Overview of Key Classes in the RxJava API

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Learning Objectives in this Part of the Lesson

- Understand key classes in the RxJava API
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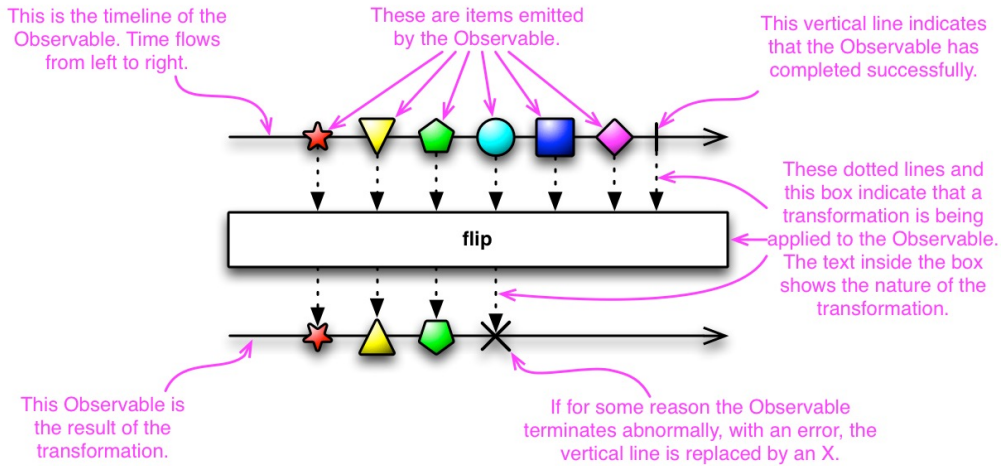
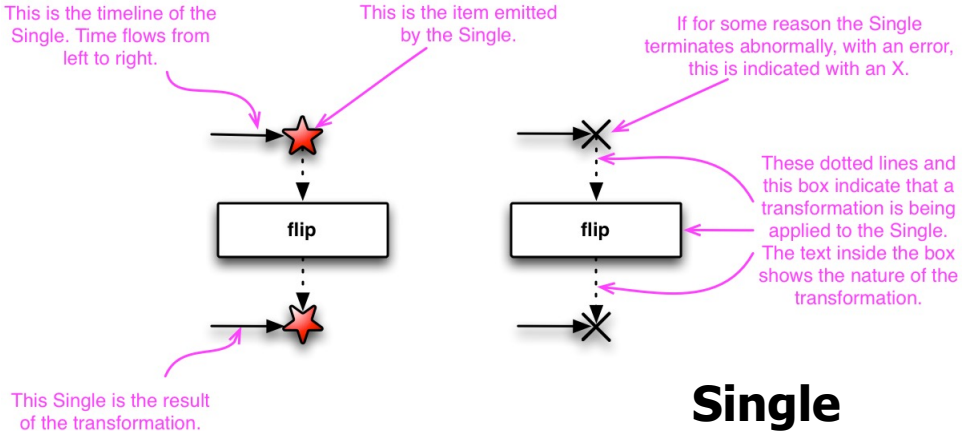


Flowable & Observable



Single

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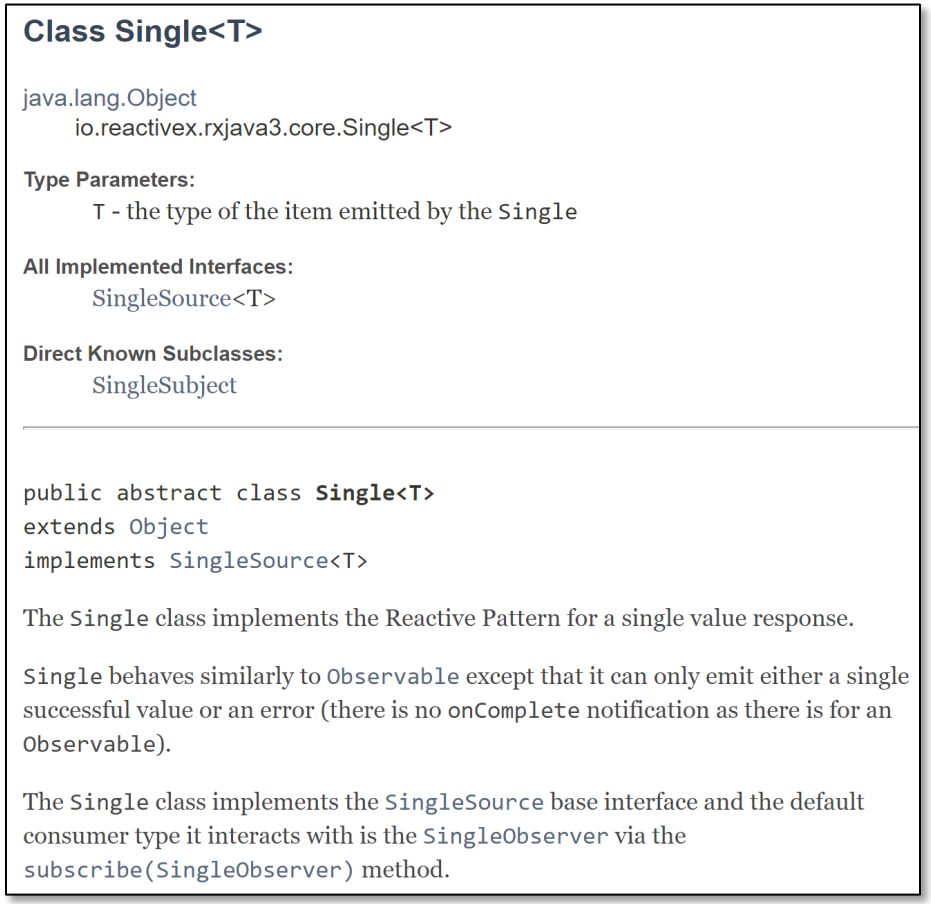
  - **Single** – Completes successfully or with failure, may or may not emit a single value



Class Single<T>

java.lang.Object
    io.reactivex.rxjava3.core.Single<T>

Type Parameters:
`T` - the type of the item emitted by the `Single`

All Implemented Interfaces:
SingleSource<T>

Direct Known Subclasses:
SingleSubject

```
public abstract class Single<T>
extends Object
implements SingleSource<T>
```

The `Single` class implements the Reactive Pattern for a single value response.

