ROME - APRIL 13/14 2018

{codemotion}

Reactive Java

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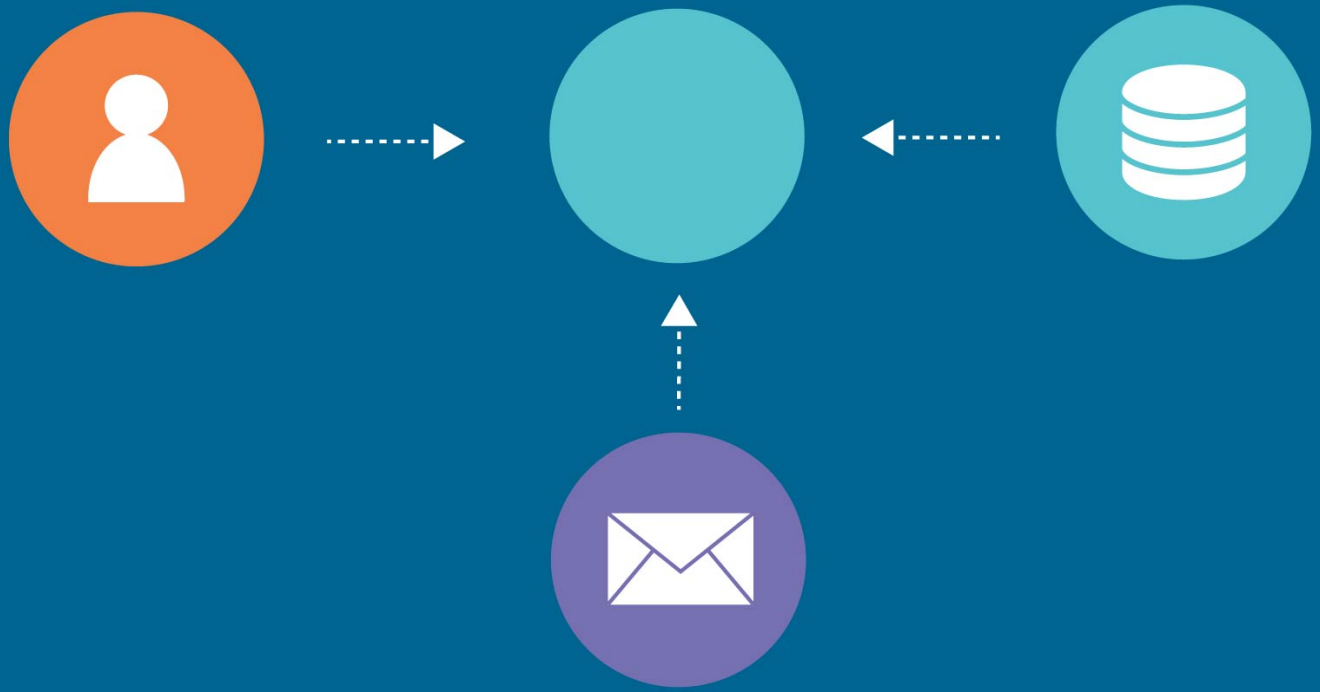
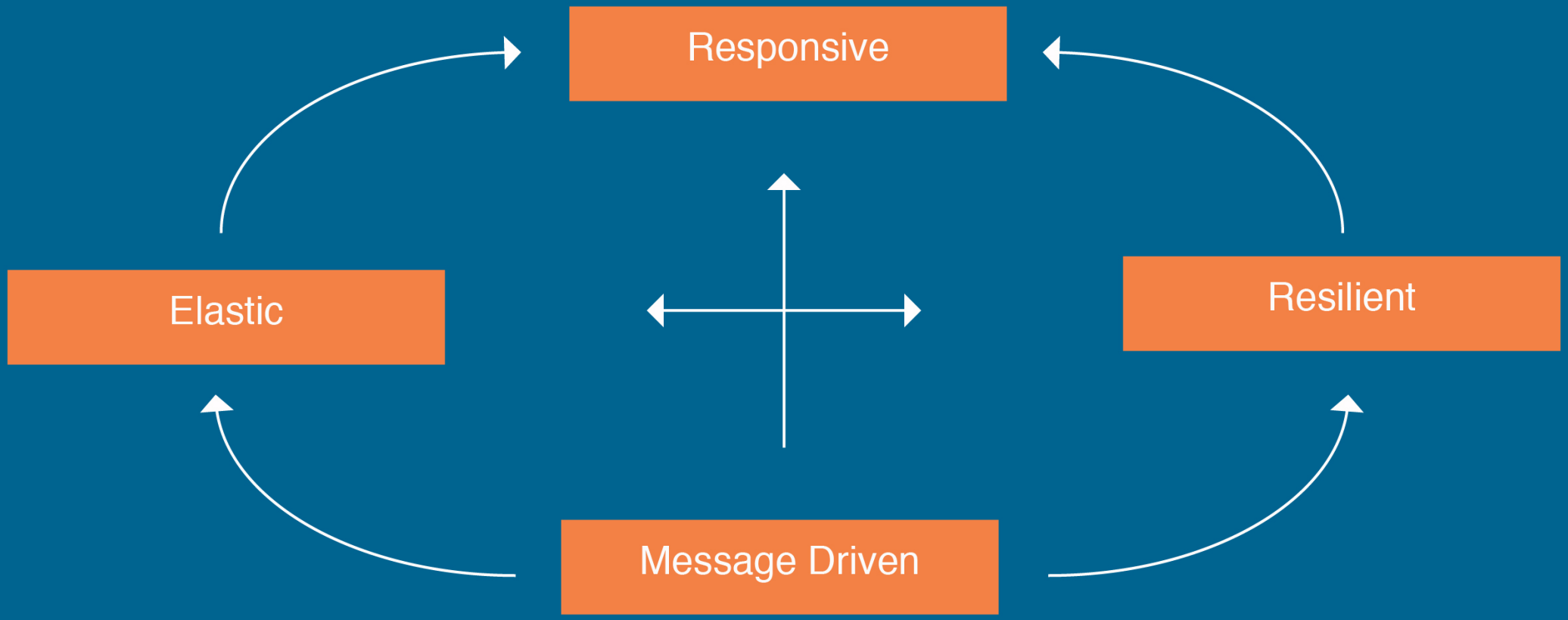
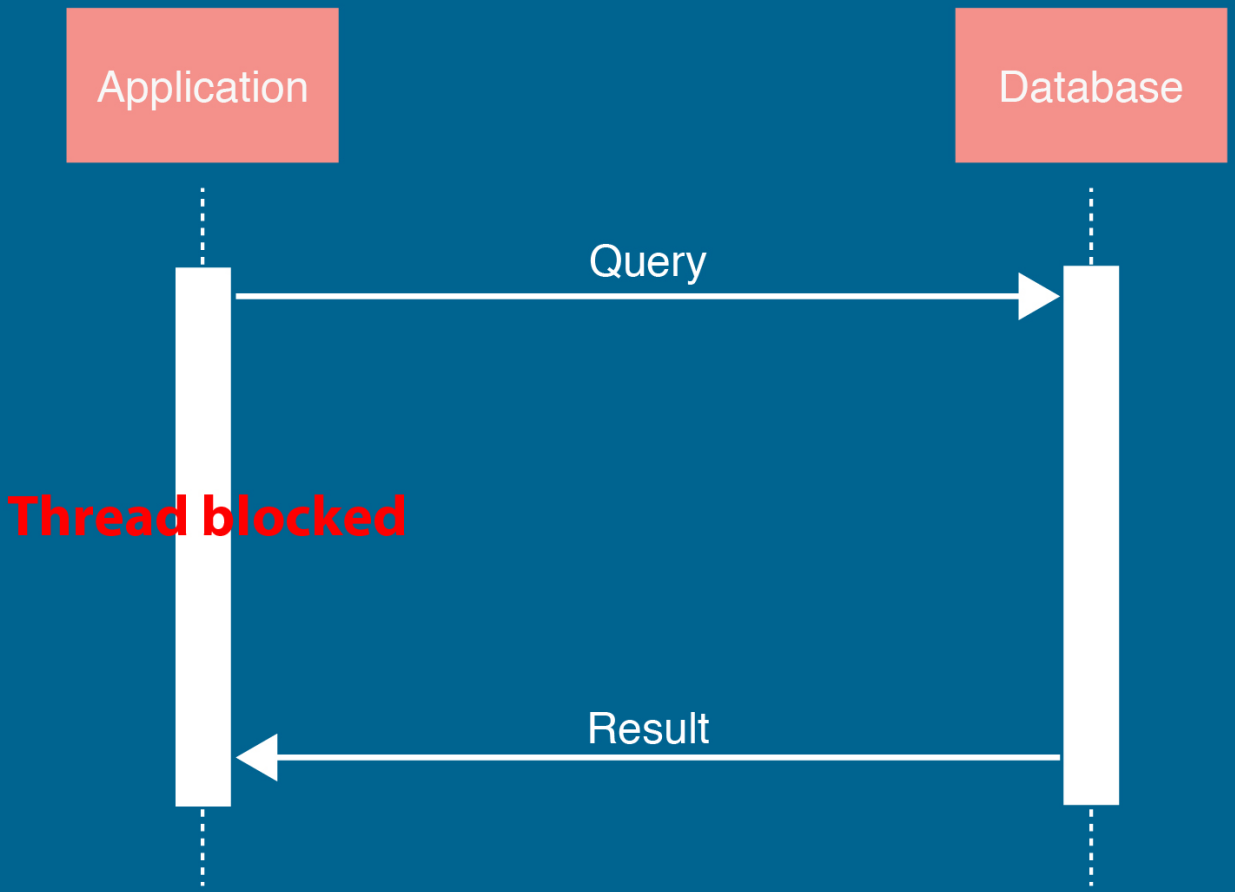
Why Reactive?

