Angular Fundamentals
Module 4 – Observables

Peter Kassenaar
info@kassenaar.com

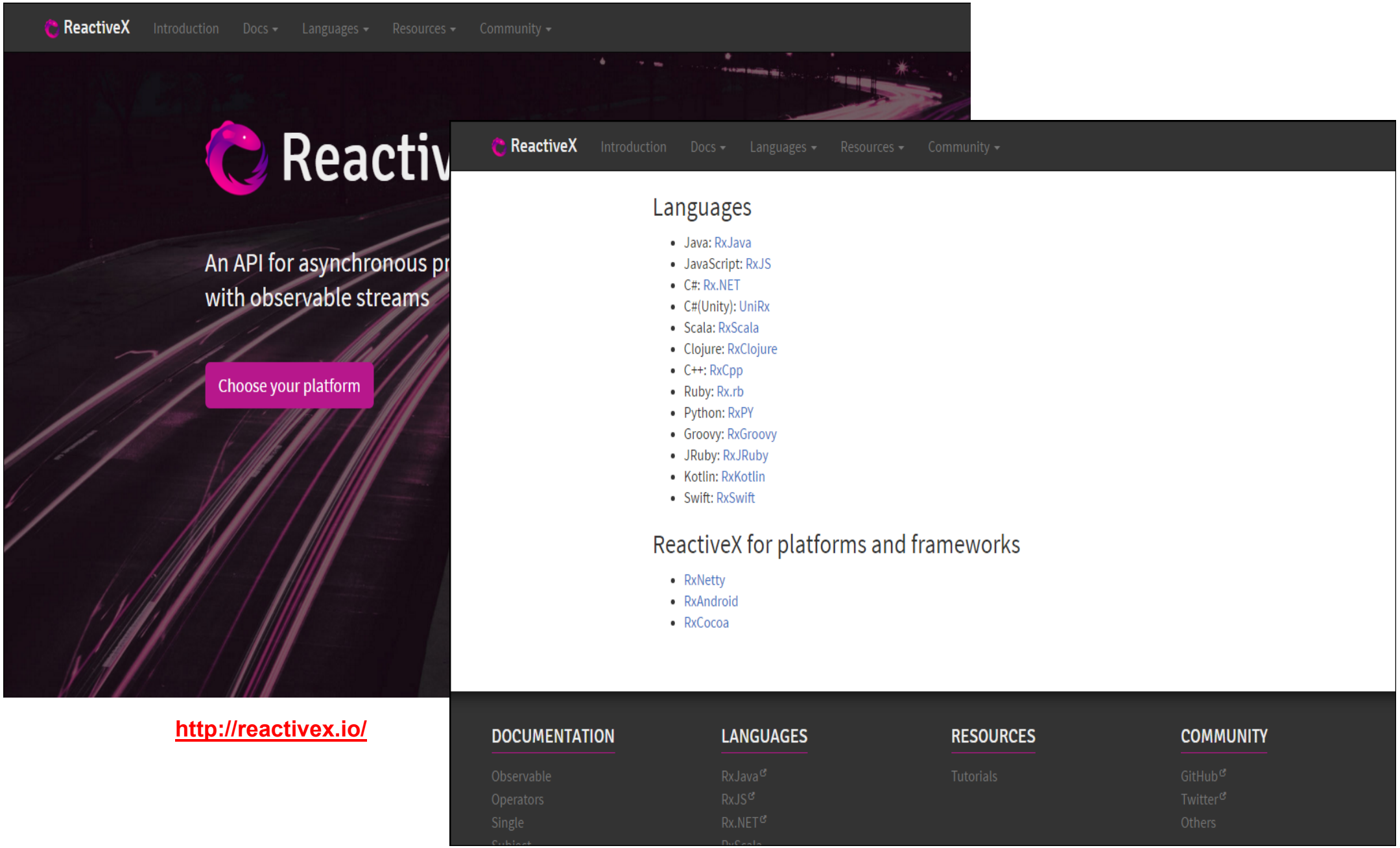
Async services with RxJS / Observables

Reactive programming
with asynchronous streams

Async Services

- Fetching static data: *synchronous* action
- Working via `HttpClient`: *asynchronous* action
- Angular 1: `Promises`
- Angular 2: `Observables`

Angular : ReactiveX library RxJS

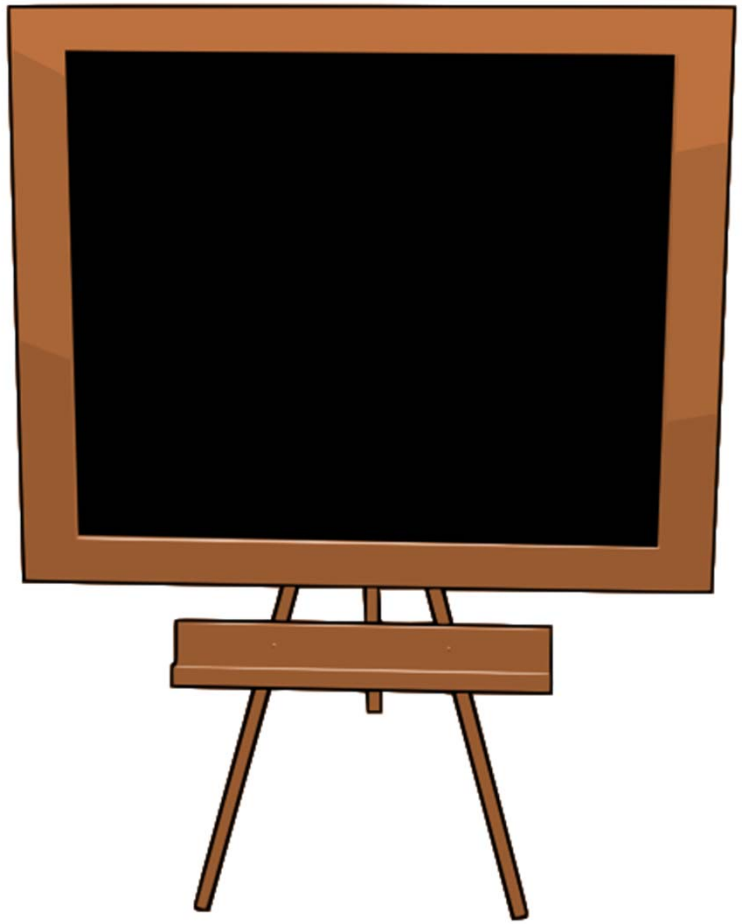


http://reactivex.io/

The observable design pattern

"Understanding the observable stream"

Explanation



Why Observables?

“We can do much more with observables than with promises.

With observables, we have a whole bunch of operators to pull from, which let us customize our streams in nearly any way we want.”

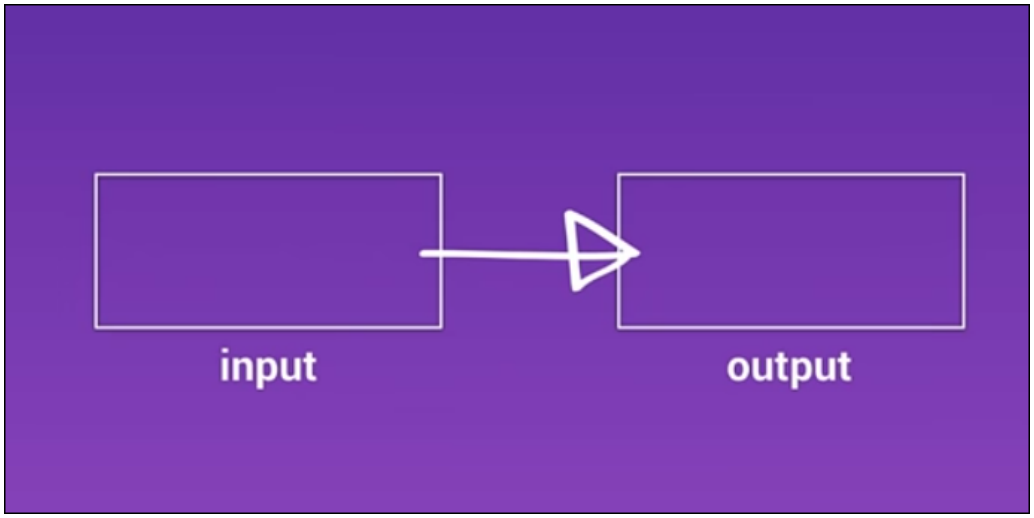
https://auth0.com/blog/2015/10/15/angular-2-series-part-3-using-http/

