Sri Lanka Institute of Information Technology

**Application Frameworks**

**(SE3040)**

**Name: Gamalath K.H**

**IT Number: IT22190598**

**Batch ID: Y3.S1.WE.SE.01.01**

AF Assignment 2

# Development of a React Frontend Application Using REST Countries API

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# 1 INTRODUCTION

This assignment involves the development of a modern, single-page web application (SPA) named **Country Explorer**, designed using the **React** JavaScript framework and built with the **Vite** development tool for optimal performance. The application enables users to browse, search, and explore detailed information about countries across the world by consuming data from the **REST Countries API (v3.1)**.A key objective of this project is to provide an interactive and user-friendly interface that integrates modern frontend libraries such as **Material-UI (MUI)** and **Tailwind CSS** for responsive design. Additionally, it incorporates **Firebase Authentication** to support secure user login via Google, and **Firestore** for persisting user-specific data, such as their list of favorite countries.The application is fully deployed and publicly accessible, showcasing skills in API integration, authentication, cloud-based data storage, responsive design, and frontend deployment. It also includes proper session management and account handling features such as logout and delete account, offering a real-world experience in building cloud-ready frontend applications.

# 2 Application Setup & Build Process

## 2.1 Development Environment

The project was developed using the following core technologies:

- **React 19** with **Vite** for fast frontend development
- **Material-UI (MUI)** and **Tailwind CSS** for responsive UI design
- **Firebase Authentication & Firestore** for secure login and user-specific data
- **REST Countries API v3.1** as the primary external data source

Additional tools and libraries include:

- axios for API requests
- react-router-dom for client-side routing
- @mui/icons-material for UI icons
- Jest and React Testing Library for testing

## 2.2 Installation and Setup

To set up the application locally:

1. **Clone the repository**

   https://github.com/Kavinigamalath/countries-app.git

   or

   https://github.com/SE1020-IT2070-OOP-DSA-25/af-2-Kavinigamalath.git

2. **Install dependencies**

   ```
   npm install
   ```

3. **Run the development server**

   ```
   npm run dev
   ```

4. **The app will be available at http://localhost:5173**

## 2.3 Firebase Configuration

Firebase was initialized using the Web SDK. The configuration file is located in src/firebase.js and uses:

- **Google Authentication** for secure login
- **Cloud Firestore** to store each user's list of favorite countries

Sensitive credentials are stored securely and excluded from version control.

## 2.4 Deployment

The application is deployed using **Cloudflare Pages**:

- The vite.config.js ensures compatibility with modern ESM-based hosting.
- The dist/ folder is generated using:

  ```
  npm run build
  ```

- Deployment is linked to GitHub for automatic CI/CD.

Live link: https://countries-app-ahb.pages.dev

# 3 API Usage and Challenges

## 3.1 Chosen APIs

The primary API used in this project is the **REST Countries API v3.1**, a free and reliable public API that provides data about countries worldwide. It offers endpoints for retrieving information such as:

- Country names, flags, capitals
- Population, region, subregion
- Currencies, languages, and borders

Key endpoints used in the app include:

- GET /all — to load all countries for the homepage and explore views
- GET /name/{name} — to support search functionality
- GET /region/{region} — to filter countries by region
- GET /alpha/{code} – detail view by country code

Additionally, **Firebase Authentication** and **Cloud Firestore** were used:

- Firebase Auth — handles secure login with Google
- Firestore — stores each user's list of favorite countries using their UID as the document ID

## 3.2 How APIs Were Integrated

The project uses an axios instance to encapsulate all REST Countries API calls in src/api/restCountries.js, allowing reuse and clean code.

```
import axios from "axios"; // HTTP client for making API requests

// Create a configured axios instance
const api = axios.create({
  baseURL: "https://restcountries.com/v3.1",
  timeout: 10000,

});

// Fetch all countries data
export const getAll = () =>
  api.get("/all");

// Fetch countries matching a given name (partial or full)
export const getByName = (name) =>
  api.get(`/name/${name}`);

// Fetch countries in a specific region (e.g., "Asia", "Europe")
```

```
export const getByRegion = (region) =>
  api.get(`/region/${region}`);

// Fetch a single country by its ISO 3166-1 alpha-3 code (e.g., "USA")
export const getByCode = (code) =>
  api.get(`/alpha/${code}`);
```

Firebase services were initialized in firebase.js and used inside AuthContext.jsx for login/logout logic and Firestore-based favorites storage.

