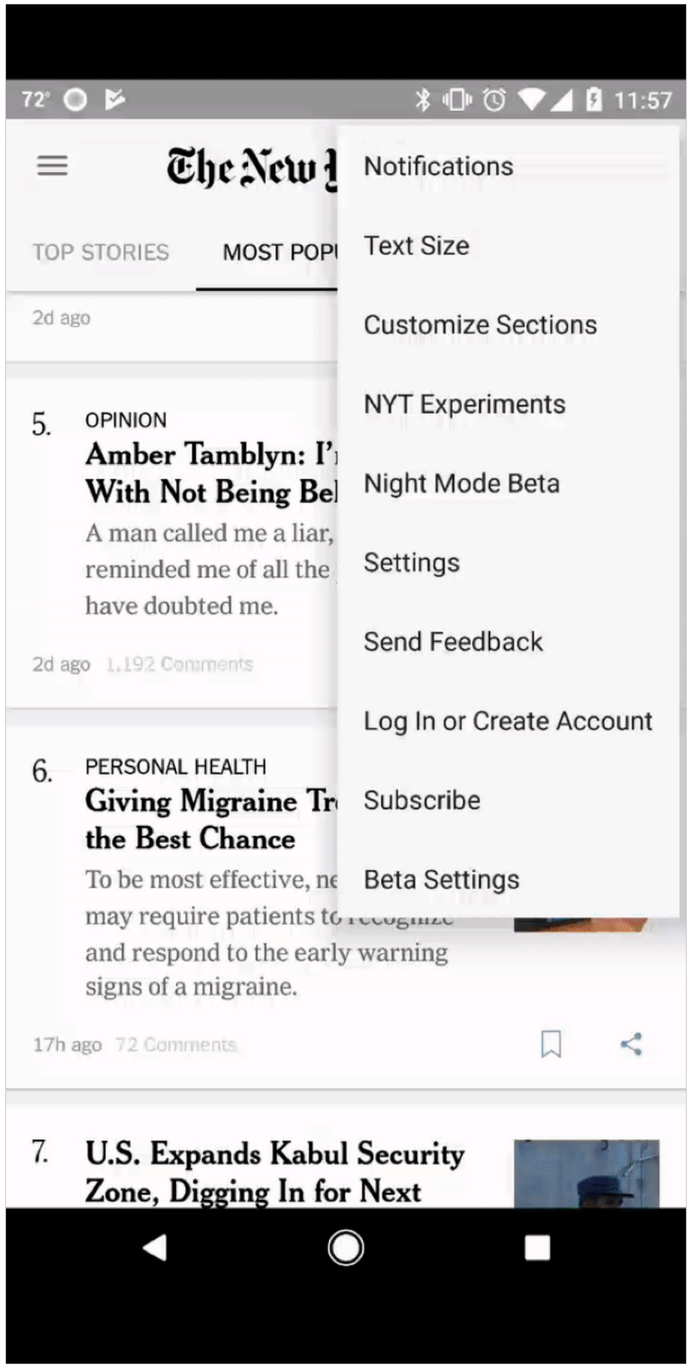
```
{
  Title: Landing Apollo on Android,
  Authors:  [“Brian Plummer”,”Mike Nakhimovich],
  Company: New York Times
}
```

We work at NYTimes

Where we do *a lot* of data loading



Data loading is challenging on Android

Challenges

Data Modeling

Storage (disk and mem)

Networking (retry and inflight)

