Ubiquitous and Mobile Computing
CS 528: Firebase Tech Talk

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What is Firebase?

- Started off as the Realtime Database
- A mobile SDK for connecting to a json NoSQL database which would update in real-time keeping apps in sync.
- In 2011, before Firebase, it was a startup called Envolve.
- In 2012, Firebase was created as a separate company that provided Backend-as-a-Service with real-time functionality.
What is Firebase?

- In 2014, Firebase Inc. was acquired by Google.
- Successful companies/apps/services use Firebase:
  
  The New York Times  
  Shazam  
  NPR One  
  trivago  
  Venmo  
  Duolingo
What is Firebase?

- Firebase now offers many different products such as:
  - Cloud Firestore
  - Cloud Function
  - ML Kit
  - Realtime Database
  - Crashlytics
  - Cloud Storage
We will discuss...

- Cloud Messaging
- Firestore Database
- Authentication
Firebase Cloud Messaging

- Firebase Cloud Messaging is the only way to do efficient push messaging on Smartphones.
- Register a service that will receive messages from Firebase server.
- Messages can contain data and notification payloads.
public void onMessageReceived(RemoteMessage remoteMessage) {
    // Check if message contains a data payload.
    if (remoteMessage.getData().size() > 0) {
        handleNow(remoteMessage.getData());
    }

    // Check if message contains a notification payload.
    if (remoteMessage.getNotification() != null) {
        Log.d(TAG, "Message Notification Body: " +
        remoteMessage.getNotification().getBody());
    }
}
Why Firestore Database

- How do you store data in your applications?
- How do you share data between devices?
Before Firestore Database

- Provisioning a relational database on your own server, or AWS requires hours of configuration
- You have to write server side code in a different language than your client app
- You have to define a REST API for the client server communication
- Forget about real time data exchange (web sockets 🤢 )
Firestore Database To The Rescue

- No server side code necessary
- Convenient client side library for language of your choice
- No json parsing required
- Real time update support built in
Firestore Database

FirebaseDatabase database = FirebaseDatabase.getInstance();

// write
database.child("posts").child("postId").setValue(post.id);

// read / listen
database.child("posts").addValueEventListener(new ValueEventListener() {
    @Override
    public void onDataChange(DataSnapshot dataSnapshot) {
        // ...
    }

    @Override
    public void onCancelled(DatabaseError databaseError) {});


### Web Console

#### Collections
- **food**
- **posts**
- **ratings**
- **users**

#### Add collection**
**food**

#### Add document**

#### Add collection**
**foodItems**

#### Add field**
- **address**: "100 Institute Rd"
- **claimed**: false
- **consumer**: "users/MzB8GGlQ567hxEYVP6Vu"
- **description**: "An apple"

#### foodItems
- **location**: [0° N, 0° E]
- **pictureURL**: "picture-url"
- **producer**: "users/MzB8GGlQ567hxEYVP6Vu"

#### tags
Queries and Limitations

- Simple queries are supported with some caveats
- Equality and ranges, but only one attribute for chained range queries
- No JOIN queries

✅ citiesRef.whereEqualTo("state", "CO")
  .whereEqualTo("name", "Denver");

✅ citiesRef.whereEqualTo("state", "CA")
  .whereGreaterThan("population", 1000000);

❌ citiesRef.whereGreaterThanOrEqualTo("state", "CA")
  .whereGreaterThan("population", 1000000);
Firebase Authentication

- Managing user data securely is difficult
- Maintaining auth tokens is tedious
- People can't remember more passwords
Firebase Authentication

- Firebase works with multiple authentication providers, set up sign in with Facebook, Twitter, Google, Email/Password, or even Anonymous Auth
- Client libraries for implementing sign in UI
- Handles tokens securely syncs data between devices, password reset, and even SMS authentication
Firebase Authentication

FirebaseAuth auth = FirebaseAuth.getInstance();

auth.signInWithEmailAndPassword(email, password)
  .addOnCompleteListener(new OnCompleteListener() {
    @Override
    public void onComplete(Task task) {
      if (task.isSuccessful()) {
        FirebaseUser user = task.getResult().getUser();
        String email = user.getEmail();
        // ...
      }
    }
  });
## Firebase Authentication Console

Search by email address, phone number, or user UID

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<th>Identifier</th>
<th>Providers</th>
<th>Created</th>
<th>Signed In</th>
<th>User UID</th>
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Next Steps

- Getting started with Firebase Codelab
- Covers all the topics we discussed in more detail including a few extra topics
- Cloud Functions allow you to write server side code that responds to update triggers
- If you're interested in ML checkout the new Firebase ML Kit documentation
- Other products include Analytics, AdMob, Cloud Storage