Angular Fundamentals
Module 4 – Observables

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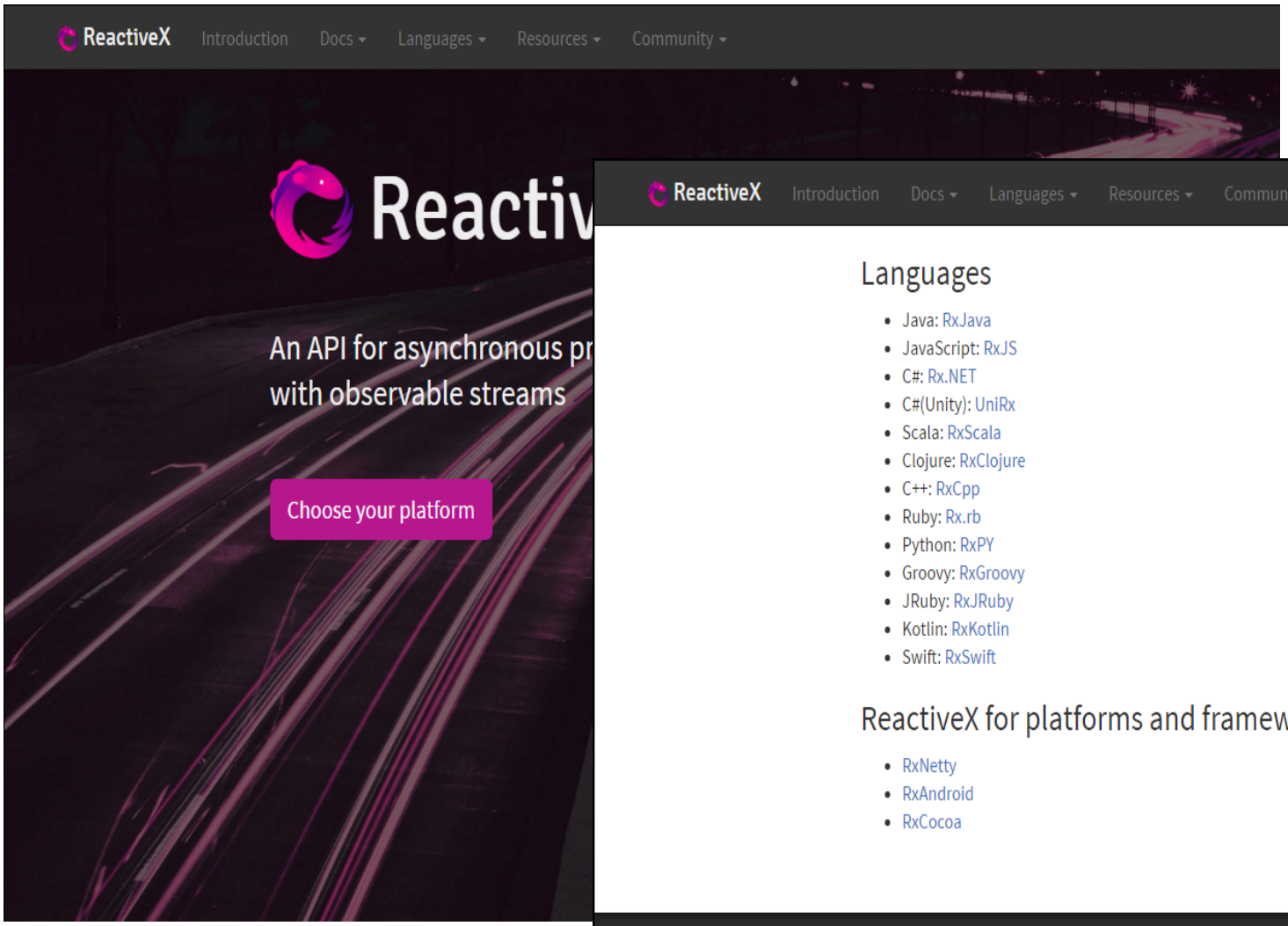
Async services with RxJS/Observables

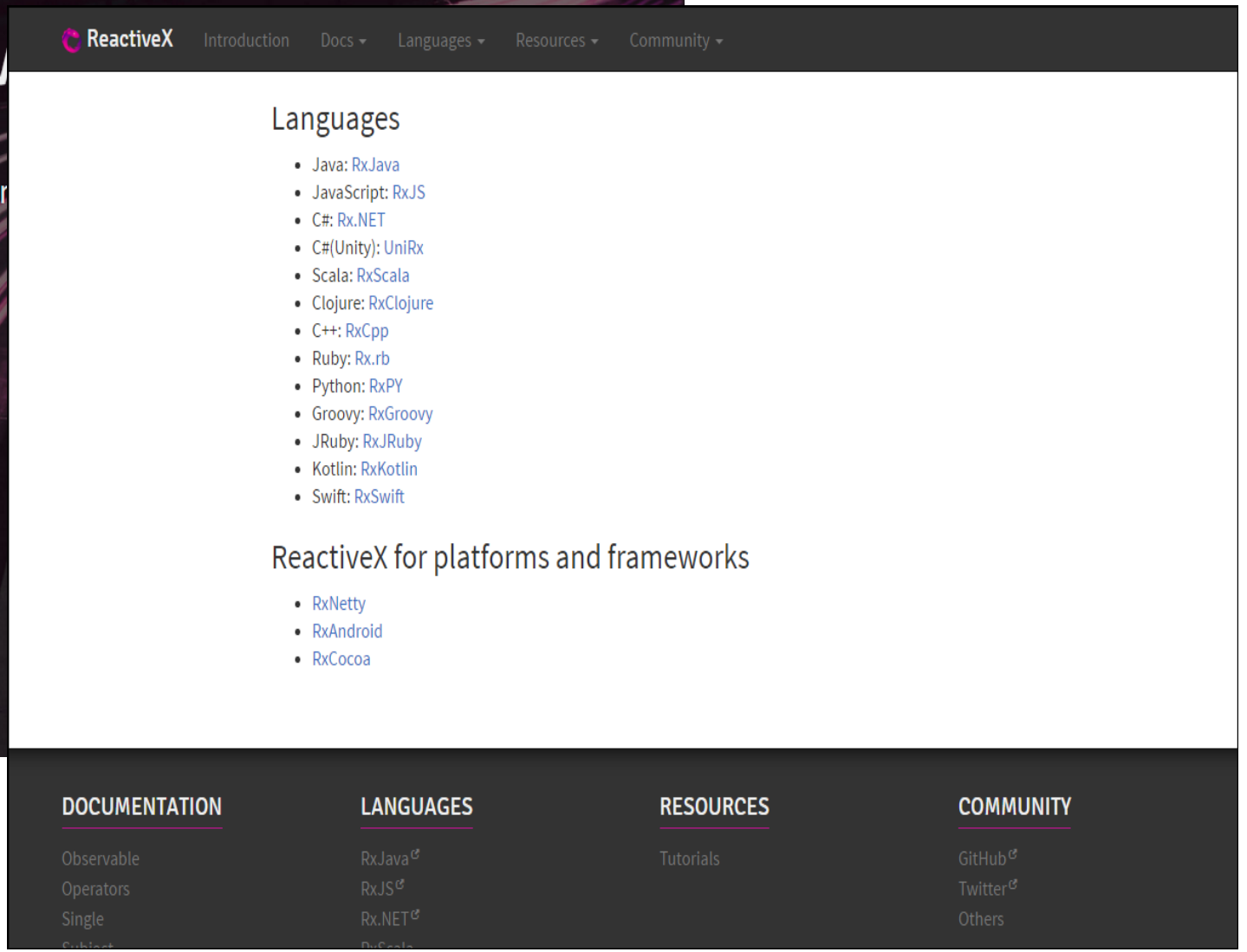
Reactive programming
with asynchronous streams

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/

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.