## 3.3 Challenges Faced and Resolutions

| Challenge | Resolution |
|---|---|
| CORS errors **when calling REST Countries API in development** | Solved by using vite.config.js with proper proxy or directly calling HTTPS endpoints in the client |
| **Difficulty** managing user sessions **across refresh and routing** | Used onAuthStateChanged() from Firebase Auth to persist login state and load favorites on app load |
| Google Sign-In failing on deployed domain (Cloudflare Pages) | 1. Added the domain to Firebase Auth<br>2. Authentication<br>3. Sign-in Method<br>4. Authorized domains |
| Slow API response time **for large /all endpoint** | Added loading spinners and optimized rendering using React memoization and conditional rendering |
| **Issues with** FireStore document structure **(overwrites)** | Solved by using document paths like favorites/{uid} and ensuring .set() with { merge: true } |

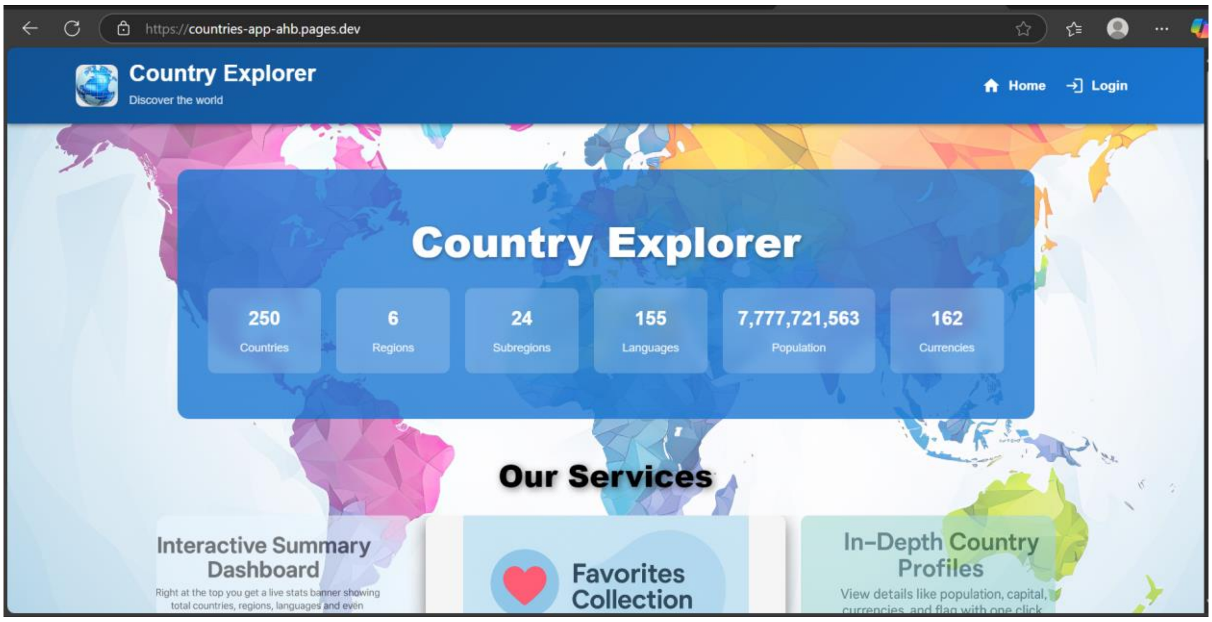
## 3.4 Lessons Learned

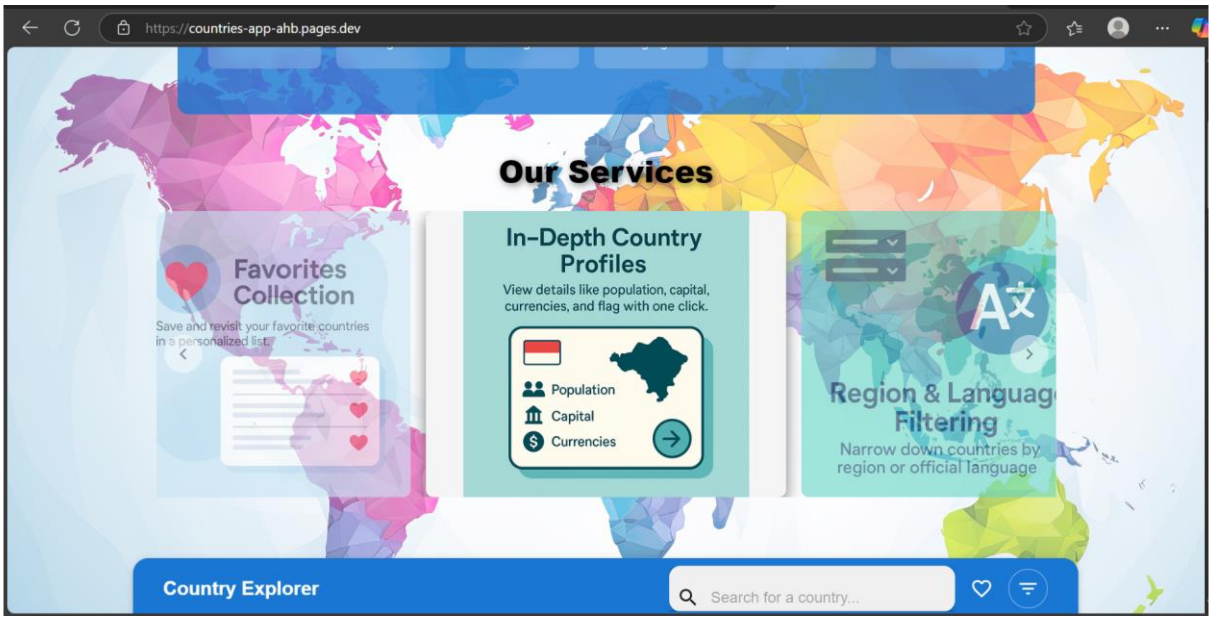
Working with real-time external APIs and Firebase services helped deepen our understanding of:

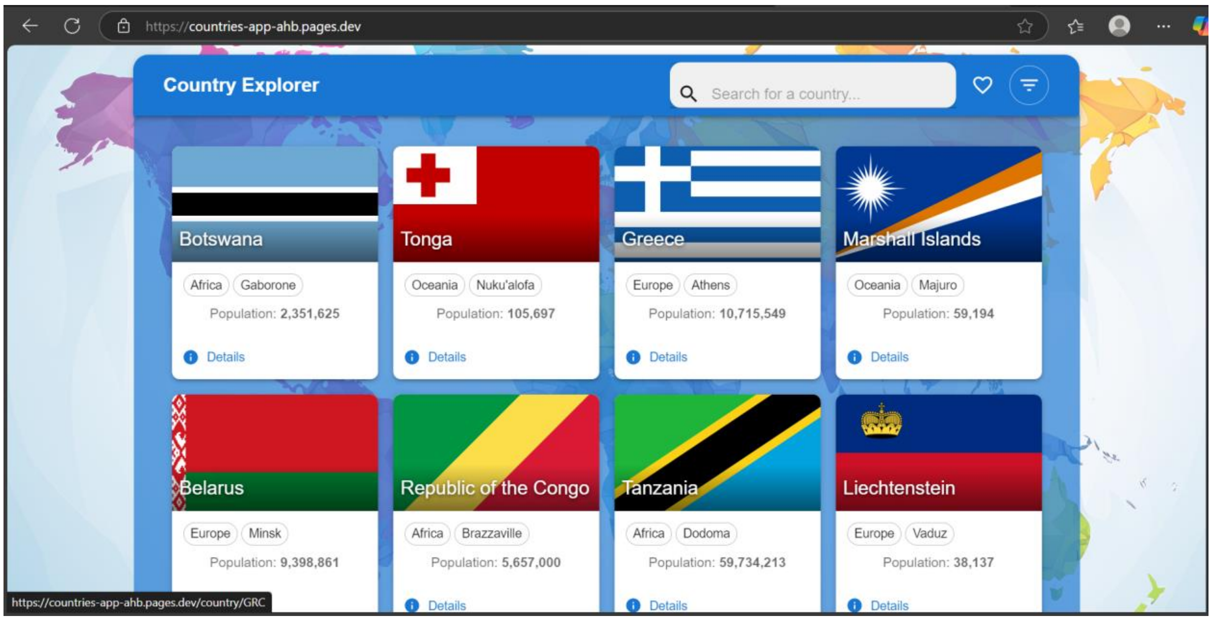
- Asynchronous data fetching and error handling
- Authentication state management in React apps
- Persistent storage using Firestore
- Optimizing UI performance for large datasets