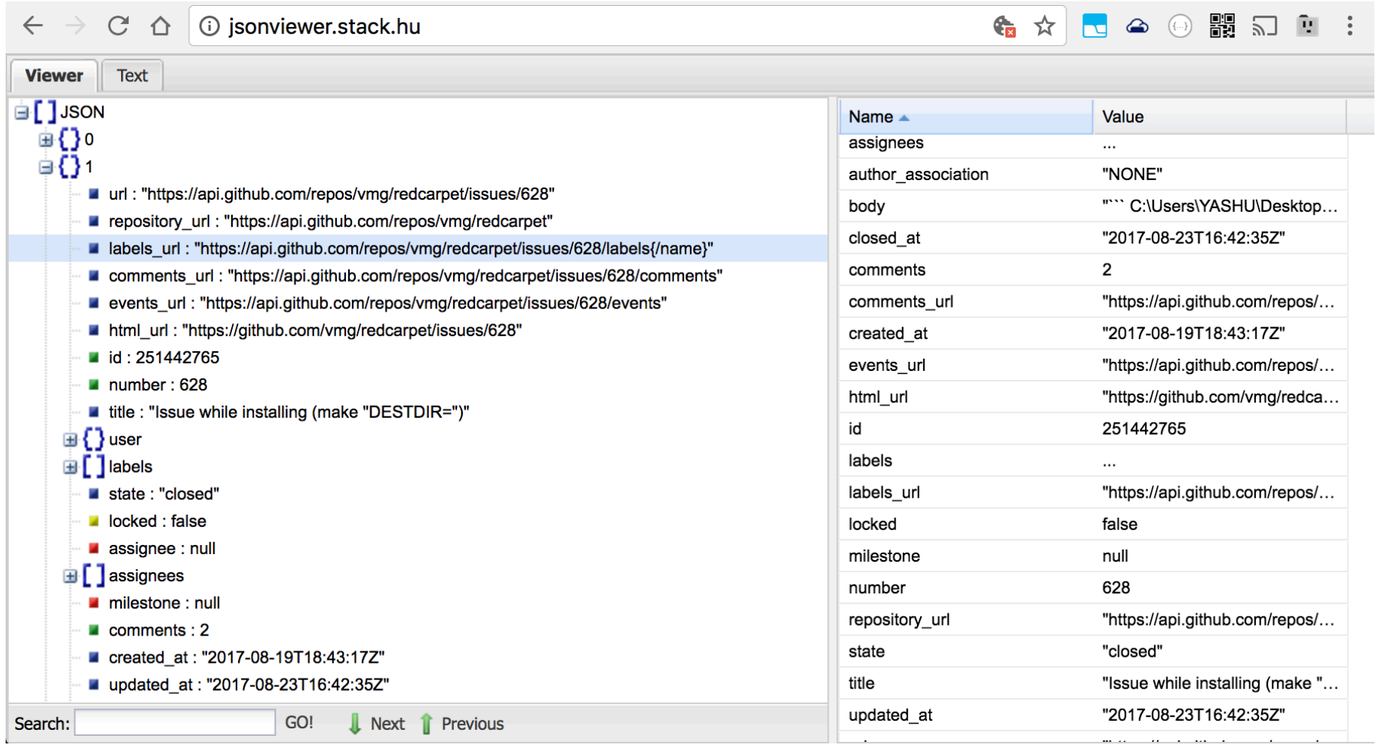
Open Source can mitigate challenges, different libraries fill gaps in REST data loading

OKhttp | RxJava | Retrofit | Immutables| Gson | Guava | SqlDelight/Brite | Store | Curl | JsonViewer.hu

Let's walk through getting Gtihub data into our app using REST and all those great libraries

Start with Inspection

```
curl -i "https://api.github.com/repos/vmg/redcarpet/issues?state=closed" >> closed_issues.json
```



Create your Value Objects with Immutables

Error Prone even with Code Generation

```
interface Issue {
    User user();
    String url();


    interface User {
        long id();
        String name();
    }
}
```

Create your Value Objects with Immutables

Error Prone even with Code Generation

```
@Value.Immutable
interface Issue {
    User user();
    String url();

    @Value.Immutable
    interface User {
        long id();
        String name();
    }
}
```

Parsing Json through code gen

```
@Gson.TypeAdapters
@Value.Immutable
interface Issue {
    User user();
    String url();

    @Value.Immutable
    interface User {
        long id();
        String name();
    }
}
```

Setting up Networking

```
open fun provideRetrofit(gson: Gson, okHttpClient: OkHttpClient): GithubApi {
        return Retrofit.Builder()
                .client(okHttpClient)
                .baseUrl(BuildConfig.BASE_URL)
                .addConverterFactory(GsonConverterFactory.create(gson))
                .addCallAdapterFactory(RxJavaCallAdapterFactory.create())
                .build()
                .create(GithubApi::class.java!!)}
```

Disk Caching with SqlDelight/Brite
Why don't we use room? Immutability

Store

Memory/Disk Caching with Fresh/Get

```
StoreBuilder.parsedWithKey<SectionFrontId, BufferedSource, SectionFront>()
                .fetcher(fetcher)
                .persister(persister)
                .parser(parser)
                .memoryPolicy(MemoryPolicy
                        .builder()
                        .setMemorySize(11L)
                        .setExpireAfterWrite(TimeUnit.HOURS.toSeconds(24))
                        .setExpireAfterTimeUnit(TimeUnit.SECONDS)
                        .build())
                .networkBeforeStale()
                .open()
```

Thats a good architecture

It's also not something we can expect a beginner to know

REST has problems

No control over response size (OOMs)

Bad introspection(Curl? Plugins?)

