



Concurrent Processing Techniques

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Agenda

- ❖ Concurrent Processing Impediments
- ❖ Demo Web Application
- ❖ Java Concurrency Package
- ❖ Akka Actors
- ❖ Asynchronous Web Services
- ❖ Questions and Feedback



Concurrent Processing Impediments

Task or Data Decomposition

Deadlocks and Starvation

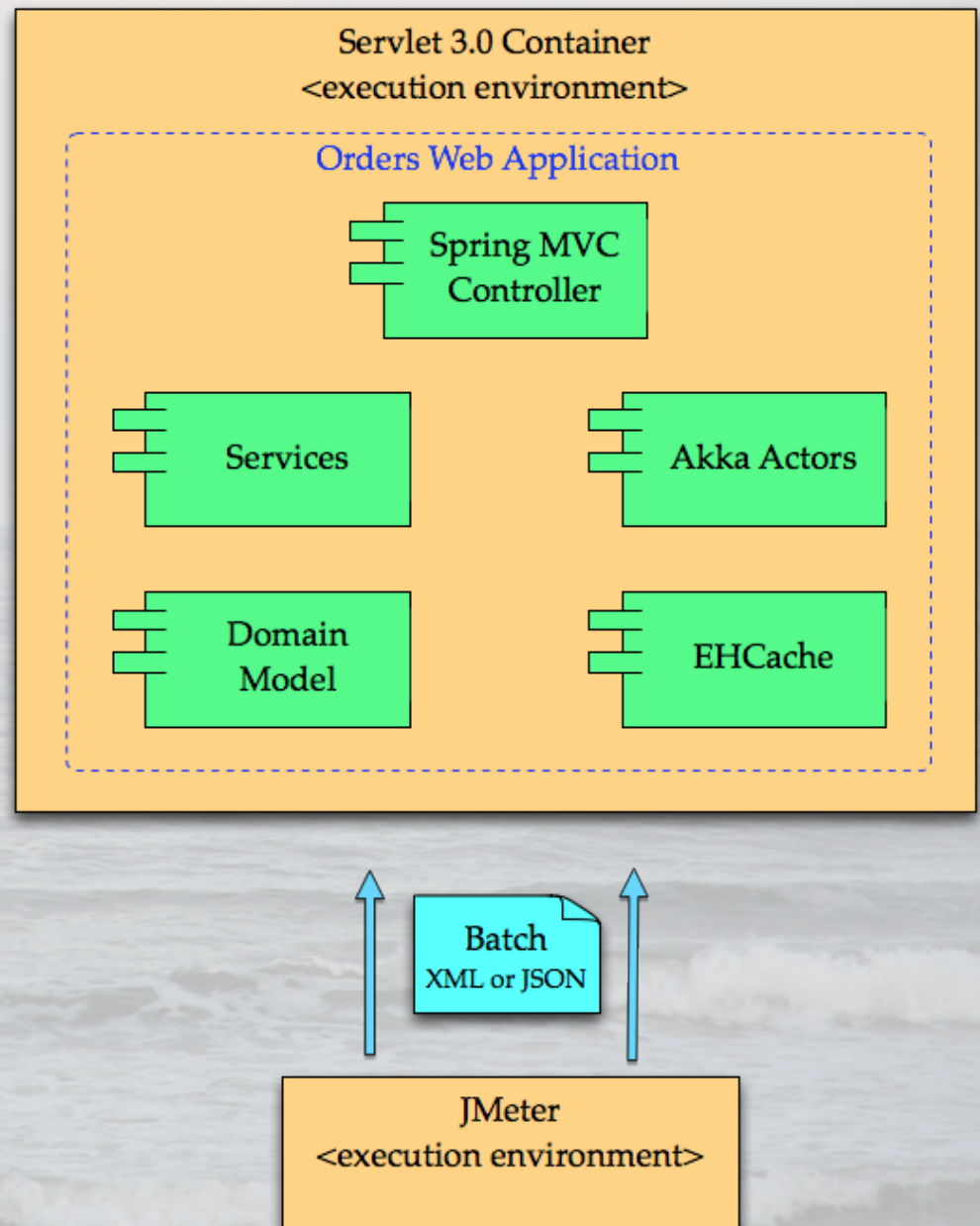
Concurrent Processing is Frackin' Hard!

