Webflux Functional Endpoints

Functional Reactive Programming

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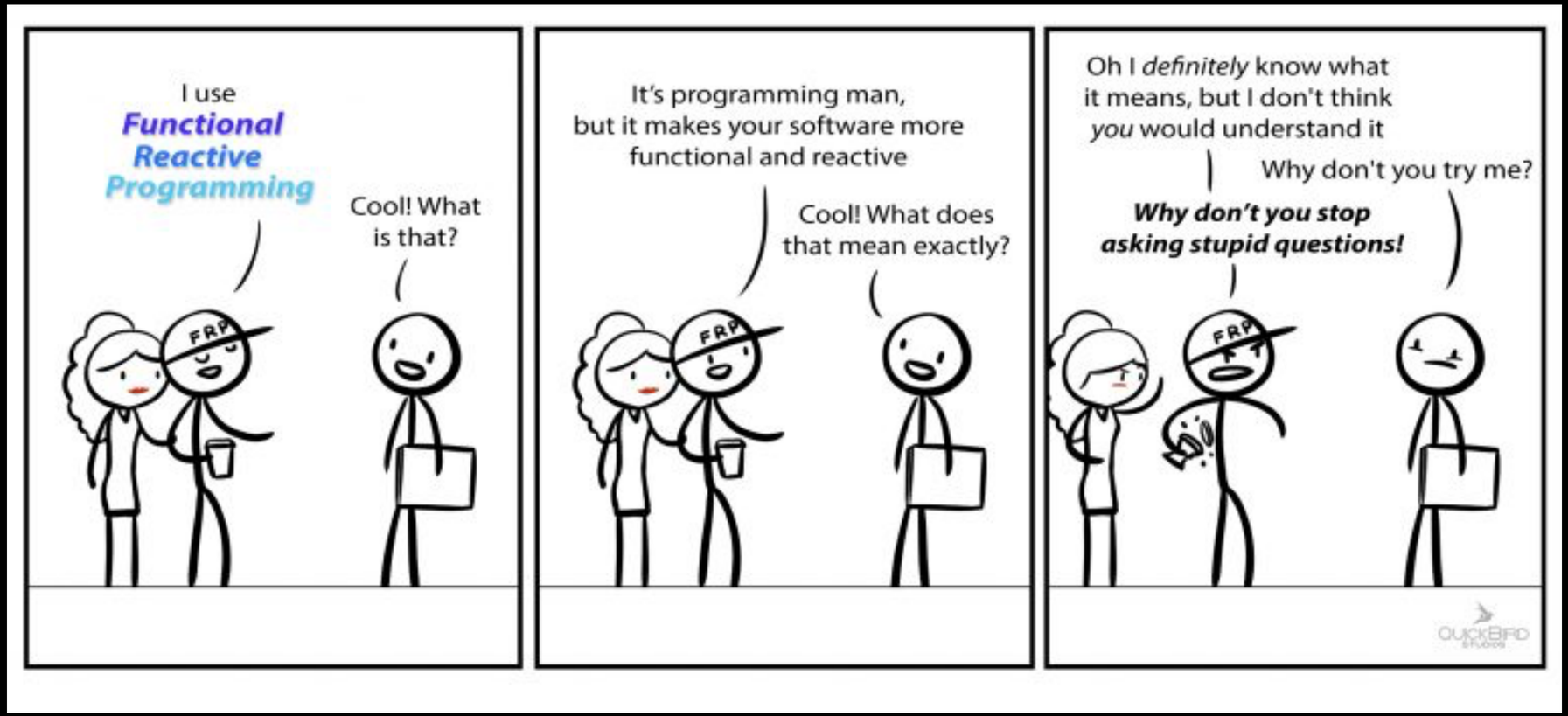
What is Functional Reactive Programming (FRP) ?


