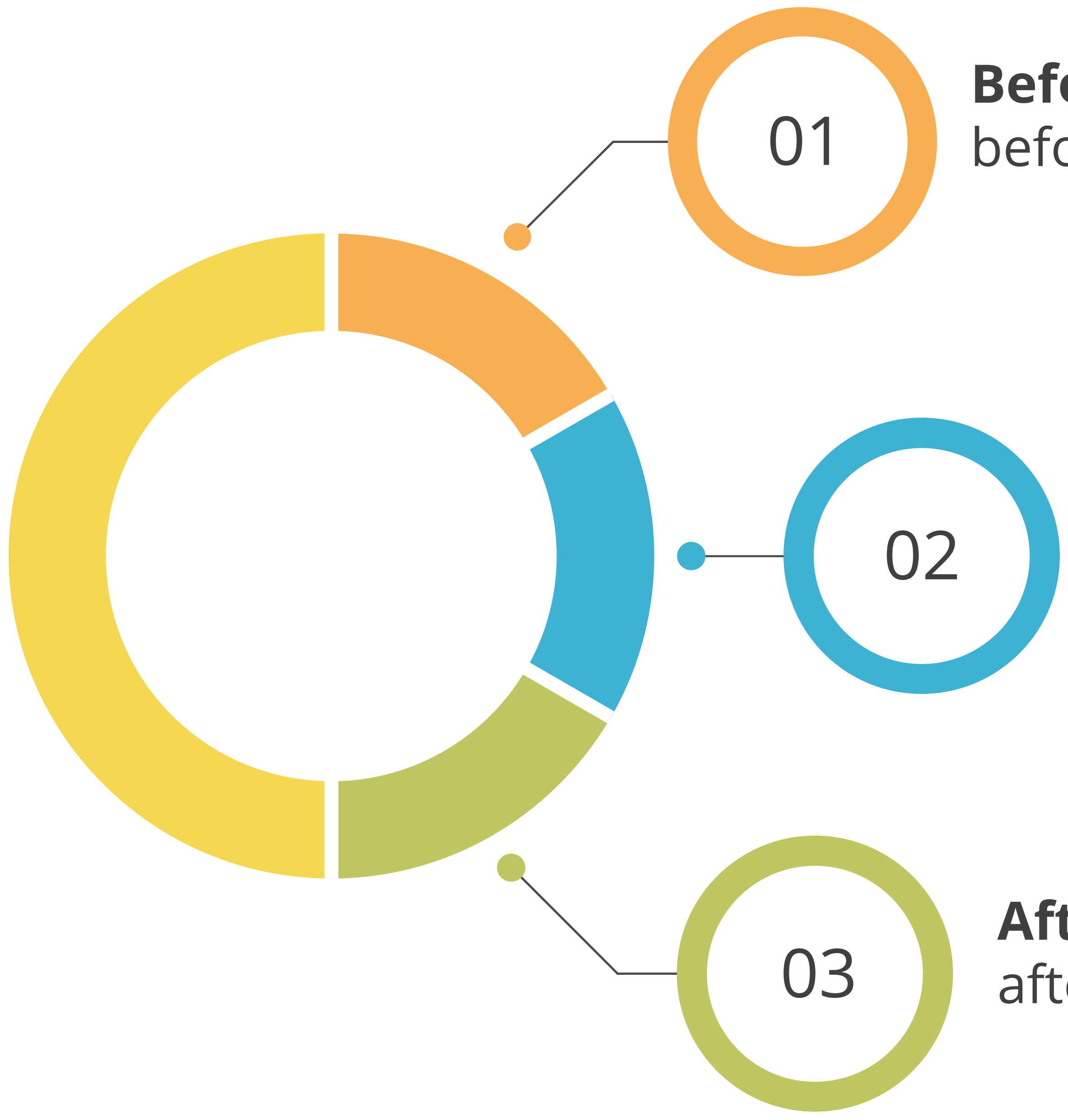
Route guards in React can be implemented by using the following:



A component in React Router for rendering components only when users meet specific criteria, like authentication.

A React hook for executing side effects in functional components, useful for tasks like checking authentication and managing conditional rendering or navigation.

