

# Reactive Programming

Reactive programming focuses on non-blocking, asynchronous execution

## The Reactive Manifesto

### Responsive

- The System responds in a timely manner
- Responsiveness is the cornerstone of usability and utility
- Responsiveness also means problems may be detected quickly
- Responsive systems provide rapid and consistent response times
- Consistent behavior simplifies error handling, builds end user confidence, and encourages further interaction

### Resilient

- System stays responsive in the face of failure
- Resilience is achieved by replication, containment, isolation, and delegation
- Failures are contained within each component
- Parts of the system can fail, without compromising the system as a whole
- Recovery of each component is delegated to another
- High-availability is ensured by replication where necessary

### Elastic

- The System stays responsive under varying workload
- Reactive Systems can react to changes in the input rate by changing the amount of resources allocated to service inputs
- Reactive Systems achieve elasticity in a cost effective way on commodity hardware and software platforms

### Message Driven

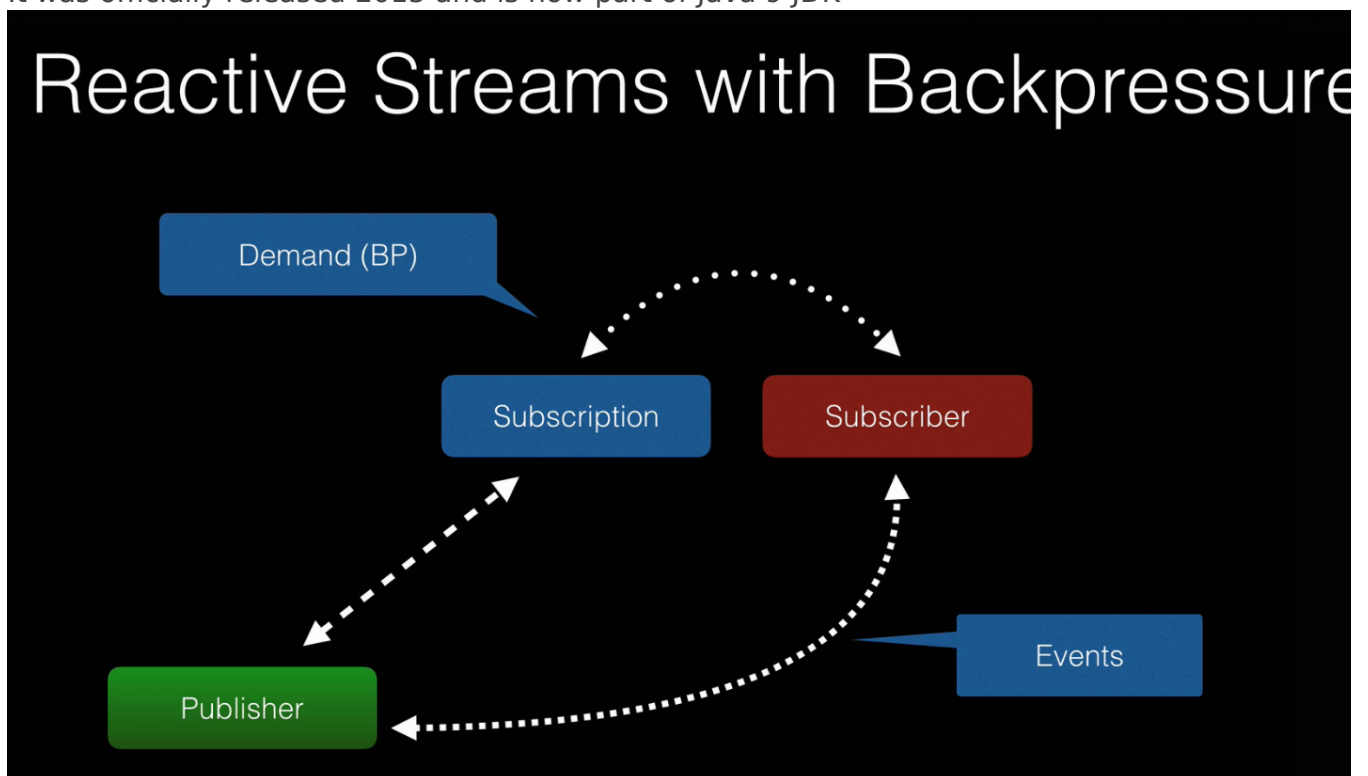
- Reactive Systems rely on asynchronous message passing to establish a boundary between components
  - This ensures loose coupling, isolation, and location transparency
- Message passing enables load management, elasticity and flow control
- Location transparent messaging makes management of failures possible
- Non-blocking communication allows recipients to only consume resources while active leading to less system overhead

# Features of Reactive Programming

- Data Streams
- Asynchronous
- Non-blocking - Process what is available and ask for a notification when more is available
- Backpressure - The ability of the client to throttle data
- Failures as Messages - Exceptions are processed by a handler function

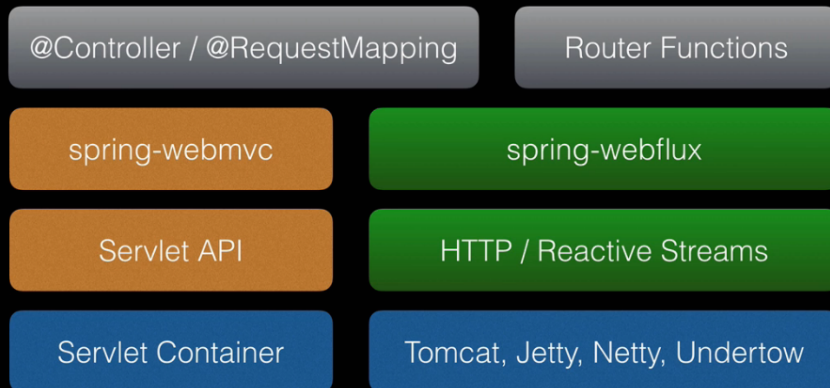
## Reactive Streams

- Reactive Streams API was started in 2013 by engineers from Netflix and other companies. It was officially released 2015 and is now part of Java 9 JDK



- spring-webflux is a whole new non-blocking API for Spring

# Spring MVC & Spring WebFlux



## Spring Reactive Types

- Mono - A publisher with 0 or 1 elements in datastream
- Flux - A publisher with 0+ elements in datastream

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Revision #1

Created 17 April 2022 00:40:45 by Elkip

Updated 17 April 2022 00:41:39 by Elkip