CMSC436: Programming Handheld Systems

Introduction to Firebase

Today's Topics

Google's Firebase Platform

Adding services to your Android application

    User Authentication

    Realtime Database

Firebase

Firebase is a mobile and web app. dev. platform

Includes wide range of components for data storage, machine learning, security management, performance monitoring, etc.

Similar to AWS for web applications

See: https://firebase.google.com

Today's Focus

Adding Firebase to an Android App

Firebase Email Authentication Service

Firebase Realtime Database

Adding Firebase to an Android App

Two choices:

Manually add firebase through the firebase console (https://console.firebase.google.com/)

Directly from inside Android Studio (select Tools -> Firebase from the menu). This option requires you to select a service to add to your app

Process generates a google-services.json file that goes into your project directory

See: https://firebase.google.com/docs/
android/setup#kotlin+ktx

Firebase Email/Password Authentication Service

Allows users to sign up with email and password

Stores users' login information separate from database

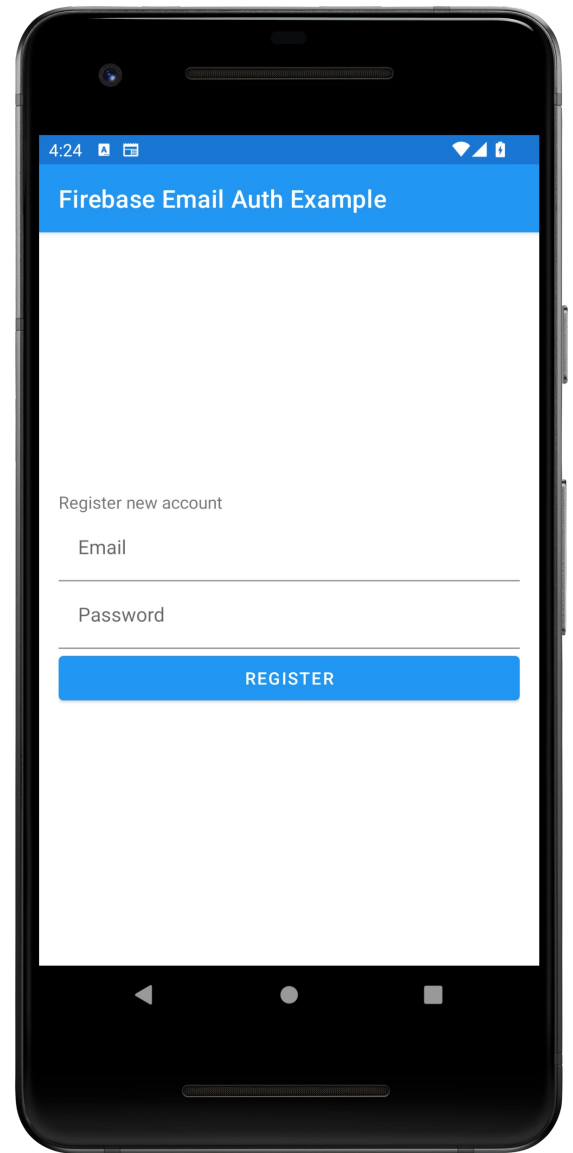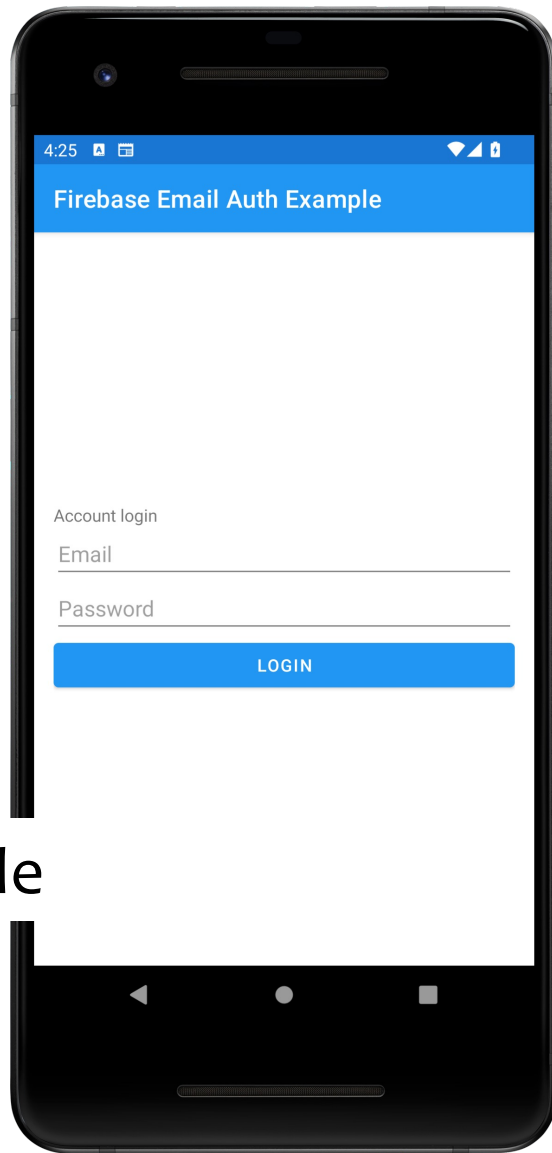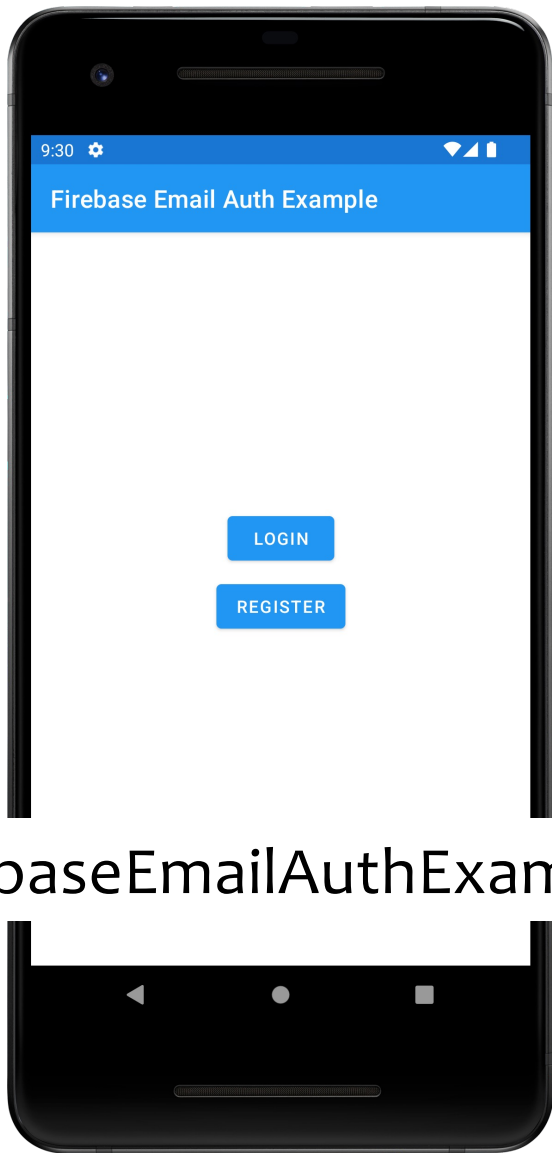Activities gain access to currently logged-in user via API

