Mobile Application Development

Produced by

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Android & Firebase Part 4

Firebase Integration

Google Services Overview

- Overview of Google Play Services and Setup
- Detailed look at
  - Google+ Sign-in and Authentication (Part 1)
  - Location & Geocoding (Part 2)
  - Google Maps (Part 3)

  - Firebase Integration (Part 4) (NEW)

Google Services Overview

- Detailed look at
  - Firebase Integration (Part 4) (NEW)

Agenda

- Firebase history
- The all new Firebase
- Real-time database
- Authentication
- Storage
- Remote config
- Hosting
- Crash reporting
- Test lab
- Firebase cloud messaging
- Dynamic links
- App indexing
- Analytics
- CoffeeMate Highlights & Demos along the way…

History of firebase

- Originally firebase was an online chat message integration service.
- Later the real time architecture was separated to create firebase database in 2012.
- Firebase surfaced as a popular choice when Parse.com went down.
- Google acquired firebase in 2014 and added a whole lot of features in *Google IO-2016*.
- Firebase is now a complete BaaS solution.

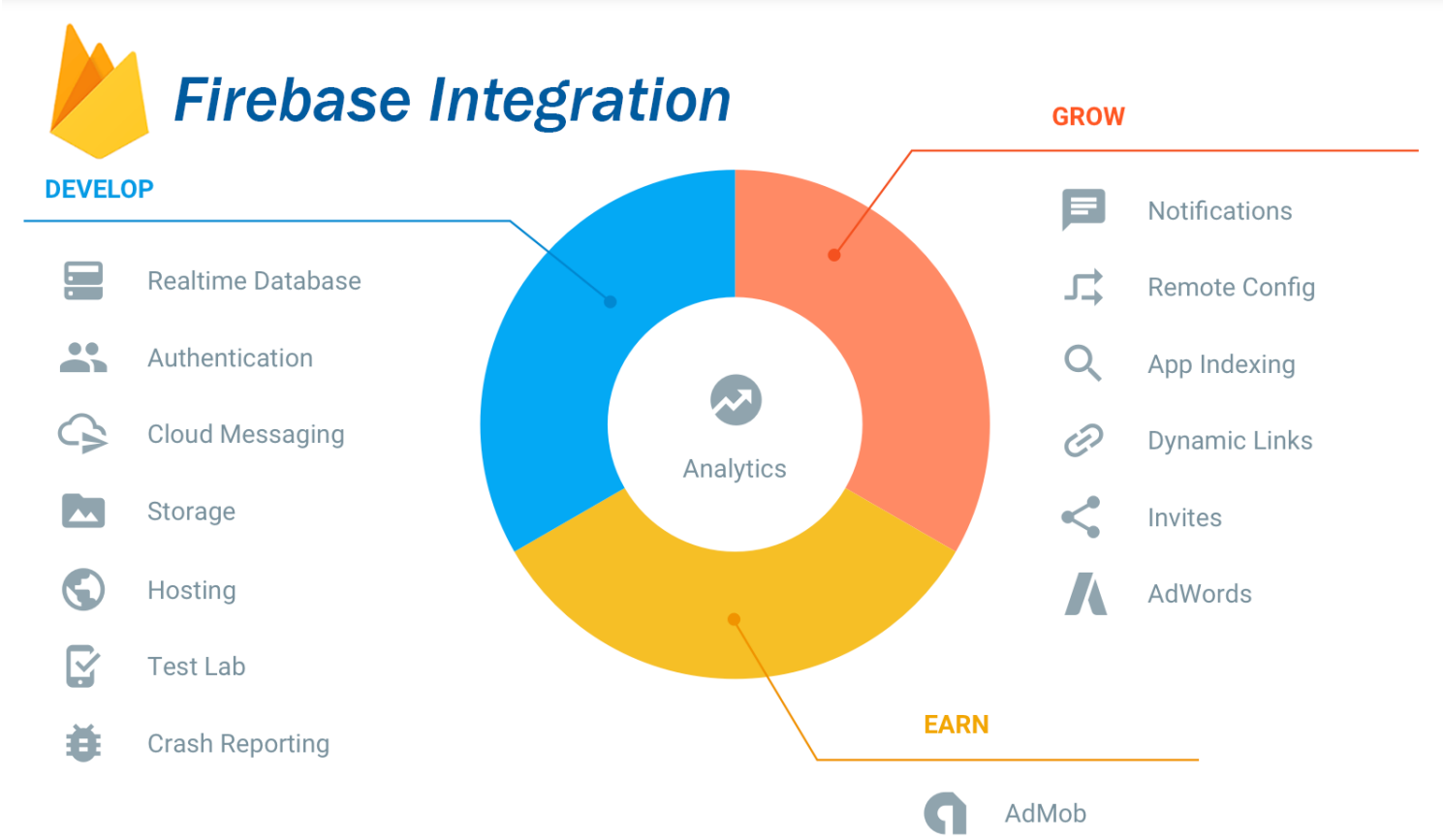
Introducing Firebase

What Is It?

- Cloud database ?
- Another name for Google app engine?
- Cross platform solution ?
- Another name for GCM ?
- Analytics ?
- Virtual private server ?
- @^#%$&)!<*>^%($....

What It Is … *

- A complete BaaS solution that includes
  - Real time JSON database
  - Authentication
  - Cloud storage
  - Cloud messaging
  - Crash reporting and analytics
  - And much much more



Firebase Products

Develop & test your app

Realtime Database
Store and sync app data in milliseconds

Crash Reporting
Find and prioritize bugs; fix them faster

Authentication
Authenticate users simply and securely

Cloud Functions
Run mobile backend code without managing servers

Cloud Storage
Store and serve files at Google scale

Hosting
Deliver web app assets with speed and security

Test Lab for Android
Test your app on devices hosted by Google

Performance Monitoring
Gain insight into your app's performance

Grow & engage your audience

Google Analytics
Get free and unlimited app analytics

Cloud Messaging
Send targeted messages and notifications

Dynamic Links
Drive growth by using deep links with attribution

Remote Config
Modify your app without deploying a new version

Invites
Make it easy to share your app and content

App Indexing
Drive search traffic to your mobile app

AdMob
Maximize revenue with in-app ads

AdWords
Drive installs with targeted ad campaigns

Idea For An App

What people think…

Create an android app
what's the big deal??

Idea For An App *

In Reality

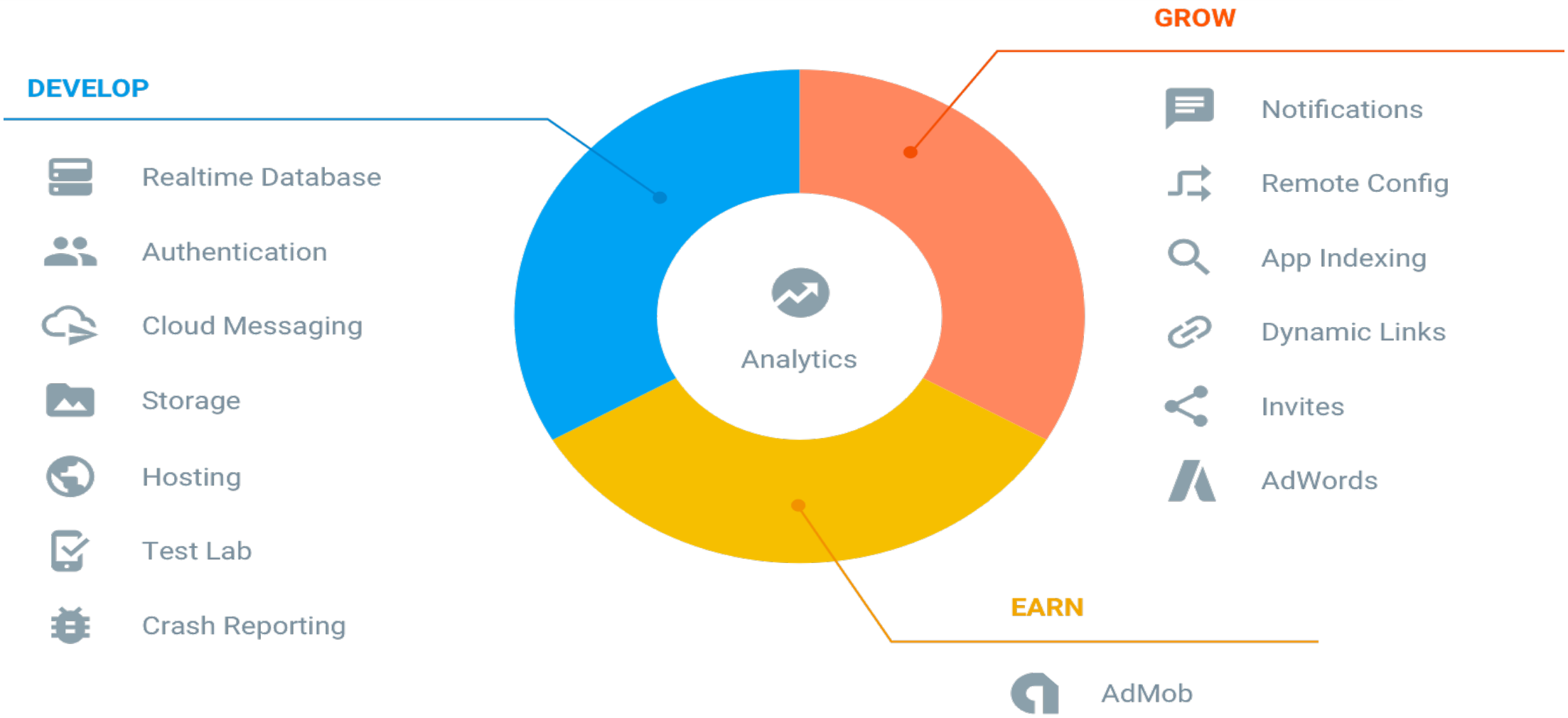
backend

In Reality

- That's a lot to learn
- A lot of code
- A lot of concerns
- A lot of resources
- A lot of maintenance
- And the most dangerous of all – a lot of unknowns

And What About… *

Enter The New Firebase



Database

Goodbye RDBMS…

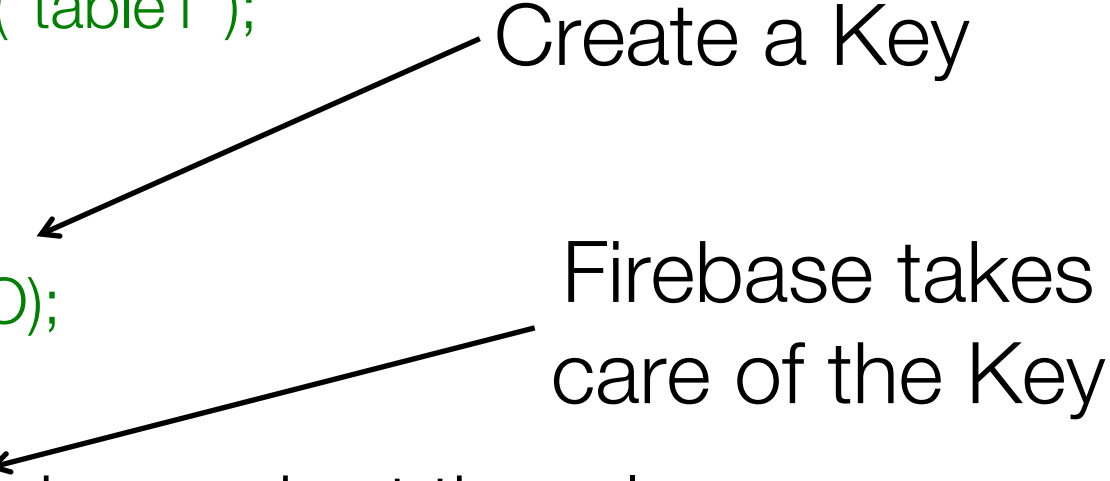
Real Time Database

- Unlike RDBMS, data is stored as JSON. It is no-SQL JSON database.
- What makes it real time it its ability to notify listeners of any change in data.
- Whenever any change is made in the JSON database structure, the firebase SDK notifies the app.
- So you can forget about REST API calls, connectivity checks, 3rd party libraries and polling.

The Core Magic Of Firebase *

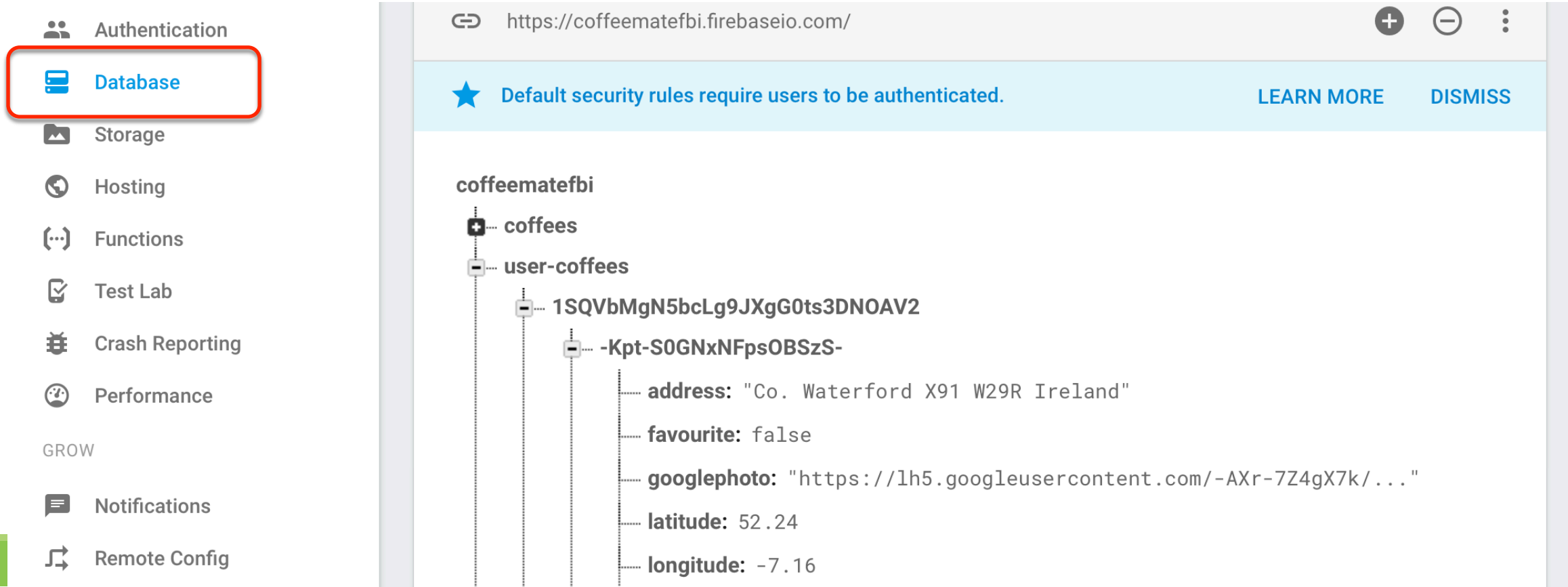
Saving Data In Firebase

- Get database reference (your base node)
  - DatabaseReference mDBRef = FirebaseDatabase.*getInstance*().getReference()
- Point it to the right JSON node
  - mDBRef = mDBRef.child("mydb").child("table1");
- Set the value at the pointed node
  - mDBRef.child('row1').setValue(myPOJO);
- Or push the value to create a unique key and set the value
  - mDBRef.push().setValue(myPOJO);



View Your Saved Data

- Log on to https://firebase.google.com.
- Go to console and select your project.
- Hit database and select data tab



Retrieving Data

- Data is retrieved via callbacks listeners.
- There are mainly 2 types of listeners
  - ValueEventListener – get entire child structure.
  - ChildEventListener – get only the child that got changed / added or deleted.
- Attach these listeners to Database reference we saw earlier.
- Both of these listeners are called once, so app can get the data and prepare UI

Attaching Data Listeners

- ValueEventListeners can be added in 2 ways:
  - addListenerForSingleValueEvent (valEvListener); //next slide
    - *Get the entire data snapshot only once*
  - addValueEventListener(valEvListener);
    - *Get entire data snapshot whenever there is a change in any of the child nodes*
- ChildEventListener can be added in only one way:
  - addChildEventListener(childEvListener)
    - *Get updates as child nodes*

Retrieving Data As POJO

```
public ChildEventListener childEvListener = new ChildEventListener() {

    public void onChildAdded(DataSnapshot dataSnapshot, String s) {
        MyPOJO m = dataSnapshot.getValue(MyPOJO.class);
    }

    public void onChildChanged(DataSnapshot dataSnapshot, String s) {}

    public void onChildRemoved(DataSnapshot dataSnapshot) {}

    public void onChildMoved(DataSnapshot dataSnapshot, String s) {}

    public void onCancelled(DatabaseError databaseError) {}
};
```

Retrieving Data As POJO

```
public ValueEventListener valEvListener = new ValueEventListener() {
    @Override
    public void onDataChange(DataSnapshot dataSnapshot) {
        MyPOJO m = dataSnapshot.getValue(MyPOJO.class);
    }

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

Filtering Data

- Set DatabaseReference to the right parent node.
  - Db = base.child('Institute').child('year');
- To get all students with major = 'Computing'.
  - Set orderByChild('major').
  - Set equalTo('Computing');
  - Add listeners

```
Db.orderByChild('major').equalTo('Computing')
.addChildEventListener(childEvListener);
```

Pagination

- Create a Query object or keep using DatabaseReference. Query is super class of DatabaseReference class.
- Set orderBy some child key (and filter if needed)
- Set limits (startAt, limit etc.)
- Attach data listeners
- And done. Appropriate callback will be called when operation is complete.

Pagination Code

```
// class level
final int limit = 50;
int start = 0;

