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RxJava & Coroutines: A Practical Analysis

ashdavies.io - @askashdavies

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Adoption

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7.7% (2015)

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19.5% (2016)

7.7% (2015)

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46.8% (2017)

19.5% (2016)

7.7% (2015)

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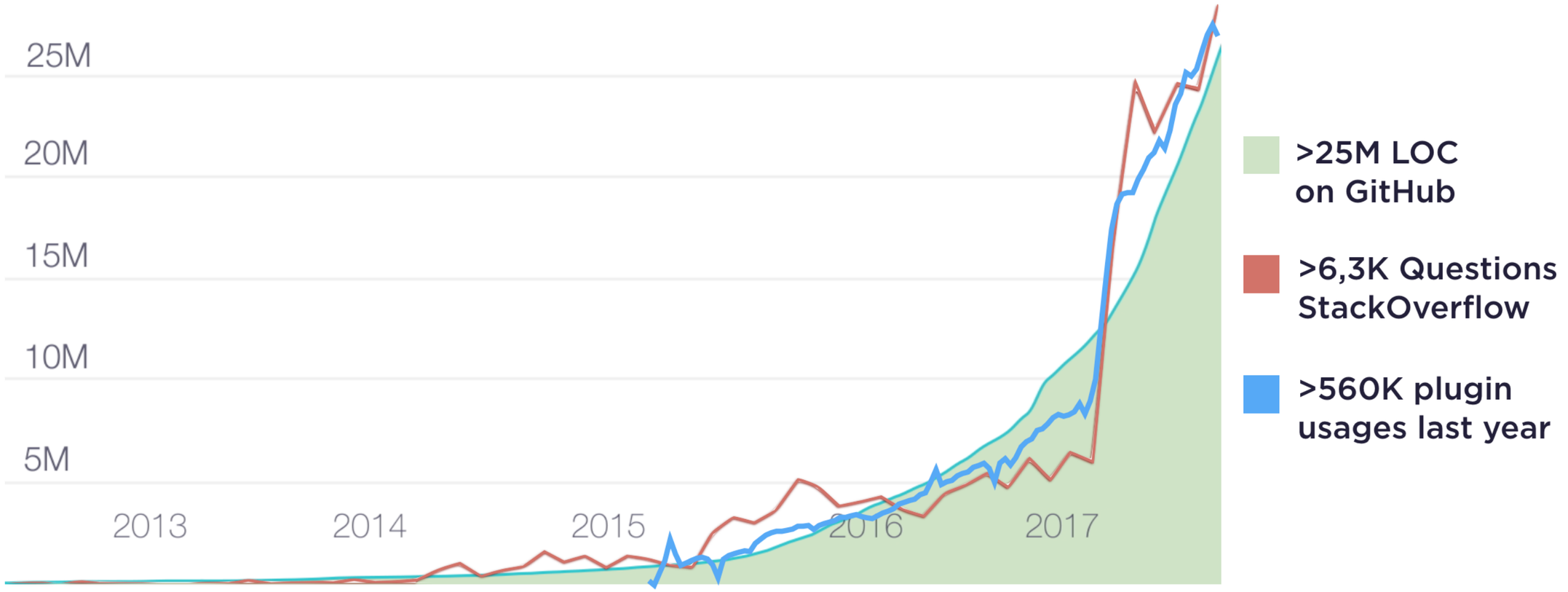

blog.jetbrains.com/kotlin/2016/02/kotlin-1-0-released-pragmatic-language-for-jvm-and-android/

Multi Platform

Coroutines

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```
fun main() {
    GlobalScope.launch {
        delay(1000L)
        println("World!")
    }
    println("Hello,")
    Thread.sleep(2000L)
}
```

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```
fun main() {
    GlobalScope.launch {
        delay(1000L)
        println("World!")
    }
    println("Hello,")
    Thread.sleep(2000L)
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```
fun main() {
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        delay(1000L)
        println("World!")
    }
    println("Hello,")
    Thread.sleep(2000L)
}
```

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Stability

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async / launch

```
val deferred: Deferred<String> = async { "Hello" }
```

```
val result: String = deferred.await()
```

```
val job: Job = launch { "Hello" }
```

```
job.join()
```

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Annotations

bit.ly/2BrxgKv

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Here be dragons

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⚠️ `@ExperimentalCoroutinesApi`

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⚠️ @ObsoleteCoroutinesApi

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`@InternalCoroutinesApi`

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elizarov commented on 28 Sep

Collaborator

From the point of usage `ObsoleteCoroutinesApi` is just like experimental. The different is in intent. When API is experimental it might change or might graduate as is. For obsolete API we already know that there are problems with designs that will force us to deprecated this API in the future when we have a better replacement.