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 Programming

let array = [1, 2, 3, 4, 5, 6]

var evenNumbers: [Int] = []

for i in 0..<array.count {
    if array[i] % 2 == 0 {
        evenNumbers.append(array[i])
    }
}
```

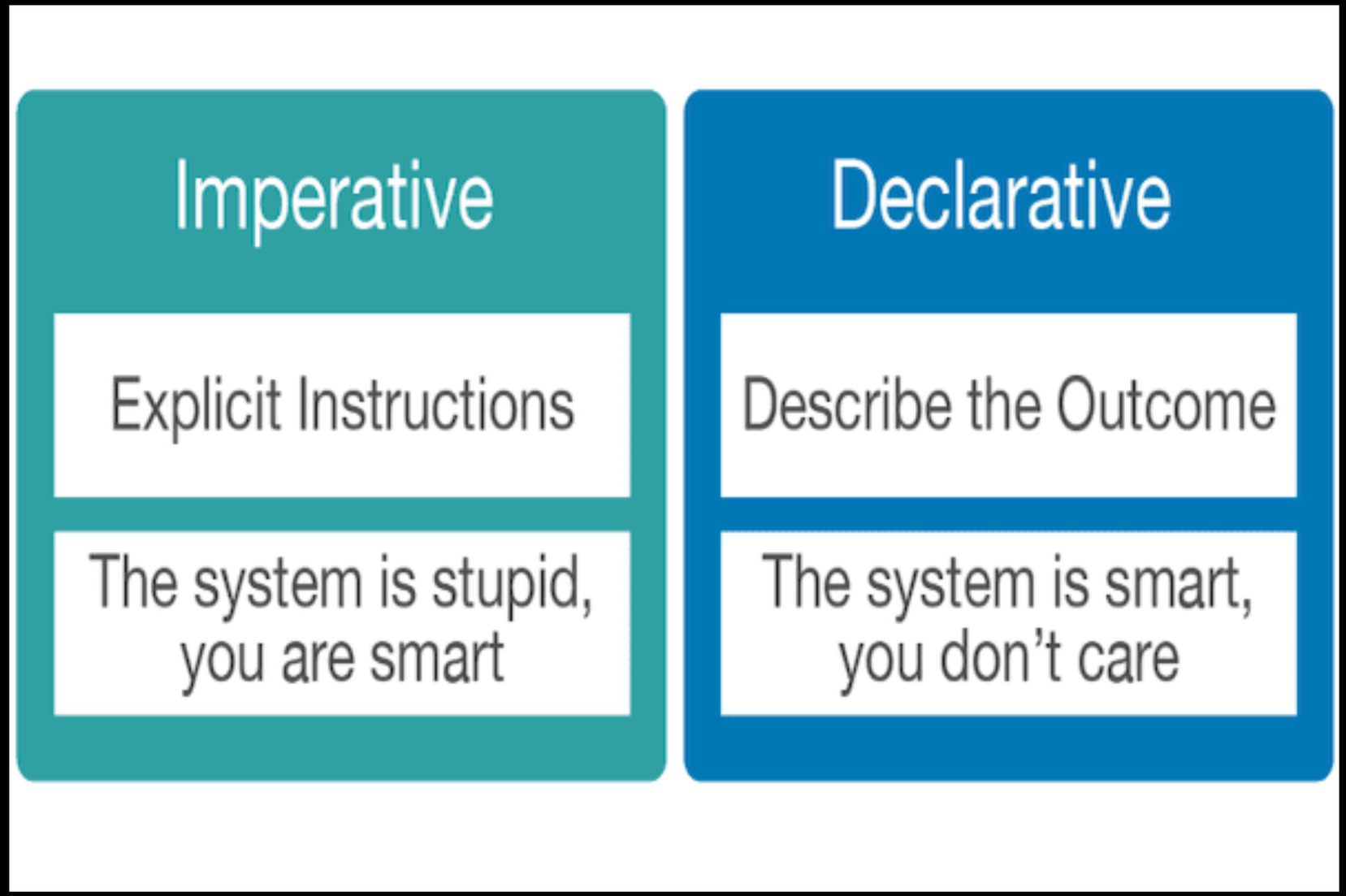
VS

DECLARATIVE

```
// Declarative

let evenNumbers2 = array.filter { $0 % 2 == 0 }
```

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

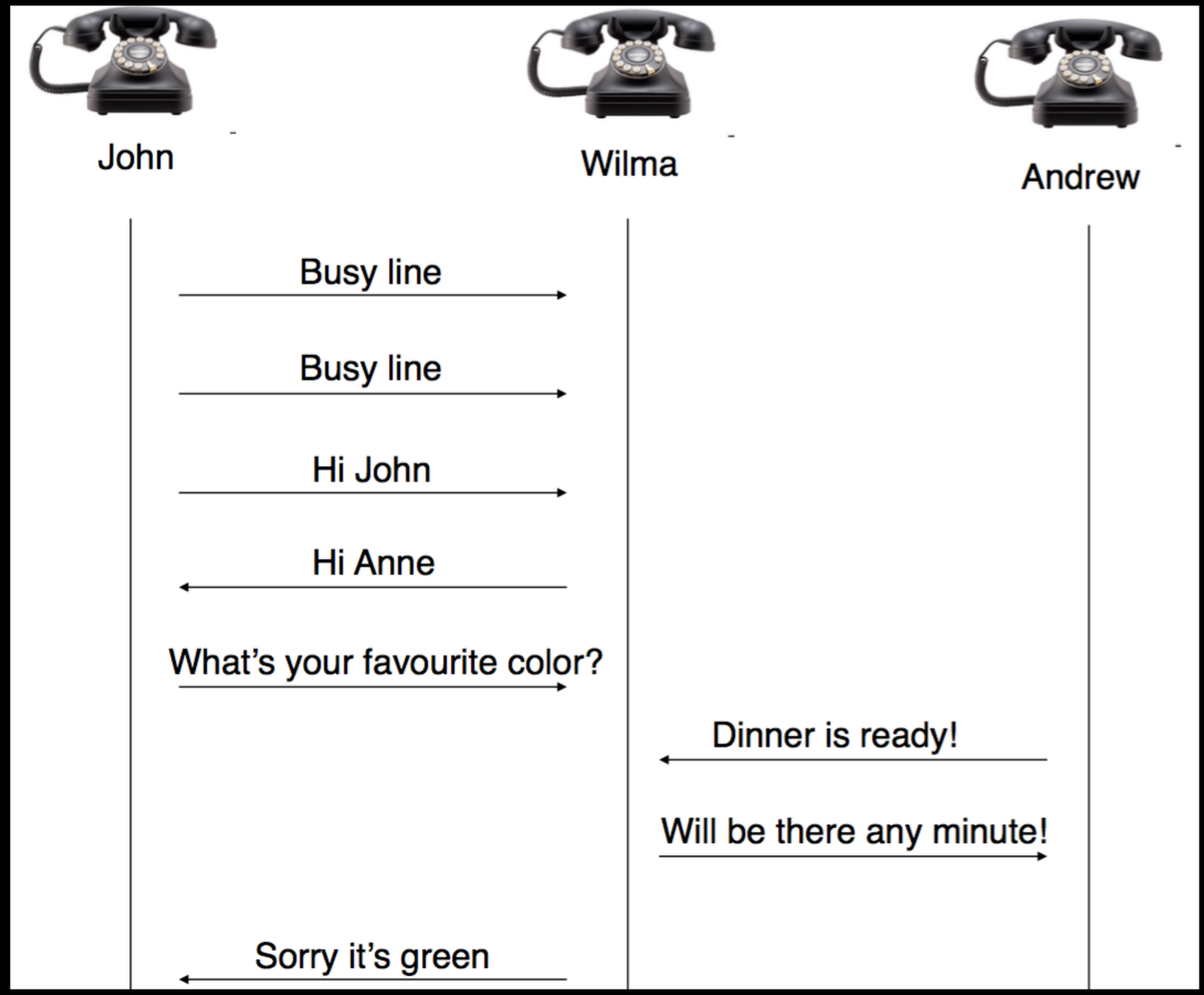
Functional Paradigm