// event level
Query userListQuery = userDBRef.orderByChild("email")
.limitToFirst(limit).startAt(start);
userListQuery.addValueEventListener(new ValueEventListener() {
    @Override
     public void onDataChange(DataSnapshot d) {
         // Do something
        start += (limit+1);
```

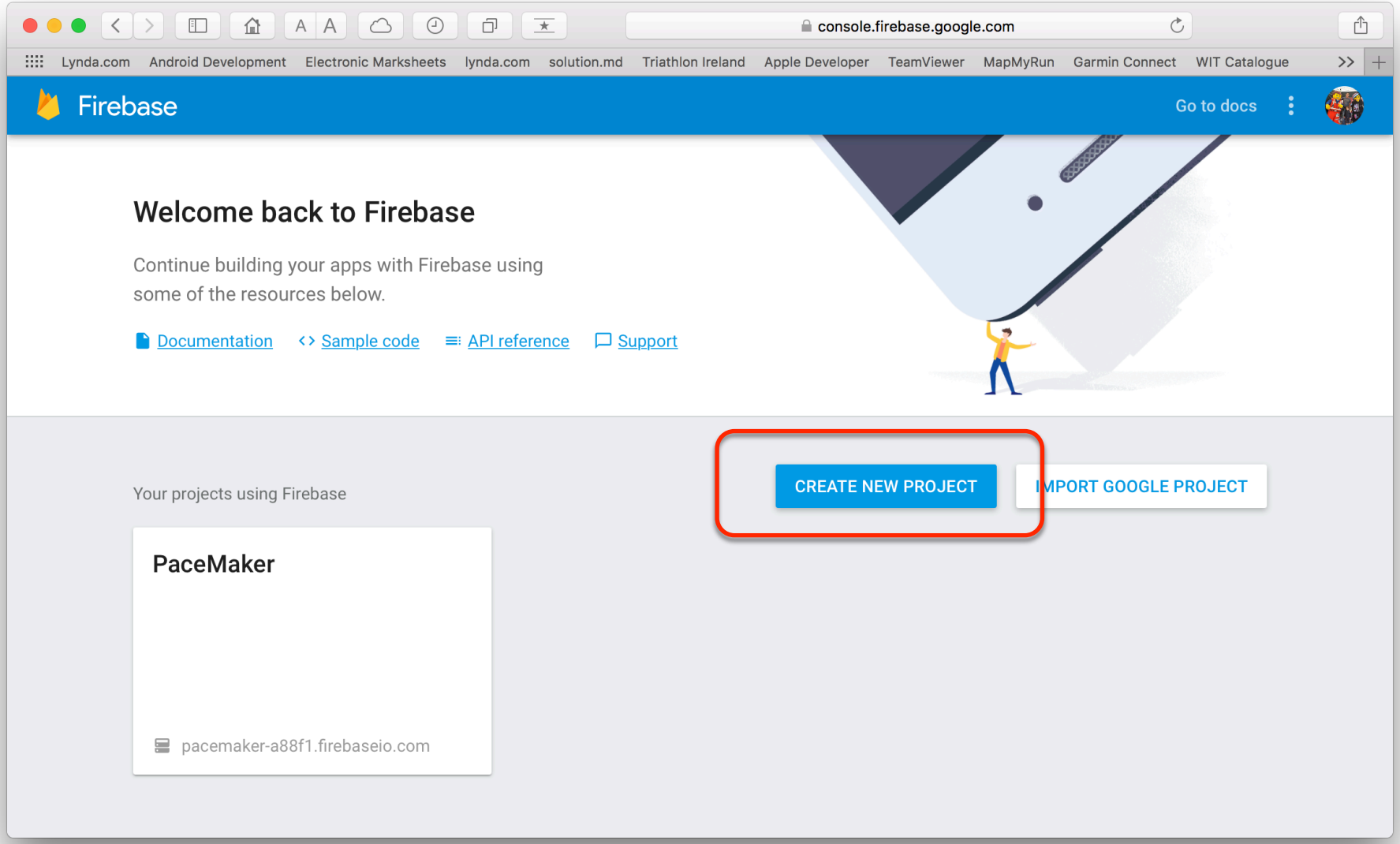
Firebase Realtime Database

Quick DEMO…

CoffeeMateFBI 1.0

Setup
&
Code
Highlights

1. Create a Firebase Project *



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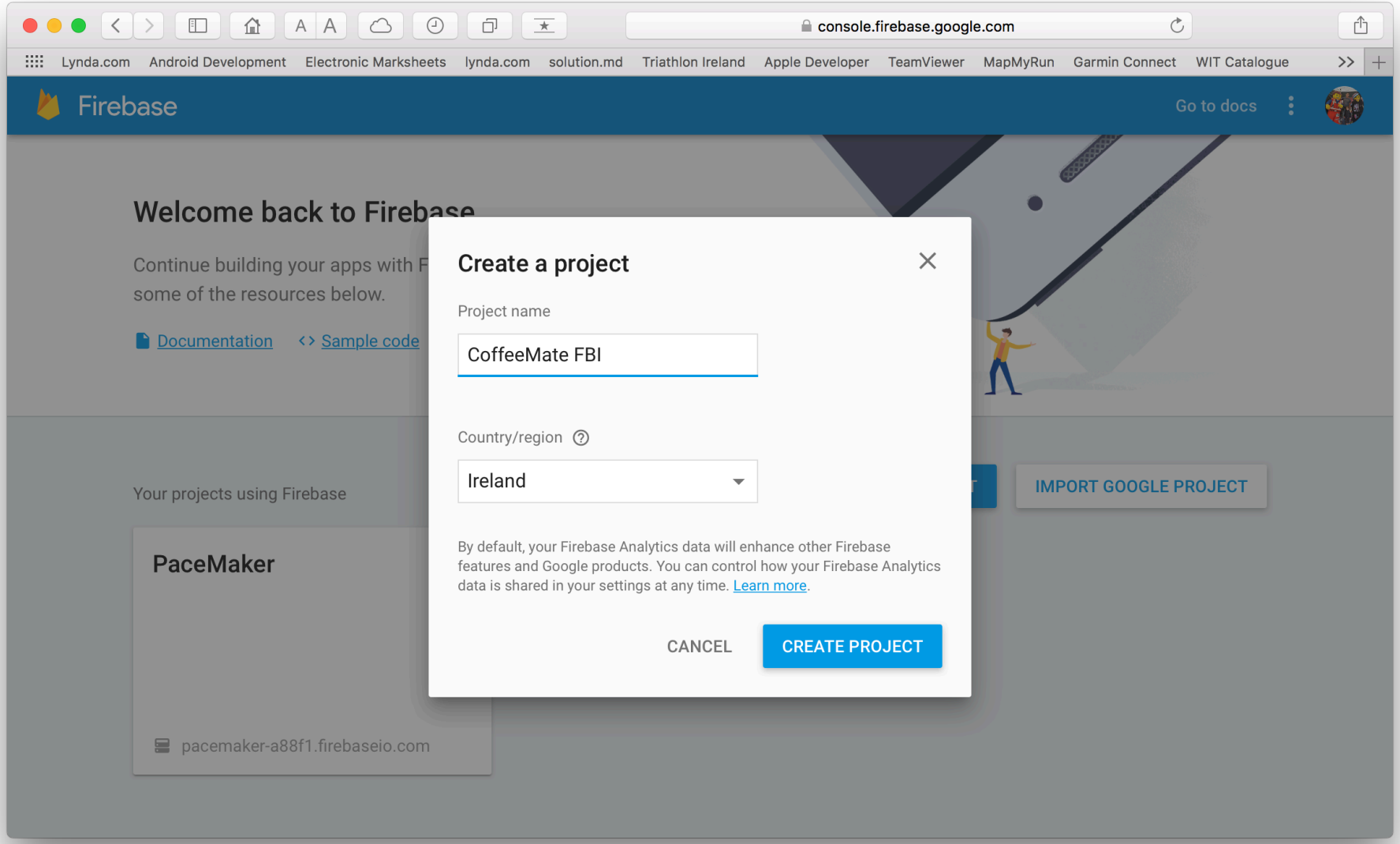

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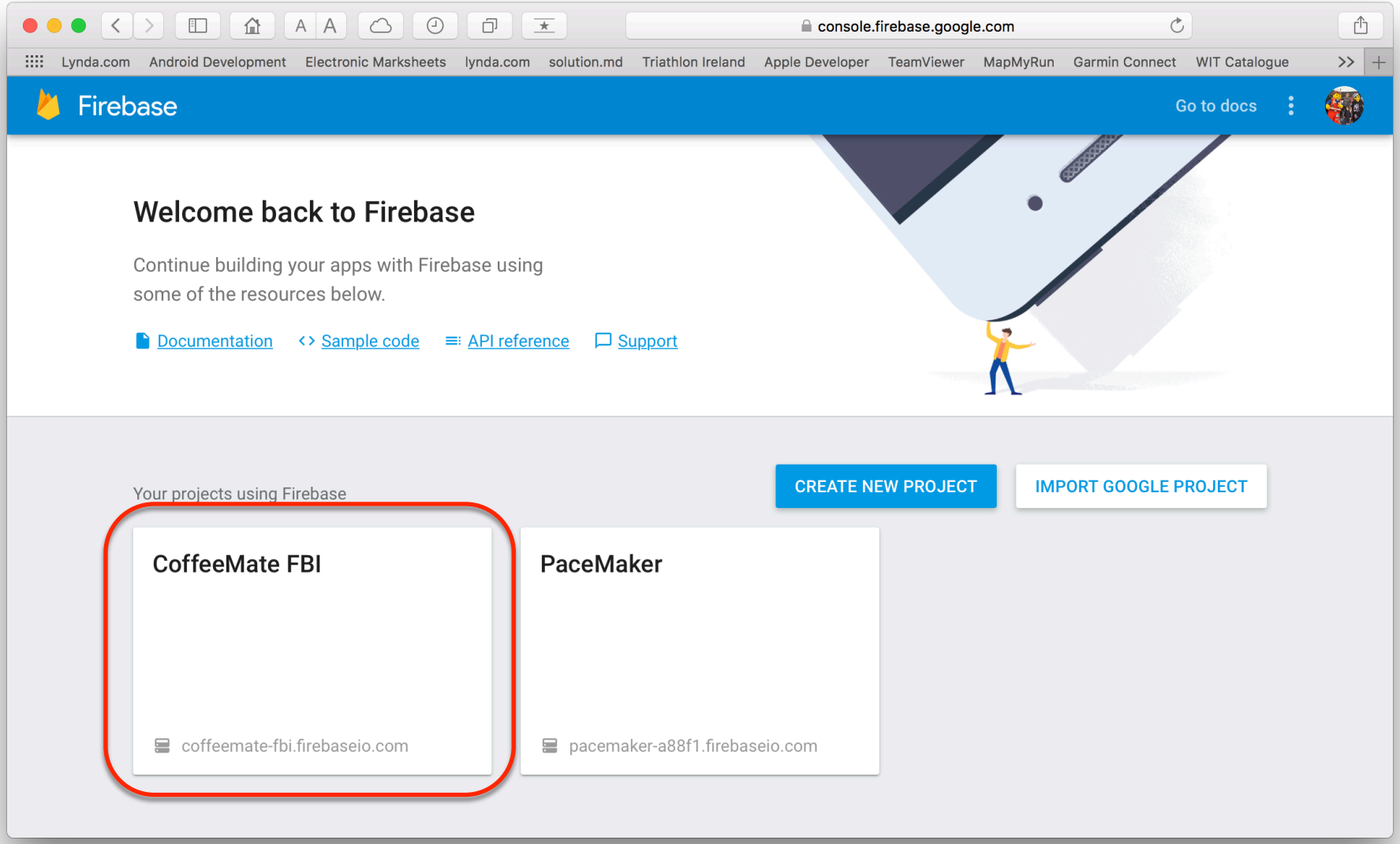
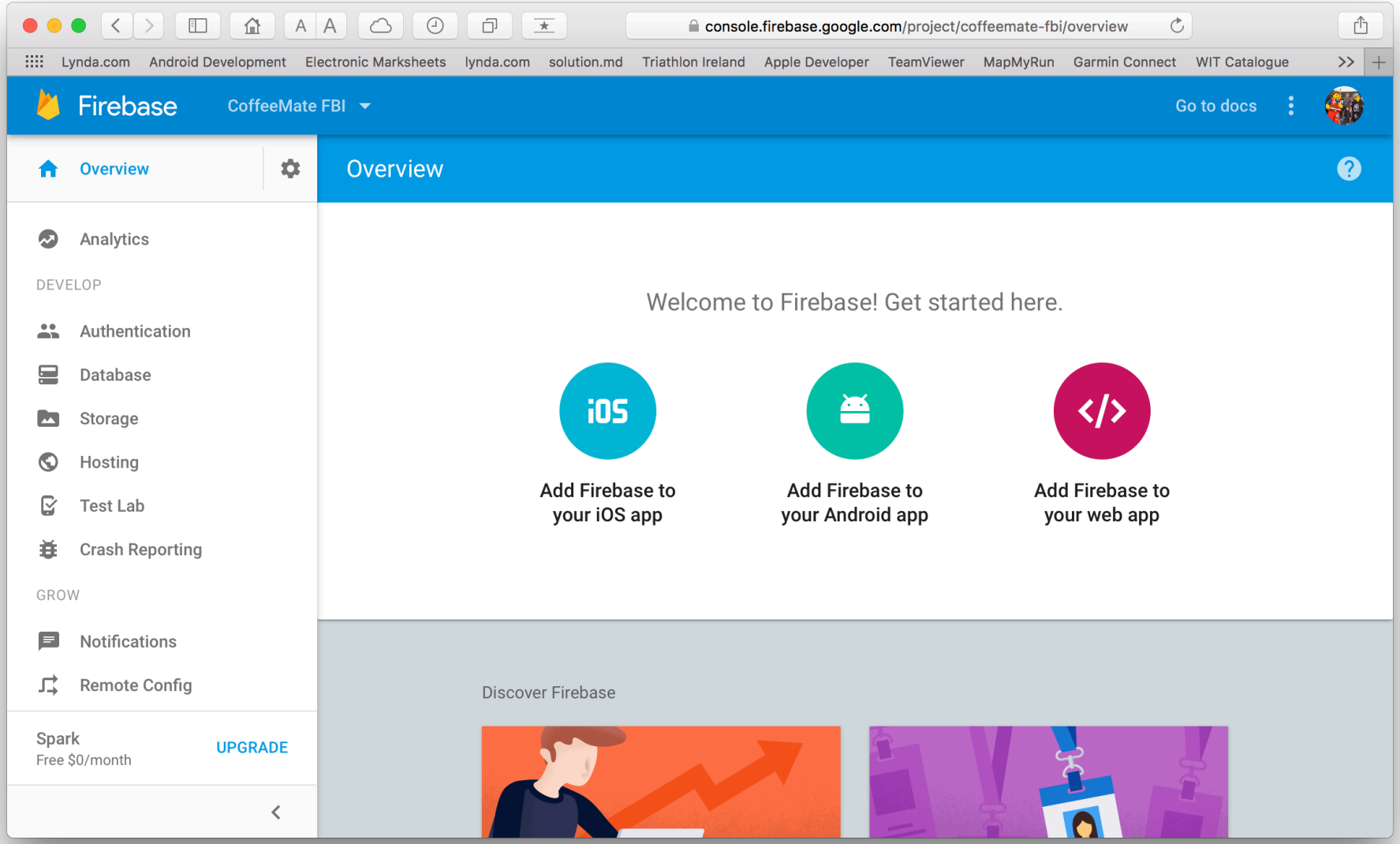


1. Create a Firebase Project - Overview



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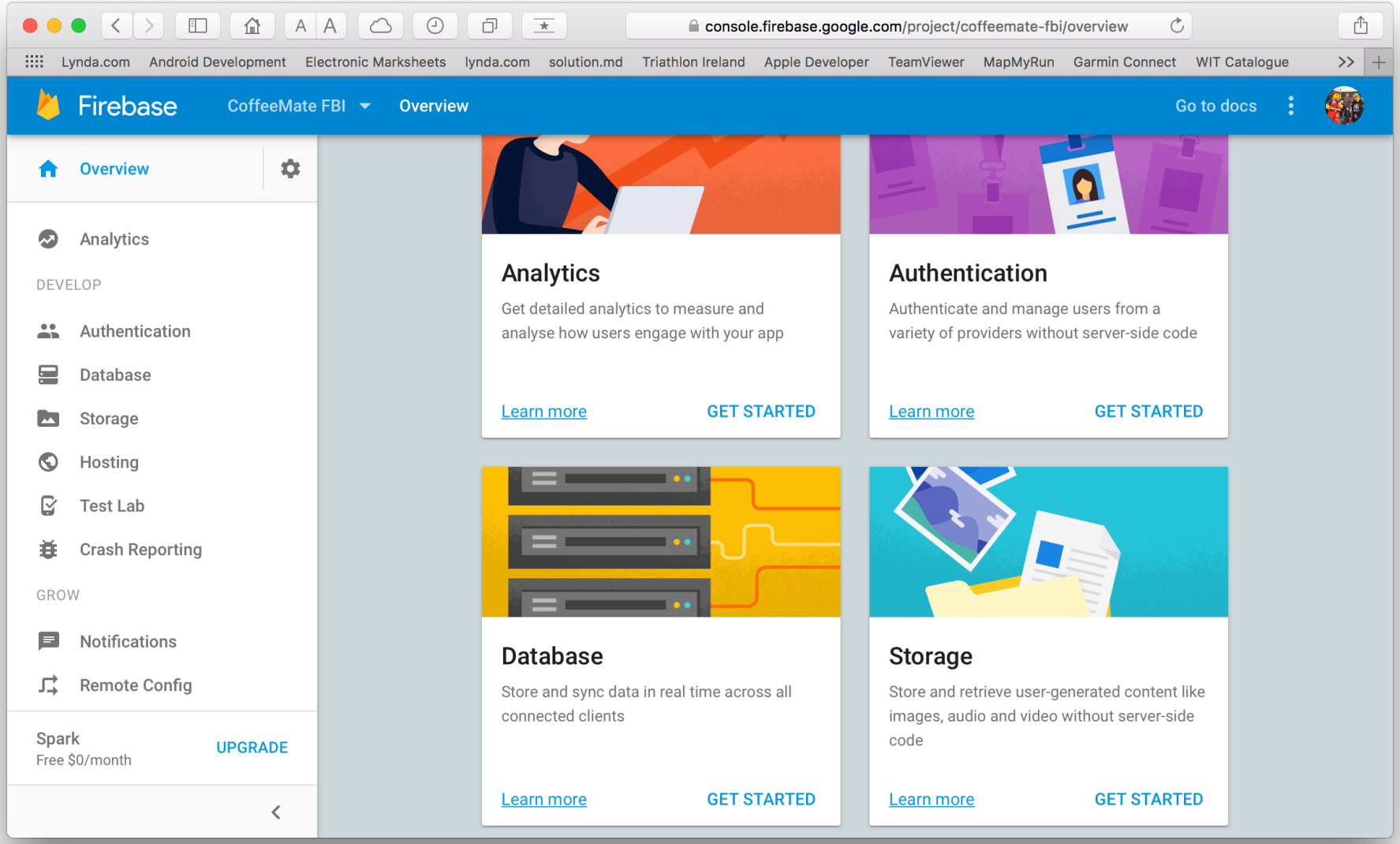
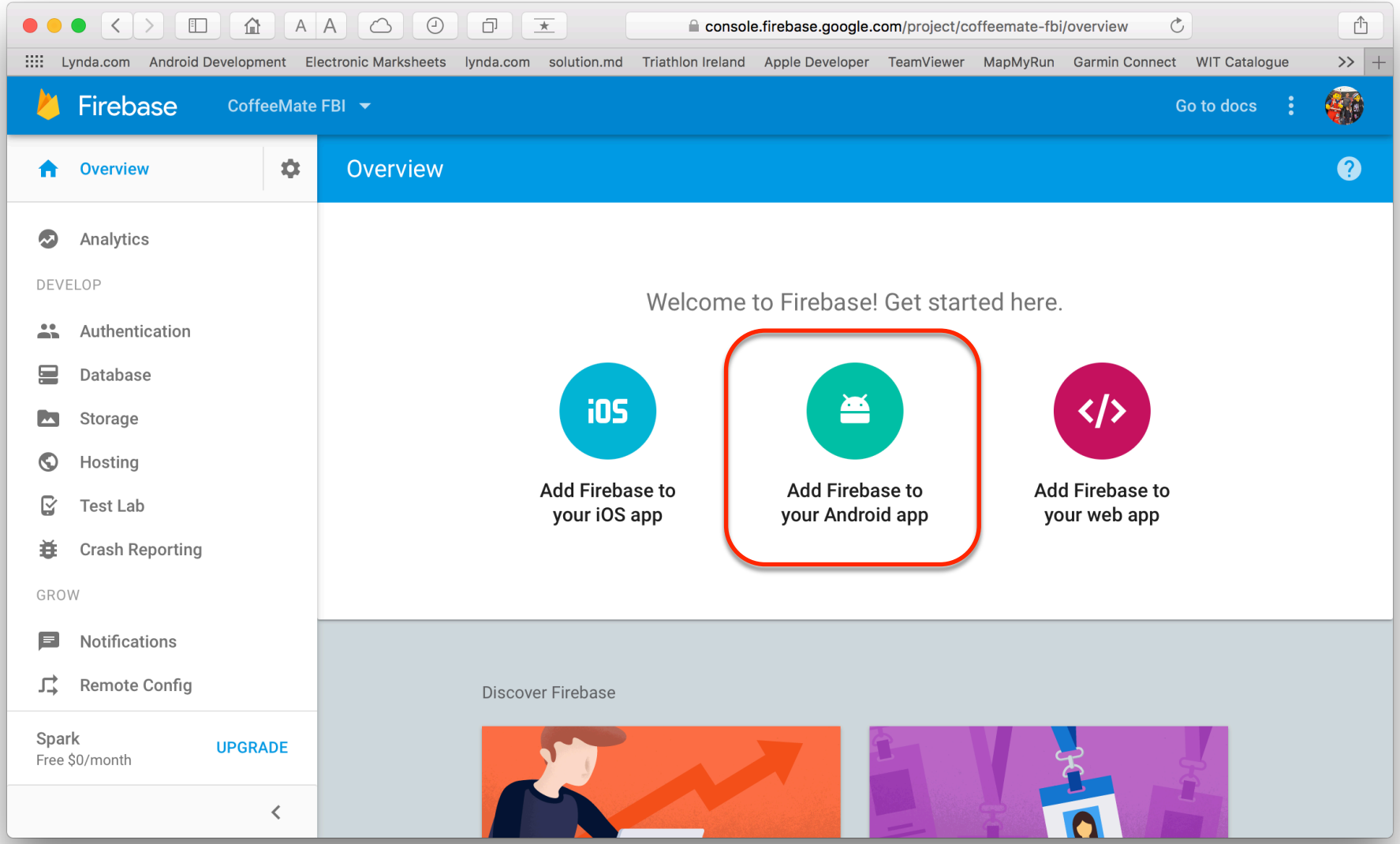
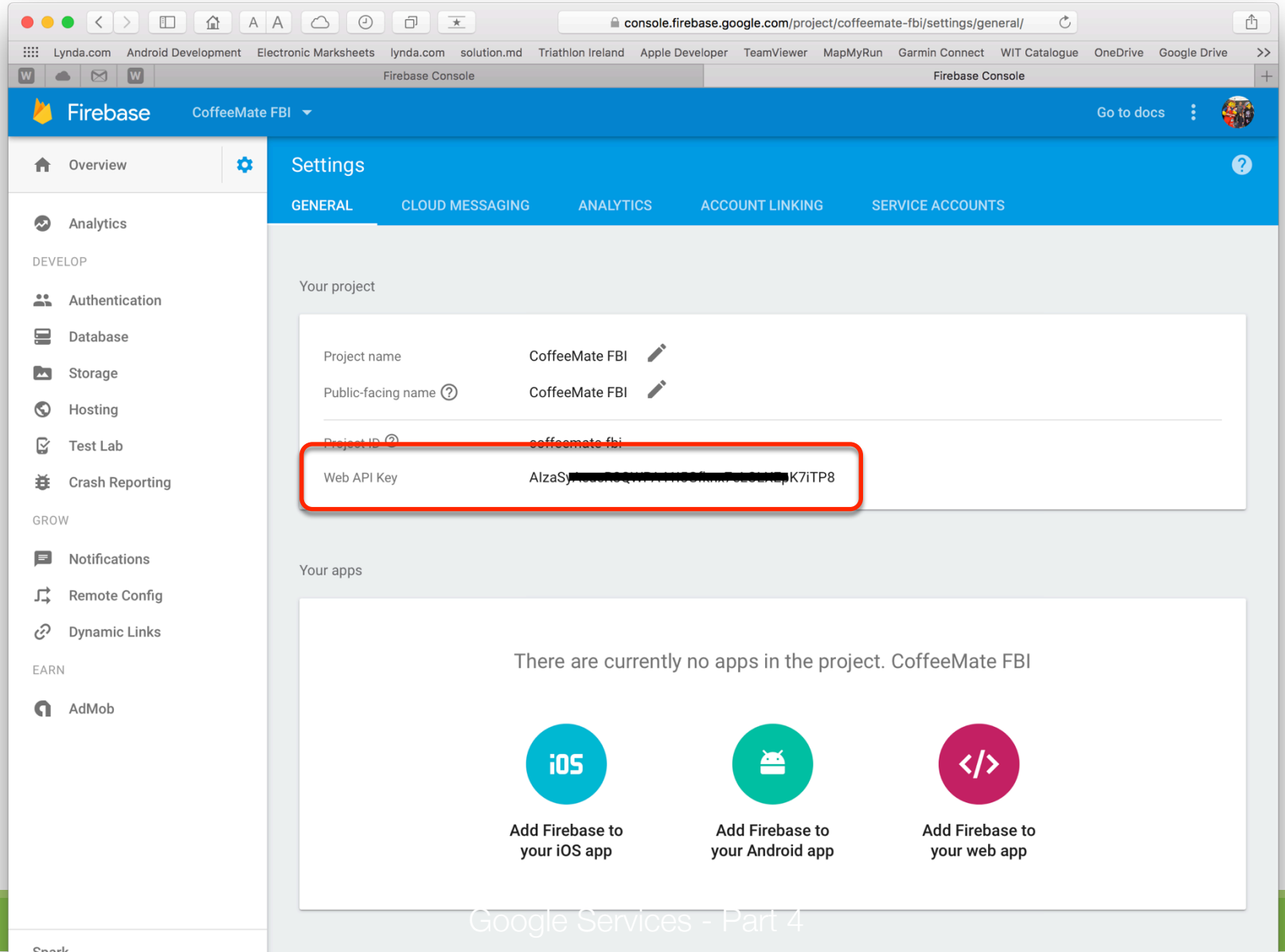


2. Add Firebase to your Android App *



2. Add Firebase to your Android App – Web Key *



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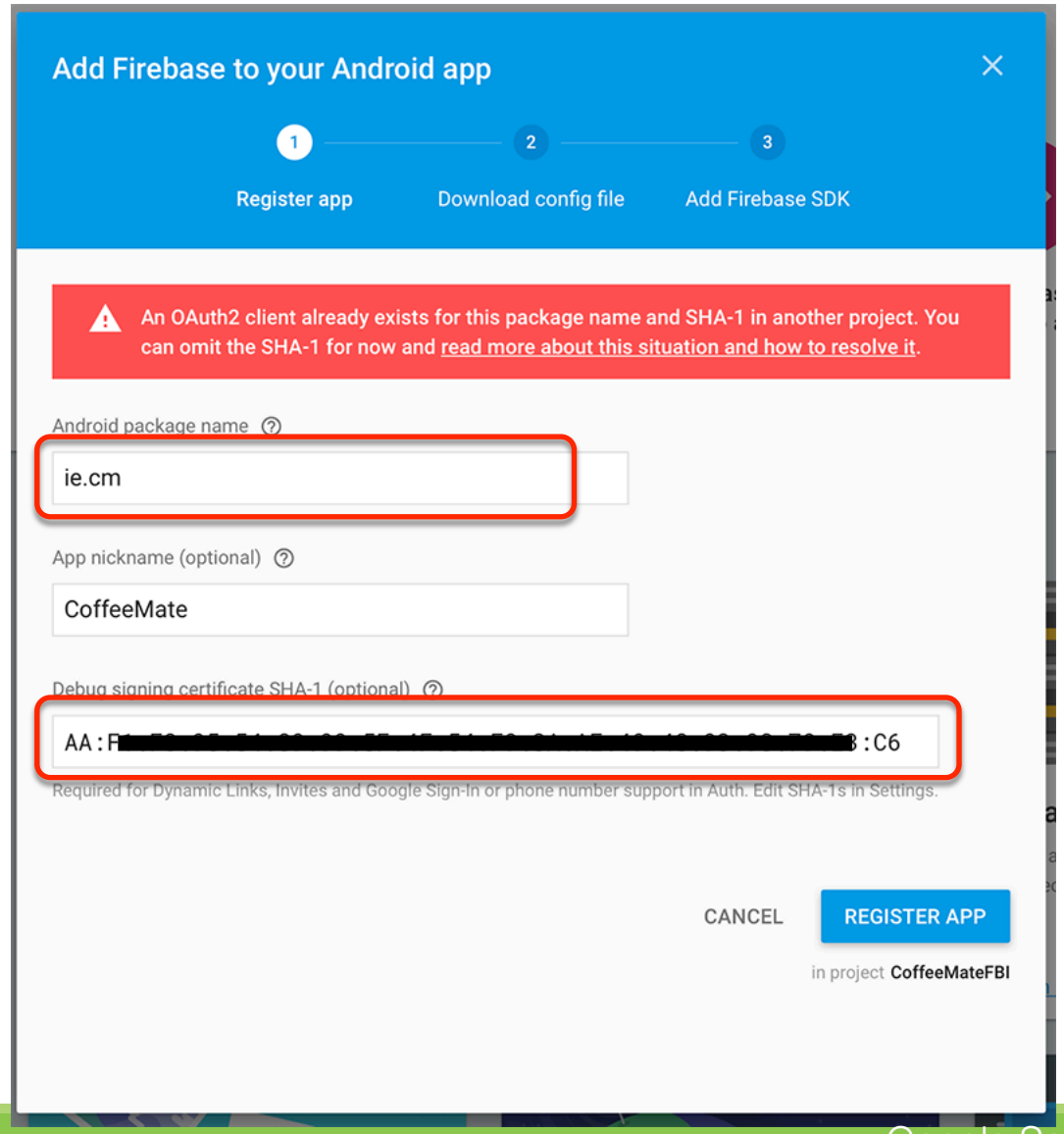
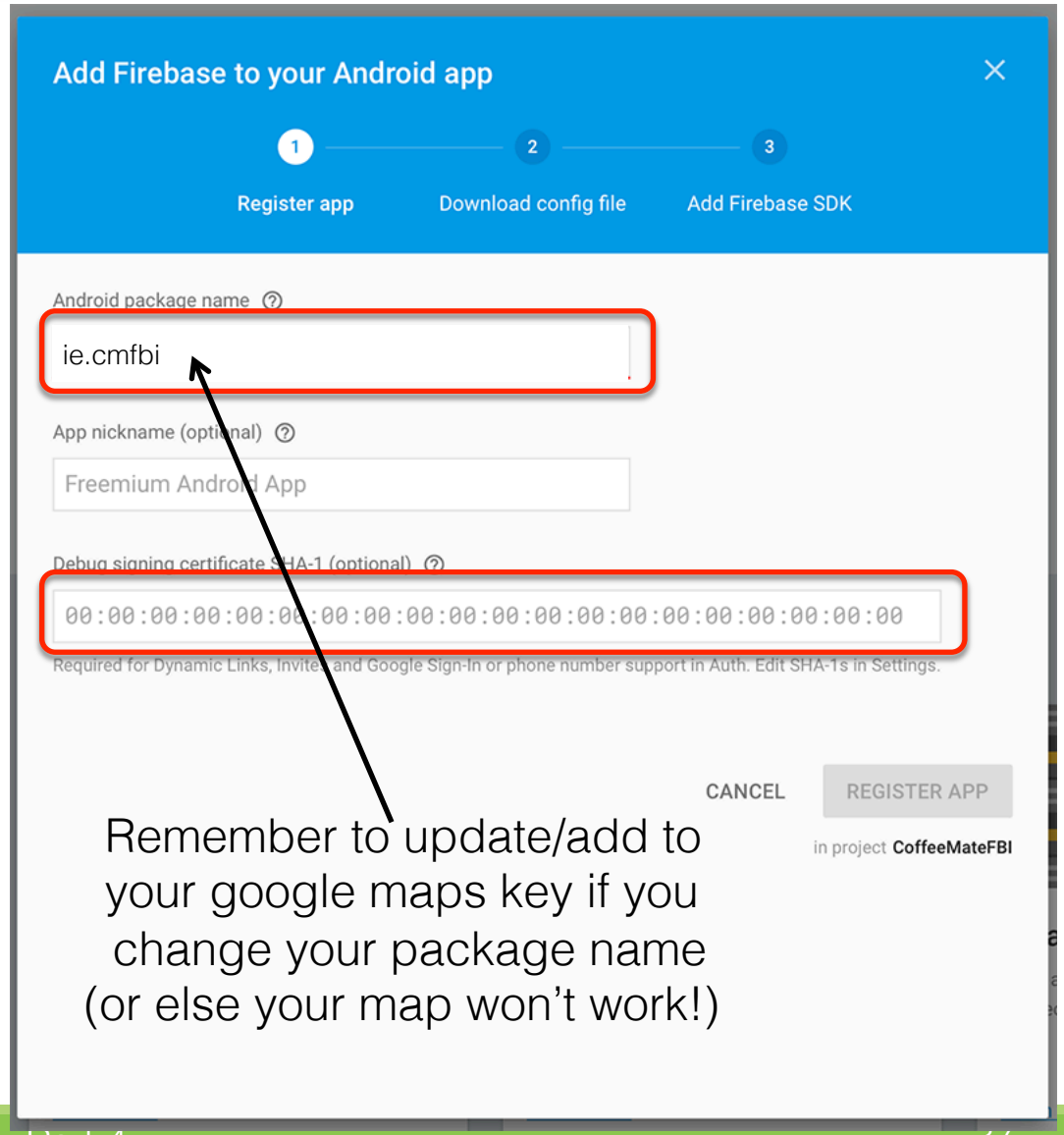
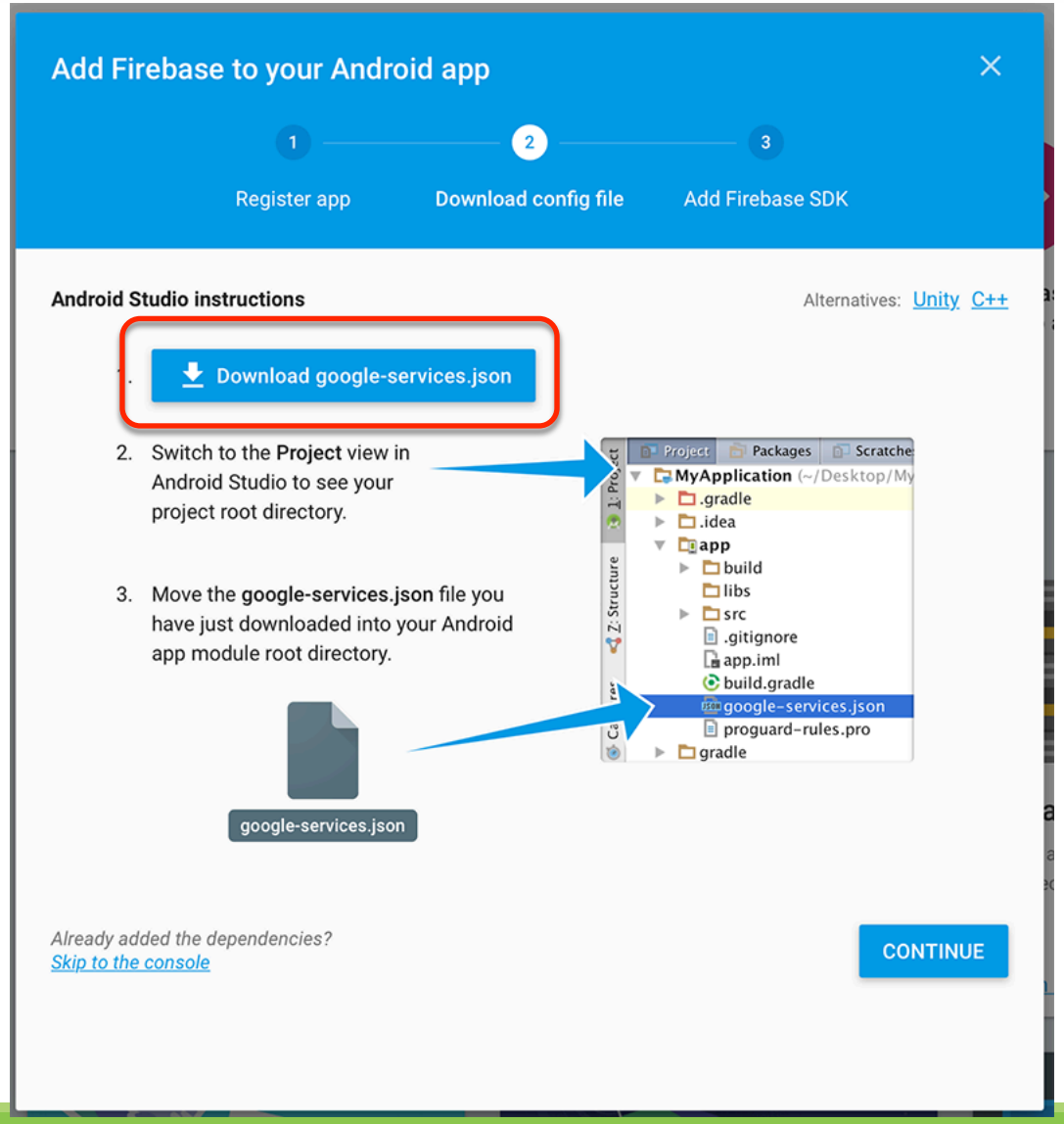




Remember to update/add to your google maps key if you change your package name (or else your map won't work!)

2. Add Firebase to your Android App *



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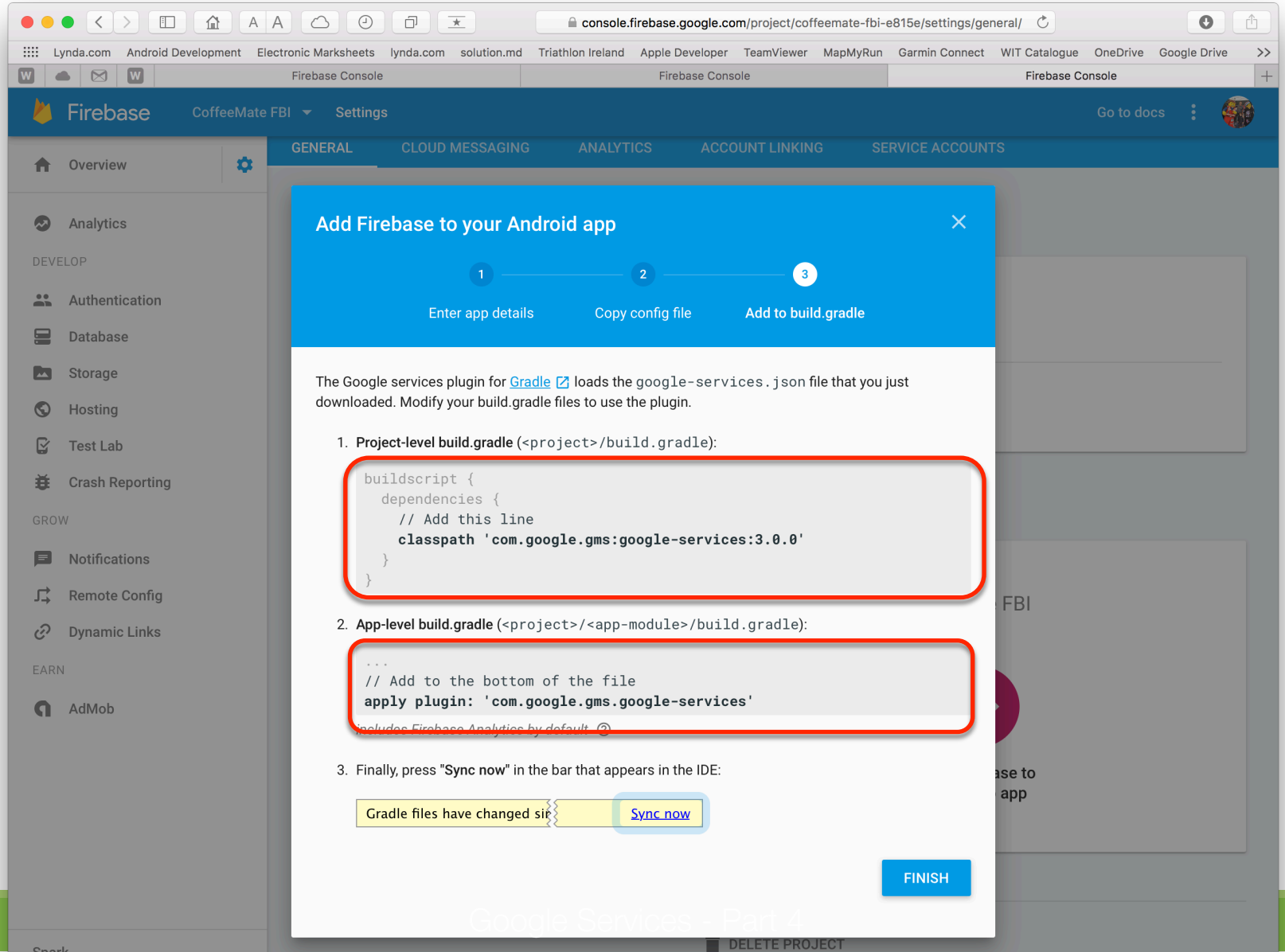


CoffeeMateFBI.1.0 Dependencies (July/2017) *

