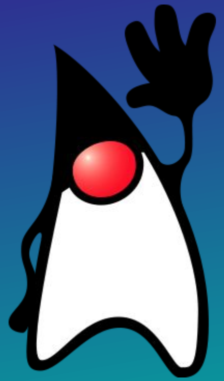
SpringOne Platform by Pivotal

Servlet or Reactive stack: You have choices...

By Rossen Stoyanchev
@rstoya05



About This Talk

Servlet and Reactive stacks
(Spring Framework 5)

Big shift towards async…
Understand and make choices

About the Speaker

Spring Framework committer

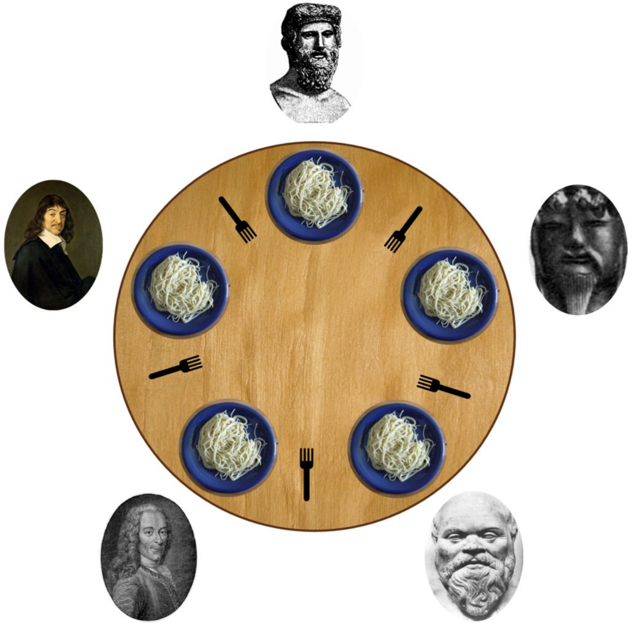
Spring MVC *for a while…*

Spring WebFlux *from inception*

Motivation for change

REACTIVE
REACTIVE, EVERYWHERE ??

Asynchronicity



Thread pools

Asynchronicity

Actors

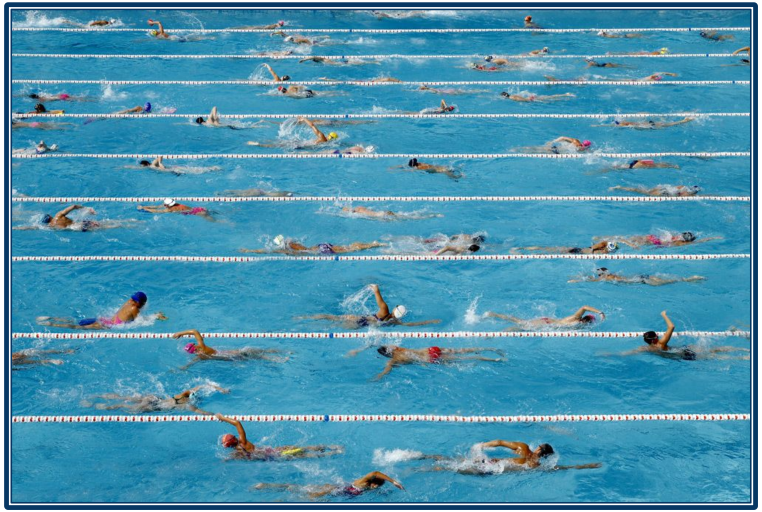
Fibers / Project Loom

Coroutines

Event loop

Thread pools

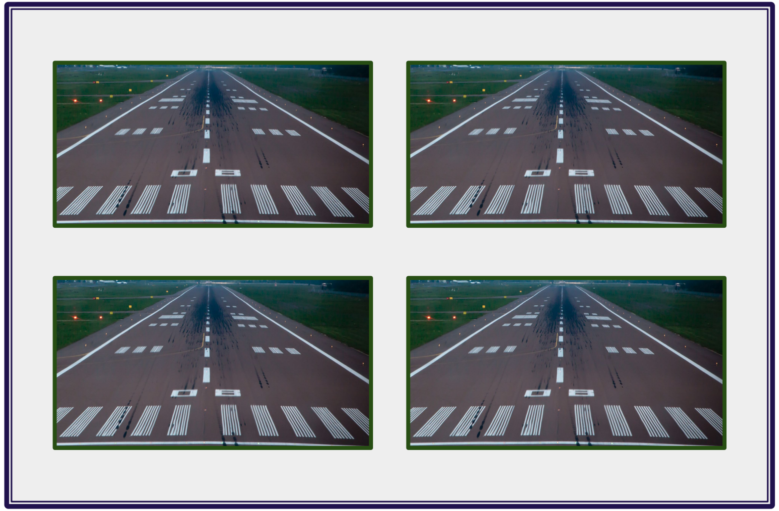
Servlet



100s, 1000s threads

(blocked)

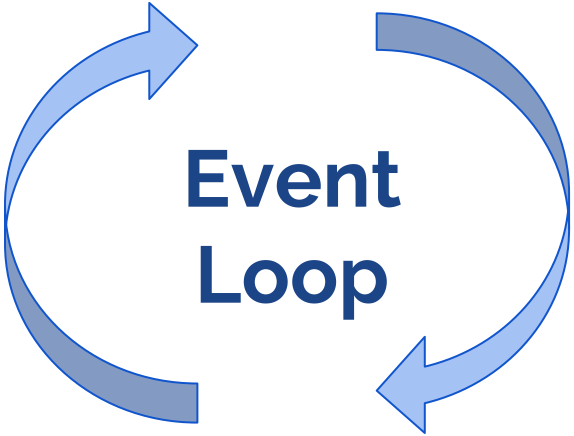
Reactive



Small, fixed # of threads

(running)