These integrations not only enhanced the feature set of the application but also prepared us for real-world development scenarios involving third-party APIs and cloud services.

# 4 SCREENSHOTS


https://countries-app-ahb.pages.dev
Country Explorer
Discover the world
Home
Login
Country Explorer
250
Countries
6
Regions
24
Subregions
155
Languages
7,777,721,563
Population
162
Currencies
Our Services
Interactive Summary Dashboard
Right at the top you get a live stats banner showing total countries, regions, languages and even
Favorites Collection
In-Depth Country Profiles
View details like population, capital, currencies, and flag with one click.


https://countries-app-ahb.pages.dev
Our Services
Favorites Collection
Save and revisit your favorite countries in a personalized list.
In-Depth Country Profiles
View details like population, capital, currencies, and flag with one click.
Population
Capital
Currencies
Region & Languag
Filtering
Narrow down countries by region or official language
Country Explorer
Search for a country...



https://countries-app-ahb.pages.dev

Country Explorer

Search for a country...

Botswana
Africa Gaborone
Population: 2,351,625
Details

Tonga
Oceania Nuku'alofa
Population: 105,697
Details

Greece
Europe Athens
Population: 10,715,549
Details

Marshall Islands
Oceania Majuro
Population: 59,194
Details

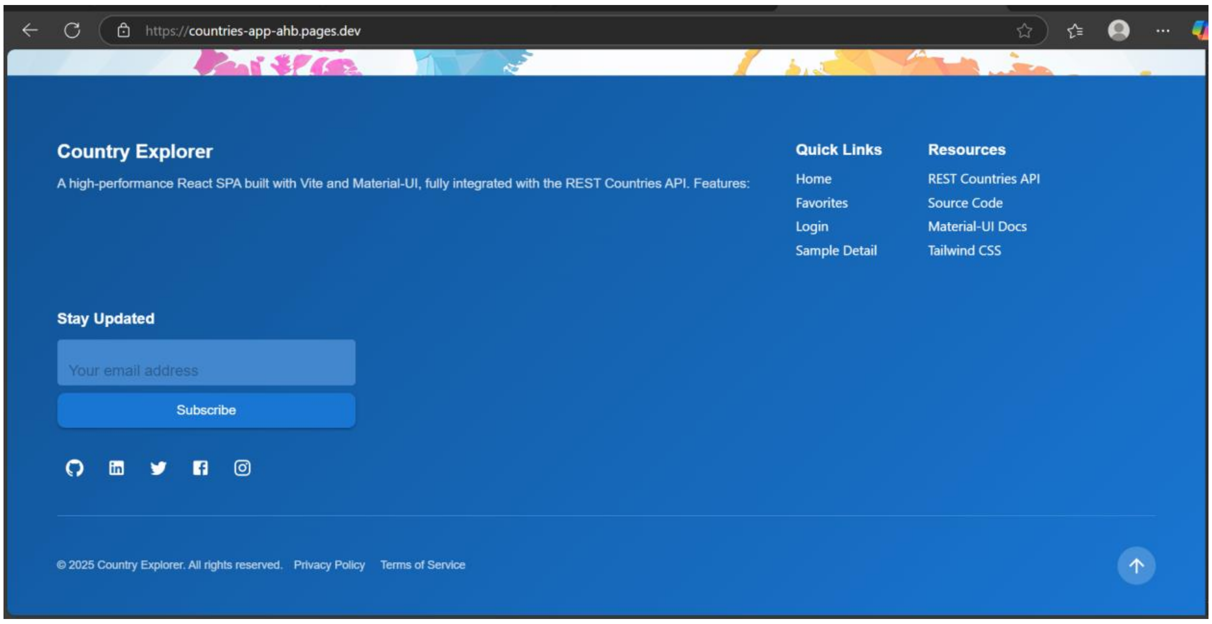
Belarus
Europe Minsk
Population: 9,398,861