## Types of Route Guards



**Before Enter or Leave**: To check conditions before entering or leaving a route

**Resolve**: To resolve data before the route is activated

**After Enter or Leave:** To perform actions after entering or leaving a route

## Route Guards: Use Cases

01 Route guards prevents non-authenticated users from accessing certain routes.

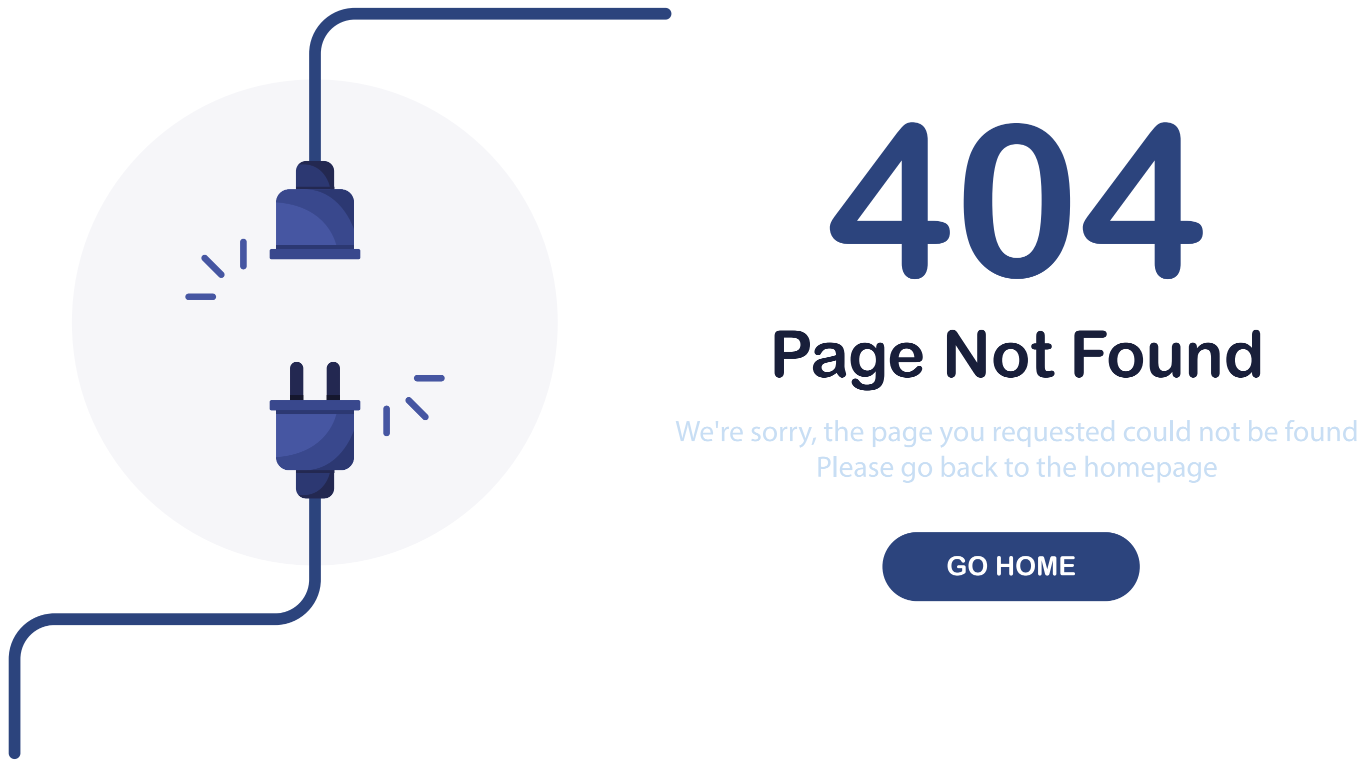
02 It prevents users from navigating away from the current view based on unsaved changes or pending operations.

03 It helps in loading necessary data before the route is activated.

## 404 Error Handling

## What Is 404 Error?

A 404 page is shown when a user tries to access a route or resource that is not available.


404
Page Not Found
We're sorry, the page you requested could not be found
Please go back to the homepage
GO HOME

The 404 is an HTTP status code representing **Not Found**.

## Custom 404 Error Page Using React Router

In React, React Router allows users to define a **<Route>** with a path of * or **404**, which is used to render a custom **404 component**.

This specific route is generally placed at the end of all route definitions, serving as a catch-all for any unrecognized URLs.

## Importance of Custom 404 Error Page

01 **User Experience:** Custom 404 pages provide a consistent and less intimidating user experience compared to generic error messages.

02 **Navigation Aid:** They offer helpful links and guidance back to the site's main sections, keeping users engaged.

03 **Brand Image:** They reinforce brand consistency and can leave a positive impression, even in error scenarios.