```
dependencies {
    compile fileTree(include: ['*.jar'], dir: 'libs')
    compile project(':volley')
    compile 'com.android.support:appcompat-v7:25.4.0'
    compile 'com.android.support:support-v4:25.4.0'
    compile 'com.android.support:design:25.4.0'
    compile 'com.makeramen:roundedimageview:2.2.1'
    compile 'com.android.support.constraint:constraint-layout:1.0.2'
    compile 'com.google.code.gson:gson:2.7'
    compile 'com.google.android.gms:play-services-auth:11.0.2'
    compile 'com.google.android.gms:play-services-maps:11.0.2'
    compile 'com.google.android.gms:play-services-location:11.0.2'

    compile 'com.google.firebase:firebase-core:11.0.2'
    compile 'com.google.firebase:firebase-auth:11.0.2'
    compile 'com.google.firebase:firebase-database:11.0.2'
    compile 'com.firebaseui:firebase-ui-database:2.1.0'
    testCompile 'junit:junit:4.12'
}
```

FBDBManager – our Firebase Database utility class *

```
public class FBDBManager {

    private static final String TAG = "coffeemate";
    public DatabaseReference mFirebaseDatabase;
    public static String mFBUserId;
    public FBDBListener mFBDBListener;


    public void open() {
        //Set up local caching
        FirebaseDatabase.getInstance().setPersistenceEnabled(true);

        //Bind to remote Firebase Database
        mFirebaseDatabase = FirebaseDatabase.getInstance().getReference();
        Log.v(TAG, "Database Connected :" + mFirebaseDatabase);
    }
```

- Our Firebase db reference.
- Binding to our db instance.

FBDBManager – usage *

```
public class CoffeeMateApp extends Application
{
    private RequestQueue mRequestQueue;
    private static CoffeeMateApp mInstance;
    //...

    public FBDBManager mFBDBManager;

  //...
    @Override
    public void onCreate() {
        super.onCreate();
        Log.v("coffeemate", "CoffeeMate App Started");
        mInstance = this;
        mRequestQueue = Volley.newRequestQueue(getApplicationContext());
        Log.v("coffeemate", "Adding Firebase offline persistence...");
        mFBDBManager = new FBDBManager();
        mFBDBManager.open();
    }
```

- Our utility class reference (inside our Application object class).
- Creating & 'Opening' a connection to our Firebase db.

FBDBManager – our Firebase Database utility class *

- ‘Query’ing the ‘*mFBUserId*’ node of the ‘*user-coffees*’ node.

```
public Query getAllCoffees()
{
    Query query = mFirebaseDatabase.child("user-coffees").child(mFBUserId)
            .orderByChild("rating");

    return query;
}
```

- As above, but only where the ‘*favourite*’ field is ‘*true*’.

```
public Query getFavouriteCoffees()
{
    Query query = mFirebaseDatabase.child("user-coffees").child(mFBUserId)
            .orderByChild("favourite").equalTo(true);

    return query;
}
```

FBDBManager – usage (in CoffeeFragment) *

```
@Override
public void onResume() {
    super.onResume();

    query = app.mFBDBManager.getAllCoffees();

    if(favourites)
        query = app.mFBDBManager.getFavouriteCoffees();

    updateUI(query);
}
```

- Returning a ‘query’ of all coffees, (or favourite coffees) which we pass to our custom firebaseUI adapter via *updateUI()*

FBDBManager – our Firebase Database utility class *

- Adding an 'ValueEventListener' and triggering our callback

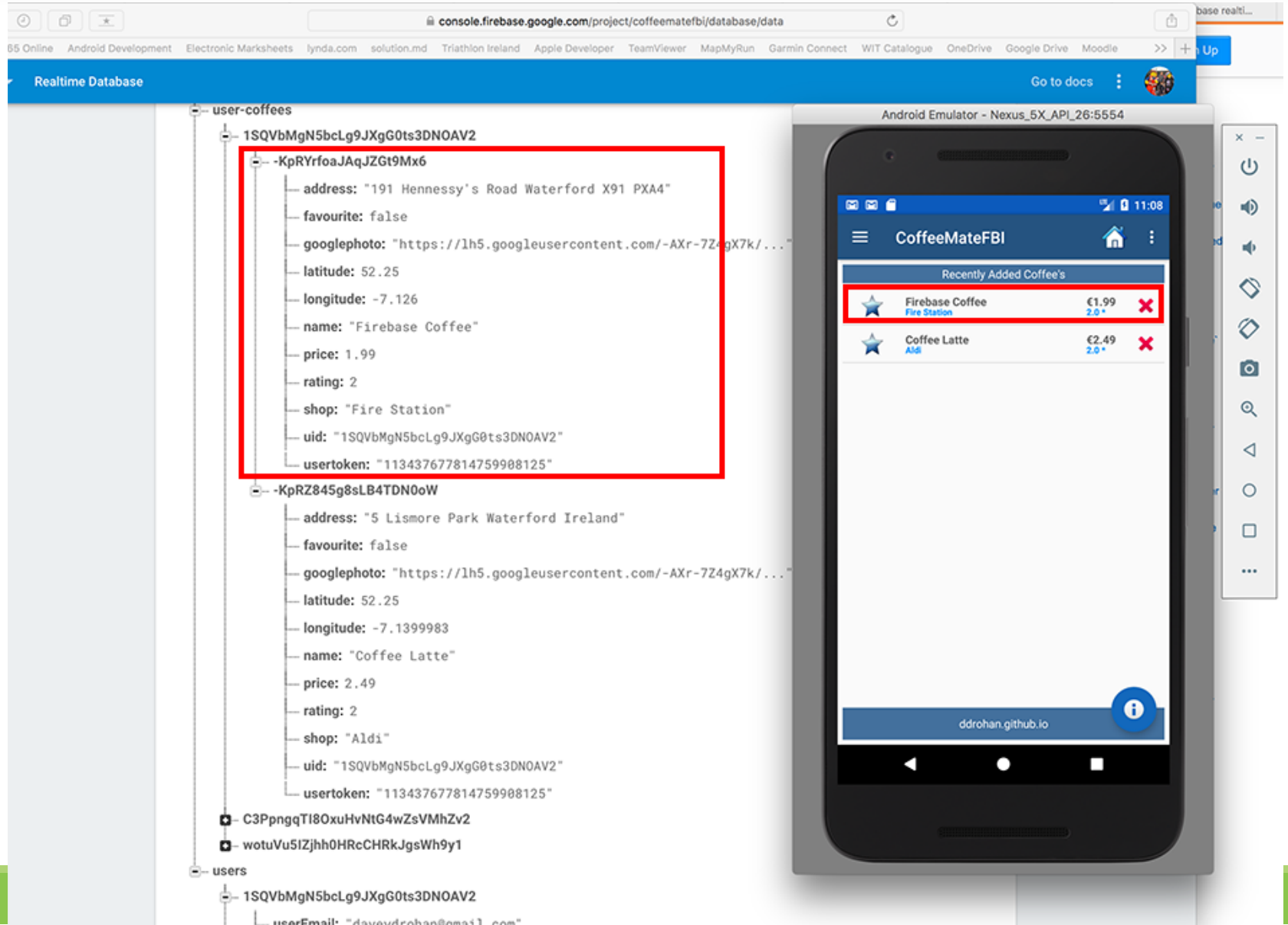
```
public void getACoffee(final String coffeeKey)
{
    mFirebaseDatabase.child("user-coffees").child(mFBUserId).child(coffeeKey)
            .addValueEventListener(
                new ValueEventListener() {
                @Override
                public void onDataChange(DataSnapshot dataSnapshot) {
                    Log.v(TAG,"The read Succeeded: " + dataSnapshot.toString());
                    mFBDBListener.onSuccess(dataSnapshot);
                }
                @Override
                public void onCancelled(DatabaseError firebaseError) {
                    Log.v(TAG,"The read failed: " + firebaseError.getMessage());
                    mFBDBListener.onFailure();
                }
            });
}
```

FBDBManager – usage (in EditFragment) *

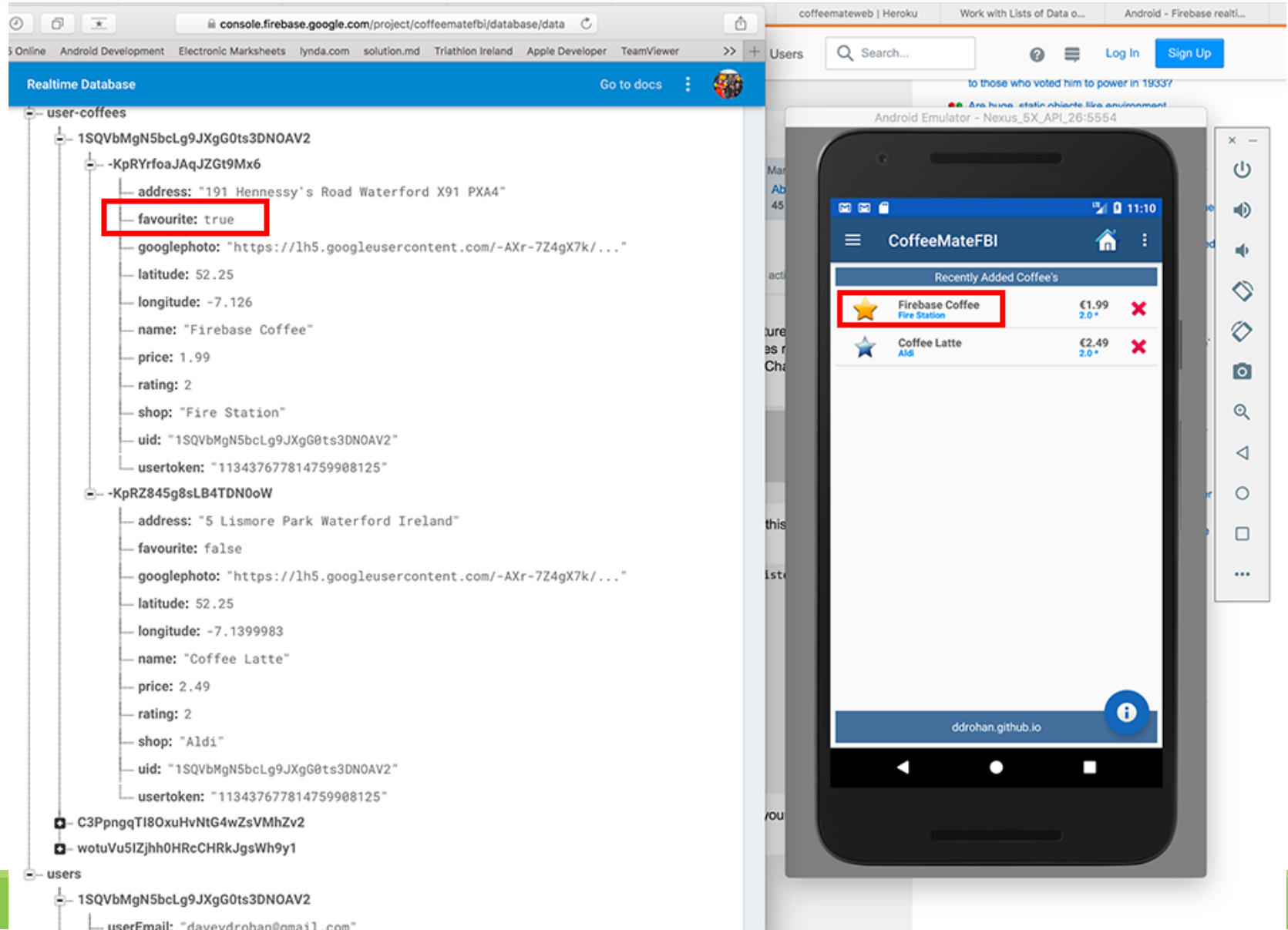
```
@Override
public void onResume() {
    super.onResume();

    app.mFBDBManager.attachListener(this);

