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Reactive Extensions for JS
Operators

Alex Thalhammer

Outline

- Motivation
- Example
- Transformation Operators
- Filtering Operators
- Combination Operators
- Error Handling
- Higher Order Observables
- Reference

Motivation

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Observables vs Promises – Operators

Observables (Streams)	Promises (Single Event)
More features	Less powerful
Can emit zero, **one or multiple** values over time.	Emit a **single** value at a time.
Lazy: they're not executed until we subscribe using the subscribe() method.	**Eager**: execute immediately after creation.
Subscriptions are **cancellable** using the unsubscribe() method, which stops the listener from receiving further values.	Are **not cancellable**.
RxJS provides a **ton of functionality** to operate on observables like the map, forEach, filter, reduce, retry, and retryWhen operators.	Don't provide any operations.
Deliver errors to the subscribers.	Push errors to the child promises.
Used by Angular in HTTP Client & Route Params	Used by Angular in Router.navigate

Example

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Example with Pipeable Operators

```
import { map } from 'rxjs/operators';

this.httpClient.get<Booking>("http://www.angular.at/api/...")
    .pipe(map((booking) => new Date(booking.date)))
    .subscribe({
        next: (date) => { … },
        error: (err) => { console.error(err); }
        complete: () => { console.log('complete'); }
    });
```