Concurrent Testing

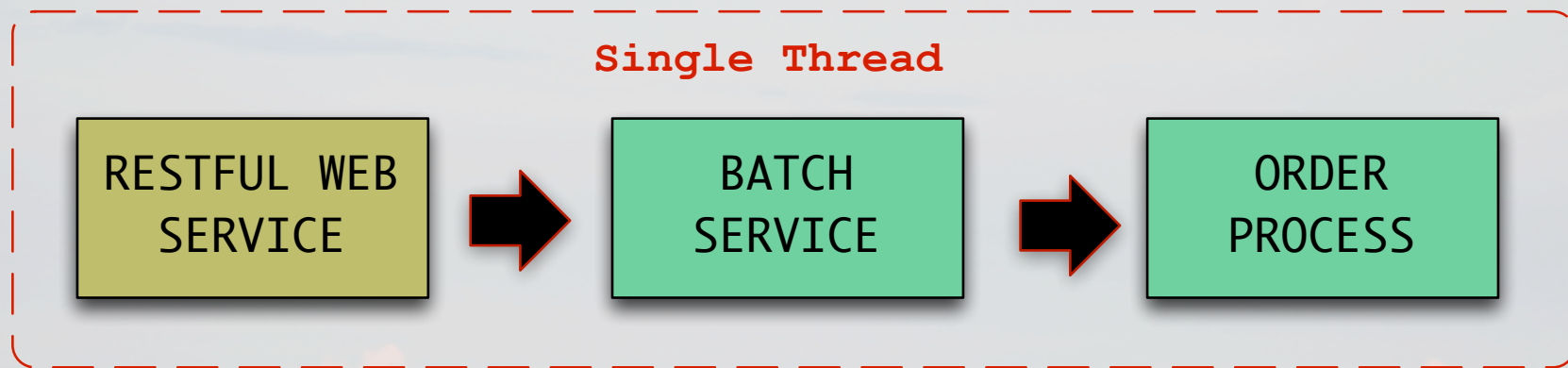
Race Conditions

Orders Web Application

- Spring MVC Web Application
 - Spring MVC 4 & Servlet 3
 - Restful Web Services
 - Java Concurrency Library
 - Akka Actors
- Concurrency Patterns
 - Fire & Forget
 - Pipeline
 - Map-Reduce
 - Fork-Join
 - Producer-Consumer



Order Processing – Single-Threaded Processing

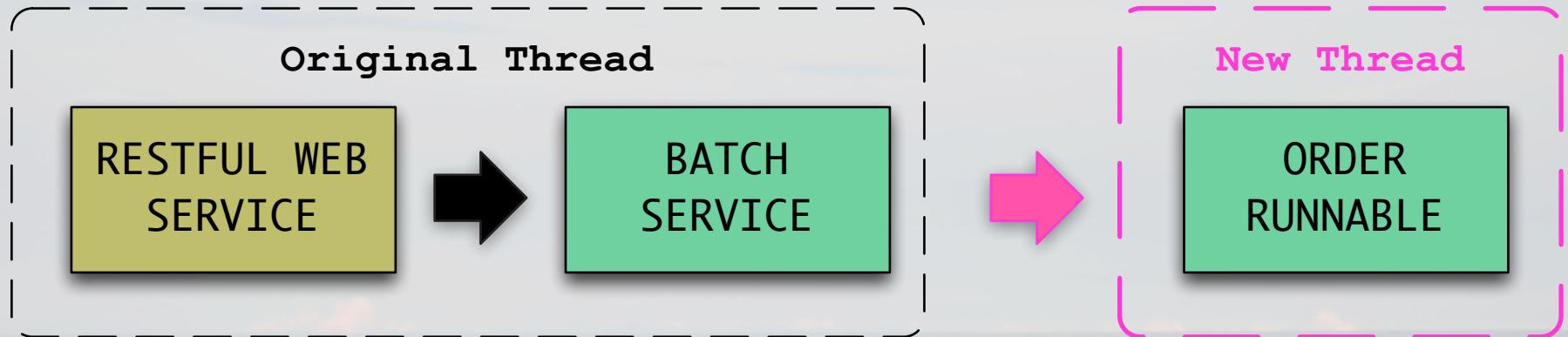


```
... | 492438277@qtp-1840511017-0 | ORD X1414 PRI $12 ST $60.0 DISC .10% T $54  
... | 492438277@qtp-1840511017-0 | ORD X1415 PRI $8 ST $32.0 DISC .5% T $16  
... | 492438277@qtp-1840511017-0 | ORD X1419 PRI $10 ST $60.0 T $60
```