Lots of manual work

Tough to load from multiple sources

Main Problem:

Rest was developed by our grandparents
It reminds me of java

GraphQL was create by Facebook as a reimagining of server/client data transfer

Give client-side developers an efficient way to query data they want to retrieve.

Give server-side developers an efficient way to get their data out to their users.

Give everyone an easy and efficient way of accessing data (it uses less resources than the REST API, especially with mobile applications).

What’s GraphQL?

— A query language for APIs and a runtime for fulfilling those queries with your existing data.

— Alternative for Rest-API

— Client driven - get only data you need
^Show chaining multiple queries

Graphql Example Schema

```
type Character {
  name: String!
  appearsIn: [Episode]!
}
```

Graphql Example Schema

```
type Character {
  name: String!
  appearsIn: [Episode]!
}
```

— **Character** is a GraphQL Object Type, meaning it's a type with some fields. Most of the types in your schema will be object types.

Graphql Example Schema

```
type Character {
  name: String!
  appearsIn: [Episode]!
}
```

— **name** and **appearsIn** are fields on the Character type. That means that name and appearsIn are the only fields that can appear in any part of a GraphQL query that operates on the Character type.

Graphql Example Schema

```
type Character {
  name: String!
  appearsIn: [Episode]!
}
```

— **String** is one of the built-in scalar types - these are types that resolve to a single scalar object, and can't have sub-selections in the query.

Graphql Example Schema

```
type Character {
  name: String!
  appearsIn: [Episode]!
}
```

— **String!** means that the field is non-nullable, meaning that the GraphQL service promises to always give you a value when you query this field.

Graphql Example Schema

```
type Character {
  name: String!
  appearsIn: [Episode]!
}
```

— **[Episode]!** represents an array of Episode objects. Since it is also non-nullable, you can always expect an array (with zero or more items) when you query the appearsIn field.

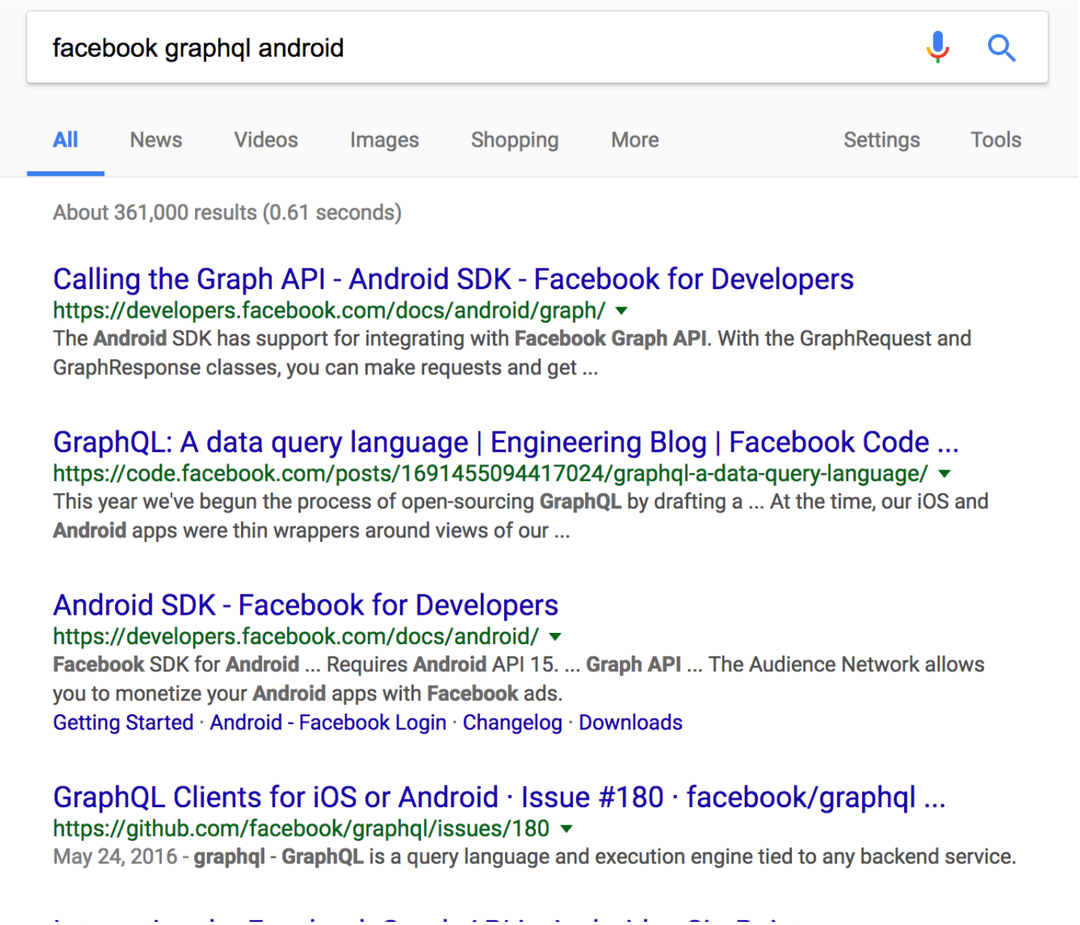
Ask for what you need, get exactly that

```
{
  hero {
    name
    heig
  }
}
```

```
{
  "hero": {
    "name": "Luke Skywalker"
  }
}
```

