

Mobile Application Development

Produced
by

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Android Persistence using Realm





Agenda & Goals

- ❑ Be aware of the different approaches to data persistence in Android Development
- ❑ Be able to work with the **SQLiteOpenHelper** & **SQLiteDatabase** classes to implement an SQLite database on an Android device (to manage our Coffees)
- ❑ Be able to work with **Realm** to implement a noSQL database on an Android device (again, to manage our Coffees)
- ❑ Be able to work with **SharedPreferences** to manage, for example, basic Login & Register screens



Data Storage Solutions *

❑ Shared Preferences

- Store private primitive data in key-value pairs.

❑ Internal Storage

- Store private data on the device memory.

❑ External Storage

- Store public data on the shared external storage.

❑ SQLite Databases

- Store structured data in a private database.

❑ Network Connection

- Store data on the web with your own network server.



Data Storage Solutions *

❑ Bundle Class

- A mapping from String values to various **Parcelable** types and functionally equivalent to a standard **Map**.
- Does not handle Back button scenario. App restarts from scratch with no saved data in that case.

❑ File

- Use **java.io.*** to read/write data on the device's internal storage.

❑ Realm Databases

- Store non-structured data in a private database.



realm

What is it?



What is Realm?

- ❑ Modern database written for mobile constraints
- ❑ Founded by Alexander Stigsen and Bjarne Christiansen (former Nokia emp.) and launched in 2014
- ❑ Available for Android and iOS (and others)
 - replacement for SQLite and/or Core Data
- ❑ Fast & Scalable
- ❑ Object-based
 - queries return objects & relationships to other objects
- ❑ Open Source
- ❑ Second most-deployed mobile database in the world (05/2018)



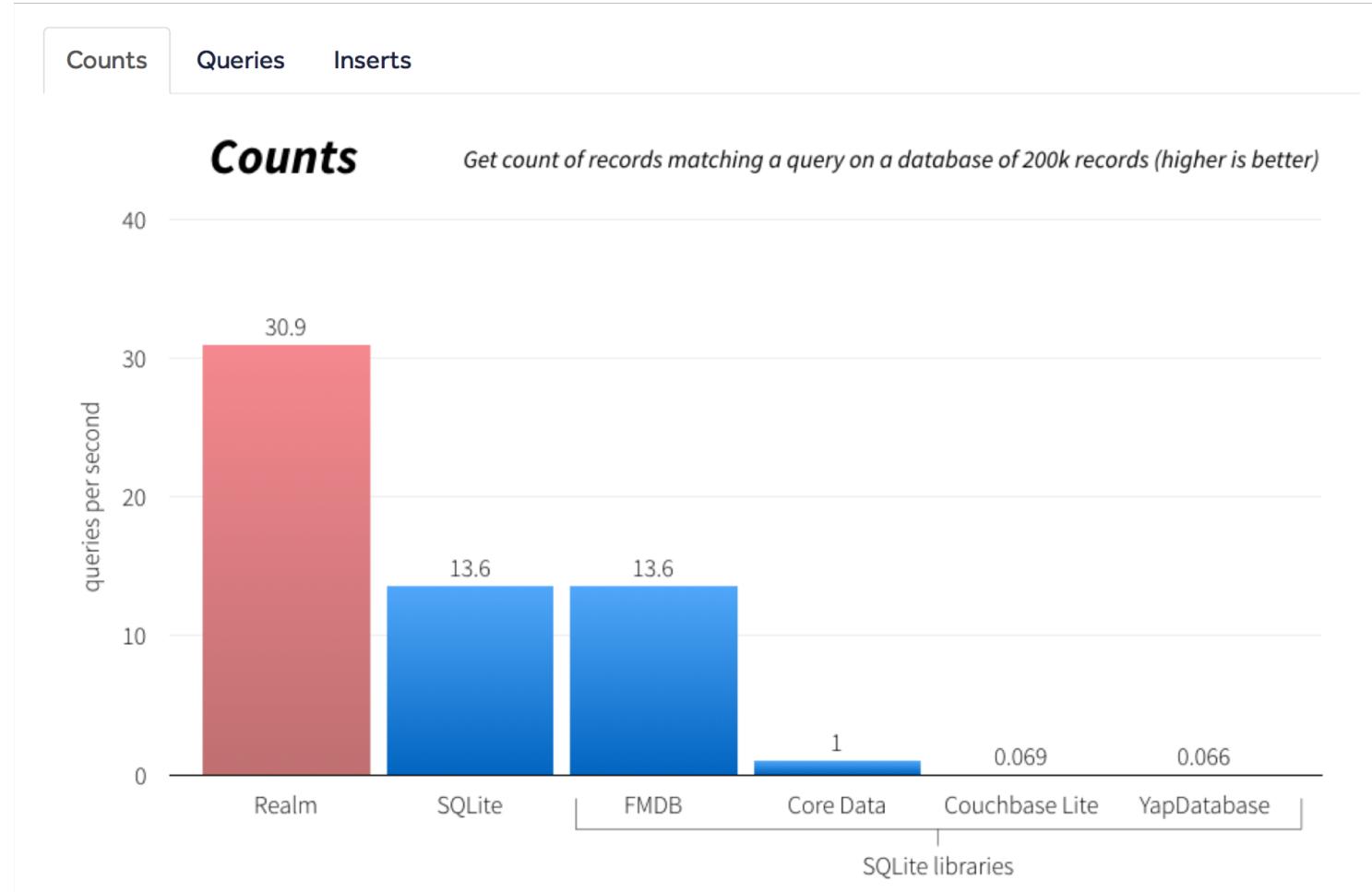
Why use it?

- Faster than SQLite (way faster...)
- Easy to use
- Object conversion
- It's free (for developers)
- Very good documentation and support
- Thread Safe
- Supports encryption



Why use it?