Java Concurrency Library



Order Processing – Java Fire & Forget

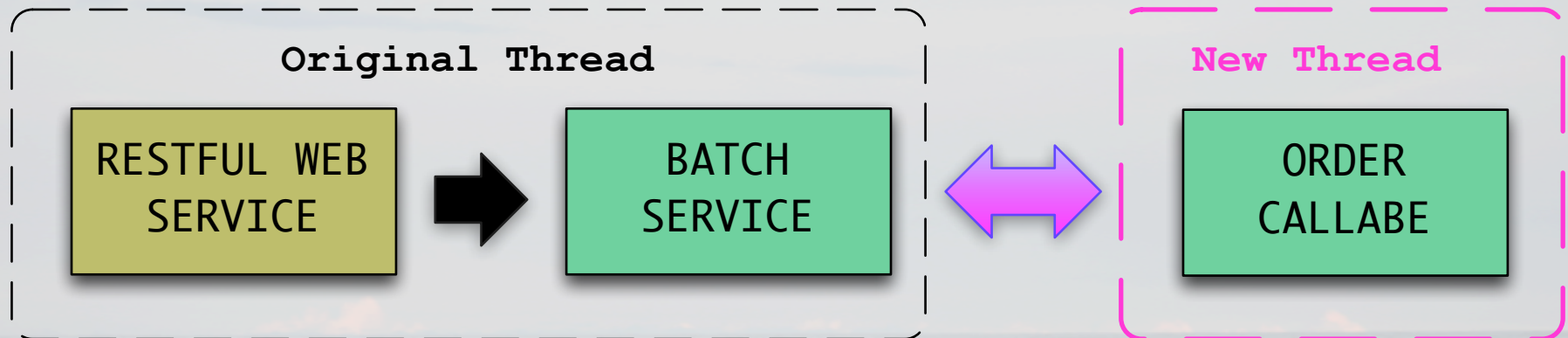


```
20:55:01:811 | pool-2-thread-5 | ORD X1218 PRI $10 ST $100.0 T $100
```

```
20:55:01:812 | pool-2-thread-5 | ORD X1419 PRI $10 ST $60.0 T $60
```

```
20:55:01:818 | pool-2-thread-1 | ORD X1406 PRI $6 ST $48.0 T $48
```


Order Processing – Java Fork-Join

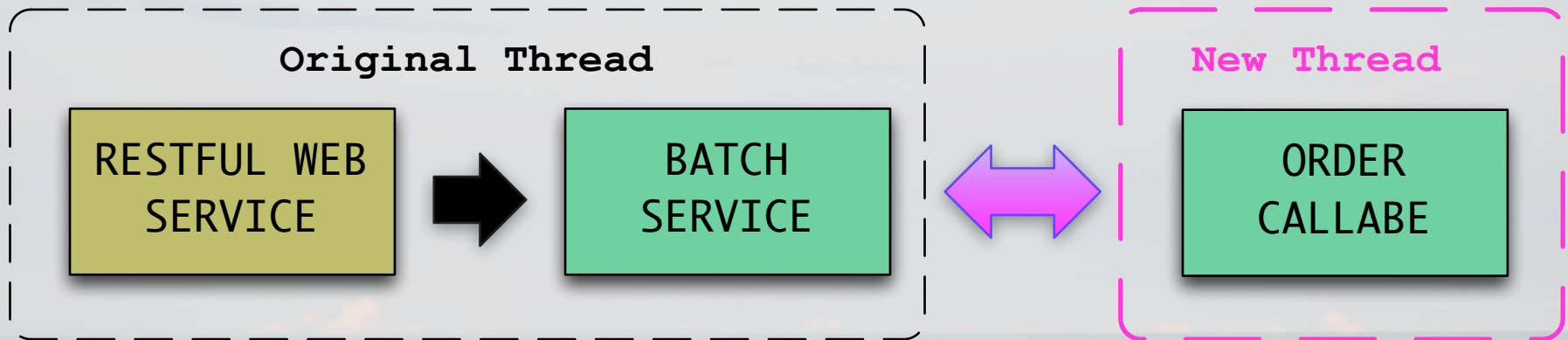


```
20:57:59:691 | pool-4-thread-36 | ORD X1363 PRI $6 ST $60.0 DISC .15% T $51
```

```
20:57:59:694 | pool-4-thread-12 | ORD X1218 PRI $10 ST $100.0 T $100
```

```
20:57:59:695 | 492438277@qtp-1840511017-0 | Batch Total $11080.0
```