Transformation Operators

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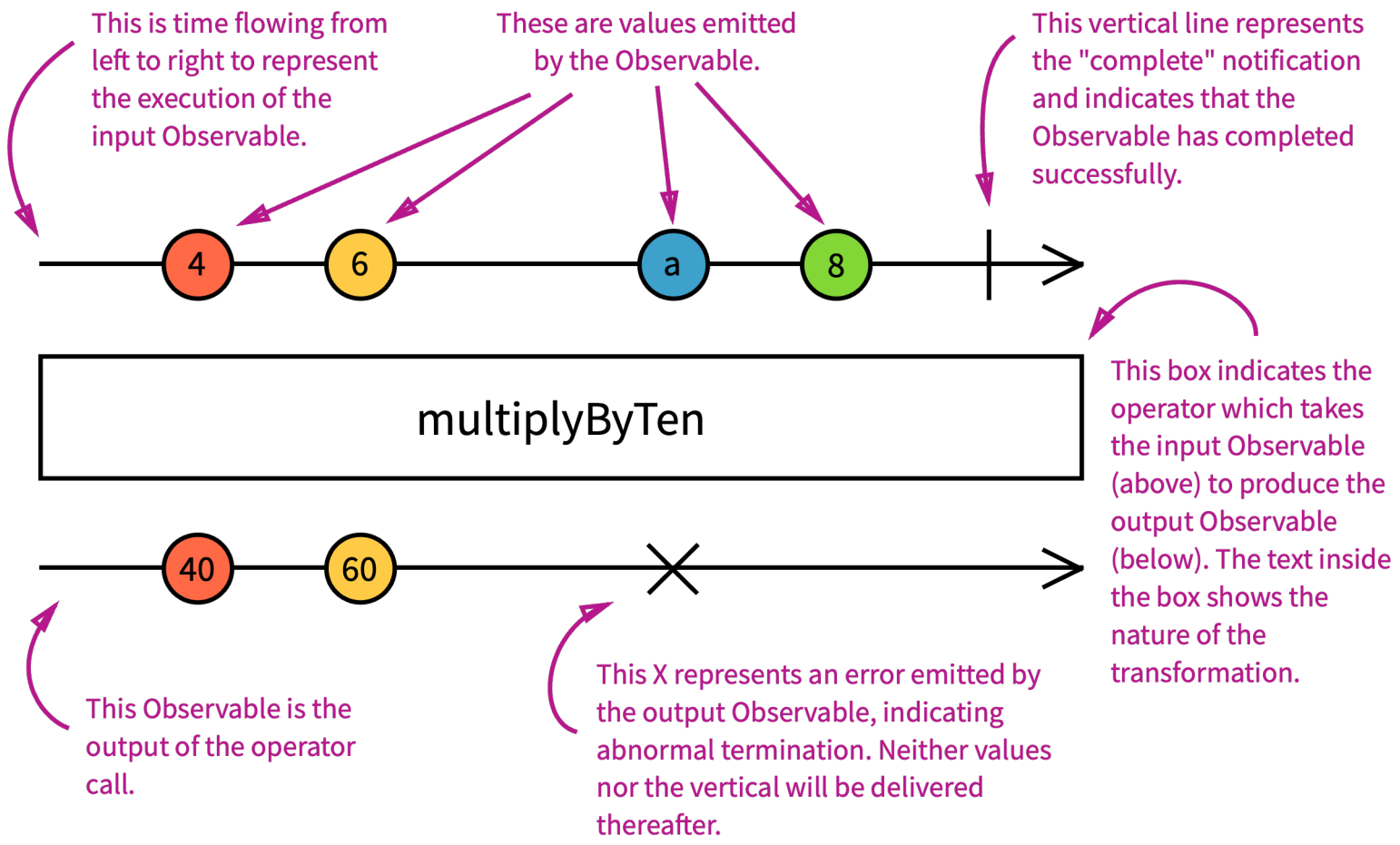
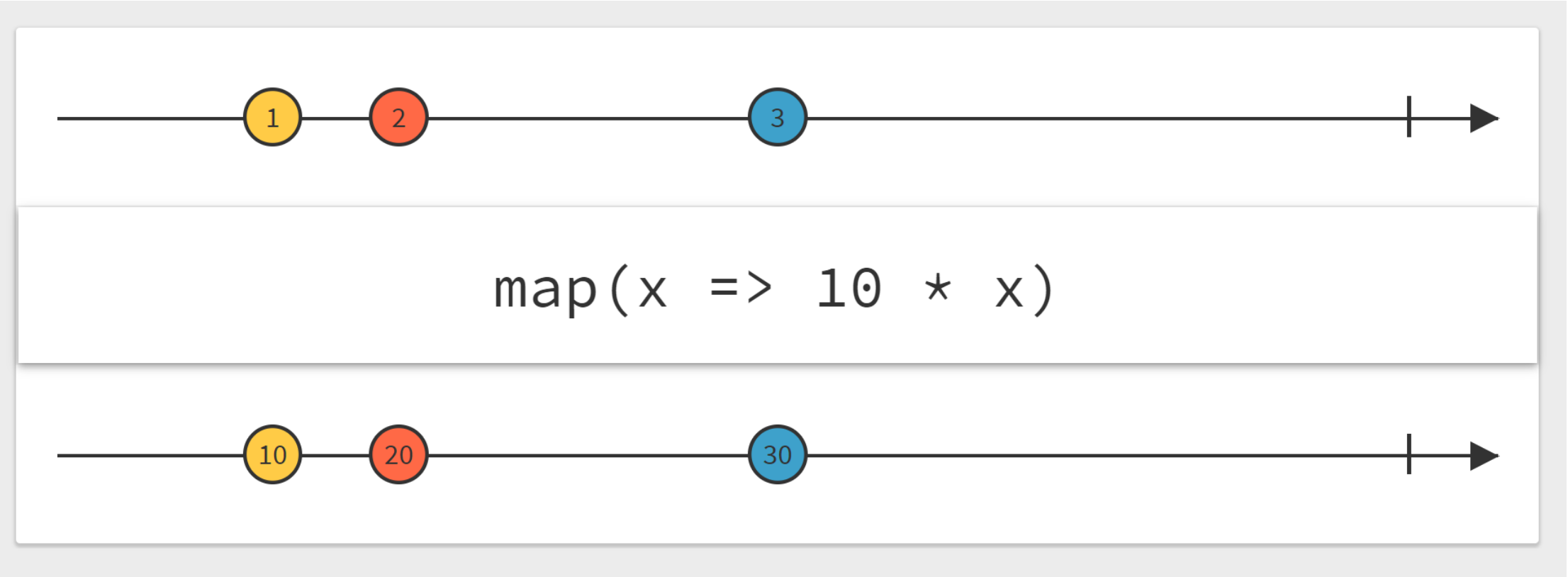
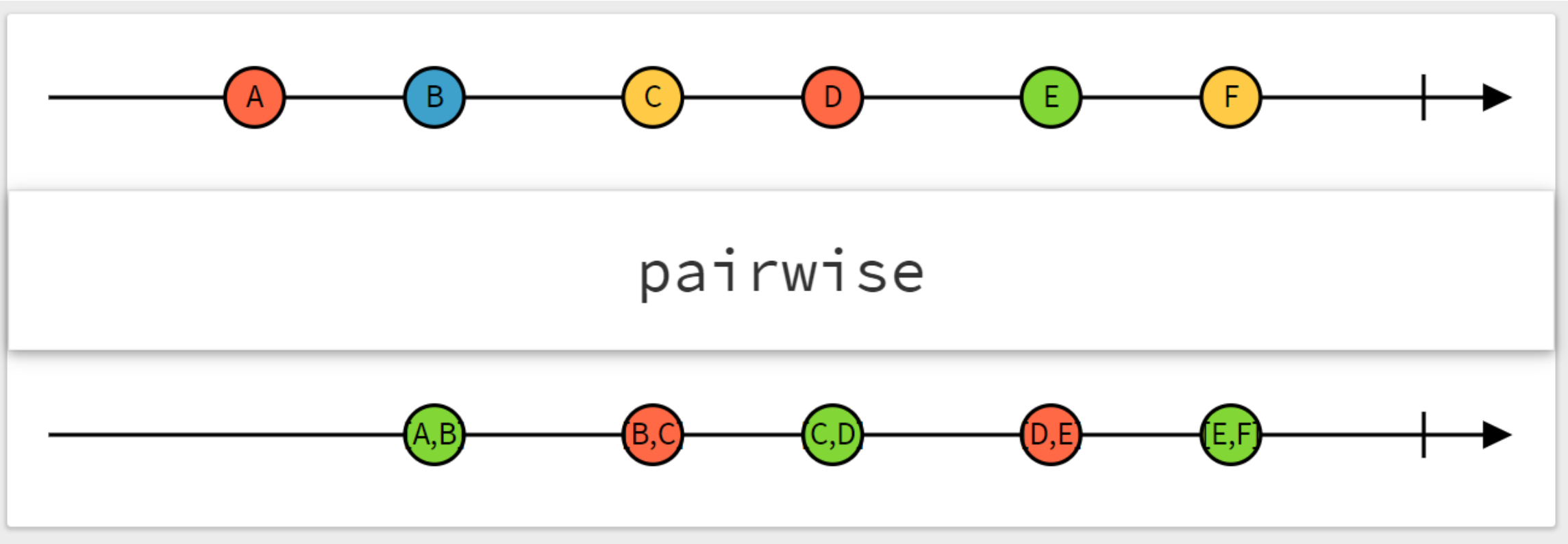
Operators