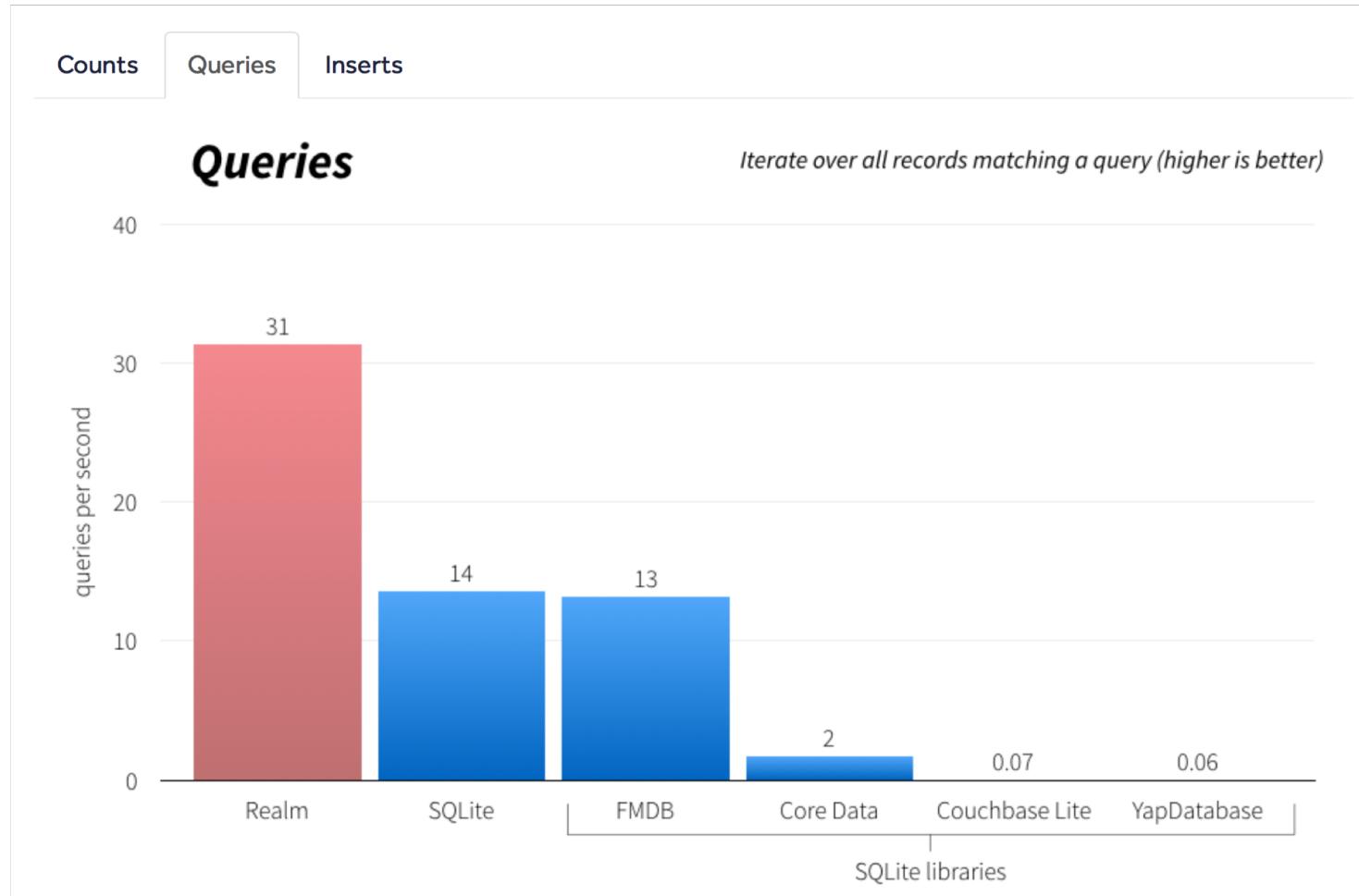
❑ Faster than SQLite (Counts)





Why use it?

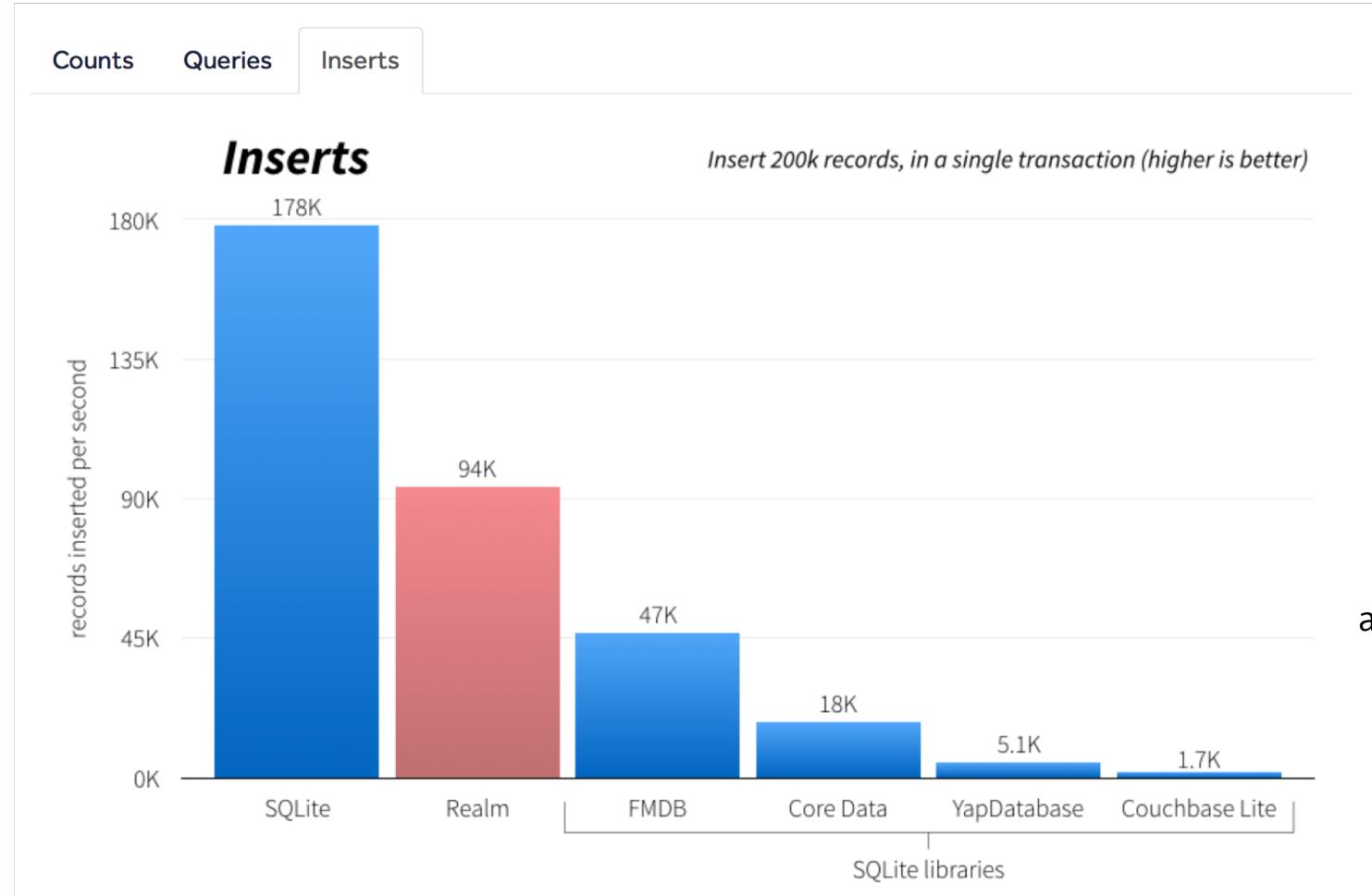
❑ Faster than SQLite (Queries)





