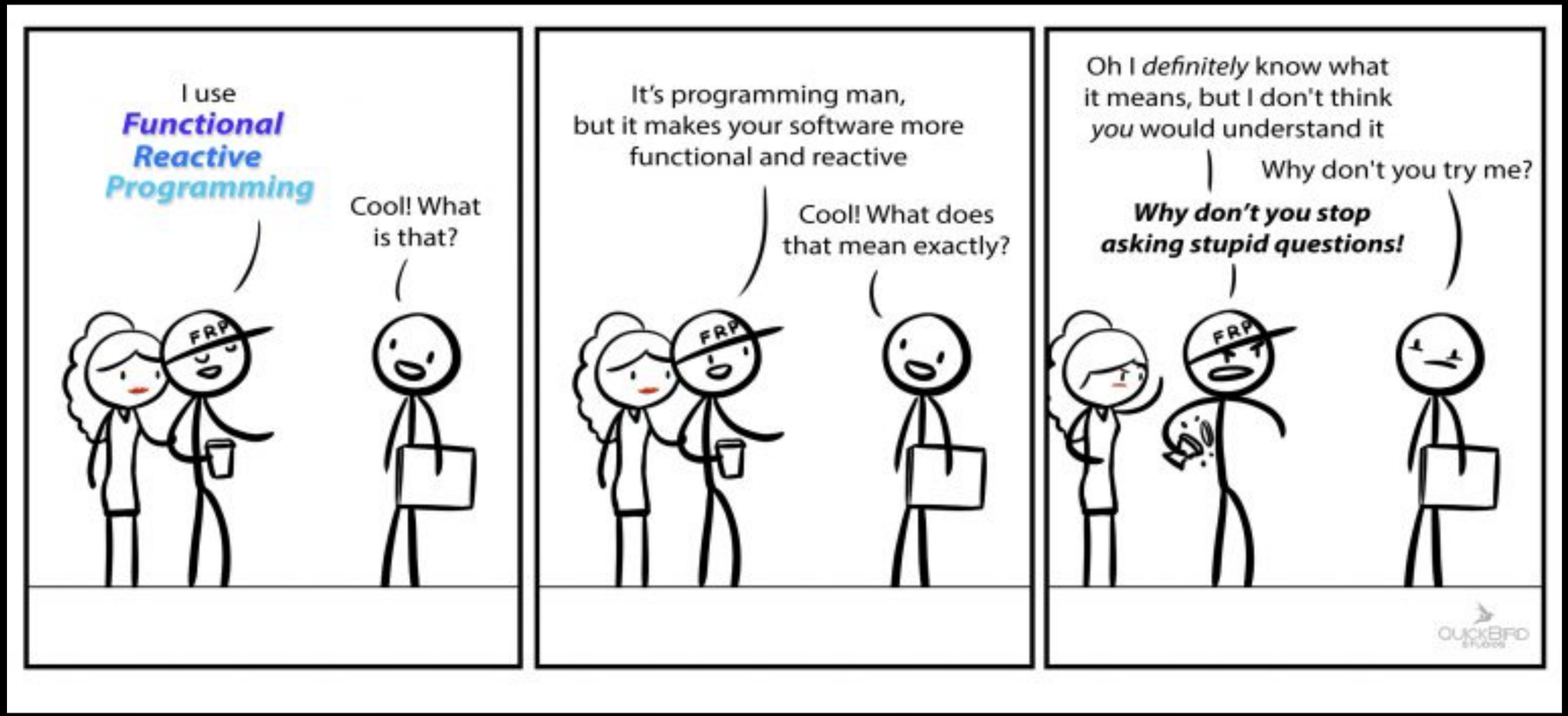
Webflux Functional Endpoints

Functional Reactive Programming

08/09/2021

What is Functional Reactive Programming (FRP) ?


I use
Functional
Reactive
Programming
FRP
Cool! What
is that?
It's programming man,
but it makes your software more
functional and reactive
FRP
Cool! What does
that mean exactly?
Oh I *definitely* know what
it means, but I don't think
you would understand it
Why don't you try me?
***Why don't you stop
asking stupid questions!***
FRP
QUICKBIRD

Functional Reactive Programming = Functional Programming + Reactive Programming

Functional Reactive Programming

- Programming Styles
  - Imperative
  - Declarative
- Programming Paradigms
  - Object-Oriented
  - Functional
  - Reactive

Imperative Style

- Java is primarily an imperative language
- Each step of the program has to be detailed
- Imperative Languages
  - C, C#, Java, JavaScript, etc.

```
if (chassisRepository.findByName(name).isEmpty()) {
    throw new EntityNotFoundException("Chassis not found with name : "+name);
}
return chassisRepository.findByName(name);
```

Declarative Style

- Tells the program what to do, not how to do it.
- This style fits in perfectly with functional programming paradigm.
- Declarative Languages
  - Domain-Specific Languages
  - SQL, CSS, XML, Groovy, etc.

```
return chassisService.searchChassisByName(name);
```

Imperative vs Declarative

Imperative

```
// Imperative

let arr = [1, 2, 3, 4, 5], arr2 = [];

for (let i = 0; i < arr.length; i++) {
    arr2[i] = arr[i] * 2;
}

return arr2;
```