Republic of the Congo
Africa Brazzaville
Population: 5,657,000
Details

Tanzania
Africa Dodoma
Population: 59,734,213
Details

Liechtenstein
Europe Vaduz
Population: 38,137
Details

https://countries-app-ahb.pages.dev/country/GRC



https://countries-app-ahb.pages.dev

Country Explorer

A high-performance React SPA built with Vite and Material-UI, fully integrated with the REST Countries API. Features:

Quick Links
- Home
- Favorites
- Login
- Sample Detail

Resources
- REST Countries API
- Source Code
- Material-UI Docs
- Tailwind CSS

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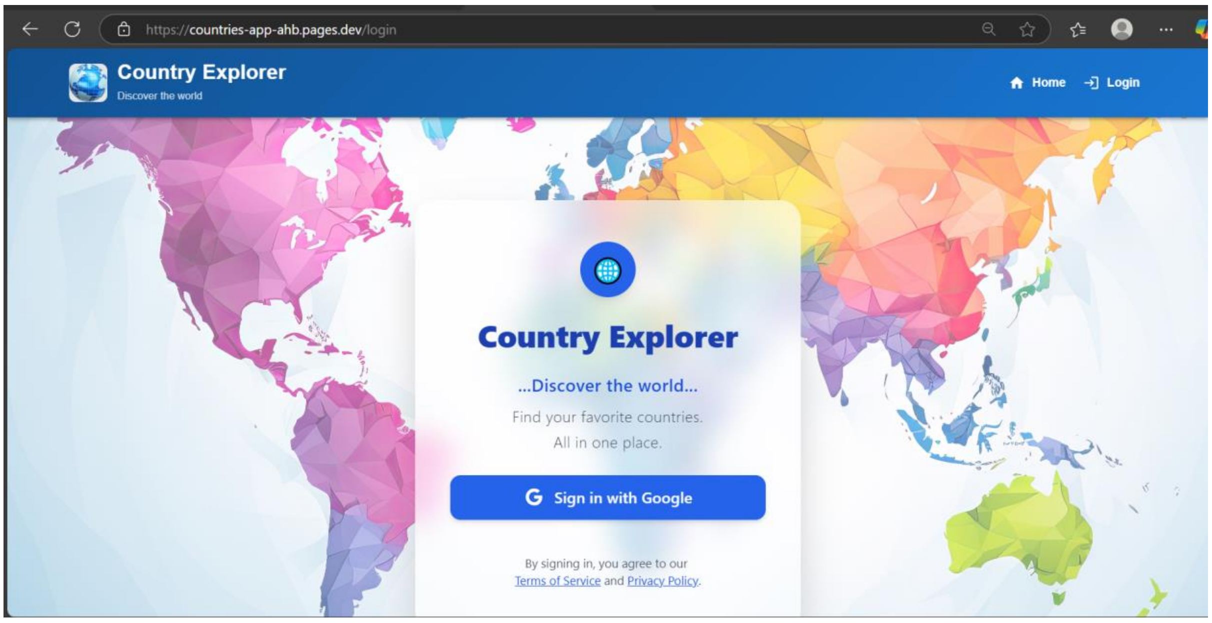