    if(getArguments() != null) {
        coffeeKey = getArguments().getString("coffeeKey");
        app.mFBDBManager.getACoffee(coffeeKey);
    }
    titleBar = (TextView) getActivity()
            .findViewById(R.id.recentAddedBarTextView);
    titleBar.setText("Update a Coffee");
}
```

- Retrieving the '*coffeeKey*' from the bundle and calling '*getACoffee()*'- which in turn triggers the callback on the edit screen

Firebase Console (actual data)



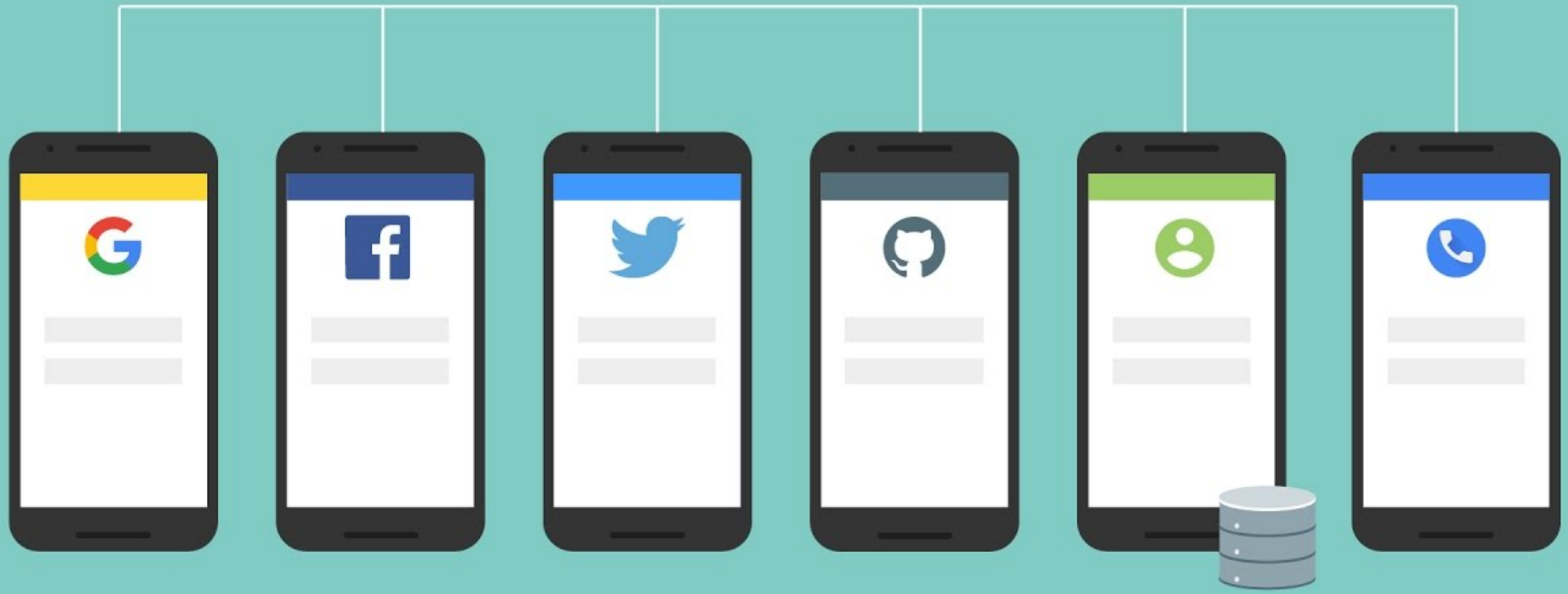
Firebase Console (actual data)



Pricing

https://firebase.google.com/pricing/

Products	Spark Plan Generous limits for hobbyists Free	Flame Plan Fixed pricing for growing apps $25/month	Blaze Plan Calculate pricing for apps at scale Pay as you go
Free Products Authentication (except Phone Auth), Analytics, App Indexing, Dynamic Links, Invites, Remote Config, Cloud Messaging (FCM), Performance Monitoring, and Crash Reporting.	✓ Included	✓ Included Free	✓ Included Free
Realtime Database			
Simultaneous connections	100	100K/instance	100K/instance
GB stored	1 GB	2.5 GB	$5/GB
GB downloaded	10 GB/month	20 GB/month	$1/GB
Automated backups	✗	✗	✓

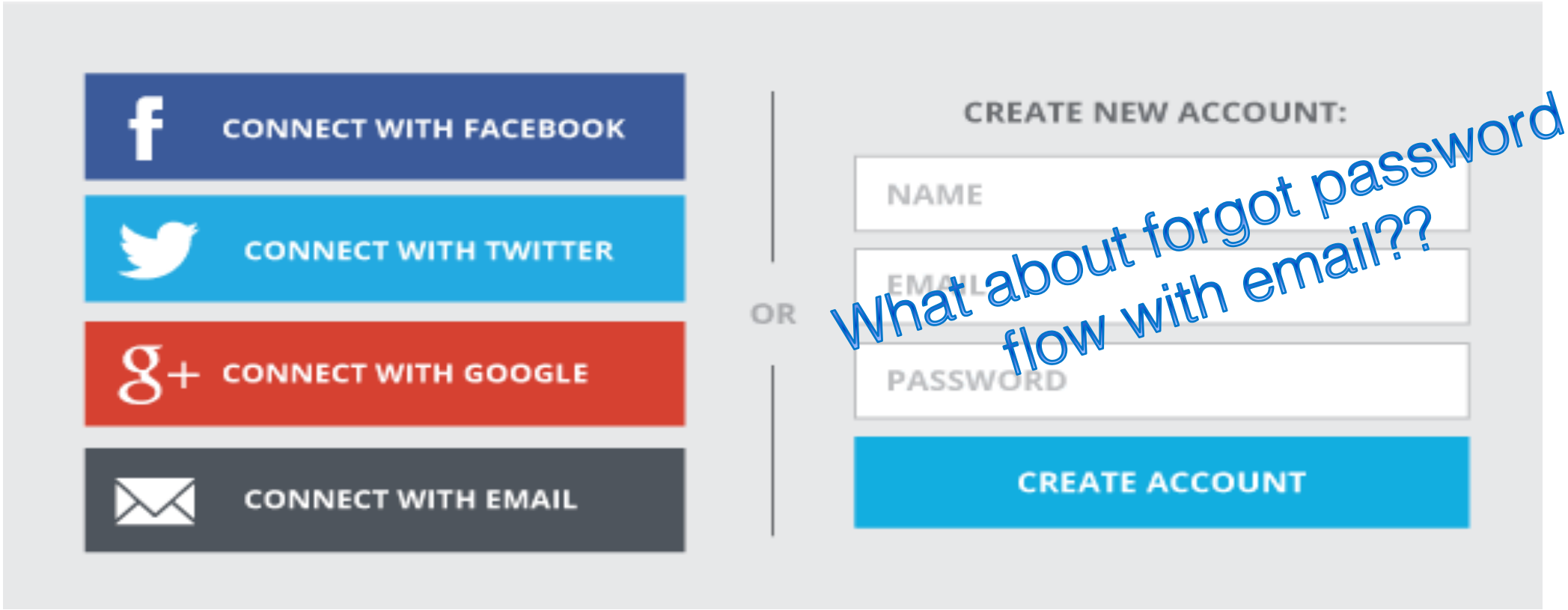


All goodness bundled as one…

Authentication

Firebase Authentication *

A type of screen present in almost all apps these days…



How long would it take you to develop this???

Firebase Authentication

- Integrate easily with popular identity providers like google, twitter, facebook and more

Firebase Authentication

- Of course you will need to register your app with individual service providers.
- Minimal client side handling, integrates seamlessly with firebase
- Ready made ‘forgot password’ flow with customizable email template

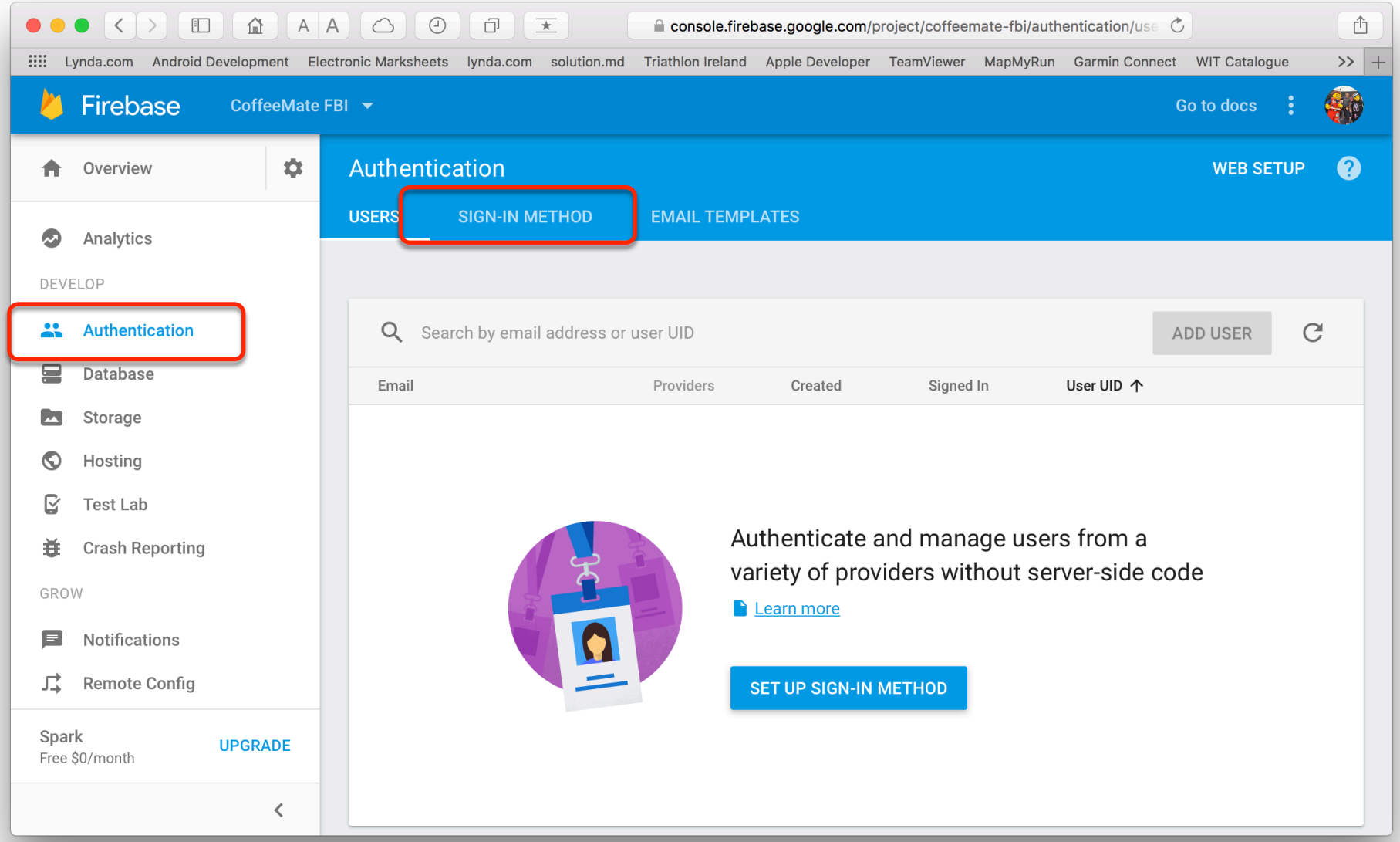
Firebase Authentication

Quick DEMO…

CoffeeMateFBI 1.0

Setup
&
Code
Highlights

1. Setup your Sign-In Method *



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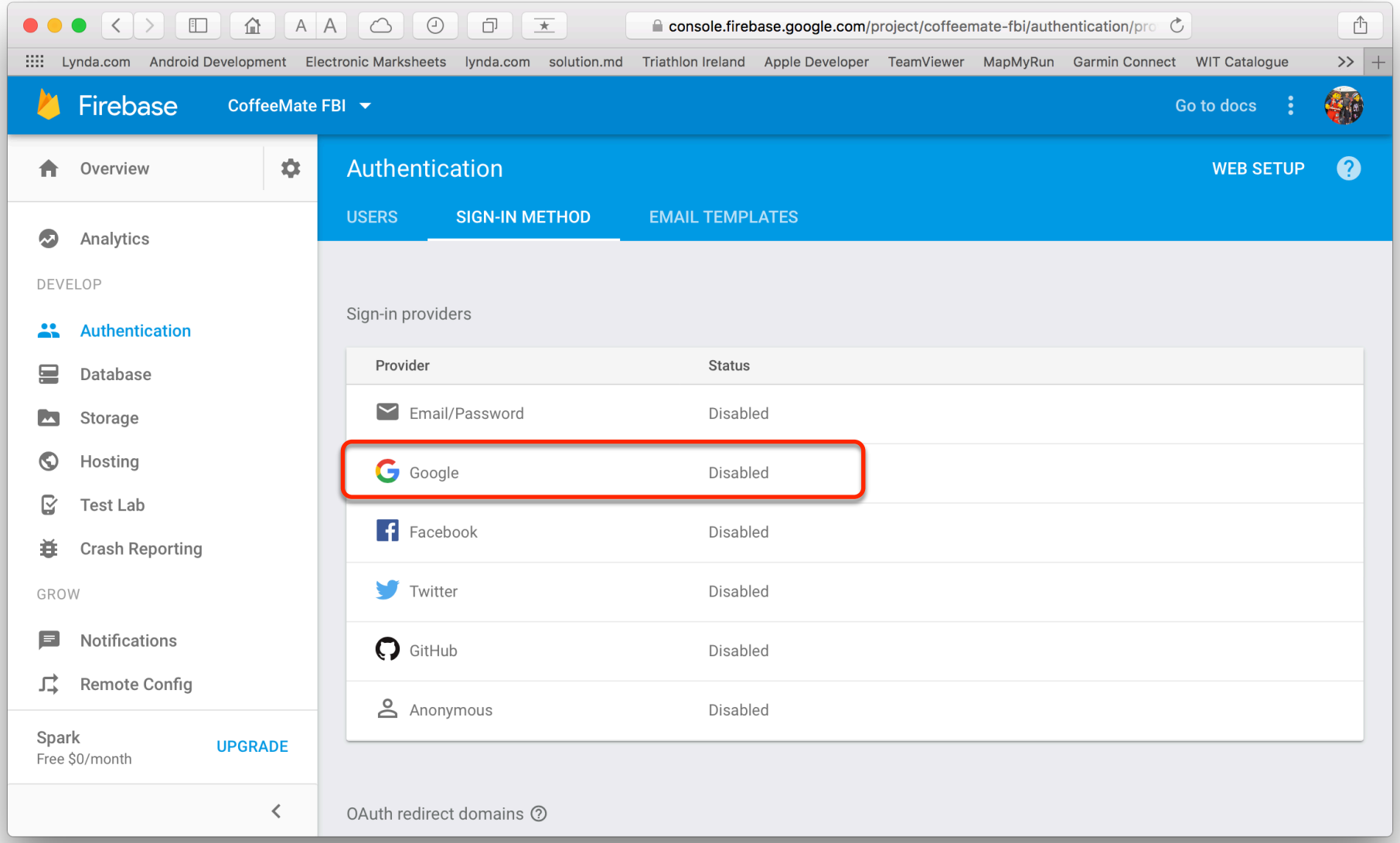

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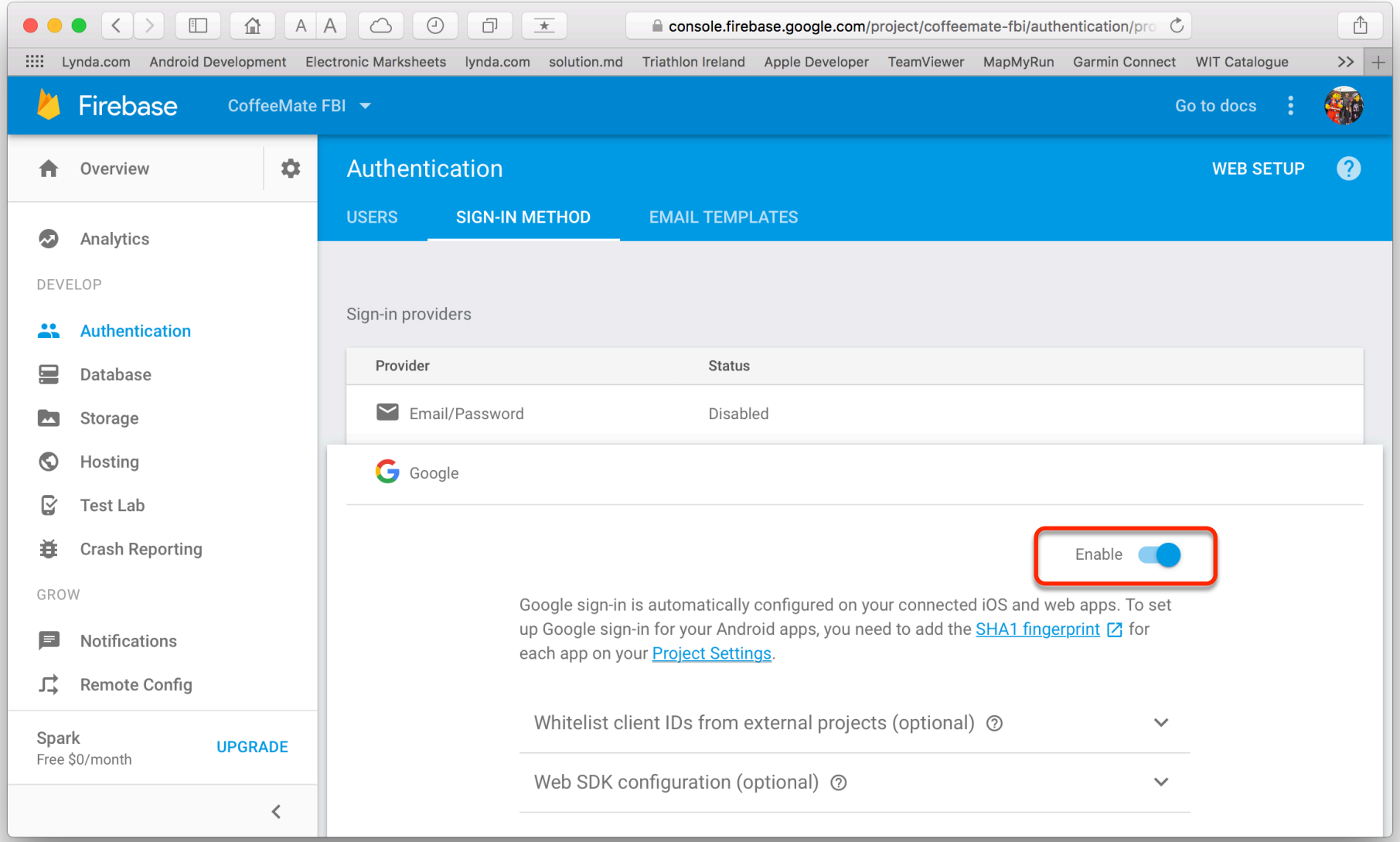

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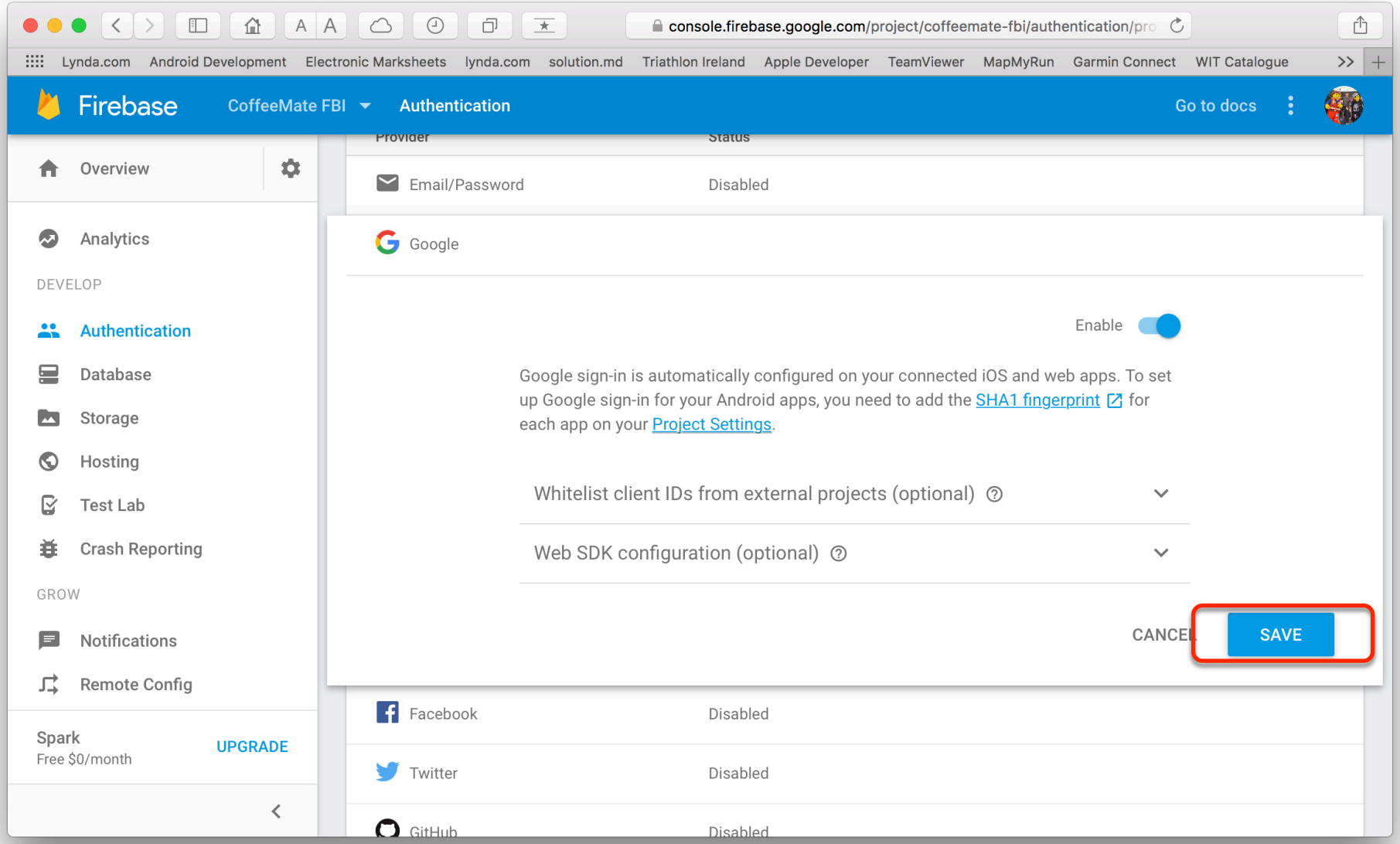


2. Introduce Authentication Flow *

```
private void firebaseAuthWithGoogle(GoogleSignInAccount acct) {
    Log.v(TAG, "firebaseAuthWithGoogle:" + acct.getEmail());

    AuthCredential credential = GoogleAuthProvider.getCredential(acct.getIdToken(), null);
    app.mFirebaseAuth.signInWithCredential(credential)
            .addOnCompleteListener(this, new OnCompleteListener<AuthResult>() {
                @Override
                public void onComplete(@NonNull Task<AuthResult> task) {
                    Log.v(TAG, "signInWithCredential:onComplete:" + task.isSuccessful());
                    validateFirebaseUser();
                    // If sign in fails, display a message to the user. If sign in succeeds
                    // the auth state listener will be notified and logic to handle the
                    // signed in user can be handled in the listener.
                    if (!task.isSuccessful()) {
                        Log.v(TAG, "signInWithCredential", task.getException());
                        Toast.makeText(Login.this, "Authentication failed.",
                                Toast.LENGTH_SHORT).show();
                    }
                }
            });
}
```

2. Introduce Authentication Flow *

```
private void validateFirebaseUser()
{
    Log.v(TAG,"Calling validateFirebaseUser() " );
    if(app.mFirebaseUser == null)
        app.mFirebaseUser = FirebaseAuth.getInstance().getCurrentUser();

    app.mFBDBManager.checkUser(app.mFirebaseUser.getUid(),
                               app.mFirebaseUser.getDisplayName(),
                               app.mFirebaseUser.getEmail());
}
```

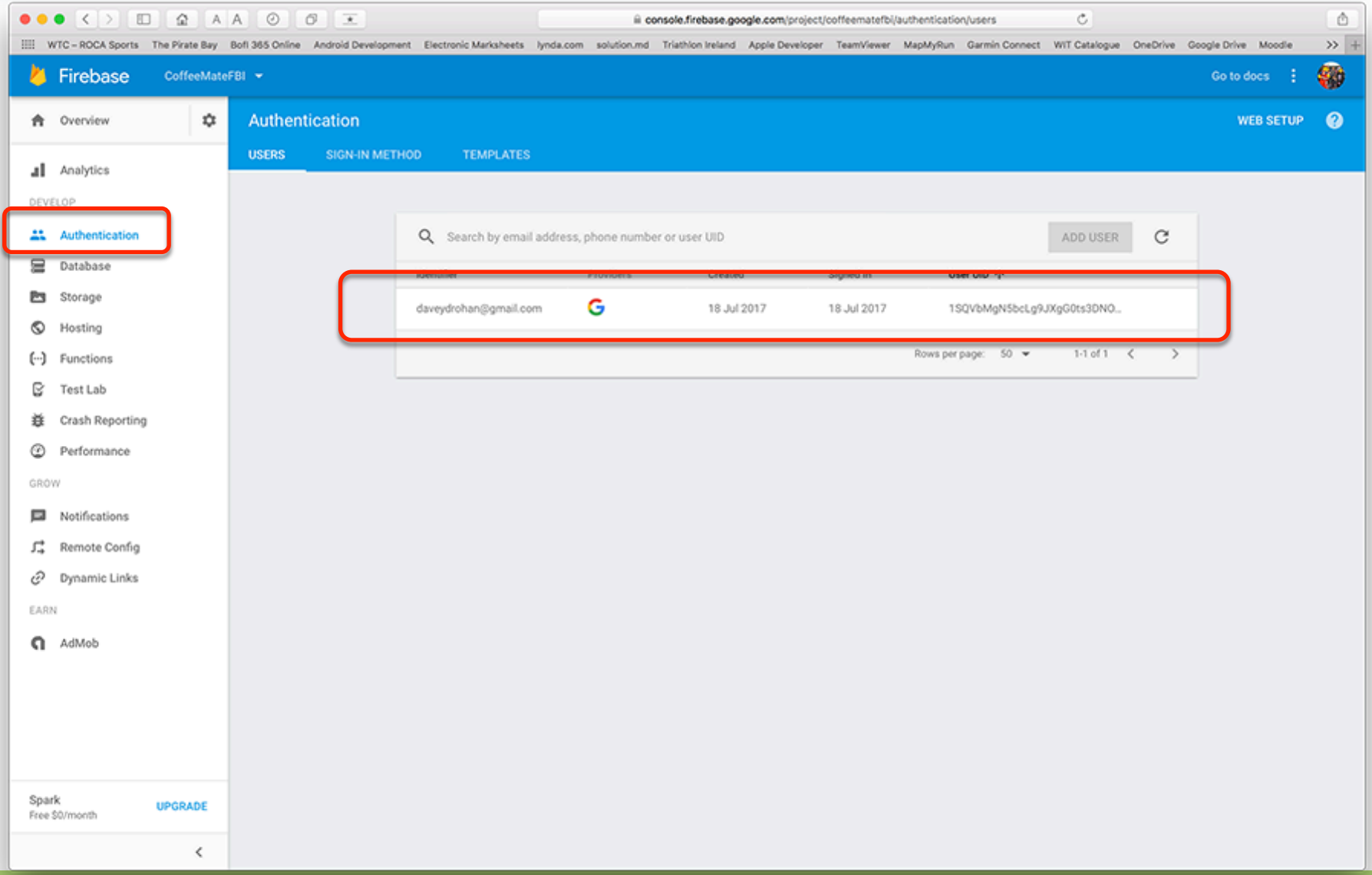
2. Introduce Authentication Flow *

```
//Check to see if the Firebase User exists in the Database
//if not, create a new User
public void checkUser(final String userid,final String username,final String email) {
    Log.v(TAG, "checkUser ID == " + userid);
    mFirebaseDatabase.child("users").child(userid).addListenerForSingleValueEvent(
            new ValueEventListener() {
                @Override
                public void onDataChange(DataSnapshot dataSnapshot) {
                    mFBDBListener.onSuccess(dataSnapshot);
                }

                @Override
                public void onCancelled(DatabaseError databaseError) {
                    mFBDBListener.onFailure();
                }
            }
    );
}
```

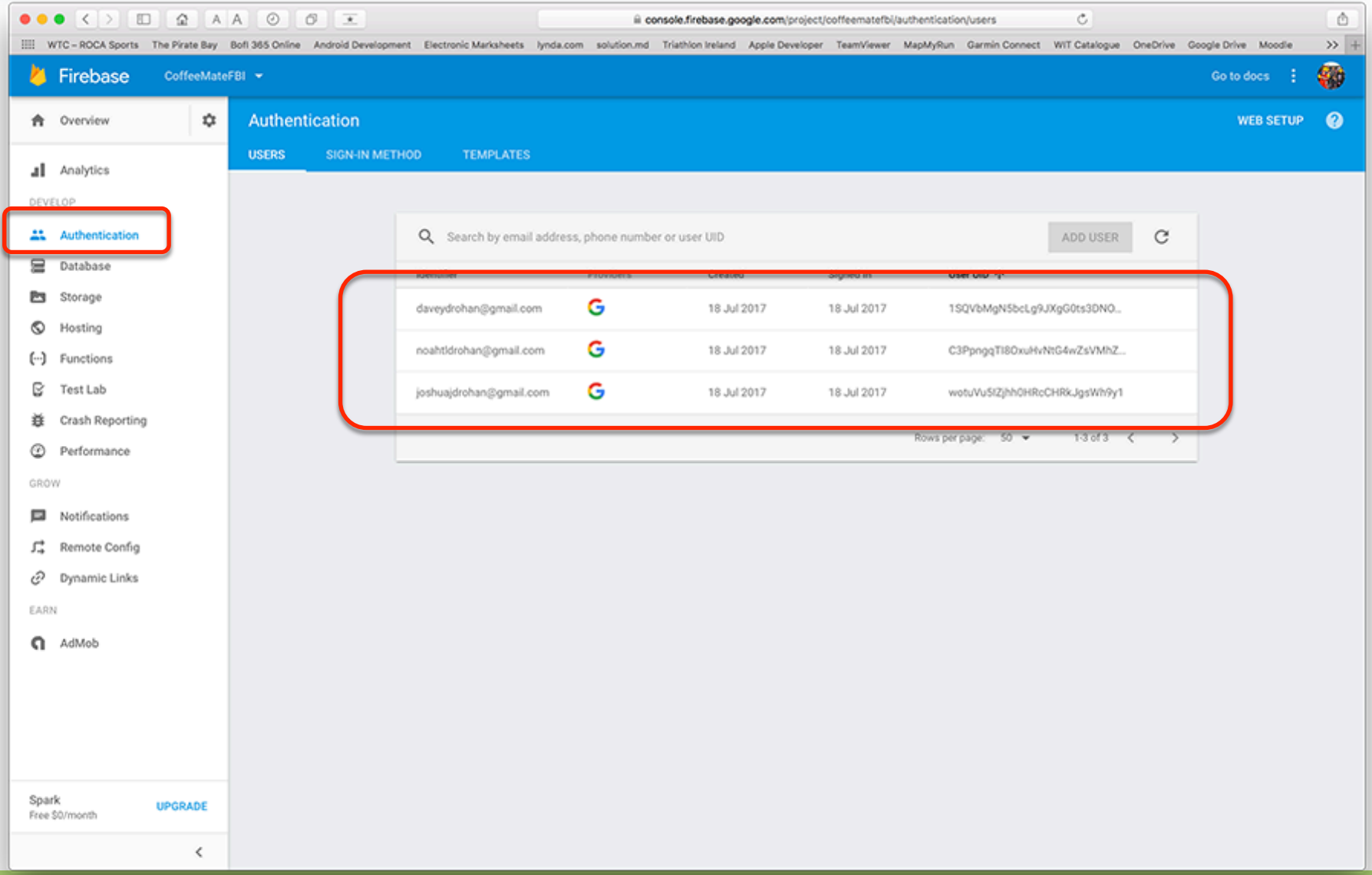
2. Introduce Authentication Flow *