VS

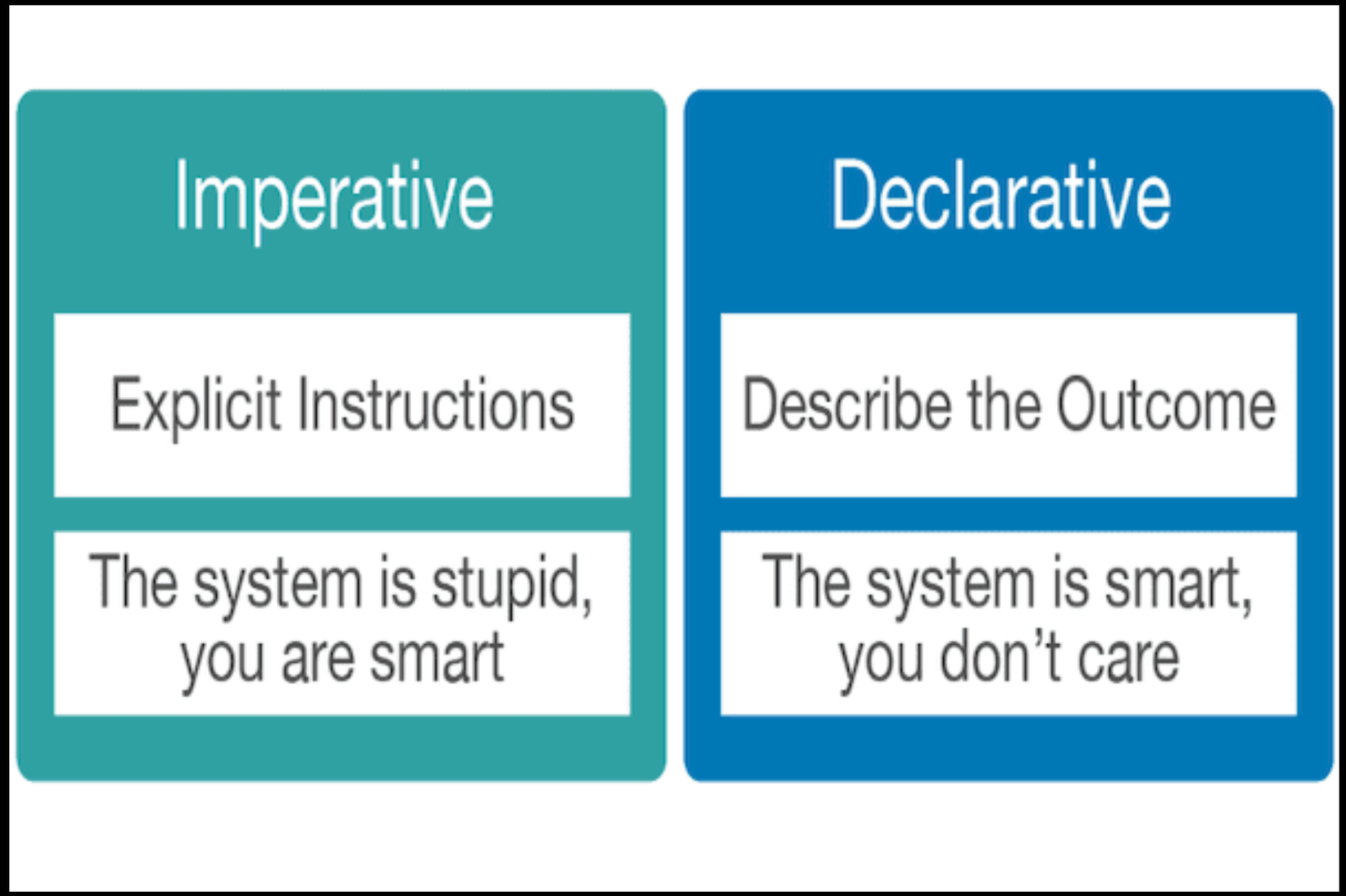
Declarative

```
// Declarative

let arr = [1,2,3,4,5];

return arr.map(v => v * 2)
```

Imperative vs Declarative



Object-Oriented Paradigm

- Everything is an object
- Object contains data (fields/attributes/properties) and code (methods)
- Class-based
- Usually imperative and procedural programming