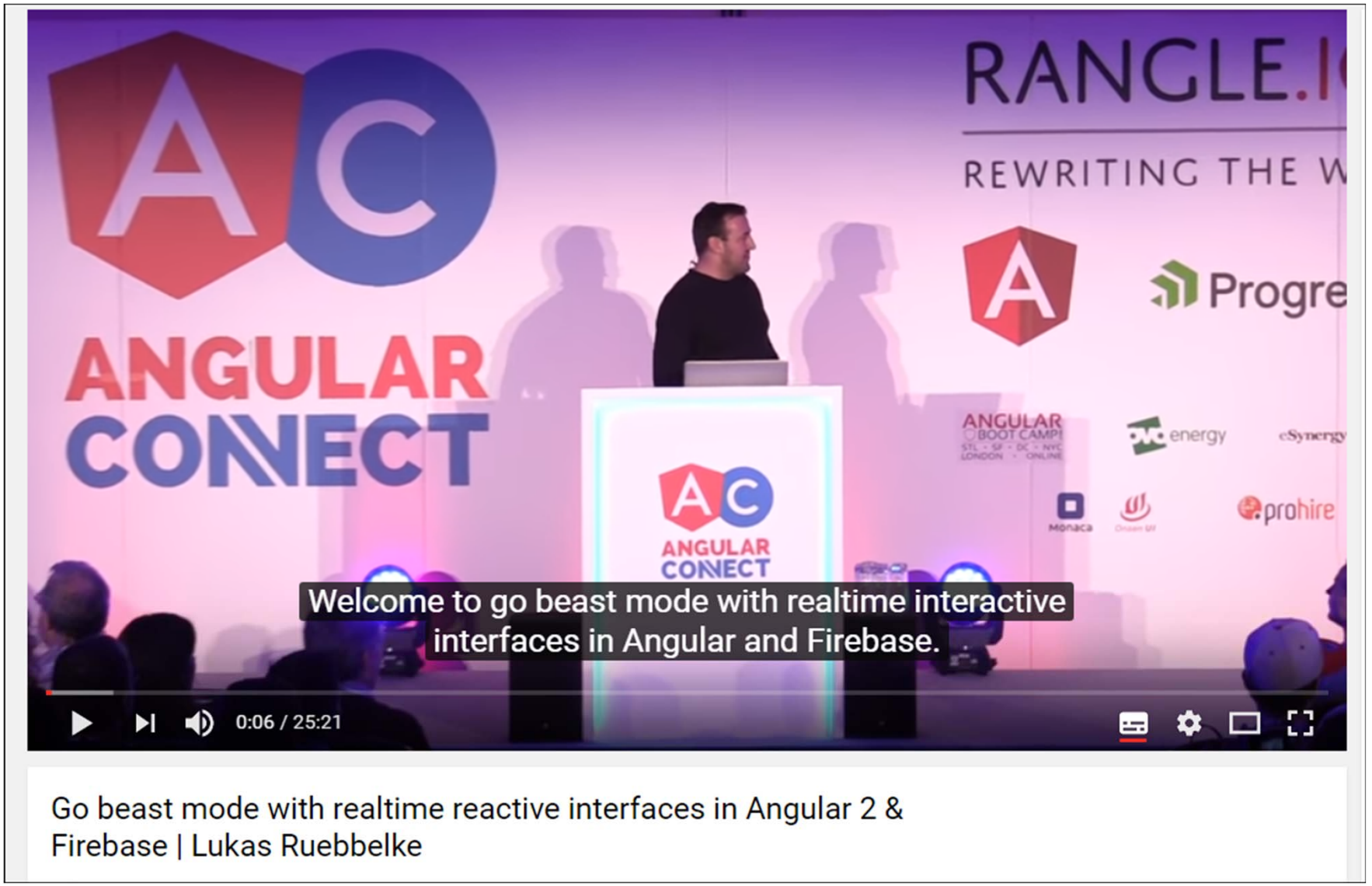
Observables and RxJs

- “Reactive Programming”
  - *“Reactive programming is programming with asynchronous data streams.”*
  - https://gist.github.com/staltz/868e7e9bc2a7b8c1f754
- Observables have a lot of extra options, as opposed to Promises
  - Mapping
  - Filtering
  - Combining
  - Cancel
  - Retry
  - …
- Consequence: no more `.success()`, `.error()` and `.then()` chaining!

How do observables work

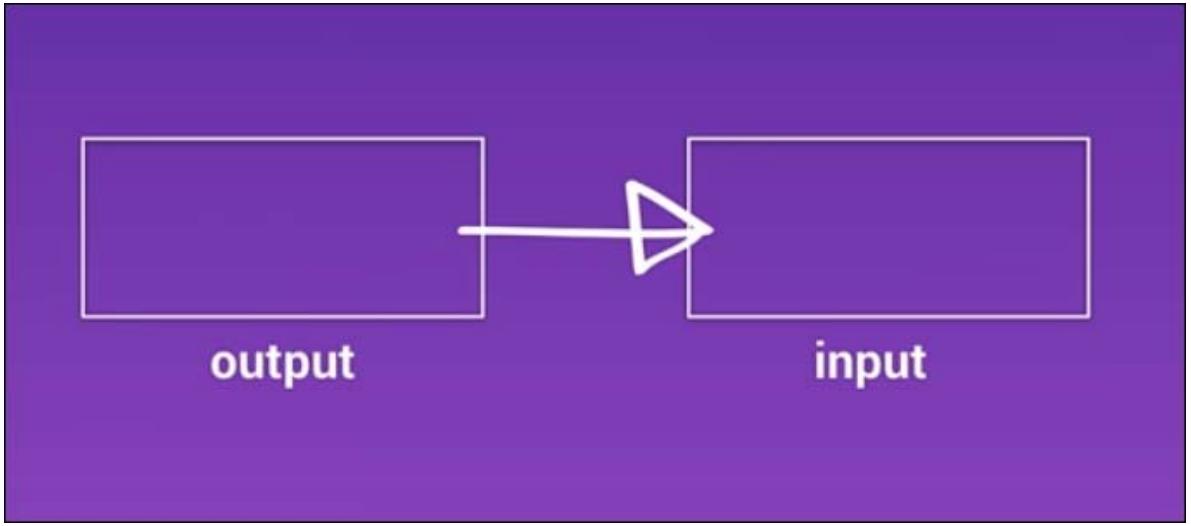
- First - The Observable Stream
- Later - all 10.000 operators…
- Traditionally:



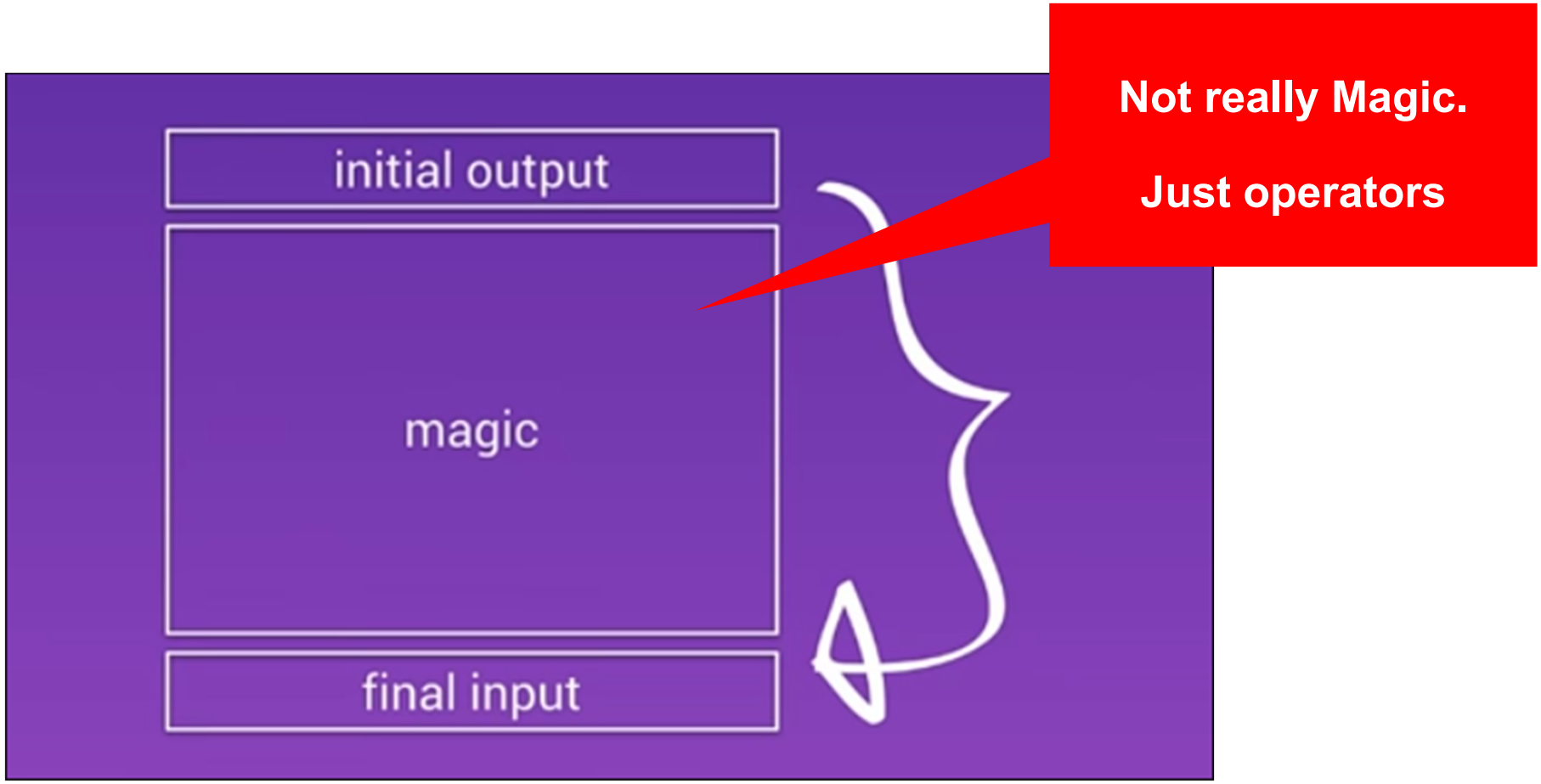


https://www.youtube.com/watch?v=5CTL7aqSvJU

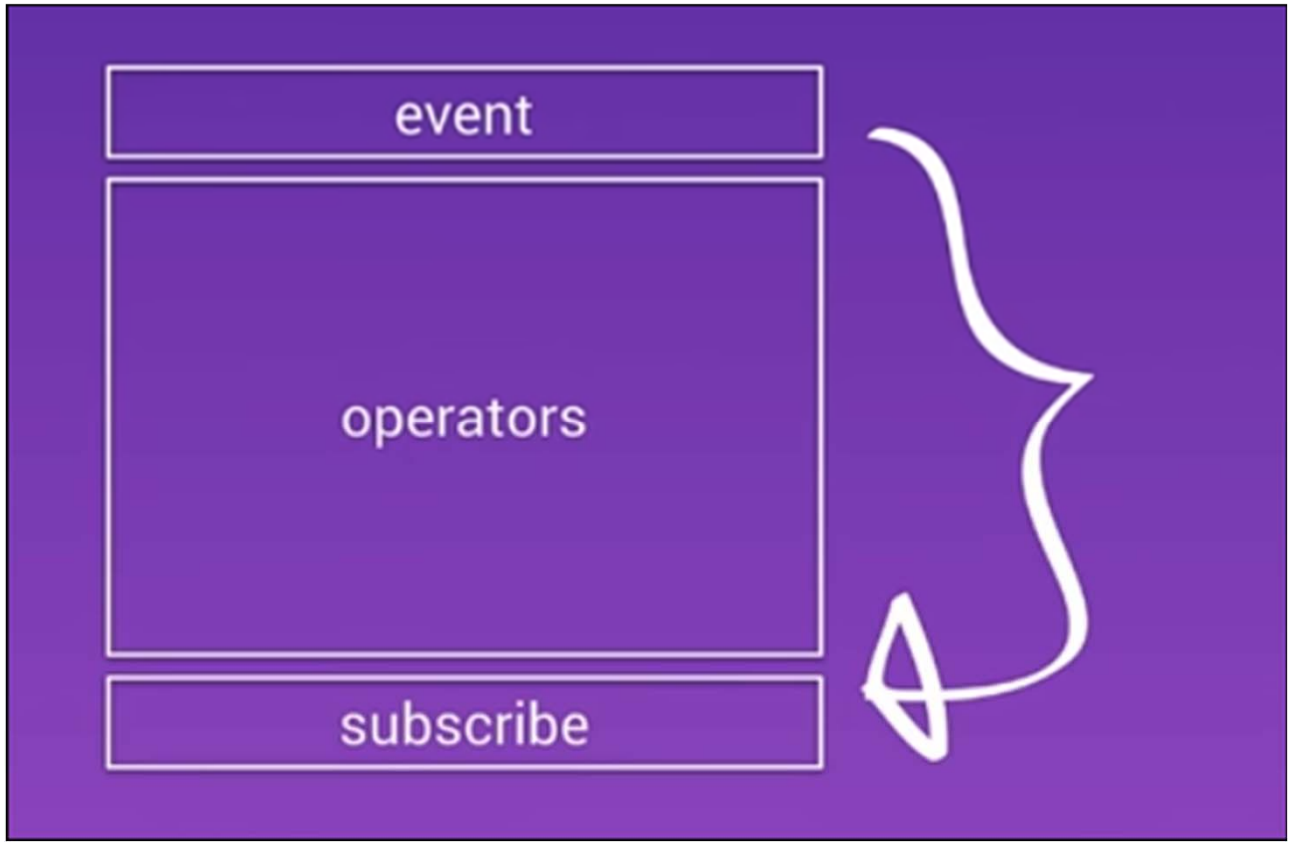
- With Observables -
  - a system, already outputting data,
  - Subscribe to that data
- "trade Output for Input"
- "Push vs. Pull"



"The observable sandwich"



“The Observable Sandwich"



In code, for http-call:

```
this.http.get<City[]>('assets/data/cities.json')
    .pipe(
       filter(…),
       map(…)
    )
    .subscribe((result) => {
      //... Do something
   });
```

Initial Output

Optional: operator(s)

Final Input

Import HttpClientModule in @ngModule – don't forget

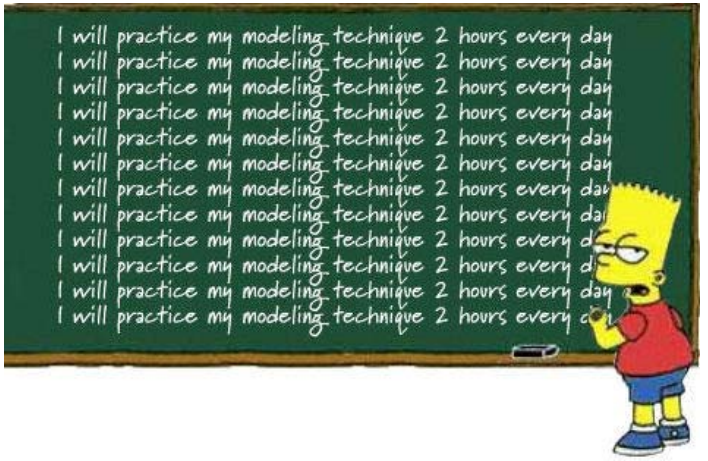
- *// Angular Modules*
  …
- **import** {HttpClientModule} **from '@angular/common/http'**;

```
// Module declaration
@NgModule({
    imports     : [BrowserModule, HttpClientModule],
    declarations: [AppComponent],
    bootstrap   : [AppComponent],
    providers   : [CityService] // DI voor service
})
export class AppModule {
}
```

Exercise

- See the example in `/201_services_http`
- Create your own `.json`-file and import it in your application.
- Exercise `5c), 5d)`

Exercise....



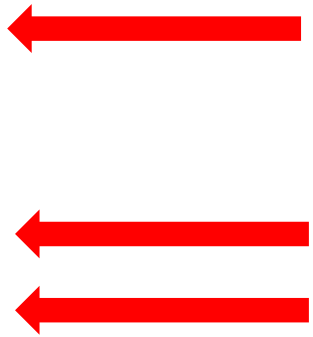
More on subscriptions

Using parameters inside the subscriber

Subscribe - only once per block!

- Part of RxJs
- Three parameters:
  - `success()`
  - `error()`
  - `complete()`

```
this.cityService.getCities()
    .subscribe(cityData => {
          this.cities = cityData
       },
       err => console.log(err),
       ()=> console.log('Getting cities complete...')
    )
```