[https://rxjs.dev/guide/operators]



Operators





Filtering Operators

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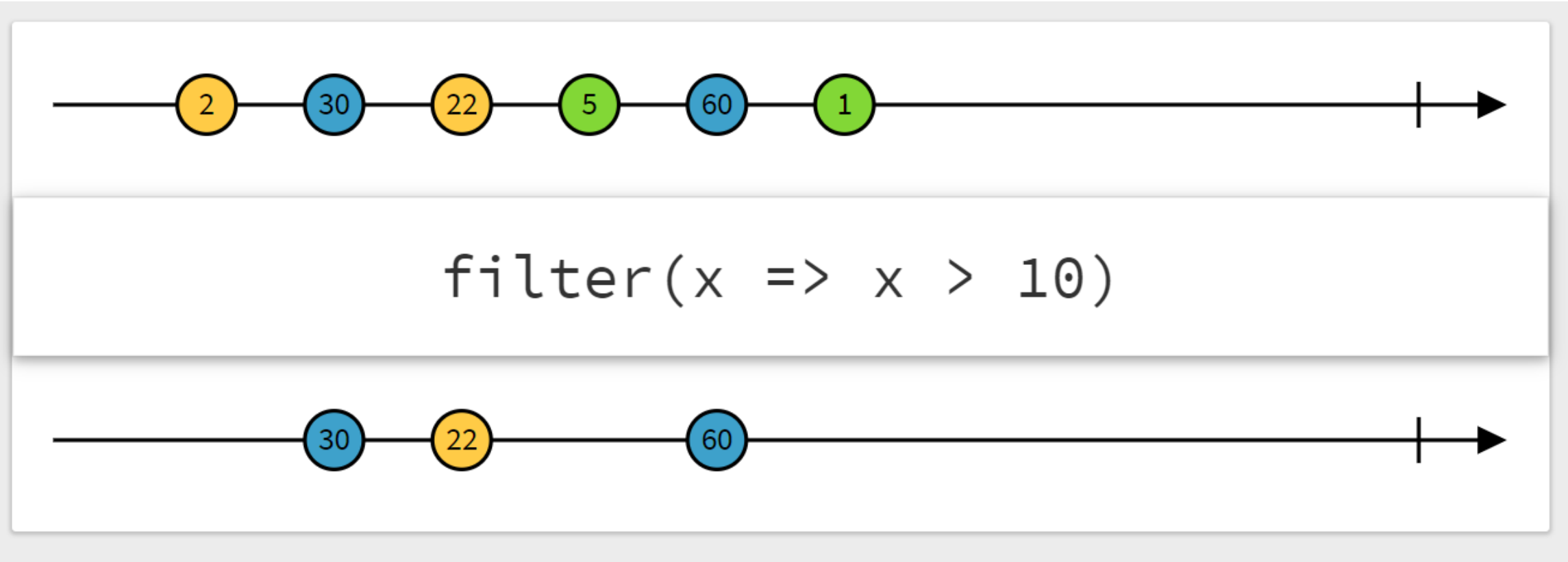