Non-blocking concurrency



Declarative composition of asynchronous logic

CompletableFuture, ReactiveX, Reactor, …

Java 8 lambdas

Functional programming models

Stack choices

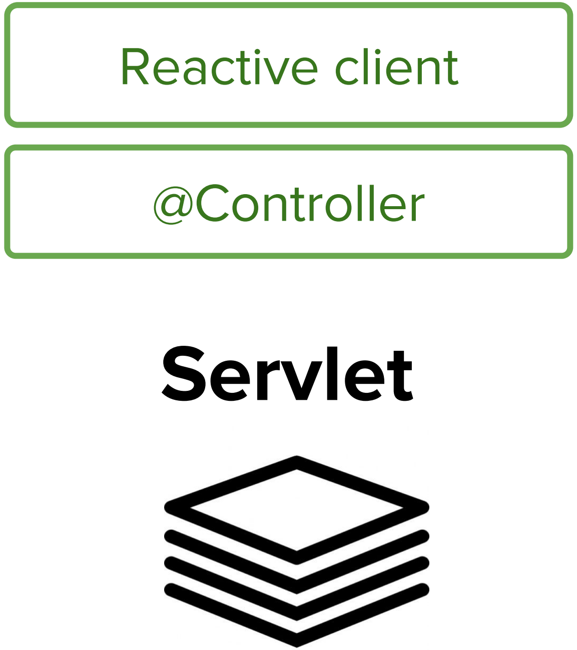
and why choice matters

@Controller

Servlet

@Controller

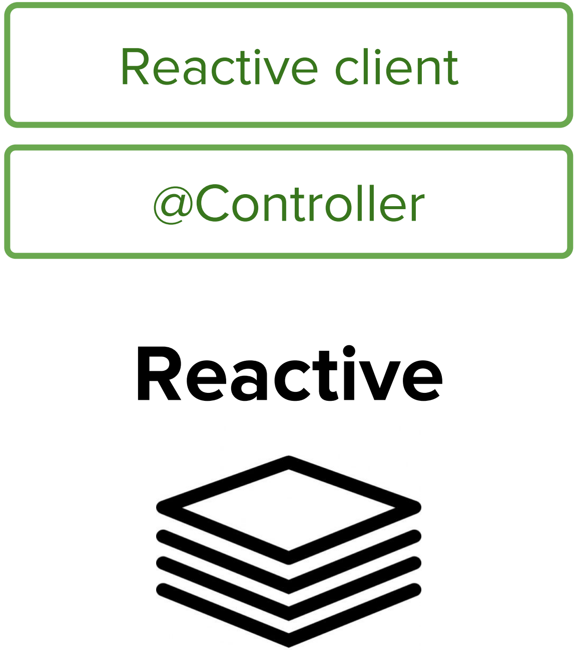
Reactive



Reactive client

@Controller

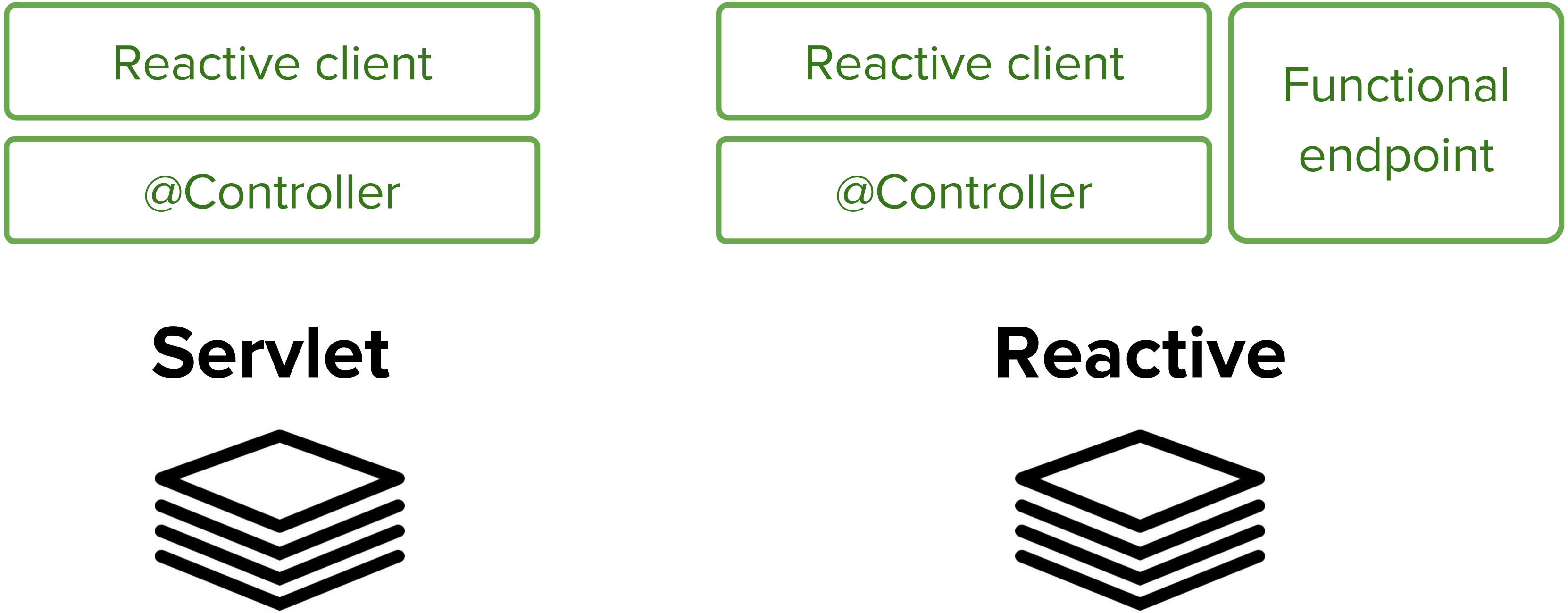
Servlet



Reactive client

@Controller

Reactive



Reactive client

@Controller

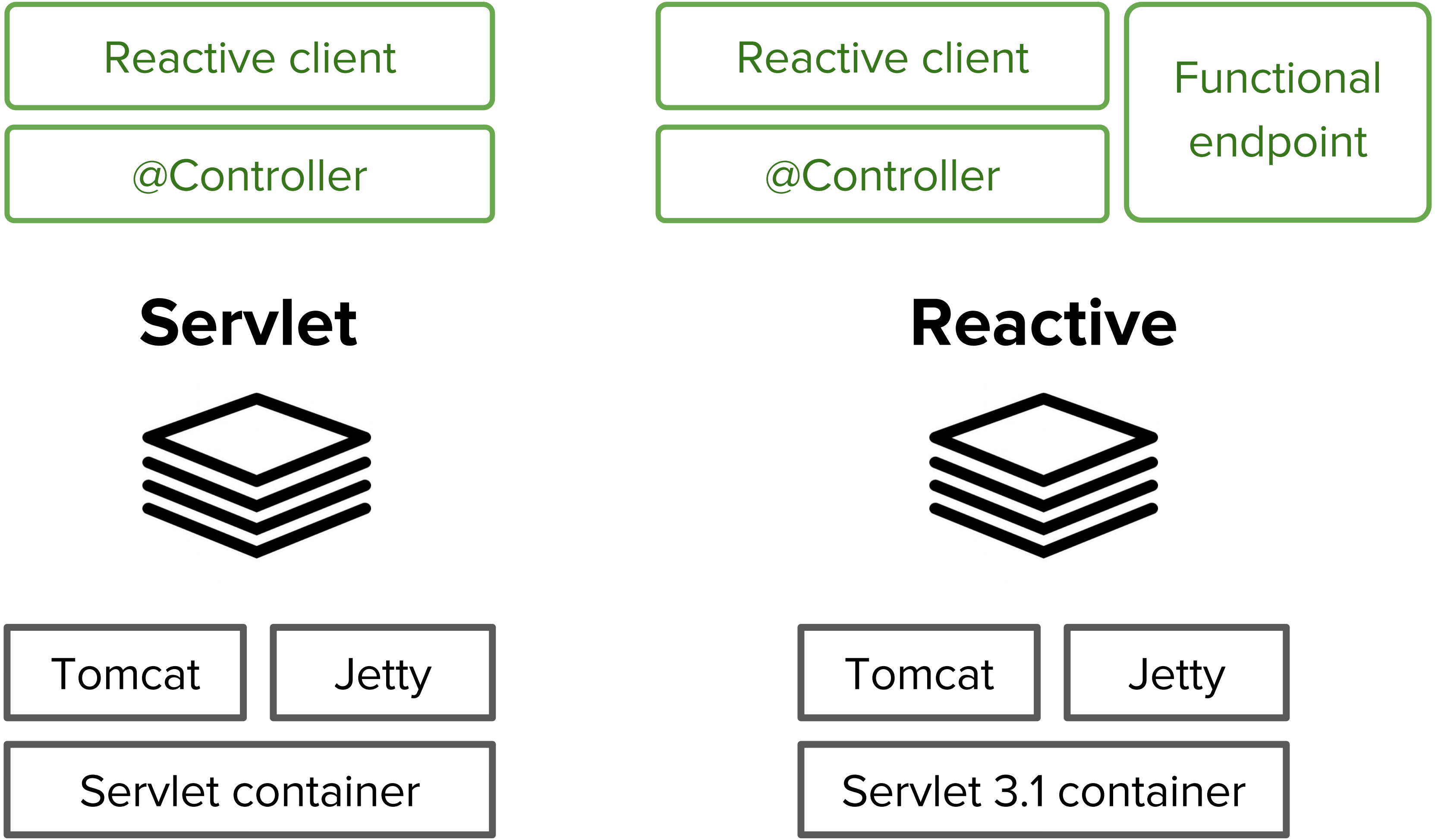
Servlet

Reactive client

@Controller

Functional endpoint

Reactive



Reactive client

@Controller

Servlet