```
@Override
public void onSuccess(DataSnapshot dataSnapshot) {
    if(dataSnapshot.exists()){
        Log.v(TAG, "User found : ");
    }
    else{
        Log.v(TAG, "User not found, Creating User on Firebase");
        User newUser = new User(app.mFirebaseUser.getUid(),
                                app.mFirebaseUser.getDisplayName(),
                                app.mFirebaseUser.getEmail(), null);
        app.mFBDBManager.mFirebaseDatabase.child("users")
                                          .child(app.mFirebaseUser.getUid())
                                          .setValue(newUser);
    }
    app.mFBDBManager.mFBUserId = app.mFirebaseUser.getUid();

    startHomeScreen();
}
```

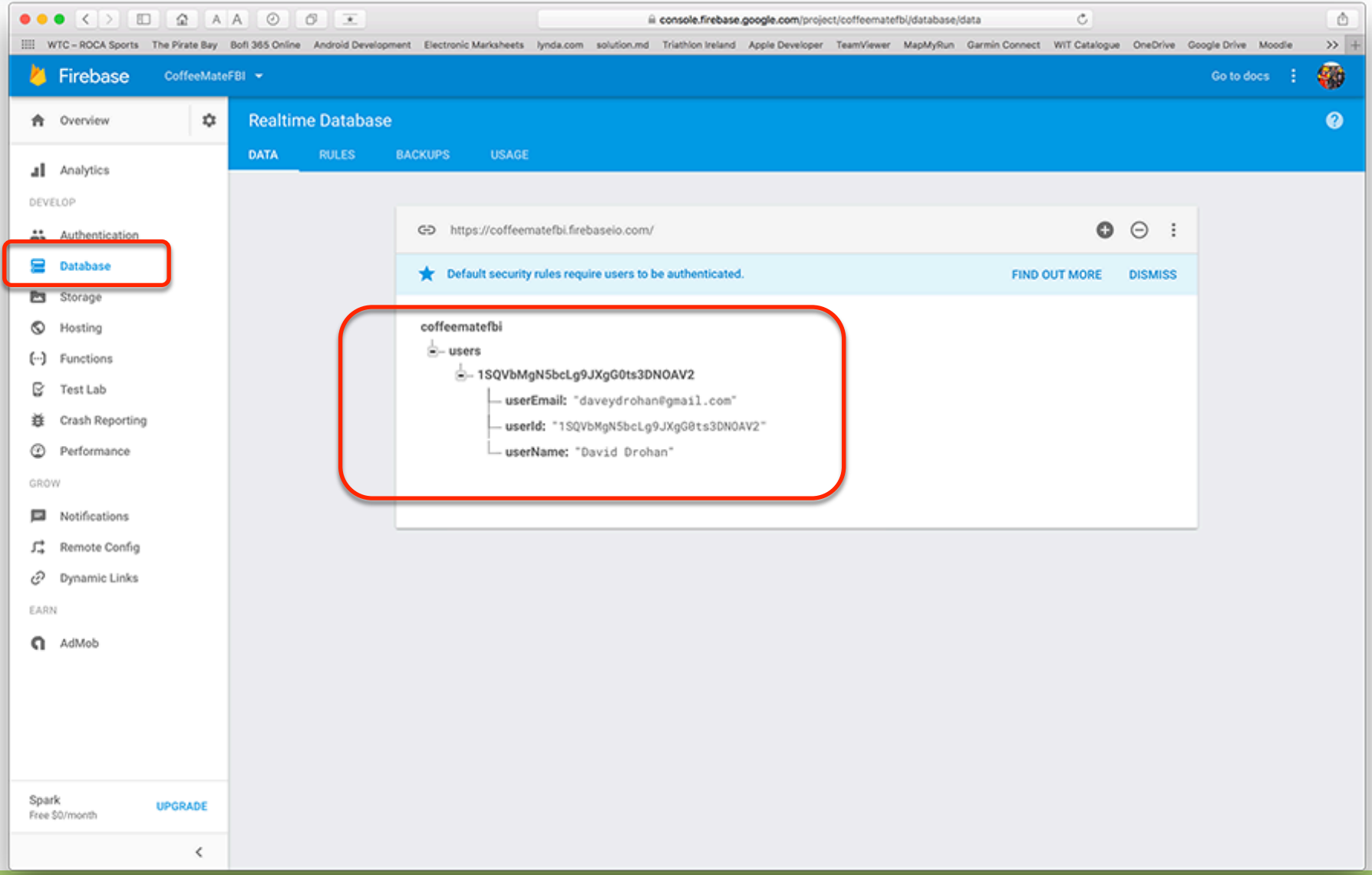
Firebase Console – Authenticated Users *



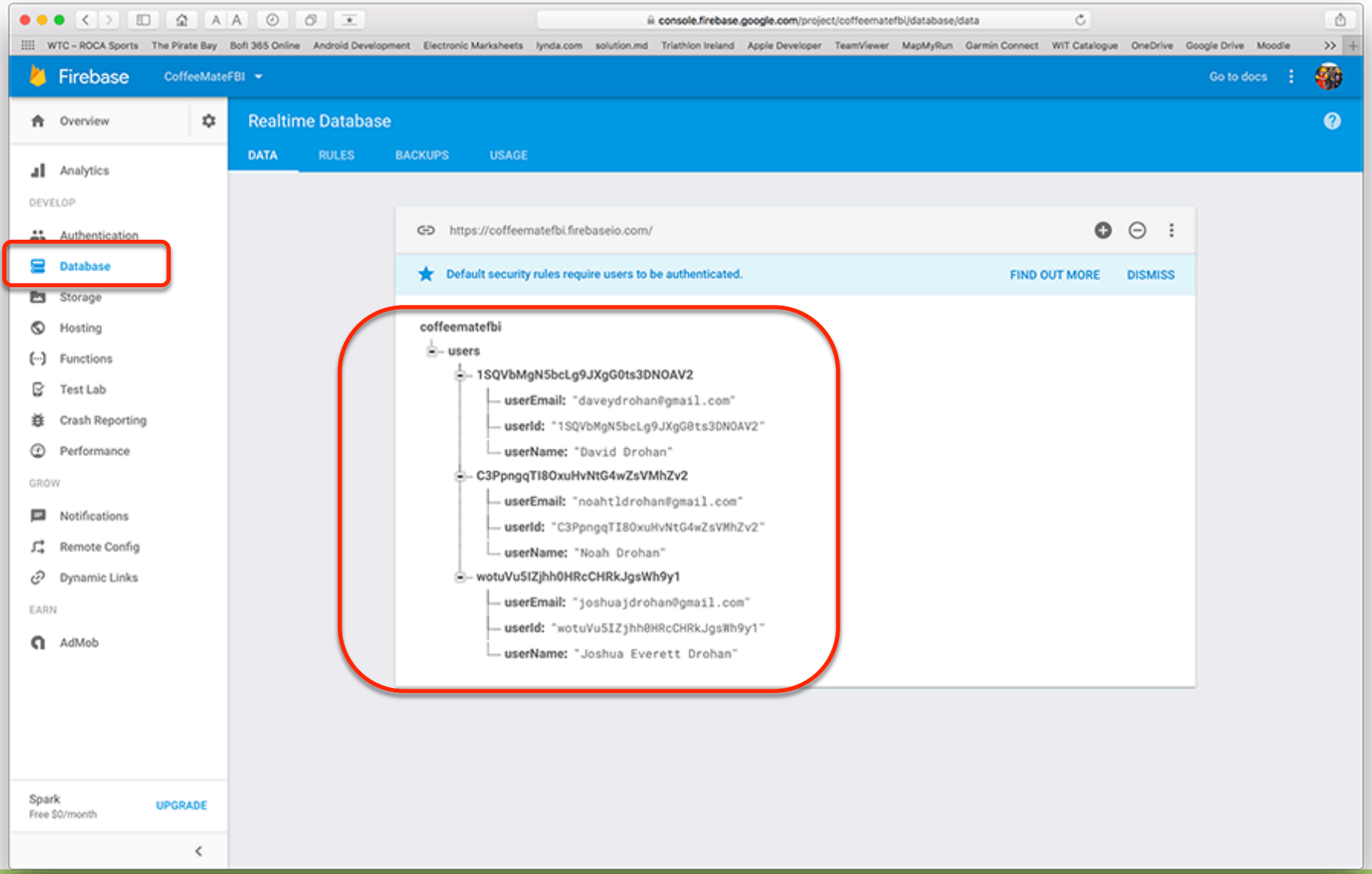
Firebase Console – Authenticated Users *

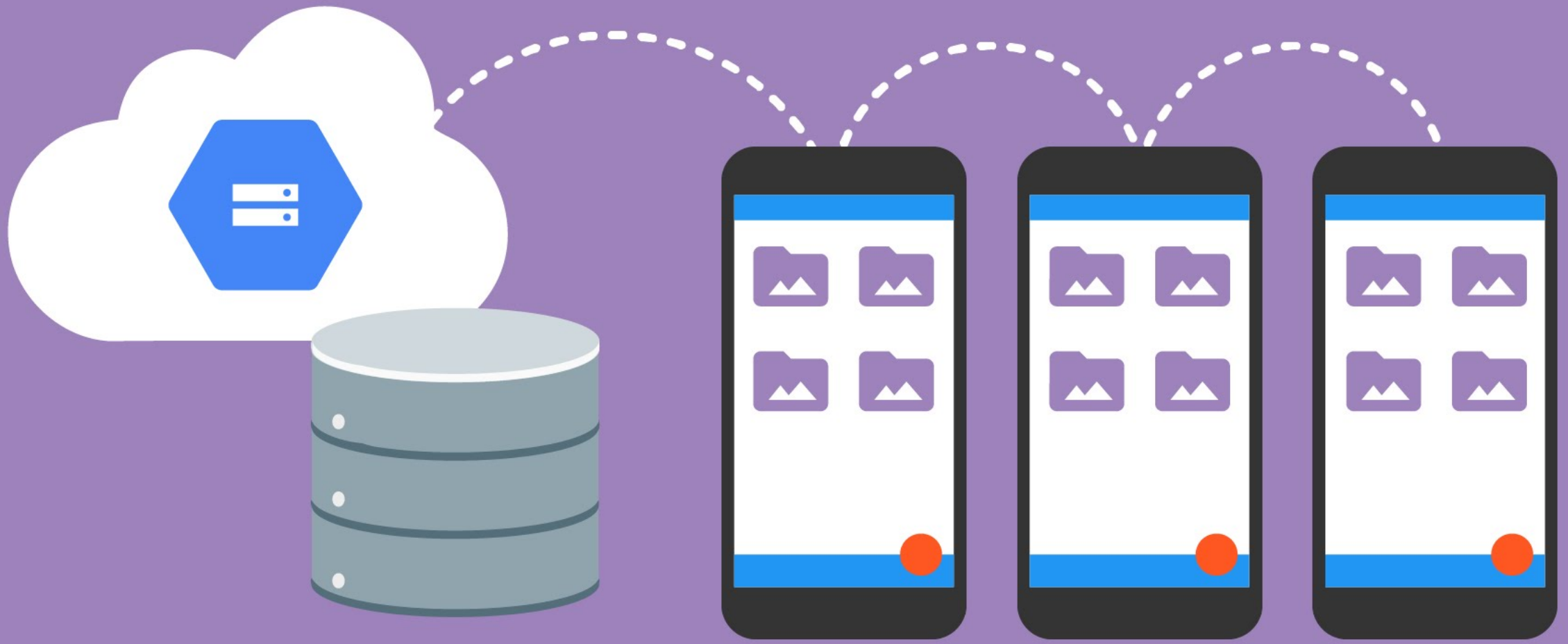


Firebase Console – User Data in db *



Firebase Console – User Data in db *





Storage

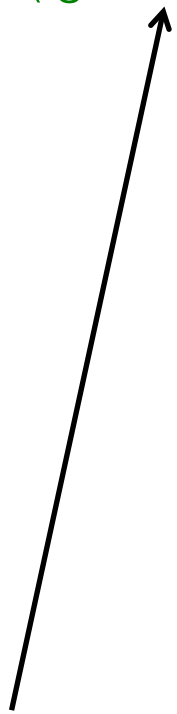
Sync files and folders seamlessly…

Firebase Storage

- Store user's image, audio, video and other content in the cloud easily without worrying about the network quality.
- Firebase adds Google security to file uploads and downloads.
- Backed by Google Cloud Storage.
- Petabyte scalability available if your app goes viral.

Upload Files To Firebase

- After adding gradle dependencies. Get Storage reference
  - StorageReference storage = FirebaseStorage.getInstance().getReferenceFromUrl('gs:<bucket>');
  - storage = storage.child('myimages/user1234pic.jpg');
- Easily change reference.
  - storage.getParent(), getRoot(), getPath(), getName(), getBucket() etc.
- Upload from memory, stream or from SD card
  - storage.putBytes(imageData); // as byte array.
  - storage.putStream(stream); // as input stream
  - Storage.putFile(fileURI): / Uri of the local file to be uploaded



gs://coffeematefbi.appspot.com

More On File Upload

- Put file metadata
  - StorageMetadata metadata = new StorageMetadata.Builder().setContentType("image/jpg").build()
  - storage.putFile(file, metadata)
- Manage uploads
  - UploadTask task = storage.putFile(file, metadata)
  - task.pause(), resume(), cancel()…
- Monitor upload
  - OnProgressListener, OnPausedListener, OnSuccessListener, OnFailuerListener

Download Files From Firebase

- Download to a local file
  - File localFile = File.createTempFile('mefile','jpg');
  - storage.getFile(localFile).addOnSuccessListener(…);
- Download to memory
  - Final long ONE_MEG = 1024*1024;
  - storage.getBytes(ONE_MEG).addOnSuccessListener(new OnSuccessListener<byte[]>() {

```
public void onSuccess(bytes[] bytes){
        }
} );
```

- Point StorageReference to desired file and call getMetadata() to get metadata.

Firebase Storage

Quick Example…

https://github.com/kotlintpoint/Firebase-Storage-Upload-Download

FirebaseStorageEx App *

- On first look, a very basic app to Upload/Download a file
- What it actually does is
  - Using System Intents, allow you to select a file from any source on your device, including your google drive
  - Allow you to name that file and upload it to your Firebase Storage space.
  - Allow you to download a file once the correct filename is supplied from your Firebase Storage and display it using third party apis (glide/picasso).

FirebaseStorageEx App - Setup *

Update your Firebase Storage rules to allow reading and writing without authentication (for demo purposes)

```
service firebase.storage {
  match /b/{bucket}/o {
    match /{allPaths=**} {
      allow read, write: if request.auth != null;
    }
  }
}
```

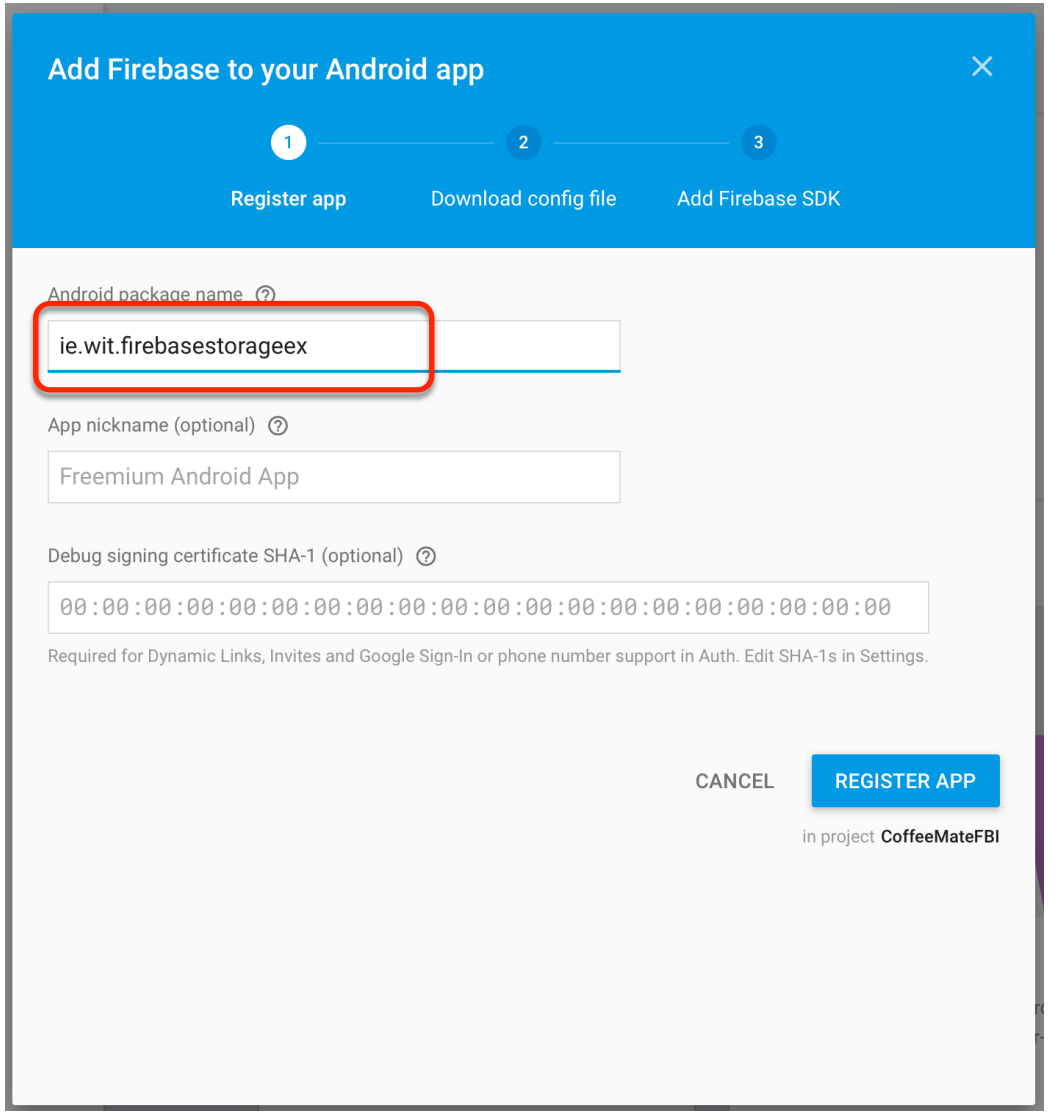
BEFORE