Ask for what you need, get exactly that

GraphQL is great but Facebook forgot to open source an Android Client 😞



GraphQL is great but Facebook forgot to open source an Android Client 😞

Apollo Android **was developed by AirBnb, Shopify & New York Times as a culmination of tools, libraries, and patterns to assist in fetching data from GraphQL servers**

Let's see a demo using Apollo to hit Github's GraphQL API

OKhttp | RxJava | Apollo-Android

You Ain't Gonna Need It

~~Retrofit~~ | ~~Immutables~~| ~~Gson~~ | ~~Guava~~ | ~~SqlDelight/Brite~~ | ~~Store~~ | ~~Curl~~ | ~~JsonViewer.hu~~

Demo: Same with Apollo in 5 minutes

Now for some explanations

What is Apollo-Android?

A strongly-typed, caching GraphQL client for Android

Created based on Facebook's GraphQl Spec

Convention over configuration

Apollo-Android has 2 main parts

*Apollo Code Gen - To generate code

*Apollo Client - For executing requests

Apollo Code Gen

Generates Java Request/Response POJOs & Parsers

Written in Kotlin with ❤

Using Apollo-Android

like a boss

Add Apollo dependencies

```
build.gradle:
dependencies {
  classpath 'com.apollographql.apollo:gradle-plugin:0.4.1'
}

app/build.gradle:
apply plugin: 'com.apollographql.android'
.....
compile 'com.apollographql.apollo:apollo-rx-support:0.4.1'
```

Basics - Start with a query

Queries have params and define shape of response

```
organization(login:”nyTimes”){
    repositories(first:6 {
            Name
    }
}
```

You can explore & build queries using graphiql

Most Graphql Servers have a GUI

Explorer shows you anything that exists in the Schema

Nullability Rules

Enum values

Data Structure

Types

Fragments = Partials, great for deduping code

TODO Brian fill in code sample

Add Schema & Query.graphql to project

Apollo Gradle Plugin will create for you RepoQuery.java a Java representation of Request|Response|Mapper

```
@Generated("Apollo GraphQL")
public final class RepoQuery implements Query<RepoQuery.Data, RepoQuery.Data, RepoQuery.Variables> {
  public static final String OPERATION_DEFINITION = "query Repo($name: String!) {\n"
      + "  organization(login: $name) {\n"
      + "    __typename\n"
      + "    repositories(first: 6, orderBy: {direction: DESC, field: STARGAZERS}) {\n"
      + "      __typename\n"
      + "      totalCount\n"
      + "      edges {\n"
      + "        __typename\n"
      + "        node {\n"
      + "          __typename\n"
      + "          stargazers {\n"
      + "            __typename\n"
      + "            totalCount\n"
      + "          }\n"
      + "          name\n"
      + "        }\n"
      + "      }\n"
      + "    }\n"
      + "  }\n"
      + "}";

  public static final String QUERY_DOCUMENT = OPERATION_DEFINITION;

  private static final OperationName OPERATION_NAME = new OperationName() {
    @Override
    public String name() {
      return "Repo";
    }
  };

  private final RepoQuery.Variables variables;

  public RepoQuery(@Nonnull String name) {
    Utils.checkNotNull(name, "name == null");
    variables = new RepoQuery.Variables(name);
  }
  ...
```