https://countries-app-ahb.pages.dev/login

Country Explorer

Discover the world

Home Login

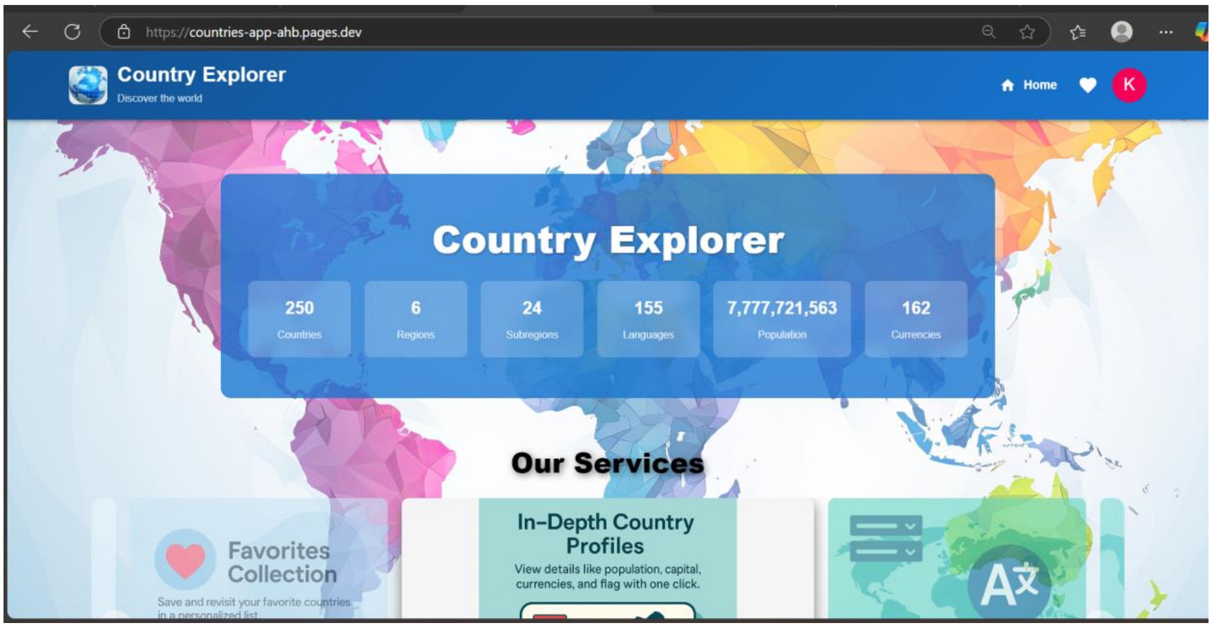
Country Explorer

...Discover the world...

Find your favorite countries.
All in one place.

Sign in with Google

By signing in, you agree to our
Terms of Service and Privacy Policy.



https://countries-app-ahb.pages.dev

Country Explorer

Discover the world

Home K

Country Explorer

| 250 | 6 | 24 | 155 | 7,777,721,563 | 162 |
|---|---|---|---|---|---|
| Countries | Regions | Subregions | Languages | Population | Currencies |