- 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 at all costs

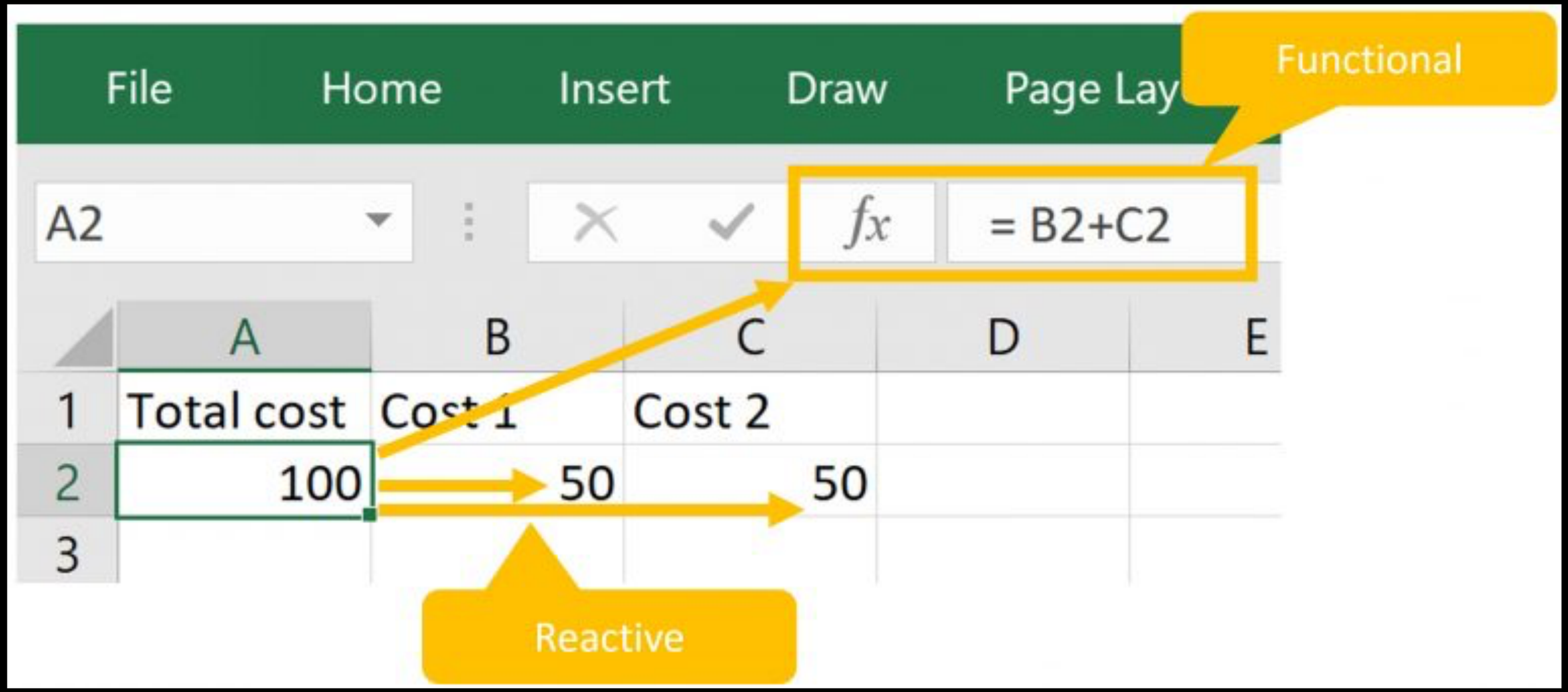
Reactive Paradigm

- 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

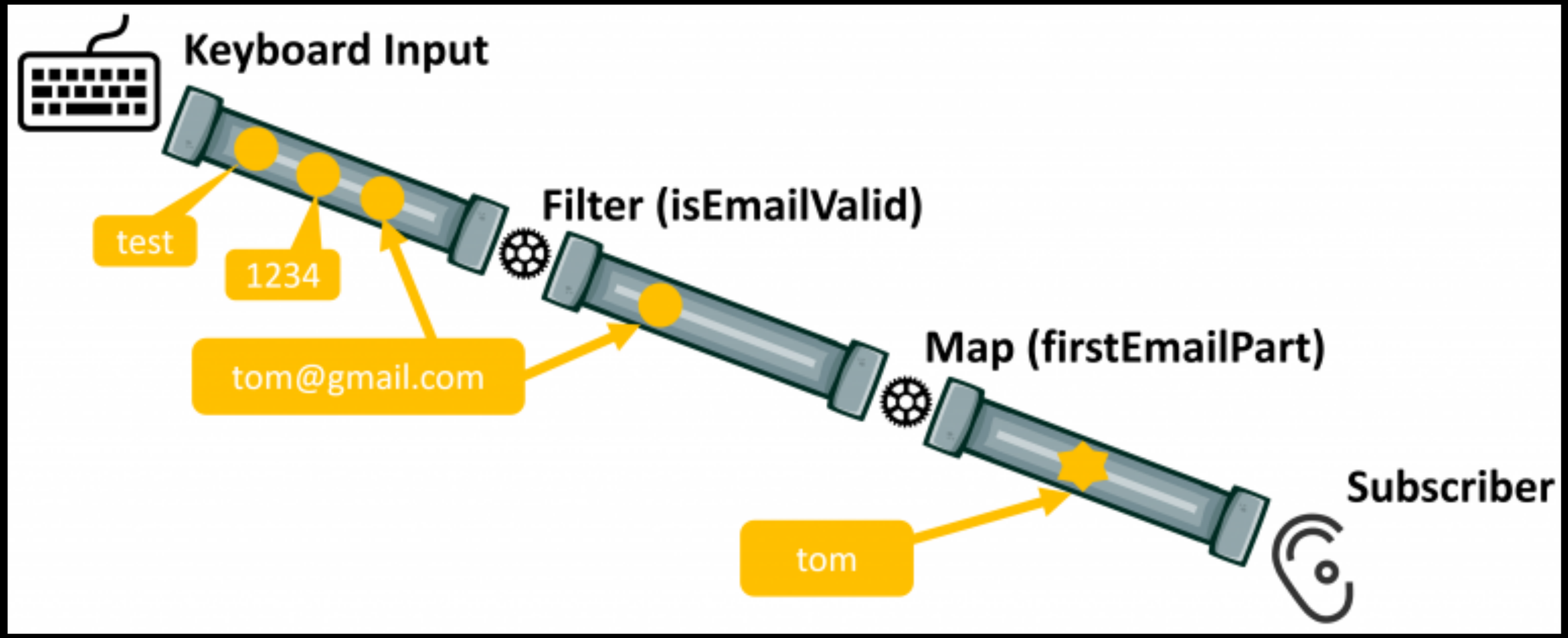
Reactive Paradigm