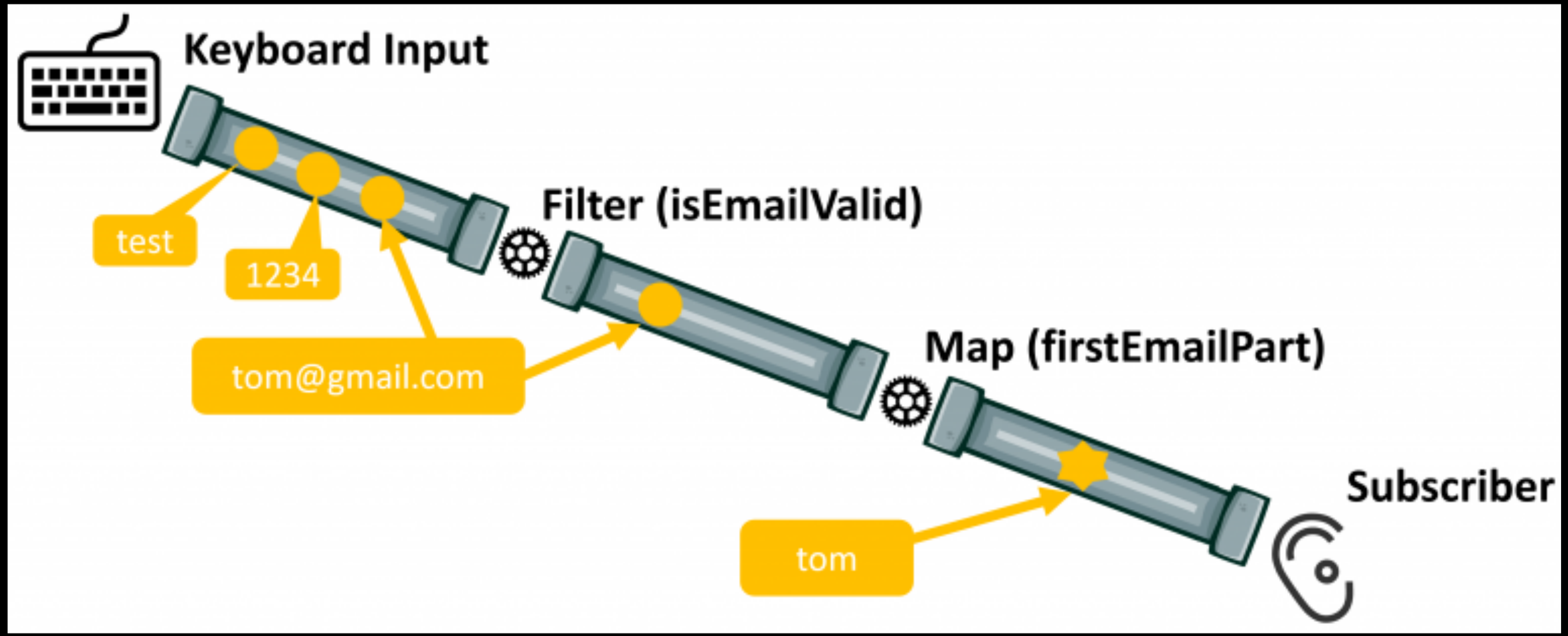
Functional Paradigm

- Having functions does not make your code functional
- Use Java 8 functional API also does not make your code functional
- Functional should tell what to do, not how to do it (declarative)
- To be functional a set of rules must to be obeyed
  - Idempotent, pure functions, immutability, closure, high-order functions, etc.
- Functions should avoid side-effects

Reactive Paradigm

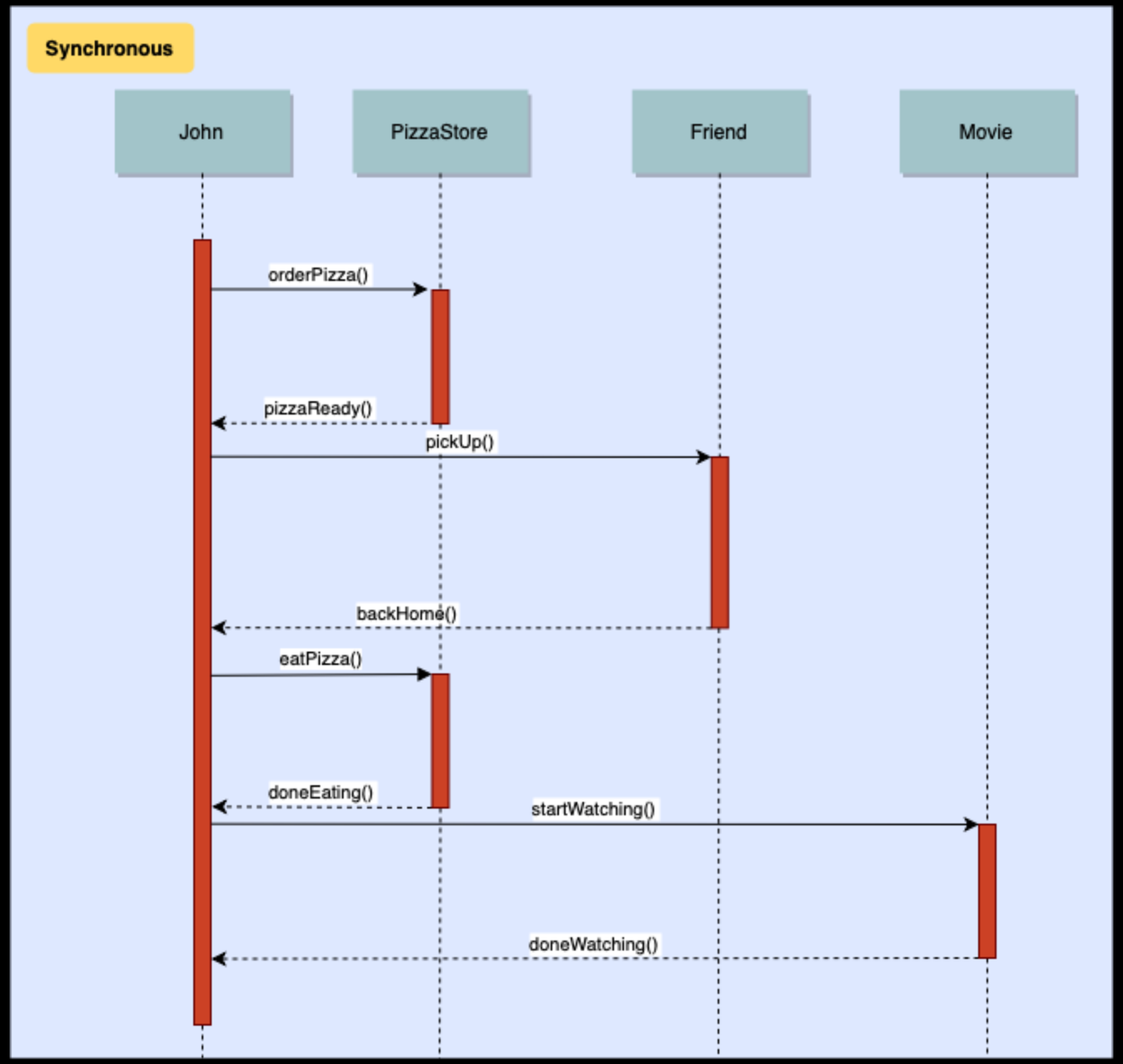
- Asynchronous data streams
- Non-Blocking
- Event-Driven
- Push and pull model
- Changed, created, combined on the fly
- Unordered execution
- Back-pressure out of the box support