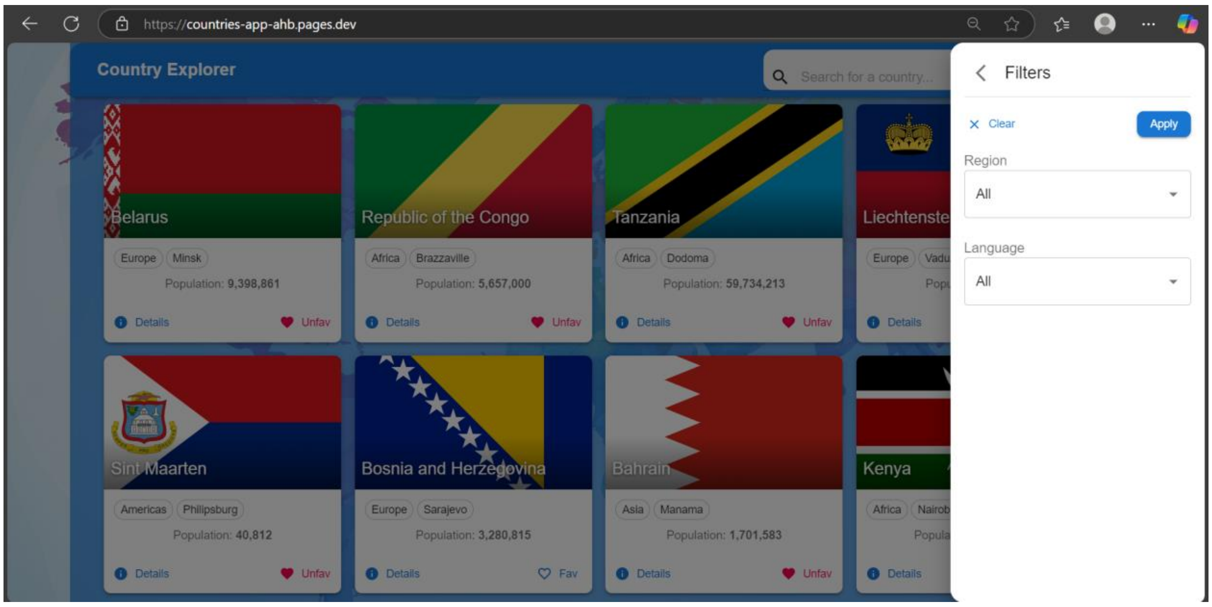
Our Services

Favorites Collection

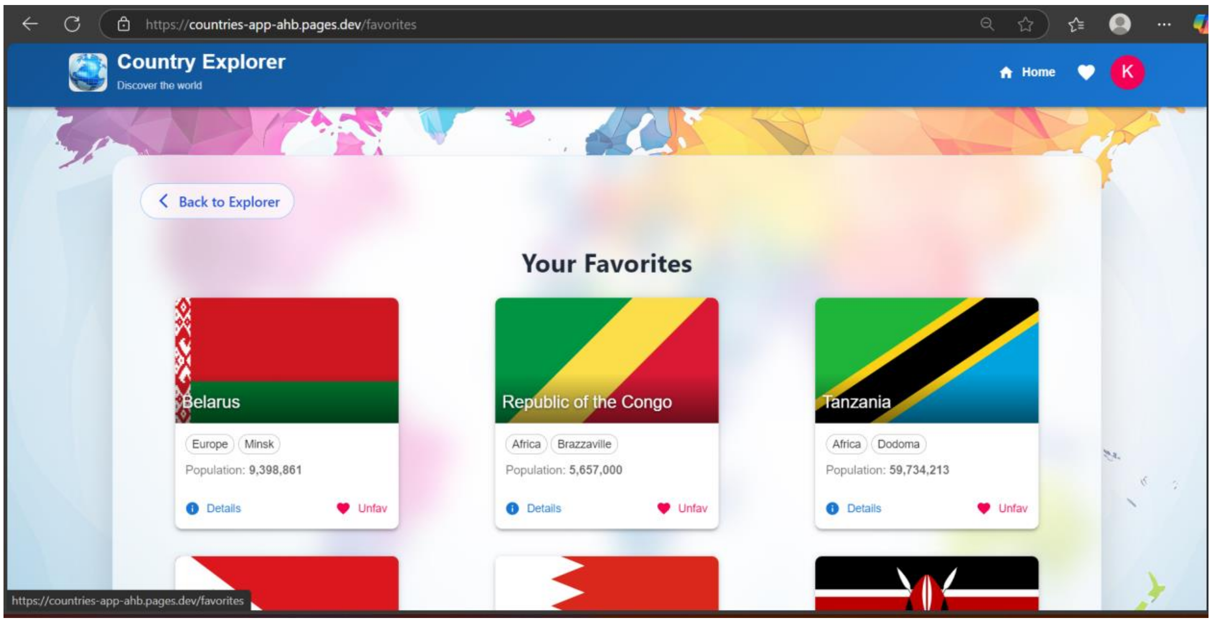
Save and revisit your favorite countries in a personalized list

In-Depth Country Profiles

View details like population, capital, currencies, and flag with one click.