Why use it?

❑ Faster than SQLite libraries (Inserts)





Why use it?

☐ Available in Multiple Languages (11/2018)

Report abuse

Realm

<https://realm.io> help@realm.io

Repositories 61 People 2 Projects 0

Pinned repositories

realm-object-server
Tracking of issues related to the Realm Object Server and other general issues not related to the specific SDK's

Shell 229 33

realm-cocoa
Realm is a mobile database: a replacement for Core Data & SQLite

Objective-C 12.7k 1.6k

realm-java
Realm is a mobile database: a replacement for SQLite & ORMs

Java 10.1k 1.6k

realm-js
Realm is a mobile database: an alternative to SQLite & key-value stores

JavaScript 3.2k 275

realm-dotnet
Realm is a mobile database: a replacement for SQLite & ORMs

C# 718 108

realm-core
Core database component for the Realm Mobile Database SDKs

C++ 682 57



Why use it?

amazon

Google

hipmunk

STARBUCKS

ebay

REI
co-op

NETFLIX

intel

HYATT

BBC

GoPro

SAP

L'ORÉAL

adidas

Alibaba

M

AVIS

Dropbox

cisco

Walmart

Virgin

NIKKEI

IBM

LINE

intuit

Budweiser

Nike

zynga

SoftBank

SIEMENS

RITE
AID

SONY

zincar

AstraZeneca

NHK

imaur



Why use it?

❑ Suitable for common Mobile Database Use Cases like...

- Local Storage
 - ◆ Ex: grocery list, health tracker, coffees list
- Cache for remote data
 - ◆ Ex: search history, coffees on a server
- Pre-loaded Data
 - ◆ Ex: Recipe book, trivia game, dummy coffees



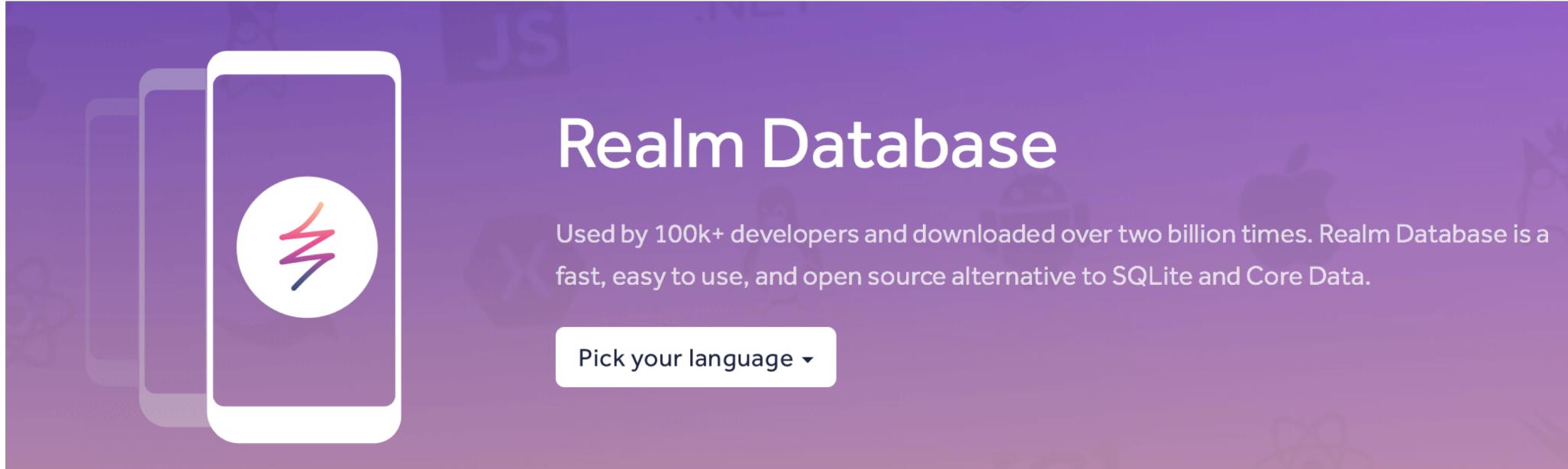
Why use it?