```
service firebase.storage {
  match /b/{bucket}/o {
    match /{allPaths=**} {
      allow read, write: if true;
    }
  }
}
```

AFTER

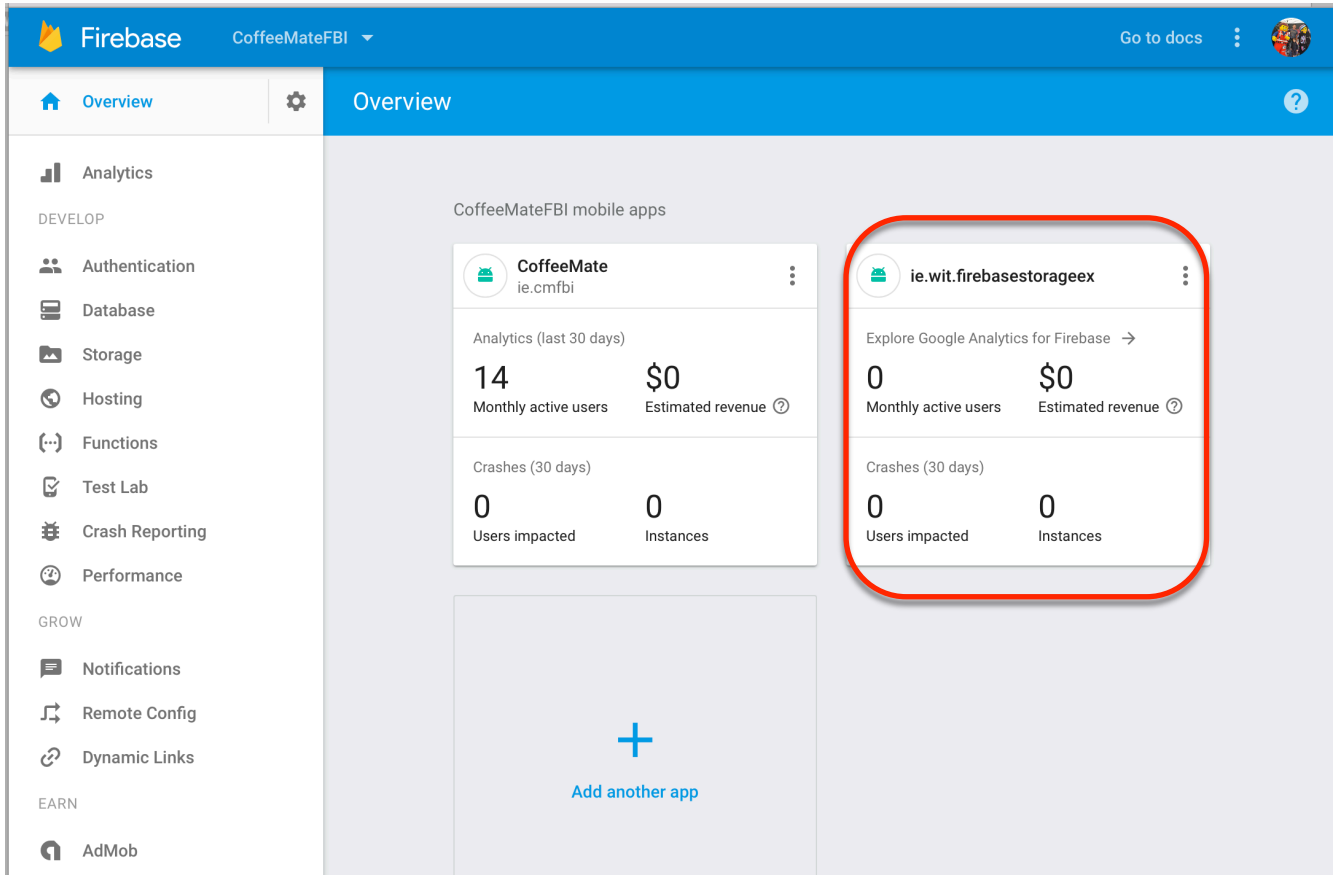
FirebaseStorageEx App - Setup *

Don’t forget to register your app with your Firebase Project

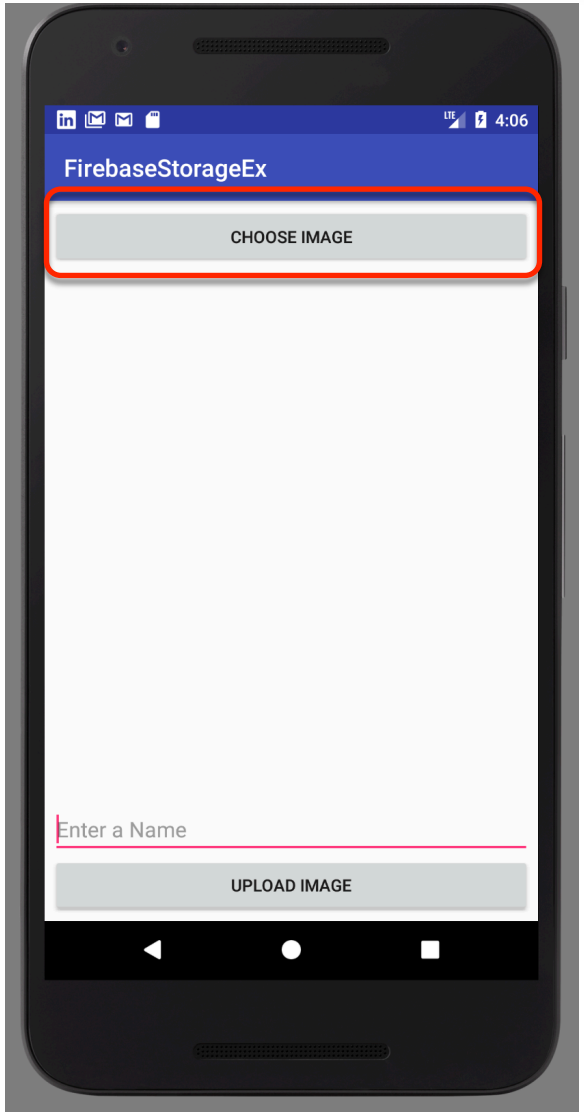


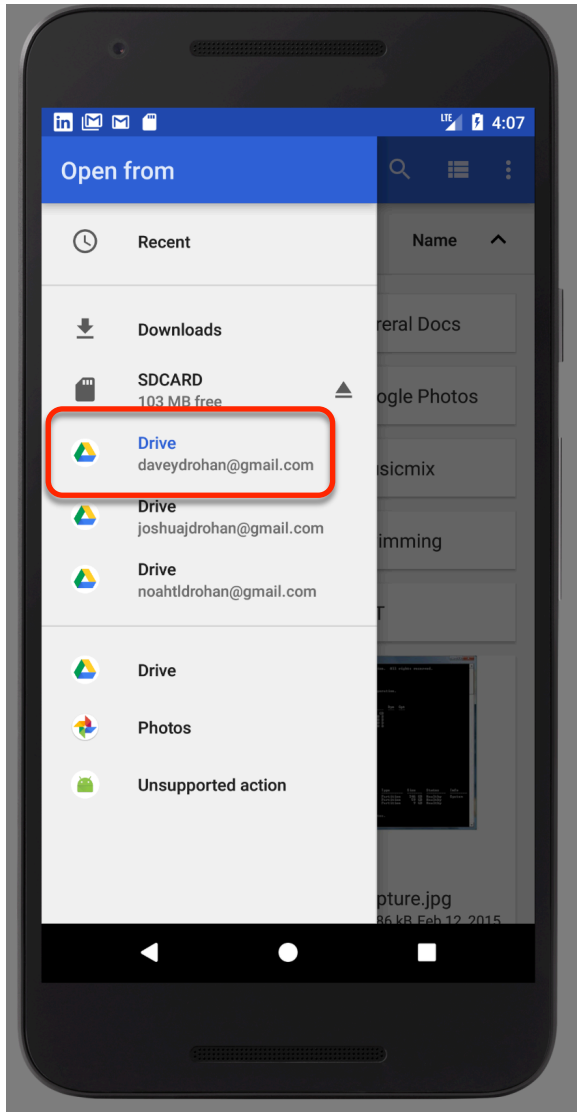
FirebaseStorageEx App - Setup *

Don’t forget to register your app with your Firebase Project

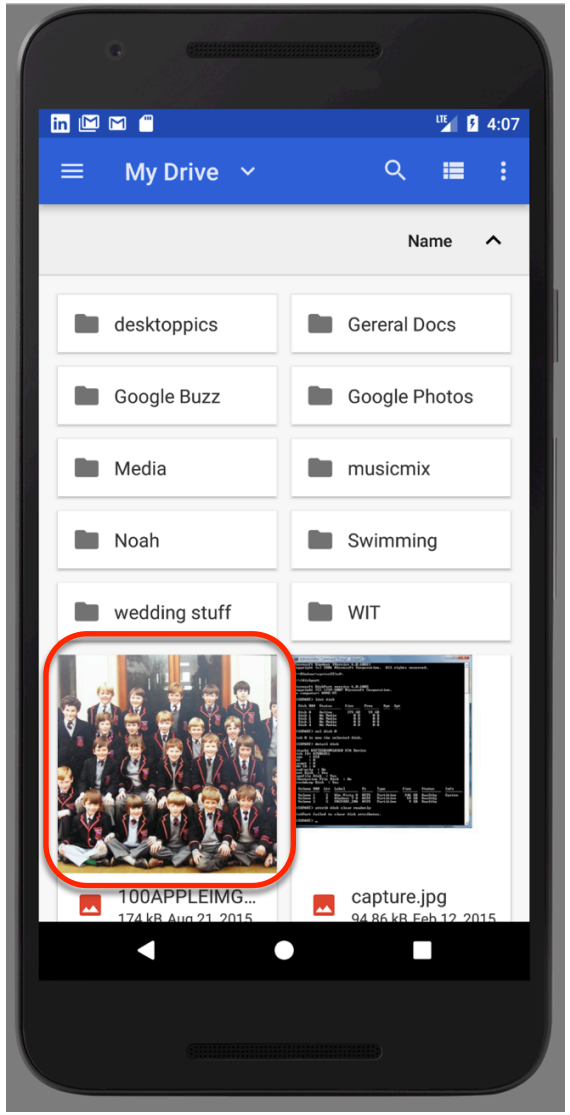


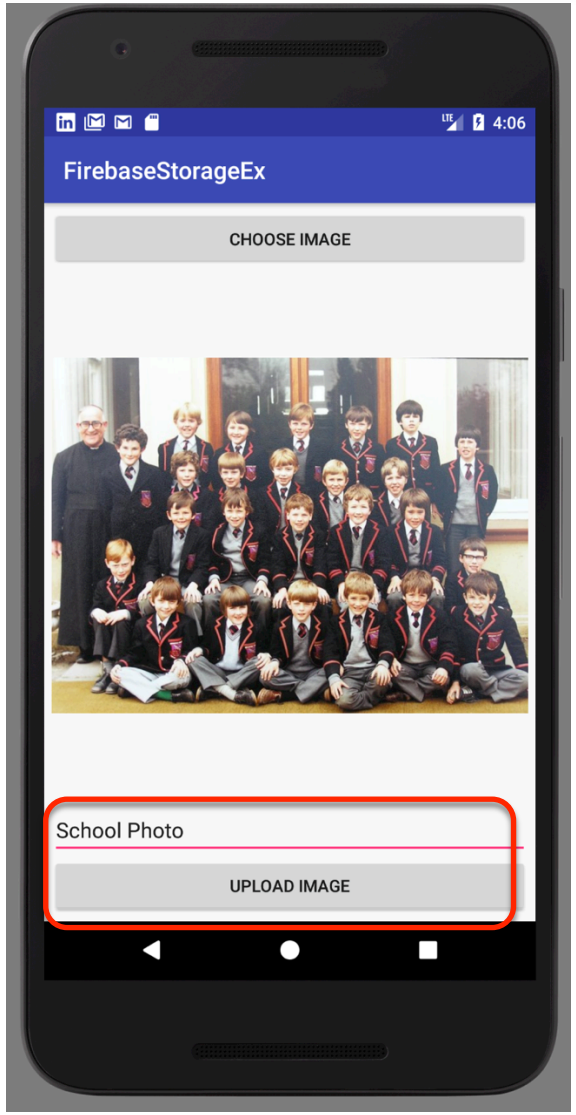
FirebaseStorageEx App - Upload *



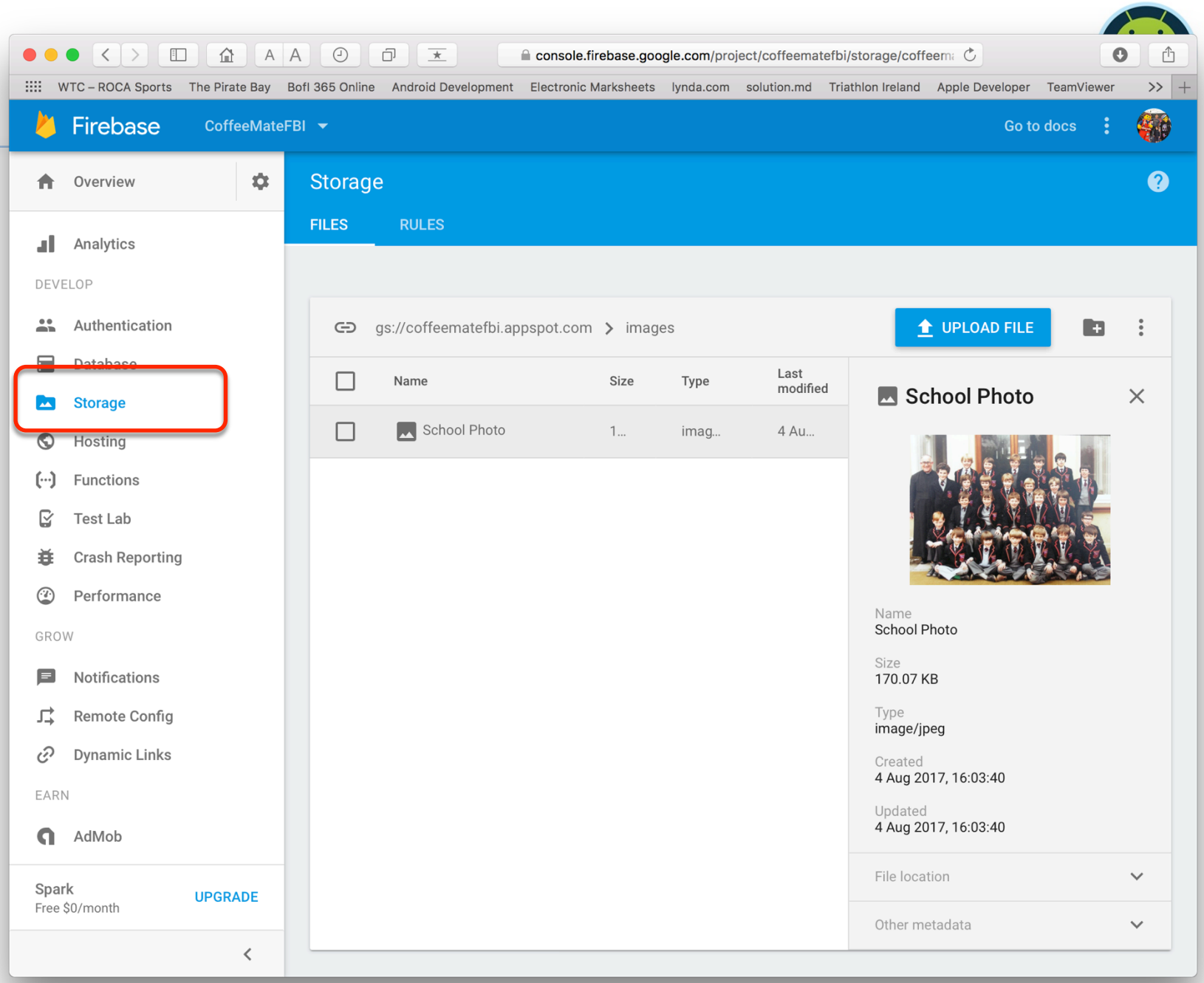


FirebaseStorageEx App - Upload *

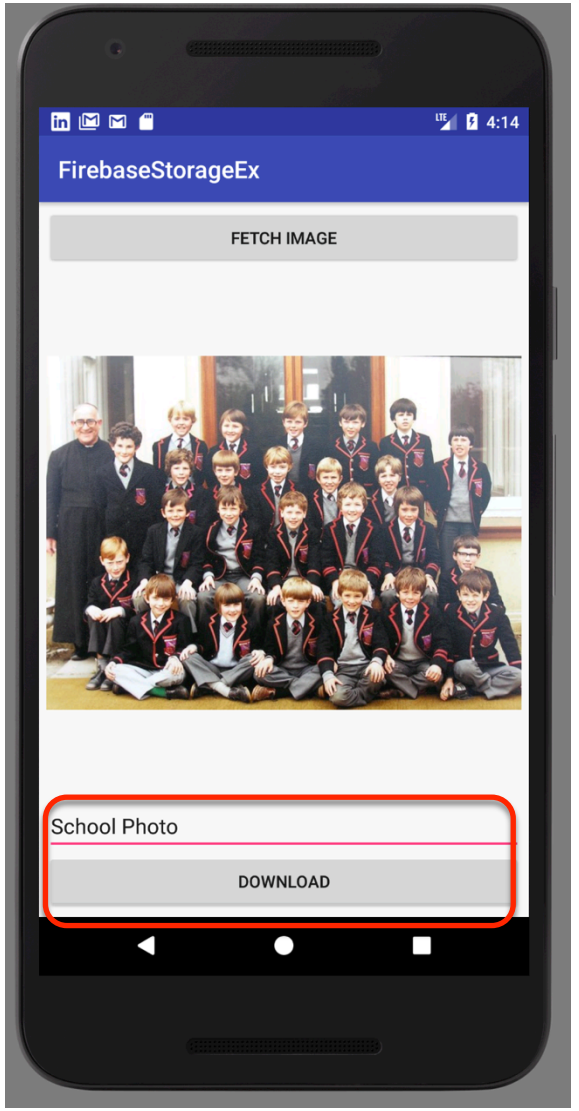




FirebaseStorageEx App – Upload



FirebaseStorageEx App - Download *



FirebaseStorageEx App – uploadImage( )*

```
private void uploadImage() {
    if(file!=null)
    {
        FirebaseStorage storage=FirebaseStorage.getInstance();
        StorageReference reference=storage.getReferenceFromUrl("gs://coffeematefbi.appspot.com");
        StorageReference imagesRef=reference.child("images/"+editTextName.getText().toString());
        UploadTask uploadTask = imagesRef.putFile(file);
        uploadTask.addOnFailureListener(new OnFailureListener() {
            @Override
            public void onFailure(@NonNull Exception e) {
                pd.dismiss();
                Toast.makeText(ImageUploadActivity.this, "Error : "+e.toString(), Toast.LENGTH_SHORT).show();
            }
        }).addOnSuccessListener(new OnSuccessListener<UploadTask.TaskSnapshot>() {
            @Override
            public void onSuccess(UploadTask.TaskSnapshot taskSnapshot) {
                pd.dismiss();
                Toast.makeText(ImageUploadActivity.this, "Uploading Done!!!", Toast.LENGTH_SHORT).show();
            }
        });
    }
}
```

FirebaseStorageEx App - fetchImage( ) *

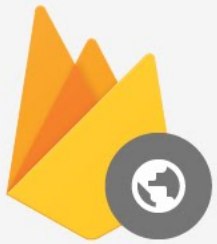
```
private void fetchImage() {
    FirebaseStorage storage=FirebaseStorage.getInstance();
    // Points to the root reference
    StorageReference storageRef = storage.getReferenceFromUrl("gs://coffeematefbi.appspot.com");
    // Points to "images" Directory
    StorageReference imagesRef = storageRef.child("images");
    // Points to "images/'filename'.jpg"
    // Note that you can use variables to create child values
    String fileName = editTextName.getText().toString();
    StorageReference fileNameRef = imagesRef.child(fileName);

    // File path is "images/'filename'.jpg"
    String path = fileNameRef.getPath();
    // File name is "'filename'.jpg"
    String name = fileNameRef.getName();
    // Points to "images"
    imagesRef = fileNameRef.getParent();

    Glide.with(this /* context */)
            .using(new FirebaseImageLoader())
            .load(fileNameRef)
            .into(imageView);
}
```

FirebaseStorageEx App - downloadImage( ) *

```
private void downloadImage() {

    FirebaseStorage storage=FirebaseStorage.getInstance();
    // Create a storage reference from our app
    StorageReference storageRef = storage.getReferenceFromUrl("gs://coffeematefbi.appspot.com");

    storageRef.child("images/"+editTextName.getText().toString()).getBytes(Long.MAX_VALUE)
            .addOnSuccessListener(new OnSuccessListener<byte[]>() {
        @Override
        public void onSuccess(byte[] bytes) {
            // Use the bytes to display the image
            String path=Environment.getExternalStorageDirectory()+"/"+editTextName.getText().toString();
            try {
                FileOutputStream fos=new FileOutputStream(path);
                fos.write(bytes);
                fos.close();
                Toast.makeText(ViewDownloadActivity.this, "Success!!!", Toast.LENGTH_SHORT).show();

            }  catch (IOException e) {
                e.printStackTrace();
                Toast.makeText(ViewDownloadActivity.this, e.toString(), Toast.LENGTH_SHORT).show();
            }
            pd.dismiss();
        }
    }).addOnFailureListener(new OnFailureListener() {
        @Override
        public void onFailure(@NonNull Exception exception) {
            // Handle any errors
            pd.dismiss();
            Toast.makeText(ViewDownloadActivity.this, exception.toString()+"!!!", Toast.LENGTH_SHORT).show();
        }
    });