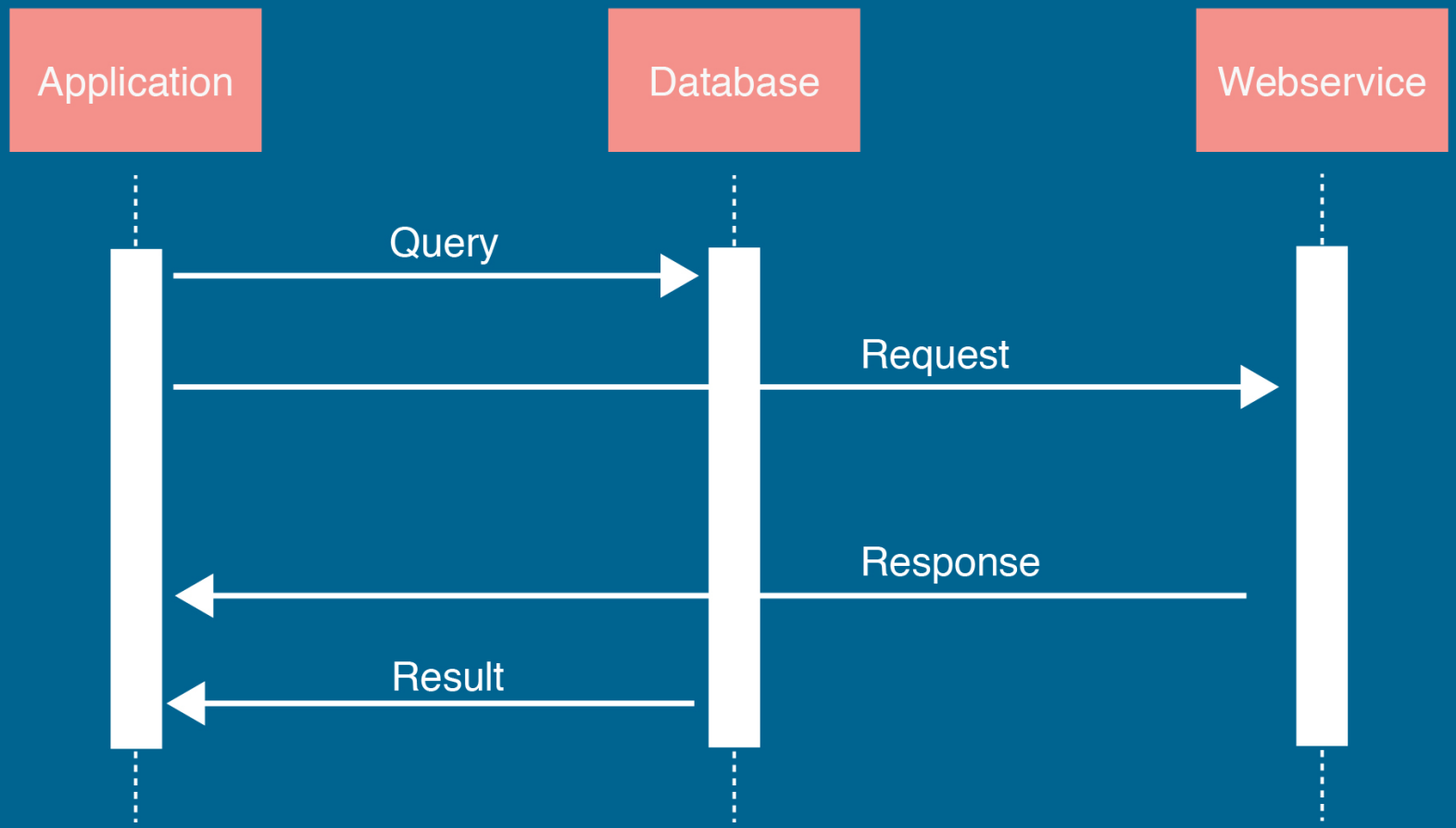



Responsive
Elastic
Resilient
Message Driven

Synchronous



Asynchronous

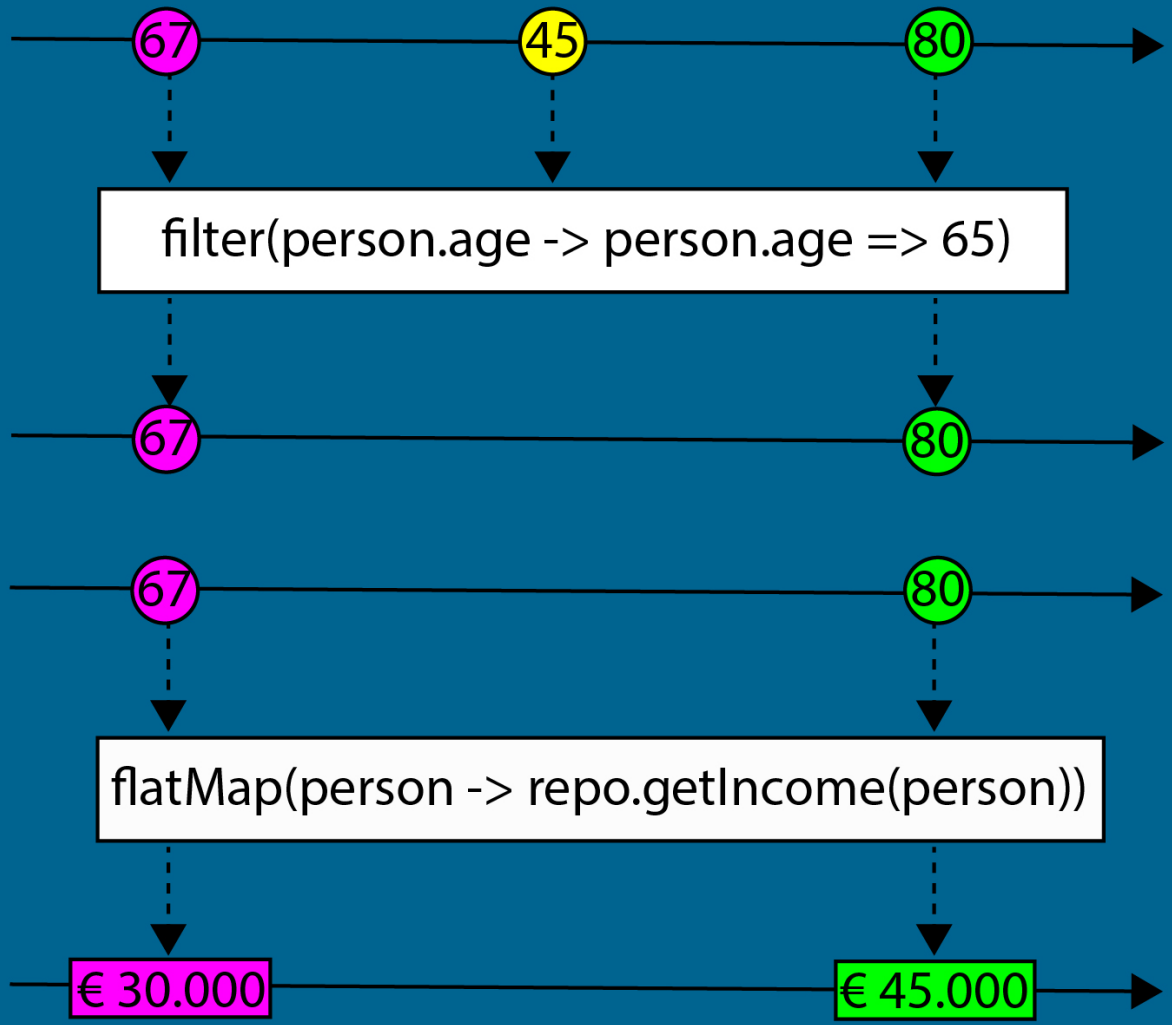


```java
//PersonRepository sync
public List<Person> findByName(String name);

public BigDecimal getIncome(String name);


//PersonRepository async
public void findByName(String name, Callback<List<Person>> persons);

public void getIncome(String name, Callback<BigDecimal> income);
```

```
//Client call
repository.findByName("Erwin",
    persons -> {
      persons.stream().filter(person -> person.getAge() >= 65)
                      .forEach(person -> {
                        repository.getIncome(person, income ->
                        totalIncome = totalIncome.add(income));
                       });
        }
);
```

```java
//PersonRepository
public Observable<Person> findByName(String name);
public Observable<BigDecimal> getIncome(Person person);

//Client call
repository.findByName("Erwin")
    .filter(person -> person.getAge() >= 65)
    .flatMap(person -> repository.getIncome(person))
    .subscribe(income -> totalIncome = totalIncome.add(income));
```

RxJava


67
45
80
filter(person.age -> person.age => 65)
67
80
67
80
flatMap(person -> repo.getIncome(person))
€ 30.000
€ 45.000