Order Processing – Java Producer-Consumer



```
15:18:17:883 | qtp1624616274-16 | order X1420 submitted
```

```
{processing}
```

```
15:18:17:883 | qtp1624616274-16 | Consumed Task #1
```

```
15:18:17:884 | qtp1624616274-16 | Consumed Task #2
```

```
{processing}
```

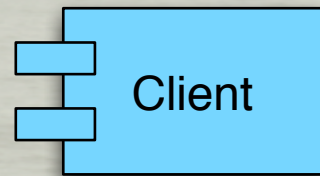
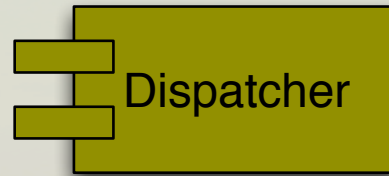
```
15:18:17:907 | pool-3-thread-17 | ORD X1420 PRI $6 ST $24.0 DISC .15% T $20
```

```
{processing}
```

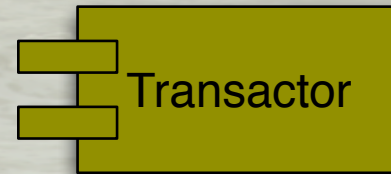
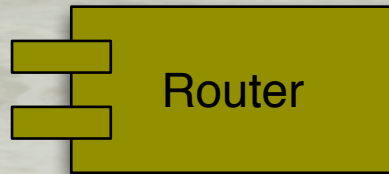
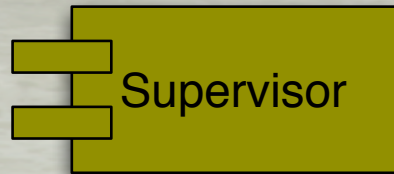
```
15:18:22:753 | qtp1624616274-16 | Batch Total $11080.0
```