Tomcat

Jetty

Servlet container

Reactive client

@Controller

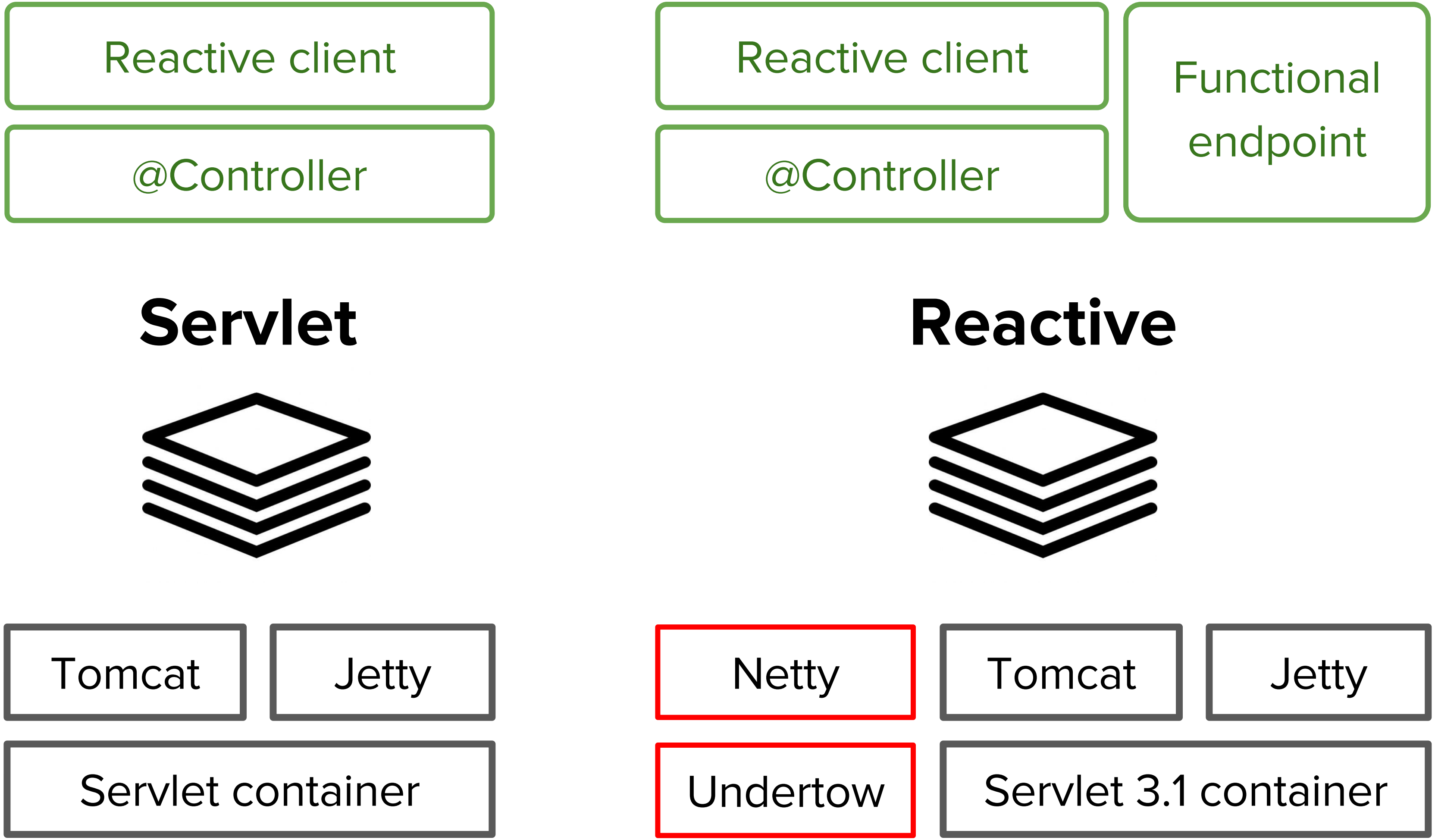
Functional endpoint

Reactive

Tomcat

Jetty

Servlet 3.1 container



Reactive client

@Controller

Servlet

Tomcat

Jetty

Servlet container

Reactive client

@Controller

Functional endpoint

Reactive

Netty

Tomcat

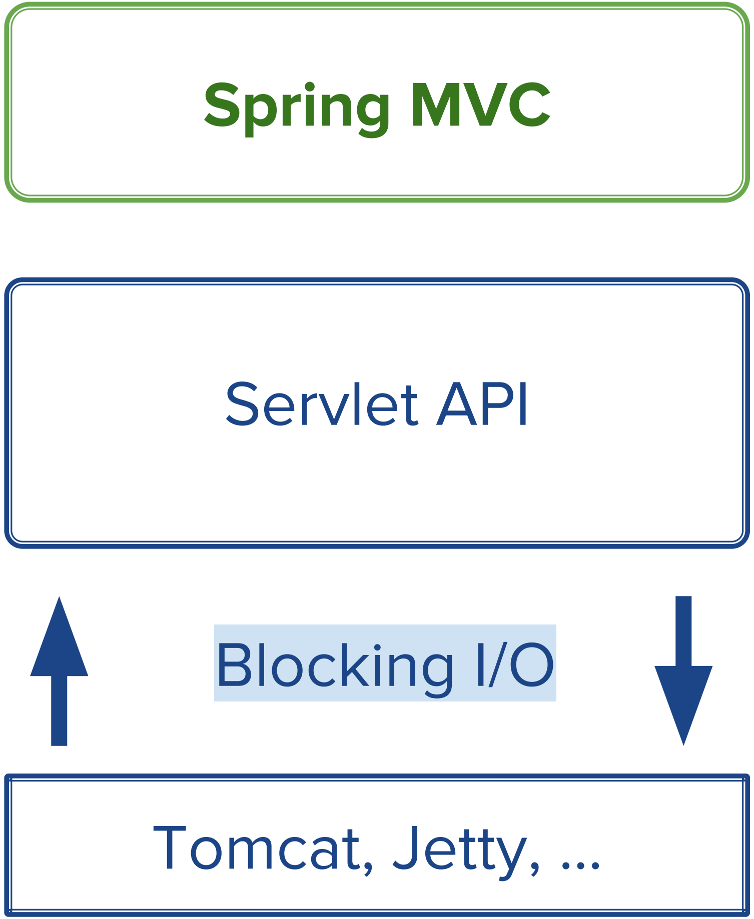
Jetty

Undertow

Servlet 3.1 container

Demo

Stack architecture



Spring MVC

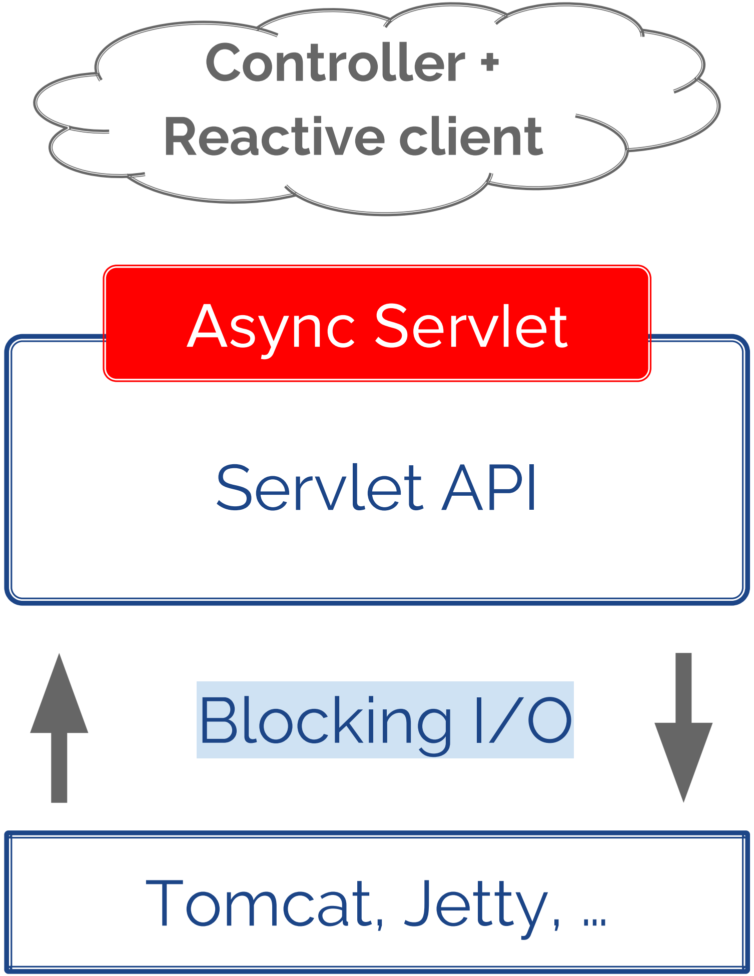
Servlet API

Blocking I/O

Tomcat, Jetty, …

History of Servlet API

1997	1.0	
...	...	
2009	3.0	Async Servlet
2013	3.1	Servlet non-blocking I/O
...	...	