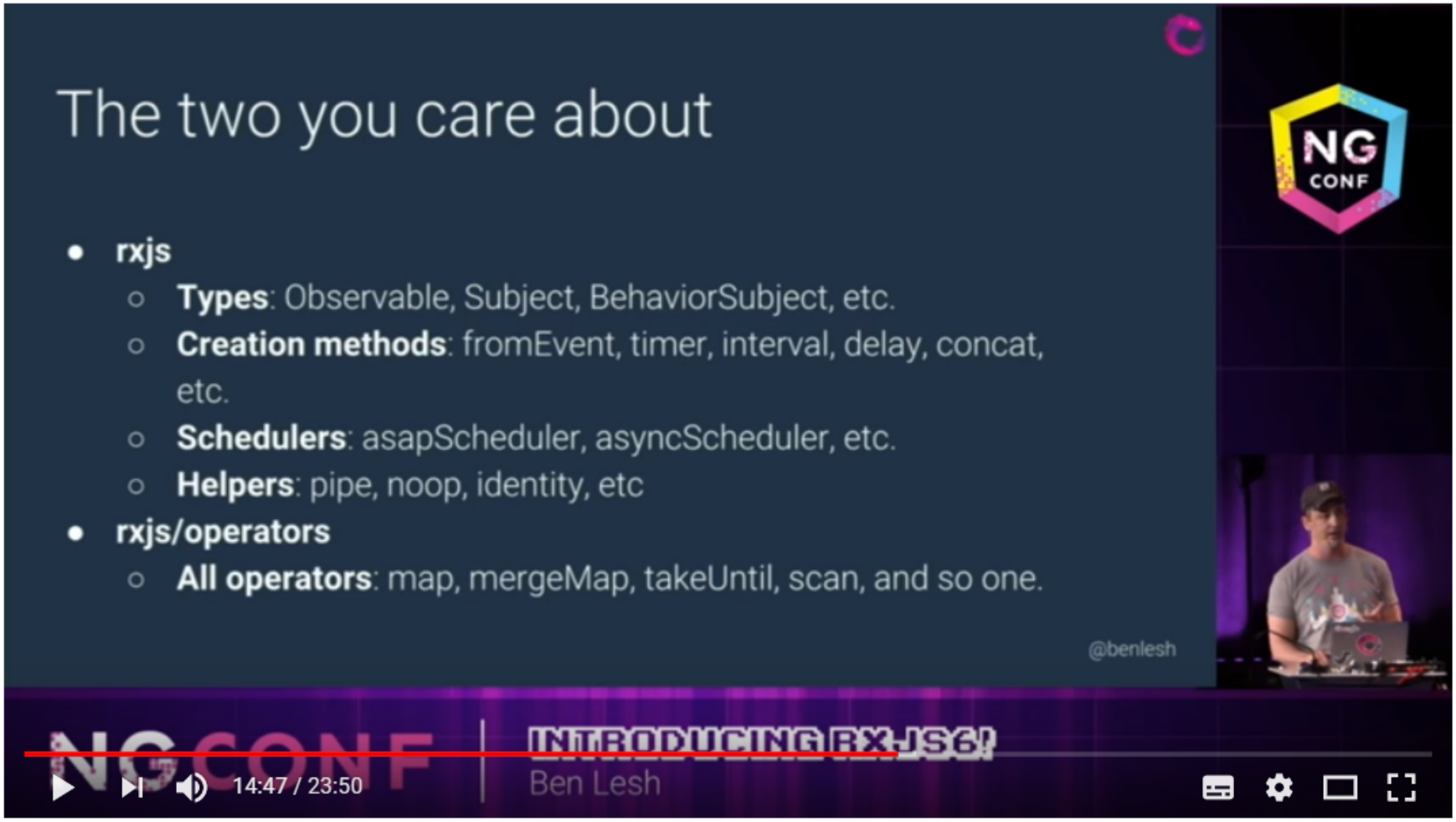


Pipeable operators

- In RxJS 6.x and up: all operators inside `.pipe()` functie
- The parameters of pipe function are the operators!
- Comma-separate different operators.
  - Don't forget `import {…} from 'rxjs/operators';`

```
.pipe(
    delay(3000),
    retry(3),
    map(result => …),
    takeUntil(…condition…)
)
```

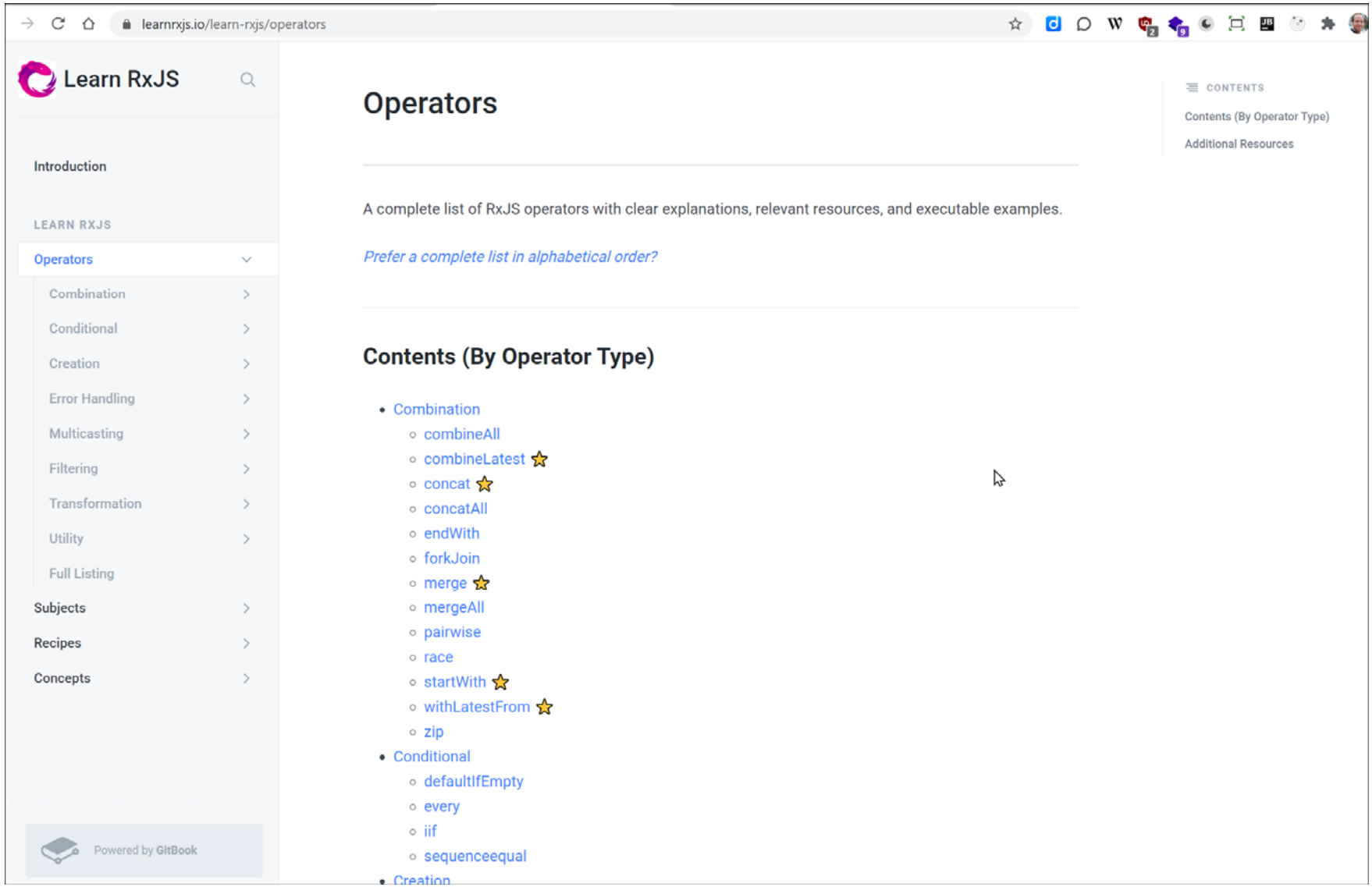
Background info: Ben Lesh on observables in RxJS 6.0



Introducing RxJS6! - Ben Lesh

https://www.youtube.com/watch?v=JCXZhe6KsxQ

https://www.learnrxjs.io/



Using the async pipe

Automagically `.subscribe()` and `.unsubscribe()`

Async Pipe

- On `.subscribe()`, you actually need to `.unsubscribe()` to avoid memory leaks
  - Best practice
  - Not *really* necessary on HTTP-requests, but you do in other subscriptions.
- No more manually `.subscribe()` and `.unsubscribe()`:
  - Use Angular async pipe

- Component:

```
cities$: Observable<City[]>; // Now: Observable to Type


…
ngOnInit() {
   // Call service, returns an Observable
   this.cities$ = this.cityService.getCities()
}
```

- View:

```
<li *ngFor="let city of cities$ | async”>
```

https://blog.angularindepth.com/angular-question-rxjs-subscribe-vs-async-pipe-in-component-templates-c956c8c0c794
(Background information)

Working with Live API's

- MovieApp
- `examples\210-services-live`

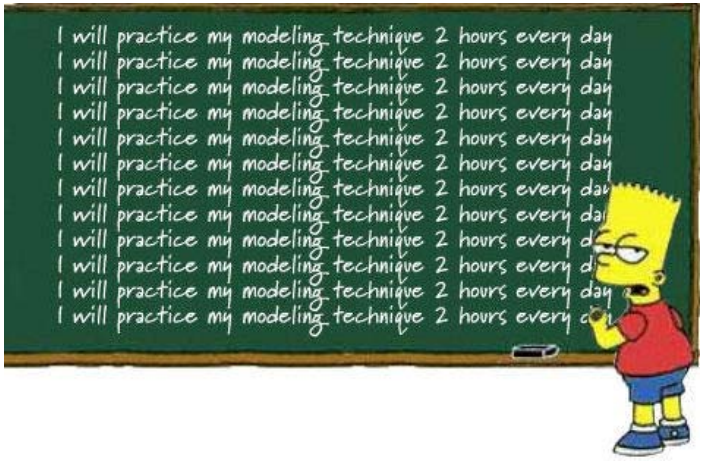
Example API's

- https://pokeapi.co/ - Pokemon API
- http://openweathermap.org/API (weather forecast)
- https://jsonplaceholder.typicode.com/ random users, posts, photos
- http://ergast.com/mrd/ - Ergast Motor (F1) API
- http://www.omdbapi.com/ - Open Movie Database
- http://swapi.co/ - Star Wars API
- See also `JavaScript APIs.txt` with other API's.

