



Experiment 2

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Subject Name: Full Stack Development – II

Subject Code: 23CSH-309

1. Aim: To implement Single Page Application (SPA) routing in the EcoTrack application using React Router, secure application routes using protected routing with Context API-based authentication, and manage shared authentication state across components.

2. Objective:

- To configure client-side routing using React Router
- To implement SPA navigation without page reloads
- To protect routes using authentication-based route guards
- To manage shared authentication state using React Context API
- To implement login and logout functionality
- To restrict unauthorized access to protected pages
- To understand redirection logic in protected routing
- To analyze the role of Context API in state management

3. Implementation / Code:

Tools & Technologies Used:

- AWS Free Tier Account
- Web Browser (Google Chrome / Firefox)
- Amazon EC2 Service
- RDP Client (Microsoft Remote Desktop)
- Internet-enabled Laptop/Desktop

Implementation Description:

- The EcoTrack application is enhanced by implementing client-side routing using React Router, enabling seamless navigation between different pages without full page reloads.
- An authentication system is implemented using React Context API, which stores and manages the authentication state (isAuthenticated) across the entire application.
- A ProtectedRoute component is created to restrict access to sensitive pages such as Dashboard, Logs, and Data. If the user is not authenticated, they are automatically redirected to the Login page.
- Login functionality updates the authentication state using context, while logout functionality resets the authentication state and redirects the user back to the login page.



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- This approach ensures secure navigation, centralized state management, and a smooth SPA user experience.

Sample Code Snippet:

src/Header.jsx

```
import { Link, useNavigate } from "react-router-dom";
import { useAuth } from "../context/AuthContext.jsx";

const Header = ({ title }) => {
  const { setIsAuthenticated } = useAuth();
  const navigate = useNavigate();

  const handleLogOut = () => {
    setIsAuthenticated(false);
    navigate("/login");
  };

  return (
    <header
      style={{
        backgroundColor: "#0f172a",
        color: "white",
        padding: "0.8rem 1.5rem",
        display: "flex",
        alignItems: "center",
        justifyContent: "space-between",
        boxShadow: "0 2px 8px rgba(0,0,0,0.15)",
      }}
    >
    {/* App Title */}
    <h1
      style={{
        fontSize: "1.4rem",
        fontWeight: "700",
        letterSpacing: "0.5px",
        margin: 0,
      }}
    >
      {title}
    </h1>

    {/* Navigation */}
    <nav style={{ display: "flex", gap: "1.5rem" }}>
      <Link
        to="/"
        style={{
          color: "#cbd5f5",
          textDecoration: "none",
          fontSize: "0.95rem",
        }}
      >
        Dashboard
      </Link>
    </nav>
  
```



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</Link>

```
<Link
  to="/log"
  style={{
    color: "#cbd5f5",
    textDecoration: "none",
    fontSize: "0.95rem",
  }}
>
  Logs
</Link>
</nav>

/* Logout */
<button
  onClick={handleLogOut}
  style={{
    backgroundColor: "#ef4444",
    color: "white",
    border: "none",
    padding: "0.35rem 0.9rem",
    borderRadius: "6px",
    fontSize: "0.85rem",
    fontWeight: "600",
    cursor: "pointer",
  }}
  onMouseOver={(e) =>
    (e.target.style.backgroundColor = "#dc2626")
  }
  onMouseOut={(e) =>
    (e.target.style.backgroundColor = "#ef4444")
  }
>
  Logout
</button>
</header>
);
};
```

export default Header;

src/pages/dashboard.jsx

```
import { logs } from "../data/logs";

const Dashboard = () => {
  const totalCarbon = logs.reduce((acc, log) => acc + log.carbon, 0);

  return (
    <div
      style={{
        minHeight: "100vh",
        backgroundColor: "#f0fdf4",
        display: "flex",
      }}
    >
```



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```
alignItems: "flex-start",
justifyContent: "center",
padding: "2rem",
}}
>
<div
  style={{
    width: "100%",
    maxWidth: "900px",
  }}
>
/* Header Section */
<div
  style={{
    marginBottom: "1.5rem",
  }}
>
<h1
  style={{
    fontSize: "2rem",
    fontWeight: "700",
    color: "#065f46",
    marginBottom: "0.4rem",
  }}
>
  Carbon Dashboard
</h1>
<p
  style={{
    color: "#047857",
    fontSize: "0.95rem",
  }}
>
  Overview of your daily environmental impact 🌎
</p>
</div>

/* Stats Card */
<div
  style={{
    backgroundColor: "#ffffff",
    borderRadius: "14px",
    padding: "2rem",
    boxShadow: "0 8px 20px rgba(0,0,0,0.08)",
    display: "flex",
    alignItems: "center",
    justifyContent: "space-between",
    flexWrap: "wrap",
  }}
>
<div>
<p
  style={{
    fontSize: "0.9rem",
  }}
```



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```
color: "#6b7280",
marginBottom: "0.4rem",
}}
>
Total Carbon Footprint
</p>
```

```
<p
style={{
fontSize: "3rem",
fontWeight: "800",
color: "#16a34a",
}}
>
{totalCarbon}
<span
style={{
fontSize: "1.1rem",
fontWeight: "500",
color: "#374151",
marginLeft: "0.5rem",
}}
>
kg CO2
</span>
</p>
</div>
```

```
/* Visual Indicator */
<div
style={{
width: "120px",
height: "120px",
borderRadius: "50%",
background:
totalCarbon > 15
? "#fee2e2"
: totalCarbon > 8
? "#fef3c7"
: "#dcfce7",
display: "flex",
alignItems: "center",
justifyContent: "center",
fontSize: "1.2rem",
fontWeight: "700",
color:
totalCarbon > 15
? "#dc2626"
: totalCarbon > 8
? "#d97706"
: "#15803d",
}}
>
{totalCarbon > 15
```