Apollo writes code so you don't have to make errors writing it yourself

MyQuery.Builder

Builder to create your request object

```
query = RepoQuery.builder().name("friendlyrobotnyc").build()
...

public static final class Builder {
    private @Nonnull String name;

    Builder() {
    }

    public Builder name(@Nonnull String name) {
      this.name = name;
      return this;
    }

    public RepoQuery build() {
      if (name == null) throw new IllegalStateException("name can't be null");
      return new RepoQuery(name);
    }
  }
```

MyQuery.Data = Effective Java Value Object

Apollo even generates comments from schema

```
public static class Repositories {
   final @Nonnull String __typename;
   final int totalCount;
   final @Nullable List<Edge> edges;
   private volatile String $toString;
   private volatile int $hashCode;
   private volatile boolean $hashCodeMemoized;

   public @Nonnull String __typename() { return this.__typename; }

   //Identifies the total count of items in the connection.
   public int totalCount() {return this.totalCount;}

   //A list of edges.
   public @Nullable List<Edge> edges() {return this.edges;}

   @Override
   public String toString() {...}

   @Override
   public boolean equals(Object o) {  ... }

   @Override
   public int hashCode() {...}
```

MyQuery.Mapper

Reflection Free parsing of a Graphql Response

```
public static final class Mapper implements ResponseFieldMapper<Repositories> {
     final Edge.Mapper edgeFieldMapper = new Edge.Mapper();

     @Override
     public Repositories map(ResponseReader reader) {
       final String __typename = reader.readString($responseFields[0]);
       final int totalCount = reader.readInt($responseFields[1]);
       final List<Edge> edges = reader.readList($responseFields[2], new ResponseReader.ListReader<Edge>() {
         @Override
         public Edge read(ResponseReader.ListItemReader reader) {
           return reader.readObject(new ResponseReader.ObjectReader<Edge>() {
             @Override
             public Edge read(ResponseReader reader) {
               return edgeFieldMapper.map(reader);
             }
           });
         }
       });
       return new Repositories(__typename, totalCount, edges);
     }
   }
```

Can parse 20mb response without OOM

Creating an Apollo Client

```
apolloClient= ApolloClient.builder()
                .serverUrl("https://api.github.com/graphql")
                .okHttpClient(provideOkhttp())
                .build();
```

Apollo’s api is very similar to Okhttp

Stateless Apollo Client that can create an `ApolloCall`

```
query = RepoQuery.builder().name("friendlyrobotnyc").build()

 ApolloQueryCall githubCall = apolloClient.query(query);

githubCall.enqueue(new ApolloCall.Callback<>() {
    @Override
    public void onResponse(@Nonnull Response<> response) {

    }

    @Override
    public void onFailure(@Nonnull ApolloException e) {

    }
});
```

Nullability

Graphql has nullable fields (show example)

Apollo can represent as @Nullable

Or as Optional<T> (Java, Guava, Shaded)

How About Caching

*HTTP

*Normalized

Http Caching

Similar to OKHTTP Cache but for POST requests

Streams response to cache same time as parsing

Can Set Cache Timeouts

Prefetch into cache

Useful for background updates of lots of data

Apollo Store - Normalized Cache

Post Parsing

Caches each field individually

Allows multiple queries to share same cached values

Two implementations of Normalized Cache

In Memory using Guava Caches (useful for rotation)

Persistent in SqlLite

Configurable on a per request basis

Apollo Is Reactive

QueryWatcher will emit new response when there are changes to the normalized cache records this query depends on or when mutation call occurs

RxJava 1 & 2 support is built in

```
RxApollo.from(ApolloManager
        .repositories())
        .map(dataResponse -> dataResponse
        .data()
        .organization()
        .repositories())
        .subscribe(view::showRepositories, view::showError)
```

RxApollo response can be transformed into LiveData

Imperative Store

Apollo can be your database

You can update the normalized cache yourself

Mutations

Queries are for getting Data
Mutations are for making changes on server

Demo: Mutation

Optimistic Updates

Mutations can update data locally prior to request being sent

If failure occurs Apollo Store will rollback changes

How its Made:

Gradle plugin with code gen written in Kotlin

ApolloClient borrows heavily from OKHTTP (fill in details)

ApolloCall is similar to OKhttpCall (interceptors all the way down)

Version 1.0 ships today

380 commits

1000s of tests

18 contributors including devs from Shopify, Airbnb, NY Times