Exercise

- Pick one of your own projects, or see for examples:
  - `210-services-live`
- Create a small application using one of the API's in the file `JavaScript API's.txt`, using RxJS-calls, for example
  - Star Wars API
  - OpenWeatherMap API
  - ...
- Exercise 5e)

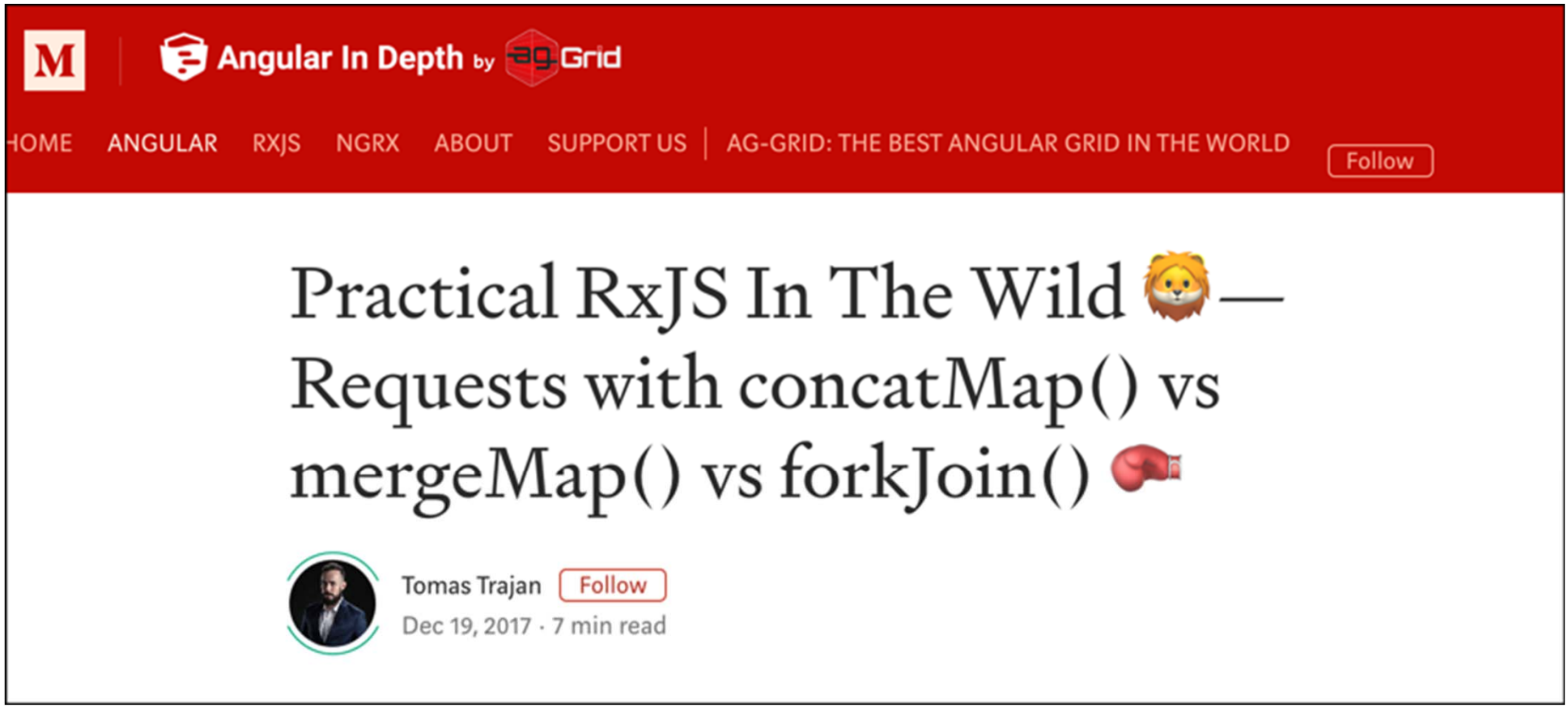
Exercise....



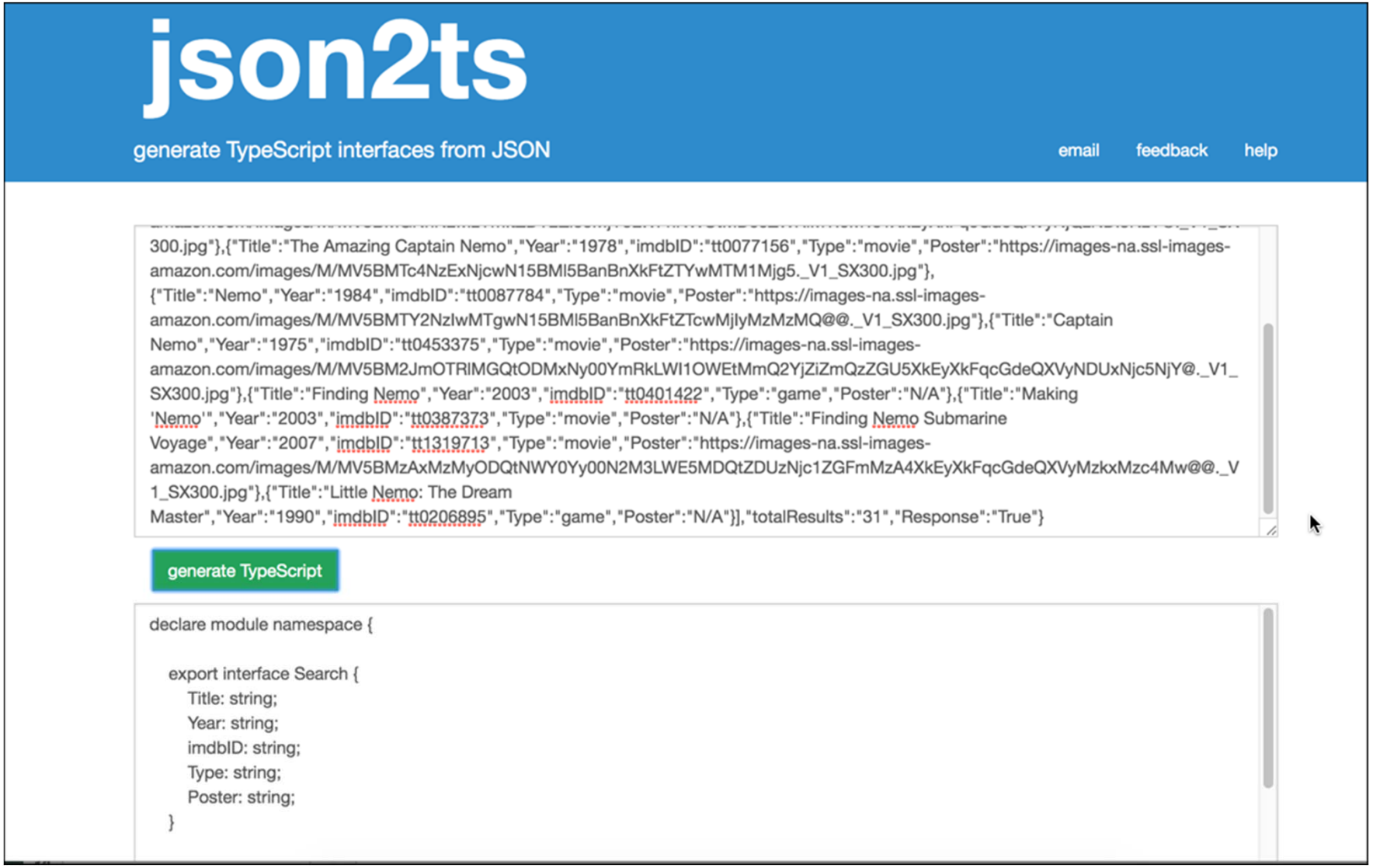
More info on observables

Fetching a collection of observables

https://blog.angularindepth.com/practical-rxjs-in-the-wild-requests-with-concatmap-vs-mergemap-vs-forkjoin-11e5b2efe293