`Single` behaves similarly to `Observable` except that it can only emit either a single successful value or an error (there is no `onComplete` notification as there is for an `Observable`).

The `Single` class implements the `SingleSource` base interface and the default consumer type it interacts with is the `SingleObserver` via the `subscribe(SingleObserver)` method.

See reactivex.io/RxJava/3.x/javadoc/io/reactivex/rxjava3/core/Single.html

Key Classes in the RxJava API

- There are three key classes in the RxJava API
  - **Single** – Completes successfully or with failure, may or may not emit a single value
    - Similar to a Java Completable Future or an async Optional<T>

```
BigFraction unreducedFraction =
  makeBigFraction(...);

Single
   .fromCallable(() -> BigFraction
        .reduce(unreducedFraction))
   .subscribeOn
       (Schedulers.single())
   .map(result ->
        result.toMixedString())
   .doOnSuccess(result ->
                System.out.println
                 ("big fraction = "
                 + result + "\n"));
```

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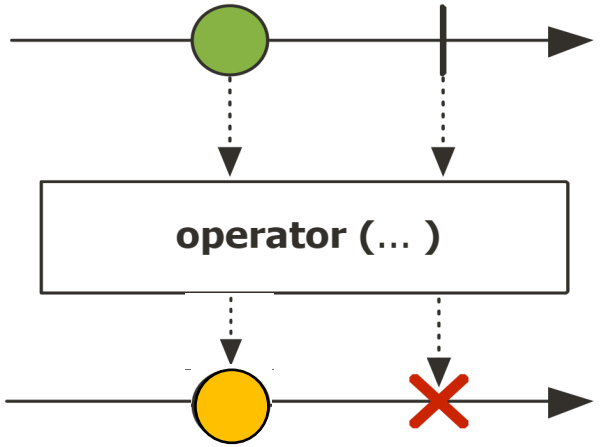
    - Can be documented via a "marble diagram"



See medium.com/@jshvarts/read-marble-diagrams-like-a-pro-3d72934d3ef5

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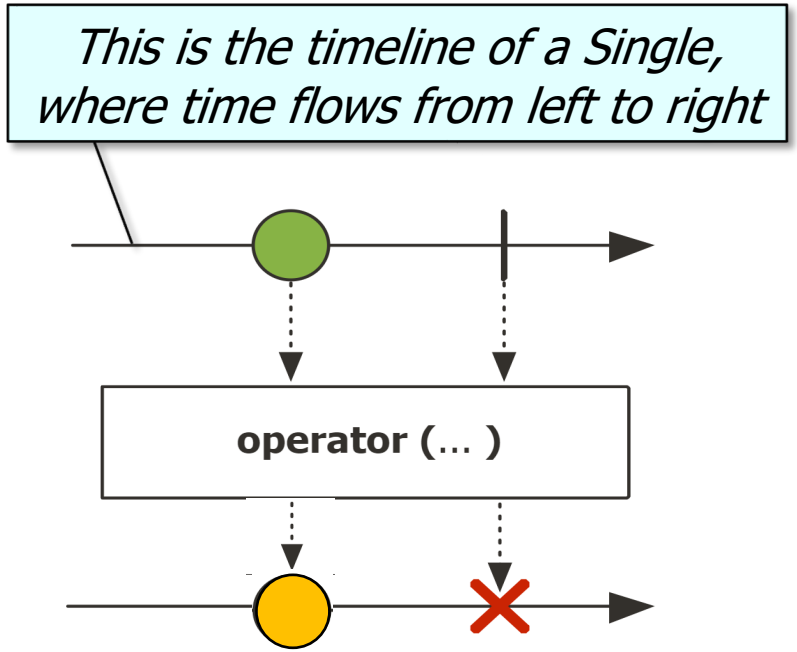

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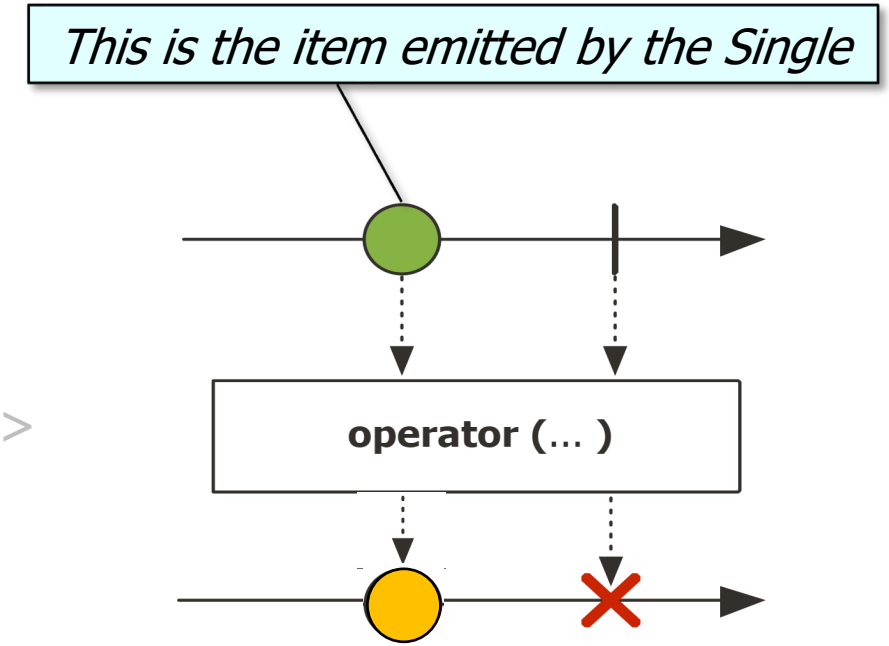

