Rx.JS — Things that you should understand before start.

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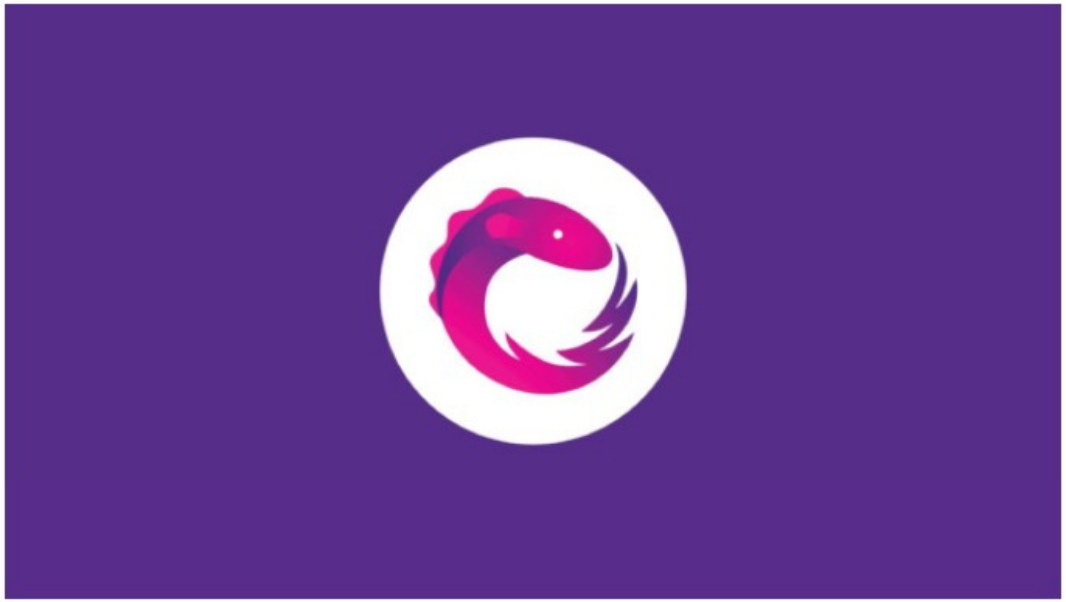

If you have ever worked with **Angular**, You probably might have seen something like **Observables**, **Subscribe()**, **Subject** and a few more. Sometimes we may be using it without knowing what it is. If you haven't familiar with those terms. Don't worry, This is **not** something about **Angular**. This is all about an **awesome** and **powerful** Javascript library that you should learn.

Let's jump into the topic 🚀

Observer Pattern 🧐

Observer Pattern is one of the **Software Design Patterns**. If you don't have any idea about this **Observer Pattern**, I highly recommend you to have a look and come back for a better understanding. Because I am not going to drag this story by explaining it. Anyway, Let me give a quick introduction.

Observer Pattern is a Design Pattern that enforces **Event-Driven Application Development**. This pattern mainly has two objects, One is "**Subject**" and another one is "**Observer**". Basically **Subject** maintains a list of **Observers**. It will notify them when the state changes.

> ***High-Level Example***
>
> *The **YouTube** (**Application**), Has more **channels** (**Subjects**).*
> ***We** (**Observers**) subscribe to one of our favourite **channels** (**Subject**).*
> *So, Whenever the **channel** (**Subject**) publishes new **content** (**Data/State**), It will notify **us** (**Observer**).*

As simple as that. 😉

Reactive X ⚡

> *ReactiveX is a library for composing asynchronous and event-based programs by using observable sequences.*

ReactiveX is a library that allows us to extend above **Observable Pattern**

and build **Reactive**, **Asynchronous** and **Even-Based Applications**. ReactiveX provides wide languages support. **RxJS** is the javascript version of it. You can find all **other language** support here.👇

Rx.JS 🔥

As I mentioned, **RxJS** is the Javascript library that extends **ReactiveX**. Before we getting started to code with **RxJS**, We should clearly understand its key objects. Otherwise, we cannot use it efficiently. **RxJs** is all about these **3O**s and **3S**s,

1. **O**bservable 🔊
2. **O**bserver 🦹
3. **O**perators 🛠
4. **S**ubscription 🔔
5. **S**ubject 🕳
6. **S**cheduler ⏰

1. Observable

Observables are the object that **push/stream** the data to their **Observer**.

> *We can **eat** only **eatable** objects. Also, we can **move** only **movable** objects. Like*

> *that, We can only **Observe**, The **Observable** objects.*

So in **Rx.JS**, If we want to **Observe** an object's changes, The object should be **Observable.** In order to execute the **Observable**, It needs at least one **Subscriber**.

Observables are **unicast**. That means it can only send data to **One Observer**. If you subscribe **Multiple Observers** to **Observable**, It will be invoked multiple times for each **Observer**.