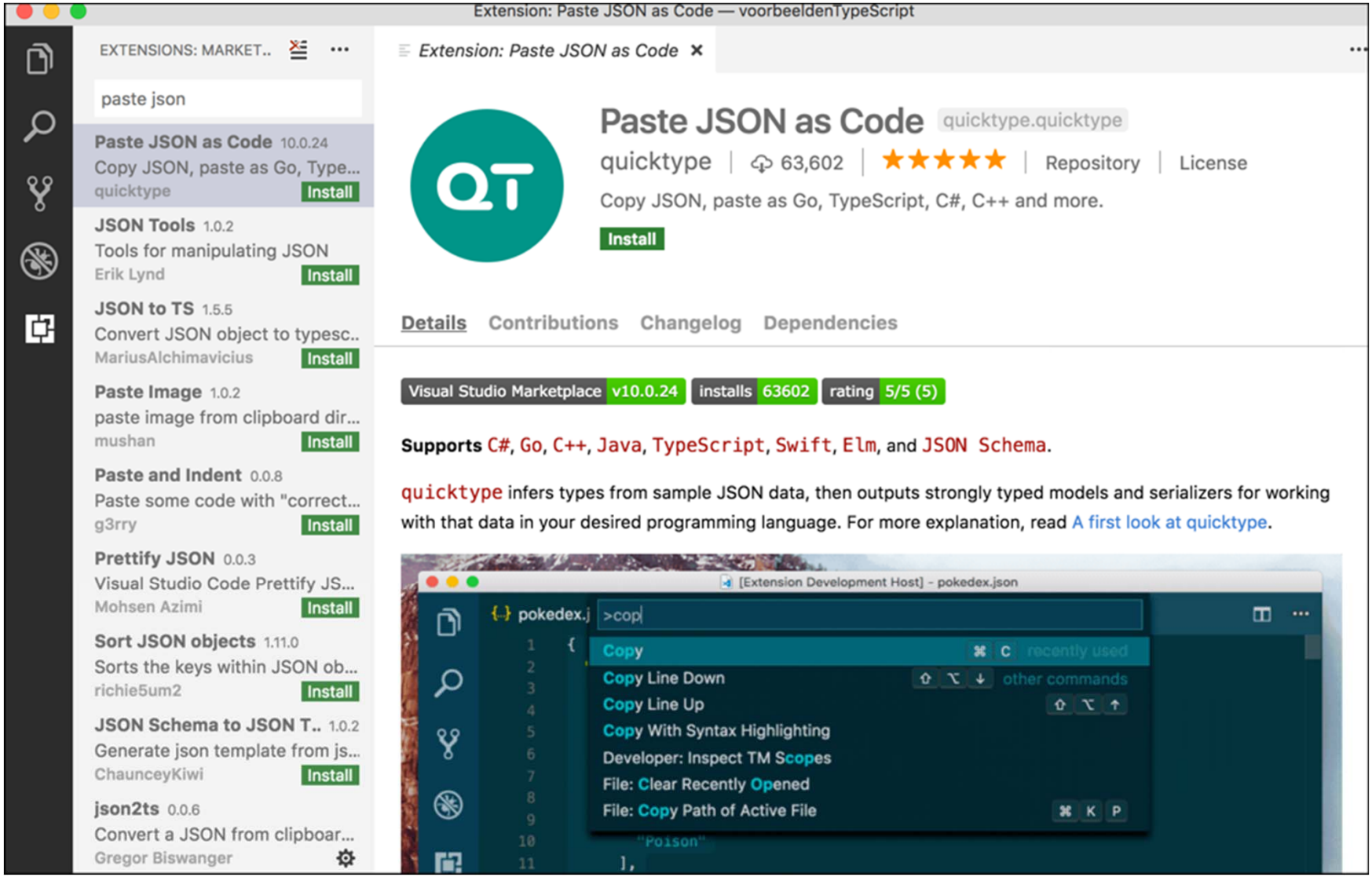


Online JSON to TypeScript converter



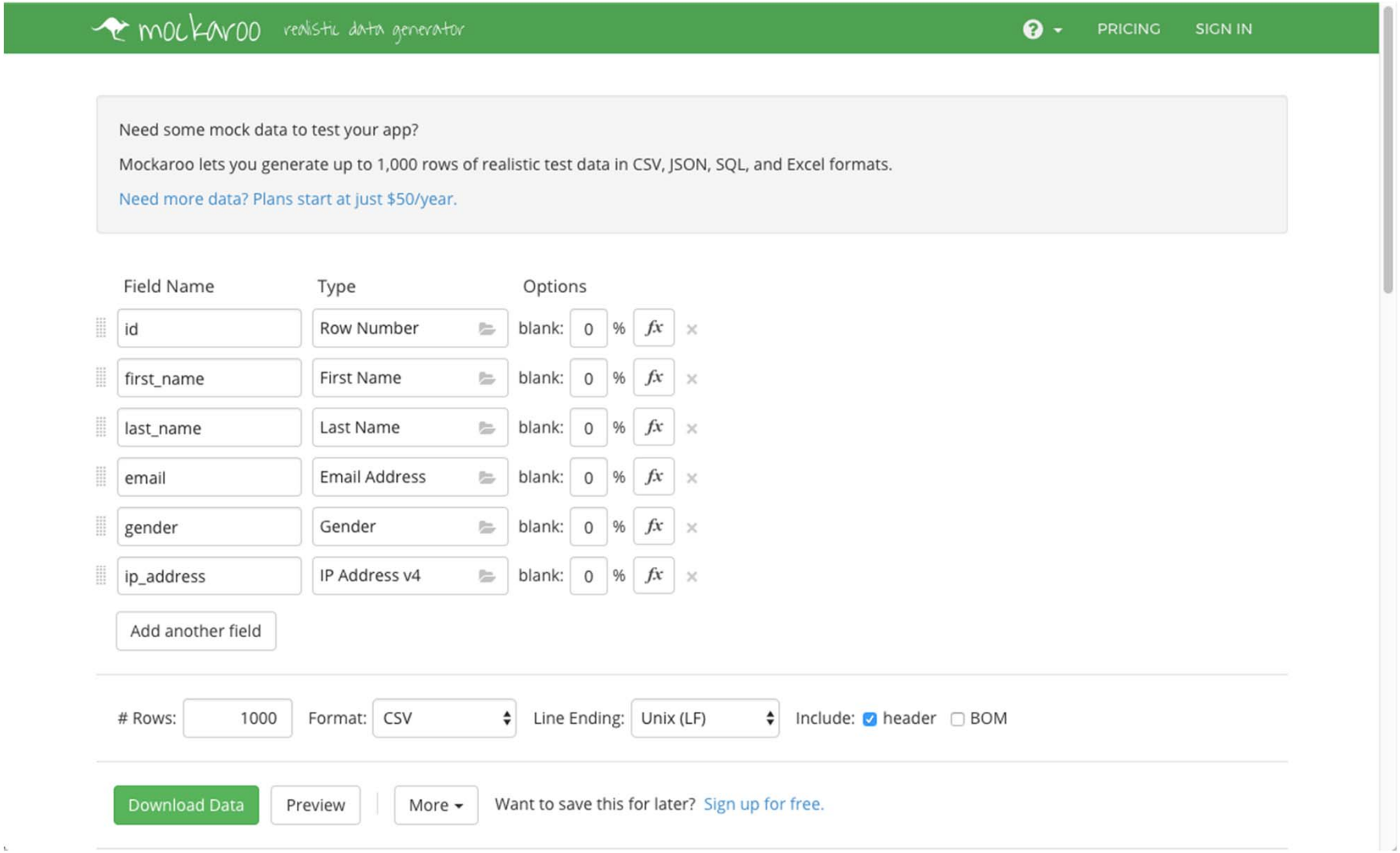
http://json2ts.com/

In VS Code? Use this extension!