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```
? "High"
: totalCarbon > 8
? "Medium"
: "Low" }

</div>
</div>

/* Footer Note */

<p
style={{
marginTop: "1.2rem",
fontSize: "0.85rem",
color: "#6b7280",
}}>
>
Tip: Reduce travel emissions and switch to renewable energy to lower
your footprint
</p>
</div>
</div>

);
};

export default Dashboard;
```

src/context/AuthContext.jsx

```
import { createContext, useContext, useState } from "react";

export const AuthContext = createContext(null);

export const AuthProvider = ({ children }) => {
  const [isAuthenticated, setIsAuthenticated] = useState(false);

  return (
    <AuthContext.Provider value={{ isAuthenticated, setIsAuthenticated }}>
      {children}
    </AuthContext.Provider>
  );
};

export const useAuth = () => useContext(AuthContext);
```

src/pages/login.jsx

```
import { useAuth } from "../context/AuthContext.jsx";
import { useNavigate } from "react-router-dom";

const Login = () => {
  const { setIsAuthenticated } = useAuth();
  const navigate = useNavigate();

  const handleLogin = () => {
    setIsAuthenticated(true);
    navigate("/");
  };
};
```



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```
return (
  <div
    style={{
      minHeight: "100vh",
      backgroundColor: "#f0fdf4",
      display: "flex",
      alignItems: "center",
      justifyContent: "center",
      padding: "2rem",
    }}
  >
  <div
    style={{
      width: "100%",
      maxWidth: "420px",
      backgroundColor: "#ffffff",
      borderRadius: "14px",
      padding: "2rem",
      boxShadow: "0 10px 24px rgba(0,0,0,0.1)",
    }}
  >
    /* Title */
    <h2
      style={{
        fontSize: "1.9rem",
        fontWeight: "700",
        color: "#065f46",
        textAlign: "center",
        marginBottom: "0.5rem",
      }}
    >
      Welcome Back
    </h2>

    <p
      style={{
        textAlign: "center",
        color: "#047857",
        fontSize: "0.95rem",
        marginBottom: "2rem",
      }}
    >
      Sign in to access your EcoTrack dashboard
    </p>

    /* Login Button */
    <button
      onClick={handleLogin}
      style={{
        width: "100%",
        padding: "0.8rem",
        borderRadius: "10px",
        backgroundColor: "#16a34a",
        color: "white",
        fontWeight: "600",
        fontSize: "1.05rem",
        border: "none",
        cursor: "pointer",
        boxShadow: "0 4px 12px rgba(0,0,0,0.15)",
      }}
    >
      onMouseOver={(e) =>
```



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```
(e.target.style.backgroundColor = "#15803d")
}
onMouseOut={(e) =>
  (e.target.style.backgroundColor = "#16a34a")
}
>
  Login
</button>

/* Footer note */
<p
  style={{
    marginTop: "1.5rem",
    fontSize: "0.85rem",
    color: "#6b7280",
    textAlign: "center",
  }}
>
  Secure access • Environment-first tracking
</p>
</div>
</div>
);
};

export default Login;
```

src/Routes/ProtectedRoute.jsx

```
import { Navigate } from "react-router-dom";
import { useAuth } from "../context/AuthContext";

const ProtectedRoute = ({ children }) => {
  const { isAuthenticated } = useAuth();

  if(!isAuthenticated){
    return <Navigate to="/login" replace />;
  }
  return children;
}

export default ProtectedRoute;
```



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4. Output:

- The EcoTrack application successfully implements SPA routing
- Navigation occurs without full page reloads
- Unauthorized users are redirected to the login page
- Authenticated users can access Dashboard, Logs, and Data pages
- System logs and environmental data are displayed dynamically
- Logout functionality securely ends the session
- Proper route protection is verified using ProtectedRoute

The screenshot shows a web application interface. At the top, there is a dark header bar with the word "Dashboard" on the left, "Logout" on the right, and "Dashboard" and "Logs" links in the center. Below the header is a large white rectangular area containing a smaller white box. The box has a green header bar with the text "Welcome Back". Below this is a line of small text: "Sign in to access your EcoTrack dashboard". In the center is a green button with the word "Login". At the bottom of the box is another line of small text: "Secure access • Environment-first tracking".

The screenshot shows a web application interface. At the top, there is a dark header bar with the word "Dashboard" on the left, "Logout" on the right, and "Dashboard" and "Logs" links in the center. Below the header is a light green header bar with the text "Carbon Dashboard" and "Overview of your daily environmental impact". The main content area is white and contains a box with rounded corners. Inside the box, on the left, is the text "Total Carbon Footprint" above a large green number "12" followed by "kg CO₂". On the right, there is a yellow circular icon with the word "Medium" in orange. At the bottom of the box is a small line of text: "Tip: Reduce travel emissions and switch to renewable energy to lower your footprint".



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The screenshot shows a dashboard titled "Activity Logs" under the "Logs" tab. It displays three activities with their respective CO₂ emissions:

Activity	CO ₂ Emissions
Car Travel	4 kg CO ₂
Electricity Usage	6 kg CO ₂
Public Transport	2 kg CO ₂

A tip at the bottom suggests: "Tip: Prefer low-carbon activities like cycling and public transport to reduce emissions".

5. Learning Outcomes (What I Have Learnt)

After completing this experiment, the student is able to:

- Implement SPA routing using React Router
- Secure application routes using protected routing
- Manage shared authentication state using Context API
- Implement login and logout functionality
- Understand route redirection logic
- Compare Context API with Redux at an introductory level
- Build scalable and secure React applications



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