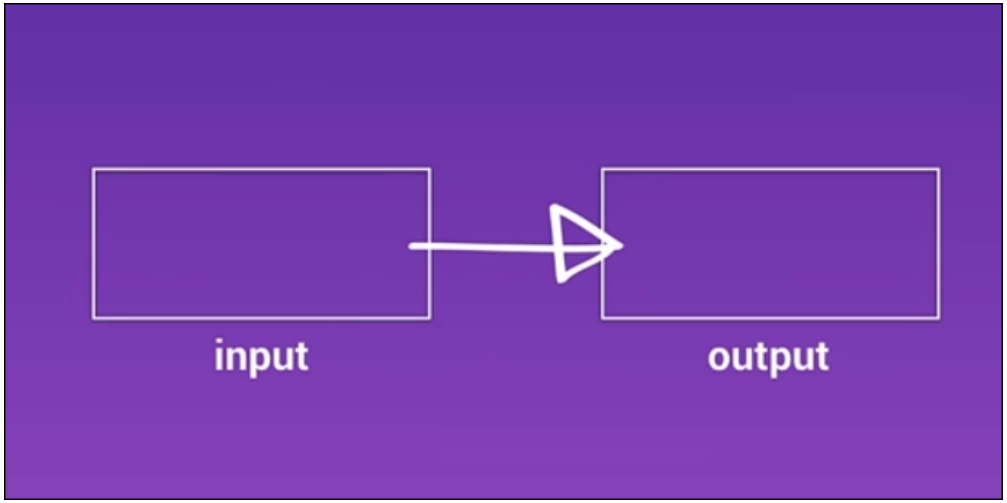
https://auth0.com/blog/2015/10/15/angular-2-series-part-3-using-http/

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

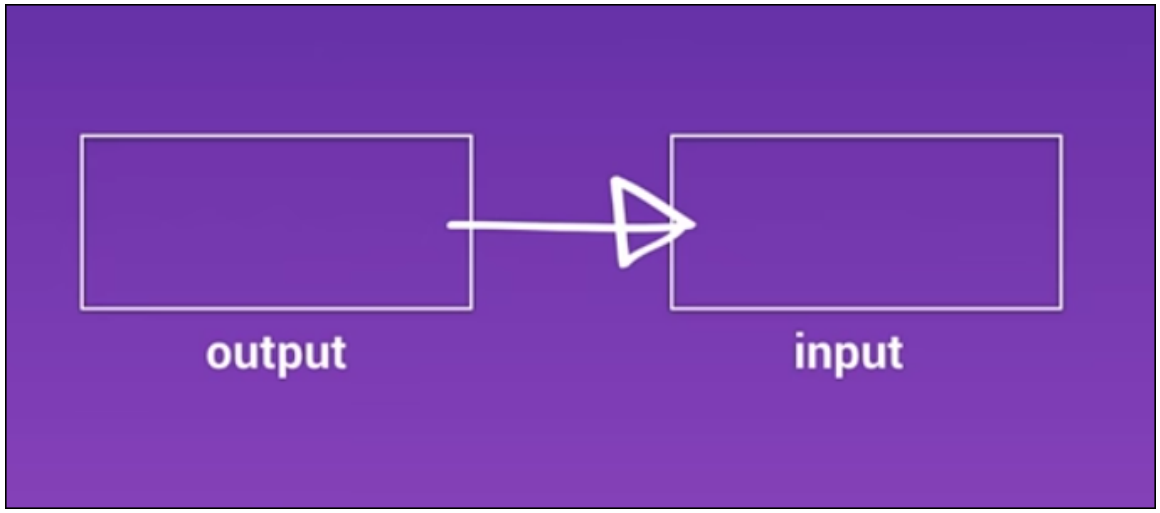
- First - The Observable Stream
- Later - all 10.000 operators…
- Traditionally:



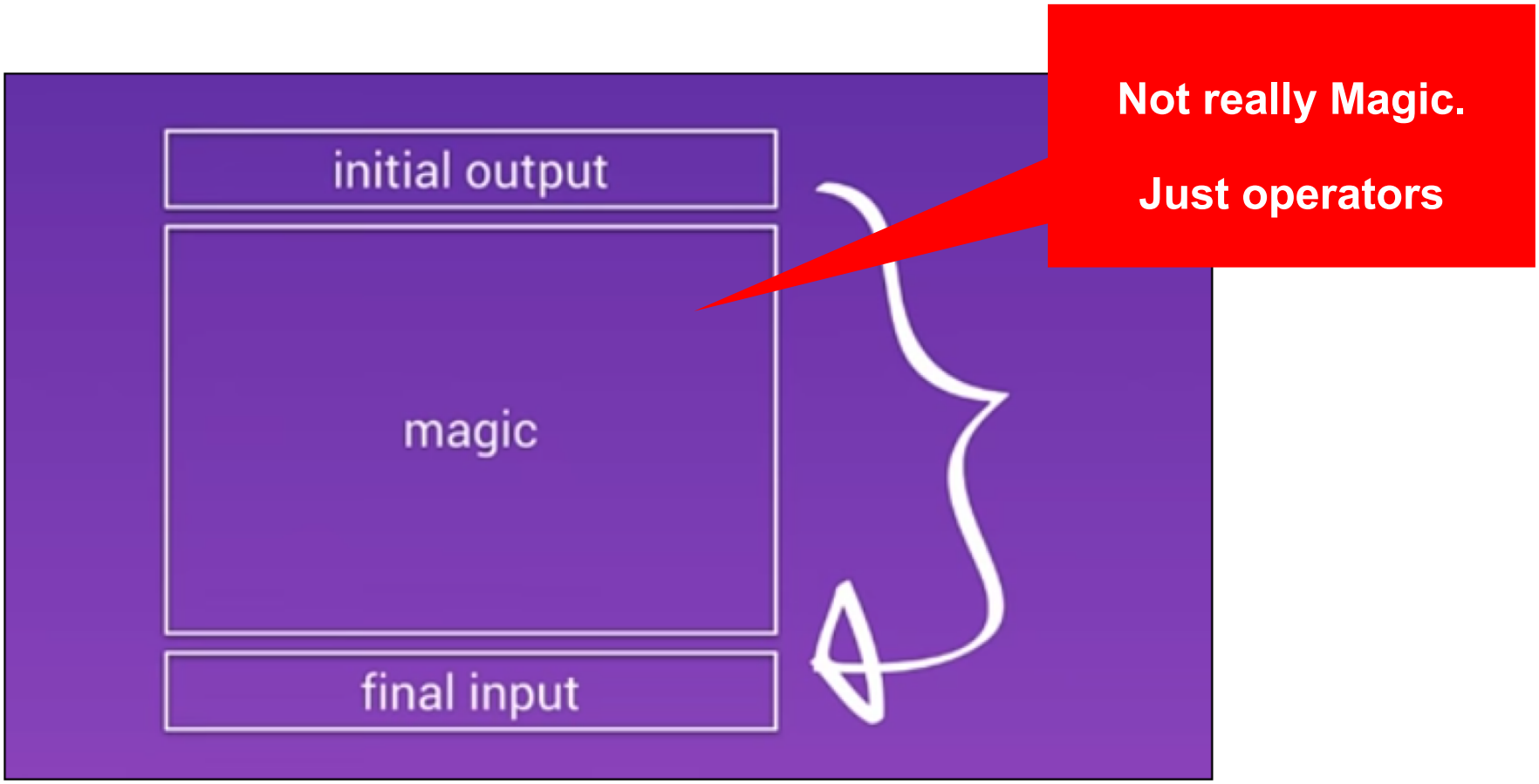
Go beast mode with realtime reactive interfaces in Angular 2 &
Firebase | Lukas Ruebbelke

