



Experiment 2

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Branch: CSE

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Subject Name: Full Stack Development – II

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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:

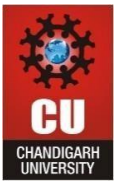
- To configure client-side routing using React Router
- To implement SPA navigation without page reloads
- To protect routes using authentication-based route guards
- To manage shared authentication state using React Context API
- To implement login and logout functionality
- To restrict unauthorized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

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")
}
>
  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",  
        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:
```



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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}
    </AuthContext.Provider>
  );
}
```



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```
    </AuthProvider>
  );
};

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>
```



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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;
```




src/Routes/ProtectedRoute.jsx

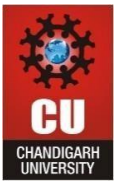
```
import {Navigate} from "react-router-dom";
import {useAuth} from "../context/AuthContext";

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

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

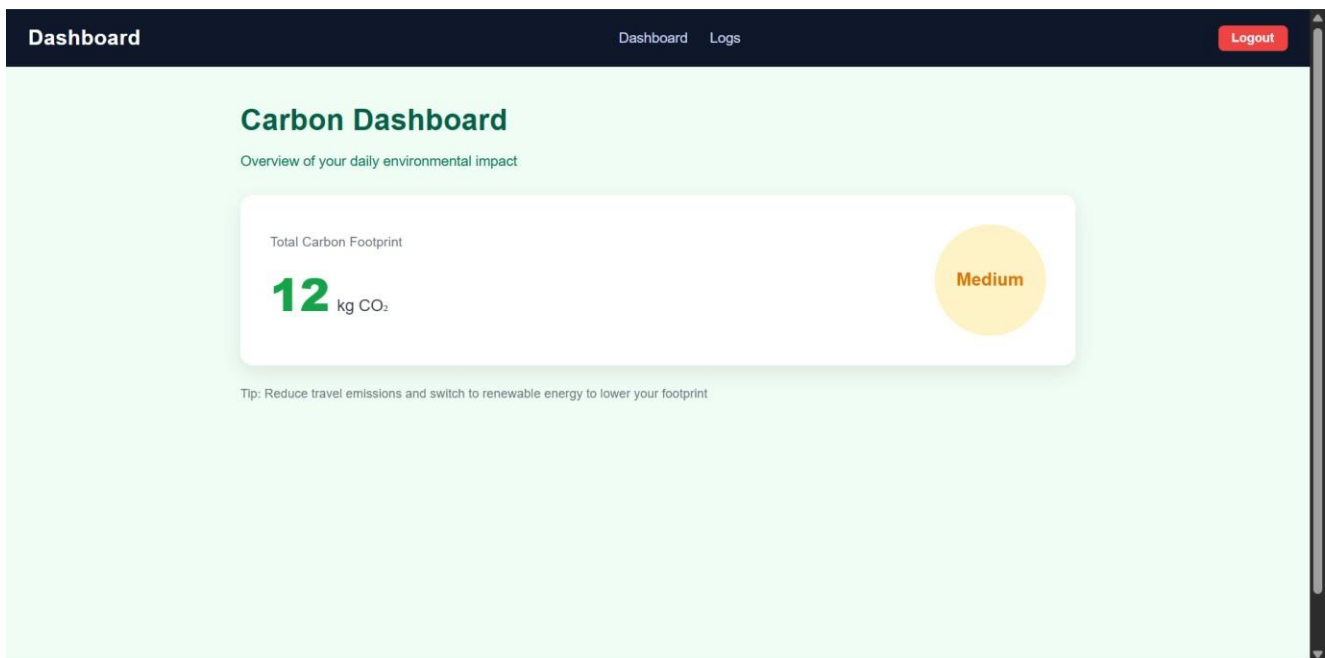
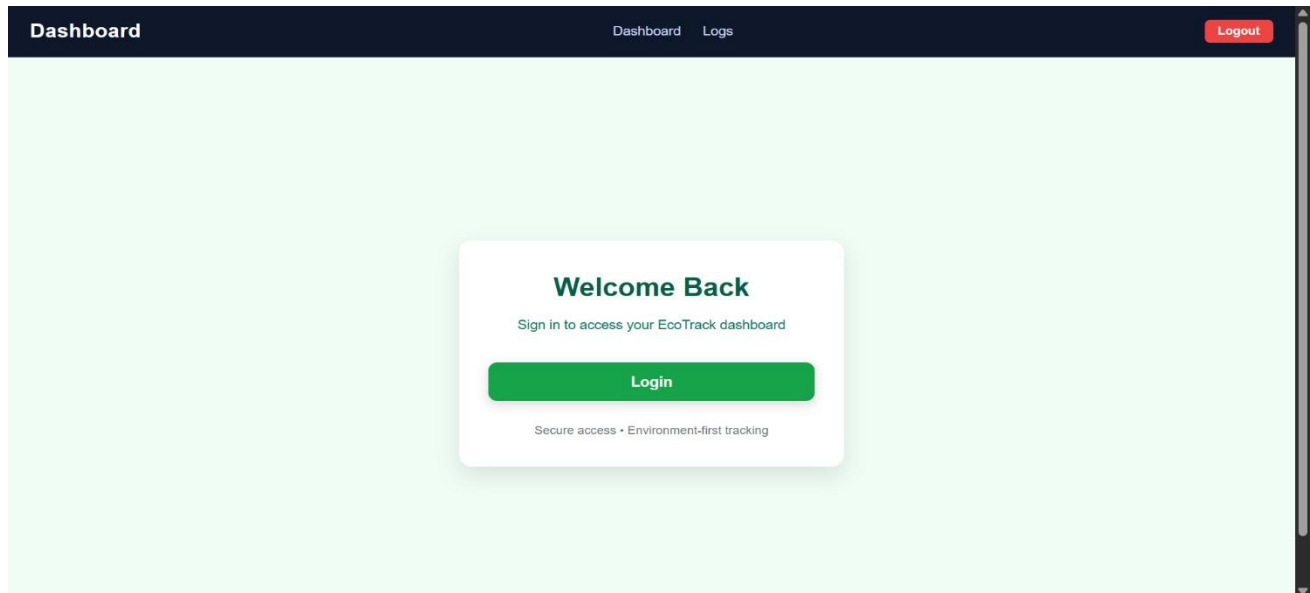
4. Output:

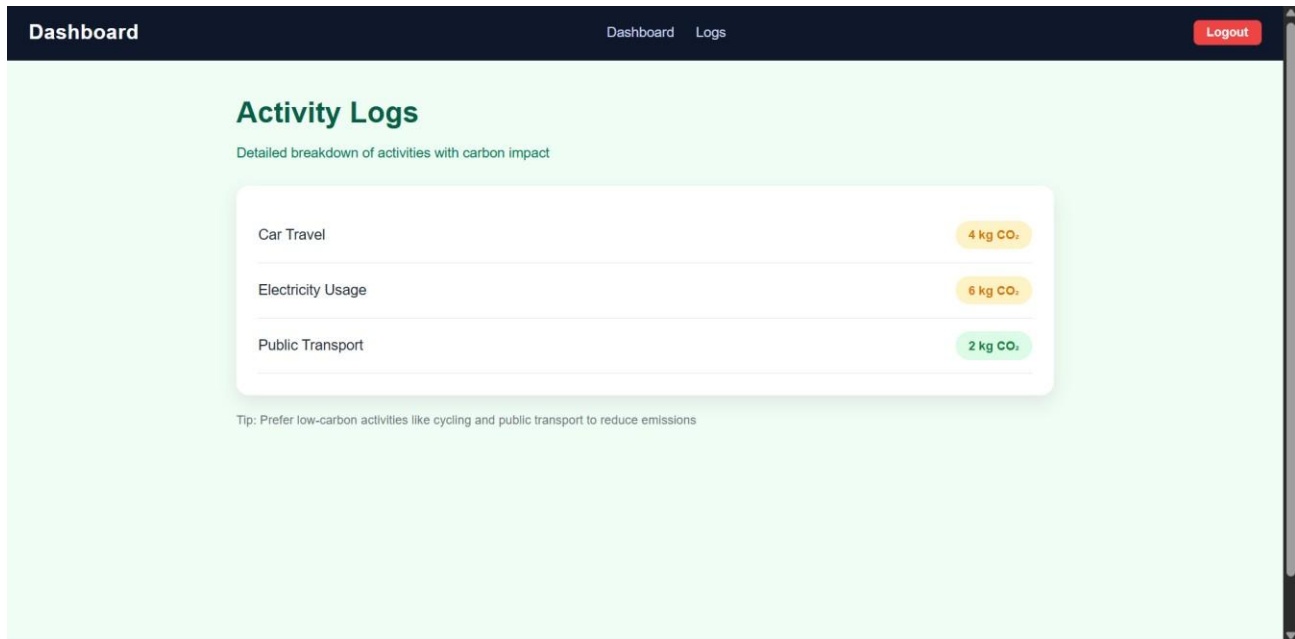
- The EcoTrack application successfully implements SPA routing
- Navigation occurs without full page reloads
- Unauthorized users are redirected to the login page
- Authenticated users can access Dashboard, Logs, and Data pages
- System logs and environmental data are displayed dynamically
- Logout functionality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



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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