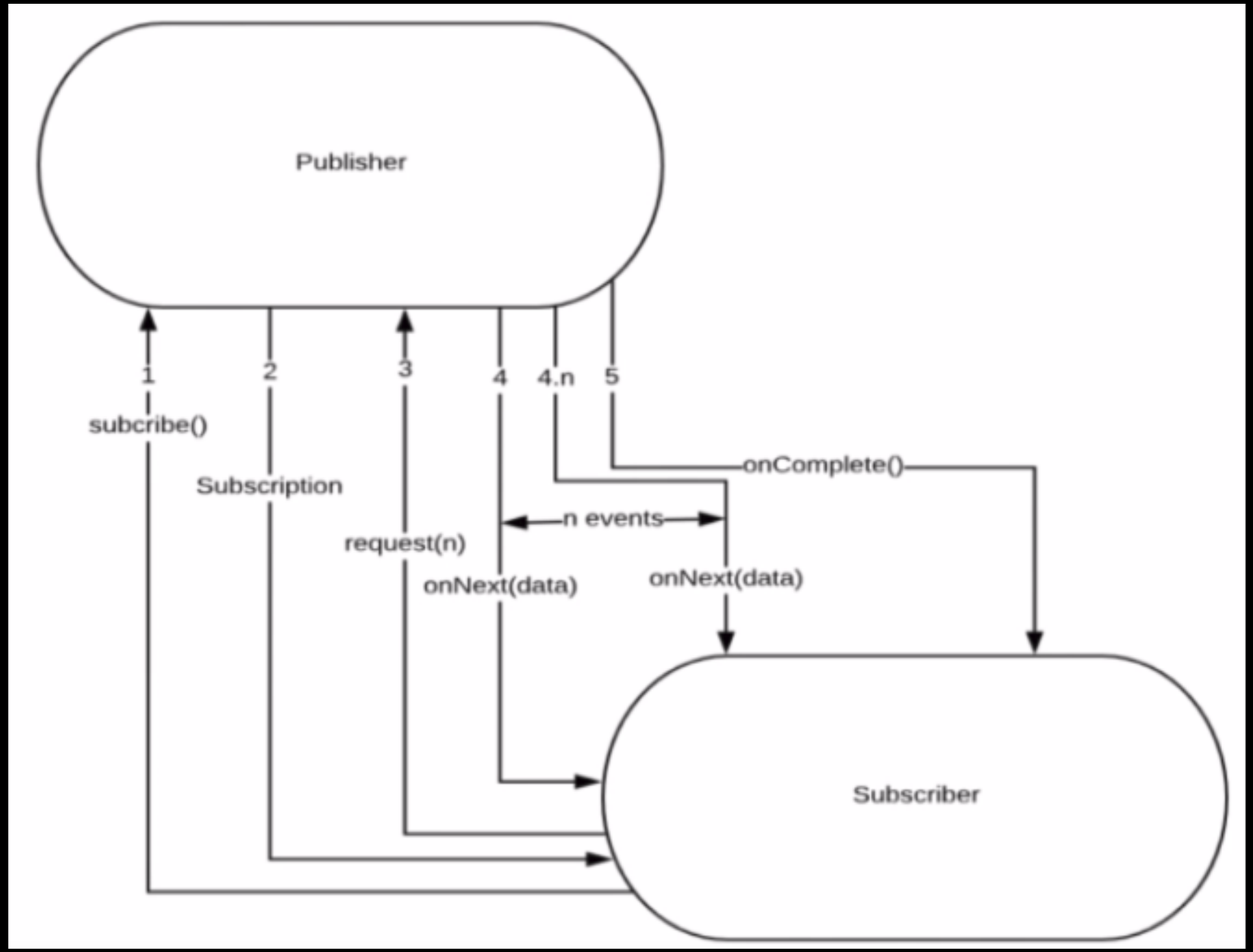
Reactive Paradigm



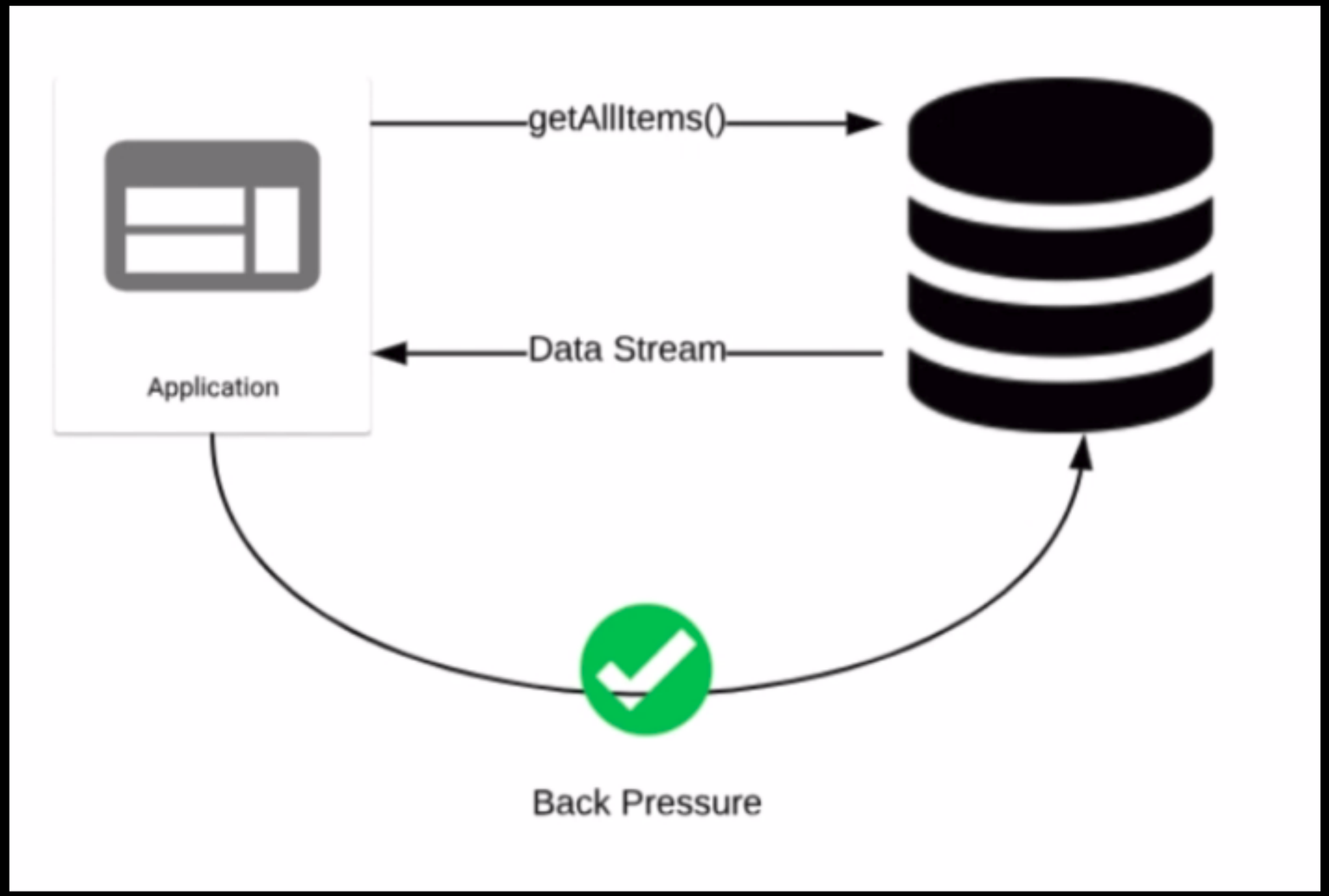
Reactive Paradigm



Reactive Flow



Back-Pressure



Push/Pull Model

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

Reactive Stream Specification

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

References

https://www.reactive-streams.org

https://github.com/reactive-streams/reactive-streams-jvm

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