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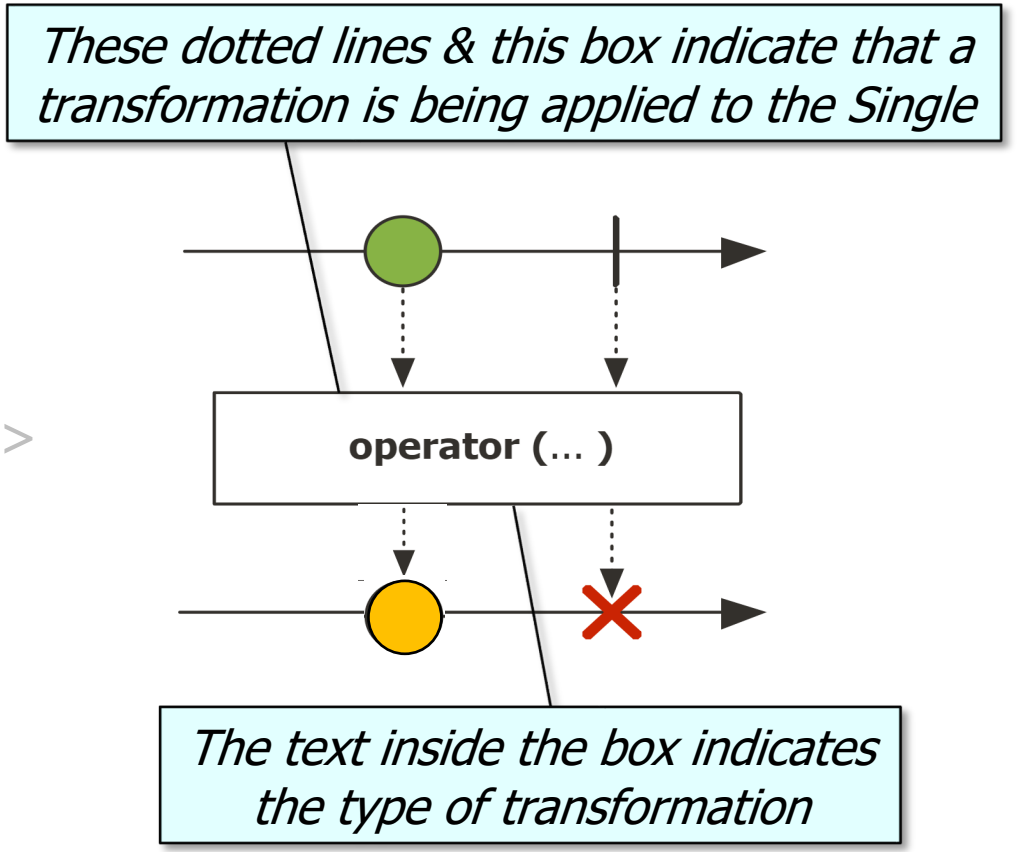

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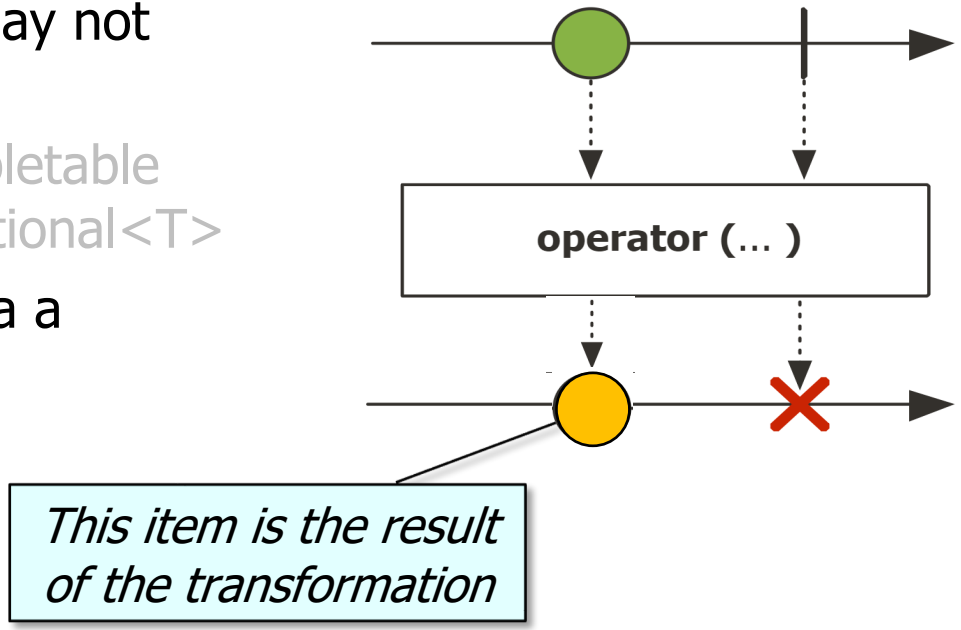

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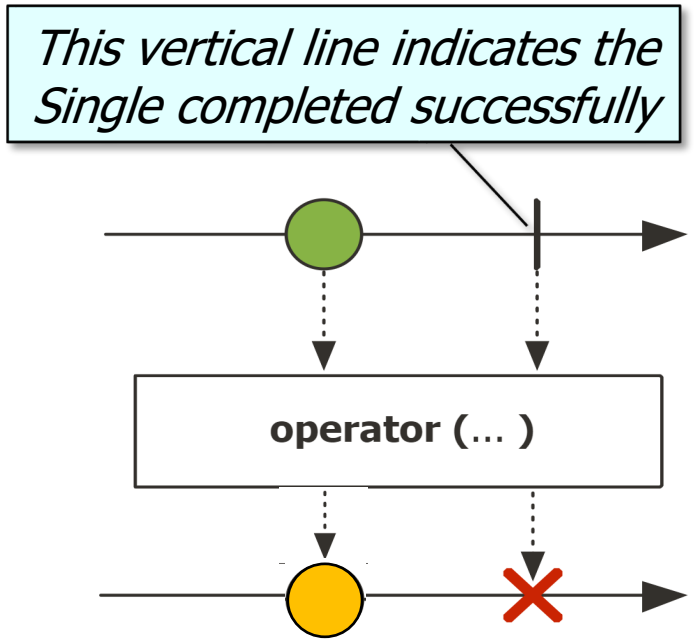