❑ Suitable for common Mobile Database Use Cases

- Local Storage
 - ◆ define your objects, save them in 3 lines of code, from anywhere (thread independent)
- Cache for remote data
 - ◆ instantiate objects from NSDictionary (iOS), easy insert-or-update methods (using primary keys)
- Pre-loaded Data
 - ◆ Realm files are small, migrating schema (making changes to your db objects) is easy



Why use it? (their Promo stuff ☺)



The image shows a screenshot of the Realm Database landing page. The background is purple with a faint watermark of a person holding a smartphone. On the left, there's a white smartphone icon with a red and white circular logo on its screen. To the right of the phone, the text "Realm Database" is displayed in large white letters. Below that, a subtitle reads: "Used by 100k+ developers and downloaded over two billion times. Realm Database is a fast, easy to use, and open source alternative to SQLite and Core Data." At the bottom, there's a white button with the text "Pick your language ▾".

Realm Database

Used by 100k+ developers and downloaded over two billion times. Realm Database is a fast, easy to use, and open source alternative to SQLite and Core Data.

Pick your language ▾



Why use it?

Realm Platform

The new standard in data synchronization providing you the most flexible mobile app solution

[Get Started Now ▾](#)

[Compare Platform Plans](#) or see [Realm Database](#)

A diagram illustrating data synchronization. On the left, a white smartphone icon contains a blue circular profile icon. To the right of the phone is a large blue cloud icon containing a white cylinder icon representing a database. Two green arrows point from the phone to the cloud: one arrow points upwards and another points downwards, indicating bidirectional data flow. Between the phone and the cloud is a small white padlock icon, symbolizing security.



Why use it?



Offline-First is the new standard

With Realm Platform's "live object" approach and embedded database, your apps can deliver a great experience — with or without a signal. Realm's realtime sync functionality ensures that data is accessible and conflicts are resolved when signal connectivity is restored.

[Read the white paper](#)



Why use it?

Mobilize your legacy databases (SQL, Postgress, Core Data, etc)

Your app's data is stuck inside existing databases that pre-date the realtime demands of modern mobile apps. Realm's data middleware enables you to automatically handle two-way data sync between legacy systems and your app.

[Watch the Webinar](#)





Why use it?



Don't let your REST APIs bog you down.

Use Realm as a "RESTless" middleware layer. Connect your endpoints to as many services you need, easily scale as your apps grow, and with no client-side networking or serialization code to maintain, your team can focus on more important things.

[Read the white paper](#)



Why use it?

Your users wait less with realtime sync.

With Realm's realtime data sync, you can drastically improve your app's performance and keep users happy with reactive apps that always feel "alive. Data as objects means that data changes are synced across all clients and the server — no serialization or networking code required.

[Read the white paper](#)





Why use it?



The diagram illustrates edge computing architecture. It features a central purple cylinder with a lightning bolt symbol, representing a database or storage unit, positioned inside a grey rectangular frame that looks like a server rack. Dashed purple lines connect this central unit to a separate icon below it, which depicts a smartphone screen displaying a list of items, representing a user interface or client device.

Bring the server closer to your users with edge computing

Edge computing capacity enables you to cache or handle data anywhere — on the server or device, or anywhere in between. The Realm Platform quickly adds data sync, conflict resolution, and event handling into your architecture.

[Contact us to learn more](#)

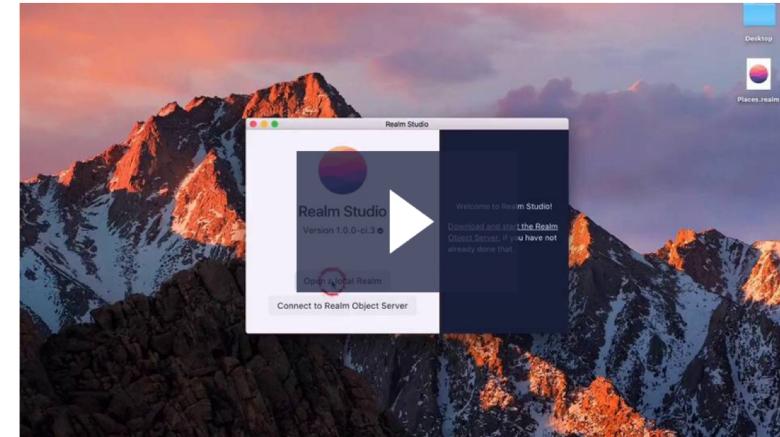


Why use it?

Realm Studio

Realm Studio is our premiere developer tool, built so you can easily manage the Realm Database and Realm Platform. With Realm Studio, you can open and edit local and synced Realms, and administer any Realm Object Server instance. Download it now on macOS, Windows, or Linux.

[Download Realm Studio](#)





What is a Realm??

- ❑ A Realm is an instance of a Realm Mobile Database container. Realms can be *local* or *synchronized*.
- ❑ A [synchronized Realm](#) uses the Realm Object Server to transparently synchronize its contents with other devices. While your application continues working with a synchronized Realm as if it's a local file, the data in that Realm might be updated by any device with write access to that Realm.
- ❑ In practice, your application works with any Realm, local or synchronized, the same way, although opening a synchronized Realm requires a [User](#) that's been [authenticated](#) to the Object Server and that's [authorized](#) to open that Realm.



realm

How Does it work?



How it Works – Configuration/Installation

- Step 1: Add the following class path dependency to the project level build.gradle file.

```
dependencies {  
    classpath 'com.android.tools.build:gradle:3.2.1'  
    classpath "io.realm:realm-gradle-plugin:5.8.0"
```

- Step 2: Apply the realm-android plugin to the top of application level build.gradle file

```
apply plugin: 'com.android.application'  
apply plugin: 'realm-android'
```



How it Works - Models

- ❑ Create Realm models by extending the `RealmObject` base class:

```
// Define your model class by extending RealmObject
public class Dog extends RealmObject {
    private String name;
    private int age;

    // ... Generated getters and setters ...
}

public class Person extends RealmObject {
    @PrimaryKey
    private long id;
    private String name;
    private RealmList<Dog> dogs; // Declare one-to-many relationships

    // ... Generated getters and setters ...
}
```

```
// Use them like regular java objects
Dog dog = new Dog();
dog.setName("Rex");
dog.setAge(1);
```

- ❑ A Realm Model Class supports `public`, `protected` and `private` fields, as well as custom methods.