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

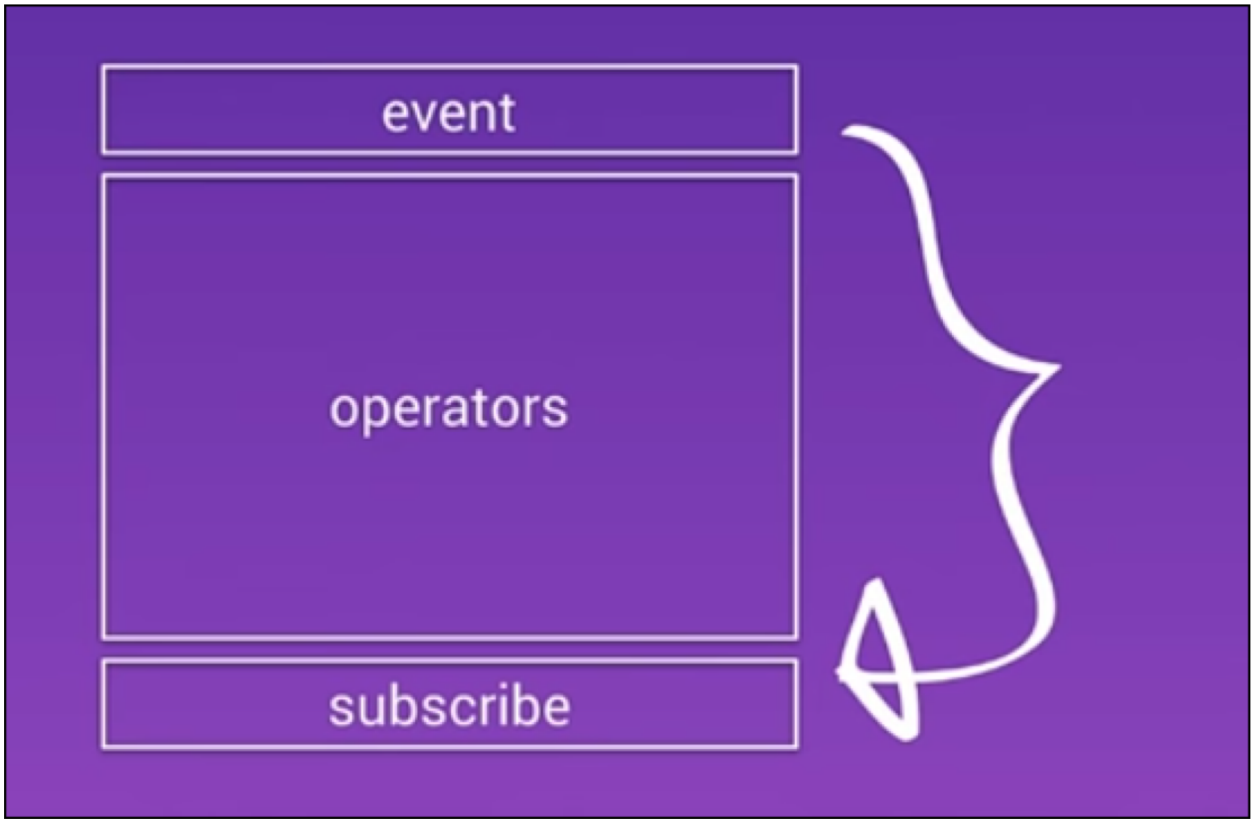
- With Observables -
  - a system, already outputting data,
  - Subscribe to that data
- "trade Output for Input"
- "Push vs. Pull"



"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 `HttpModule` 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 {

  }

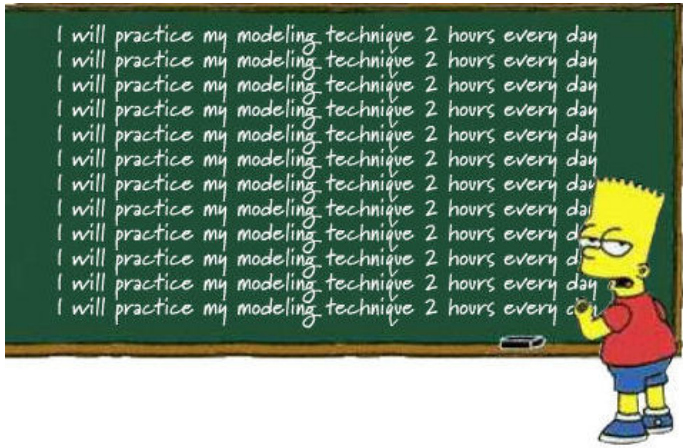
OLD/Deprecated: Angular < 4.3: `HttpModule`

- In @ngModule: `imports : [HttpModule]`
- Using map-operator `.map(res => res.json()).`
  - Json has to be extracted by using `.map()`.
- `HttpModule` will be removed in future versions!
- Now we also have Interceptors (in `HttpClientModule`)
- https://alligator.io/angular/httpclient-intro/ and
- https://alligator.io/angular/httpclient-interceptors/

Exercise

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

Exercise….

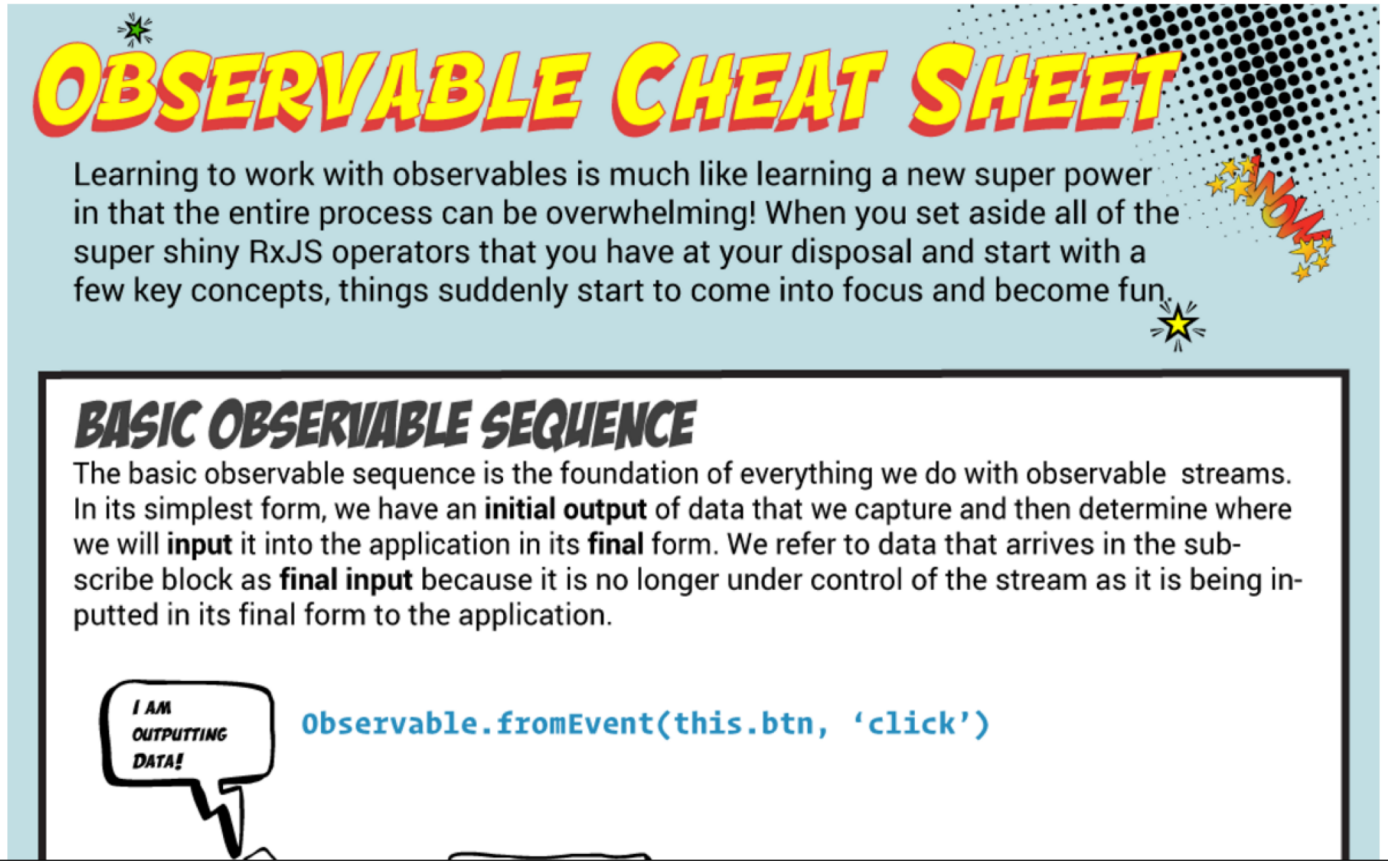


Observable Cheat Sheet

genius to understand.

You can download the full-sized infographic at http://bit.ly/observable-cheat-sheet.