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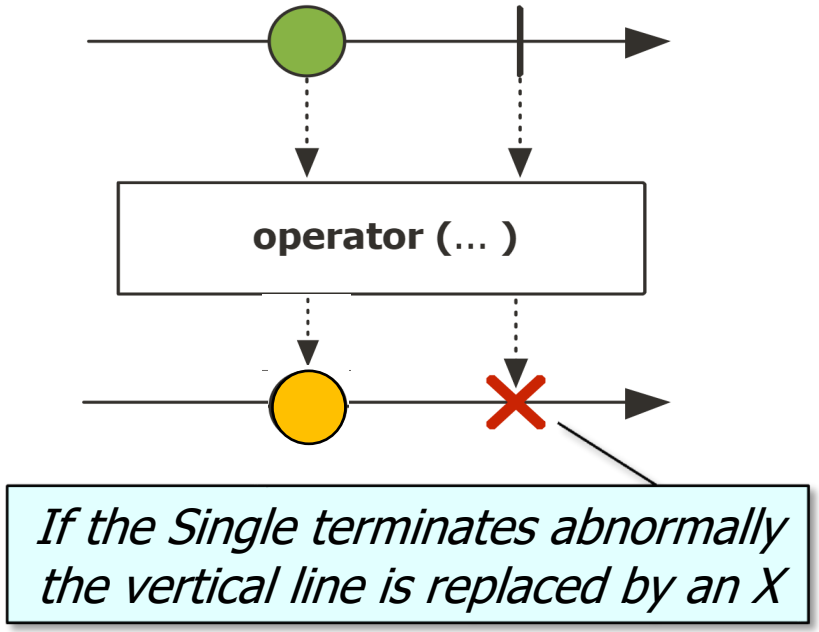

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- There are three key classes in the RxJava API
  - **Single** – Completes successfully or with failure, may or may not emit a single value
    - Similar to a Java Completable Future or an async Optional<T>
    - Can be documented via a "marble diagram"
    - Provides many operators
- Factory method operators
- Transforming operators
- Action operators
- Concurrency & scheduler operators
- Combining operators
- Suppressing operators
- Blocking operators
- etc.

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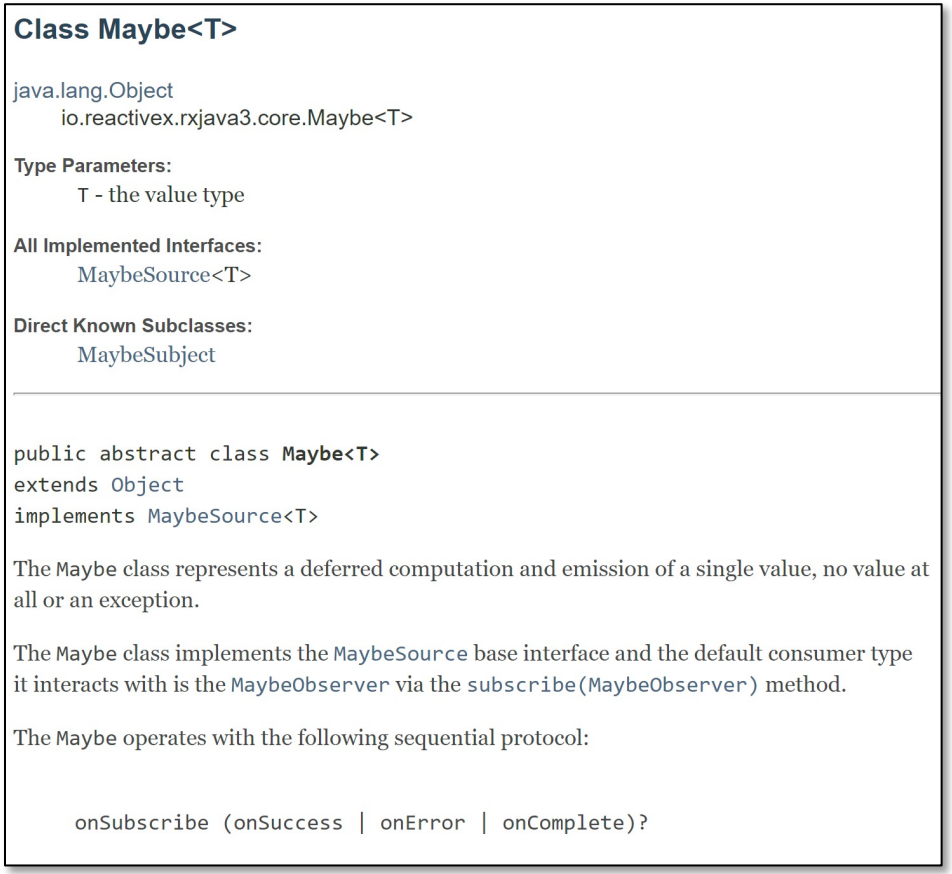
    - Provides many operators
  - Maybe is a variant of Single



Class Maybe<T>

java.lang.Object
io.reactivex.rxjava3.core.Maybe<T>

Type Parameters:
T - the value type

All Implemented Interfaces:
MaybeSource<T>

Direct Known Subclasses:
MaybeSubject

```
public abstract class Maybe<T>
extends Object
implements MaybeSource<T>
```

The Maybe class represents a deferred computation and emission of a single value, no value at all or an exception.

The Maybe class implements the MaybeSource base interface and the default consumer type it interacts with is the MaybeObserver via the subscribe(MaybeObserver) method.