## Importance of Custom 404 Error Page

04 **Feedback Channel:** They encourage users to report broken links, aiding in site maintenance and error resolution.

05 **SEO Maintenance:** Properly configured 404 pages help maintain SEO health by preventing search engines from indexing non-existent pages.

06 **Creative Outlet:** They offer an opportunity for creativity and humor, making the site memorable and shareable.

## Creating a Custom 404 Page with React Router

Follow these simple steps with code examples to create a custom 404 page in React with React Router:

### Step 1: Create the 404 component

```
oror NotFoundPage.js

import React from 'react';

const NotFoundPage = () => {
  return (
    <div>
      <h1>404 Not Found<orh1>
      <p>The page you are looking for doesn't exist.<orp>
    <ordiv>
  );
};

export default NotFoundPage;
```

## Creating a Custom 404 Page with React Router

### Step 2: Set up react router

```
npm install react-router-dom
```

# Creating a Custom 404 Page with React Router

## Step 3: Define routes in your application

```
oror App.js

import React from 'react';
import { BrowserRouter as Router, Route, Switch } from 'react-router-dom';
import HomePage from '.orHomePage'; oror Import your home page component
import AboutPage from '.orAboutPage'; oror Import your about page component
import NotFoundPage from '.orNotFoundPage'; oror Import your 404 page
component

const App = () => {
  return (
    <Router>
      <Switch>
        <Route exact path="or" component={HomePage} or>
        <Route path="orabout" component={AboutPage} or>
        {or* Define other routes as needed *or}

        {or* Catch-all Route for 404 Not Found *or}
        <Route component={NotFoundPage} or>
      <orSwitch>
    <orRouter>
  );
};

export default App;
```

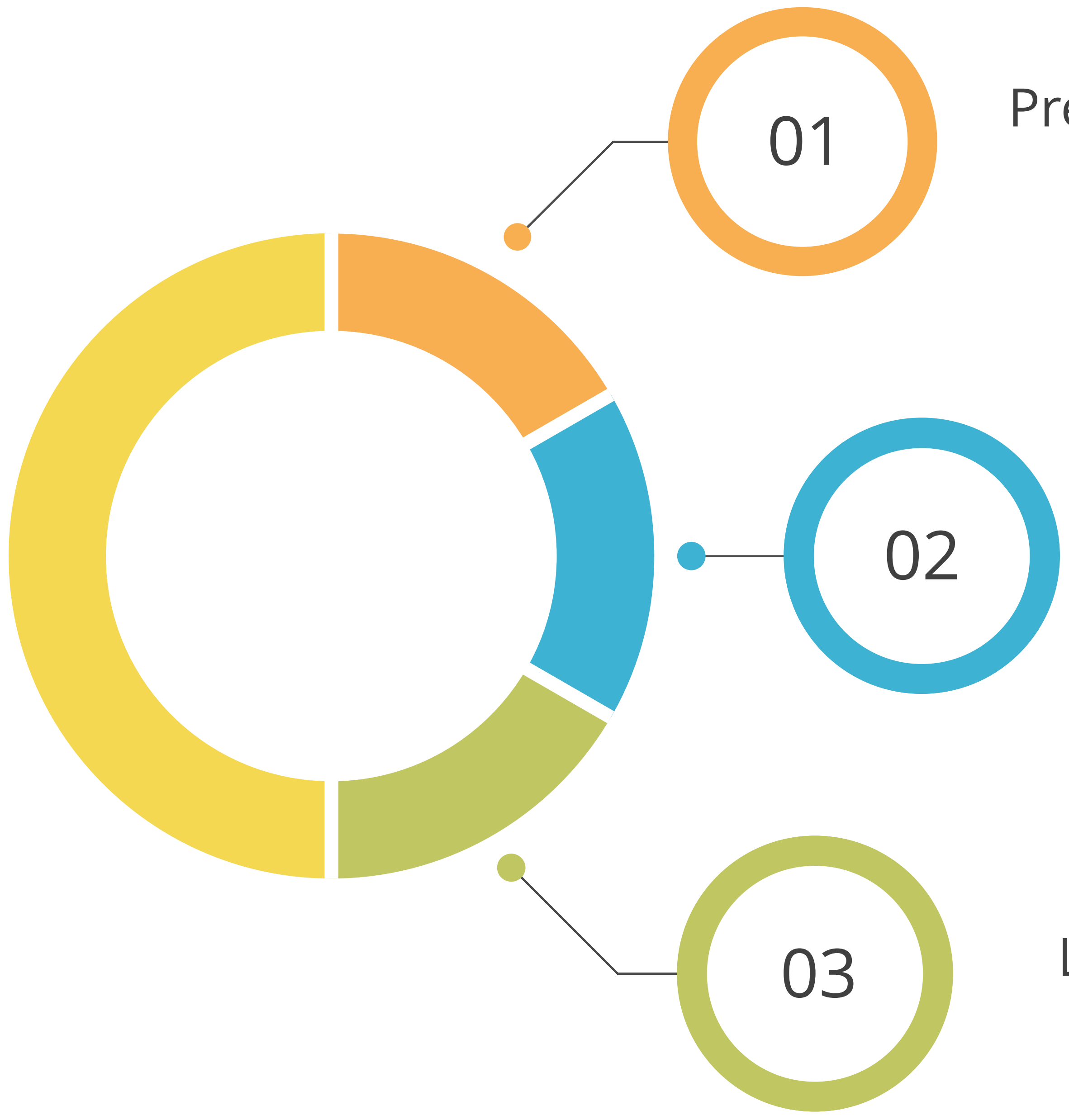
## Creating a Custom 404 Page with React Router

