Key Combining Operators in the Observable Class (Part 2)

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Learning Objectives in this Part of the Lesson

- Recognize key Observable operators
  - Factory method operations
  - Transforming operators
  - Concurrency & scheduler operators
  - Error handling operators
  - Combining operators
    - This operator creates a Maybe by accumulating elements in an Observable stream
      - e.g., reduce()

Key Combining Operators in the Observable Class

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- The reduce() operator
  - Reduce this Observable's values into a single object of the same type as the emitted items

```
Maybe<T> reduce
   (BiFunction<T, T, T> reducer)
```

See reactivex.io/RxJava/3.x/javadoc/io/reactivex/rxjava3/core/Observable.html#reduce

Key Combining Operators in the Observable Class

- The reduce() operator
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    - Reduction is performed using a BiFunction param

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Interface BiFunction<T,U,R>

Type Parameters:

T - the type of the first argument to the function

U - the type of the second argument to the function

R - the type of the result of the function

All Known Subinterfaces:

BinaryOperator<T>

Functional Interface:

This is a functional interface and can therefore be used as the assignment target for a lambda expression or method reference.

See reactivex.io/RxJava/3.x/javadoc/io/reactivex/rxjava3/functions/BiFunction.html

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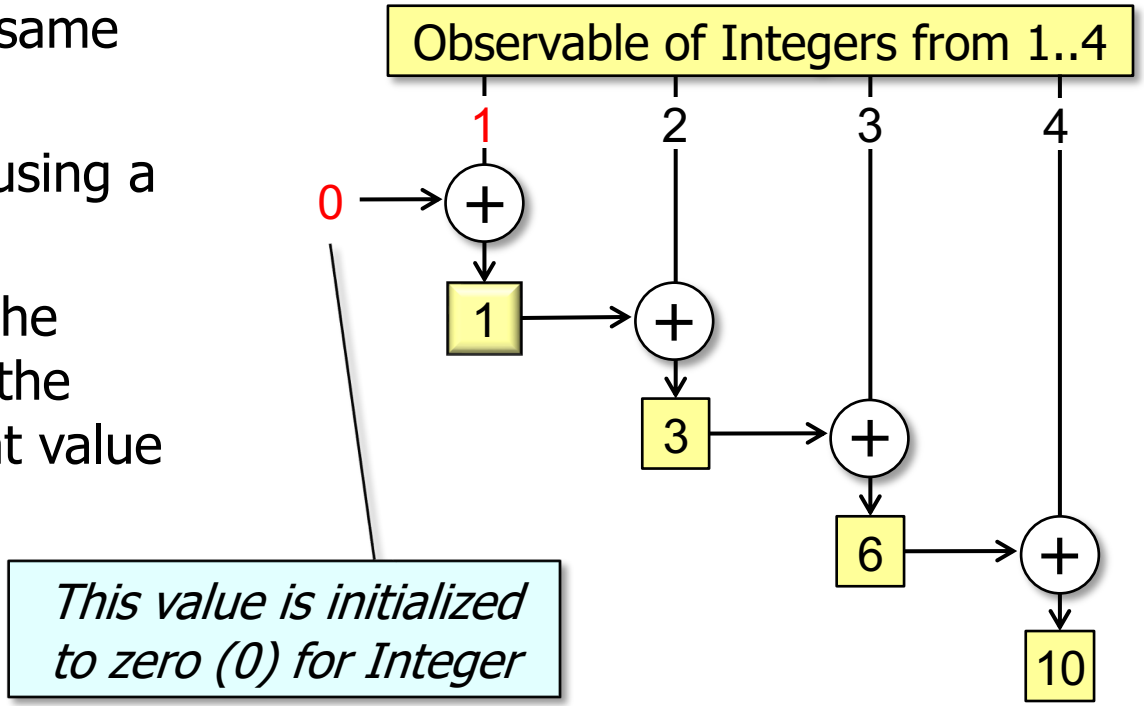