Actors

Actor System

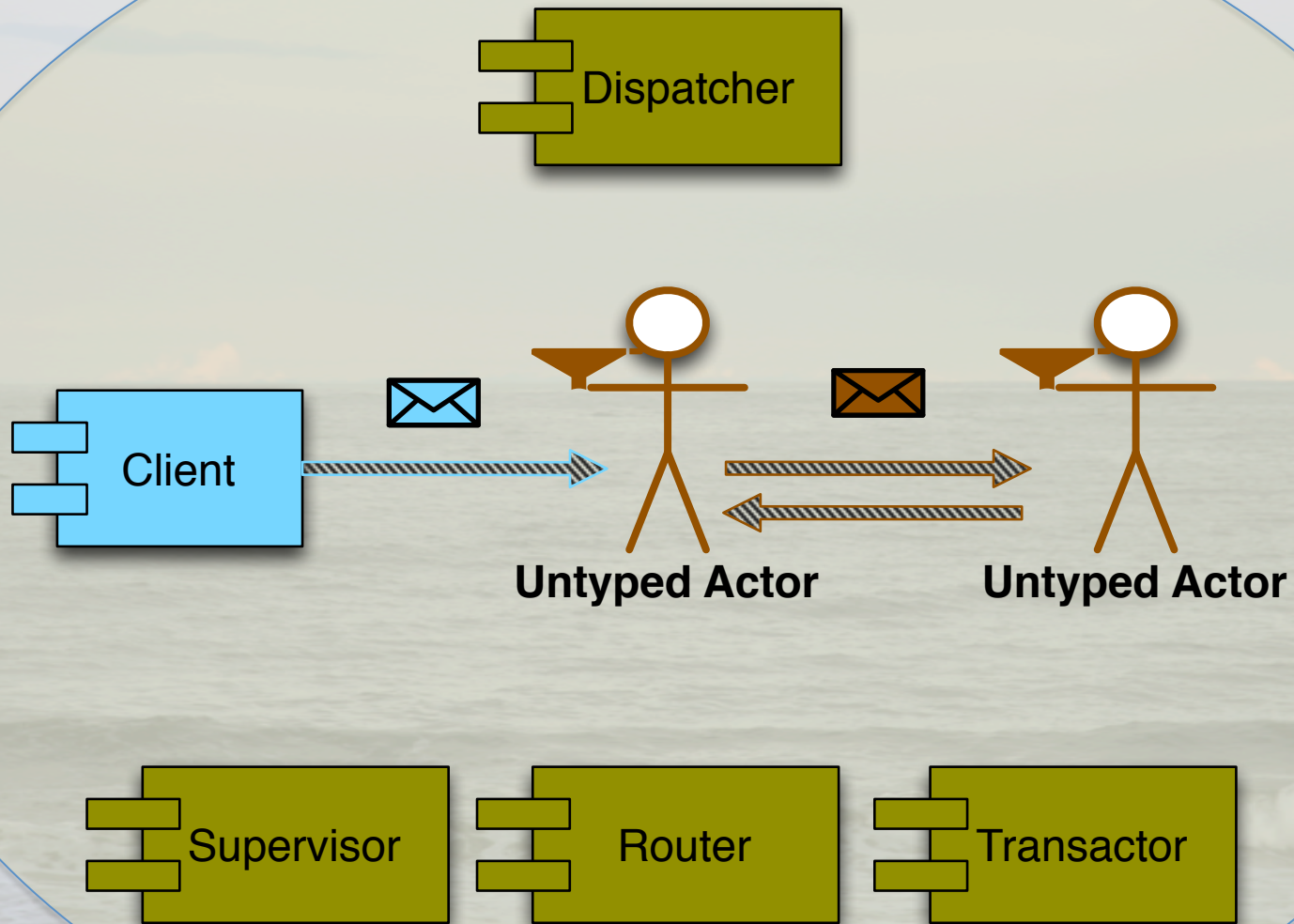


Untyped Actor



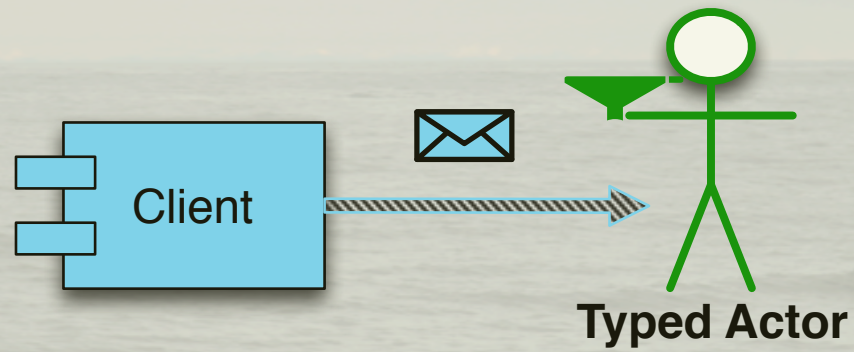
Actors

Actor System



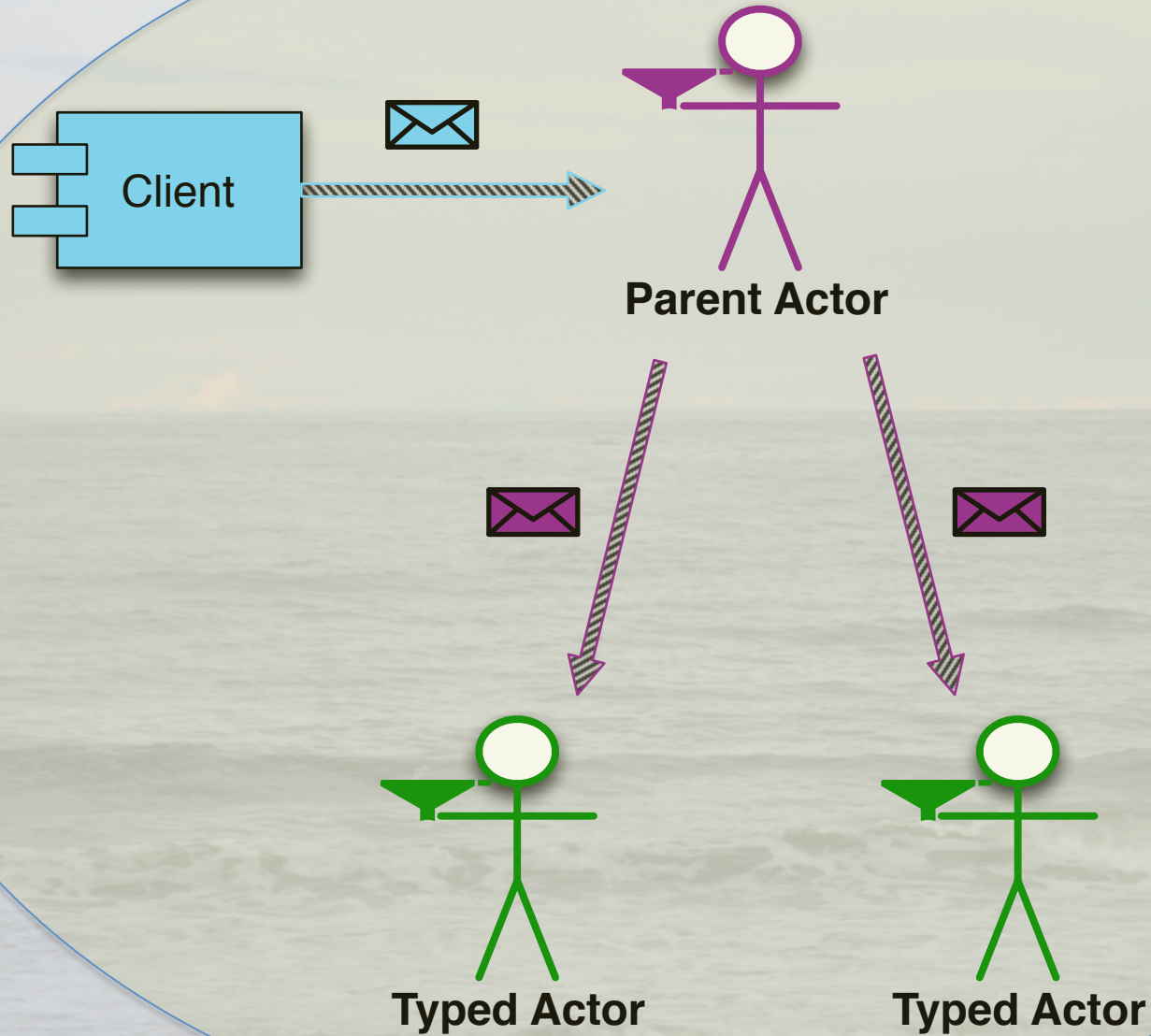
Actors

Actor System



Actors

Actor System