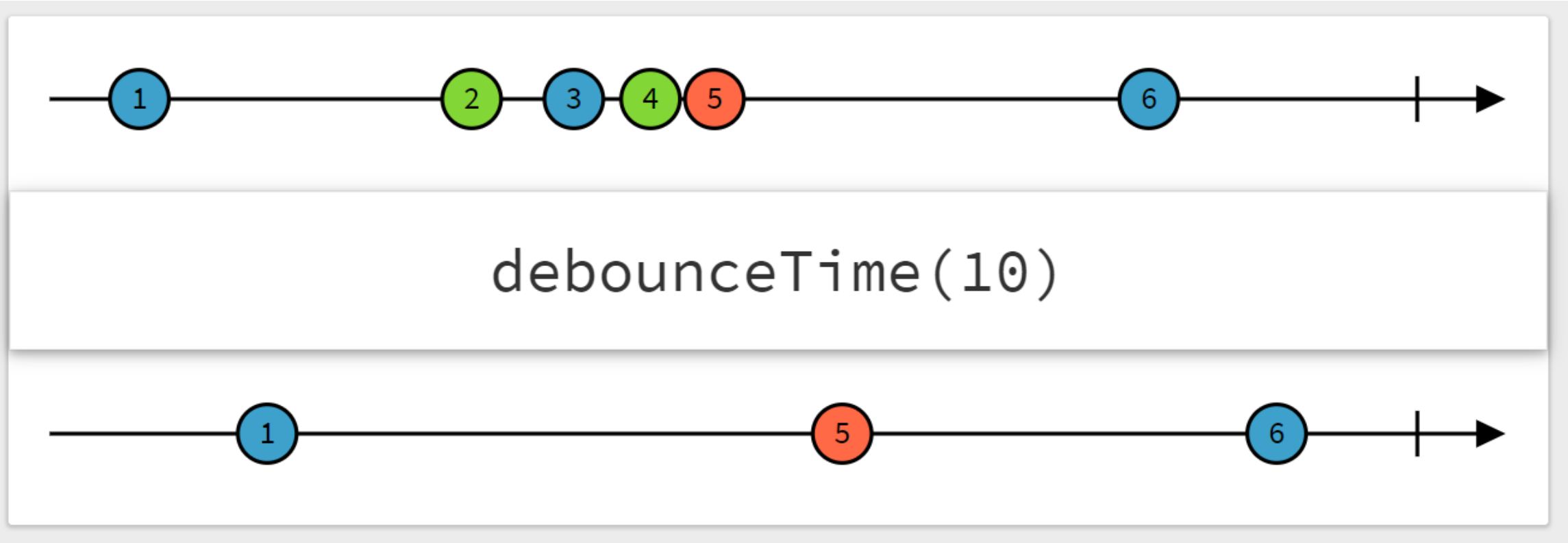

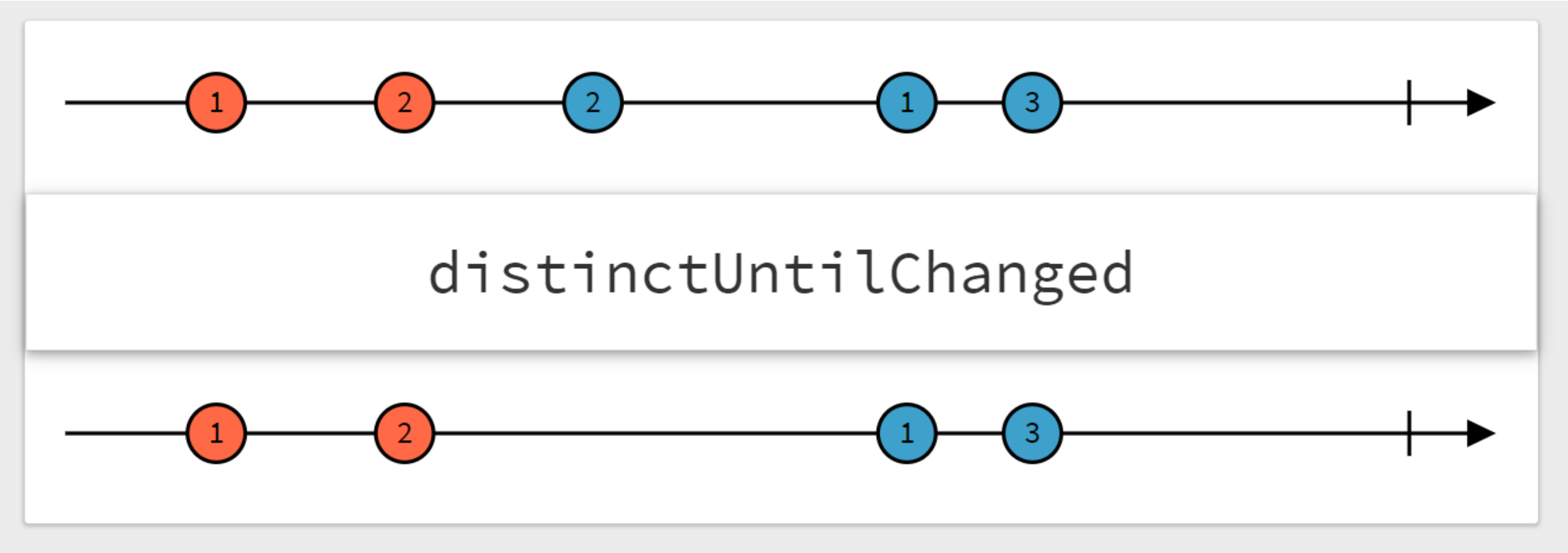

Demo

Simple Lookahead