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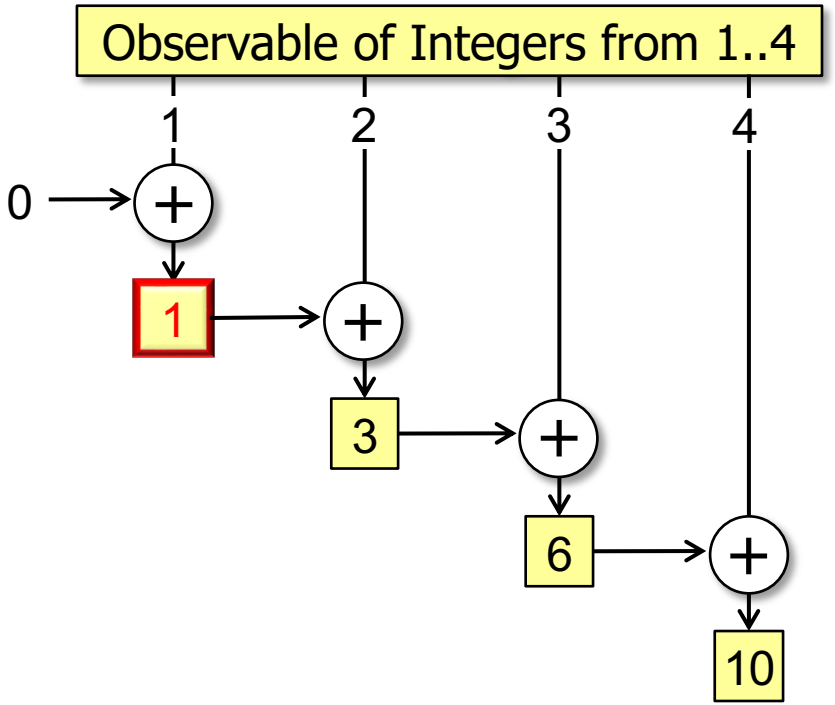

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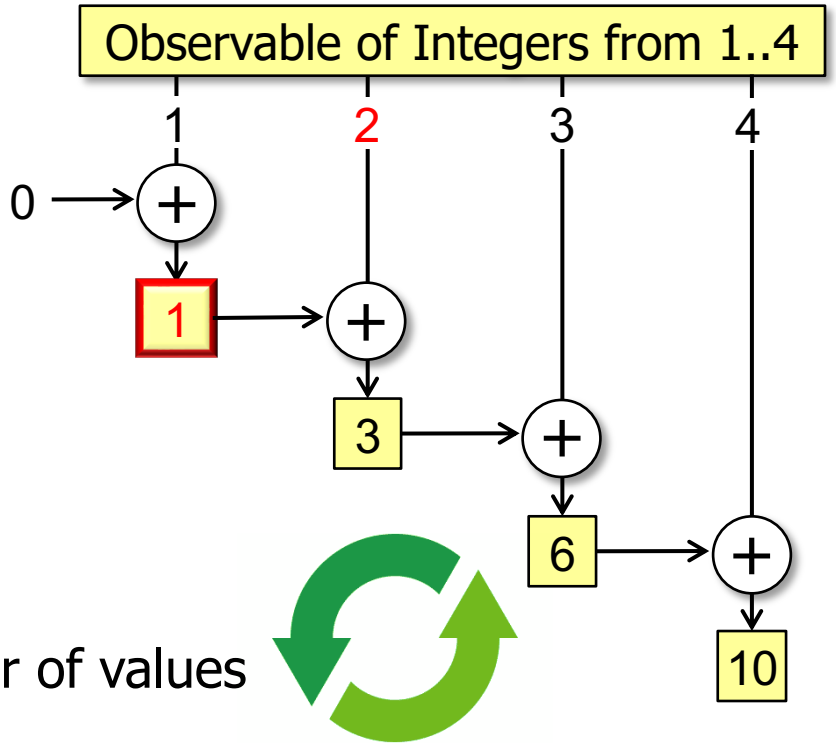