Java 8 Streams vs. RX Observables

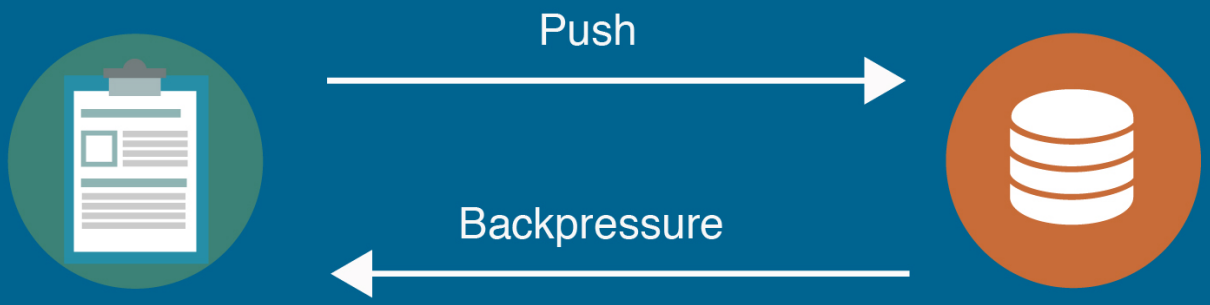
Pull vs. Push

Finite vs. Infinite

Sync vs. Async

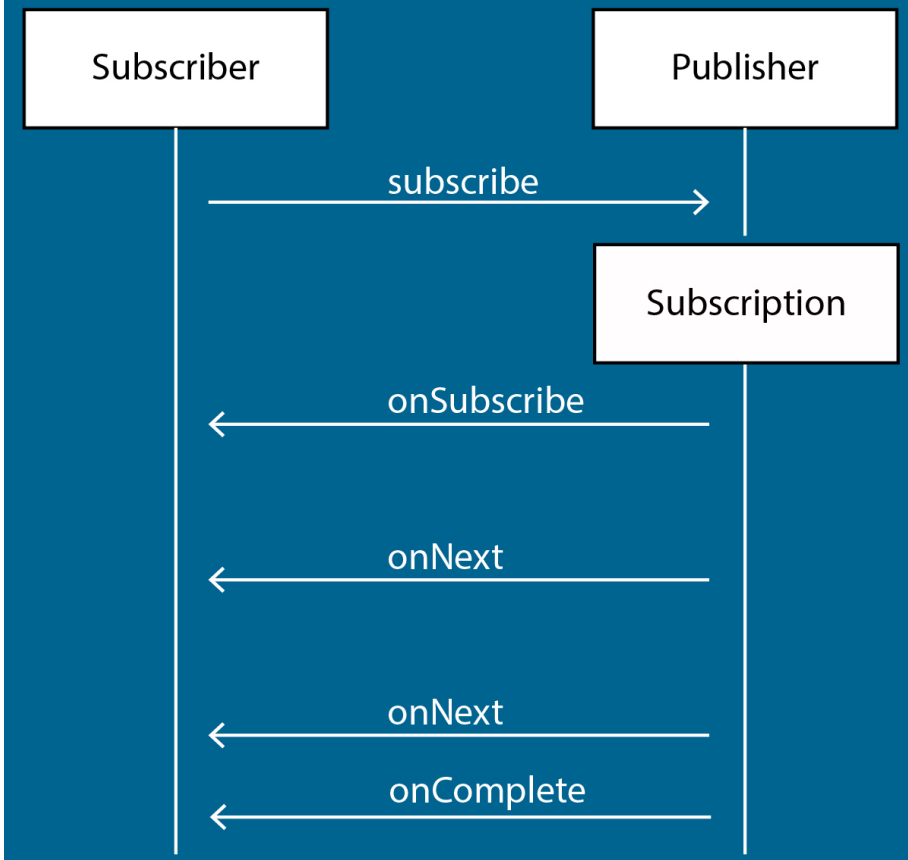
Java 8 Streams vs. RX Observables

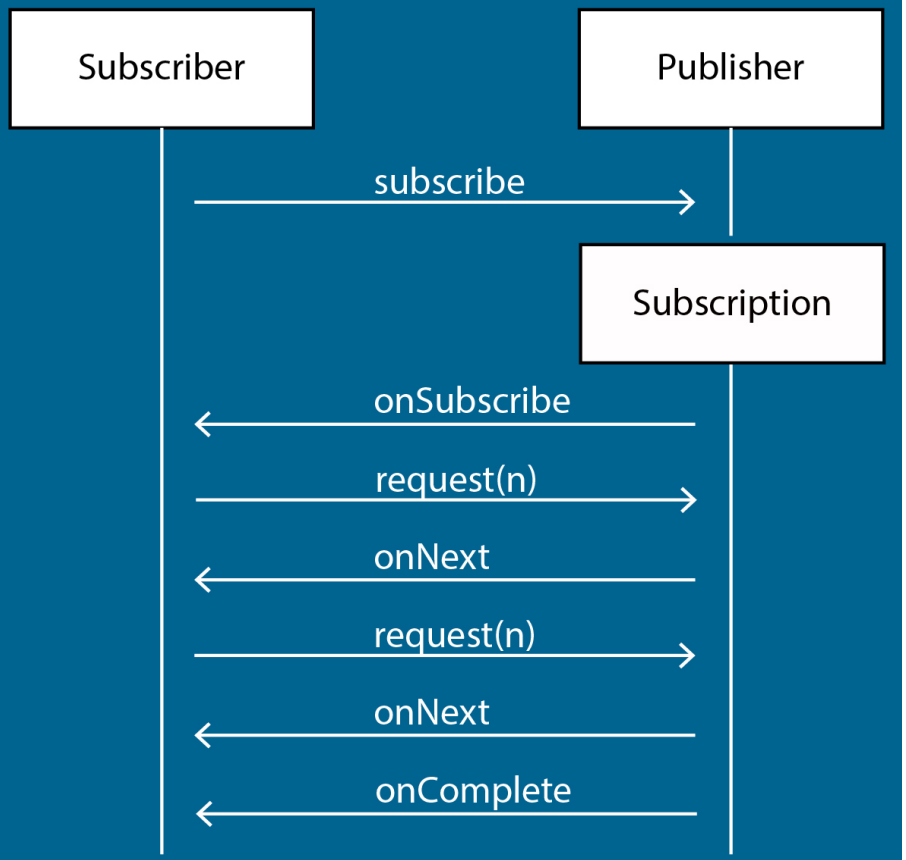
RxJava 2



http://www.reactive-streams.org

Backpressure





Reactive Streams

- RxJava 2
- Project Reactor
- Akka Streams
- Java 9 Flow API

Java 9

- Flow API
- Interfaces copied from reactive streams
- Connecting different Rx implementations
- Easier to use Reactive Frameworks

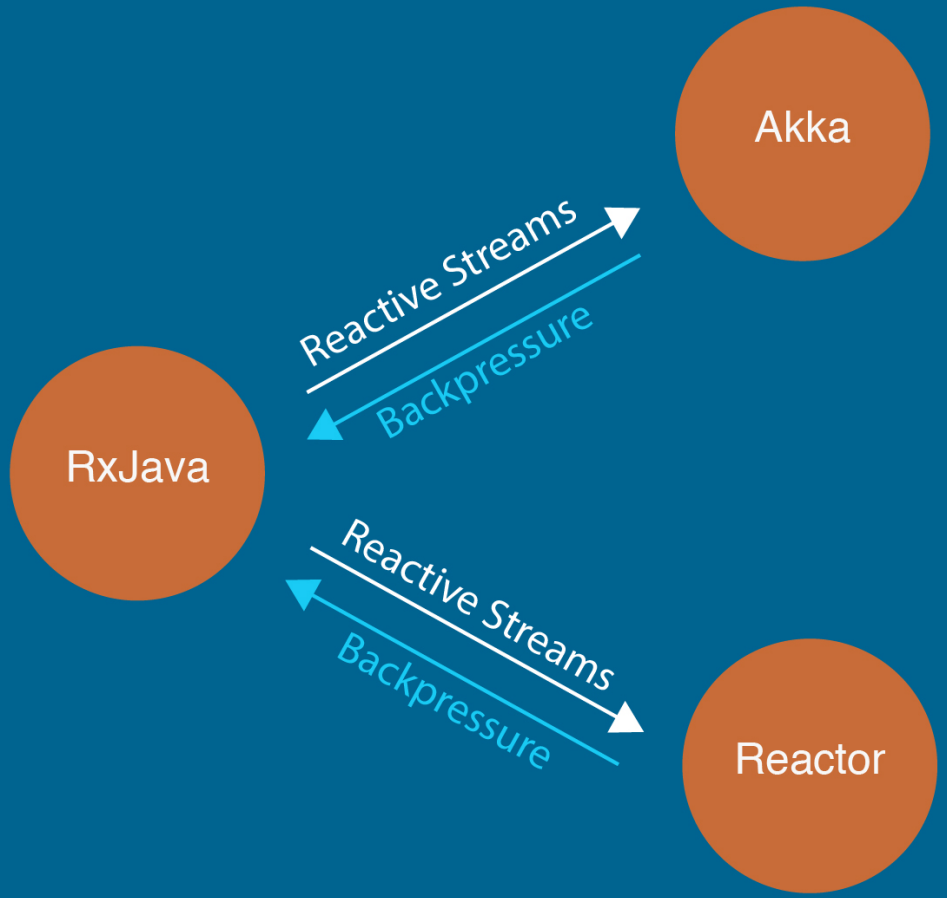
Java vs. Reactive Streams

	No Value	Single Value	Multiple Values
Java Blocking	void	T	Iterable<T>
Java Non-blocking	CompletableFuture<Void>	CompletableFuture<T>	CompletableFuture<List<T>>
Reactive Streams	Publisher<Void>	Publisher<T>	Publisher<T>
RxJava	Observable<Void>	Single<T>	Observable<T>
Project Reactor	Mono<Void>	Mono<T>	Flux<T>
Akka Streams	Source<Void>	Source<T>	Source<T>
Java 9 Flow	Flow.Publisher<Void>	Flow.Publisher<T>	Flow.Publisher<T>