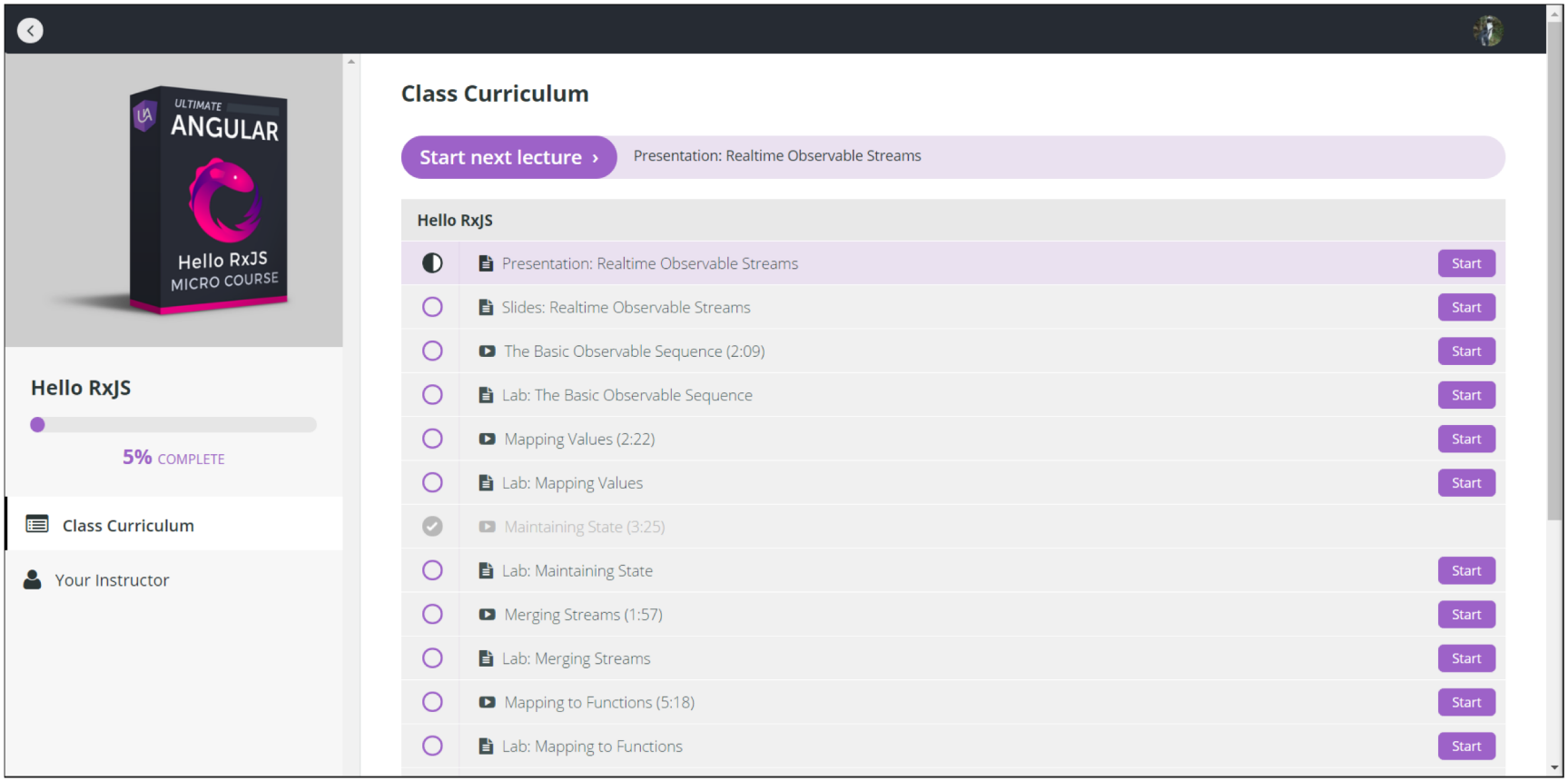
I really hope that you find the infographic helpful. Be sure to drop me a line below if you have any questions or comments. #highFive



http://onehungrymind.com/observable-cheat-sheet/

Hello RxJS

Free online training



http://courses.ultimateangular.com/

Pipeable operators

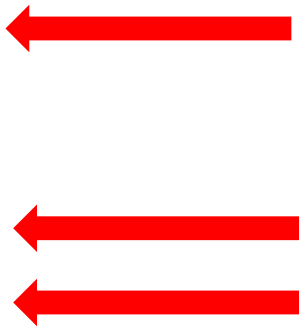
- In RxJS 6.x and up: all operators inside `.pipe()` functie
- The parameters of pipe function are the operators!
- Comma-separate different operators.
  - Don’t forget `import {…} from ‘rxjs/operators’;`

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

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...')
    )
```

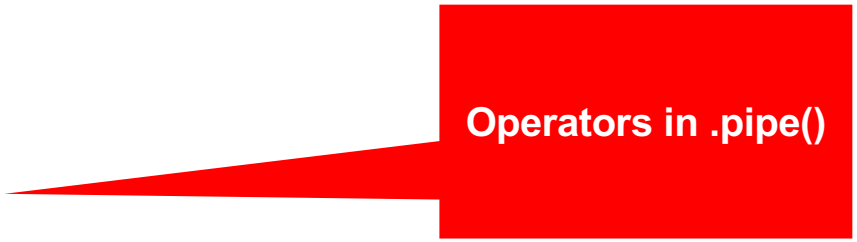


RxJS-operators in the service

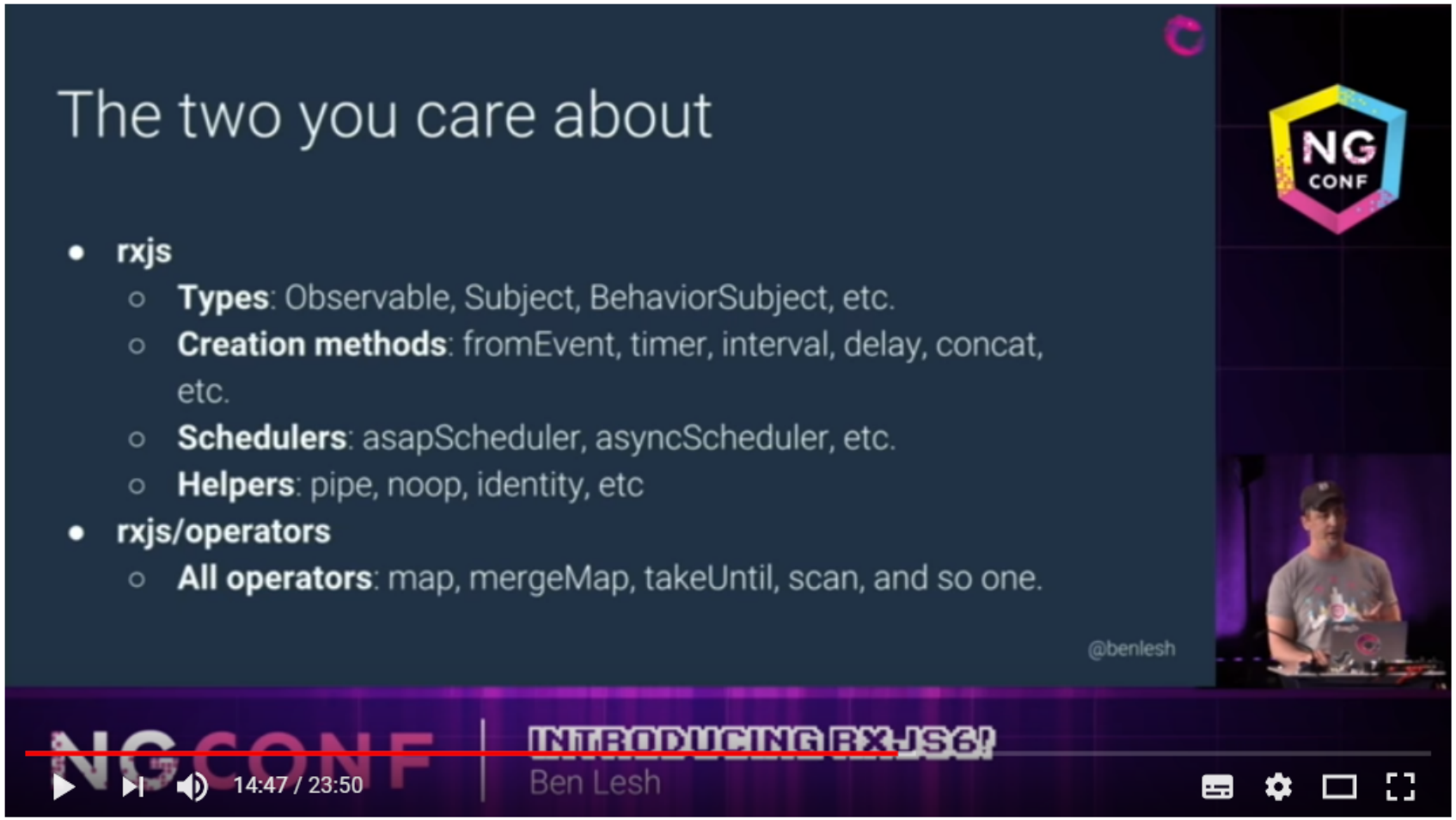
```
import {Injectable} from '@angular/core';
import {HttpClient} from "@angular/common/http";
import {map, delay, takeUntil, …} from "rxjs/operators";