Combined with security rules can restrict data access to the logged in user (Note: this requires the data be structured in a particular pattern – more on this later)

Firebase Email/Password Authentication Service

Can view all application users from the firebase console

See:

https://firebase.google.com/docs/reference/android/com/google/firebase/auth/FirebaseAuth.html

FirebaseEmailAuthExample

Firebase Realtime Database

Firebase offers two types of database services

  Realtime Database (Original)

  Cloud Firestore (Newer service)

For differences between these offerings, see

  https://firebase.google.com/docs/database/rtdb-vs-firestore?authuser=0

Firebase Realtime Database

This lecture focuses on the original Realtime Database

An efficient, low-latency solution for mobile apps that require synced states across clients in real-time

Firebase Realtime Database

Add dependency for Realtime Database to your app-level build.gradle file

> e.g., implementation 'com.google.firebase:firebase-database:20.0.4'

Configure Realtime Database Rules

See: https://firebase.google.com/docs/database/android/start?authuser=0

Example Rules with No Authorization

```
{
  "rules": {
    ".read": true,
    ".write": true
  }
}
```

Example Rules with Authorization

```
{
  "rules": {
    ".read": "auth != null",
    ".write": "auth != null"
  }
}
```

Firebase Realtime Database

Realtime Database has a REST API

You can use a Firebase Database URL as a REST endpoint by appending .json to the end of the URL and sending a request from an HTTPS client

See: https://firebase.google.com/docs/reference/rest/database

Firebase Realtime Database

Data is structured and a JSON tree

When you add data to the JSON tree, it becomes a node in the existing JSON structure with an associated key

Data Structure Best Practices

Avoid nesting data

- Iterating through the data becomes problematic
- Data requests can end up returning the entire tree

Data Structure Best Practices

Flatten the data structure

Denormalize data

  Split data into separate paths

  I.e., add precomputed redundant data to improve performance of database reads

Can efficiently download data in separate calls as needed

Reading and Writing Data

Data written to FirebaseDatabase reference

Retrieved by attaching an asynchronous listener to the reference

Listener triggered once for the initial state of the data and again anytime the data changes