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Combination Operators

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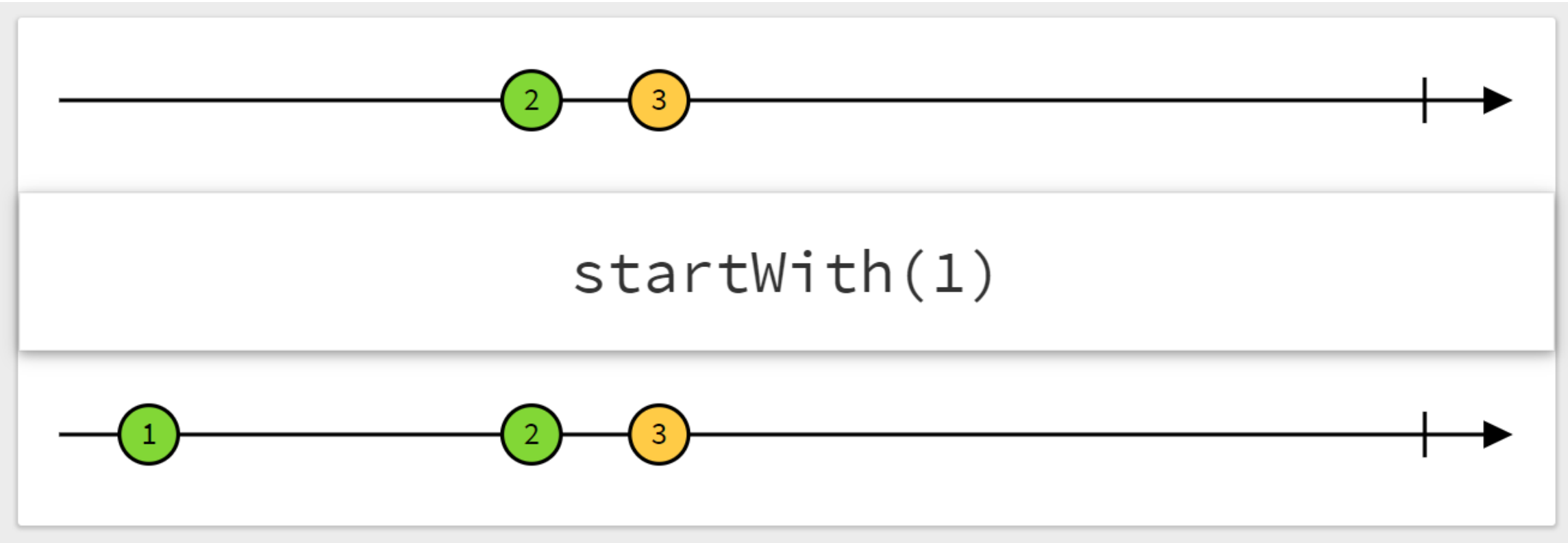
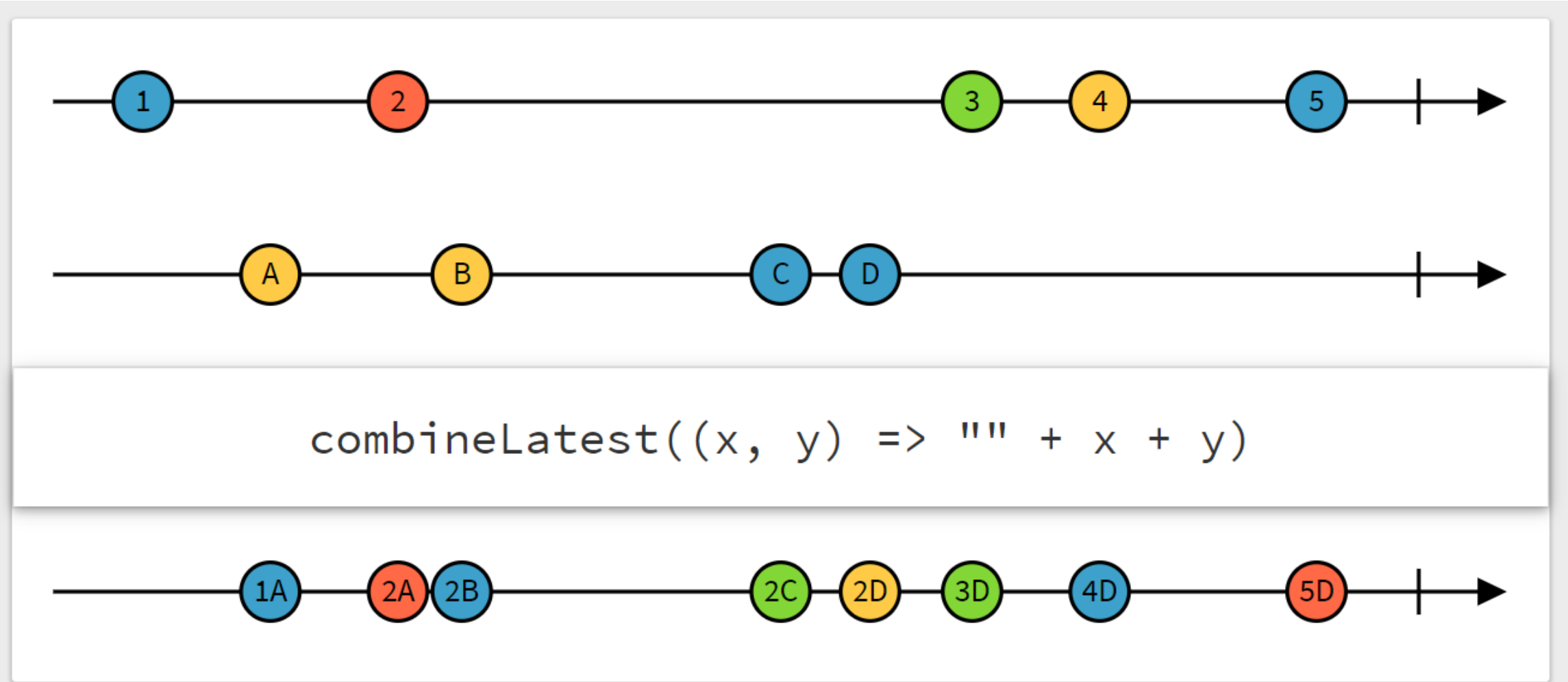
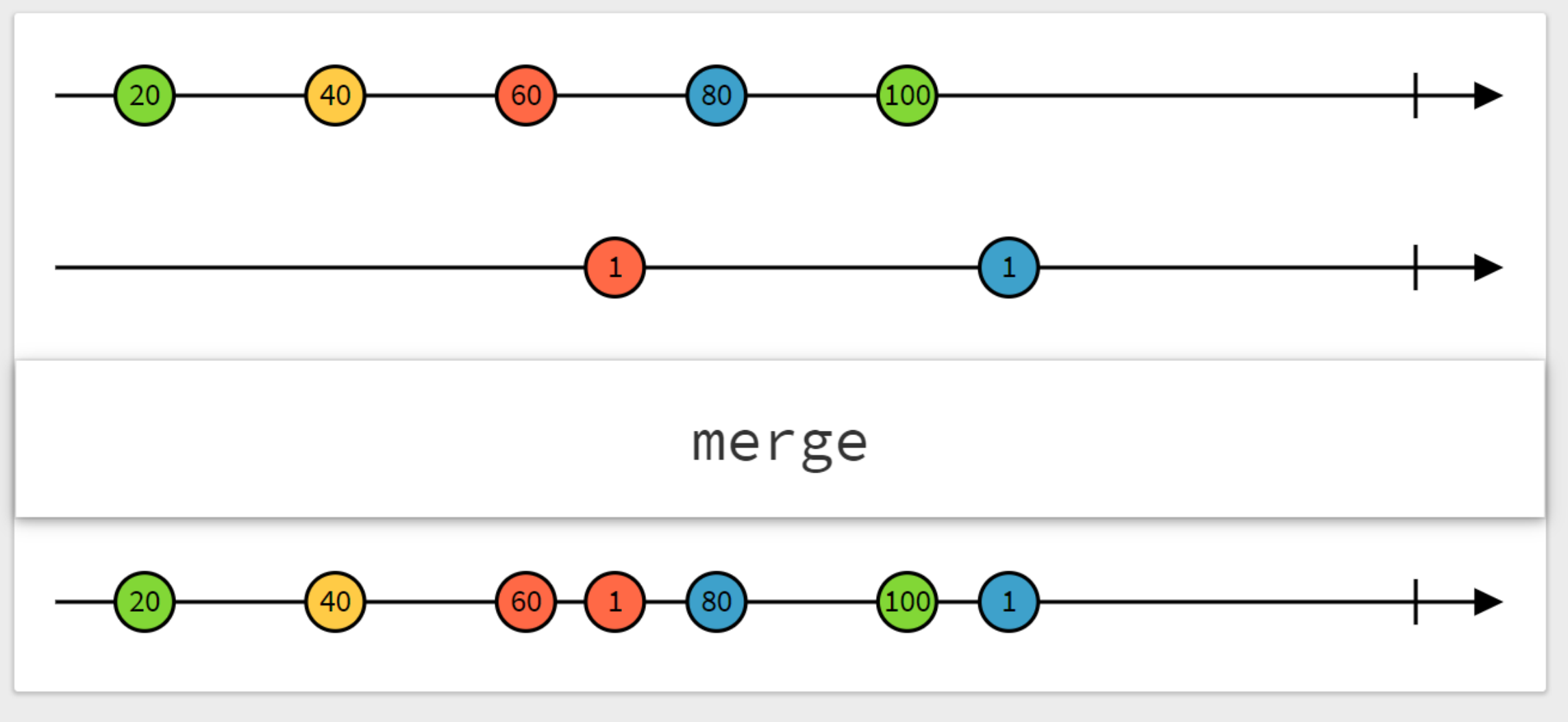