@Injectable()
export class CityService {

   constructor(private http: HttpClient) {

   }

   // retourneer alle cities
   getCities(): Observable<Response> {
      return this.http.get('shared/data/cities.json')
         .pipe(…);
   }

}
```

The result of the first operator is the input of the next operator in the pipeline

```
getCities() {
   if (!this.cities) {
      this.cityService.getCities()
         .pipe(
               delay(3000),
               retry(3)
                map(result => …),
               takeUntil(…condition…)
         )
      .subscribe(cityData => {
            this.cities = cityData;
       })
   }
}
```



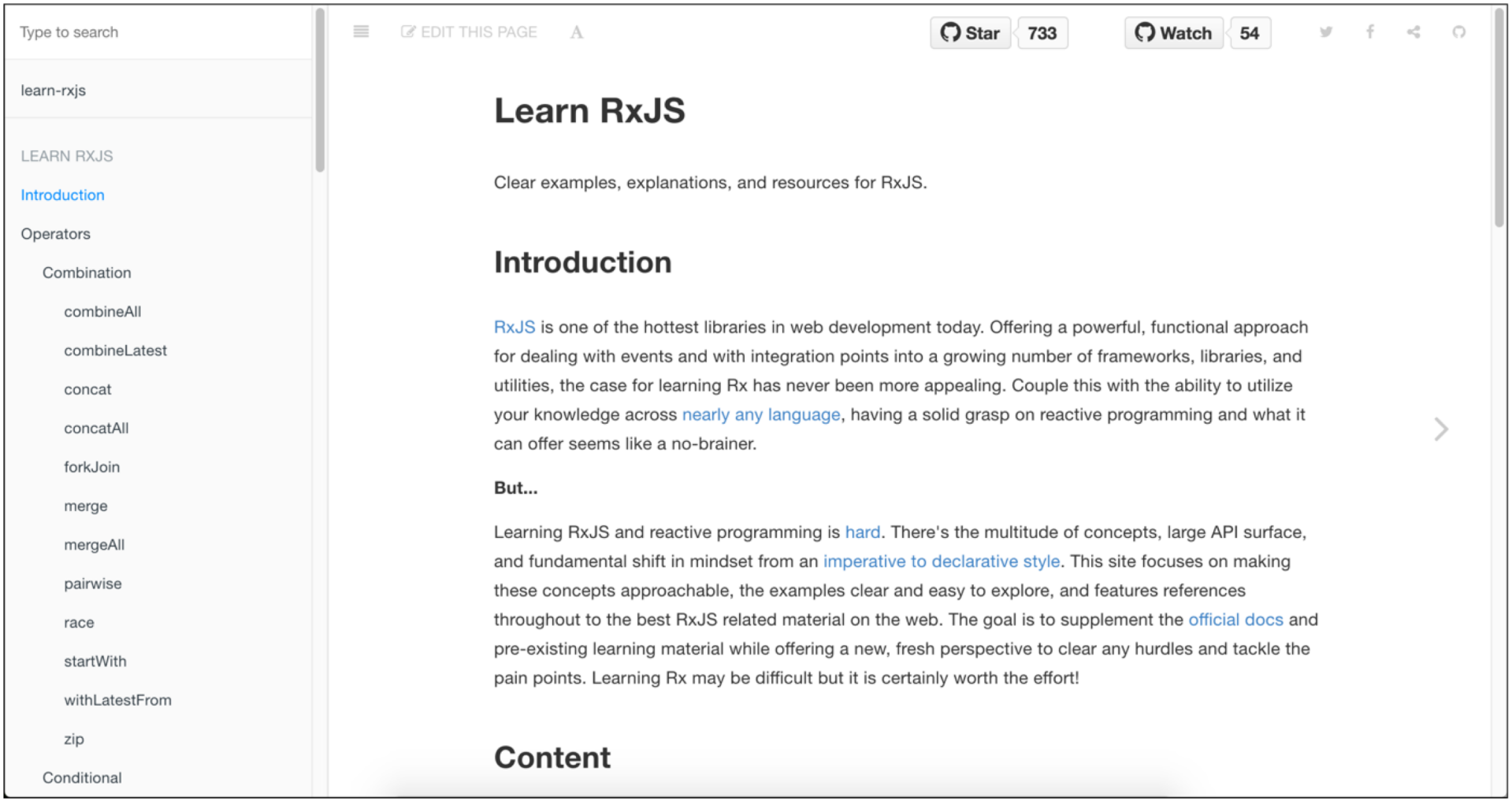
Ben Lesh on observables in RxJS 6.0



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()`
  - Best practice
  - Not *really* necessary on HTTP-requests, but you do in other subscriptions wel, to avoid memory leaks.
- 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`

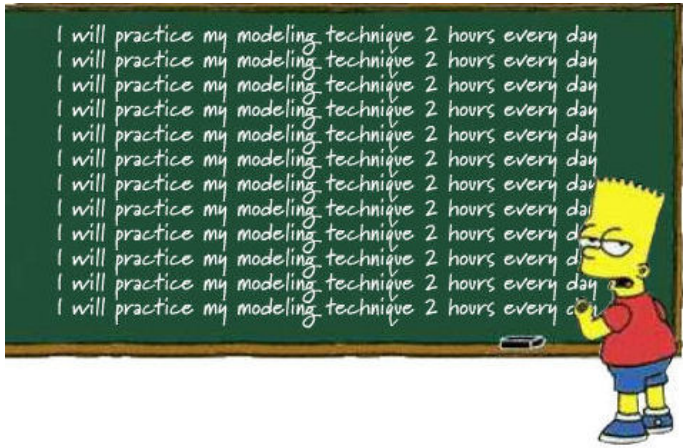
Example API's

- https://pokeapi.co/ - Pokemon API
- http://openweathermap.org/API (weather forecast)
- http://randomuser.me/ (random user data)
- 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

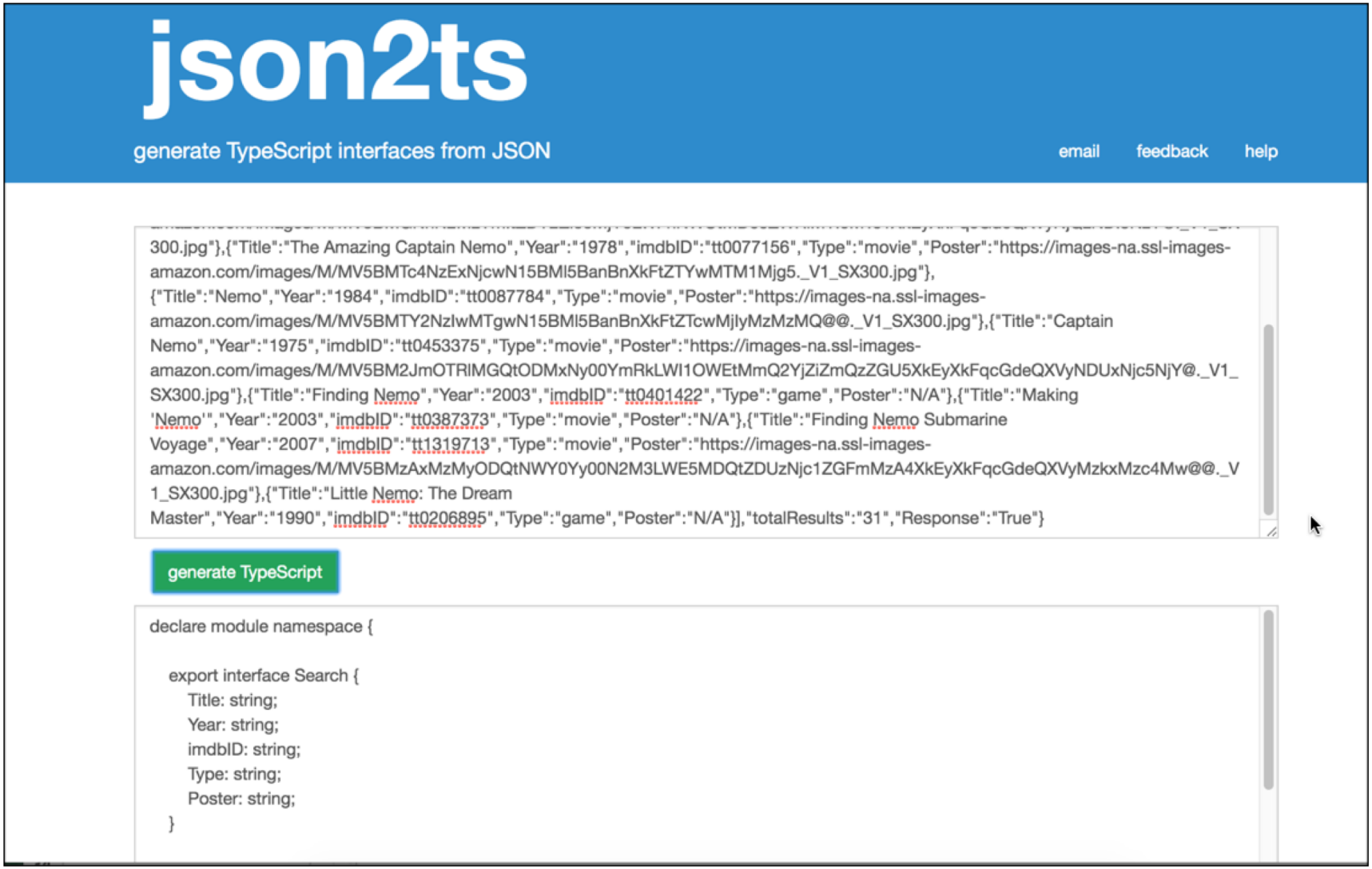