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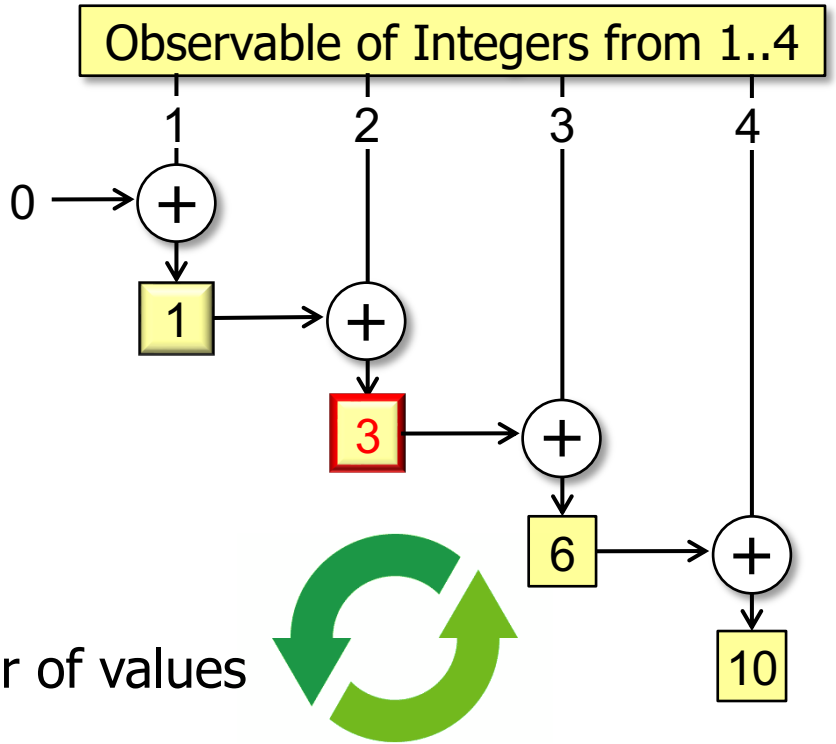

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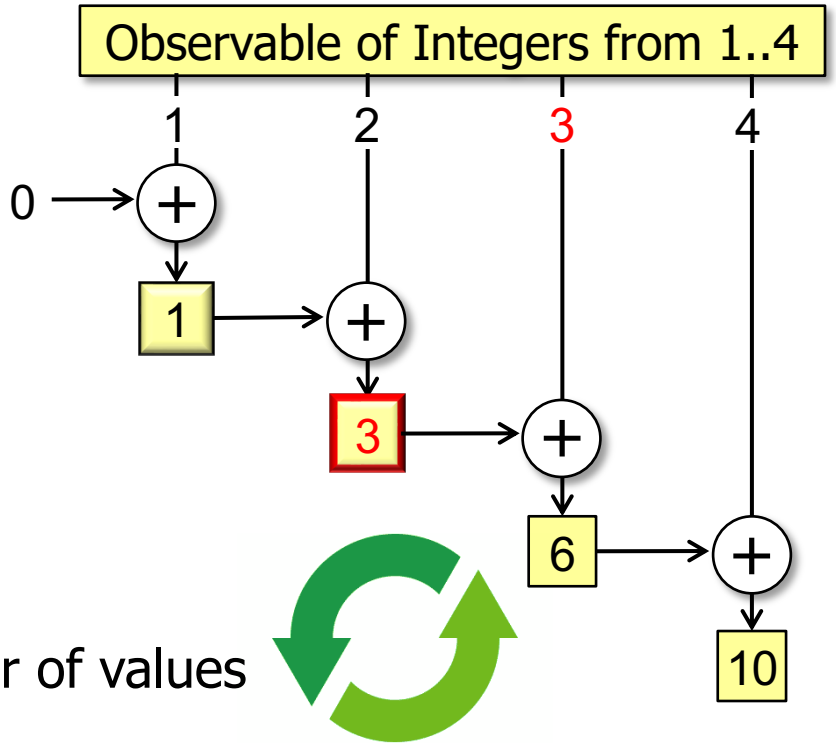