https://countries-app-ahb.pages.dev
Country Explorer
Search for a country...
Filters
Clear
Apply
Region
All
Language
All
Belarus
Europe
Minsk
Population: 9,398,861
Details
Unfav
Republic of the Congo
Africa
Brazzaville
Population: 5,657,000
Details
Unfav
Tanzania
Africa
Dodoma
Population: 59,734,213
Details
Unfav
Liechtenste
Europe
Vadu
Details
Sint Maarten
Americas
Philipsburg
Population: 40,812
Details
Unfav
Bosnia and Herzegovina
Europe
Sarajevo
Population: 3,280,815
Details
Fav
Bahrain
Asia
Manama
Population: 1,701,583
Details
Unfav
Kenya
Africa
Nairob
Details



https://countries-app-ahb.pages.dev/favorites
Country Explorer
Discover the world
Home
K
Back to Explorer
Your Favorites
Belarus
Europe
Minsk
Population: 9,398,861
Details
Unfav
Republic of the Congo
Africa
Brazzaville
Population: 5,657,000
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Unfav
Tanzania
Africa
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Details
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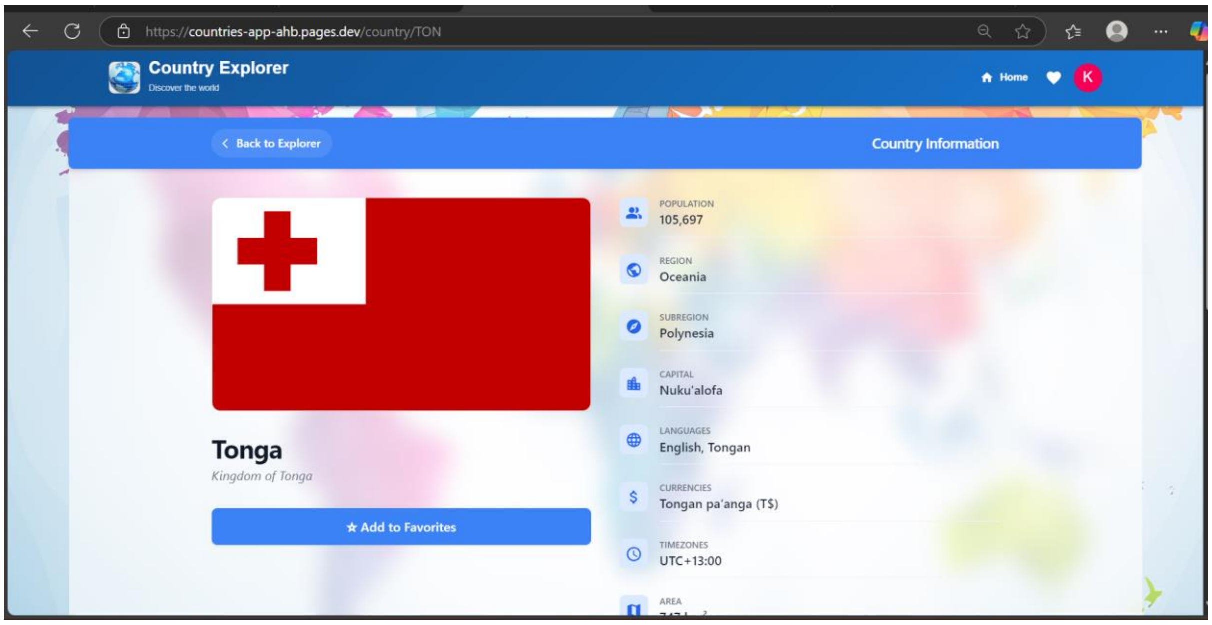
https://countries-app-ahb.pages.dev/favorites



https://countries-app-ahb.pages.dev/country/TON

Country Explorer
Discover the world

Home

K

Back to Explorer

Country Information

Tonga
Kingdom of Tonga

Add to Favorites

POPULATION
105,697

REGION
Oceania

SUBREGION
Polynesia

CAPITAL
Nuku'alofa

LANGUAGES
English, Tongan

CURRENCIES
Tongan pa'anga (T$)

TIMEZONES
UTC+13:00

AREA