How it Works – Initializing & Opening Realms

- ❑ Before you can use a Realm in your app, you must initialize it. This only has to be done once.

```
// Initialize Realm (just once per application)
Realm.init(context);

// Get a Realm instance for this thread
Realm realm = Realm.getDefaultInstance();
```

- ❑ The `getDefaultInstance` method instantiates the Realm with a default `RealmConfiguration`. (next slide)
- ❑ We'll put this code in our `DBManager` Class, but could easily be placed in an Application Object, or even a Base Activity.



How it Works – Configuring a Realm

- To control how Realms are created, use a **RealmConfiguration** object. The minimal configuration usable by Realm is:

```
RealmConfiguration config = new RealmConfiguration.Builder().build();
```

- That configuration—with no options—uses the Realm file '`default.realm`' located in **Context.getFilesDir**.



How it Works – Configuring a Realm

- ❑ To use another configuration, you would create a new **RealmConfiguration** object:

```
// The RealmConfiguration is created using the builder pattern.  
// The Realm file will be located in Context.getFilesDir() with name "myrealm.realm"  
RealmConfiguration config = new RealmConfiguration.Builder()  
    .name("myrealm.realm")  
    .encryptionKey(getKey())  
    .schemaVersion(42)  
    .modules(new MySchemaModule())  
    .migration(new MyMigration())  
    .build();  
// Use the config  
Realm realm = Realm.getInstance(config);
```



How it Works – Configuring a Realm

- You can have multiple **RealmConfiguration** objects, so you can control the version, schema and location of each Realm independently.

```
RealmConfiguration myConfig = new RealmConfiguration.Builder()  
    .name("myrealm.realm")  
    .schemaVersion(2)  
    .modules(new MyCustomSchema())  
    .build();  
  
RealmConfiguration otherConfig = new RealmConfiguration.Builder()  
    .name("otherrealm.realm")  
    .schemaVersion(5)  
    .modules(new MyOtherSchema())  
    .build();  
  
Realm myRealm = Realm.getInstance(myConfig);  
Realm otherRealm = Realm.getInstance(otherConfig);
```



How it Works – Query Your Realm

- ❑ Executing queries on your Realm is very straight forward, for example :

```
// Query Realm for all dogs younger than 2 years old
final RealmResults<Dog> puppies = realm.where(Dog.class).lessThan("age", 2).findAll();
puppies.size(); // => 0 because no dogs have been added to the Realm yet
```

- ❑ There are numerous ‘clauses’ available for querying your data. For full details, dive into the RealmQuery API reference.

- `between()`, `greaterThan()`, `lessThan()`, `greaterThanOrEqualTo() & lessThanOrEqualTo()`
- `equalTo()` & `notEqualTo()`
- `contains()`, `beginsWith()` & `endsWith()`
- `isNull()` & `isNotNull()`
- `isEmpty()` & `isNotEmpty()`



How it Works – Query Your Realm

- To find all users named John or Peter, you would write:

```
// Build the query looking at all users:  
RealmQuery<User> query = realm.where(User.class);  
  
// Add query conditions:  
query.equalTo("name", "John");  
query.or().equalTo("name", "Peter");  
  
// Execute the query:  
RealmResults<User> result1 = query.findAll();  
  
// Or alternatively do the same all at once (the "Fluent interface"):  
RealmResults<User> result2 = realm.where(User.class)  
        .equalTo("name", "John")  
        .or()  
        .equalTo("name", "Peter")  
        .findAll();
```



How it Works – Adding to Your Realm *

- ❑ Inserting data into your Realm is just as easy, for example :

```
// Persist your data in a transaction
realm.beginTransaction();
final Dog managedDog = realm.copyToRealm(dog); // Persist unmanaged objects
Person person = realm.createObject(Person.class); // Create managed objects directly
person.getDogs().add(managedDog);
realm.commitTransaction();
```

- ❑ You can either
 - Persist ‘unmanaged’ objects or
 - Create ‘managed objects



How it Works – Auto-updating Objects *

- ❑ **RealmObjects** are live, auto-updating views into the underlying data; you never have to refresh objects.
- ❑ Changes to objects are instantly reflected in query results.

```
realm.executeTransaction(new Realm.Transaction() {  
    @Override  
    public void execute(Realm realm) {  
        Dog myDog = realm.createObject(Dog.class);  
        myDog.setName("Fido");  
        myDog.setAge(1);  
    }  
});  
Dog myDog = realm.where(Dog.class).equalTo("age", 1).findFirst();  
  
realm.executeTransaction(new Realm.Transaction() {  
    @Override  
    public void execute(Realm realm) {  
        Dog myPuppy = realm.where(Dog.class).equalTo("age", 1).findFirst();  
        myPuppy.setAge(2);  
    }  
});  
myDog.getAge(); // => 2
```



How it Works – Auto-updating Objects

- This not only keeps Realm fast and efficient, it allows your code to be simpler and more reactive.
- If your Activity or Fragment is dependent on a specific **RealmObject** or **RealmResults** instance, you don't need worry about refreshing or re-fetching it before updating the UI.
- You can subscribe to [Realm notifications](#) to know when Realm data is updated.