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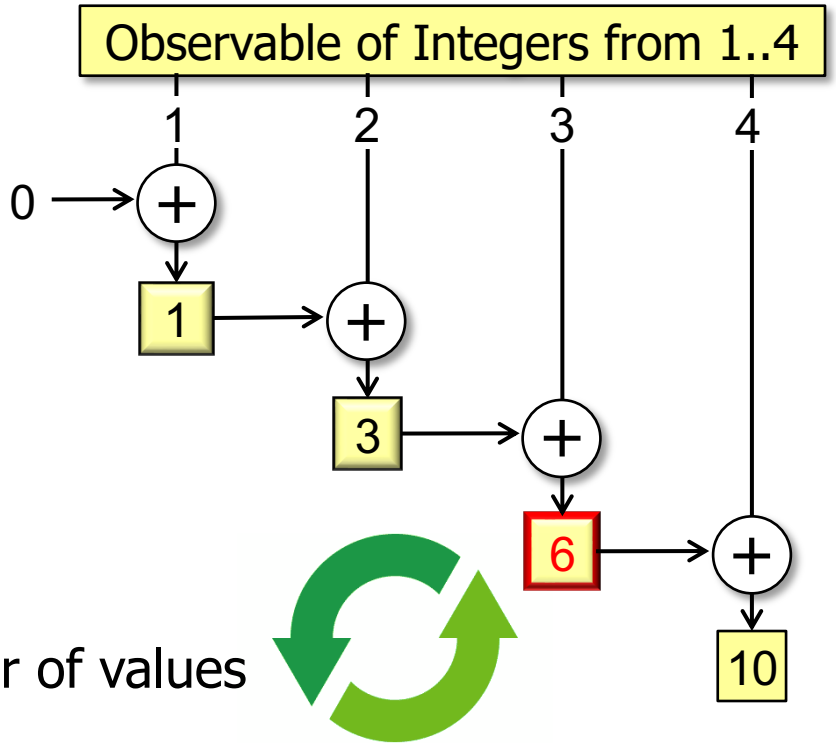

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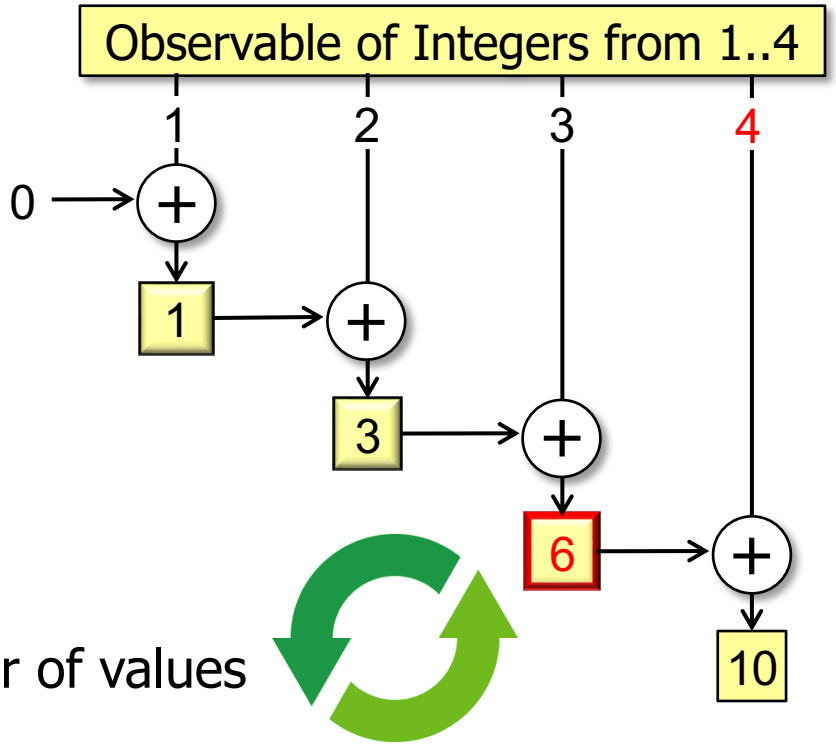