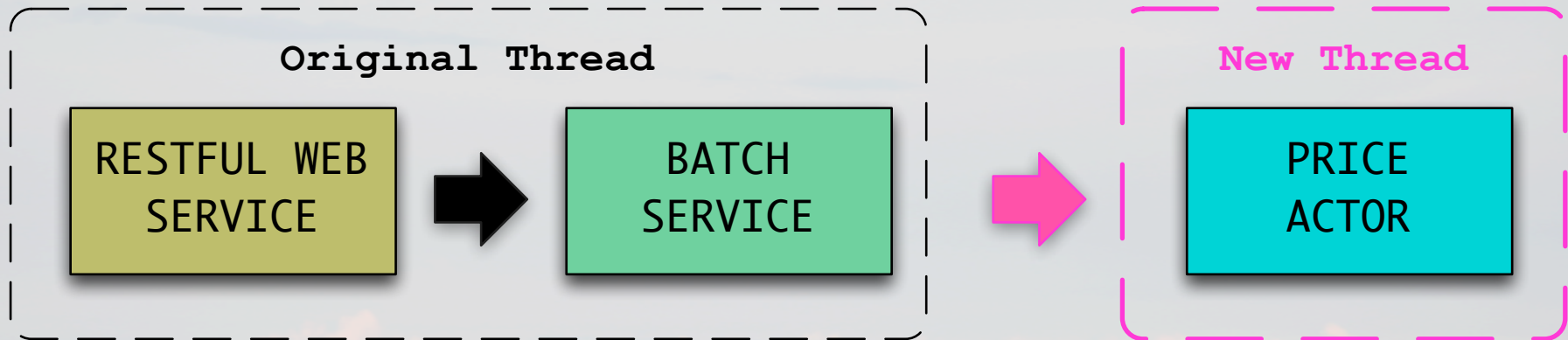


Akka Actors



- ❖ Actors Framework (Scala & Java API)
- ❖ Standalone (Microkernel) or Embedded
- ❖ High Availability (Remote Actors)
- ❖ Fault Tolerant (Supervision & Monitoring)
- ❖ Software Transactional Memory (STM)