### Step 4: Test your 404 page

```
npm start
```

This configuration displays a custom 404 page for undefined routes in your React app, enhancing user experience and managing navigation errors smoothly.

## 404 Error: Use Cases

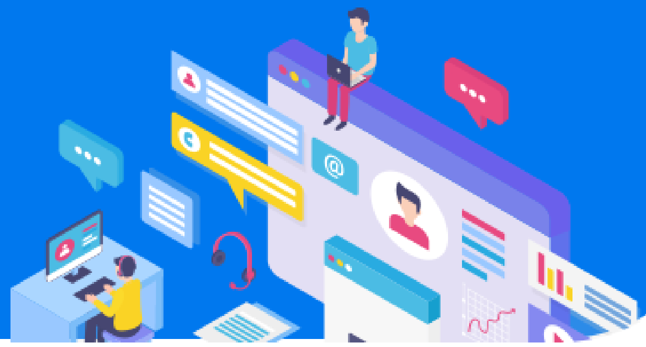


01 Preventing non-authenticated users from accessing certain routes.

02 Preventing users from navigating away from the current view based on unsaved changes or pending operations.

03 Loading necessary data before the route is activated.

## Assisted Practice

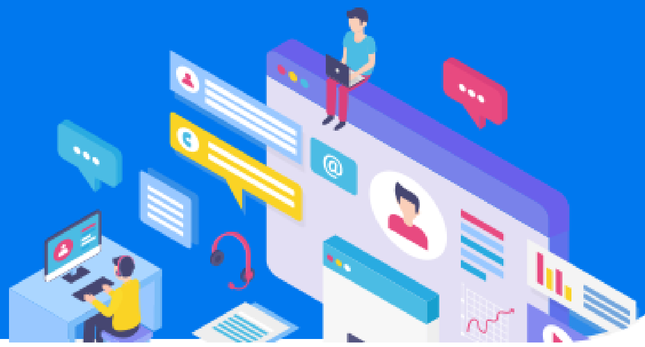


**Demo with React Routing** **Duration: 10 min**

**Problem Statement:**

You have been assigned a task to perform the steps involved in implementing Protected Routes in a React Application.

## Assisted Practice - Guidelines



Steps to be followed:

1. Set up a new React application
2. Install React Router
3. Create component files
4. Implement Protected Routes
5. Run the application