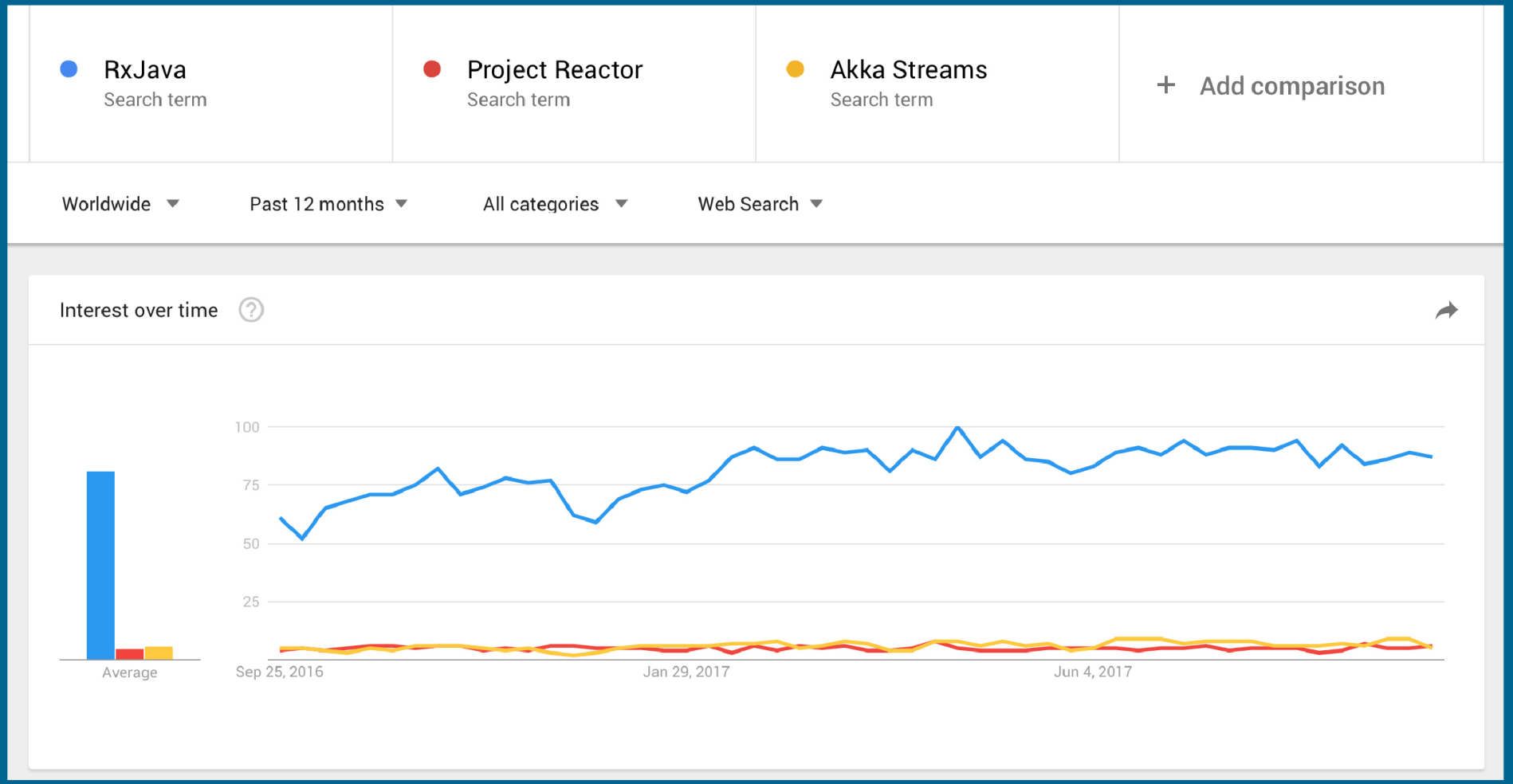
Java 8 Streams vs. Reactive Streams

```
Stream<Integer> j = Arrays.asList(1, 2, 3, 4, 5).stream();

j.map(i -> i * 10)
  .forEach(System.out::println);

j.map(i -> i + 5)
  .forEach(System.out::println); //IllegalState Exception
```

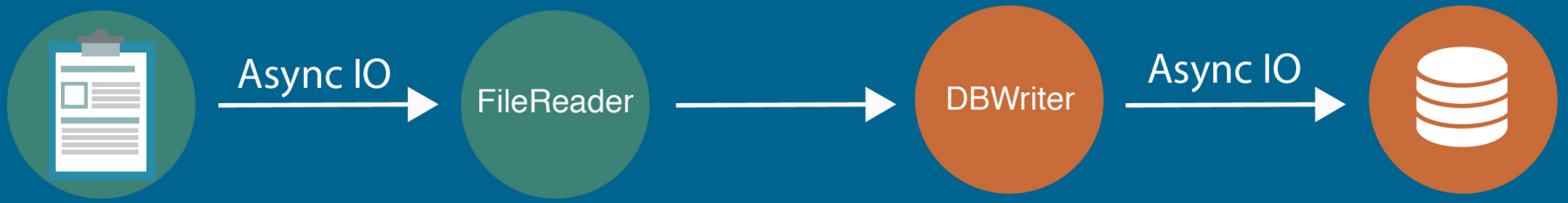
```
Flux<Integer> j = Flux.just(1, 2, 3, 4, 5);

j.map(i -> i * 10)
  .subscribe(System.out::println);

j.map(i -> i + 5)
  .subscribe(System.out::println);
```


Akka
Reactive Streams
Backpressure
RxJava
Reactive Streams
Backpressure
Reactor

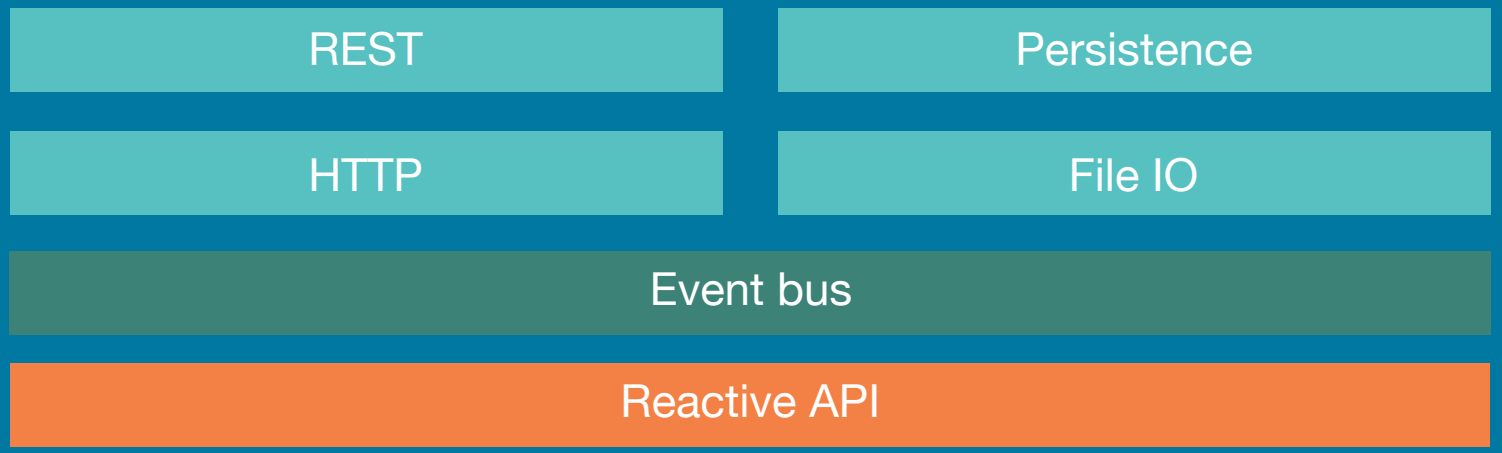
Popularity


RxJava
Search term
Project Reactor
Search term
Akka Streams
Search term
+ Add comparison
Worldwide
Past 12 months
All categories
Web Search
Interest over time
100
75
50
25
Average
Sep 25, 2016
Jan 29, 2017
Jun 4, 2017