- Pick one of your own projects, or see for examples:
  - `210-services-live`
  - `(502-forms-typeahead` (We'll cover forms later on))
- Create a small application using one of the API's in the file `JavaScript API's.txt`, using RxJS-calls, for example
  - Star Wars API
  - OpenWeatherMap API
  - …
-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

Exercise….



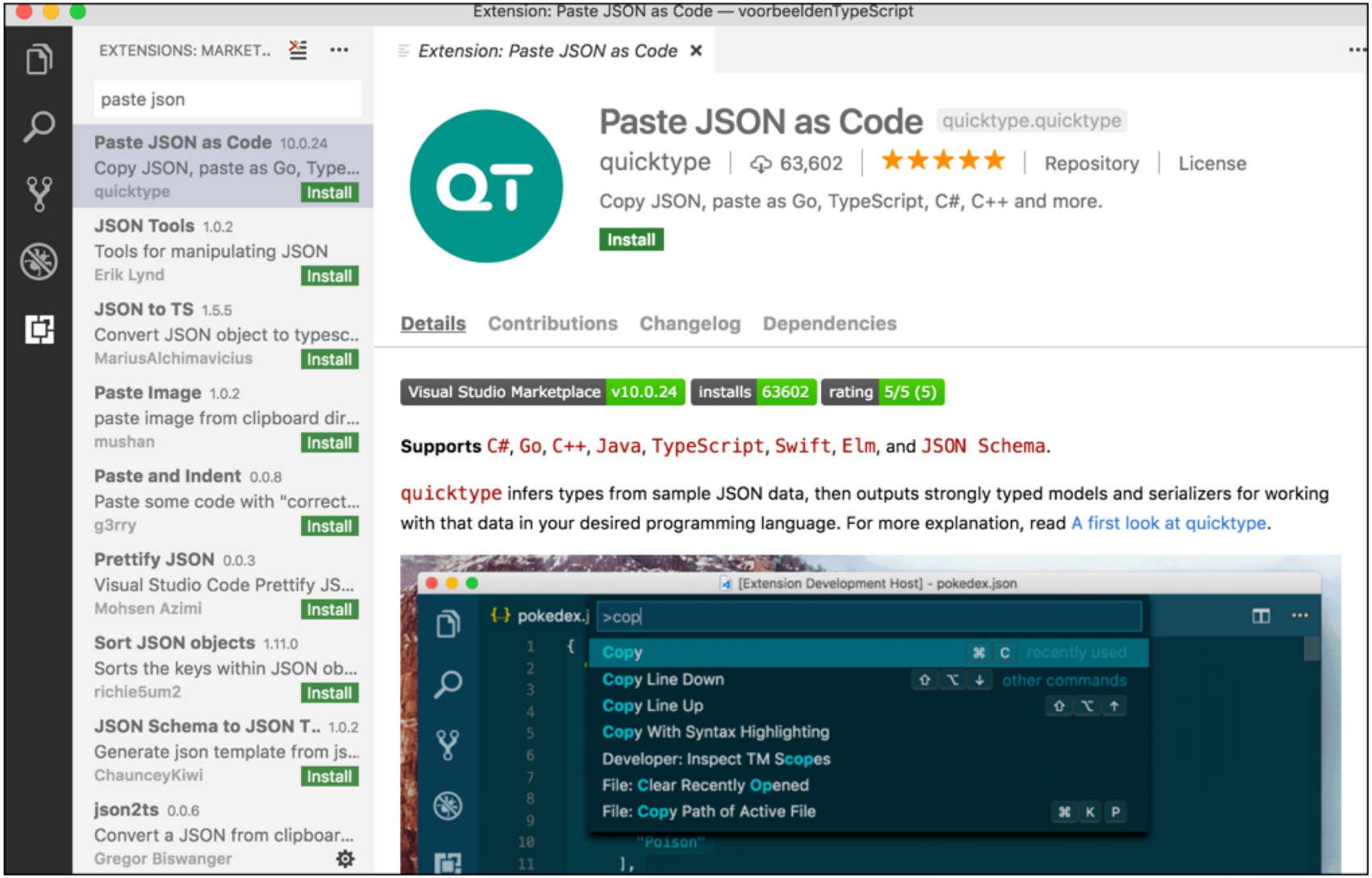
More info on observables

Online JSON to TypeScript converter



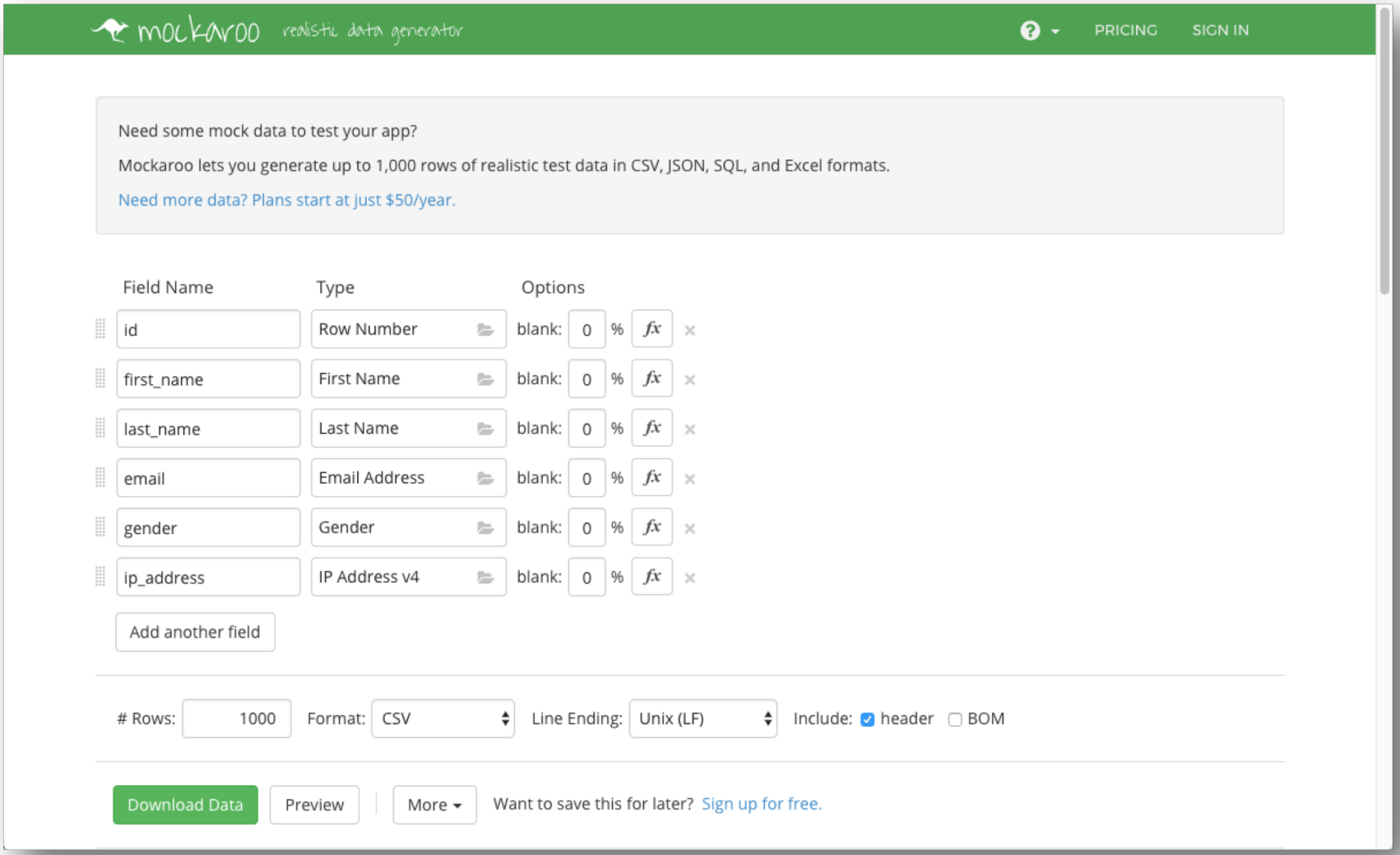
http://json2ts.com/

In VS Code? Use this extension!



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