Reactive Paradigm



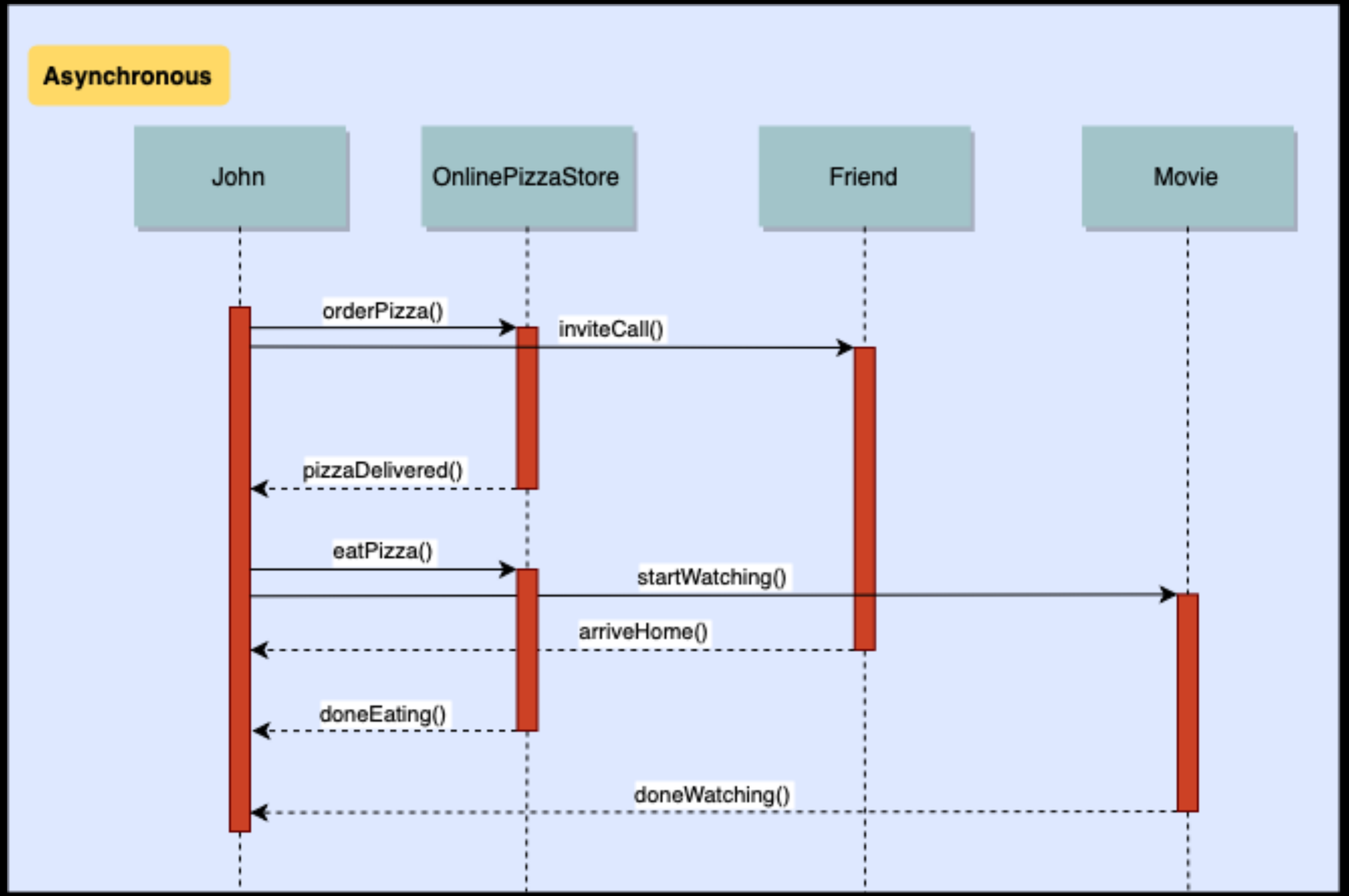
Synchronous Calls

The Bad



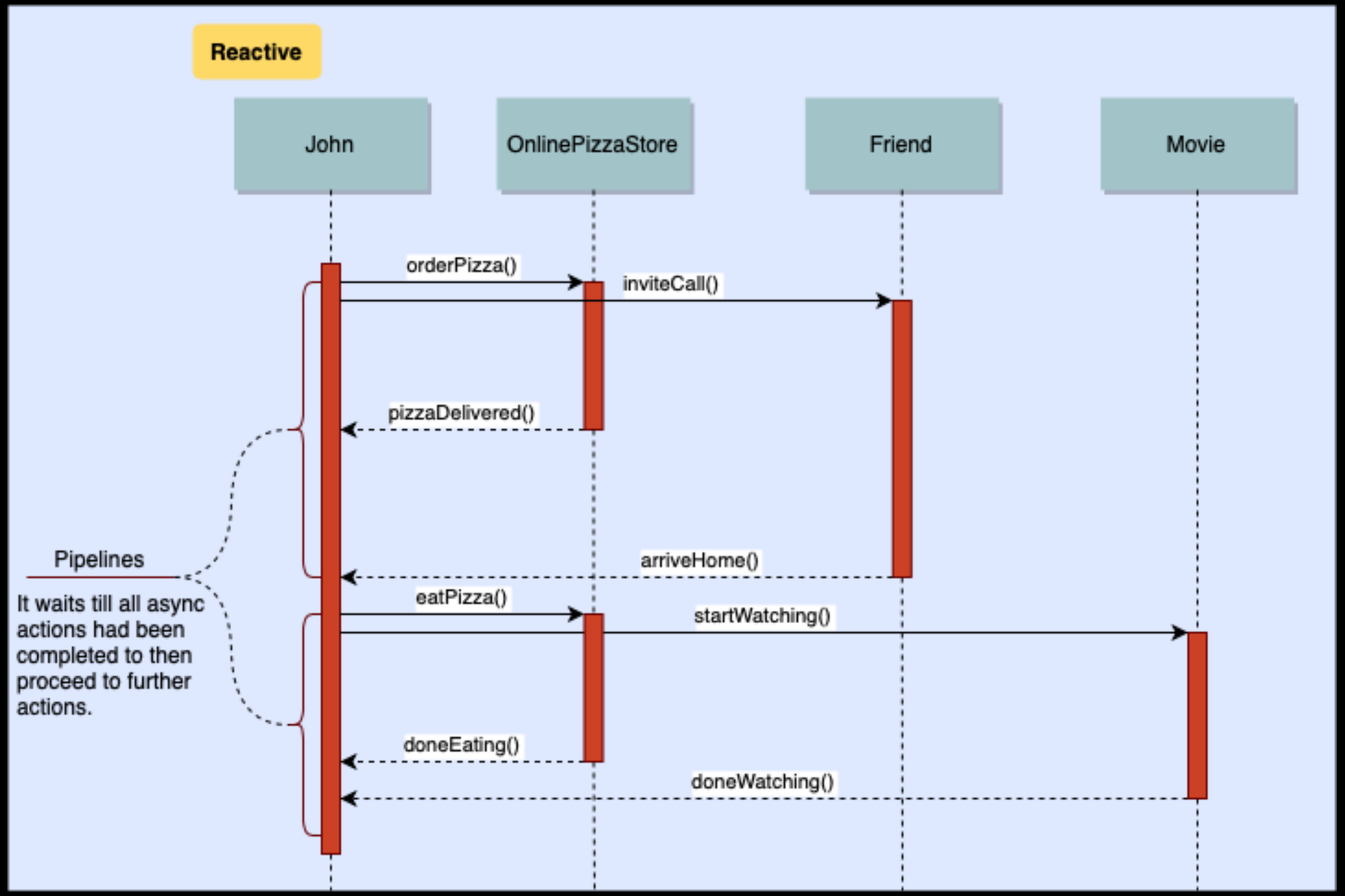
Asynchronous Calls

The Ugly

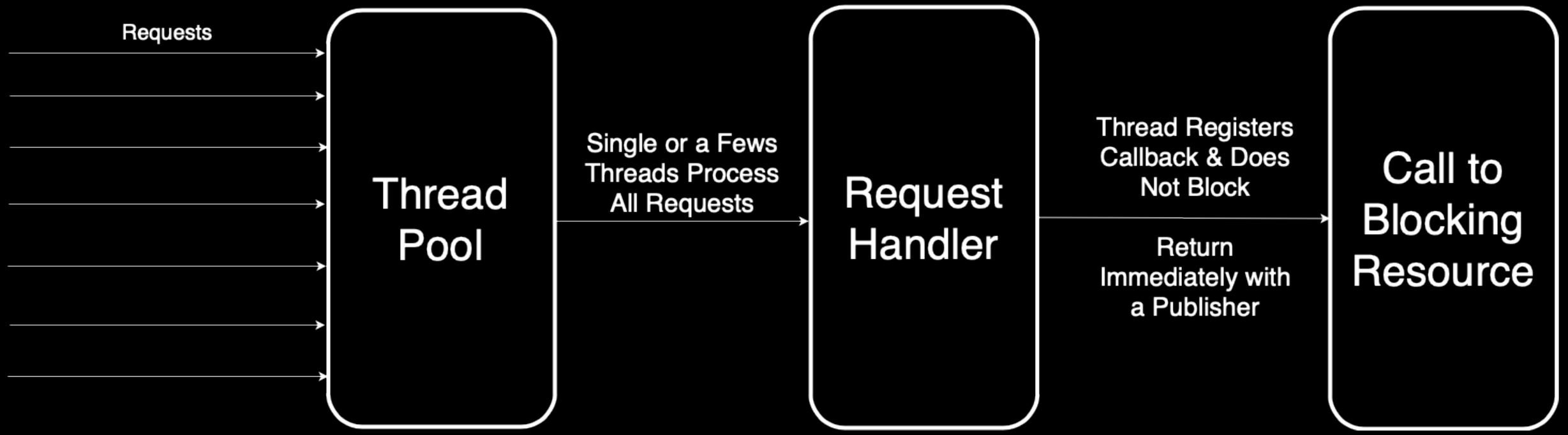


Reactive Calls

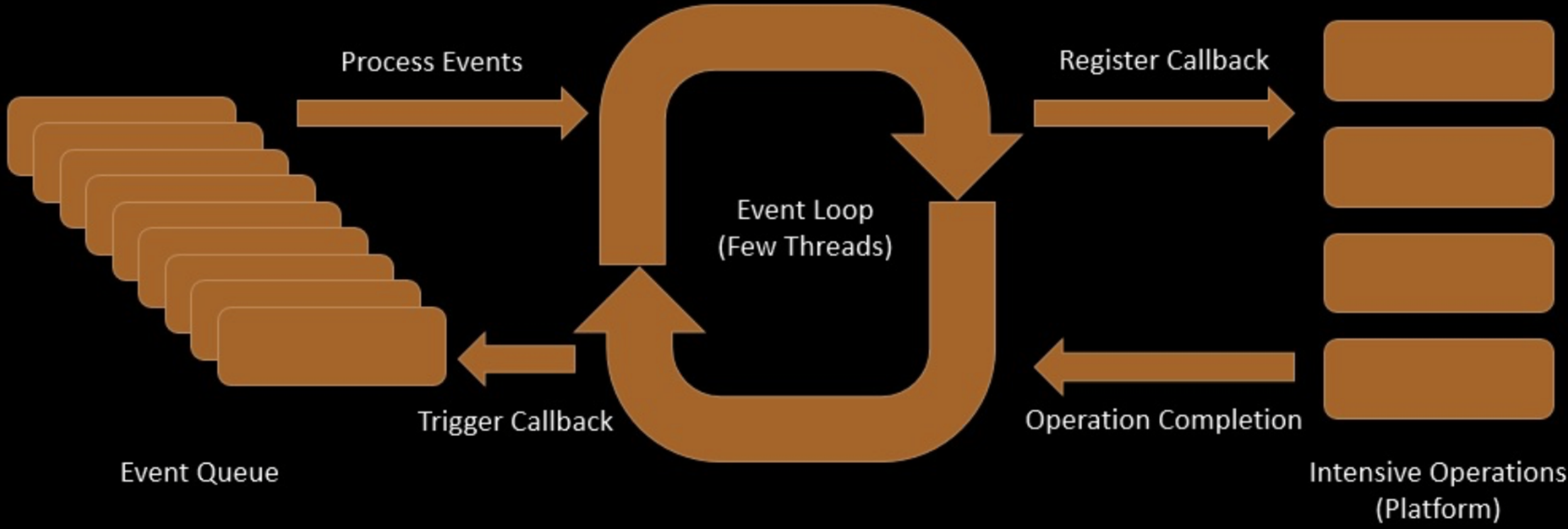