Observables are **uni-directional**. That means It can only pass data from **Observable** to **Observer**. We cannot feed data into **Observer** from the outside.

```
import { Observable } from 'rxjs';

const observable = new Observable(subscriber => {

  subscriber.next("First State / Data of Observable"); // Notifiying first state
  subscriber.next("Second State / Data of Observable"); // Notifiying second state
  subscriber.next("Third State / Data of Observable"); // Notifiying third state

  // Just waiting 5 seconds

  setTimeout(() => {
    subscriber.next("Fourth State / Data of Observable"); // Notifiying fourth state
    subscriber.complete(); // Notifiying that the is no more data to notify
  }, 5000);

});
```

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2. Observer

An **Observer** is an object that subscribes to **Observables** so it can be called

by **Observables** to emit the data.

> *We subscribe to **Newsletters**, So we can get updates. In this case, We are **Observers** and Newsletter is **Observable**.*

An **Observer** object will have 3 methods **next()**, **error()** and **complete()**. These methods will be called by the **Observable** that it subscribes.

next(param)

This method will be called by the **Observable** to send new data. It accepts one **parameter** as the **data** sent by the **Observable**. The data can be anything such as ***Number***, ***String***, ***Array***, ***Object*** & etc.

error(param)

Same as **next()**, But here **Observable** calls this method in order to notify any **error**. This method also accepts one **parameter** that is an **error** message from the **Observable**.

complete()

When the **Observable** is done with notifying and if there are no events left, It will call this method to notify that there is nothing to emit. This method doesn't accept any parameters.

```
1  // Simple Observer Object
2
3  const observer = {
4    next(data) {
5      console.log('We Received new data ' + data);
6    },
```

```
  error(err) {
    console.error('Oh, No. We got an error : ' + err);
  },
  complete() {
    console.log('Done. Nothing more.');
  }
};
```

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3. Operators

Let's talk about this at the end of this story. 😊

4. Subscription

An **Observer** or **Observable** cannot do anything by itself. In order to work with the **Observable**, An **Observer** should subscribe to it. A **subscription** is an object that holds the execution of an **Observable**. This subscriber has one method called **unsubscribe()**. This method just cancels the existing subscription. So the **Observable** will not execute the **Observer** anymore.

Also, A **subscription** may have another **child subscription**. In that case, If you **unsubscribe** the parent one, Then the child will be unsubscribed too.

```

/**
First Example
**/

import { Observable } from 'rxjs';

// Observable Object
const observable = new Observable(subscriber => {
  subscriber.next("First Message");
  subscriber.next("Second Message");
});

// Observer Object
```

```
const observer = {
  next: (data) => console.log('We Received new data ' + data),
  error: (err) => console.error('Oh, No. We got an error : ' + err),
  complete: () => console.log('Done. Nothing more.')
};

// Subscribing
const subscription = observable.subscribe(observer);

// Unsubscribing
subscription.unsubscribe();
```

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```

/**
Second Example
**/

import { Observable } from 'rxjs';

// First Observable Object
const observable = new Observable(subscriber => {
  subscriber.next("First Message");
});

// Second Observable Object
const observable2 = new Observable(subscriber => {
  subscriber.next("Second Message");
});

// first subscription
const subscription = observable.subscribe(data => console.log("We got a data " + data));

// second subscription
const subscriptionChild = observable2.subscribe(data => console.log("We got a child data " + dat

// adding 2nd subscription as child of 1st
subscription.add(subscriptionChild);

// unsubscribing parent BUT child also will be unsubscribed
subscription.unsubscribe();
```

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5. Subject

Subjects are a special type of **Observable**. It can act as both **Observable** and **Observer**. That means you can use a **Subject** as **Observable** as well as **Observer**.

Subject as an Observable

Unlike the normal **Observable**, **Subjects** are **Multicast**. It can stream the data to multiple **Observers** without maintaining separate executions.

Subjects as an Observer

Subjects are **bi-directional**. You can pass data from **Subject** to **Observer** as well as **Observer** to **Subject**. You can simply feed data into the Subject by calling the **next()** method.

```
import { Subject } from 'rxjs';

const subject = new Subject();

subject.subscribe({
  next: (v) => console.log(`observerA: ${v}`)
});
subject.subscribe({
  next: (v) => console.log(`observerB: ${v}`)
});

subject.next("First Data");
subject.next("Second Data");

// CONSOLE OUTPUTS ---------------------

// > observerA: First Data
// > observerB: First Data
// > observerA: Second Data
// > observerB: Second Data
```

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Subject vs Observable