How it Works – Adapters

- ❑ Realm offers abstract utility classes to help bind data coming from **OrderedRealmCollections** (both **RealmResults** and **RealmList** implement this interface) to standard UI widgets.
 - Use **RealmBaseAdapter** with **ListView**.
 - Use **RealmRecyclerViewAdapter** with **RecyclerView**.
- ❑ To use the adapters, add the following dependency to the application level build.gradle:

```
implementation 'io.realm:android-adapters:2.1.1'
```



Other Notable Features

- ❑ Sorting
- ❑ Chaining Queries
- ❑ Filtering
- ❑ ChangeListeners
- ❑ Transaction Blocks
- ❑ Asynchronous Transactions
- ❑ 1-N, N-M & Inverse Relationships
- ❑ Read-Only, In-memory Realms



Current Limitations (11/2018)

- ❑ Realm aims to strike a balance between flexibility and performance. In order to accomplish this goal, realistic limits are imposed on various aspects of storing information in a Realm. For example:
 - The upper limit of class names is 57 characters. Realm Java prepends class_ to all names, and the browser will show it as part of the name.
 - The length of field names has a upper limit of 63 character.
 - It is not possible to have two model classes with the same name in different packages.
 - Nested transactions are not supported, and an exception is thrown if they are detected.
 - Strings and byte arrays (byte[]) cannot be larger than 16 MB.
 - Realm models have no support for final and volatile fields. This is mainly to avoid discrepancies between how an object would behave as managed by Realm or unmanaged.
 - **If a custom constructor is provided, a public no-arg constructor must also be present.**
 - Realm model classes are not allowed to extend any other class than RealmObject.



<https://realm.io/docs/java/latest/>



realm

Compare & Contrast CoffeeMate





Database Setup & Connection *

❑ SQLite

```
public class DBManager {  
  
    private SQLiteDatabase database;  
    private DBDesigner dbHelper;  
  
    public DBManager(Context context) {  
        dbHelper = new DBDesigner(context);  
    }
```

```
public class DBDesigner extends SQLiteOpenHelper {  
  
    private static final String DATABASE_NAME = "coffeemate.db";  
    private static final int DATABASE_VERSION = 1;  
    private static final String CREATE_TABLE_COFFEE = "create table table_coffee"  
        + " ( coffeeid integer primary key autoincrement,  
        + "coffeename text not null,"  
        + "shop text not null,"  
        + "price double not null,"  
        + "rating double not null,"  
        + "favourite integer not null);";  
  
    public DBDesigner(Context context) {  
        super(context, DATABASE_NAME, null, DATABASE_VERSION);  
    }  
  
    @Override  
    public void onCreate(SQLiteDatabase database) {  
        database.execSQL(CREATE_TABLE_COFFEE);  
    }  
  
    @Override  
    public void onUpgrade(SQLiteDatabase db, int oldVersion, int newVersion) {  
        Log.w(DBDesigner.class.getName(),  
            "Upgrading database from version " + oldVersion + " to "  
                + newVersion + ", which will destroy all old data");  
        db.execSQL("DROP TABLE IF EXISTS table_coffee");  
        onCreate(db);  
    }  
}
```

❑ Realm

```
public class DBManager {  
  
    public Realm realmDatabase;  
  
    public DBManager(Context context) {  
        Realm.init(context);  
  
        RealmConfiguration config = new RealmConfiguration.Builder()  
            .name("coffees.realm")  
            .schemaVersion(1)  
            .build();  
  
        Realm.setDefaultConfiguration(config);  
    }
```



Database Setup & Connection

❑ SQLite

```
public void open() throws SQLException {  
    database = dbHelper.getWritableDatabase();  
}
```

❑ Realm

```
public void open() {  
    realmDatabase = Realm.getDefaultInstance();  
}
```



Create Your Model

❑ SQLite

```
public class Coffee implements Serializable
{
    public int coffeeId;
    public String coffeeName;
    public String shop;
    public double rating;
    public double price;
    public boolean favourite;

    public Coffee() {}

    public Coffee(String name, String shop, double rating, double price, boolean fav)
    {
        //this.coffeeId = UUID.randomUUID().toString();
        this.coffeeName = name;
        this.shop = shop;
        this.rating = rating;
        this.price = price;
        this.favourite = fav;
    }

    @Override
    public String toString() {
        return coffeeId + " " + coffeeName + ", " + shop + ", " + rating
               + ", " + price + ", fav =" + favourite;
    }
}
```



Create Your Model *

☐ Realm

```
public class Coffee extends RealmObject
{
    @PrimaryKey
    public String coffeeId;
    public String name;
    public String shop;
    public double rating;
    public double price;
    public boolean favourite;

    public Coffee() {}

    public Coffee(String name, String shop, double rating, double price, boolean fav)
    {
        this.coffeeId = UUID.randomUUID().toString();
        this.name = name;
        this.shop = shop;
        this.rating = rating;
        this.price = price;
        this.favourite = fav;
    }

    @Override
    public String toString()
    {
        return "Coffee [name=" + name
               + ", shop =" + shop + ", rating=" + rating + ", price=" + price
               + ", fav =" + favourite + "]";
    }
}
```

No args Constructor

Universal Unique IDentifier



Create Your Schema

SQLite

```
public class DBDesigner extends SQLiteOpenHelper
{
    private static final String DATABASE_NAME = "coffeemate.db";
    private static final int DATABASE_VERSION = 1;
    private static final String CREATE_TABLE_COFFEE = "create table table_coffee"
        + " ( coffeeid integer primary key autoincrement, "
        + "coffeename text not null,"
        + "shop text not null,"
        + "price double not null,"
        + "rating double not null,"
        + "favourite integer not null);";

    public DBDesigner(Context context) {
        super(context, DATABASE_NAME, null, DATABASE_VERSION);
    }

    @Override
    public void onCreate(SQLiteDatabase database) {
        database.execSQL(CREATE_TABLE_COFFEE);
    }

    @Override
    public void onUpgrade(SQLiteDatabase db, int oldVersion, int newVersion) {
        Log.w(DBDesigner.class.getName(),
                "Upgrading database from version " + oldVersion + " to "
                + newVersion + ", which will destroy all old data");
        db.execSQL("DROP TABLE IF EXISTS table_coffee");
        onCreate(db);
    }
}
```