The Maybe operates with the following sequential protocol:

```
onSubscribe (onSuccess | onError | onComplete)?
```

See reactivex.io/RxJava/3.x/javadoc/io/reactivex/rxjava3/core/Maybe.html

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    - Similar to a Java Completable Future or an async Optional<T>
    - Can be documented via a "marble diagram"
    - Provides many operators
  - Maybe is a variant of Single
    - It may emit a single value, no value at all, or an exception

```
BigInteger factorial(BigInteger n){
  return Observable
    .rangeLong(1, n.longValue())
    .map(BigInteger::valueOf)
    .reduce(BigInteger::multiply)
```

reduce() returns a Maybe, which may contain no value at all if n is 0

```
    .blockingGet(BigInteger.ONE);
```

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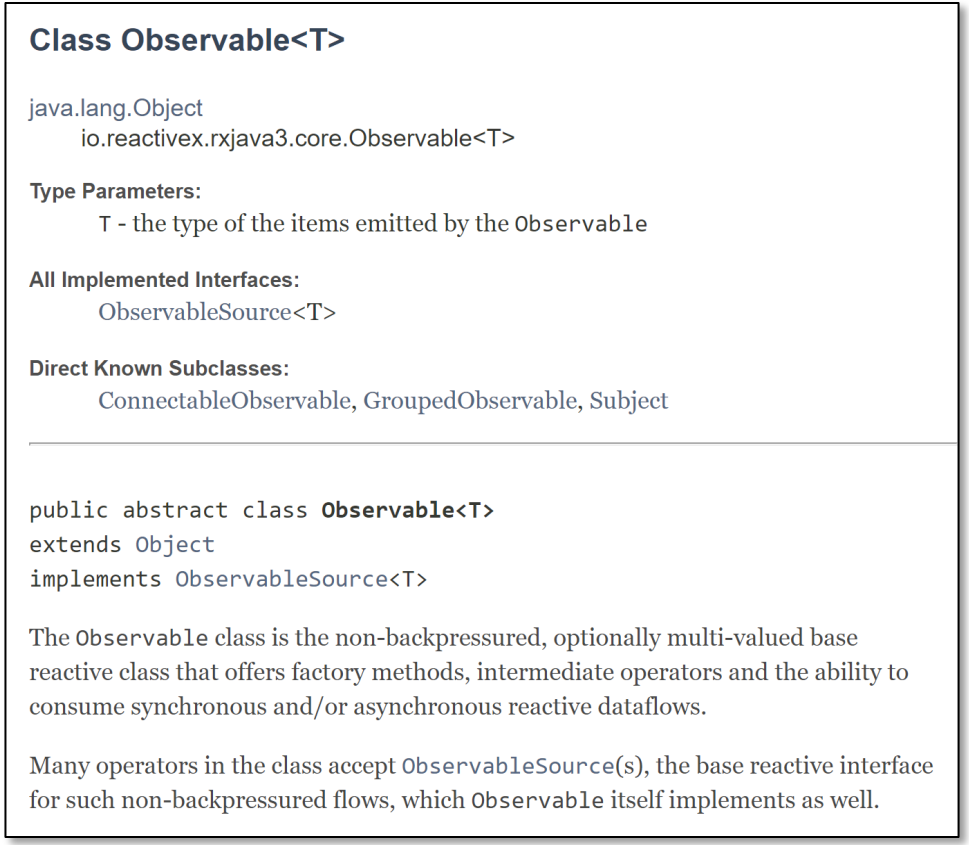

Class Observable<T>

java.lang.Object
  io.reactivex.rxjava3.core.Observable<T>

Type Parameters:
  `T` - the type of the items emitted by the `Observable`

All Implemented Interfaces:
  ObservableSource<T>

Direct Known Subclasses:
  ConnectableObservable, GroupedObservable, Subject

```
public abstract class Observable<T>
extends Object
implements ObservableSource<T>
```

The `Observable` class is the non-backpressured, optionally multi-valued base reactive class that offers factory methods, intermediate operators and the ability to consume synchronous and/or asynchronous reactive dataflows.

Many operators in the class accept `ObservableSource`(s), the base reactive interface for such non-backpressured flows, which `Observable` itself implements as well.

See reactivex.io/RxJava/3.x/javadoc/io/reactivex/rxjava3/core/Flowable.html

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  - **Single** – Completes successfully or with failure, may or may not emit a single value
  - **Observable** – Emits an indefinite # of events (zero to infinite) & may complete successfully or fail
    - Similar to an async Java stream
      - i.e., completable futures used with a Java stream

```
return Observable
   .fromArray(bigFractionList)

   .subscribeOn(scheduler)

   .flatMap(reducedFraction ->
       Observable
          .fromCallable(() ->
            reducedFraction.multiply
               (sBigReducedFraction))

          .subscribeOn
             (scheduler))

   .reduce(BigFraction::add);
```

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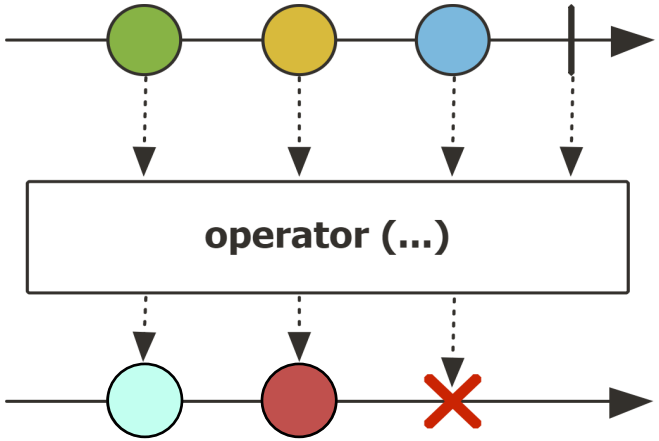
    - Similar to an async Java stream
    - Can also be documented via a marble diagram