Order Processing – Akka Actors Pipeline



```
...| akka:event-driven:dispatcher:global-1 | Order ID: X1418  
Amount SubTotal: $100.0 Discounted SubTotal: $
```

```
...| akka:event-driven:dispatcher:global-1 | Order ID: X1419  
Amount SubTotal: $60.0 Discounted SubTotal: $
```

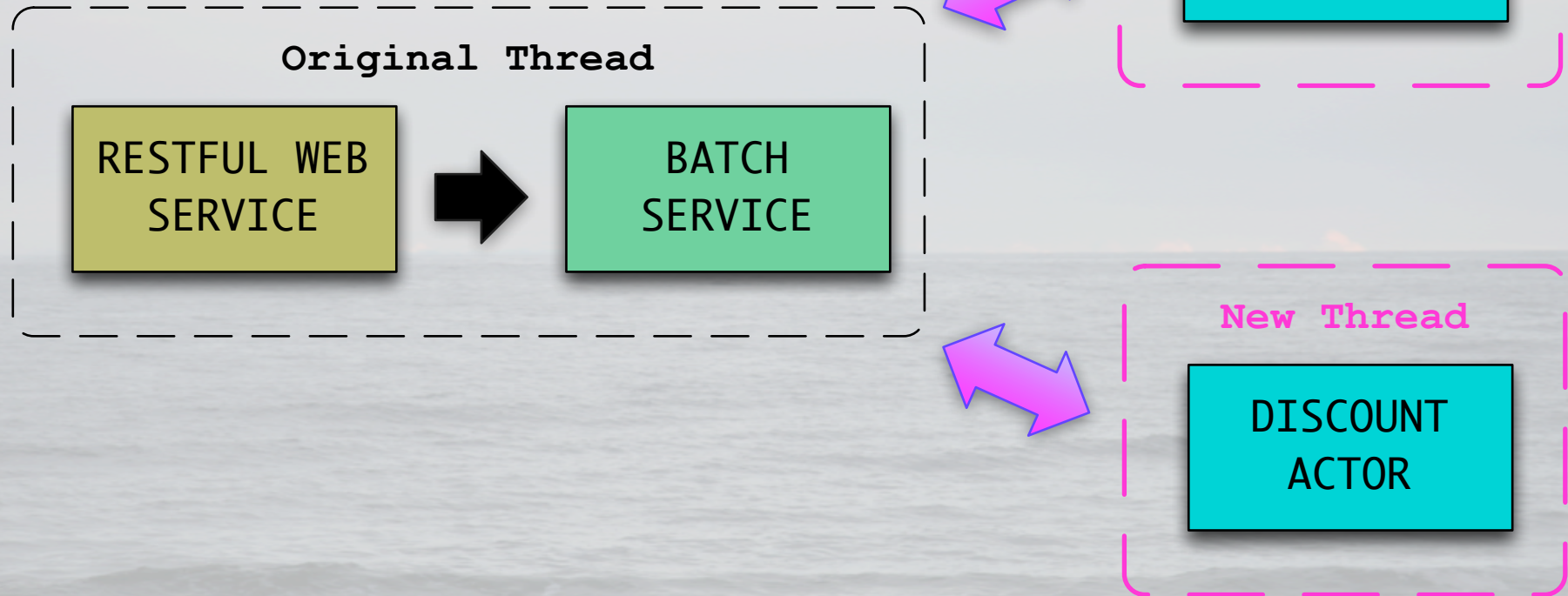
```
...| akka:event-driven:dispatcher:global-11 | Order ID: X1418  
Amount SubTotal: $100.0 Discounted SubTotal: $100.0
```

```
...| akka:event-driven:dispatcher:global-1 | Order ID: X1420  
Amount SubTotal: $24.0 Discounted SubTotal: $
```

```
...| akka:event-driven:dispatcher:global-11 | Order ID: X1419  
Amount SubTotal: $60.0 Discounted SubTotal: $60.0
```