Async operations



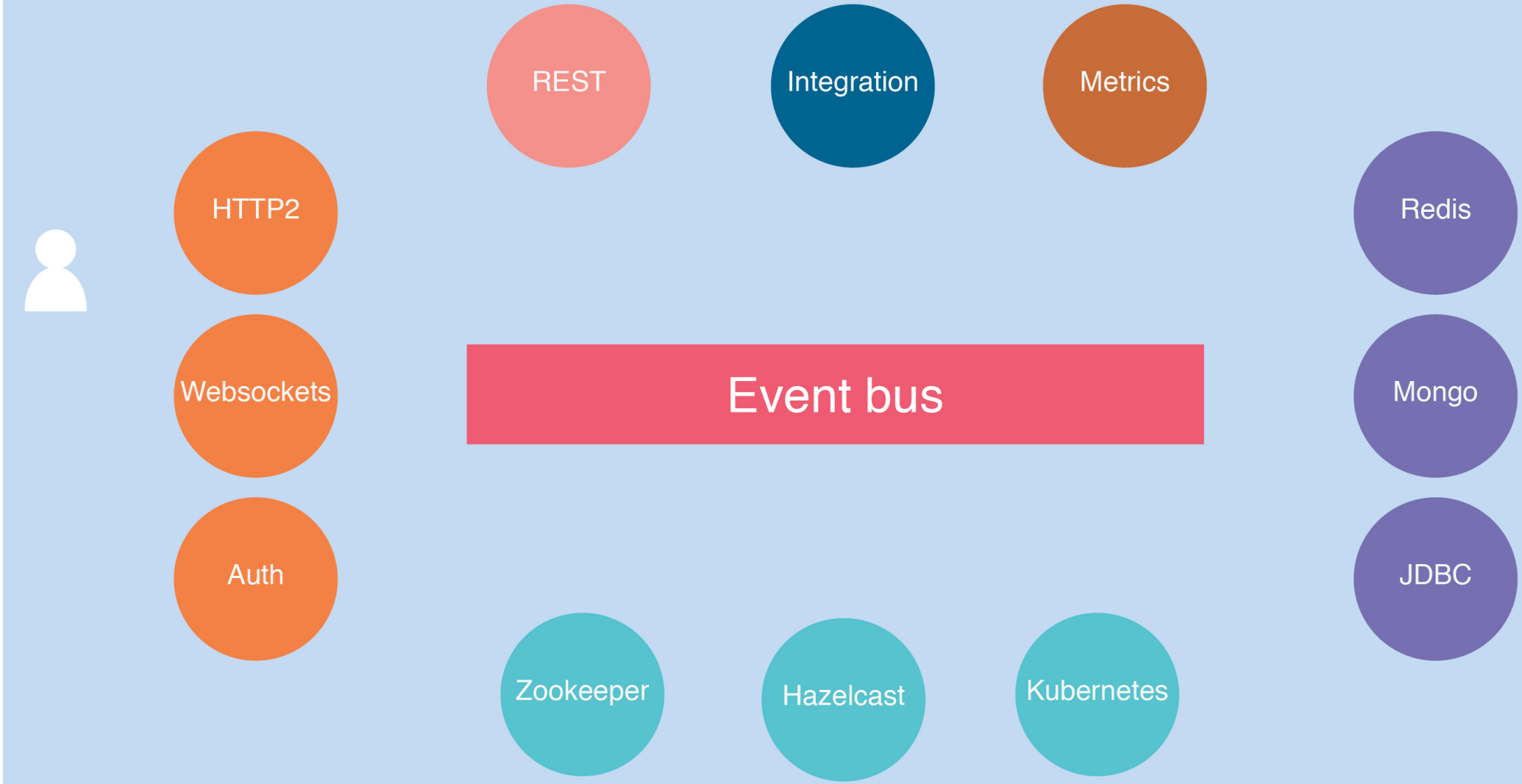
Reactive Stack

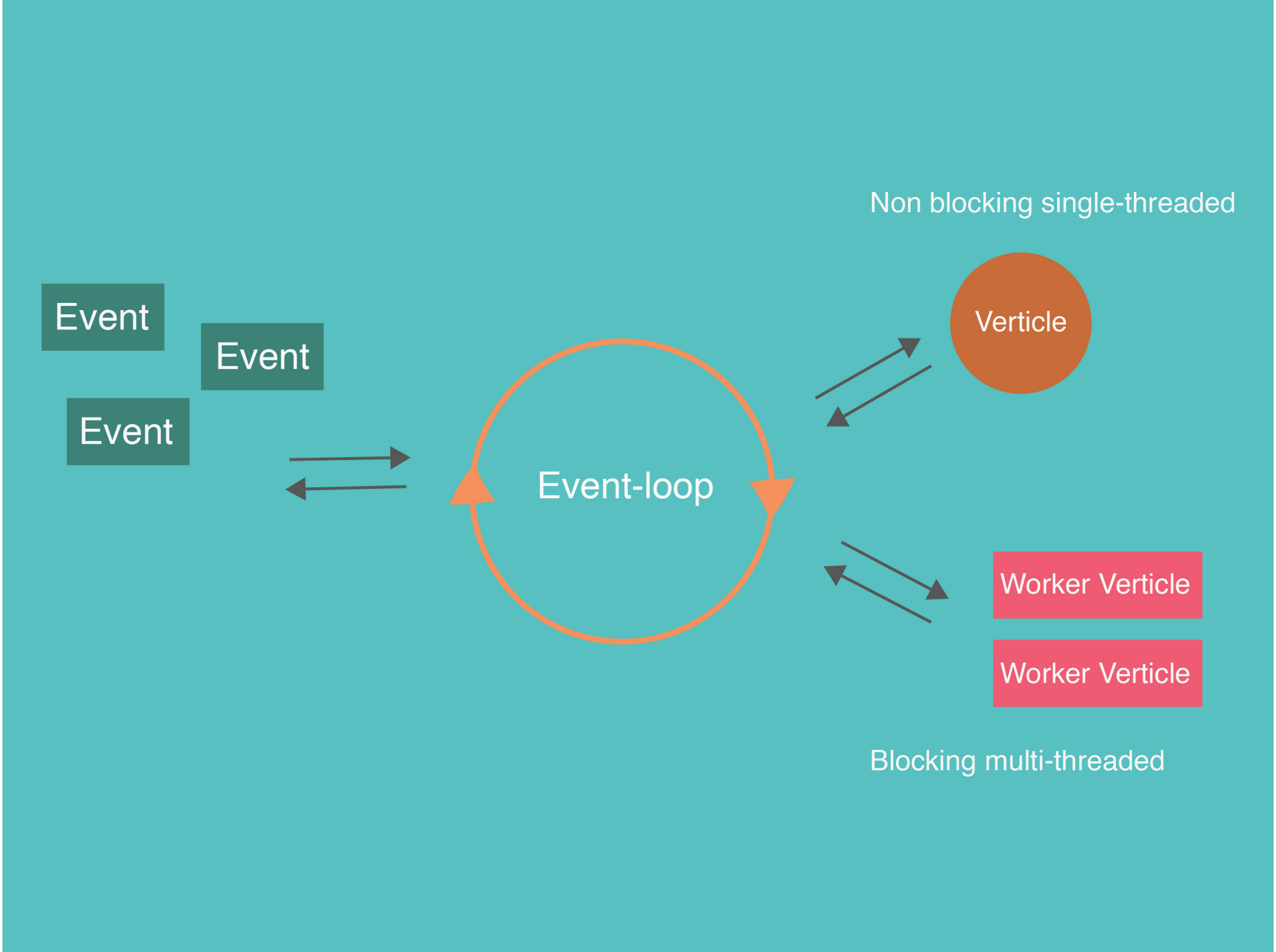


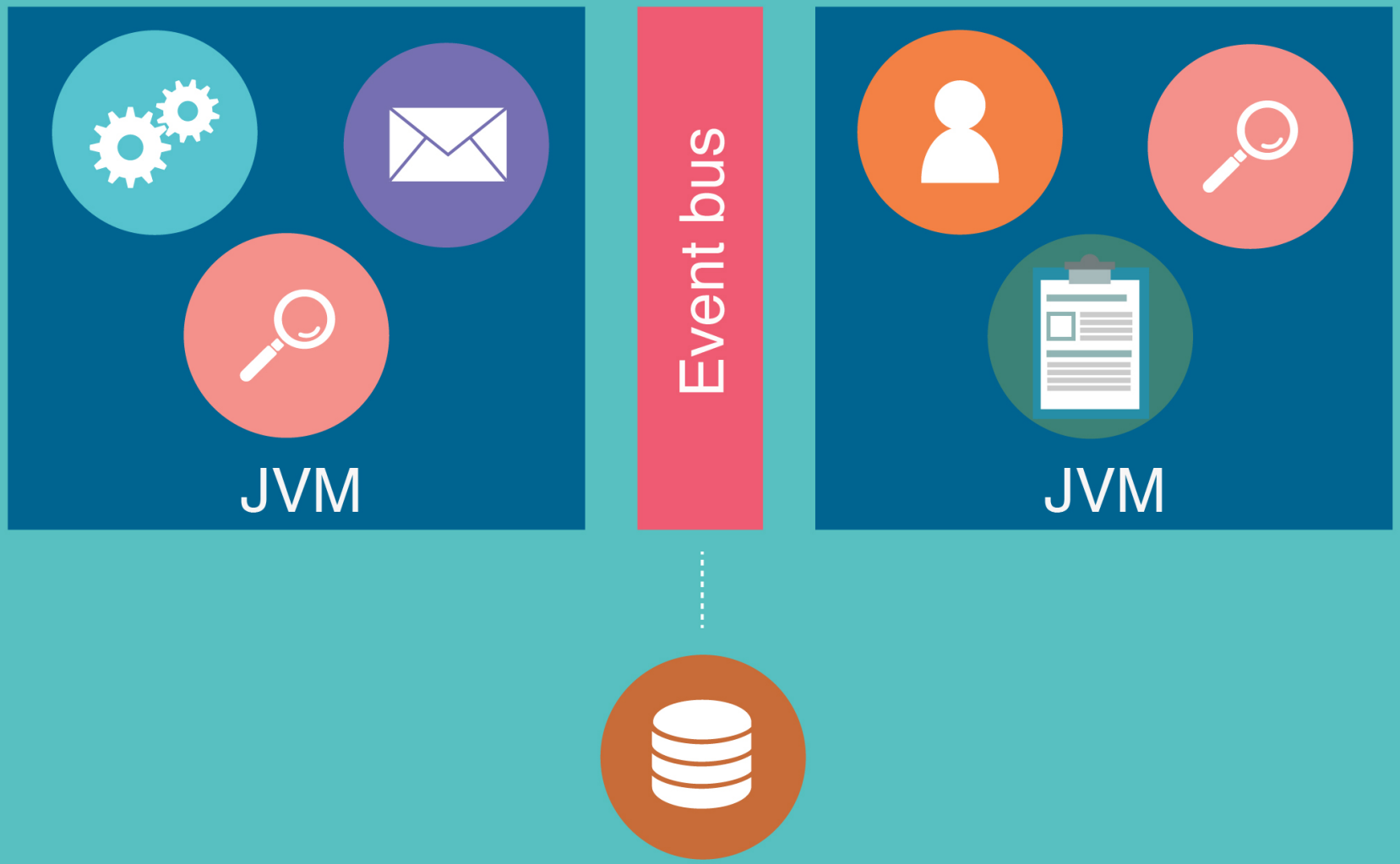
Reactive Frameworks

- Vert.x
- Spring 5
- Akka

- Runnable Jar
- Reactive
- Polyglot
- Distributed


REST
Integration
Metrics
HTTP2
Redis
Websockets
Event bus
Mongo
Auth
JDBC
Zookeeper
Hazelcast
Kubernetes


Non blocking single-threaded
Event
Event
Event
Event-loop
Verticle
Worker Verticle
Worker Verticle
Blocking multi-threaded


JVM
Event bus
JVM

```java
public class HelloWorldVerticle extends AbstractVerticle{

  @Override
  public void start() throws Exception {
    vertx.eventBus().consumer("hello-channel",message -> System.out.println(message.body()));

    vertx.eventBus().send("hello-channel","Hello world!");
  }
}
```

```java