Right now there is no replacement for channel operations, so you have no choice but continue using them. However, we plan to replace them with mechanism based on lazy/cold streams (#254) in the future, which will get you much better performance.

👍 1

Coroutines

 Best thing since sliced bread

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💪 Coroutines

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Native first-party library

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😊 Easy-to-use

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👌 `suspend fun`

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Dispatchers.Main

 History of Android

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Background Processes

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🏛 Runnable / Handler

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 AsyncTask

IntentService

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 Loader<T>

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WorkManager

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Background Processes

`AlarmManager`, `AsyncTask`, `CountDownTimer`, `FutureTask<T>`, `GcmNetworkManager`, `Handler`, `HandlerThread`, `IntentService`, `JobDispatcher`, `JobScheduler`, `Loader<T>`, `ScheduledThreadPoolExecutor`, `Timer`, `Task<T>`, `WorkManager`

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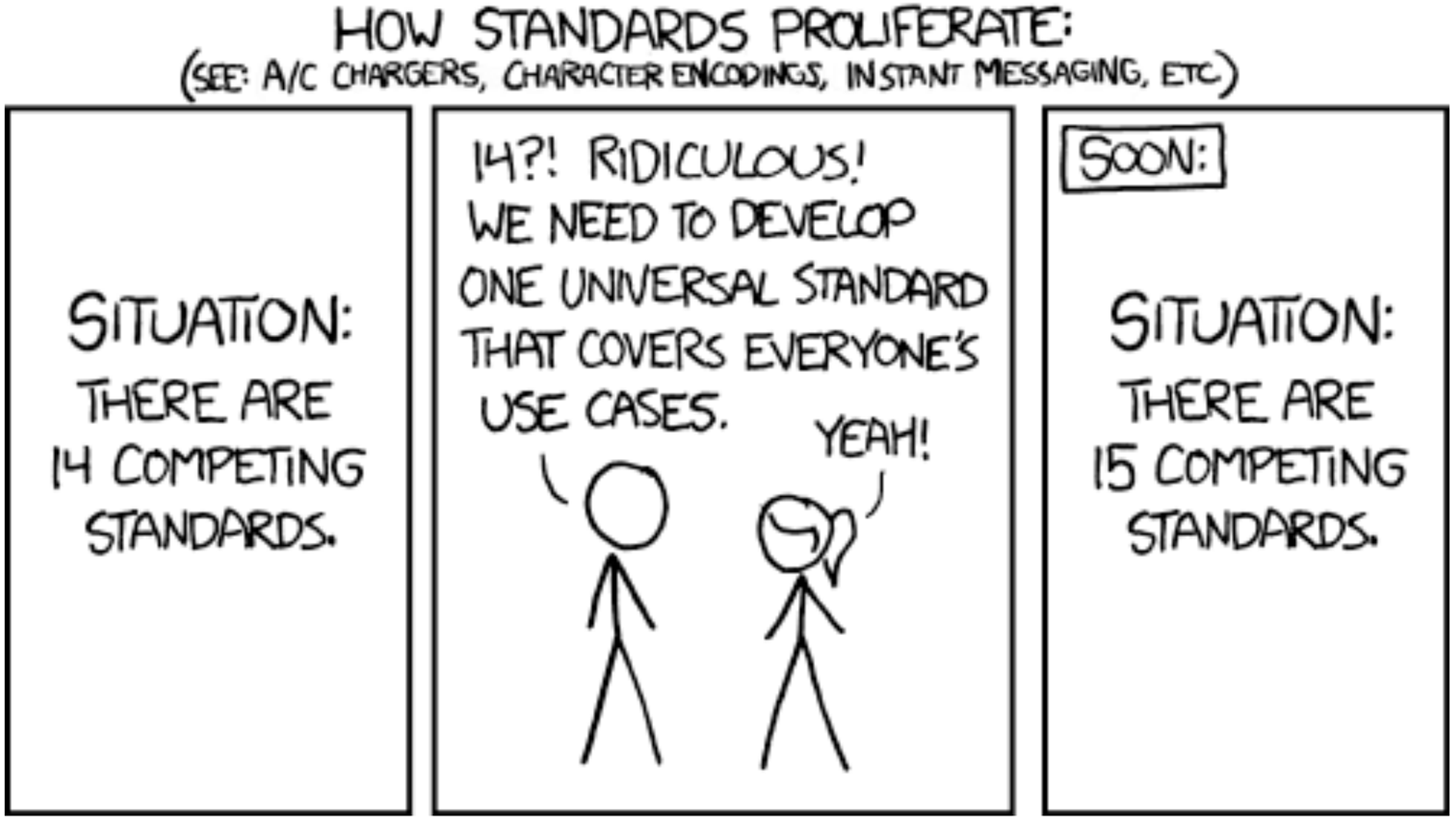

