



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

CHANDIGARH UNIVERSITY

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Experiment 2

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Semester: 6th
Subject Name: Full Stack Development – II

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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.

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.



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- Login functionality updates the authentication state using context, while logout functionality resets the authentication state and redirects the user back to the login page.
- 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" }}>
```



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```
<Link      to="/" style={{ color: "#cbd5f5", textDecoration: "none", fontSize: "0.95rem", }}> Dashboard </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")}> </button>
</header>
);

};

export default Header;
```



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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",
        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>
      </div>
    </div>
  );
}

/* Stats Card */
<div
  style={{
    backgroundColor: "#ffffff",
    borderRadius:
```



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```
"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",      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:
```



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```
"flex",      alignItems:  
"center",    justifyContent:  
"center",    fontSize:  
"1.2rem",   fontWeight:  
"700",      color:  
            totalCarbon > 15  
            ? "#dc2626"  
            : totalCarbon > 8  
            ? "#d97706"  
            : "#15803d";  
        }  
>  
        {totalCarbon > 15  
        ? "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}
```



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```
</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("/");
  };

  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>
      </div>
    </div>
  );
}

export default Login;
```



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```
<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) => (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;
```



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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;
```

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



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Dashboard Dashboard Logs Logout

Welcome Back

Sign in to access your EcoTrack dashboard

[Login](#)

Secure access • Environment-first tracking

Dashboard Dashboard Logs Logout

Carbon Dashboard

Overview of your daily environmental impact

Total Carbon Footprint

12 kg CO₂

Medium

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 corresponding 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 application