The Good



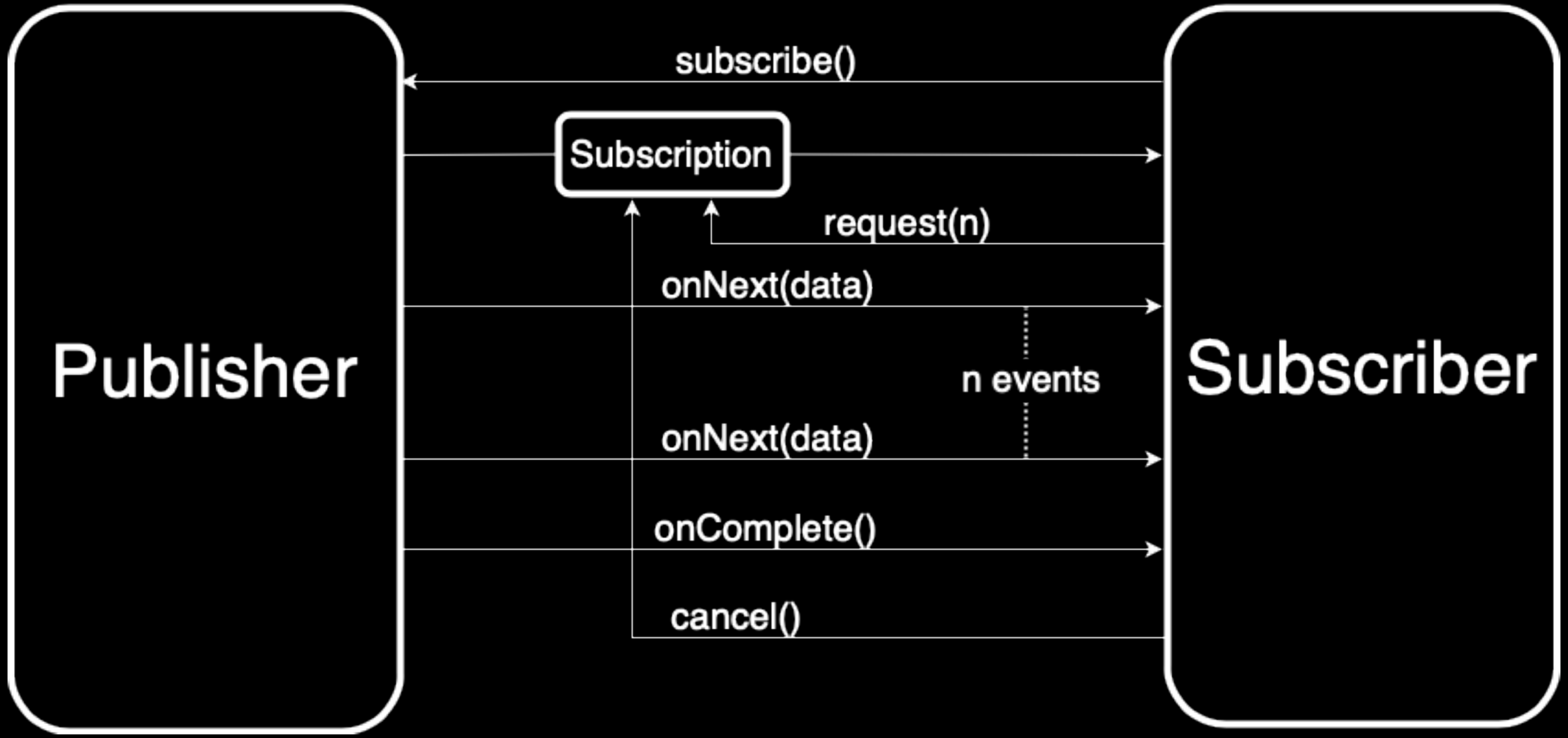
Concurrency in Reactive Programming



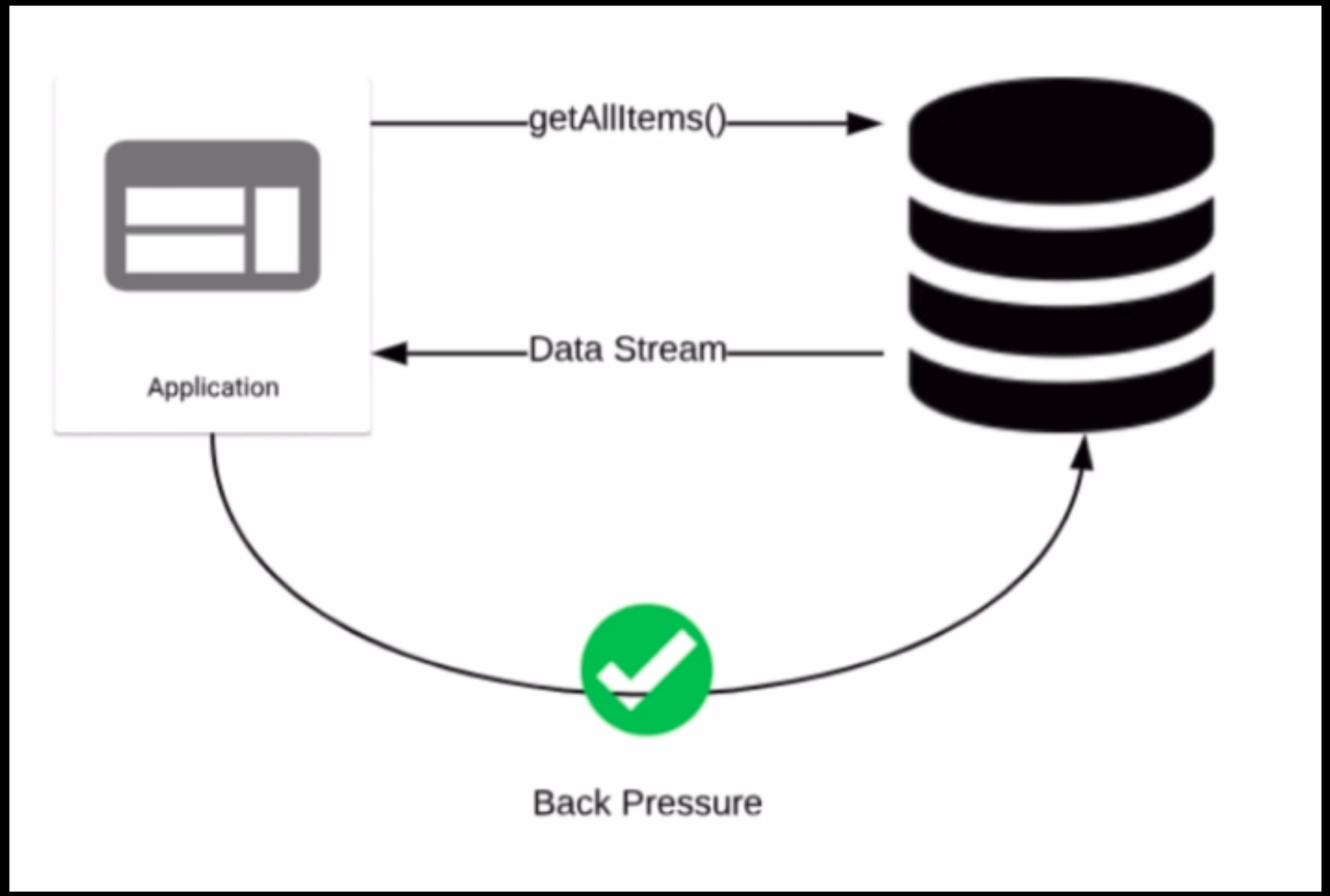
Concurrency in Reactive Programming



Reactive Flow



Back-Pressure



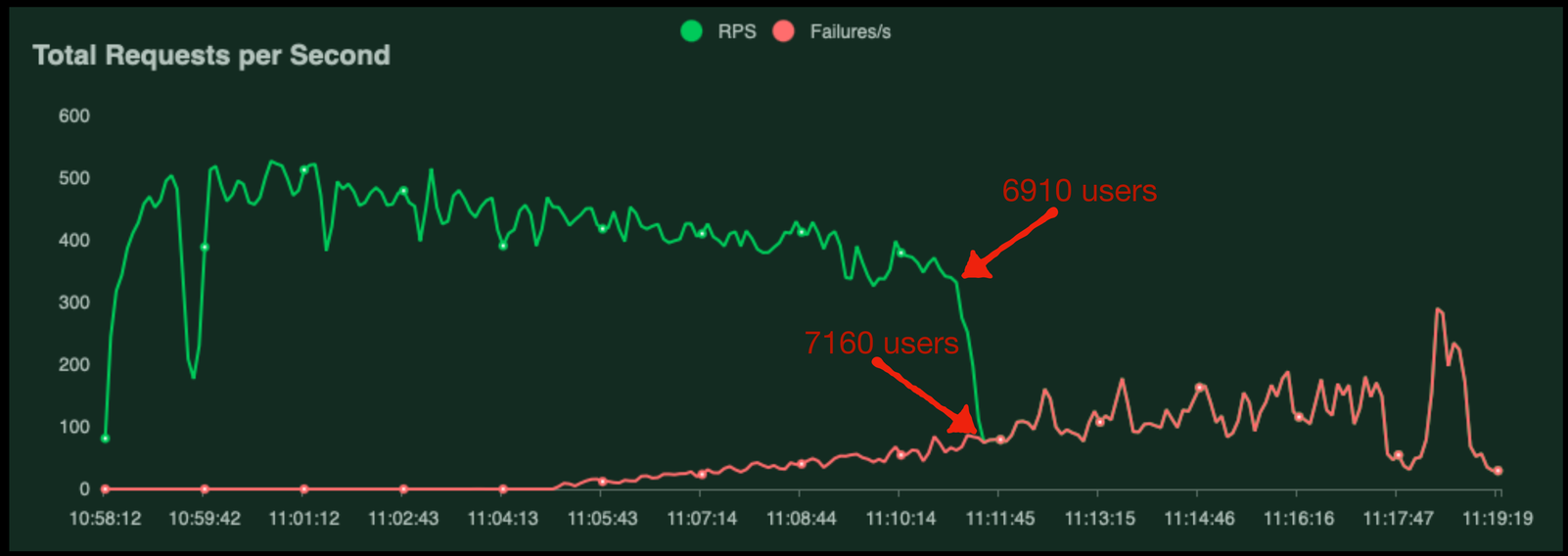
Push/Pull Model