https://xkcd.com/927/

RxJava to the rescue

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⛓️ Chained operations

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⬆️⬇️ Abstracted threading

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😮 Reactive programming

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😮

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RxFingerprint: Android Fingerprint Authentication and Encryption in RxJava2

RxFingerprint wraps the Android Fingerprint APIs (introduced in Android Marshmallow) and makes it easy to:

RxTuples2

RxTuples2 is a library to smooth RxJava2 usage by adding simple Tuple creation functions.

For the RxJava 1.X version, please go to RxTuples.

RxMocks Apache License 2.0

Mocks/Assertions for RxJava testing

RxPermissions

JitPack 0.10.2 | nuget v0.10.2 ▾ 1.2k | build passing

This library allows the usage of RxJava with the new Android M permission model.

RxLoader

License Apache 2.0 | API 16+ | JCenter 2.1.0

An Android Loader that wraps an RxJava Observable.

RxAndroidBle build passing | maven-central v1.7.1

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RxAnimations

Download 0.9.1 API 15+

RxAnimations is a library with the main goal to make android animations more solid and cohesive.

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Rx Preferences

Reactive `SharedPreferences` for Android.

Android Arsenal RxPaparazzo

RxJava extension for Android to take photos using the camera, select files or photos from the device and optionally crop or rotate any selected images.

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RxPaparazzo

RxPermissions

JitPack 0.10.2 nuget v0.10.2 1.2k build passing

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downloads 245/month

Android Arsenal RxCache

RxCache

Android Arsenal RxActivityResult

chat on gitter

> 中文文档

For a more reactive approach go here.

RxBinding

RxJava binding APIs for Android UI widgets from the platform and support libraries.

RxActivityResult

RxLoader

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RxAndroidBle build passing maven-central v1.7.1

RxLifecycle

This library allows one to automatically complete sequences based on a second lifecycle stream.

This capability is useful in Android, where incomplete subscriptions can cause memory leaks.

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RxPresso

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RxFileWatcher allows you to observe directories (recursively or not) for file system events with a RxJava ot based on the JDK WatchService, but it is much more convenient.

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RxMocks

Apache License 2.0

ocks/Assertions fo

Reactive Fit API Library for Android

build passing codecov unknown Download 2.0.1 Android Arsenal RxFit API 9+

RxPaparazzo

RxCupboard

RxCupboard brings the excellent Android Cupboard library into the world of RxJava. Usin `Flowable` s, you can fluently store and retrieve streams of POJOs from your database.

RxPermissions

RxFileObserver

Android Arsenal RxFileObserver

Reactive wrapper around Android's FileObserver

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ndroid Arsenal RxCache

JitPack 0.10.2 nug

This library allows tl

RxBonjour

RxActivityResult

build failing

A reactive wrapper around network service discovery functionalities for Kotlin and Java.

RxCache

中文文档

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build passing maven-central v1.7.1

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RxPalette

RxJava binding APIs for the Palette Android library.

Rx Preferences

Reactive `SharedPreferences` for Android.

Android Arsenal RxPaparazzo

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Reactive wrapper around Android's FileObserver

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Android Arsenal RxCache

RxBonjou

build failing

Reactive Wearable API Library for Android

build passing codecov unknown Download 1.3.0 Android Arsenal RxWear API 9+

Arsenal RxActivityResult

gitter

A reactive wrapper around network service discovery functionalities for Kotlin and Java.