Create Your Schema

Realm

Your Model *IS* your Schema



Reading Data *

□ SQLite

```
public List<Coffee> getAll() {  
    List<Coffee> coffees = new ArrayList<~>();  
    Cursor cursor = database.rawQuery("SELECT * FROM table_coffee", null);  
    cursor.moveToFirst();  
    while (!cursor.isAfterLast()) {  
        coffees.add(toCoffee(cursor));  
        cursor.moveToNext();  
    }  
    cursor.close();  
    return coffees;  
}
```

```
private Coffee toCoffee(Cursor cursor) {  
    Coffee pojo = new Coffee();  
    pojo.coffeeId = cursor.getInt(0);  
    pojo.name = cursor.getString(1);  
    pojo.shop = cursor.getString(2);  
    pojo.price = cursor.getDouble(3);  
    pojo.rating = cursor.getDouble(4);  
    pojo.favourite = cursor.getInt(5) == 1 ? true : false;  
  
    return pojo;  
}
```

□ Realm

```
public RealmResults<Coffee> getAll() {  
    RealmResults<Coffee> result = realmDatabase.where(Coffee.class)  
        .findAll();  
    return result;  
}
```



Reading Data *

❑ SQLite

```
public List<Coffee> getFavourites() {  
    List<Coffee> coffees = new ArrayList<>();  
    Cursor cursor = database.rawQuery("SELECT * FROM table_coffee"  
        + " WHERE favourite = 1", null);  
    cursor.moveToFirst();  
    while (!cursor.isAfterLast()) {  
        coffees.add(toCoffee(cursor));  
        cursor.moveToNext();  
    }  
    cursor.close();  
    return coffees;  
}
```

❑ Realm

```
public RealmResults<Coffee> getFavourites() {  
    return realmDatabase.where(Coffee.class)  
        .equalTo(fieldName: "favourite", value: true)  
        .findAll();  
}
```



Reading Data *

❑ SQLite

```
public Coffee get(int id) {  
    Coffee pojo = null;  
  
    Cursor cursor = database.rawQuery("SELECT * FROM table_coffee"  
        + " WHERE coffeeid = " + id, null);  
    cursor.moveToFirst();  
    while (!cursor.isAfterLast()) {  
        Coffee temp = toCoffee(cursor);  
        pojo = temp;  
        cursor.moveToNext();  
    }  
    cursor.close();  
    return pojo;  
}
```

❑ Realm

```
public Coffee get(String coffeeId) {  
    return realmDatabase.where(Coffee.class)  
        .equalTo(fieldName: "coffeeId", coffeeId)  
        .findAll()  
        .first();  
}
```



Writing Data *

❑ SQLite

```
public void insert(Coffee c) {  
    ContentValues values = new ContentValues();  
    values.put("coffeename", c.coffeeName);  
    values.put("shop", c.shop);  
    values.put("price", c.price);  
    values.put("rating", c.rating);  
    values.put("favourite", c.favourite == true ? 1 : 0);  
  
    database.insert("table_coffee", null, values);  
}
```

❑ Realm

```
public void insert(Coffee c) {  
    realmDatabase.beginTransaction();  
    realmDatabase.copyToRealm(c);  
    realmDatabase.commitTransaction();  
}
```



Updating Data *

❑ SQLite

```
public void update(Coffee c) {  
    ContentValues values = new ContentValues();  
    values.put("coffeename", c.coffeeName);  
    values.put("shop", c.shop);  
    values.put("price", c.price);  
    values.put("rating", c.rating);  
    values.put("favourite", c.favourite == true ? 1 : 0);  
  
    database.update("table_coffee", values,  
        "coffeeid = " + c.coffeeId, null);  
}
```

❑ Realm

```
public void update(Coffee c, String name ,String shop, double price , double rating)  
{  
    realmDatabase.beginTransaction();  
    c.name = name;  
    c.shop = shop;  
    c.price = price;  
    c.rating = rating;  
    realmDatabase.commitTransaction();  
}
```



Deleting Data *

❑ SQLite

```
public void delete(int id) {  
    Log.v("DB", "Coffee deleted with id: " + id);  
    database.delete("table_coffee", "coffeeid = " + id, null);  
}
```

❑ Realm

```
public void delete(String coffeeId) {  
    realmDatabase.beginTransaction();  
    realmDatabase.where(Coffee.class)  
        .equalTo(fieldName: "coffeeId", coffeeId)  
        .findAll()  
        .deleteAllFromRealm();  
    realmDatabase.commitTransaction();  
}
```