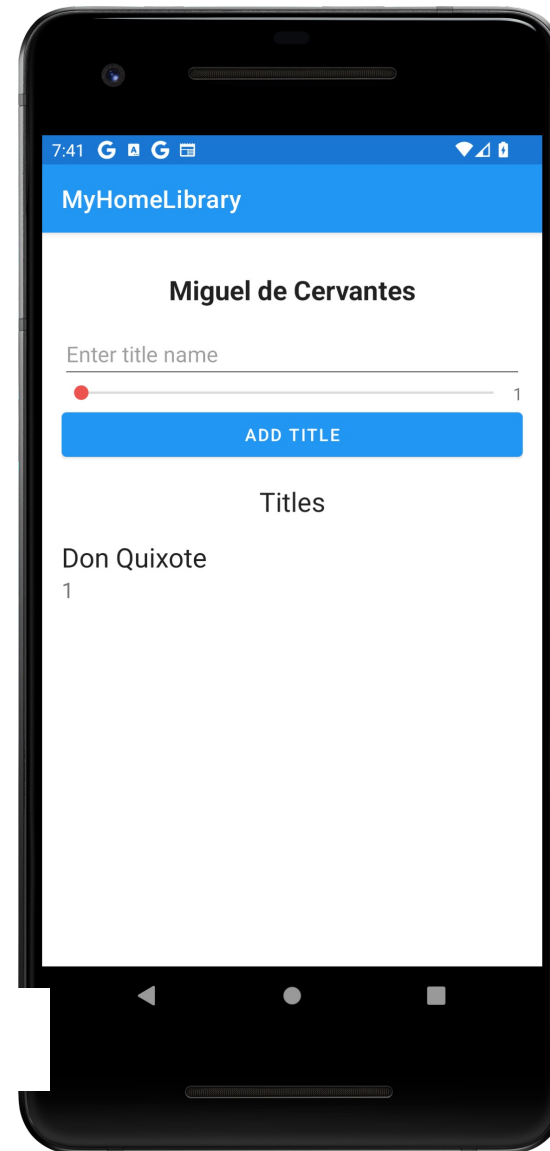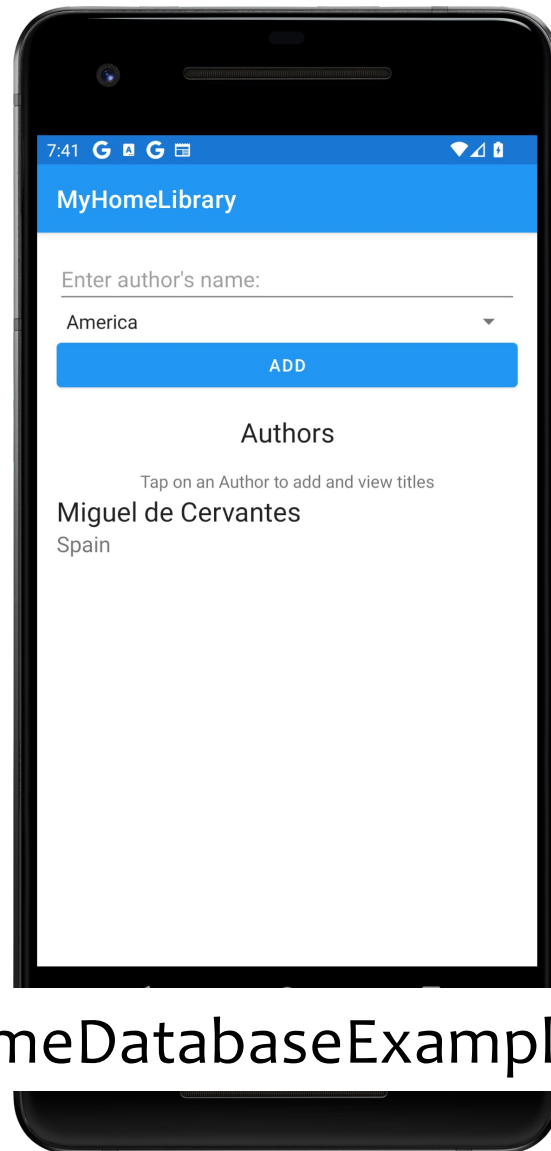See: https://firebase.google.com/docs/database/android/read-and-write?authuser=0

Firebase Realtime Database

Working with lists of Data

See: https://firebase.google.com/docs/
     database/android/lists-of-data?authuser=0

FirebaseRealtimeDatabaseExample

Called MyHomeLibrary on Firebase

Allows you to add the authors in your home library and corresponding titles

FirebaseRealtimeDatabaseExample

Firebase Realtime Database

API Reference:

See: https://firebase.google.com/docs/reference/android/
com/google/firebase/database/DatabaseReference.html

Example Apps

FirebaseRealtimeDatabaseExample

FirebaseEmailAuthExample