https://marketplace.visualstudio.com/items?itemName=quicktype.quicktype

Data Mocking - Mockaroo

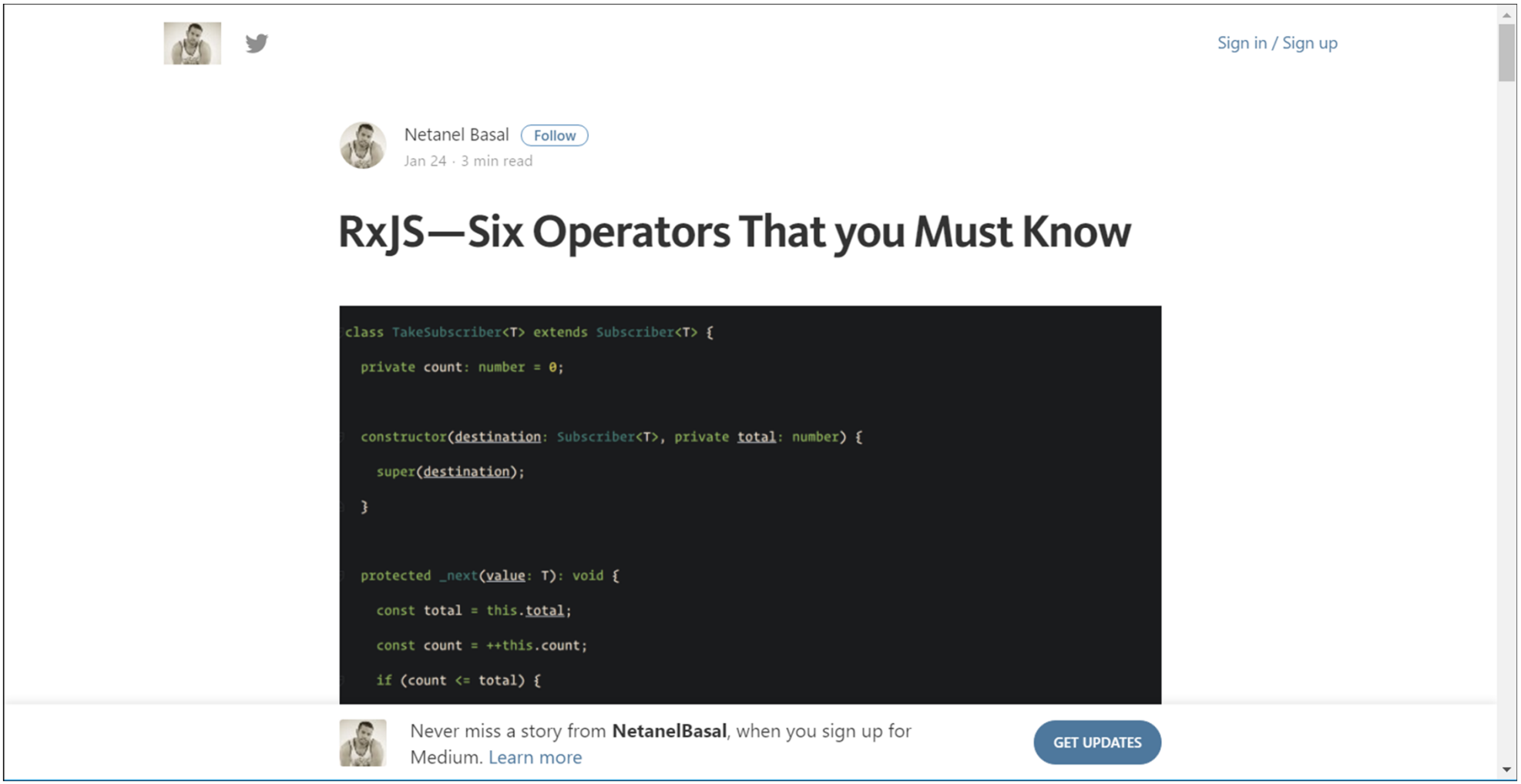


http://mockaroo.com/

Useful operators

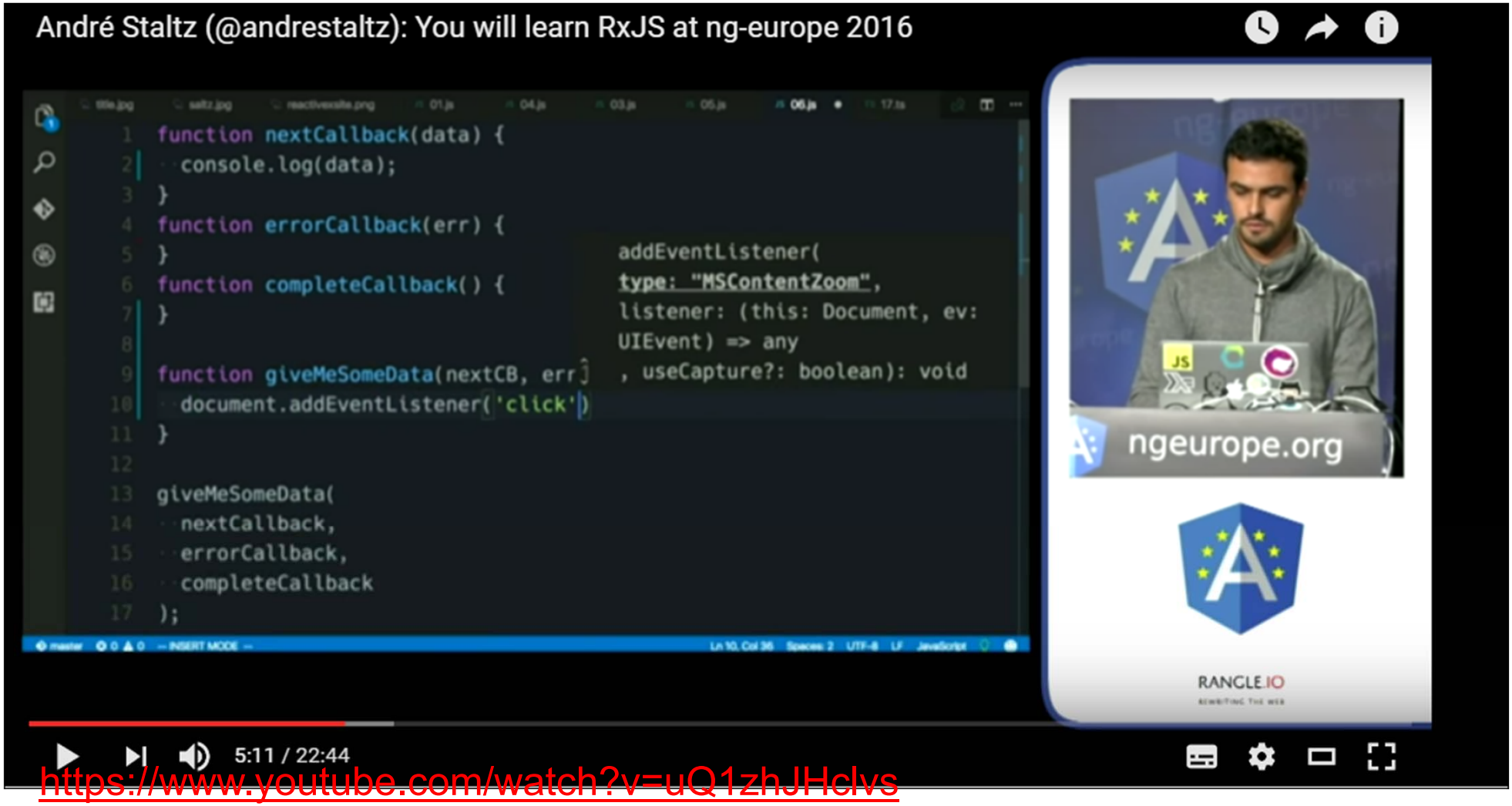
- RxJS operators are (mostly) just like Array operators
- Perform actions on a stream of objects
- Grouped by subject
  - Creation operators
  - Transforming
  - Filtering
  - Combining
  - Error Handling
  - Conditional and Boolean
  - Mathematical
  - ...

6 Operators you must know

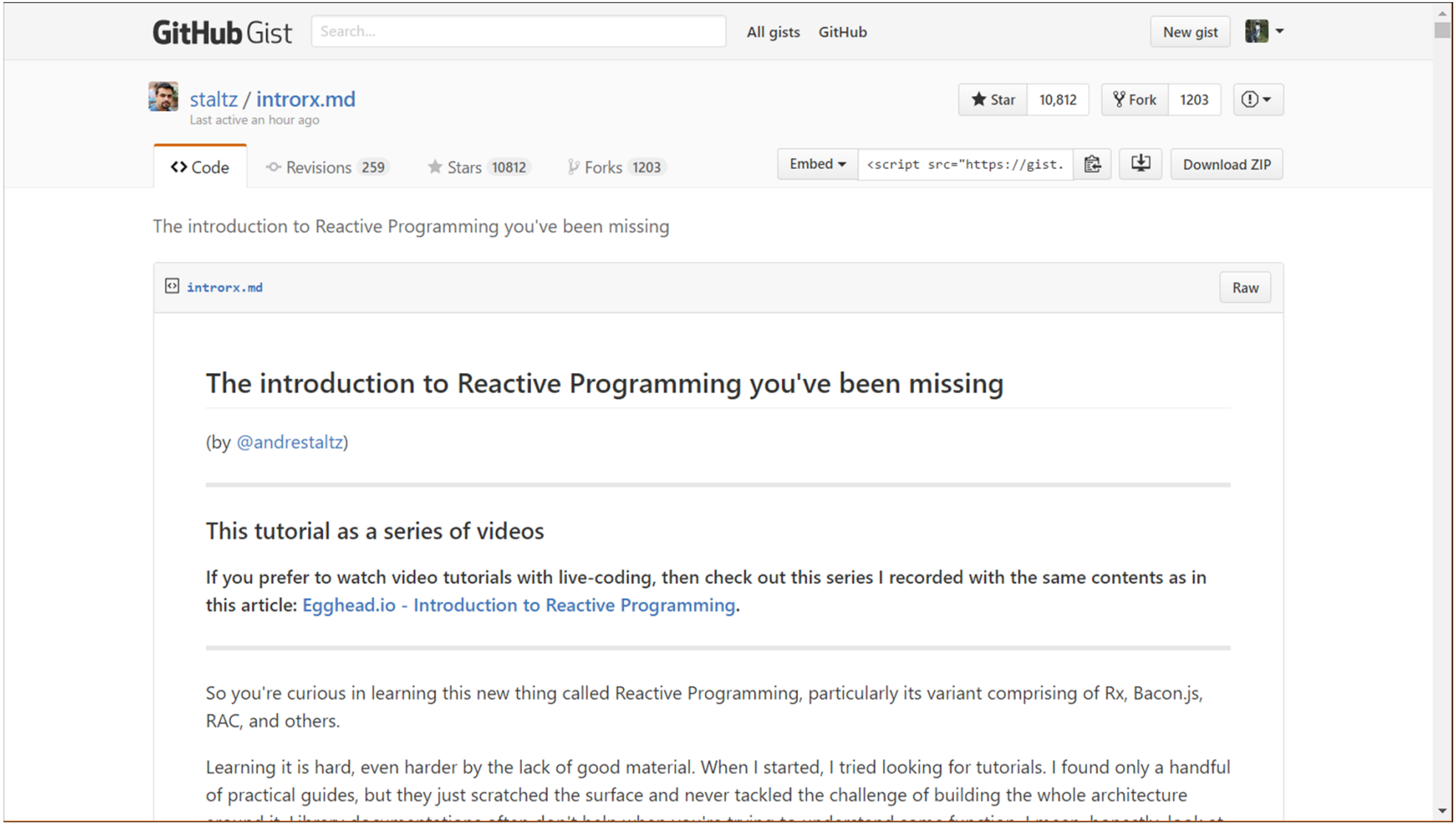


https://netbasal.com/rxjs-six-operators-that-you-must-know-5ed3b6e238a0#.11of73aox