```
1  import { Subject, Observable } from 'rxjs';
2
3  const observable = new Observable(subscriber => {
4     subscriber.next(Math.random()); // passing a random number
5  })
6
7  // Gives 2 different number. Because Observables are unicast and it will be execute separatly fo
8
9  observable.subscribe(data => {
10   console.log('subscription a :', data); //subscription a :0.2859800202682865
11 });
12
13 observable.subscribe(data => {
14   console.log('subscription b :', data); //subscription b :0.694302021731573
15 });
16
17
18
19 const subject = new Subject();
20
21 // Getting same data for both subscription, Because Subjects will be executed once and
22 // multicasting the data to multiple observers.
23
24 subject.subscribe(data => {
25   console.log('subscription a :', data); // subscription a : 0.91767565496093
26 });
27
28 subject.subscribe(data => {
29   console.log('subscription b :', data); // subscription b : 0.91767565496093
30 });
31
32 // passing from outsite. Yes we can do it for subject becuase it is bi-directional
33 subject.next(Math.random());
```

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Operators

> *Let's discuss the skipped part Operators.*

Operators are very important and helpful. These are just helper functions that make the complex async to be easily composed.

There are 2 types of **Operators**.

1. **Pipeable Operators**
2. **Creation Operators**

Pipeable Operators can be attached to an **Observable** using **pipe()** method. It will not change the existing **Observable Object**. Instead, It takes the existing **Observable** and outputs a **new Observable**.

```
import { Observable } from 'rxjs';
import { first } from 'rxjs/operators';

// Create a Observable which emits 2 values
const observable = new Observable(subscriber => {
  subscriber.next('First Message');
  subscriber.next('Second Message');
});

// "first()" is a pipeable operator that only returns the observable with the first value.
observable
  .pipe(first())
  .subscribe(data => console.log(data));

// CONSOLE OUTPUT ------------------
// > First Message
```

Creation Operators are standalone functions that can create **Observables** from standard predefined behaviours or by combining other **Observables**. These operators **cannot** be **piped** with **Observables**.

```
import { of } from 'rxjs';

// of is a Creation Operator,
// That can create new Observable by taking the parameters as the emitting values.

of("First Data", "Second Data")
  .subscribe(data => console.log(data));

// CONSOLE OUTPUT ------------------------
// > First Data
// > Second Data
```

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Apart from **Of()** and **First(),** there are a lot of **Operators** that I can't explain in this story. But I am pretty sure that If you understand this basics, Then you can easily understand others as well. Find more useful **Operators** below.

RxJS Operators: https://rxjs.dev/guide/operators

5. Scheduler

The **scheduler** is a control mechanism that takes care of, when a **subscription** starts and when the **subscriber** gets notified.

A **Scheduler** consists of the following components:

1. **Data Structure:** The scheduler knows how to store, arrange and queue the tasks based on their priority or any other ruleset.

2. **Execution Context**: The scheduler can control whether the task should be executed immediately or should be passed into another mechanism as a callback.
3. **Virtual Clock**: The tasks beings scheduled on a scheduler will follow the time that is denoted by the clock.

If you don't understand the **Scheduler** concept. Don't worry, It is not that necessary to start **Rx.JS**. I am stopping here because I want to make this story as basic and clear as possible. Just have look at this code so you will have a basic idea of how the scheduler works.

```
import { Observable, asyncScheduler } from 'rxjs';
import { observeOn } from 'rxjs/operators';

// "asyncScheduler" is a type of Scheduler which executes the Observable Asynchronously.
// "observeOn" is a Pipeable Operator that help us to re-emit the data with Scheduler.

const observable = new Observable((observer) => {
  observer.next("First Data");
  observer.next("Second Data");
  observer.next("Third Data");
}).pipe(
  observeOn(asyncScheduler)
);

console.log('just before subscribe');

// Since we are using "asyncScheduler", This code will be executed asynchronously.
observable.subscribe({
  next(data) {
    console.log(data)
  }
});

console.log('just after subscribe');

// CONSOLE OUTPUT
// > just before subscribe
// > just after subscribe
```

```
29  // > First Data
30  // > Second Data
31  // > Third Data
```

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RxJS Scheduler: https://rxjs.dev/guide/scheduler

Conclusion

Rx.JS is the best library to build **Asynchronous** and **Event-Driven** Applications on Javascript. It is a standalone library so you can directly use it with any javascript framework or library. **Rx.JS** comes with Angular by default. In Angular, **Rx.JS** is very helpful to stream notifications and states across components.

I tried my best to keep this story **beginner-friendly**. I ignored the most confusing and advanced concepts. It is totally fine, If you understand what we discuss so far then you can start working on **Rx.JS** also you are capable of understanding advanced topics. Hope you find this useful.

Give few claps 👏, If you really like this.

Happy Coding… ❤

Rxjs Reactivex Observables Event Driven Programming JavaScript

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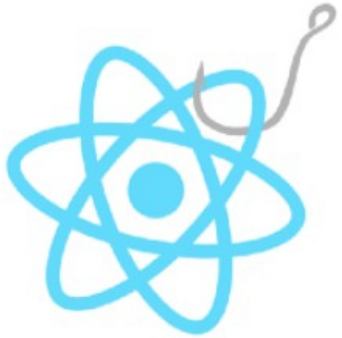

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