Data Mocking - Mockaroo



http://mockaroo.com/

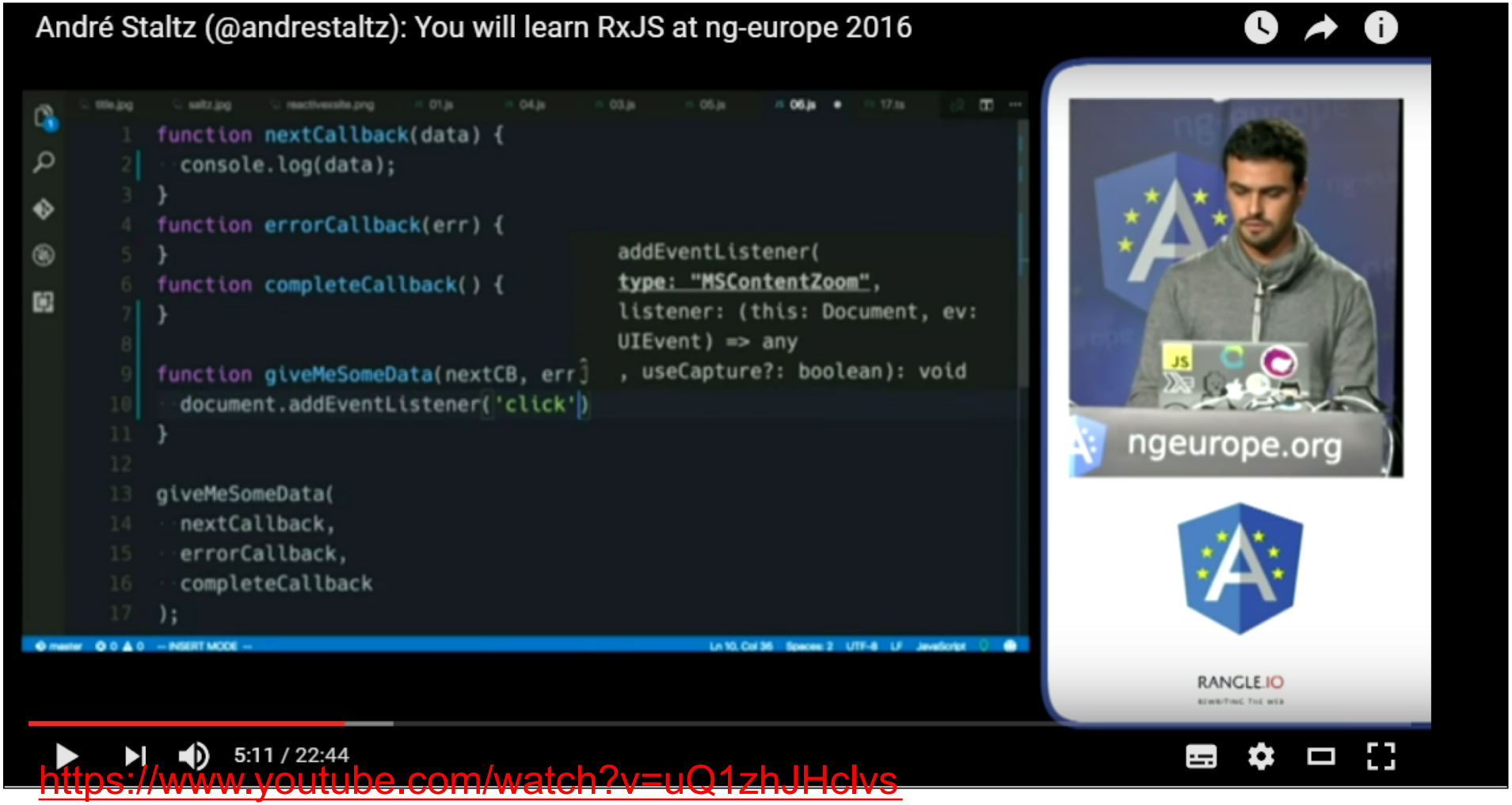
Useful operators

- 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
  - …

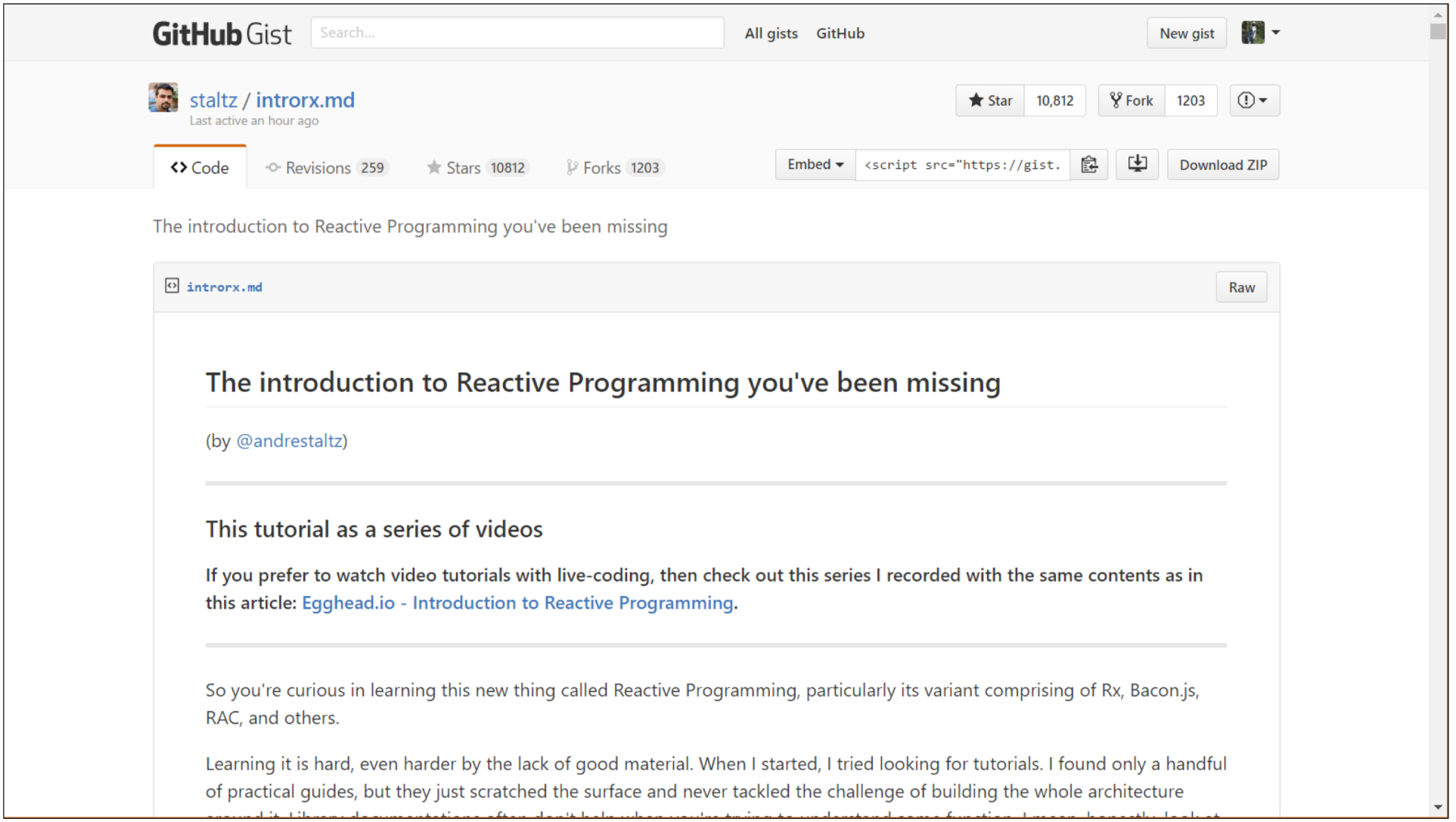
6 Operators you must know

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

Creating Observables from scratch - André Staltz

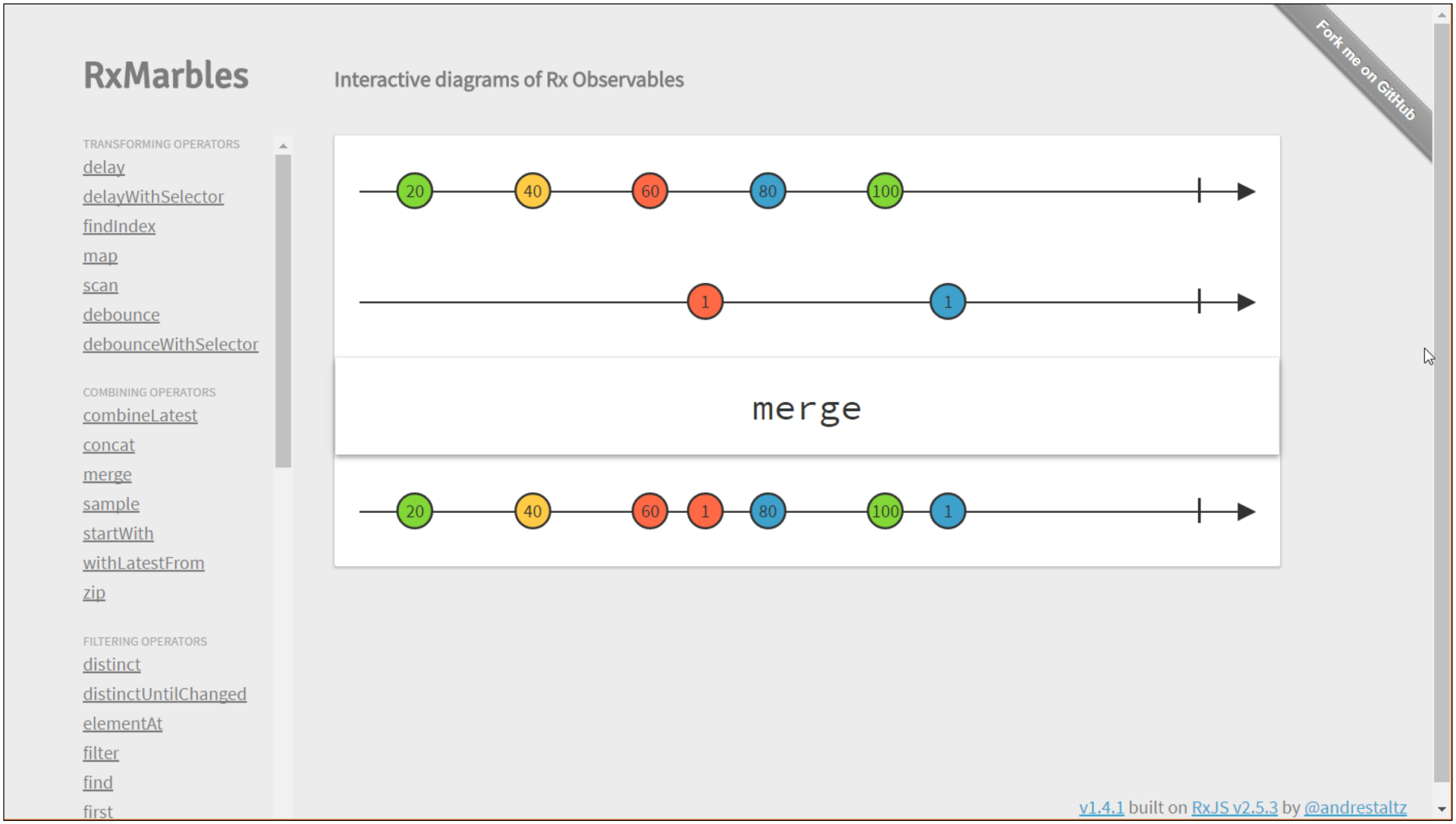


https://www.youtube.com/watch?v=uQ1zhJHclvs

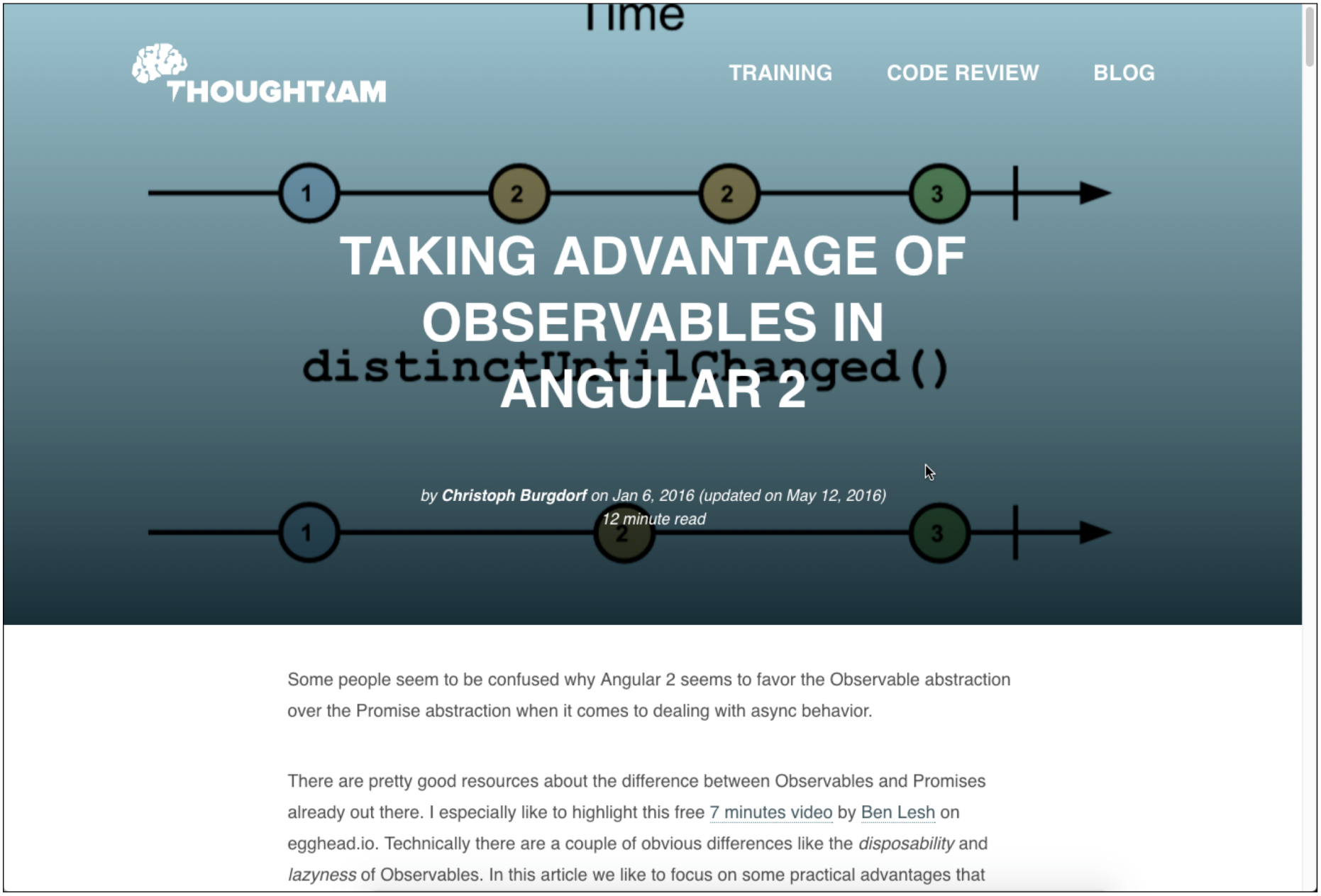


https://gist.github.com/staltz/868e7e9bc2a7b8c1f754

RxMarbles



http://rxmarbles.com/



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