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中文文档

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RxBinding

RxJava binding APIs for Android UI widgets from the platform and support libraries.

RxActivityResult

RxRelay

an RxJava Observable.

Relays are RxJava types which are both an `Observable` and a `Consumer` .

Basically: A `Subject` except without

Android RxFirebase

build error coverage unknown bintray invalid license apache 2.0

RxJava wrapper for use with the Android Firebase client

RxAndroidBle

build passing maven

RxLifecycle

Android RxTasks

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ibrary allows one to automatically complete sequences based on a second lifecycle stream.

capability is useful in Android, where incomplete subscriptions can cause memory leaks.

ashdavies / **rx-tasks**

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👍 Asynchronous API's

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👎 Synchronous API's

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```
Observable.fromIterable()
```

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Flowable / Observable / Single / Completable / Maybe

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From \ To	Flowable	Observable	Maybe	Single	Completable
Flowable		toObservable()	reduce() elementAt() firstElement() lastElement() singleElement()	scan() elementAt() first()/firstOrError() last()/lastOrError() single/singleOrError() all()/any()/count() (and more)	ignoreElements()
Observable	toFlowable()		reduce() elementAt() firstElement() lastElement() singleElement()	scan() elementAt() first()/firstOrError() last()/lastOrError() single/singleOrError() all()/any()/count() (and more)	ignoreElements()
Maybe	toFlowable()	toObservable()		toSingle() sequenceEqual()	toCompletable()
Single	toFlowable()	toObservable()	toMaybe()		toCompletable()
Completable	toFlowable()	toObservable()	toMaybe()	toSingle() toSingleDefault()	

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```
Observable
  .fromIterable(resourceDraft.getResources())
  .flatMap(resourceServiceApiClient::createUploadContainer)
  .zipWith(Observable.fromIterable(resourceDraft.getResources()), Pair::create)
  .flatMap(uploadResources())
  .toList()
  .toObservable()
  .flatMapMaybe(resourceCache.getResourceCachedItem())
  .defaultIfEmpty(Resource.getDefaultItem())
  .flatMap(postResource(resourceId, resourceDraft.getText(), currentUser, resourceDraft.getIntent()))
  .observeOn(AndroidSchedulers.mainThread())
  .subscribeOn(Schedulers.io())
  .subscribe(
      resource -> repository.setResource(resourceId, resource, provisionalResourceId),
      resourceUploadError(resourceId, resourceDraft, provisionalResourceId)
  );
```

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RON BURGUNDY
IS #1 IN SAN DIEGO
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Hidden complexity

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😭 Hidden gotchas

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💾 Memory footprint

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 Steep learning curve

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http://explosm.net/comics/3185/


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#RxMustDie

pca.st/7IJG

"When all you have is a hammer, everything looks like a nail"

Ivan Morgillo (@hamen)

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Reactive & Imperative programming

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Coroutine Use Cases

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Network Call Handling

```
// RxJava2
fun getUser(): Single<User> = Single.fromCallable { /* ... */ }

// Coroutine
suspend fun getUser(): User = /* ... */
```

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Cache Retrieval

```
// RxJava2
fun getUser(): Maybe<User> = Maybe.fromCallable { /* ... */ }

// Coroutine
suspend fun getUser(): User? = /* ... */
```

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Background Task Handling

```
// RxJava2
fun storeUser(user: User): Completable.fromCallable { /* ... */ }

// Coroutine
suspend fun storeUser(user: User) { /* ... */ }
```

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RxJava2 / Coroutines

Single<T> / T

Maybe<T> / T?