Digression: combineLatest vs forkJoin

combineLatest (ReactiveForms)	forkJoin (HttpClient)
Emits whenever all input $ have emitted at least once.	Emits when all input $ have been completed.
Multiple emits over time.	**Single** emit with last values.
Error will stop the emits.	Error will avoid any emit.
Unsubscribing necessary.	**Unsubscribing** recommended (as almost always).



Demo

Combine Streams

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Error Handling

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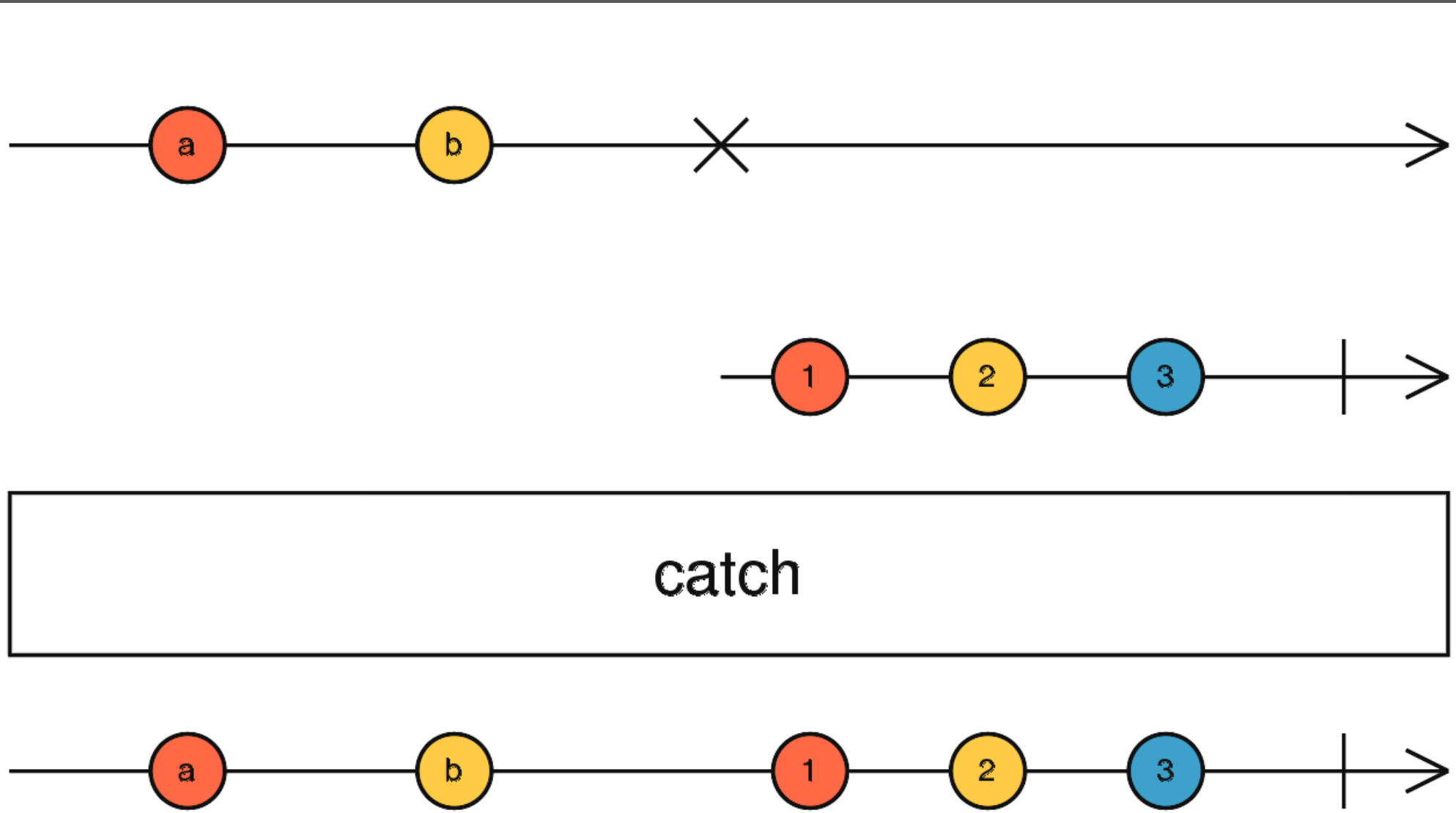
Operators for Error Handling

- ```
  catchError((err) => {
    console.log('Error caught:');
    console.log(err);
    return of([]);
  })
  ```

- ```
  retry(3)
  ```

- ```
  throwError(() => new Error('im an error'))
  ```

- ```
  finalize(() => {
    this.isLoading = false;
  })
  ```