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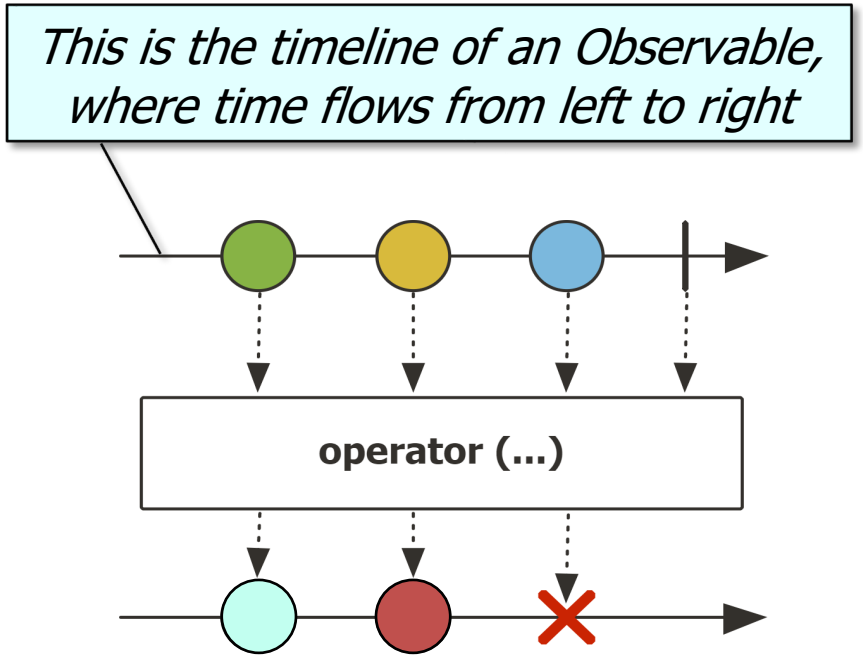

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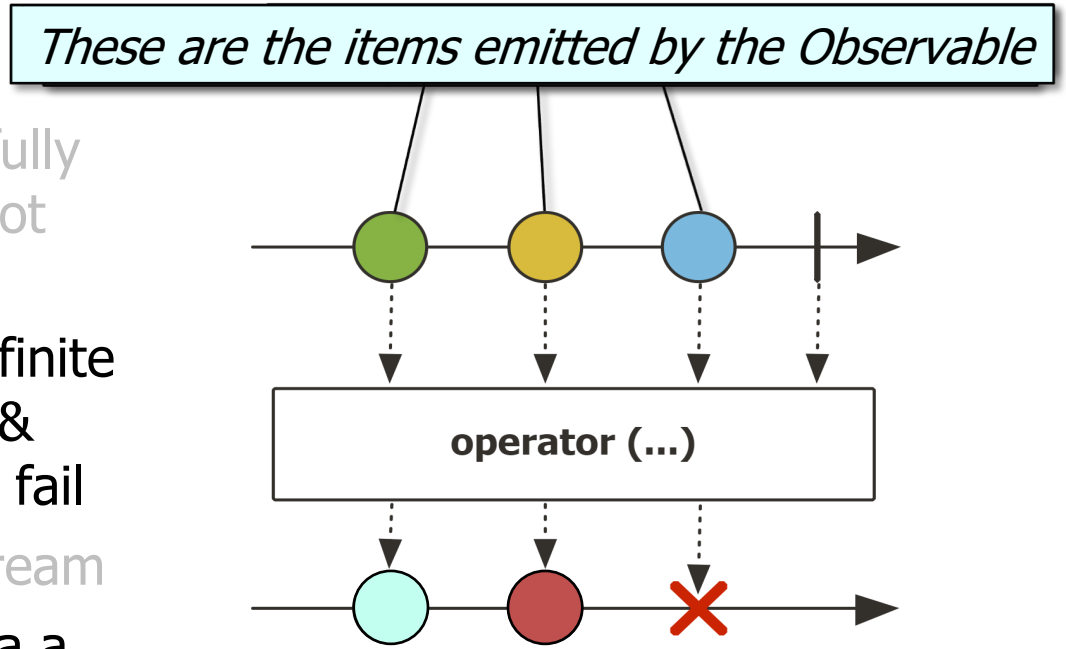

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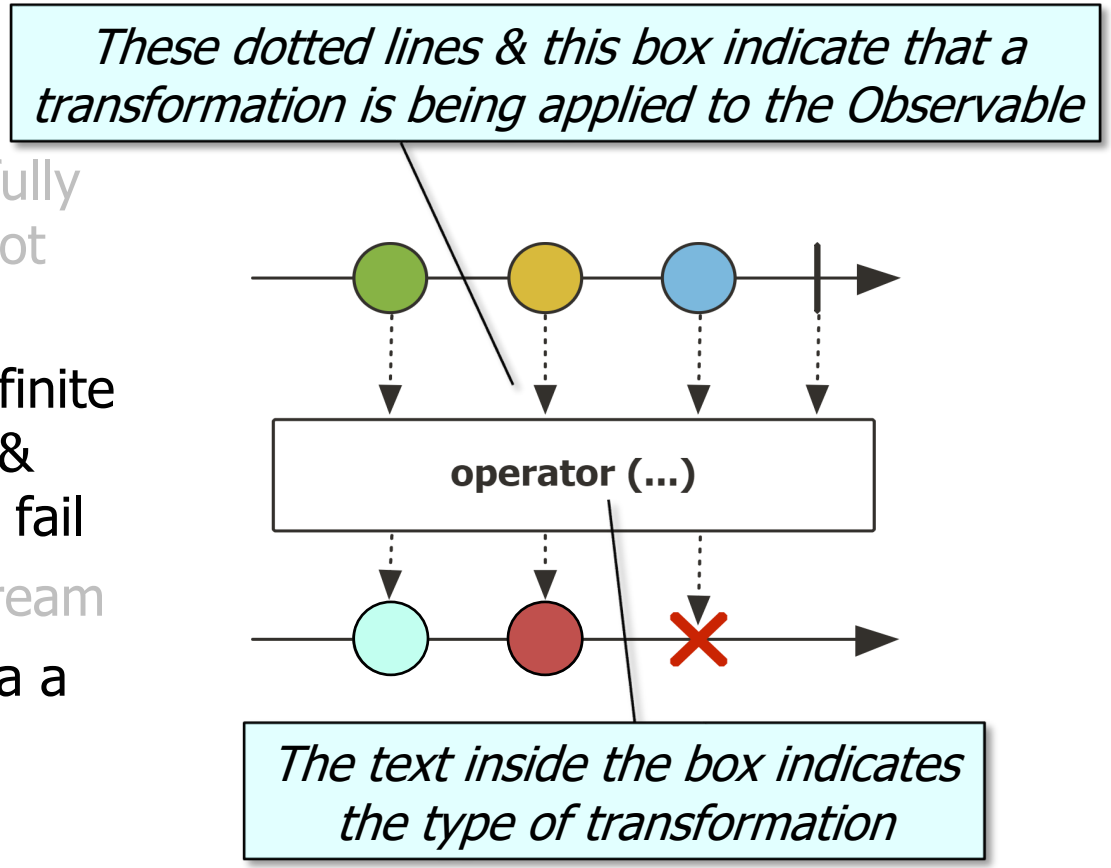