Completable / Unit

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Thread Handling

```
// RxJava2
getUser()
  .subscribeOn(Schedulers.computation())
  .observeOn(AndroidSchedulers.mainThread())
  .subscribe { /* Do something */ }

// Coroutine
launch(Dispatchers.Main) {
  val user = getUser()
  /* Do something */
}
```

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💪 ~~FlatMap~~

```
// RxJava2
getUser()
  .flatMap { doSomethingWithUser(it) }
  .subscribeOn(Schedulers.computation())
  .observeOn(AndroidSchedulers.mainThread())
  .subscribe { /* Do something else */ }

// Coroutine
launch(Dispatchers.Main) {
  val user = getUser()
  val smth = doSomethingWithUser(user)

  /* Do something else */
}
```

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Callback Consumption

```
// RxJava2
fun getSingle(): Single = Single.create<T> { emitter ->
  doSomethingAsync(object: Callback<T> {
    override fun onComplete(result: T) = emitter.onSuccess(result)
    override fun onException(exception: Exception) = emitter.onError(exception)
  })
}

// Coroutine
suspend fun getCoroutine() : T = suspendCoroutine { continuation ->
  doSomethingAsync(object : Callback<Baz> {
    override fun onComplete(result: T) = continuation.resume(result)
    override fun onException(exception: Exception) = continuation.resumeWithException(exception)
  })
}
```

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Task Cancellation

```
// RxJava2
val disposable: Disposable = Single.create { /* Do something */ }
    .subscribe { /* Do something else */ }
disposable.dispose()

// Coroutine
val parent: Job = Job()
launch(Dispatchers.Main + parent) { /* Do something */ }
parent.cancelChildren()
```

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Lifecycle Task Cancellation

bit.ly/2POmNBJ

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Lifecycle Task Cancellation

```
class MainActivity : AppCompatActivity {

  override fun onCreate(savedInstanceState: Bundle?) {
    super.onCreate(savedInstanceState)

    lifecycle.coroutineScope.launch {
      someSuspendFunction()
      someOtherSuspendFunction()
      someCancellableSuspendFunction()
    }
  }
}
```

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Value Streams

```
// RxJava2
val publisher = PublishSubject()
publisher.subscribe { /* Do something */ }
publisher.onNext("Hello")

// Coroutine
val channel = Channel<String>()
launch { channel.send("Hello") }
launch { channel.consumeEach { /* Do something */ } }
```

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💪 Backpressure

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~~Channels~~

bit.ly/2DQU7lb

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RxJava Use Cases

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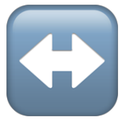

Channels

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Cold Streams

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Complex Business Logic

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Coroutines & RxJava: An Asynchronicity Comparison

Manuel Vivo (@manuelvicnt)

bit.ly/2R27stP

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Is Coroutines a replacement for RxJava?

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Maybe...

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Should I migrate to Coroutines?

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Probably not...

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"Don't fix what ain't broke"

Some Guy

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Did "I" migrate to Coroutines?

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 Yes!

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How could I migrate to Coroutines?

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🤝 Migration Policy

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Retrofit Services

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Retrofit2 Coroutines Adapter bit.ly/2TyGXOh

`com.jakewharton.retrofit:retrofit2-kotlin-coroutines-adapter:+`

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```
interface UserService {

  @GET("/user")
  fun getUser(): Deferred<User>
}

val retrofit = Retrofit.Builder()
    .baseUrl("https://example.com/")
    .addCallAdapterFactory(CoroutineCallAdapterFactory())
    .build()

GlobalScope.launch {
    val user = retrofit
        .create<UserService>() // >= 2.5.0
        .getUser()
        .await()
}
```

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Coroutines RxJava2 bit.ly/2DQ2ZYn

`org.jetbrains.kotlinx:kotlinx-coroutines-rx2:+`

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Name	Result	Scope	Description
[rxCompletable]	`Completable`	[CoroutineScope]	Cold completable that starts coroutine on subscribe
[rxMaybe]	`Maybe`	[CoroutineScope]	Cold maybe that starts coroutine on subscribe
[rxSingle]	`Single`	[CoroutineScope]	Cold single that starts coroutine on subscribe
[rxObservable]	`Observable`	[ProducerScope]	Cold observable that starts coroutine on subscribe
[rxFlowable]	`Flowable`	[ProducerScope]	Cold observable that starts coroutine on subscribe with **backpressure** support

```
val service: UserService = /* ... */

GlobalScope.rxSingle { service.getUser() }
    .observeOn(AndroidSchedulers.mainThread())
    .subscribeOn(Schedulers.io())
    .subscribe(
        { /* Do something with user */ },
        { /* Handle error ... maybe */ }
    )
```

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😅 Conclusion

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THE END

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Cheers! 


ITS OVER. GO HOME!