Controller + Reactive client

Async Servlet

Servlet API

Blocking I/O

Tomcat, Jetty, …

History of Servlet API

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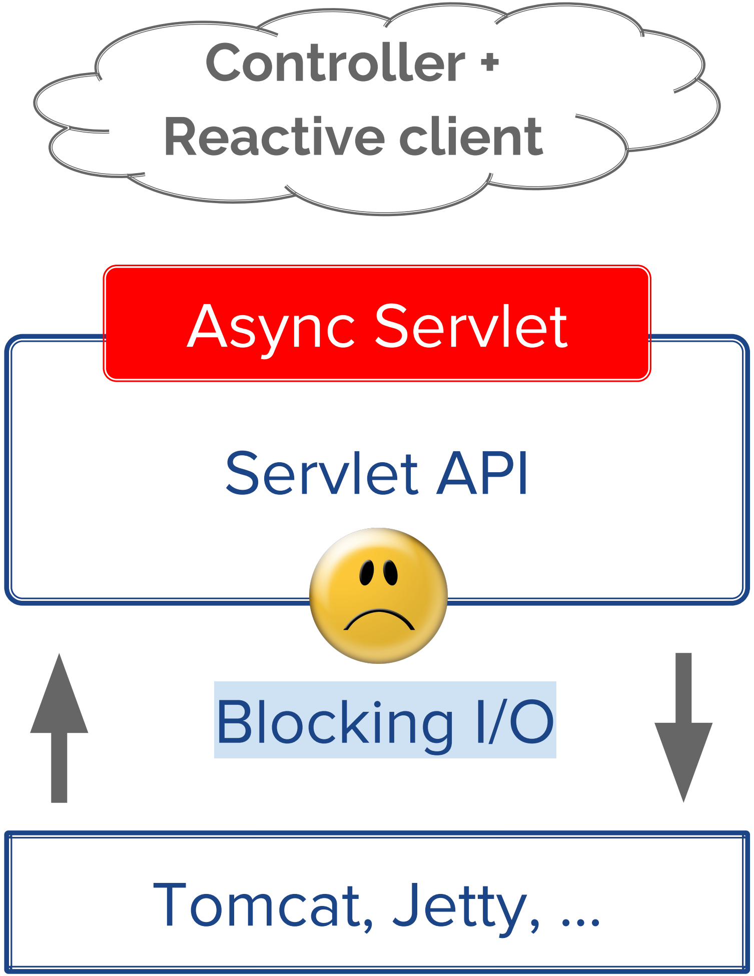
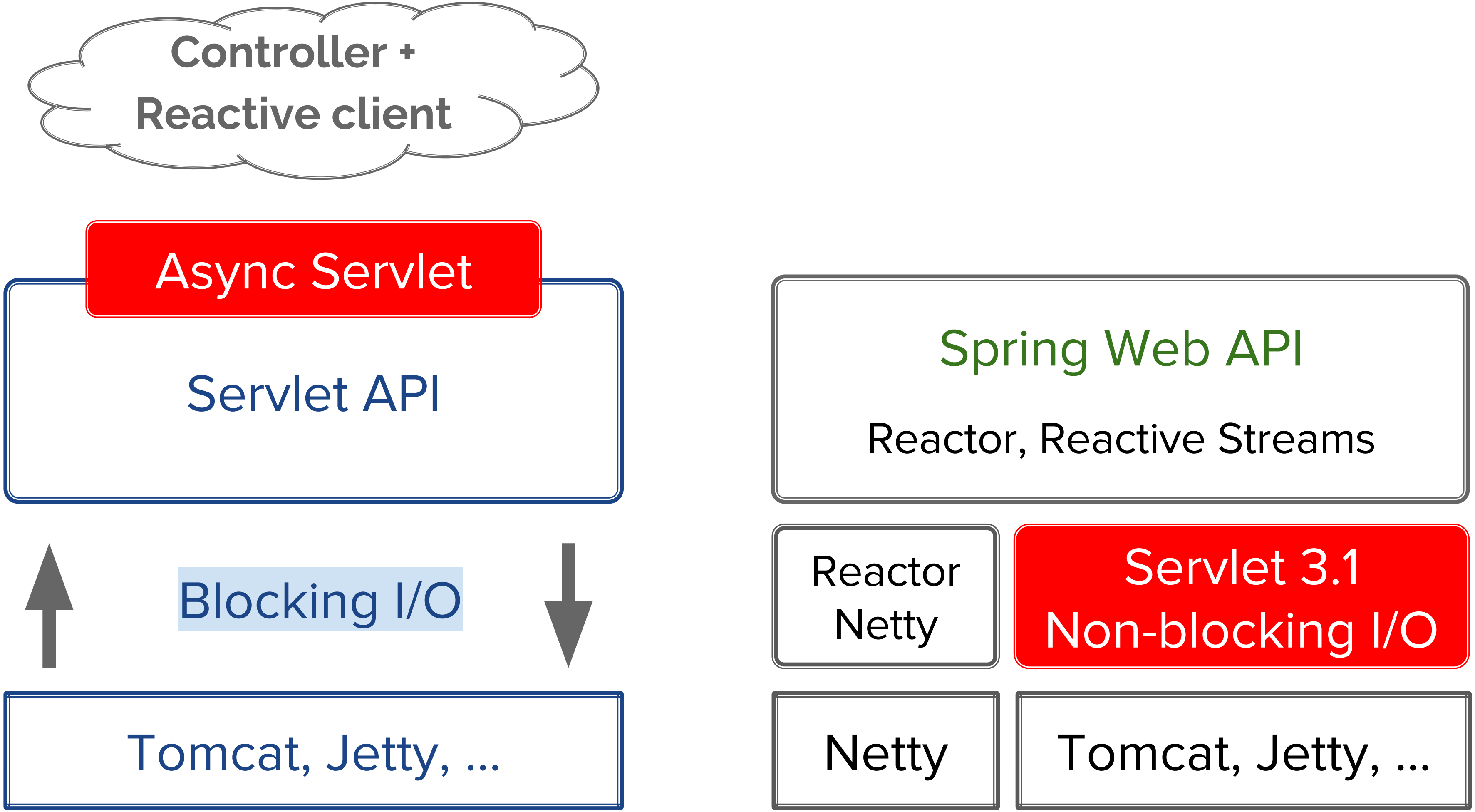

Controller +
Reactive client
Async Servlet
Servlet API
Blocking I/O
Tomcat, Jetty, …