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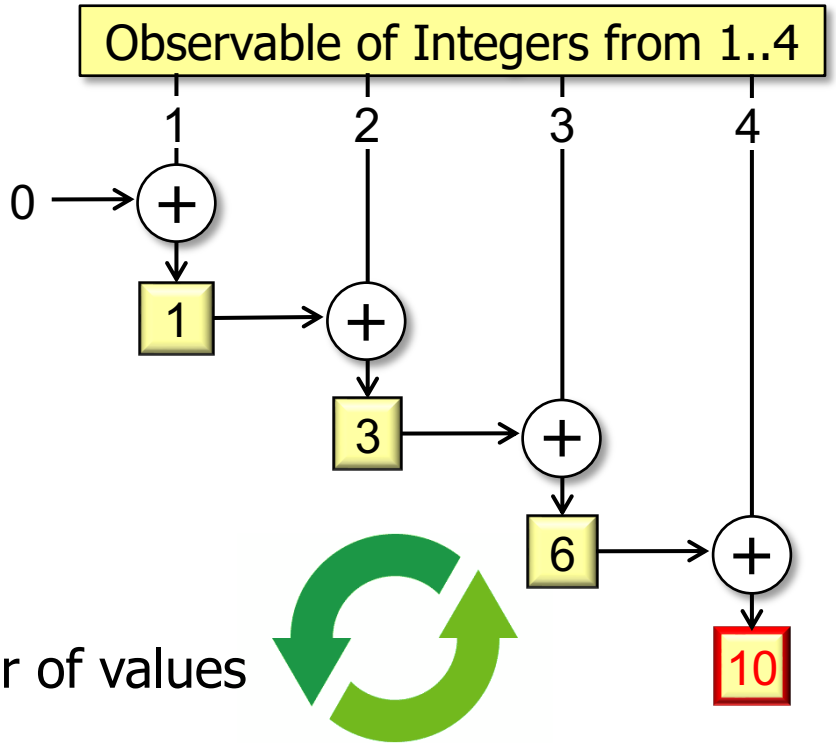

Key Combining Operators in the Observable Class

- The reduce() operator
  - Reduce this Observable's values into a single object of the same type as the emitted items
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  - The final result is emitted from the final call as the sole item of a Maybe

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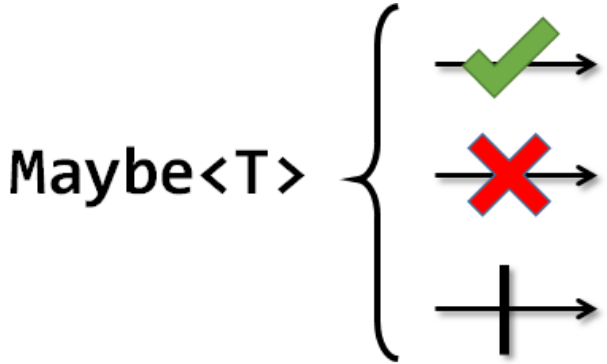

See reactivex.io/RxJava/3.x/javadoc/io/reactivex/rxjava3/core/Maybe.html

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    - An empty Maybe will be returned if the Observable emits no items

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```
Maybe<T> reduce
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```
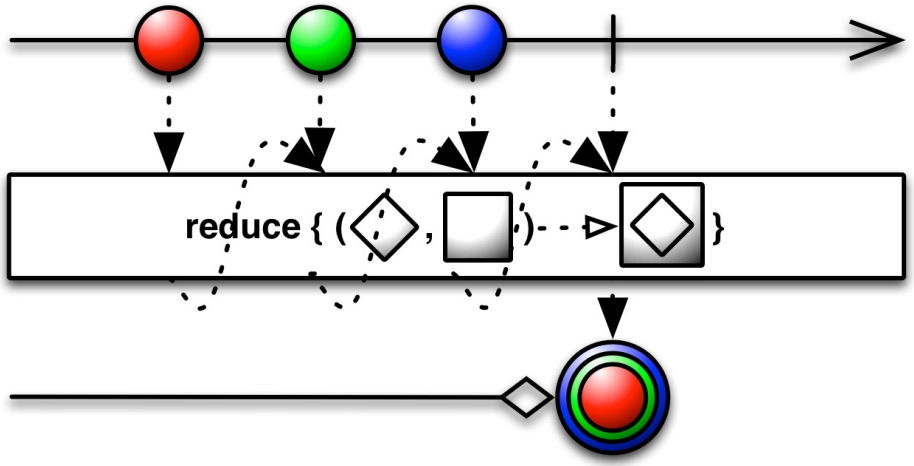