## Route Animation

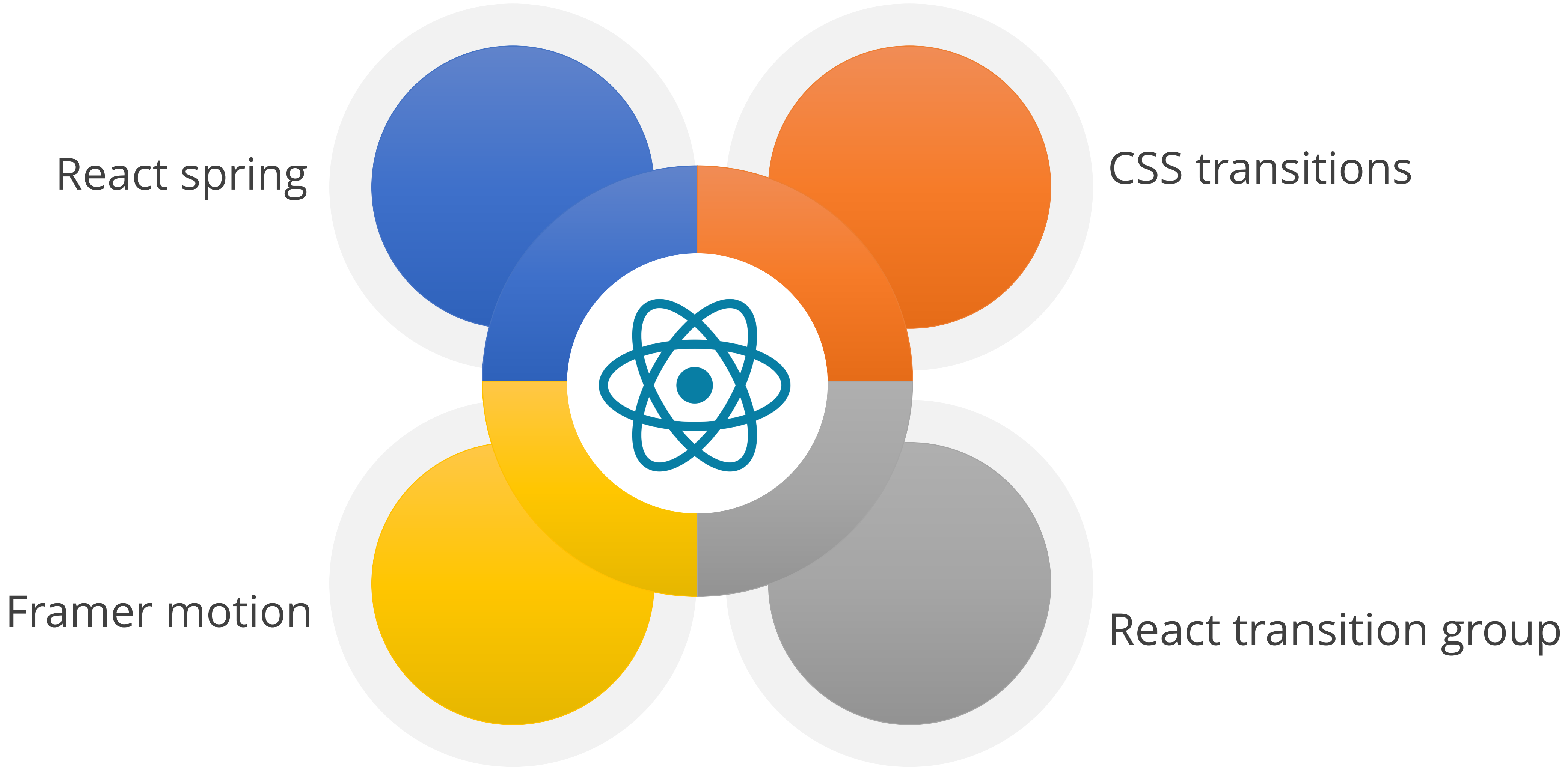
## What Are Route Animations?

Route animations in React are visual effects that occur during the transition between routes in a Single Page Application (SPA), providing a dynamic change rather than a static page swap.

These animations create a smooth visual flow as users navigate, improving interactivity and delivering a polished navigation experience.

## How to Implement Route Animations?

React requires external libraries for animations, with several options available to add route transitions some of them are as follows:



## Example: Using Route Animation

Here is an example demonstrating the use of React Transition Group for route transition animations:

**Example:**

```
import { Route, Switch, useLocation } from 'react-router-dom';
import { TransitionGroup, CSSTransition } from 'react-transition-group';

function AnimatedSwitch() {
  const location = useLocation();

  return (
    <TransitionGroup>
      <CSSTransition key={location.key} classNames="fade" timeout={300}>
        <Switch location={location}>
          <Route exact path="or" component={Home} or>
          <Route path="orabout" component={About} or>
          {or* other routes *or}
        <orSwitch>
      <orCSSTransition>
    <orTransitionGroup>
  );
}
```

## Key Takeaways

- React Router enhances application navigation by structuring code more effectively, giving developers better control over the navigation flow.
- It is vital for enabling smooth navigation and URL management in single-page React applications, enhancing user experience.
- It supports dynamic route parameters, allowing for flexible, data-driven components based on URL changes.
- Implementing route guards is crucial for controlling access based on criteria like authentication and ensuring secure and appropriate user access to routes.
- Creating custom 404 error pages in React Router improves user experience and maintains brand consistency during navigation errors.

Thank You