Controller +
Reactive client

Async Servlet

Servlet API

Blocking I/O

Tomcat, Jetty, …

Spring Web API

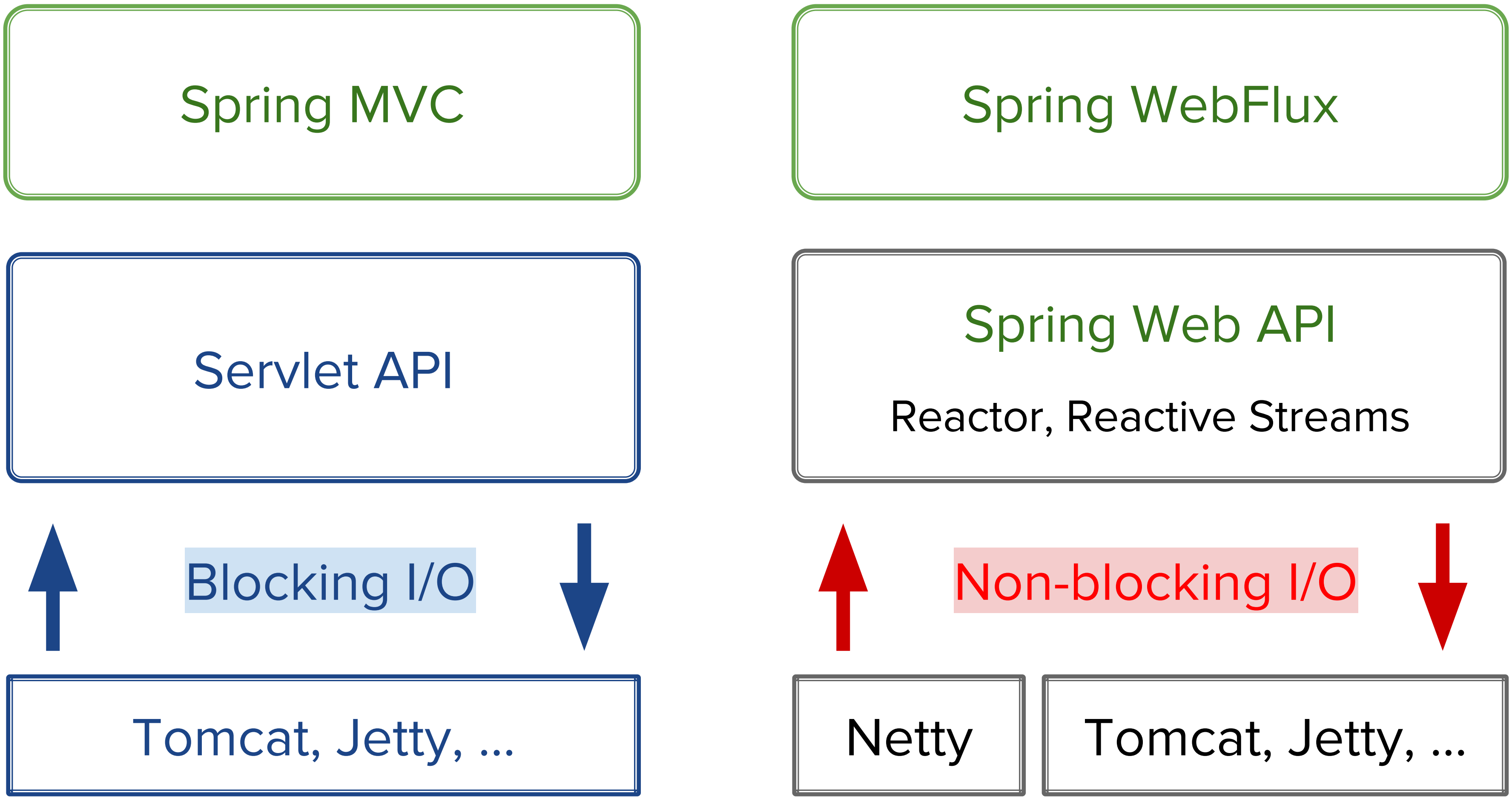
Reactor, Reactive Streams

Reactor
Netty

Servlet 3.1
Non-blocking I/O

Netty

Tomcat, Jetty, …



Spring MVC

Servlet API

Blocking I/O

Tomcat, Jetty, …

Spring WebFlux

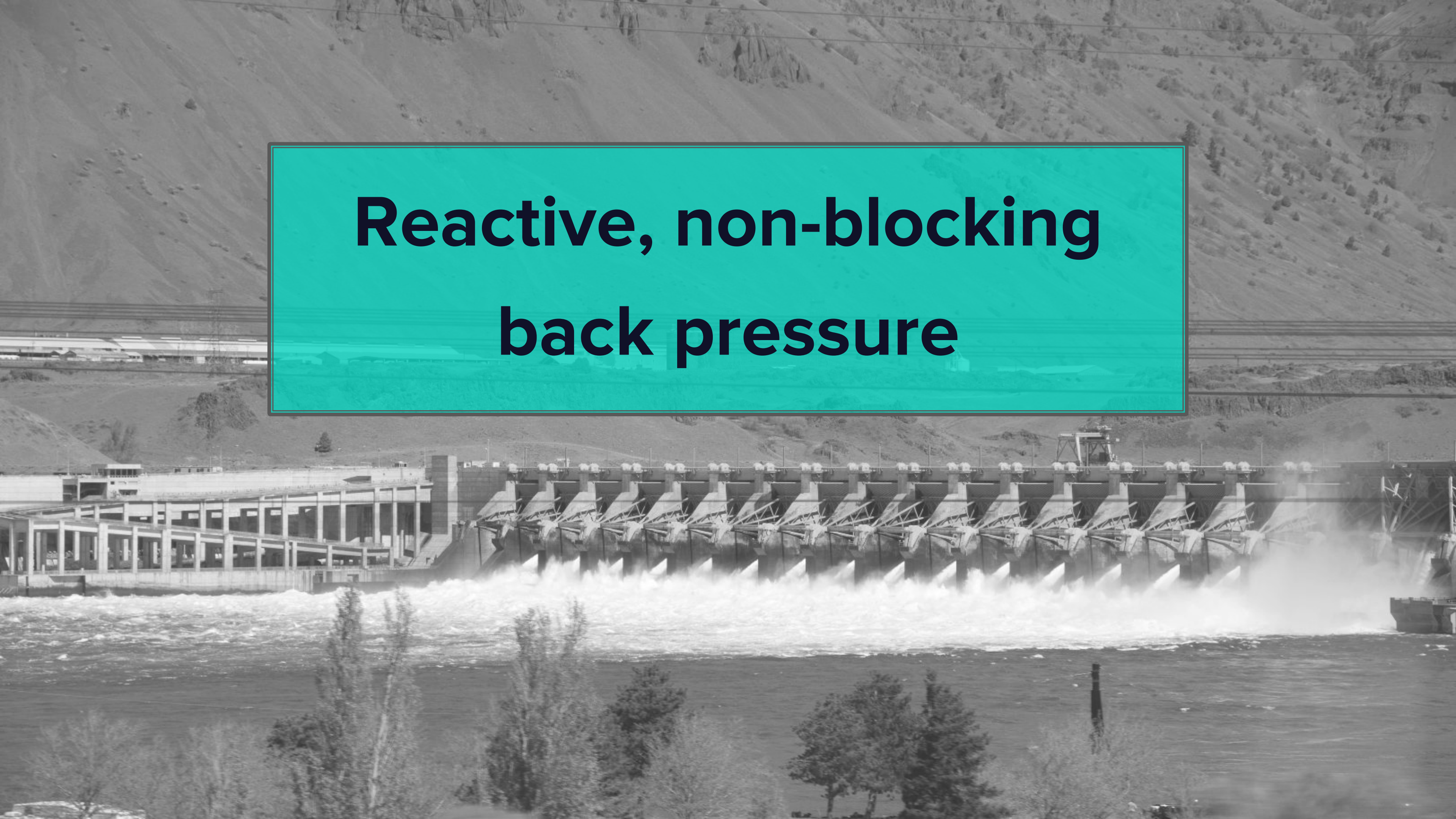
Spring Web API

Reactor, Reactive Streams

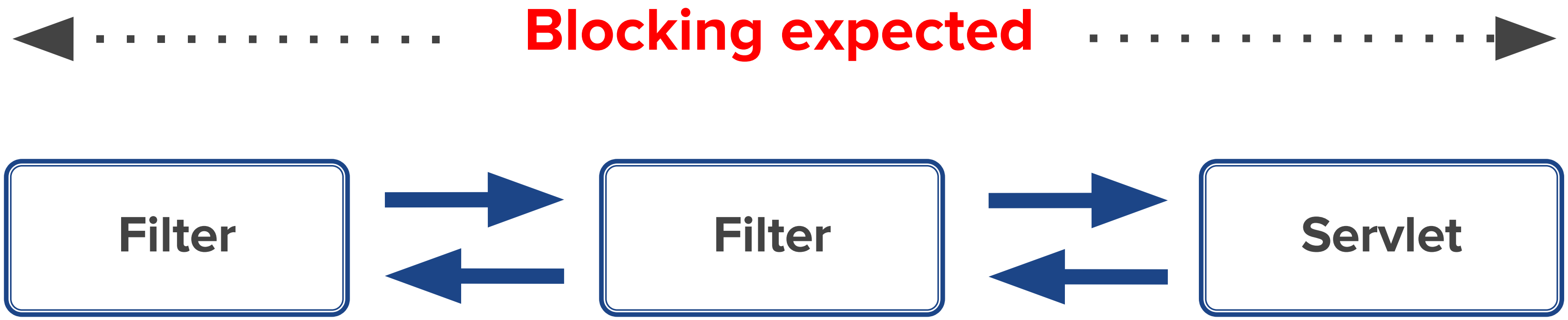
Non-blocking I/O

Netty

Tomcat, Jetty, …



Reactive, non-blocking back pressure

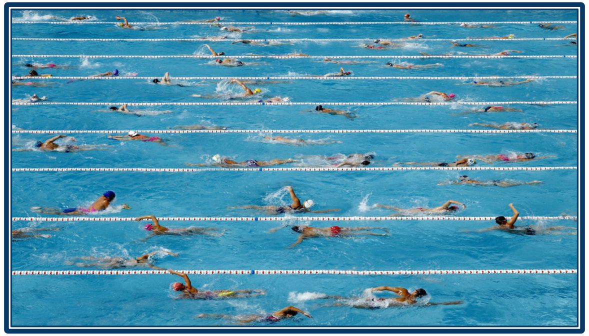


Blocking expected

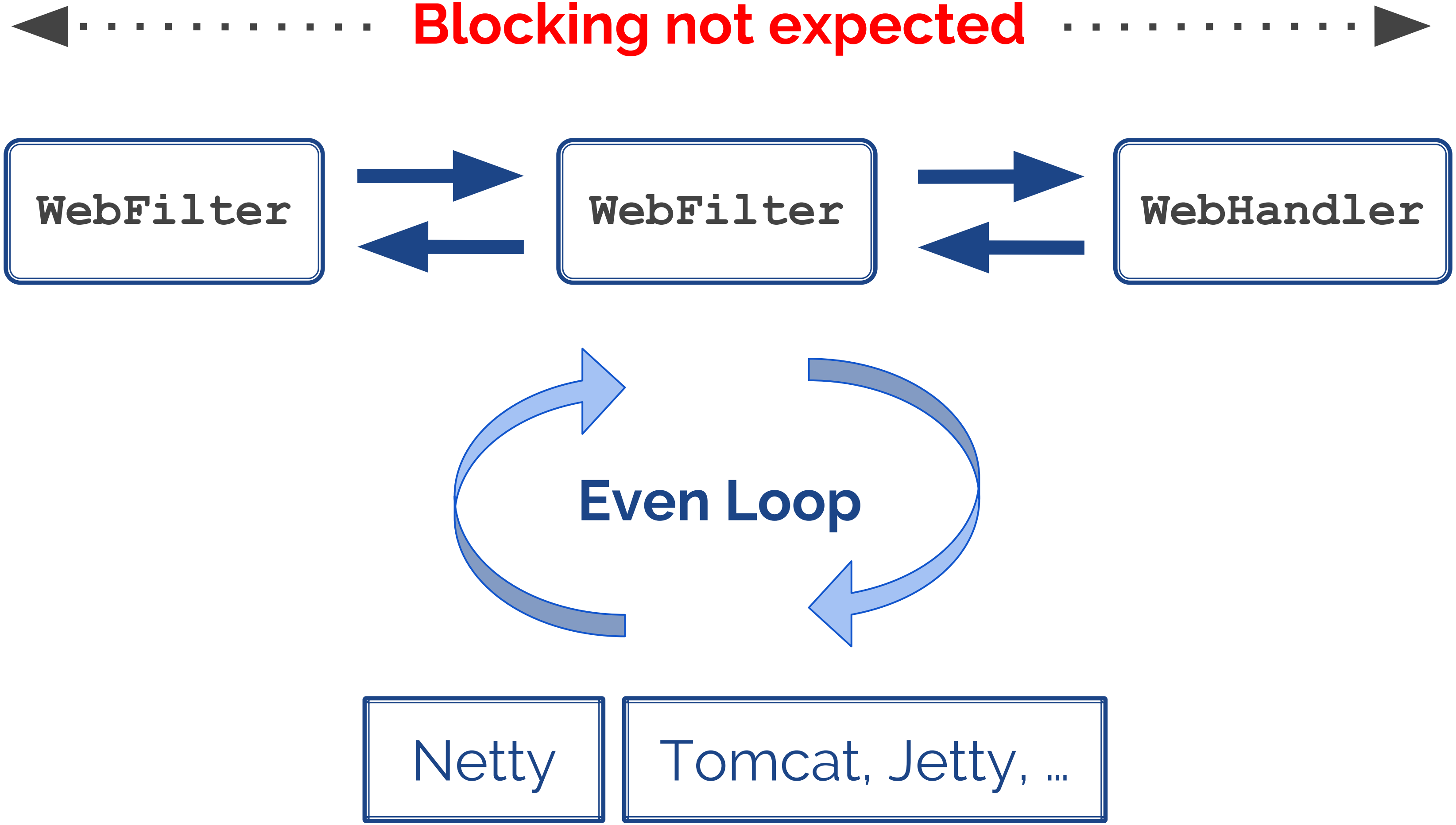
Filter

Filter

Servlet



Tomcat, Jetty, ...



