Bibliophilic

By

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System Design and Architecture

1. Modular Design & System Architecture

From the very beginning, we built the app using a modular approach. Our system is divided into
two main, independent parts: the Front-End and the Back-End.
System Components:

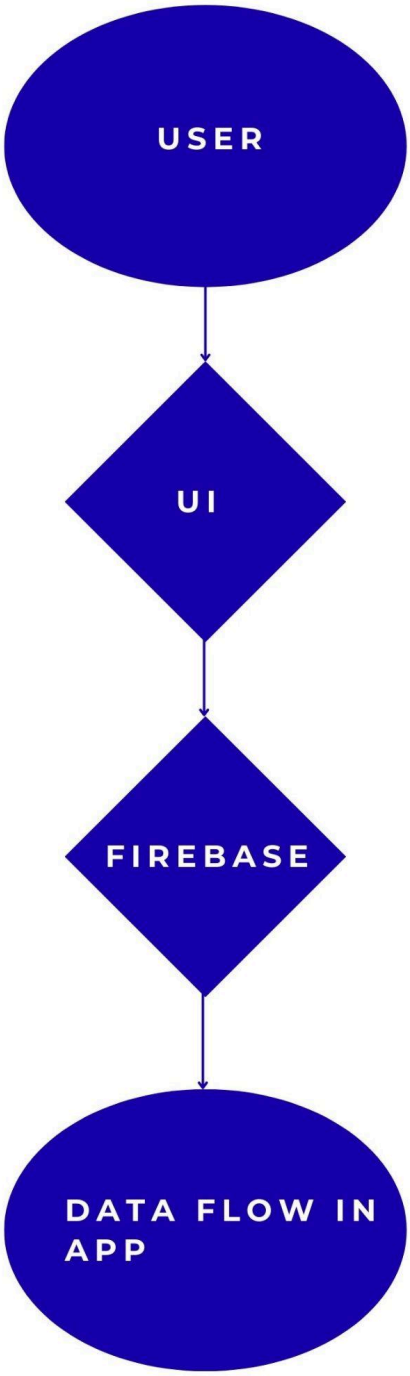
● **Front-End (The Flutter App)**: This is what runs on the user's phone. Even this part is modular:

  ○ **UI Layer (The "Views")**: These are all the individual screens you've created
  (signup.dart, login.dart, author_dashboard.dart). Their only job is to look good and show information to the user.
  ○ **Service Layer** : This is our services folder, which contains auth.dart, database.dart, and storage.dart. This layer is the real workhorse. It handles all the logic, like how to log a user in, how to save a post, or how to upload an image. The UI Layer talks to this Service Layer to get things done.

● **Back-End (Firebase)**: This is our powerful, cloud-based engine.

○ **Firebase Authentication**: Acts as our app's security guard, managing all user signups and logins.
○ **Firestore Database**: This is our organized filing cabinet for all the text-based data,like user profiles, roles, and post details.
○ **Firebase Storage**: This is our bulk storage warehouse, specifically for large files like user-uploaded images.

System Architecture Diagram:



2. Technology Stack

● **Front-End Framework**: Flutter (with Dart)

● **Back-End Platform**: Google Firebase

■ **Firestore Database**: I chose Firestore because it's a real-time database. This is
the magic that allows the "My Content" page to update instantly after an author
publishes a new post, creating a very dynamic user experience.

■ **Firebase Authentication**: This was a huge time-saver. It provides a secure,
ready-made solution for handling user accounts, including email/password and
Google Sign-In. Building this from scratch would have taken weeks.

■ **Firebase Storage**: When it comes to storing user-uploaded files like images,
Firebase Storage is the perfect tool. It's built to handle large files and integrates
directly with our Firestore database and security rules.

3. **Scalability Planning**

● **How We Handle More Users**: Our choice of Firebase is the core of our scalability plan. Firebase is a Google product and is designed to scale automatically. As more users sign up and create content, Firebase seamlessly allocates more resources behind the scenes. We don't have to worry about buying new servers or managing database capacity; it's all handled for us.

● **Addressing Potential Bottlenecks:**

1. Slow Database Queries:

■ **Problem**: As our app grows to have thousands of books and posts, searching for specific content could become slow.

■ **Solution**: We have already implemented the primary solution: Firestore Indexing. By creating indexes on our data (for example, on the createdAt field),

we give Firestore a "cheat sheet" to find the information it needs almost instantly,
even in a huge database.

2. Slow App Performance on Bad Internet:

■ **Problem**: Users with slow or unreliable internet connections might have a bad
experience waiting for content to load.

■ **Solution**: Firestore has a fantastic built-in feature for offline persistence. It automatically saves a copy of recently viewed data on the user's device. This means that pages like "My Content" can load instantly from the local cache, even
if the user has a poor connection.

3. Controlling Costs:

■ **Problem**: As our user base grows, so will the cost of using Firebase.

■ **Solution**: We are using Firebase's "Blaze" plan, which is pay-as-you-go, so our
costs are directly related to our success. We can implement budget alerts in the
Google Cloud Console to get notified if our spending is approaching a certain
limit. Furthermore, by designing our database queries efficiently (using indexes
and fetching only the data we need), we minimize the number of reads and writes, which directly reduces our monthly bills