  - The internally accumulated value is discarded upon cancellation or error

Key Combining Operators in the Observable Class

- The reduce() operator
  - Reduce this Observable's values into a single object of the same type as the emitted items
  - Upstream must signal onComplete() before accumulator can be emitted




```
return Observable
   .fromArray(bigFractions)
   ...
   .flatMap(bf ->
            multiplyFractions(bf, Schedulers.computation()))
   .reduce(BigFraction::add)
   ...
```

Sum the results of async multiplications

See Reactive/Observable/ex3/src/main/java/ObserableEx.java

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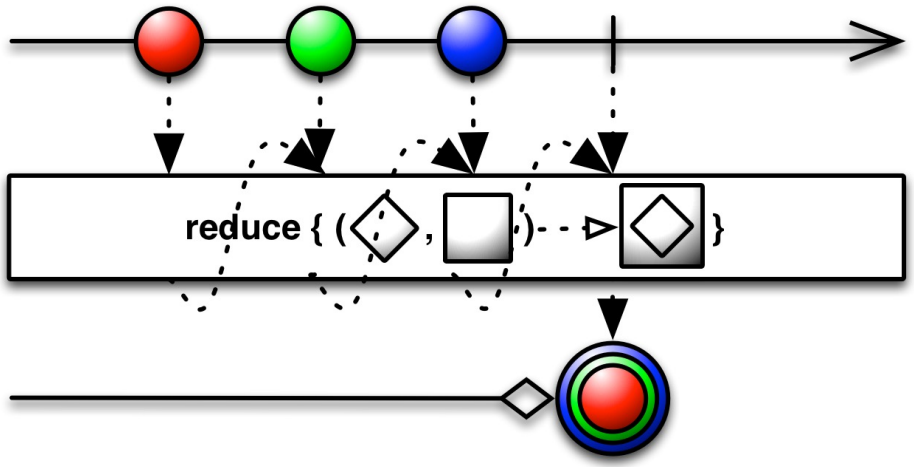
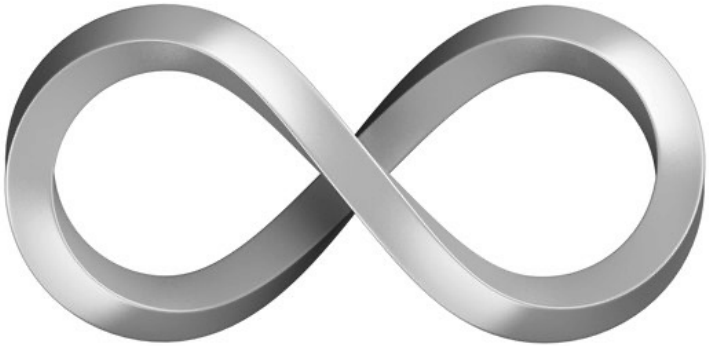
    - Sources that are infinite & never complete will never emit anything through this operator





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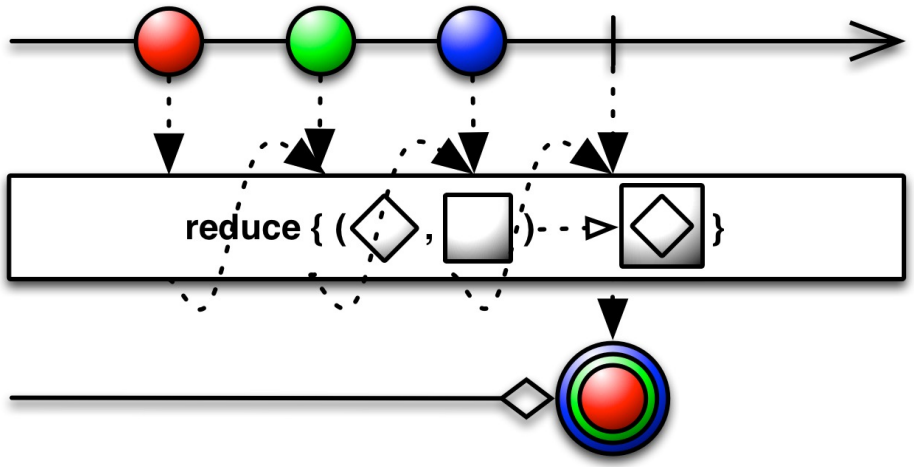
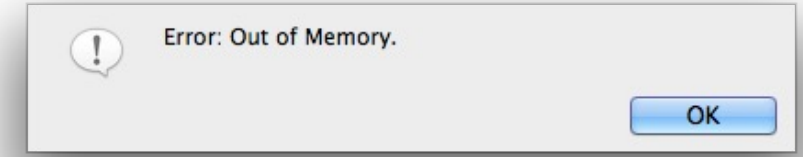
- The reduce() operator
  - Reduce this Observable's values into a single object of the same type as the emitted items
  - Upstream must signal onComplete() before accumulator can be emitted
    - Sources that are infinite & never complete will never emit anything through this operator
      - An infinite source may lead to a fatal OutOfMemoryError