}
```

Pricing

Products	Spark Plan Generous limits for hobbyists Free	Flame Plan Fixed pricing for growing apps $25/month	Blaze Plan Calculate pricing for apps at scale Pay as you go
Free Products Authentication (except Phone Auth), Analytics, App Indexing, Dynamic Links, Invites, Remote Config, Cloud Messaging (FCM), Performance Monitoring, and Crash Reporting.	✓ Included	✓ Included Free	✓ Included Free
Storage			
GB stored	5 GB	50 GB	$0.026/GB
GB downloaded	1 GB/day	50 GB/day	$0.12/GB
Upload operations	20K/day	100K/day	$0.10/thousand
Download operations	50K/day	250K/day	$0.01/thousand



Hosting

The new VPS in town…

Firebase Hosting

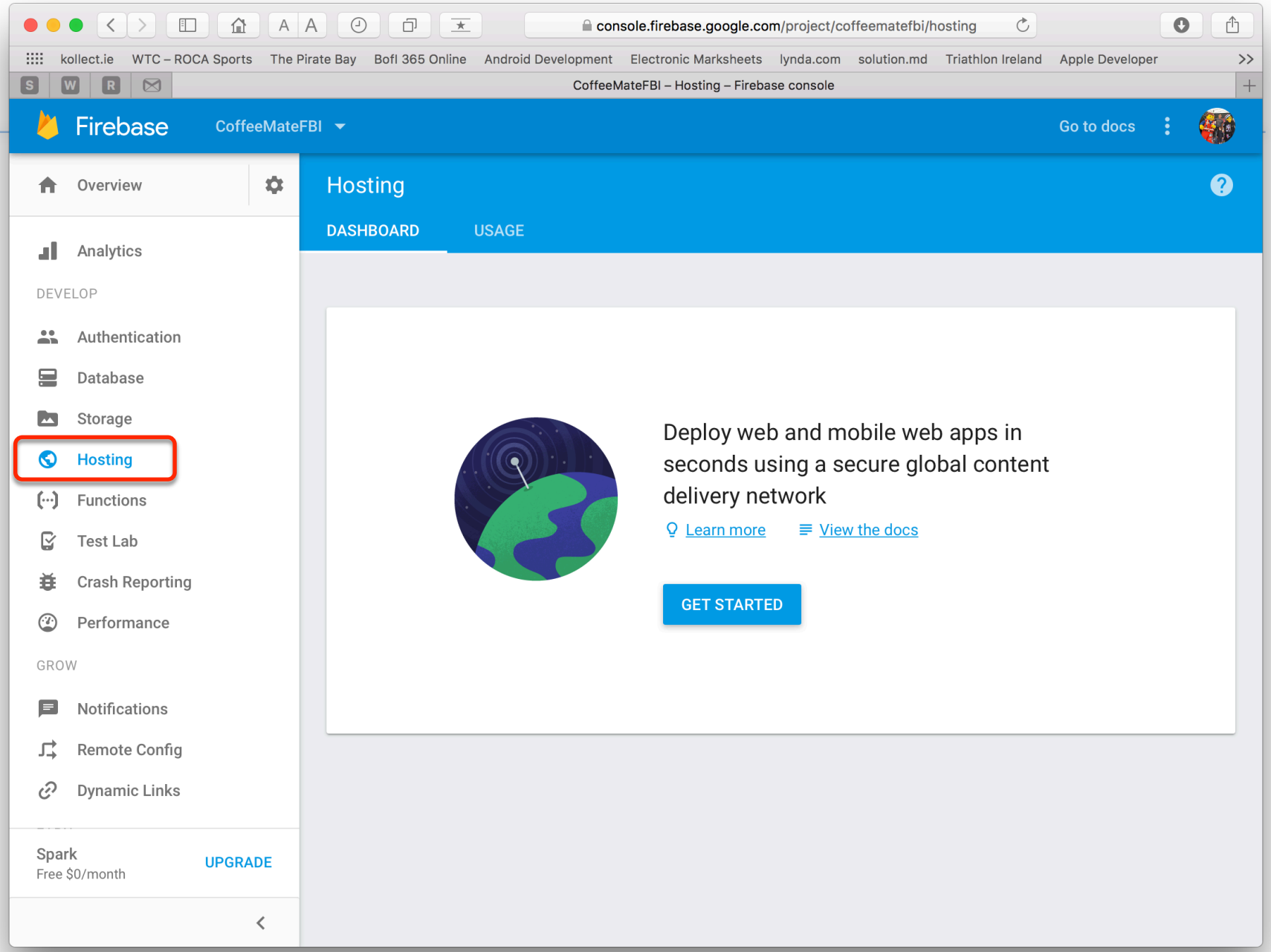
- Firebase hosting provides a fast and secure static hosting for your web app.
- It is a production grade web content hosting.
- No need to look for any other VPS solution
- Hosting gives a subdomain of “firebaseapp.com”
- You can also get a custom domain.
- Install firebase CLI and deploy in a matter of seconds.
- Also suited for progressive web apps

Deploy Your Site In Seconds

- Install npm.
- Install firebase CLI
  - npm install –g firebase-tools
- Initialize your app
  - firebase init
- Set root folder and put your static content there.
- Deploy
  - firebase deploy

Firebase Hosting

Quick DEMO…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Deploy web and mobile web apps in seconds using a secure global content delivery network
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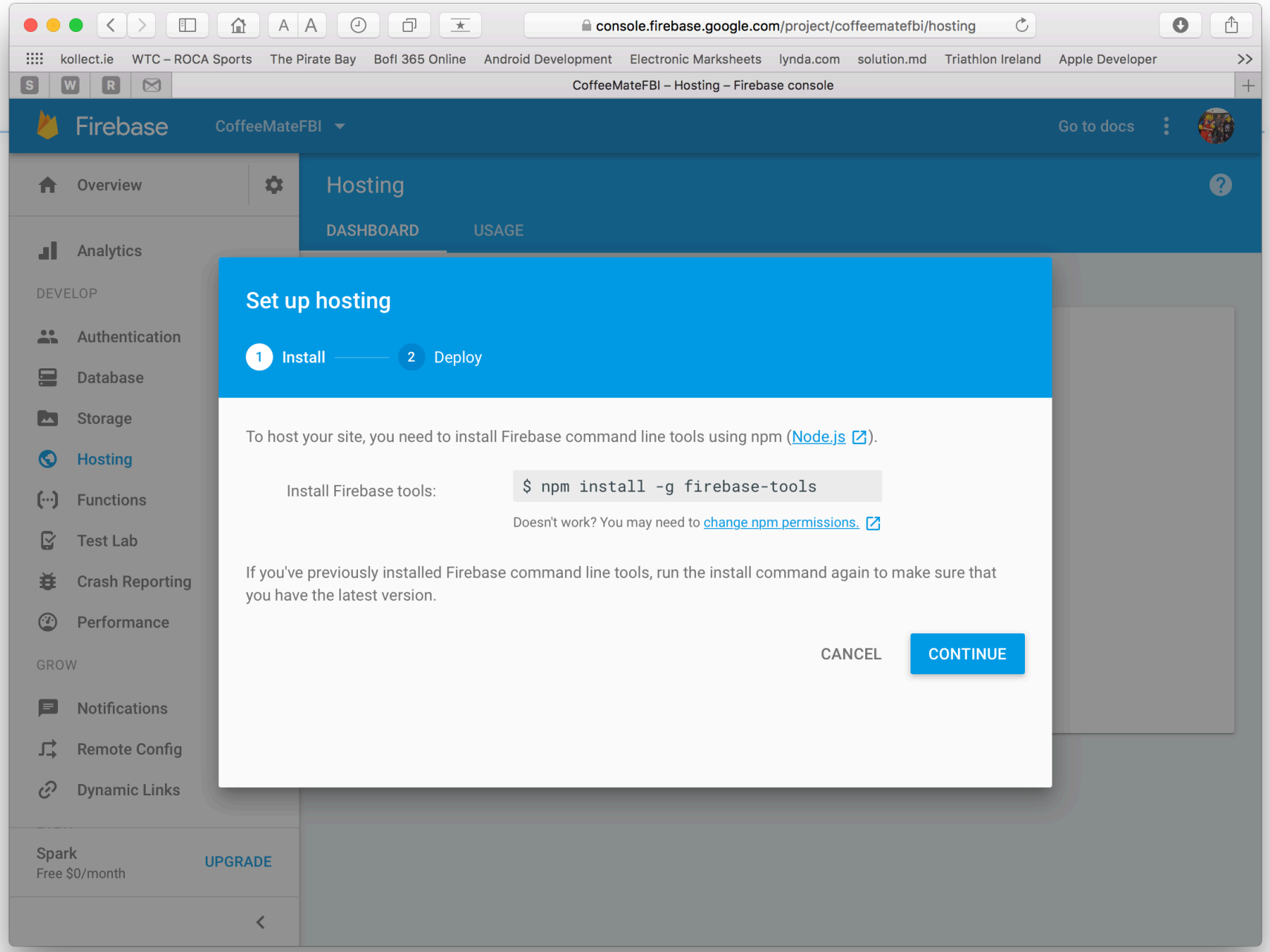
GET STARTED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UPGRADE
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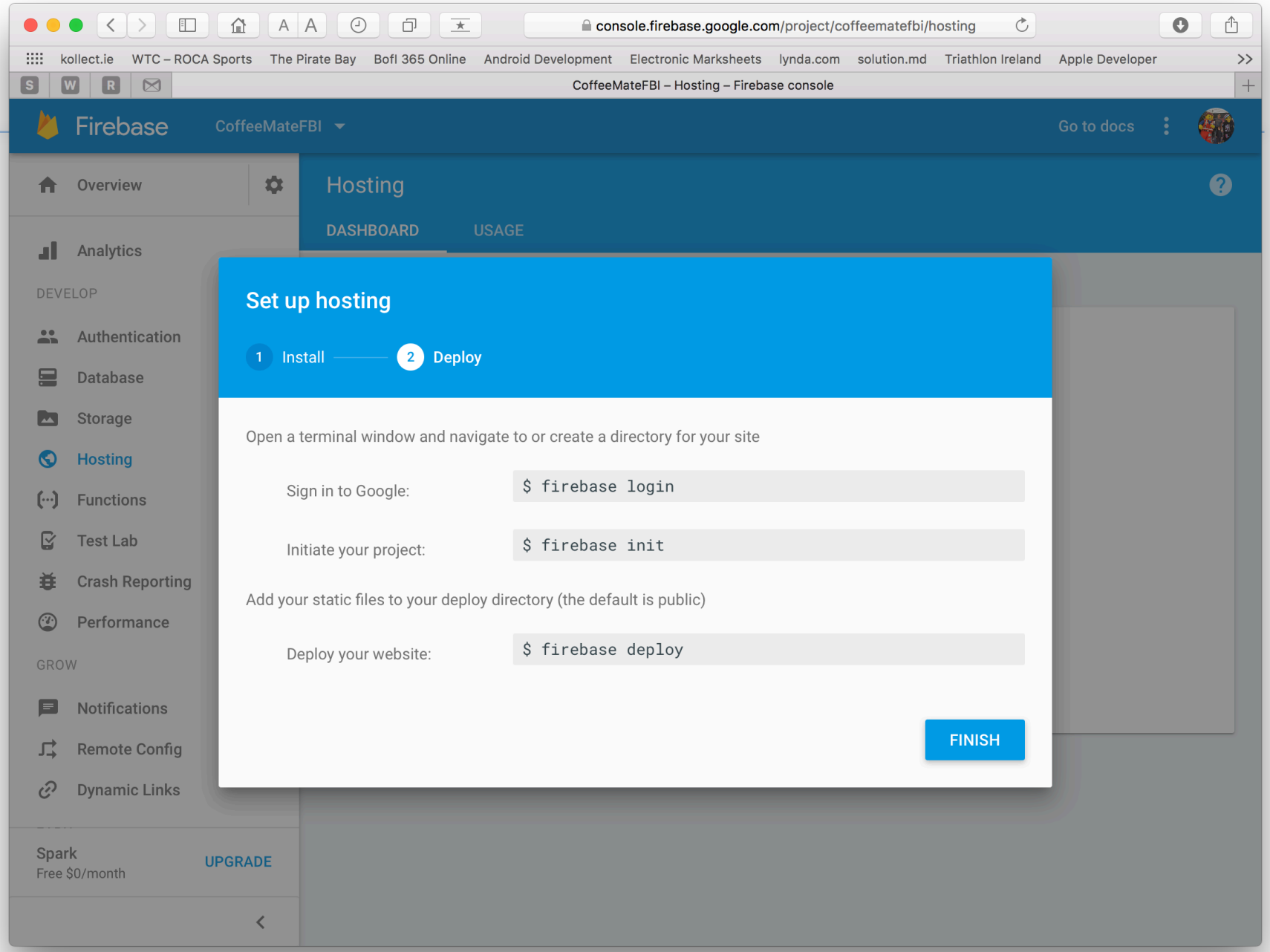
DASHBOARD
USAGE
Set up hosting
1 Install
2 Deploy
To host your site, you need to install Firebase command line tools using npm (Node.js).
Install Firebase tools:
$ npm install -g firebase-tools
Doesn't work? You may need to change npm permissions.
If you've previously installed Firebase command line tools, run the install command again to make sure that you have the latest version.
CANCEL
CONTINUE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UPGRADE
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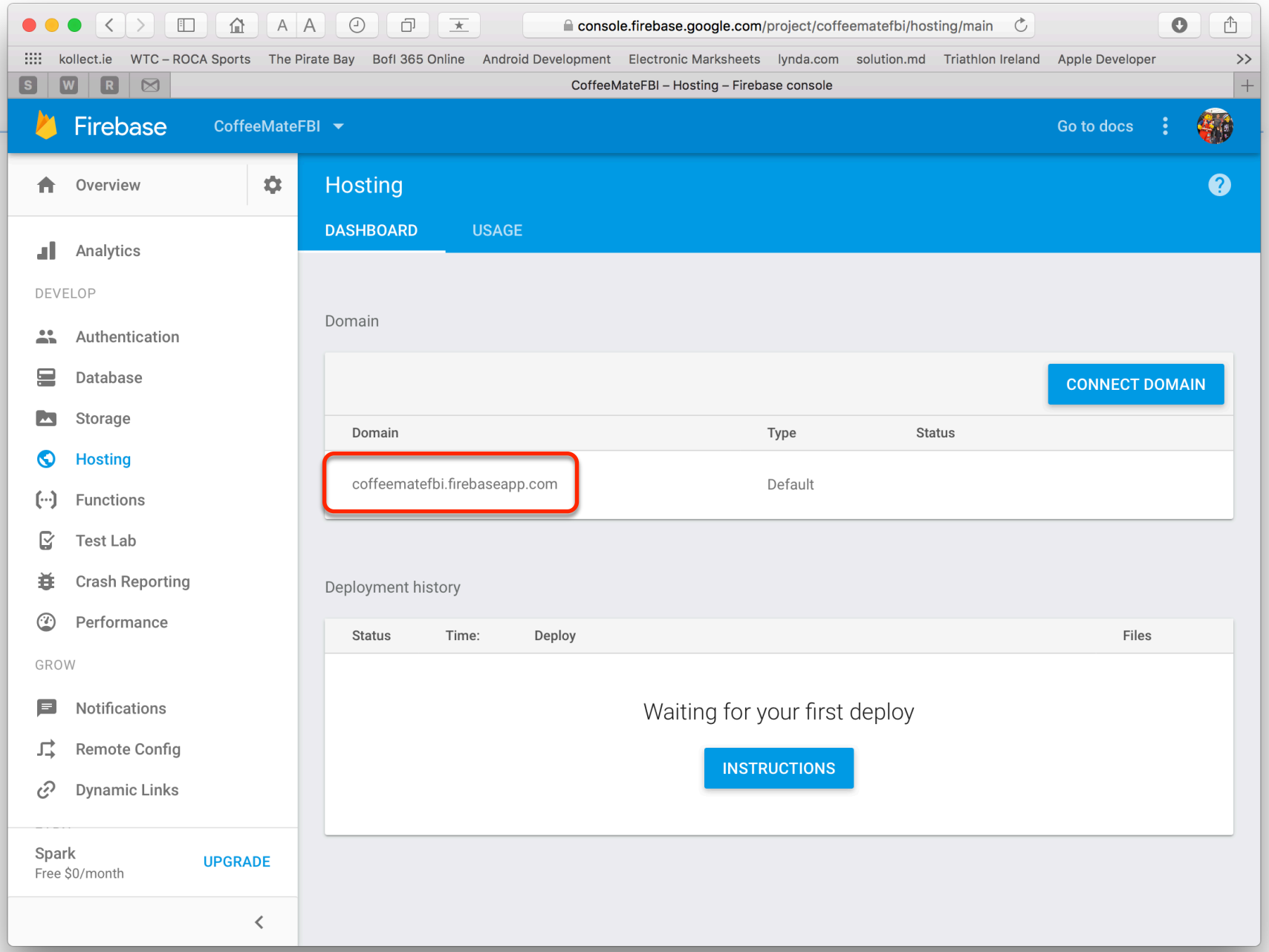
DASHBOARD
USAGE
Set up hosting
1 Install
2 Deploy
Open a terminal window and navigate to or create a directory for your site
Sign in to Google:
$ firebase login
Initiate your project:
$ firebase init
Add your static files to your deploy directory (the default is public)
Deploy your website:
$ firebase deploy
FINISH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Domain
Type
Status
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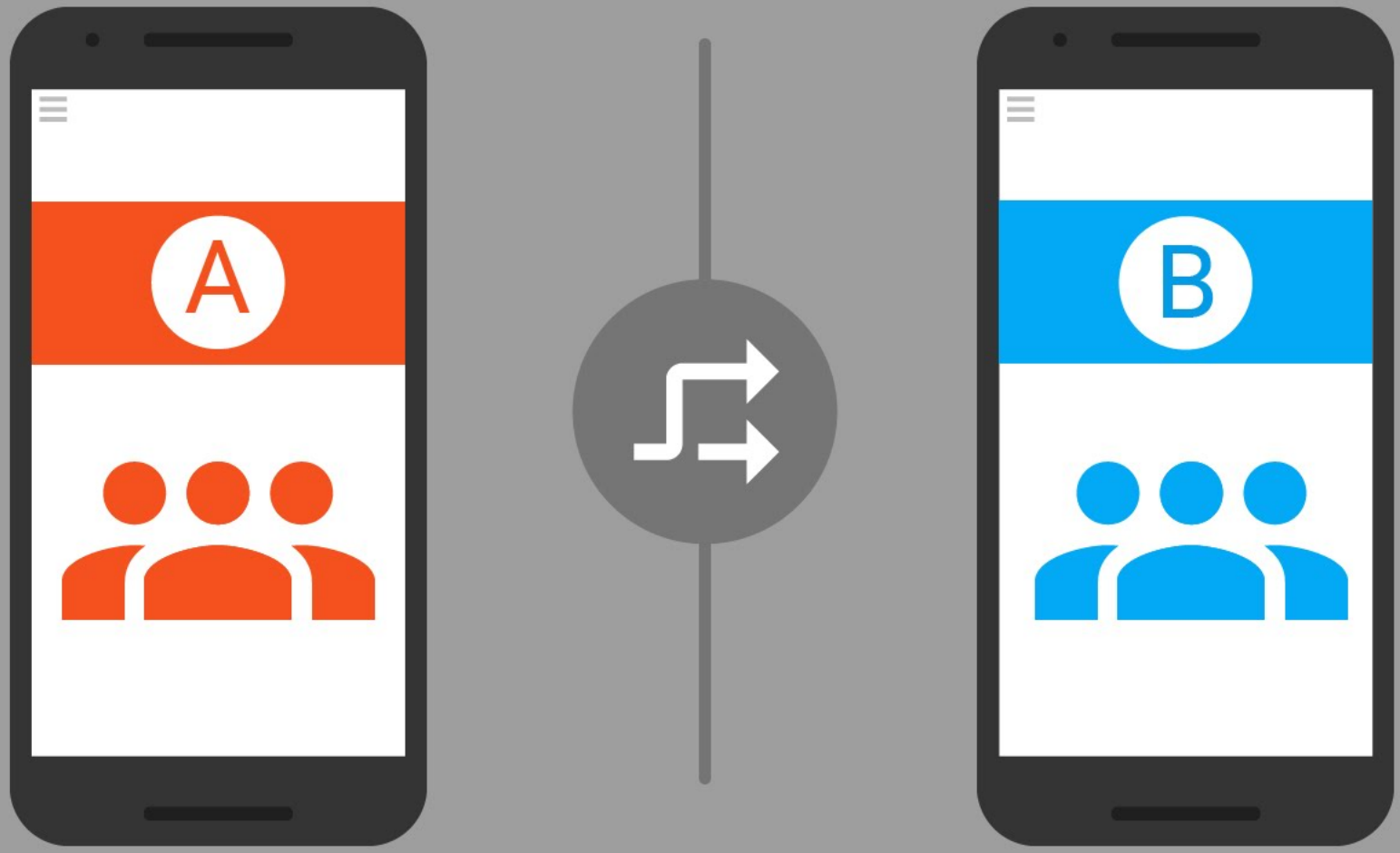
Default
Deployment history
Status
Time:
Deploy
Files
Waiting for your first deploy
INSTRUCTIONS

Pricing

Products	Spark Plan Generous limits for hobbyists Free	Flame Plan Fixed pricing for growing apps $25/month	Blaze Plan Calculate pricing for apps at scale Pay as you go
Free Products Authentication (except Phone Auth), Analytics, App Indexing, Dynamic Links, Invites, Remote Config, Cloud Messaging (FCM), Performance Monitoring, and Crash Reporting.	✓ Included	✓ Included Free	✓ Included Free
Hosting			
GB stored	1 GB	10 GB	$0.026/GB
GB transferred	10 GB/month	50 GB/month	$0.15/GB
Custom domain & SSL	✓	✓	✓



Remote Config

Update your App without actually updating it

Remote Config

- Change behavior and config without app update.
- Set in-app default values that app uses to work.
- Override these values from firebase console when app is published.
- Change configuration on the fly.
- Change configuration based on condition. Ideal for A/B testing

Customize Experience

- Create segments and customize experience
- Background = blue (default green) if
  - Country = India &&
  - OS Type = Android

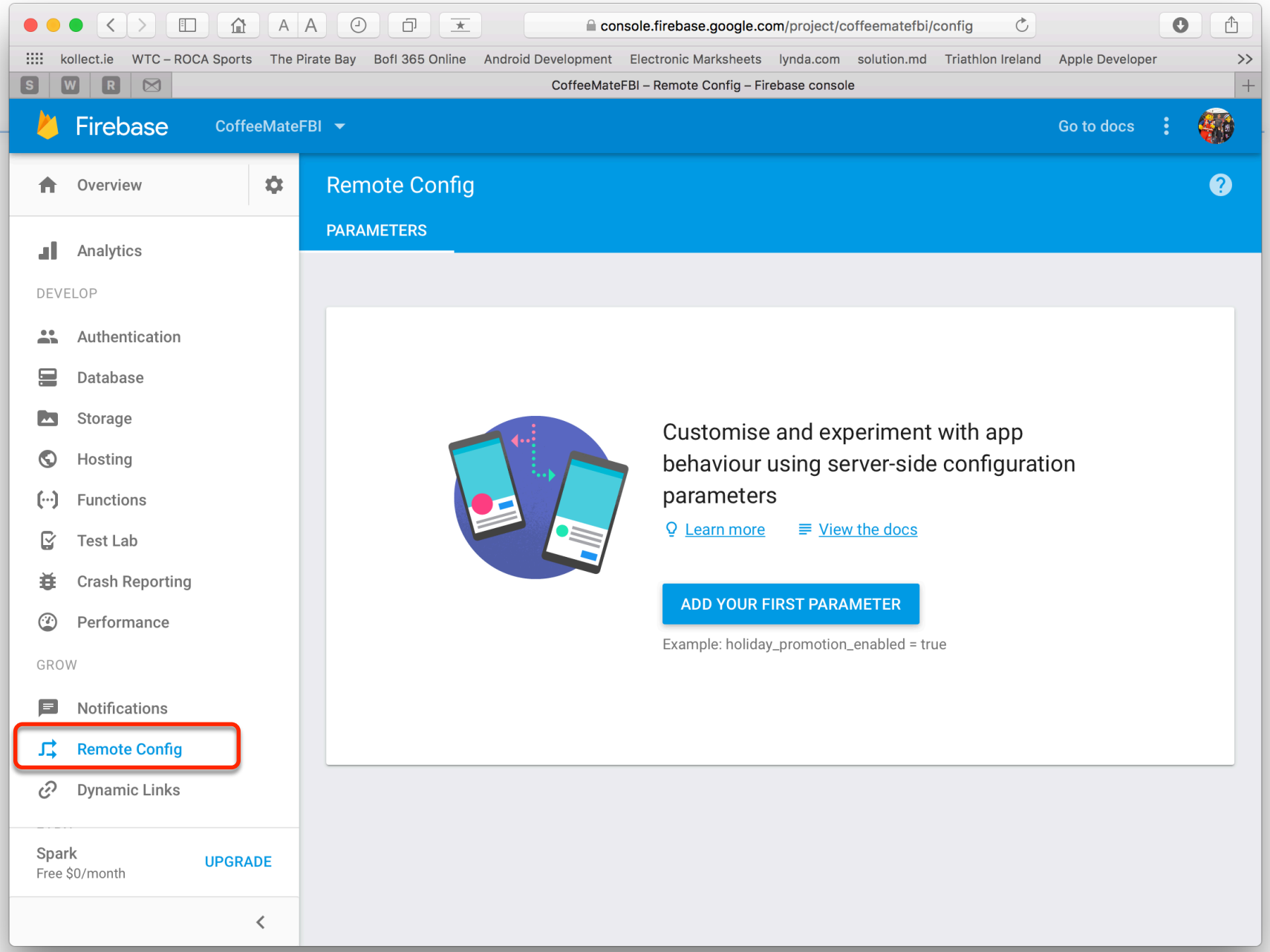
- Discount = 30% (default 5%) if
  - OS Type = iOS
  - Version = 2.3.0

The “2 Line Code” cliché

- Fetch parameters from remote config server
  - mFirebaseRemoteConfig.fetch(300).addOnCompleteListener(…)
- Make the fetched parameters available to your app
  - mFirebaseRemoteConfig.activateFetched();
- And all is done for your app

Remote Config

Quick DEMO… TBD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PARAMETERS
Customise and experiment with app behaviour using server-side configuration parameters
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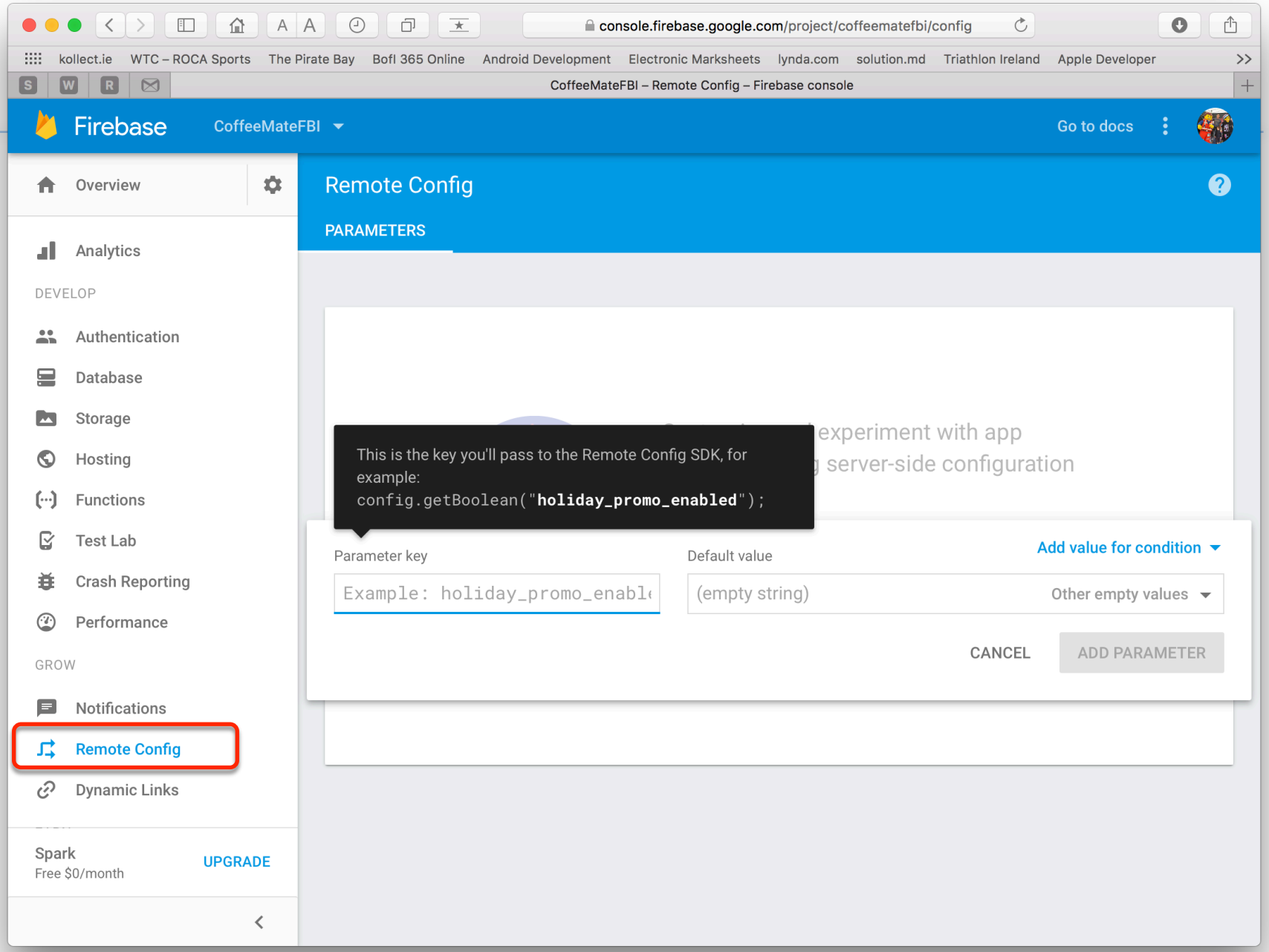
ADD YOUR FIRST PARAMETER
Example: holiday_promotion_enabled = true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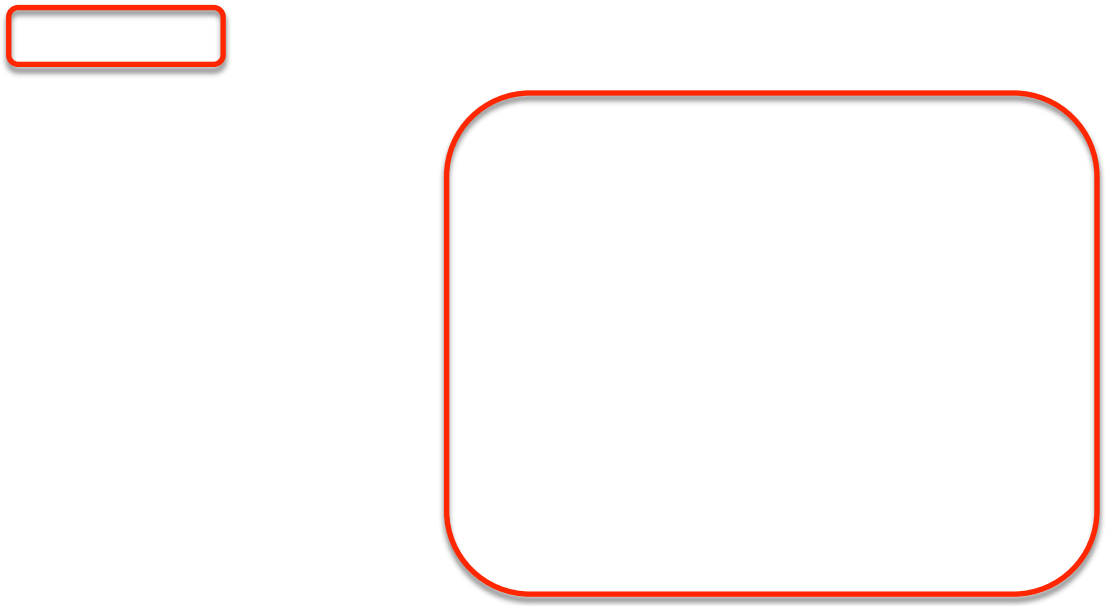
UPGRADE
Remote Config
PARAMETERS
experiment with app
server-side configuration
This is the key you'll pass to the Remote Config SDK, for example:
config.getBoolean("holiday_promo_enabled");
Parameter key
Example: holiday_promo_enabl
Default value
(empty string)
Other empty values
Add value for condition
CANCEL
ADD PARAMETER

FirebaseStorageEx App *



Crash Reporting

And finding the root cause

Crash Reporting

- Monitor fatal and non-fatal errors.
- Errors are grouped into clusters of similar stack traces.
- Find bug cause easily - Report consists of stack trace, device characteristics, performance etc.
- Enable email alerts to be notified of a new crash anytime.
- Integrate with analytics to find order of events that caused the crash.
- Seamless across android and iOS.

Implement Crash Reporting

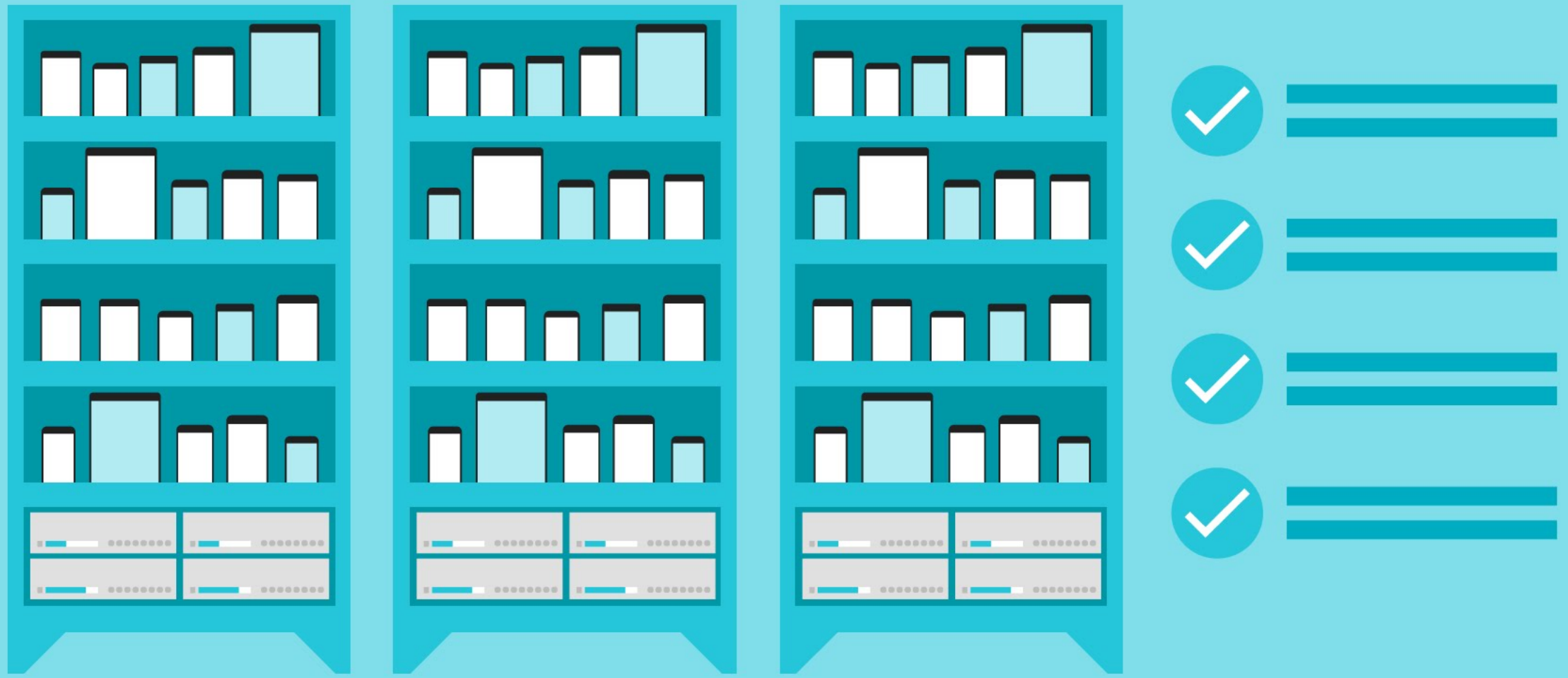
- Connect your app with firebase console.
- Add firebase dependency into gradle.
- Add custom logs wherever required.
  - FirebaseCrash.log("SQLite syntax error");
- Report server side errors with Google Stackdriver Error reporting.
- See console.

Crash reporting with proguard

- In proguarded apps the stack trace is not sufficient to identify the root cause.
- Usually we view the mapping files and try to make sense out of it.
- All of this is done by firebase. Just upload the mapping files and you will see meaningful stacktraces.

Demo

Stack trace in firebase console



Test Lab for Android

Test virtually on popular REAL devices

Firebase test lab for android

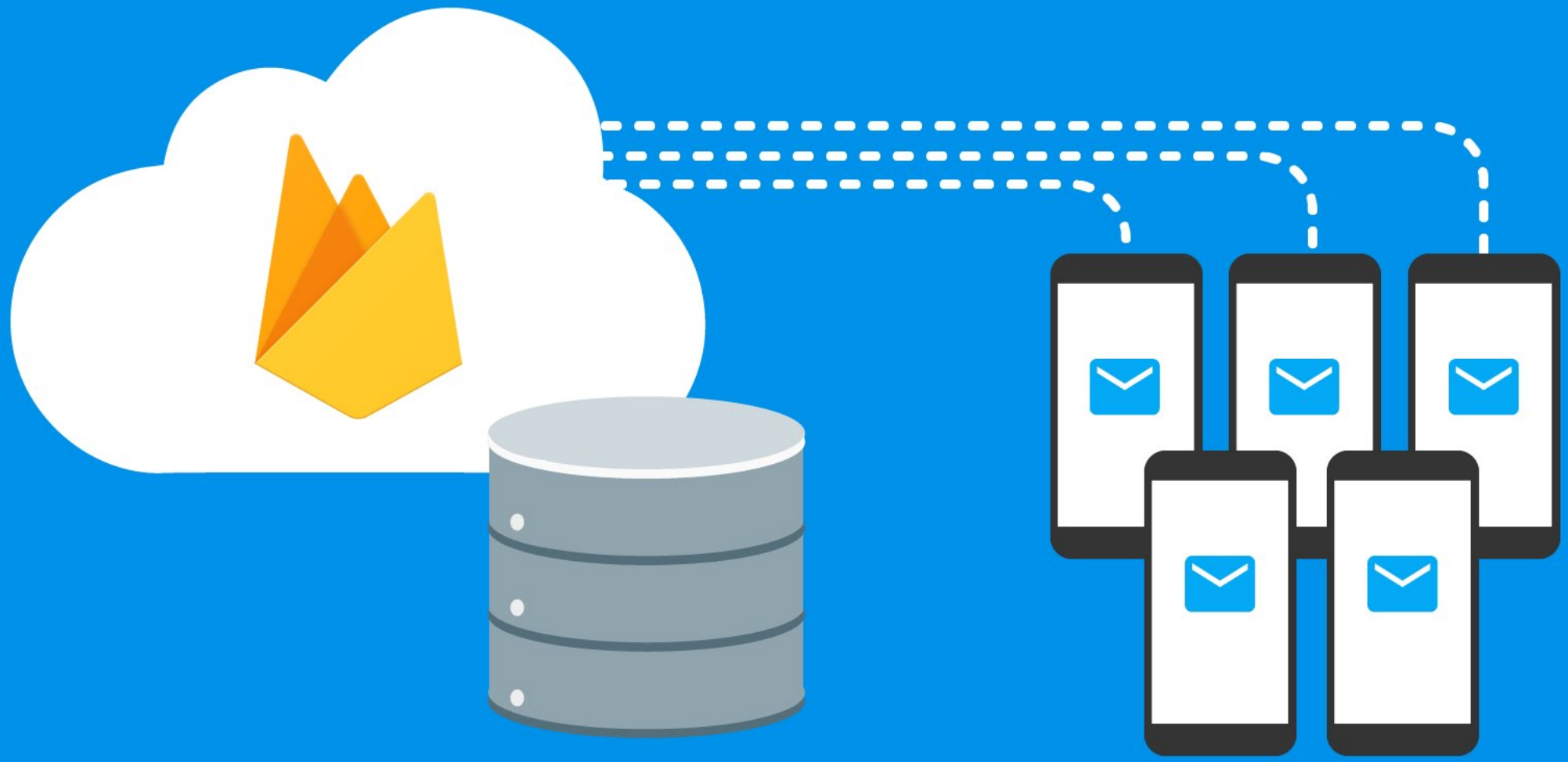
- Cloud based infrastructure for testing android apps.
- Test across variety of devices and device configurations.
- Test results include logs, videos and screenshots.
- Integrate with android studio and CI systems easily.

Demo

Show integration in android studio
Test lab results
Show video
Show logs

Pricing

		SPARK Free Generous limits for hobbyists	FLAME $25 per month Predictable pricing for growing apps	BLAZE Pay as you go Commodity pricing for apps at scale
Included Free Analytics, App Indexing, Authentication, Cloud Messaging, Crash Reporting, Dynamic Links, Invites, Notifications & Remote Config		✓	✓	✓
Test Lab	Daily quota or hourly rate	15 tests per day[3]	15 tests per day[3]	hourly, per device[4]



Cloud Messaging

The awesome user engagement and more

Firebase Cloud Messaging

- It is a cross-platform messaging solution that reliably delivers messages at no cost.
- Send notifications that are displayed to your user. Or send data messages which can be consumed by application code.
- Distribute messages to your client app in any of three ways — to single devices, to groups of devices, or to devices subscribed to topics.
- Send acknowledgments from devices back to your server over FCM's reliable and battery-efficient connection channel.
- 95% of the messages delivered in under 250 milliseconds.

How does FCM works?

FCM message structure