public class HelloWorldRestVerticle extends AbstractVerticle{

  @Override
  public void start() {
    Router router = Router.router(vertx);
    router.get("/hello").handler(routingContext -> {
      routingContext.response()
        .end(new JsonObject().put("message", "Hello World").encode());
    });

    vertx.createHttpServer().requestHandler(router::accept).listen(8080);
  }
}
```

Spring 5

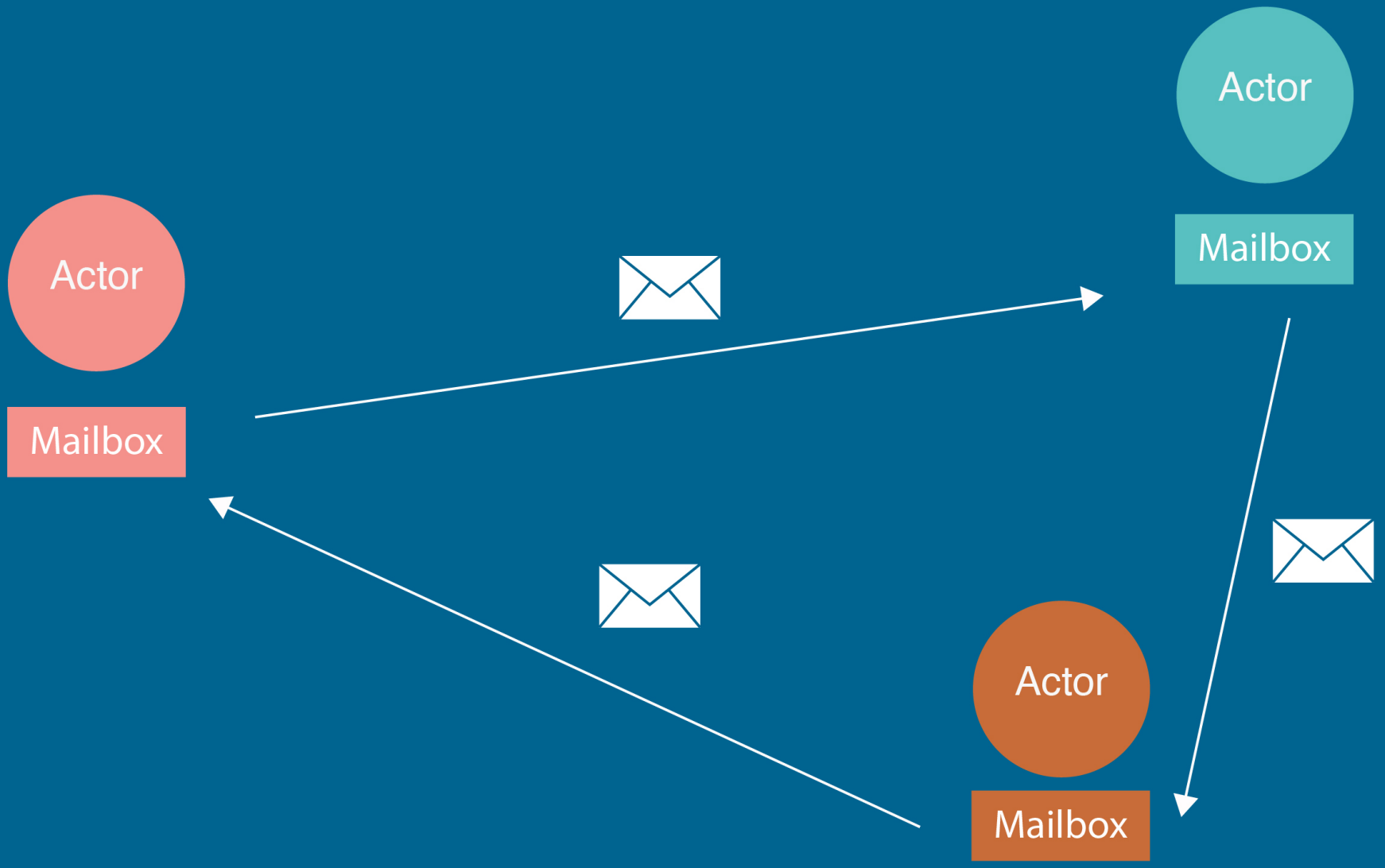
- Spring Webflux
- Project Reactor
- Reactive Data Repositories
- Project Reactor event bus

```java
@RestController("hello")
public class HelloController {

    @GetMapping
    Mono<String> hello(){
        return Mono.just("Hello World");
    }
}

@RestController("person")
public class PersonController {
    @Autowired
    private ReactivePersonRepository personRepository;

    @GetMapping
    Flux<Person> getPersons() {
        return this.personRepository.findAll();
    }

    @PostMapping
    Mono<ResponseEntity<Person>> savePerson(@RequestBody Person person) {
        return this.personRepository.save(person)
                .map(result -> new ResponseEntity<>(result, HttpStatus.CREATED));
    }
}
```

```
public void createOrder(Command command){
  this.commandGateway.send(command)
          .flatMap(id -> queryGateway.send(new FindOrderSummaryQuery( id)))
          .retryWhen(errors -> errors.delayElements(Duration.of(100, MILLIS))
          .take(10)).concatWith(Mono.error(new RuntimeException())).next()
          .onErrorReturn(new OrderSummary(orderID,OrderStatus.CREATED))
          .map(orderResponse -> ResponseEntity.ok().body(orderResponse)).toFuture();
}
```