a
b
1
2
3
catch
a
b
1
2
3

Demo

Error Handling

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Taking Operators

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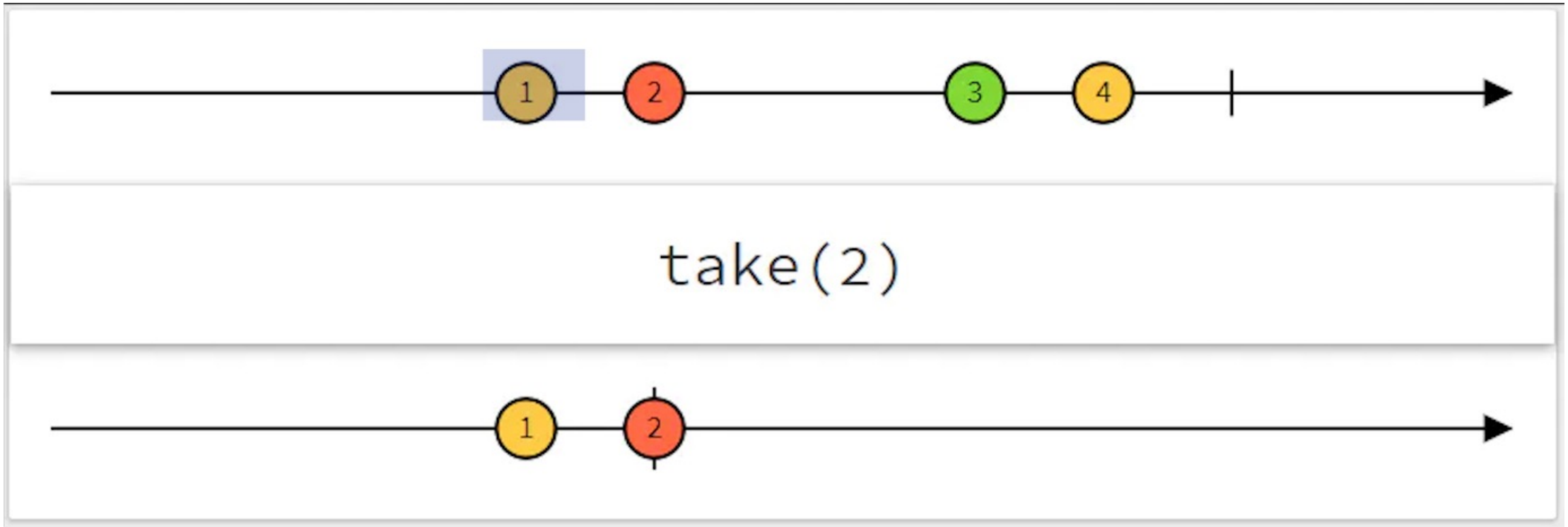

Taking operators

- take(n)
- first(predicate?: boolean)
- takeUntil(observable) & takeWhile(boolean)

One more thing ☺

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Higher Order Observables

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Operators for Higher Order Observables

- mergeMap
  - merges outer (source) and inner observables
- exhaustMap
  - outer is ignored until inner is finished
- switchMap
  - inner will be completed after next outer
- concatMap
  - outer will be sent after inner is finished

https://thinkrx.io/rxjs/mergeMap-vs-exhaustMap-vs-switchMap-vs-concatMap/

Lab Time

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Custom operators?

- Operators are functions with input and output of type observable
- We can create our own operator function
- To avoid code duplications (DRY as ever)
- There is an example at the end of the lab

Recap

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Like RxJS?

- Marble Diagrams
  - http://rxmarbles.com

- Usefull Links
  - https://rxjs.dev/guide/overview
    - https://reactive.how/rxjs/ (Launchpad)
    - https://rxjs-dev.firebaseapp.com/operator-decision-tree (ODT)
  - https://www.learnrxjs.io/
  - https://angular.io/guide/rx-library