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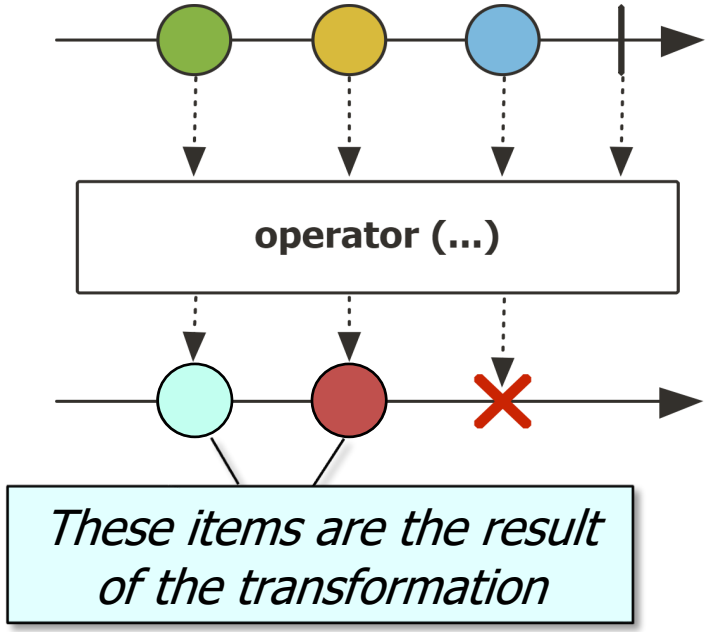

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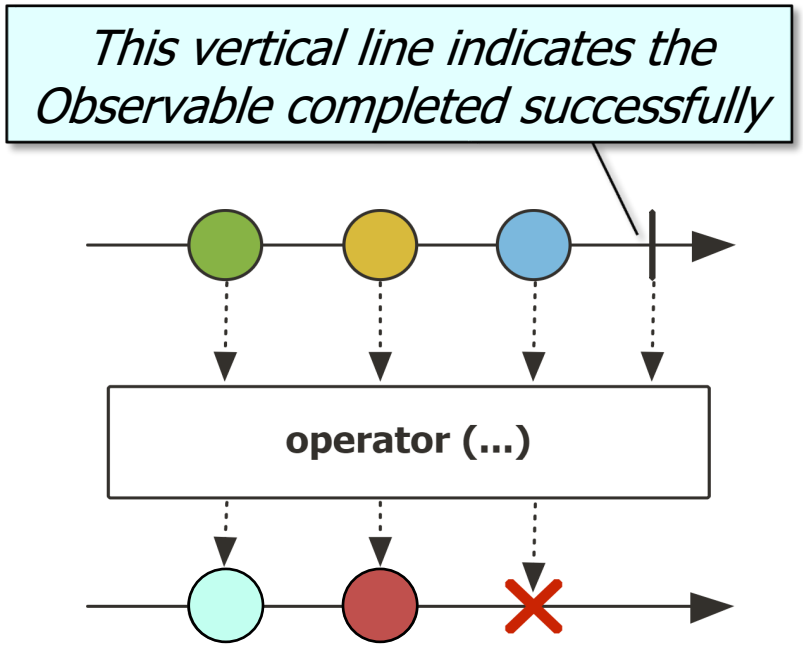

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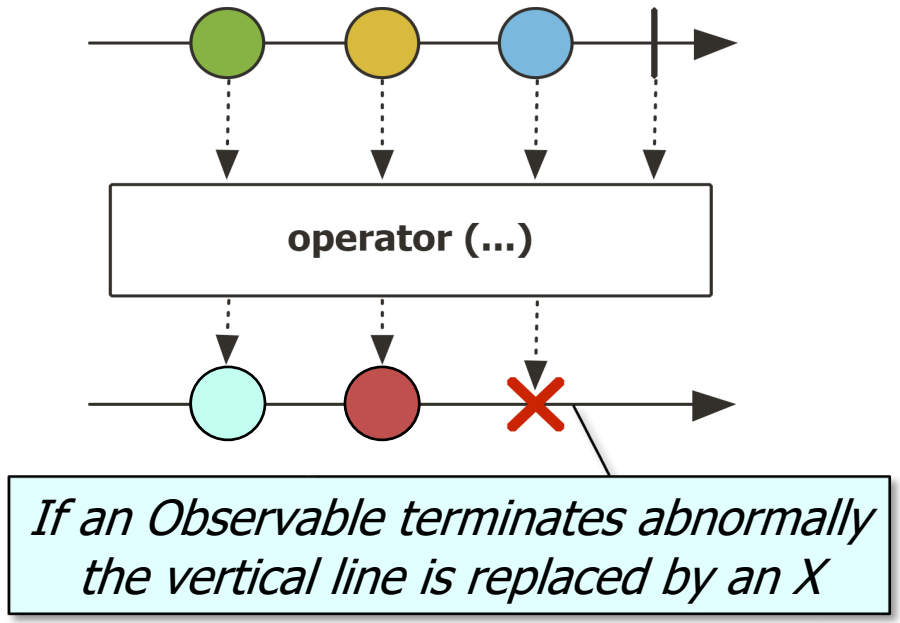

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    - Similar to an async Java stream
    - Can also be documented via a marble diagram
    - Provides many operators
      - Factory method operators
      - Transforming operators
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      - etc.