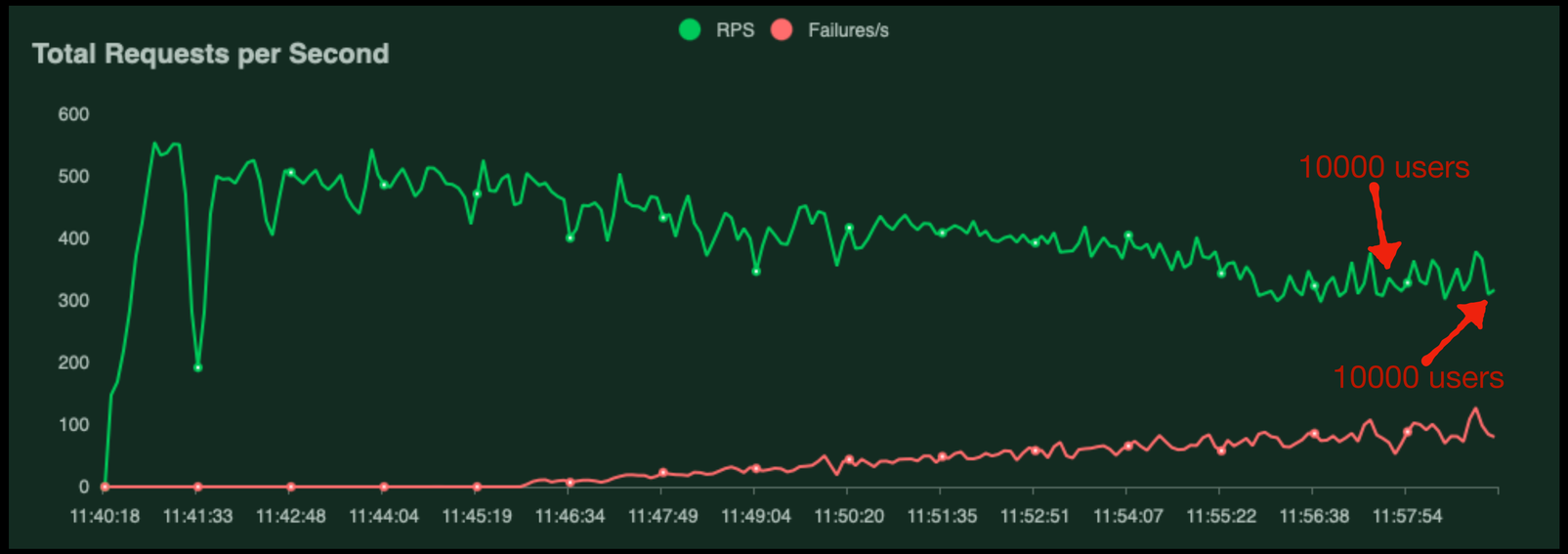
- The publisher starts pushing data, as soon as, the subscription is made
- The subscriber controls how much data it would like to pull
- The subscriber decides when cancel the subscription

Reactive Stream Specification

- Java 9 Reactive Stream SPI Support in the JDK
- Implementations
  - ReactiveX (RxJava)
  - Akka Streams
  - Project Reactor (Spring Webflux)

Why Reactive?





References

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https://projectreactor.io

https://docs.spring.io/spring-framework/docs/current/reference/html/web-reactive.html

http://reactivex.io

https://github.com/ReactiveX/RxJava

https://doc.akka.io/docs/akka/current/stream/index.html

“Talk is cheap. Show me the code.”

— Linus Torvalds