Creating Observables from scratch - André Staltz

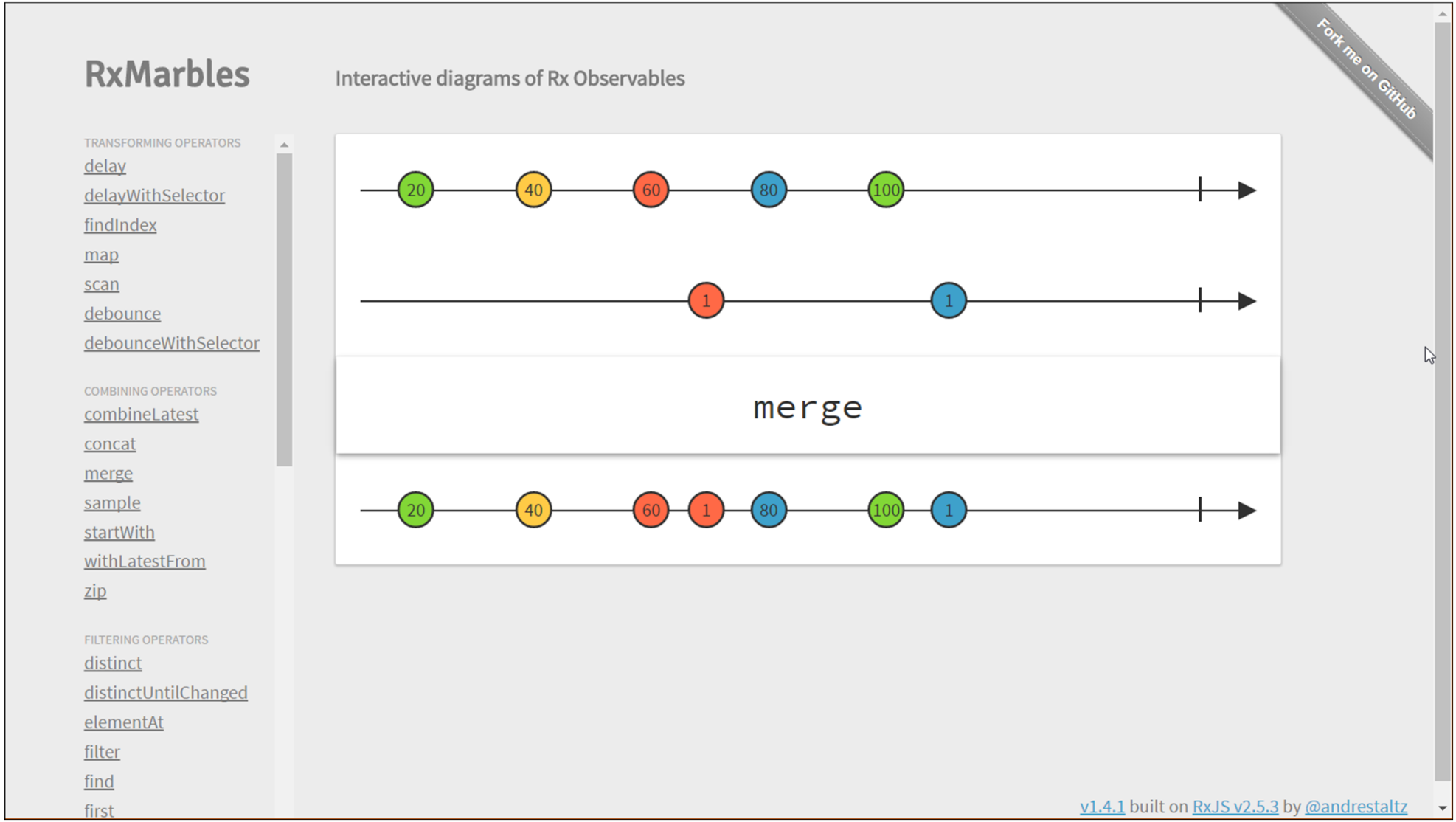


https://www.youtube.com/watch?v=uQ1zhJHclvs

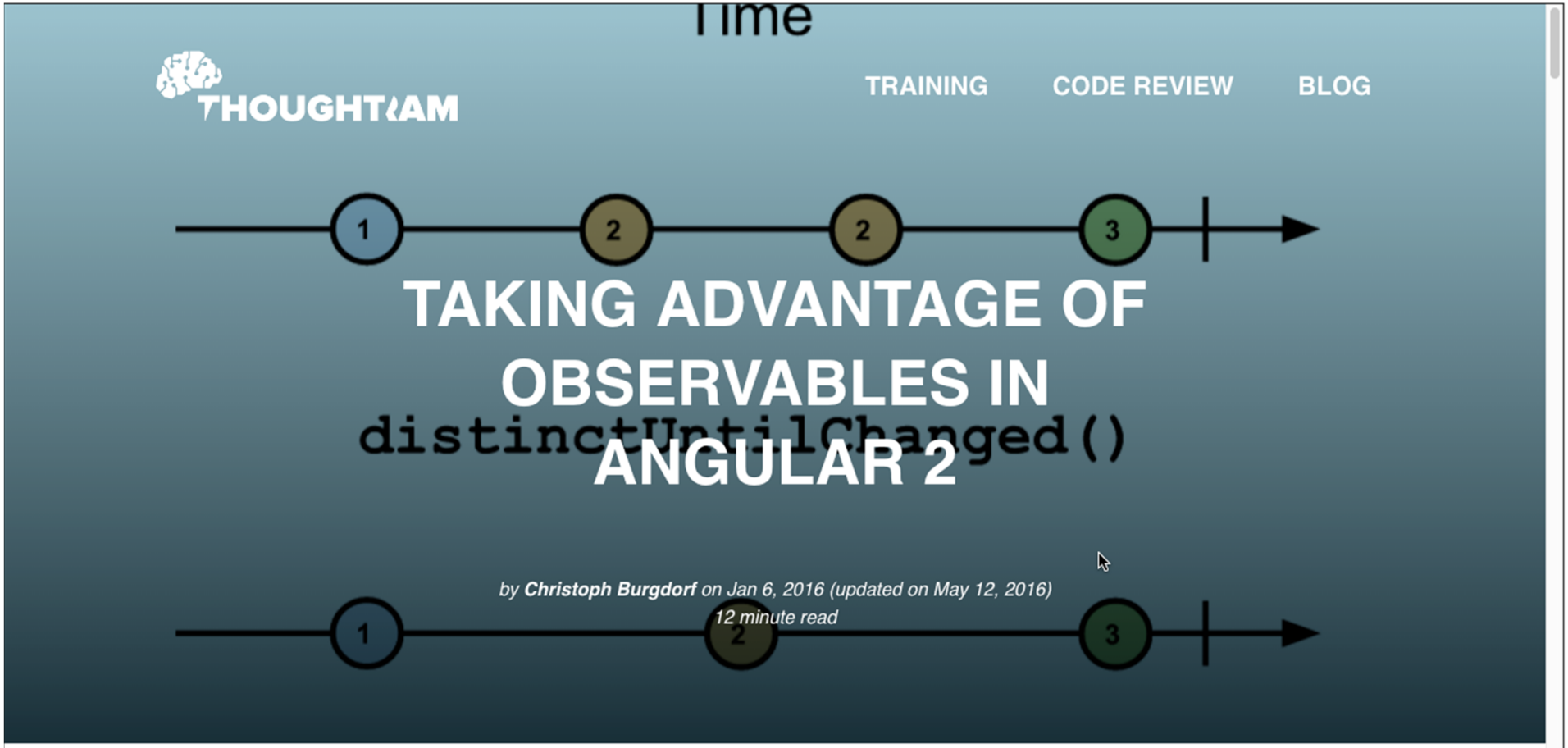


https://gist.github.com/staltz/868e7e9bc2a7b8c1f754

RxMarbles



http://rxmarbles.com/



http://blog.thoughtram.io/angular/2016/01/06/taking-advantage-of-observables-in-angular2.html