Blocking not expected

WebFilter

WebFilter

WebHandler

Even Loop

Netty

Tomcat, Jetty, …

`WebFilter, WebHandler`

`Mono<Void>`

Request

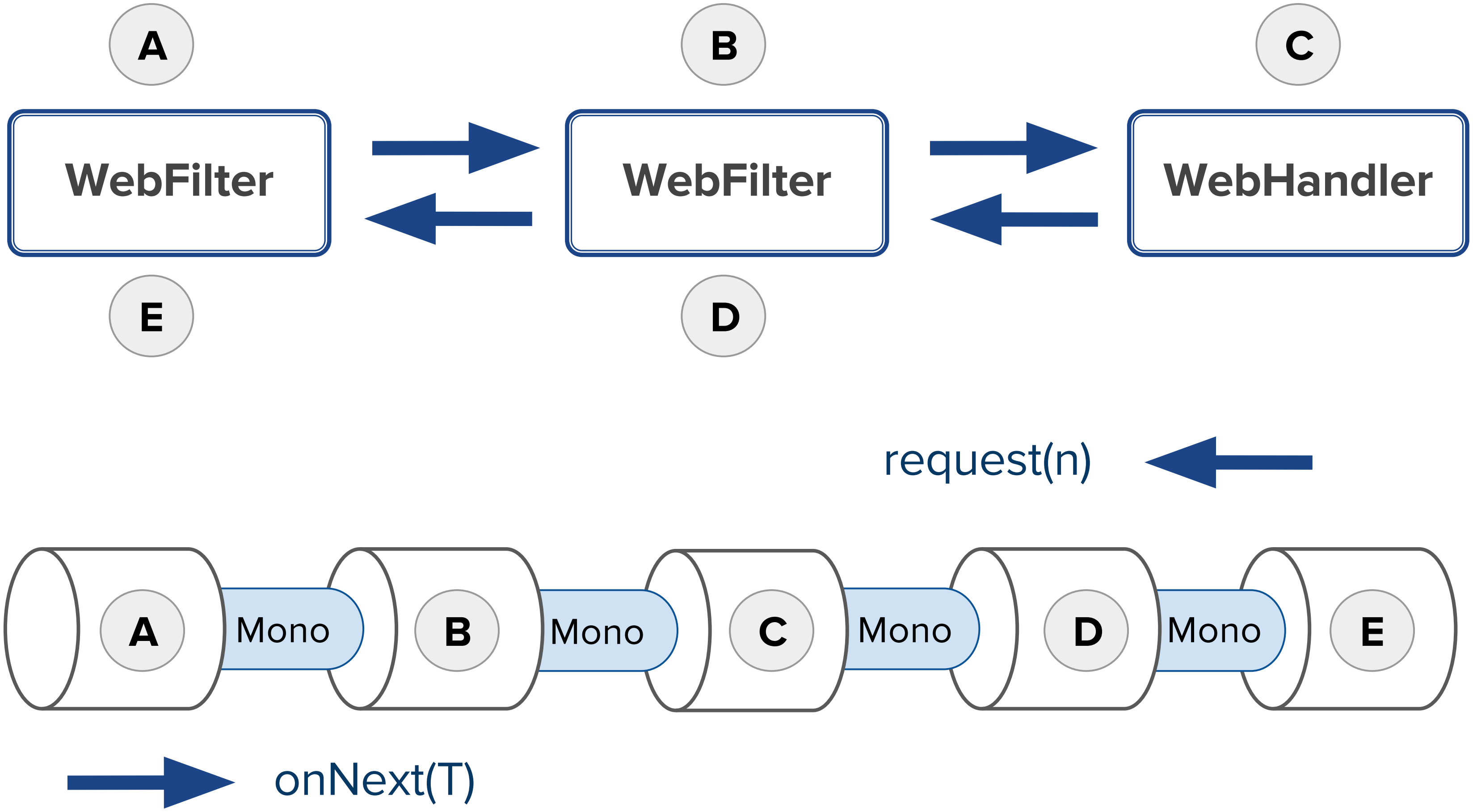
```
Flux<DataBuffer> getBody()
```

Response

```
writeWith(Flux<DataBuffer>)
```

Codecs

`Flux<DataBuffer>` ⇔ `Flux<T>`



A

B

C

WebFilter

WebFilter

WebHandler

E

D

request(n)