See docs.oracle.com/javase/8/docs/api/java/lang/OutOfMemoryError.html

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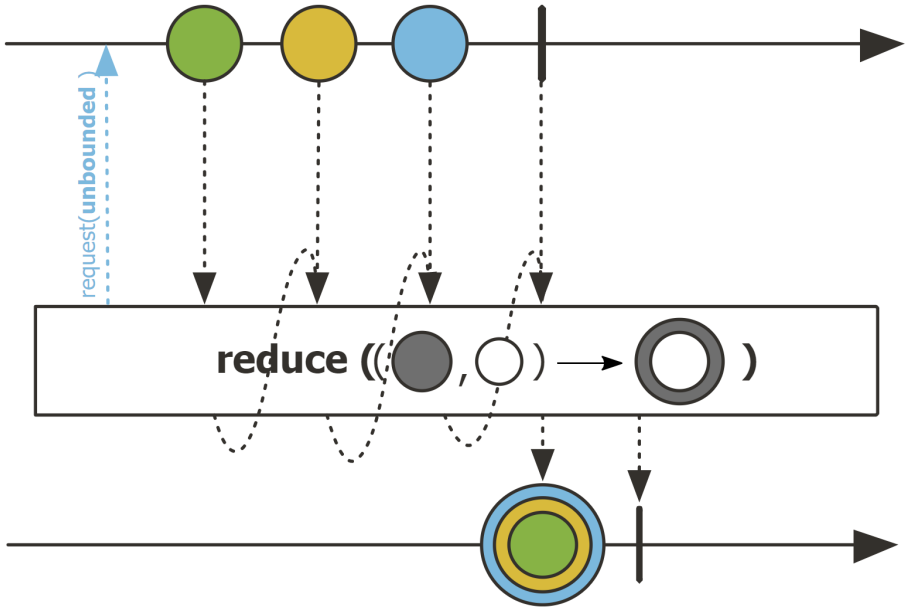
- The reduce() operator
  - Reduce this Observable's values into a single object of the same type as the emitted items
  - Upstream must signal onComplete() before accumulator can be emitted
  - Project Reactor's Flux.reduce() operator works the same




```
return Flux
    .fromArray(bigFractions)
    .flatMap(bf -> multiplyFractions(bf, Schedulers.parallel()))
    .reduce(BigFraction::add)
    ...
```

Sum results of async multiplications

See projectreactor.io/docs/core/release/api/reactor/core/publisher/Flux.html#reduce

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- The reduce() operator
  - Reduce this Observable's values into a single object of the same type as the emitted items
  - Upstream must signal onComplete() before accumulator can be emitted
  - Project Reactor's Flux.reduce() operator works the same
  - Similar to the Stream.reduce() method in Java Streams

reduce

`Optional<T> reduce(BinaryOperator<T> accumulator)`

Performs a reduction on the elements of this stream, using an associative accumulation function, and returns an `Optional` describing the reduced value, if any. This is equivalent to:

```
boolean foundAny = false;
T result = null;
for (T element : this stream) {
    if (!foundAny) {
        foundAny = true;
        result = element;
    }
    else
        result = accumulator.apply(result, element);
}
return foundAny ? Optional.of(result) : Optional.empty();
```

```
int result = List
   .of(1, 2, 3, 4, 5, 6).stream()
   .reduce(0, Math::addExact);
```

Sum the List values

See docs.oracle.com/javase/8/docs/api/java/util/stream/Stream.html#reduce

End of Key Combining Operators in the Observable Class (Part 2)