```
{
   "to" : "APA91bHun4MxP5egoKMwt2KZFBaFUH-1RYqx...",
   "notification" : {
         "body" : "great match!",
         "title" : "Portugal vs. Denmark",
         "icon" : "myicon"
         },
   "data" : {
         ”nick" : "Mario",
         ”room" : "PortugalVSDenmark"
         }
 }
```

Set up FCM with android app

gradel dependency : compile 'com.google.firebase:firebase-messaging:x.x.x'

A service that extends **FirebaseInstanceIdService** is required to handle the creation, rotation, and updation of registration tokens which is required to send the notification or message to specific devices or for creating device groups.

```
<service
    android:name=". MyFirebaseInstanceIDService">
    <intent-filter>
        <action android:name="com.google.firebase.INSTANCE_ID_EVENT"/>
    </intent-filter>
</service>
```

```
@Override
public void onTokenRefresh() {
        String refreshedToken = FirebaseInstanceId.getInstance().getToken();
        sendRegistrationToServer(refreshedToken);
}
```

Send FCM from firebase console

- Open the **Notifications** tab of the Firebase console and select **New Message**.
- Enter the message text.
- Select **Single Device** for the message target.
- In the field labeled **FCM Registration Token**, enter the registration token you obtained in a previous section of this guide.

Receive message

Manifest declaration:-

A service that extends **FirebaseMessagingService** is required if you want to do any message handling beyond receiving notifications on apps in the background.

To receive notifications in foregrounded apps, to receive data payload, to send upstream messages, and so on, you must extend this service.

```
<service
    android:name=".MyFirebaseMessagingService">
    <intent-filter>
        <action android:name="com.google.firebase.MESSAGING_EVENT"/>
    </intent-filter>
</service>
```

Receive a Message

- By overriding the method **onMessageReceived**, you can perform actions based on the received RemoteMessage object and get the message data:

```
@Override
public void onMessageReceived(RemoteMessage remoteMessage) {

    Log.d(TAG, "From: " + remoteMessage.getFrom());

    Log.d(TAG, "Message data payload: " + remoteMessage.getData());

    Log.d(TAG, "Message Notification Body: " +
remoteMessage.getNotification().getBody());

}
```

Topic messaging

Subscribe the client app to a topic:

```
FirebaseMessaging.getInstance().subscribeToTopic(“Golf");
```

HTTP POST request Send to a single topic:

URL: https://fcm.googleapis.com/fcm/send

```
{
        "to": "/topics/Golf",
        "data": {
                "message": “Woods made history!!",
        }
}
```

Topic messaging to multiple topics

Send to a multiple topic:

```
{
        "condition": "‘Golf' in topics || ‘Cricket' in topics",
        "data": {
                "message": “Subsidy worth $7mn allotted!"
        }
}
```

HTTP response:

```
//Success example:
{
        "message_id": "1023456"
}
```

Device group messaging

Before sending messages to a device group, you must:

- Obtain registration tokens for each device you want to add to the group.
- Create the notification_key, which identifies the device group by mapping a particular group (typically a user) to all of the group's associated registration tokens.
- To create a device group, send a POST request that provides a name for the group, and a list of registration tokens for the devices. FCM returns a new notification_key that represents the device group

Device group messaging

- HTTP post to : https://android.googleapis.com/gcm/notification

```
project_id:SENDER_ID

{
        "operation": "create",
        "notification_key_name": "appUser-Chris",
        "registration_ids": [”token1", ”token2", ….. ”token 9"]
}
```

- Response format

```
{
        "notification_key": "APA91bGHXQBB...9QgnYOEURwm0l3lmyqzk2TXQ“
}
```

Send an upstream message

To initiate an upstream message, the client app sends a request containing the following:

- The address of the receiving app server in the format **SENDER_ID@gcm.googleapis.com**.
- A **message ID** that should be unique for each sender ID.
- The message data comprising the key-value pairs of the message's payload.

```
FirebaseMessaging fm = FirebaseMessaging.getInstance();
fm.send(new RemoteMessage.Builder(SENDER_ID + "@gcm.googleapis.com")
        .setMessageId(Integer.toString(msgId.incrementAndGet()))
        .addData("my_message", "Hello World")
        .addData("my_action","SAY_HELLO")
        .build());
```

- Check the status of upstream messages with callbacks **onMessageSent** and **onSendError**.

Migrating from GCM

- In the Firebase console, select **Import Google Project.**
- All the permissions required by FCM are now added automatically by library.
- com.google.android.gms.gcm.GcmReceiver is already with FCM added automatically. No need to add in manifest.
- Remove registration.
- **GcmPubSub** methods have been integrated and simplified in the **FirebaseMessaging** class.

Dynamic Links

Works the way it's supposed to

Firebase Dynamic Links

- When users open a Dynamic Link into an app that is not installed, the app's Play Store page opens, where users can install the app. After users install and open the app, the app displays the deep-linked content.
- Dynamic Links work seamlessly across iOS, Android, and web apps.
- if your app needs to be upgraded to open a link, your app automatically opens the link (with appropriate content) after upgrading.
- Create short links using the Firebase console.
- Free, unlimited use.

Create a Dynamic Link

Gradle dependency: 'com.google.firebase:firebase-invites:x.x.x'

- In the Firebase Console, open the **Dynamic Links** section. Accept the terms of service if you are prompted to do so.
- Take note of your project's Dynamic Links domain, which is displayed at the top of the Dynamic Links page. You need your project's Dynamic Links domain to programmatically create Dynamic Links. **A Dynamic Links** domain looks like *app_code*.app.goo.gl.

You can also create a Dynamic Link programmatically by constructing a URL with the following form:

- https://*domain*/?link=*your_deep_link*&apn=*package_name*[&amv=*minimum_version*][&al=*android_link*][&afl=*fallback_link*]

Open Dynamic Links in your app

- you must call **getInvitation**() in every activity that might be launched by the link, even though the link might be available from the intent using getIntent().getData().

- Calling **getInvitation**() retrieves the link and clears that data so it is only processed once by your app.

```
intent-filter>
    <action android:name="android.intent.action.VIEW"/>
    <category android:name="android.intent.category.DEFAULT"/>
    <category android:name="android.intent.category.BROWSABLE"/>
    <data android:host="www.example.com" android:scheme="http"/>
    <data android:host="www.example.com" android:scheme="https"/>
</intent-filter>
```

Handle deep links

```
mGoogleApiClient = new GoogleApiClient.Builder(this).enableAutoManage(this, this)
        .addApi(AppInvite.API).build();

boolean autoLaunchDeepLink = false;
AppInvite.AppInviteApi.getInvitation(mGoogleApiClient, this, autoLaunchDeepLink)
        .setResultCallback(
            new ResultCallback<AppInviteInvitationResult>() {


                @Override
                public void onResult(@NonNull AppInviteInvitationResult result) {
                    if (result.getStatus().isSuccess()) {
                        Intent intent = result.getInvitationIntent();
                        String deepLink = AppInviteReferral.getDeepLink(intent);
                    }
                }
            });
```

App Indexing

Measure your Success

App Indexing

- Firebase App Indexing gets your app into Google Search.
- If users have your app installed, they can launch your app and go directly to the content they searched for.
- App Indexing re-engages your app users by helping them find both public and personal content right on their device, even offering query **auto completions** to help them more quickly find what they need.
- If users don't yet have your app, relevant queries trigger an install card for your app in Search results.

Gradle dependencies: compile 'com.google.firebase:firebase-appindexing:x.x.x'

Enable public content

1. Associate your site and your app

Associate your site with your app using **Digital Asset Link** and build your app against **API level 23** or higher for the Android platform.

Digital Asset Links take the form of a JSON file called **assetlinks.json** in your web server's well-known directory. Configure the following fields in your assetlinks.json file:

```
[{
    "relation": ["delegate_permission/common.handle_all_urls"],
    "target" : { "namespace": "android_app",
      "package_name": "com.recipe_app",
                "sha256_cert_fingerprints": ["hash_of_app_certificate"] }
  }]
```

Upload your **assetlinks.json** file and make sure the read access is set as visible to everyone at https://<yoursite>/.well-known/assetlinks.json.

Enable public content

2 . Route incoming links

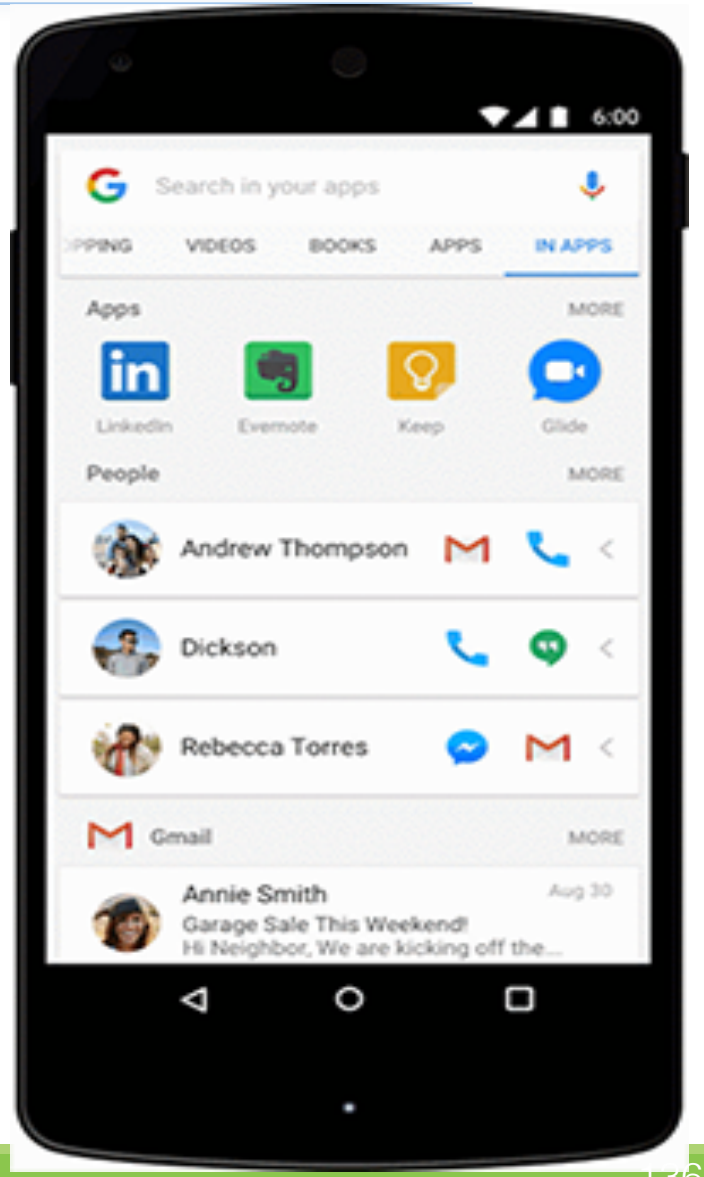
```
<activity
 android:name=".client.RecipeActivity"
<intent-filter android:label="@string/app_name" android:autoVerify="true">
        <action android:name="android.intent.action.VIEW" />
        <category android:name="android.intent.category.DEFAULT" />
        <category android:name="android.intent.category.BROWSABLE" />

        <data android:scheme="http"
        android:host="recipe-app.com"
        android:pathPrefix="/recipe" />
</intent-filter>
</activity>
```

Handle incoming URLs

```
Intent intent = getIntent();
String action = intent.getAction();
String data = intent.getDataString();
if (Intent.ACTION_VIEW.equals(action) && data != null)
{
        // process your link
        String recipeId = data.substring(data.lastIndexOf("/") + 1);
}
```

Enable Personal Content Indexing

- Create an IntentService.
- To include items in the app's personal content index, create Indexable objects in the same class.
- Set the unique URL and title for each indexable object through the setUrl() and setName() setters, respectively. **These properties are required.**
- To create your indexable objects more conveniently, use existing builders whenever possible (e.g., for messages, documents, and spreadsheets).
- For content types that don't have custom builders, use the generic Indexable.Builder().



Generate and refresh the index

- Use intent filters to add user's existing personal content to the on-device index and allow Google Play services to periodically call AppIndexingService to update the index

- With this periodic update, the on-device index accurately reflects any changes that happen to the indexed content over time.

```
<service android:name=".client.AppIndexingService"
  android:exported="true"
  android:permission="com.google.android.gms.permission.APPINDEXING">
  <intent-filter>
    <action android:name="com.google.firebase.appindexing.UPDATE_INDEX" />
  </intent-filter>
</service>
```

Remove/update the personal content

```
FirebaseAppIndex.getInstance().remove(noteUrl);
FirebaseAppIndex.getInstance().update(noteUrl);
FirebaseAppIndex.getInstance().removeAll();
```

Define Indexable objects for the following types of content:

- Content that's important to users, such as favorites or content that they may want to access more frequently. For example, documents or songs that they've bookmarked or marked for offline use.

- Content generated in your app, not just accessed by it. For example, contacts that are created by users directly in your app, and stored by your app, not contacts from the phone's directory.

Analytics

Measure your Success

Thank you

Any questions?

Demo app available at
https://goo.gl/WBP5fR

Backup slides

Some important points

- Do not think RDBMS, think JSON. How data should be structured is very important.
- Firebase has a recycler view, that integrates with real time database smoothly without any listeners.
- Test lab which is available in paid plan (Blaze), is an amazing feature for testing your app on different real and virtual devices.
- Set developer mode to true when testing remote config.

Firebase Setup

Goodbye RDBMS…

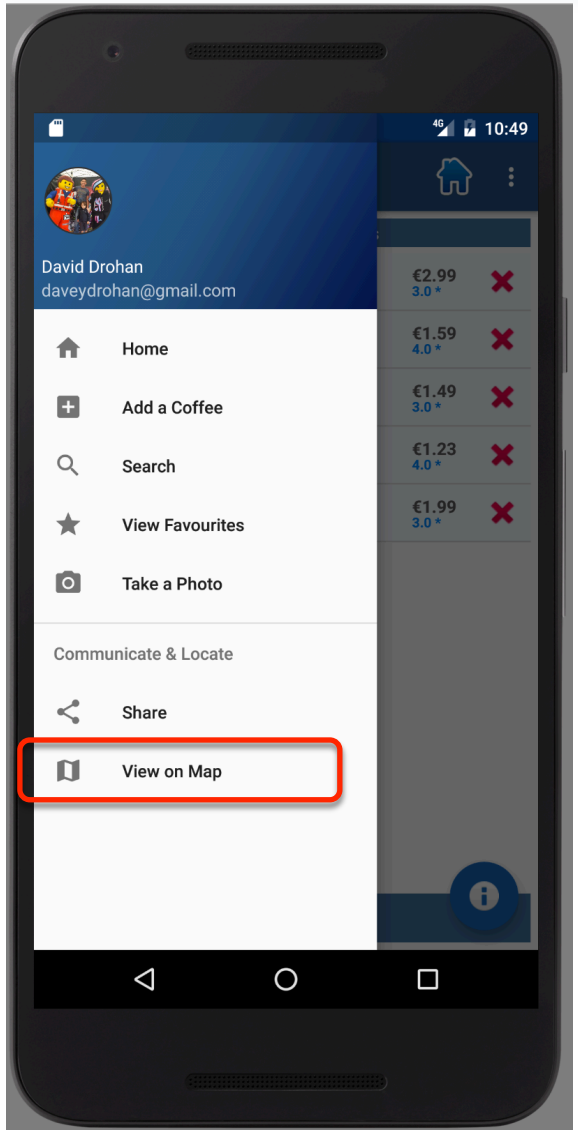
Adding Gradle Dependency

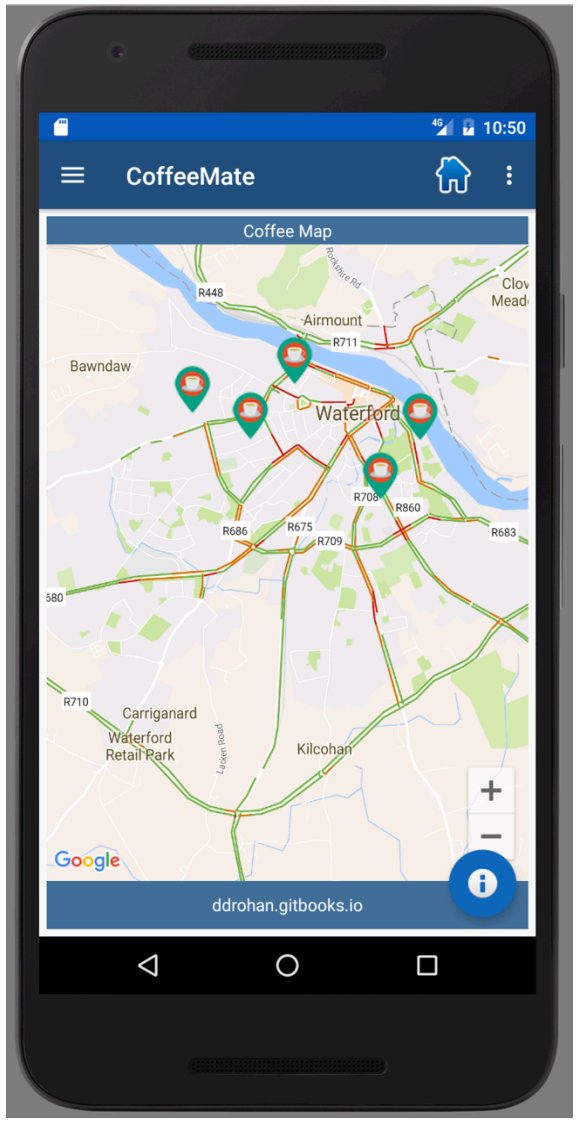
Add this in your app Gradle dependency

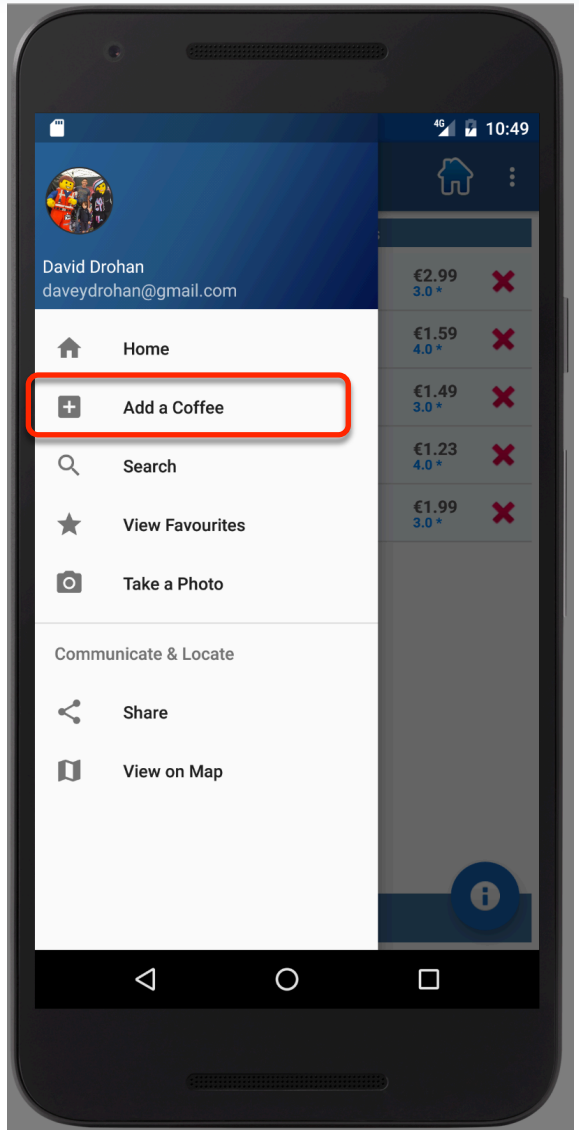
'com.google.firebase:firebase-database:X.X.X'

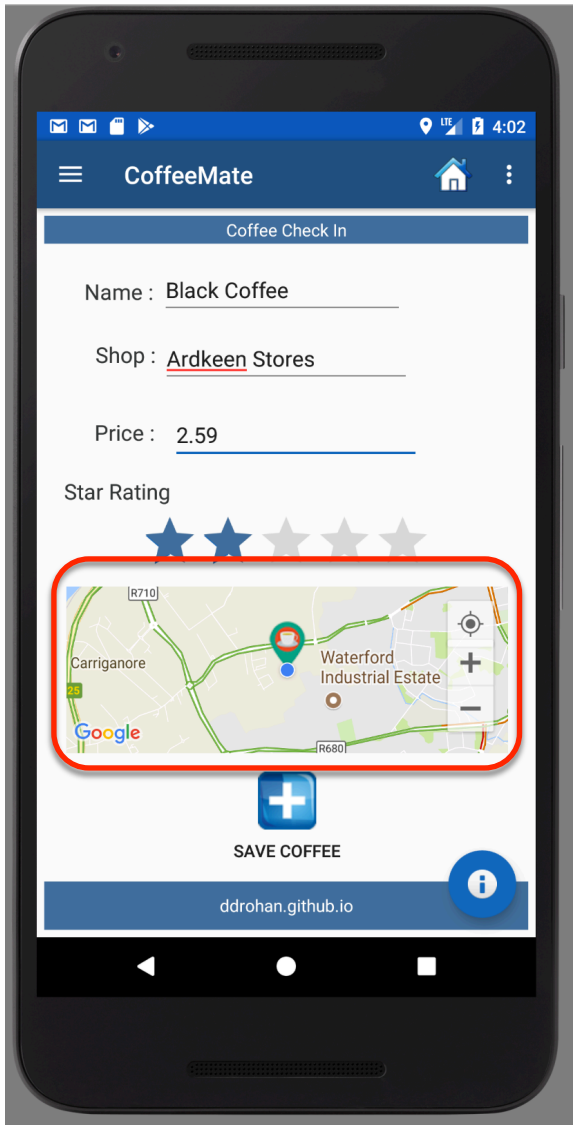
And sync the project

CoffeeMateFBI 1.0 *









References & Links

- Presentation by Kaushal Dhruw & Shakti Moyal 2016
- https://firebase.google.com

Questions?