AKKA

- Actor model
- Akka HTTP
- Scala
- Message driven


Actor
Mailbox
Actor
Mailbox
Actor
Mailbox

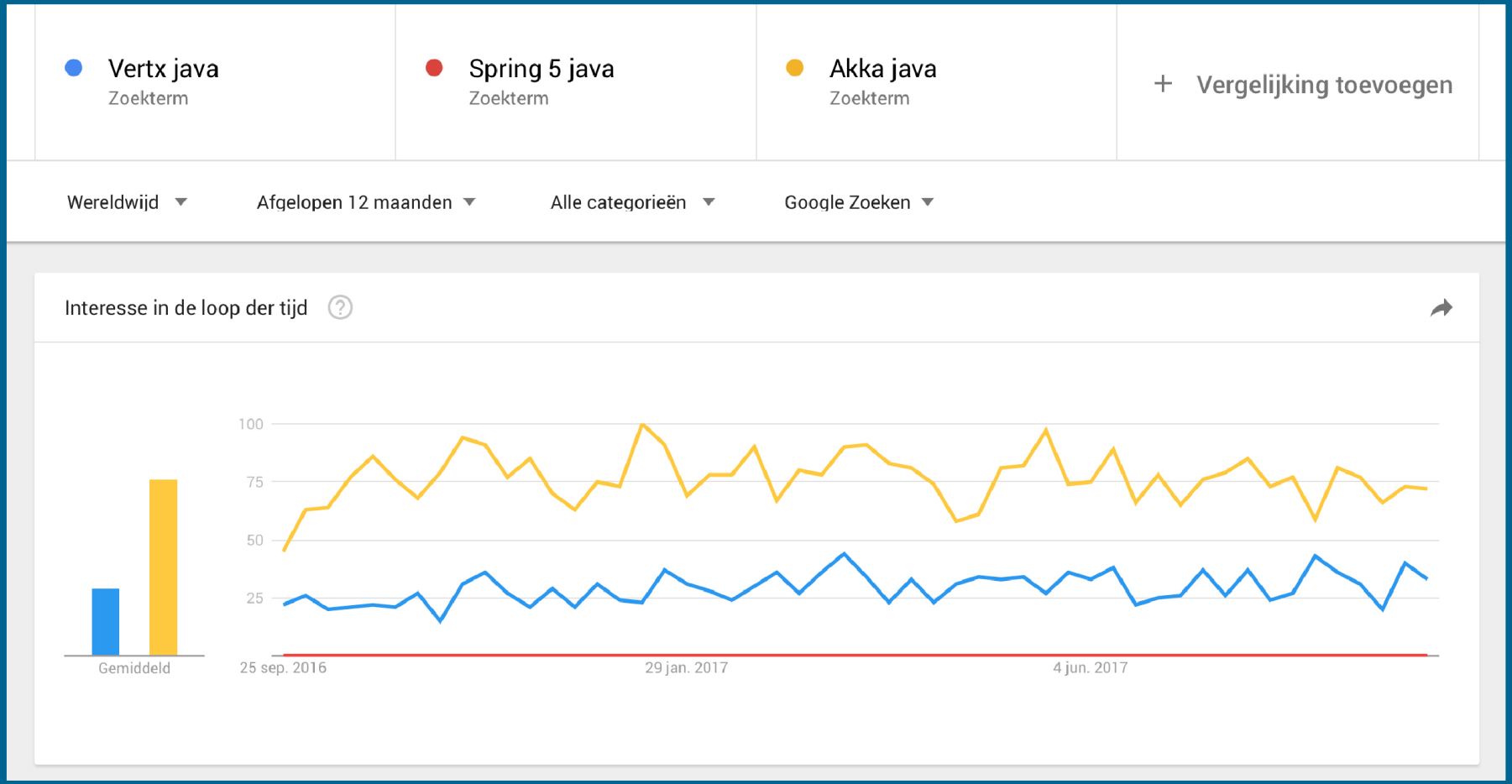
Actor

- State
- Behavior
- Mailbox
- Supervision of child actors

```
public class HelloWorld extends UntypedActor {

  @Override
  public void preStart() {
    // create the greeter actor
    final ActorRef greeter = getContext().actorOf(Props.create(Greeter.class), "greeter");
    // tell it to perform the greeting
    greeter.tell(Greeter.Msg.GREET, getSelf());
  }

  @Override
  public void onReceive(Object msg) {
      getContext().stop(getSelf());
  }
}

public class Greeter extends UntypedActor {

  @Override
  public void onReceive(Object msg) {
      System.out.println("Hello World!");
      getSender().tell(Msg.DONE, getSelf());
  }
}
```

```java
public class HttpServer extends HttpApp {

    public static void main(String[] args) throws IOException {
        ActorSystem system = ActorSystem.create();

        new HttpServer().bindRoute("localhost", 8080, system);
    }
    @Override
    public Route createRoute() {
        Route helloRoute = handleWith((ctx)
                -> ctx.complete("Hello World!"));

        return route(get(path("hello").route(helloRoute)));
    }
}
```

Popularity


Vertx java
Zoekterm
Spring 5 java
Zoekterm
Akka java
Zoekterm
Vergelijking toevoegen
Wereldwijd
Afgelopen 12 maanden
Alle categorieën
Google Zoeken
Interesse in de loop der tijd
100
75
50
25
Gemiddeld
25 sep. 2016
29 jan. 2017
4 jun. 2017

Landscape overview

	Event model	Annotations	Actor model
Framework	VERT.X	spring by Pivotal	akka
API	 RxJava	PROJECT REACTOR	akka streams