Filtering

SQLite

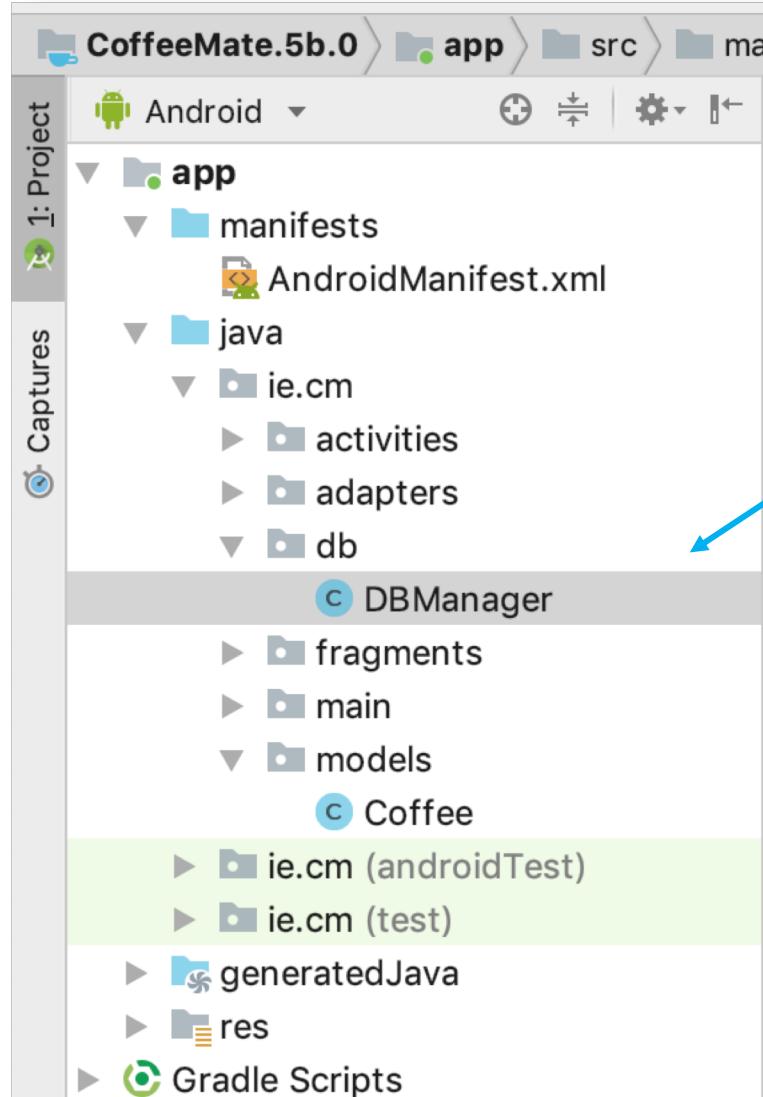
```
public class CoffeeFilter extends Filter {  
    private List<Coffee> originalCoffeeList;  
    private String filterText;  
    private CoffeeListAdapter adapter;  
  
    public CoffeeFilter(List<Coffee> originalCoffeeList, String filterText,  
                       CoffeeListAdapter adapter) {  
        super();  
        this.originalCoffeeList = originalCoffeeList;  
        this.filterText = filterText;  
        this.adapter = adapter;  
    }  
  
    public void setFilter(String filterText) {  
        this.filterText = filterText;  
    }  
  
    @Override  
    protected FilterResults performFiltering(CharSequence prefix) {  
        FilterResults results = new FilterResults();  
  
        if (originalCoffeeList == null) {  
            originalCoffeeList = new ArrayList<Coffee>();  
        }  
        if (prefix == null || prefix.length() == 0) {  
            List<Coffee> newCoffees = new ArrayList<~>();  
            if (filterText.equals("all")) {  
                results.values = originalCoffeeList;  
                results.count = originalCoffeeList.size();  
            } else {  
                if (filterText.equals("favourites")) {  
                    for (Coffee c : originalCoffeeList)  
                        if (c.favorite)  
                            newCoffees.add(c);  
                }  
                results.values = newCoffees;  
                results.count = newCoffees.size();  
            }  
        } else {  
            String prefixString = prefix.toString().toLowerCase();  
            final ArrayList<Coffee> newCoffees = new ArrayList<~>();  
  
            for (Coffee c : originalCoffeeList) {  
                final String itemName = c.name.toLowerCase();  
                if (itemName.contains(prefixString)) {  
                    if (filterText.equals("all"))  
                        newCoffees.add(c);  
                    } else if (c.favorite)  
                        newCoffees.add(c);  
                }  
            }  
            results.values = newCoffees;  
            results.count = newCoffees.size();  
        }  
        return results;  
    }  
  
    @SuppressWarnings("unchecked")  
    @Override  
    protected void publishResults(CharSequence prefix, FilterResults results) {  
        adapter.coffeeList = (ArrayList<Coffee>) results.values;  
  
        if (results.count >= 0)  
            adapter.notifyDataSetChanged();  
        else {  
            adapter.notifyDataSetInvalidated();  
            adapter.coffeeList = originalCoffeeList;  
        }  
    }  
}
```

Realm

```
public class CoffeeFilter extends Filter {  
    private OrderedRealmCollection<Coffee> originalCoffeeList;  
    private RealmResults<Coffee> realmCoffeResults;  
    private CoffeeListAdapter adapter;  
    private boolean favourites = false;  
    private DBManager dbManager;  
  
    public CoffeeFilter(DBManager dbManager, CoffeeListAdapter adapter) {  
        super();  
        this.dbManager = dbManager;  
        this.originalCoffeeList = dbManager.getAll();  
        this.adapter = adapter;  
    }  
  
    public void setFilter(String filterText) {  
        favourites = !filterText.equals("all");  
    }  
  
    @Override  
    protected FilterResults performFiltering(CharSequence prefix) {  
        return new FilterResults();  
    }  
  
    @Override  
    protected void publishResults(CharSequence prefix, FilterResults results) {  
        if ((prefix == null || prefix.length() == 0))  
            if (!favourites)  
                realmCoffeResults = dbManager.getAll();  
            else  
                realmCoffeResults = dbManager.getFavourites();  
        else {  
            realmCoffeResults = dbManager.realmDatabase  
                .where(Coffee.class)  
                .equalTo("favourite", favourites)  
                .contains("name", prefix.toString(), Case.INSENSITIVE)  
                .or()  
                .contains("shop", prefix.toString(), Case.INSENSITIVE)  
                .findAll();  
        }  
  
        adapter.coffeeList = realmCoffeResults;  
        if (adapter.coffeeList.size() > 0)  
            adapter.notifyDataSetChanged();  
        else {  
            adapter.notifyDataSetInvalidated();  
            adapter.coffeeList = originalCoffeeList;  
        }  
    }  
}
```



CoffeeMate 5b.0.Realm – Project Structure



- Our Realm Database class
- Xml layouts
- Xml menu
- Xml files for resources
- Xml ‘configuration’ file



More Reading

- ❑ <https://realm.io>
- ❑ <https://github.com/realm/presentation/blob/master/slides.md>
- ❑ <http://blog.mallow-tech.com/2017/01/up-and-running-with-realm-for-android/>
- ❑ <https://barta.me/persist-data-android-realm/>



Questions?