A

Mono

B

Mono

C

Mono

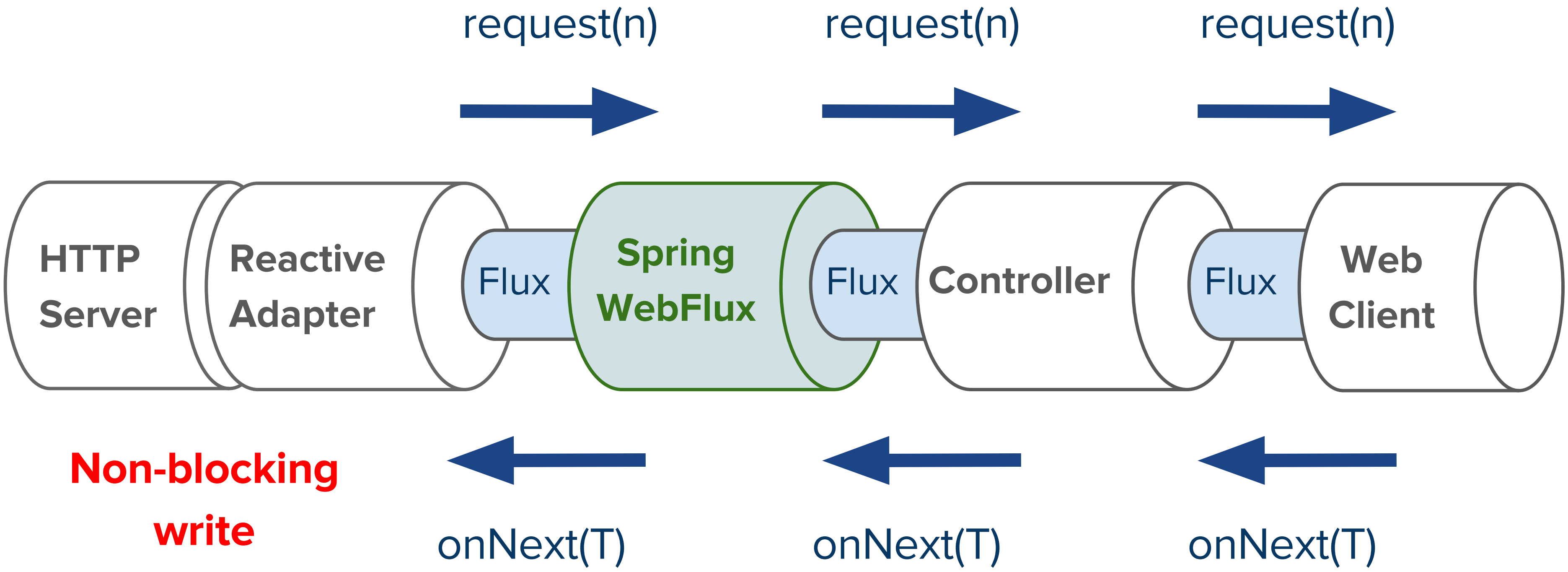
D

Mono

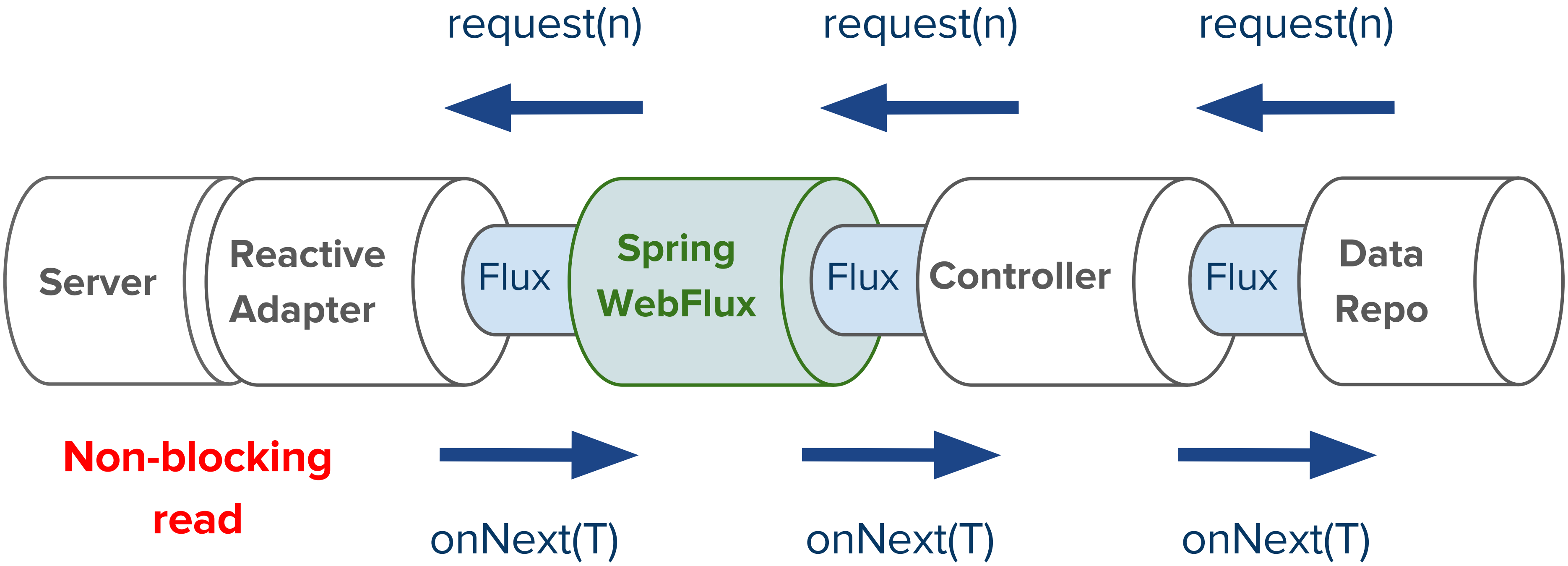
E

onNext(T)

WebFlux Response

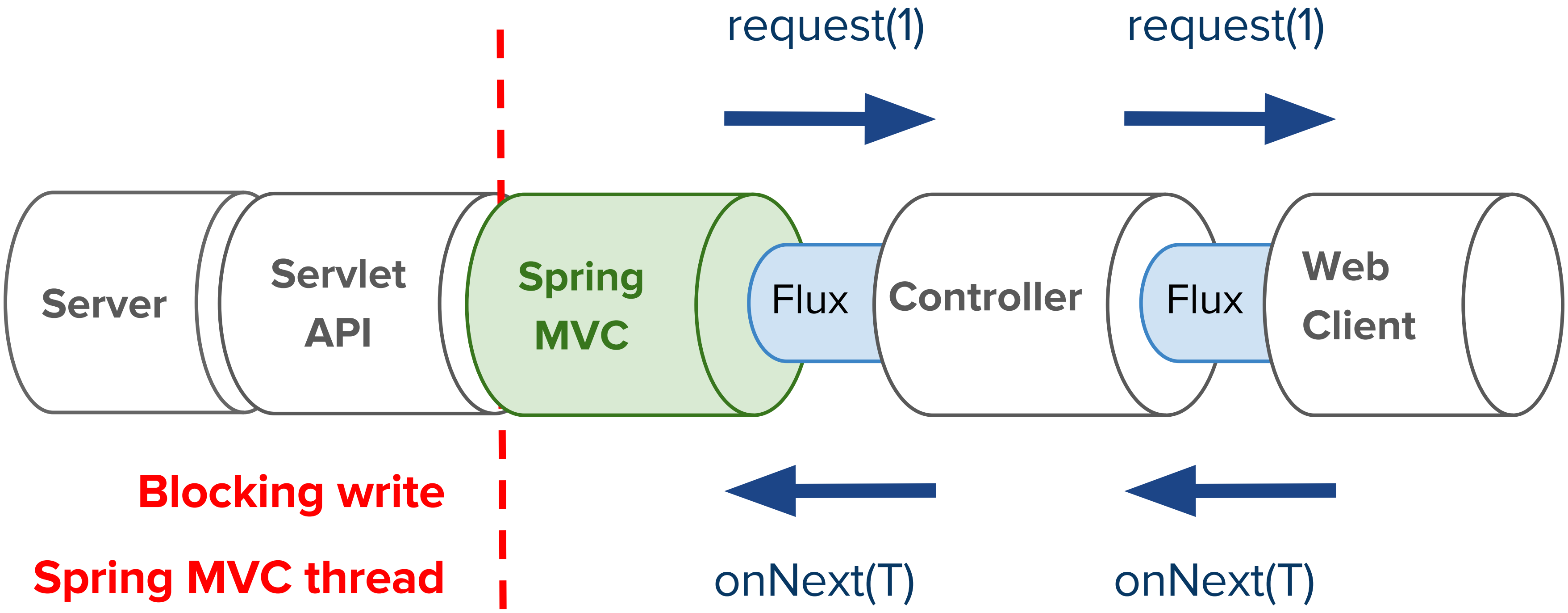


WebFlux Request



Non-blocking read

Spring MVC Response



Demo

Making Choices

Spring MVC || WebFlux ?