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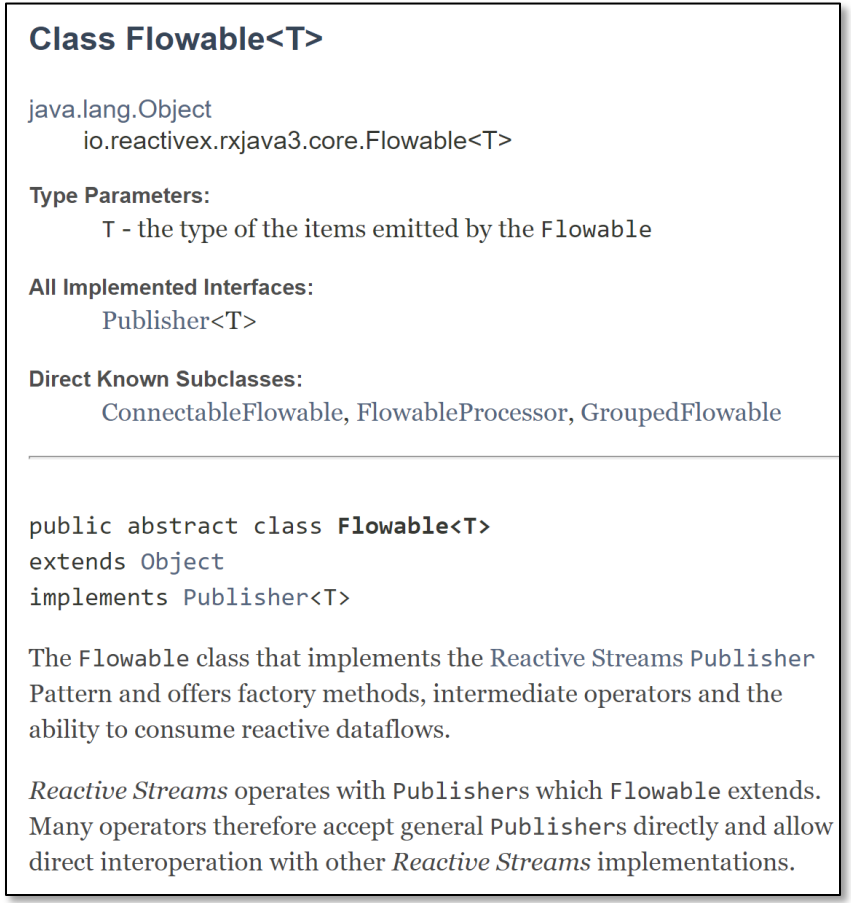
  - **Single** – Completes successfully or with failure, may or may not emit a single value
  - **Observable** – Emits an indefinite # of events (zero to infinite) & may complete successfully or fail
  - **Flowable** – Generalizes Observable to support backpressure



Class Flowable<T>

java.lang.Object
io.reactivex.rxjava3.core.Flowable<T>

Type Parameters:
T - the type of the items emitted by the Flowable

All Implemented Interfaces:
Publisher<T>

Direct Known Subclasses:
ConnectableFlowable, FlowableProcessor, GroupedFlowable

```
public abstract class Flowable<T>
extends Object
implements Publisher<T>
```

The Flowable class that implements the Reactive Streams Publisher Pattern and offers factory methods, intermediate operators and the ability to consume reactive dataflows.

Reactive Streams operates with Publishers which Flowable extends. Many operators therefore accept general Publishers directly and allow direct interoperation with other *Reactive Streams* implementations.

See reactivex.io/RxJava/3.x/javadoc/io/reactivex/rxjava3/core/Flowable.html

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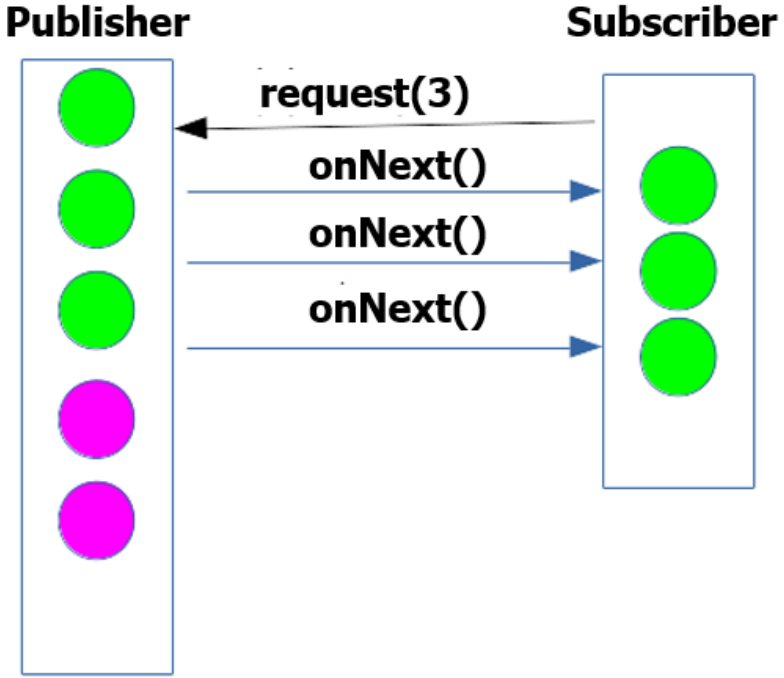
  - **Flowable** – Generalizes Observable to support backpressure
    - The subscriber indicates to the publisher how much data it can consume



See www.baeldung.com/rxjava-backpressure

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  - **Flowable** – Generalizes Observable to support backpressure
    - The subscriber indicates to the publisher how much data it can consume
    - A Flowable can be converted to a ParallelFlowable

```
return Flowable
   .fromArray(bigFractions)
   .parallel()
   .runOn(scheduler)
   .flatMap(bigFraction ->
      bigFraction.multiply
         (sBigReducedFraction))
   .sequential()
   .reduce(BigFraction::add)
   ...
```

See reactivex.io/RxJava/3.x/javadoc/io/reactivex/rxjava3/parallel/ParallelFlowable.html

End of Overview of Key Classes in the RxJava API