&&

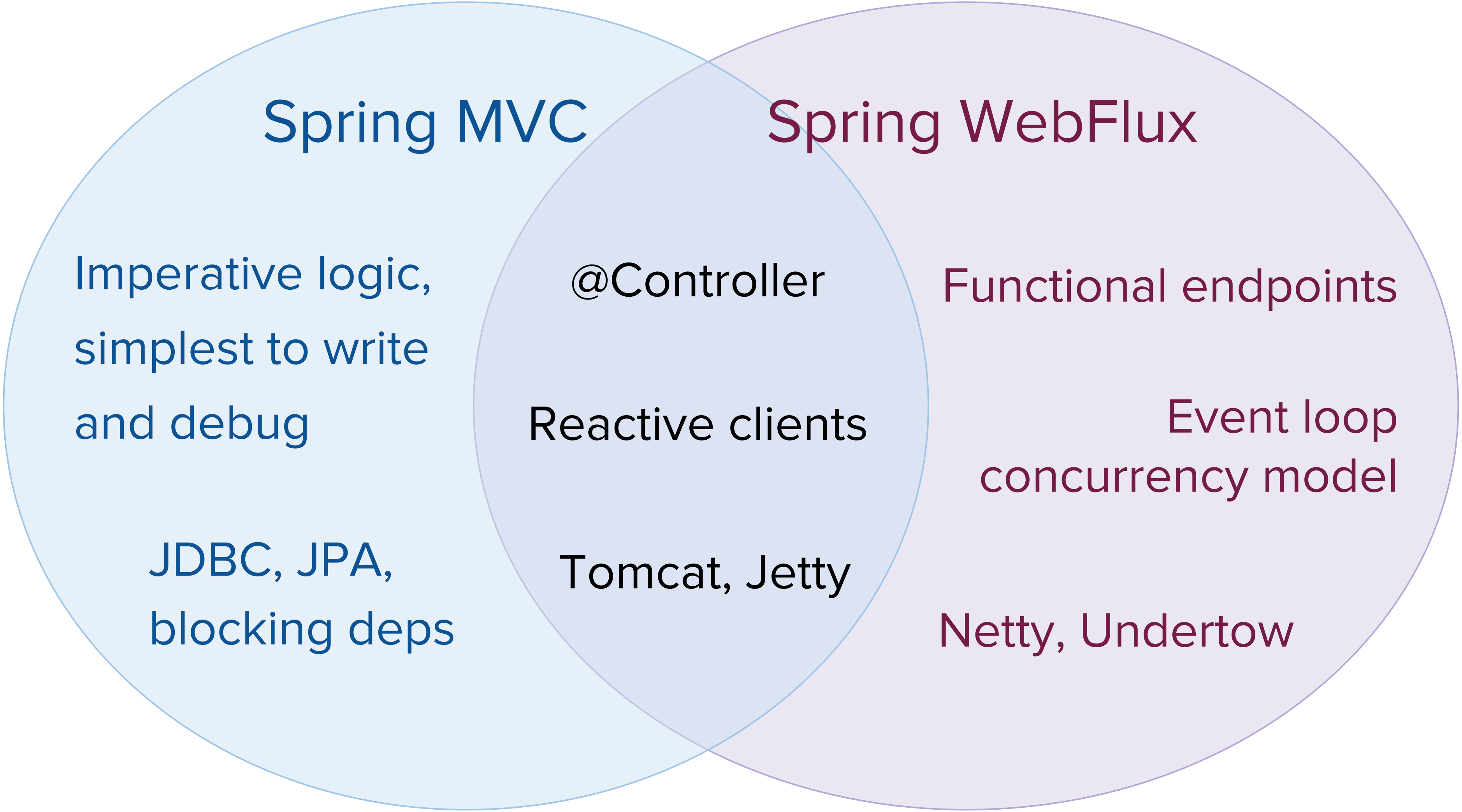
Spring MVC ~~||~~ WebFlux

Both available side by side

in Spring Framework 5

You’ve a wider range of options

in your tool chest



Spring MVC

Imperative logic,
simplest to write
and debug

JDBC, JPA,
blocking deps

@Controller

Reactive clients

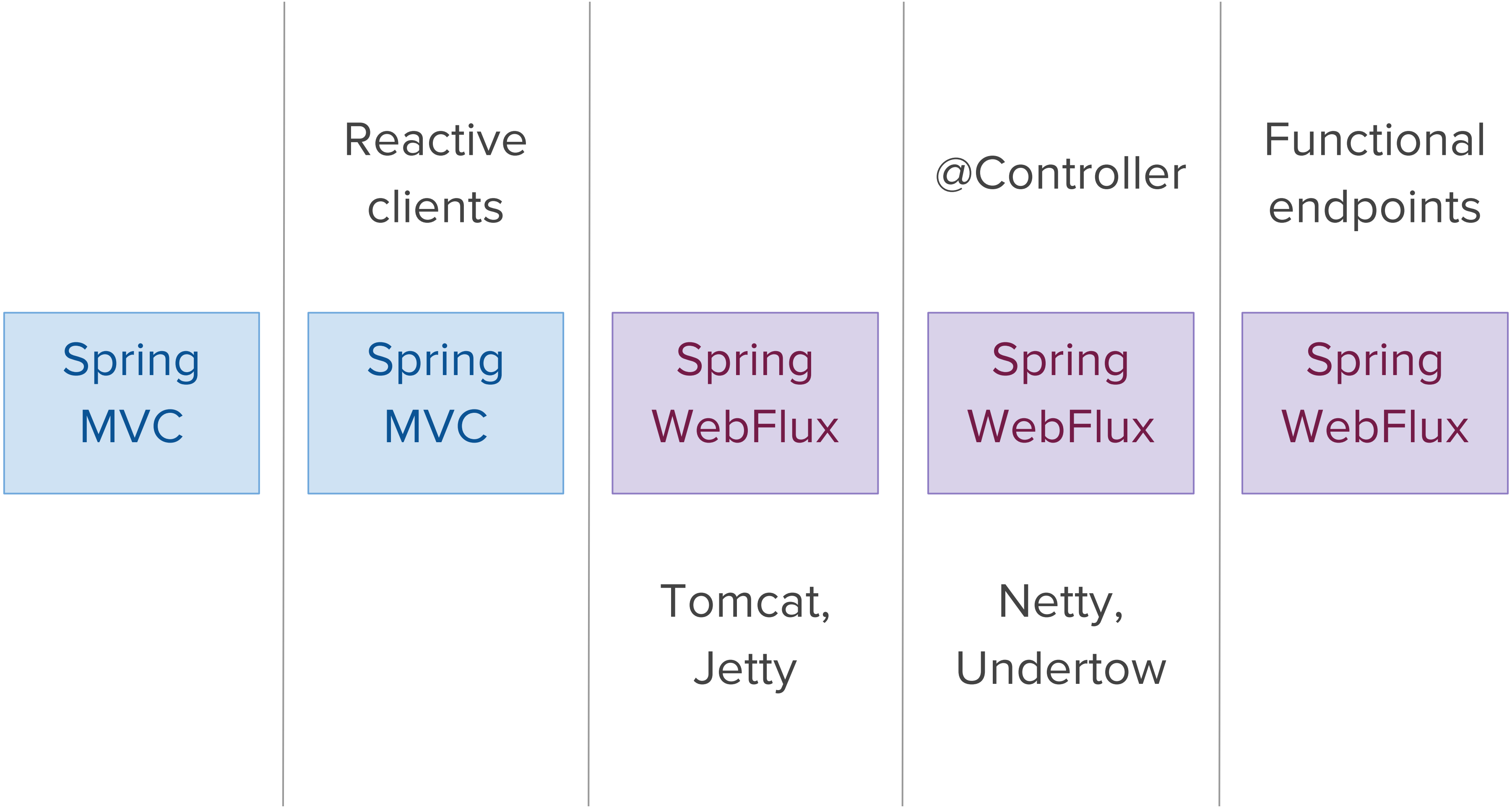
Tomcat, Jetty

Spring WebFlux

Functional endpoints

Event loop
concurrency model

Netty, Undertow



Spring MVC

Reactive clients

Spring MVC

Spring WebFlux

Tomcat, Jetty

@Controller

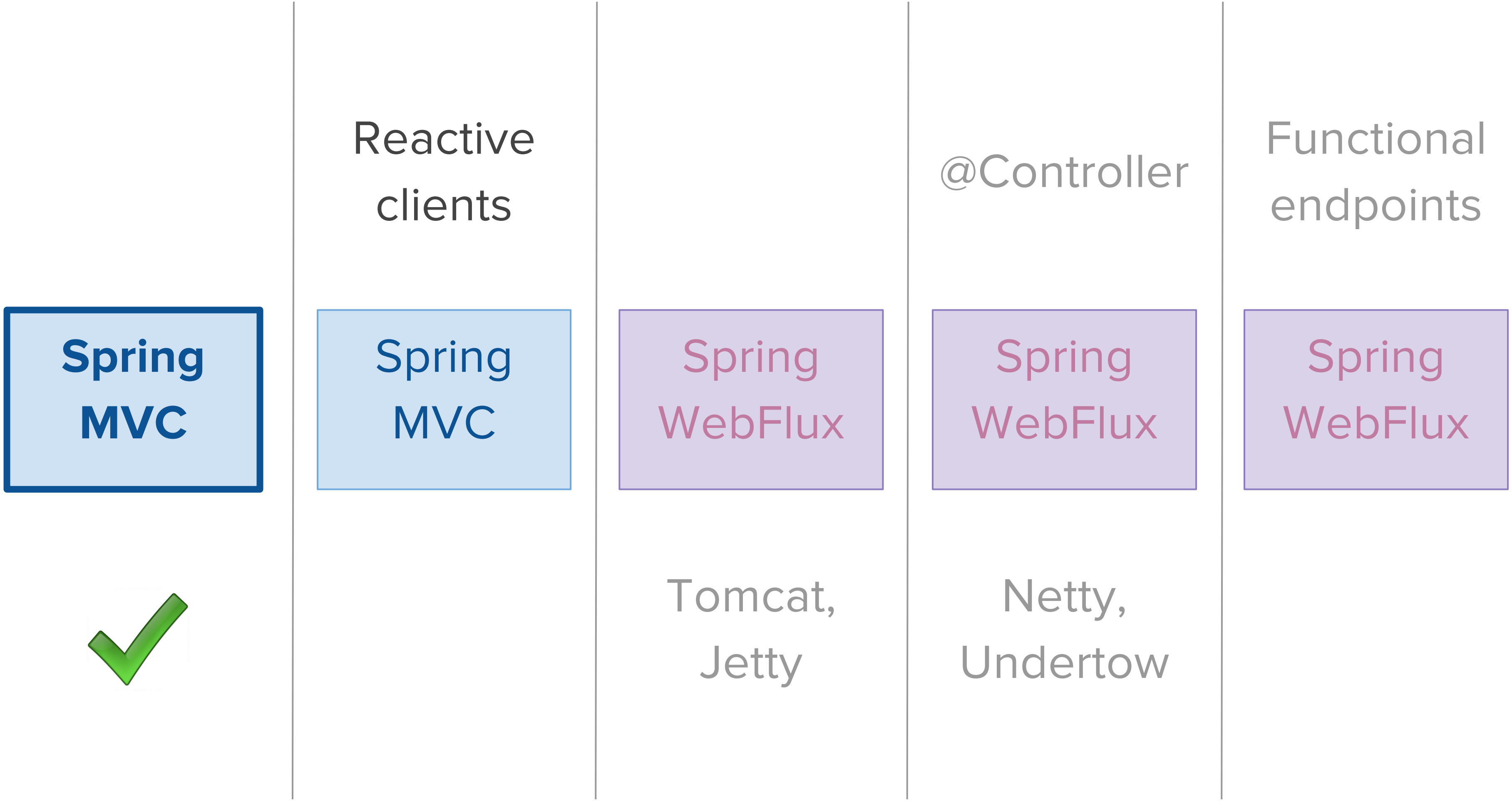
Spring WebFlux

Netty, Undertow

Functional endpoints

Spring WebFlux

If it ain’t broken, don’t fix it



	Reactive clients		@Controller	Functional endpoints
Spring MVC	Spring MVC	Spring WebFlux	Spring WebFlux	Spring WebFlux
✓		Tomcat, Jetty	Netty, Undertow	

Imperative is simple until it’s not

	Reactive clients		@Controller	Functional endpoints
Spring MVC	**Spring MVC**	Spring WebFlux	Spring WebFlux	Spring WebFlux
	✓	Tomcat, Jetty	Netty, Undertow	

Reasons for WebFlux

Gateways, edge services, high traffic

Latency, streaming scenarios

High concurrency with less hardware resources

Reasons for WebFlux (continued)

Functional programming model

Lightweight and transparent (less magic, more control)

Immutability

Testing performance

Look Out For...

Learning curve

Team size, background

3rd party dependencies that block

Thank You

https://github.com/rstoyanchev/demo-reactive-spring

SpringOne Platform by Pivotal

#springone