Order Processing – Akka Actors Fork-Join

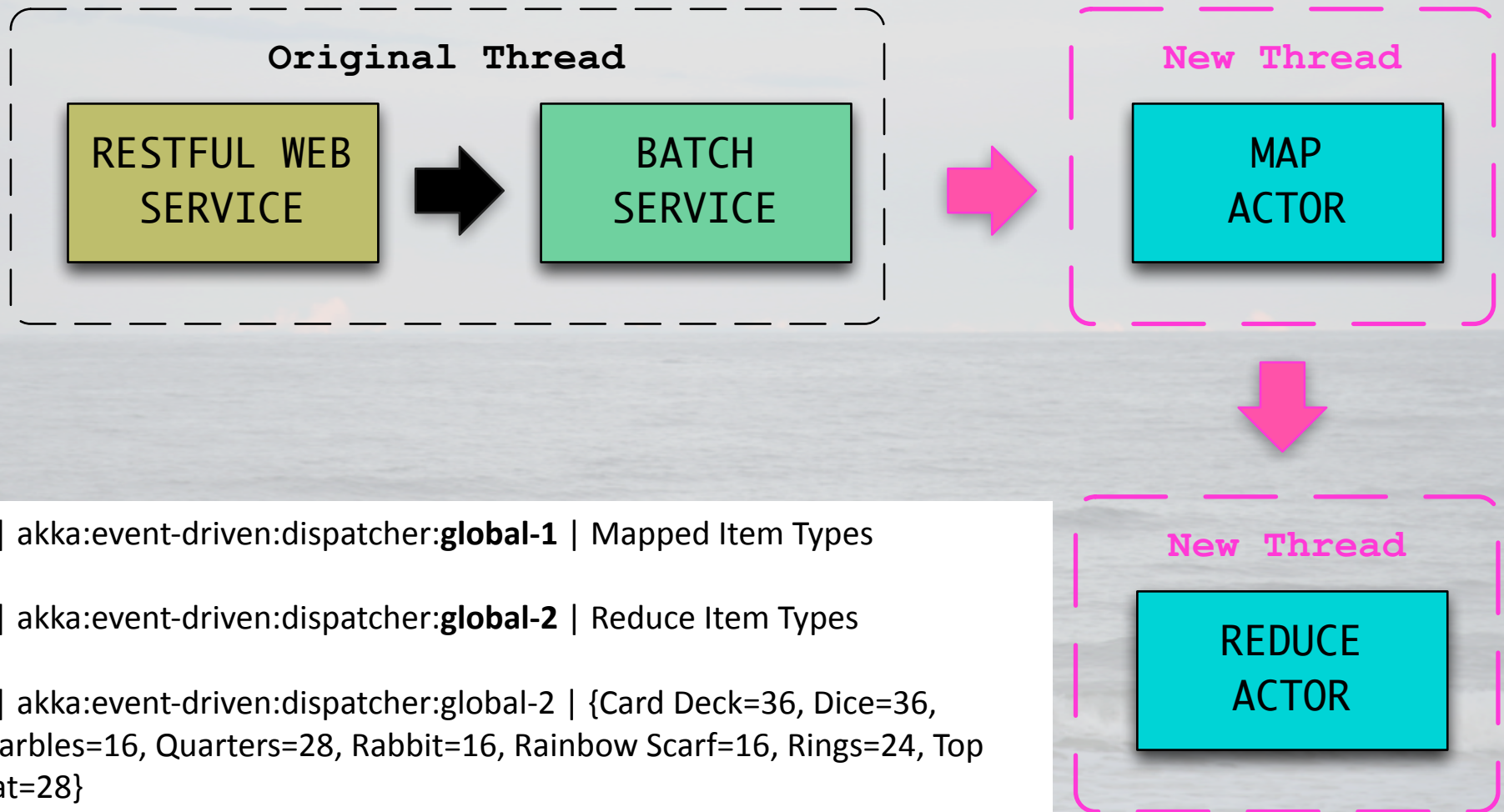


```
...| akka:event-driven:dispatcher:global-1 | Order ID: X1420 Discount: 15%
```

```
...| akka:event-driven:dispatcher:global-11 | Order ID: X1420 Amount  
SubTotal: $24.0
```

```
...| 492438277@qtp-1840511017-0 | Batch Total $11080.0
```

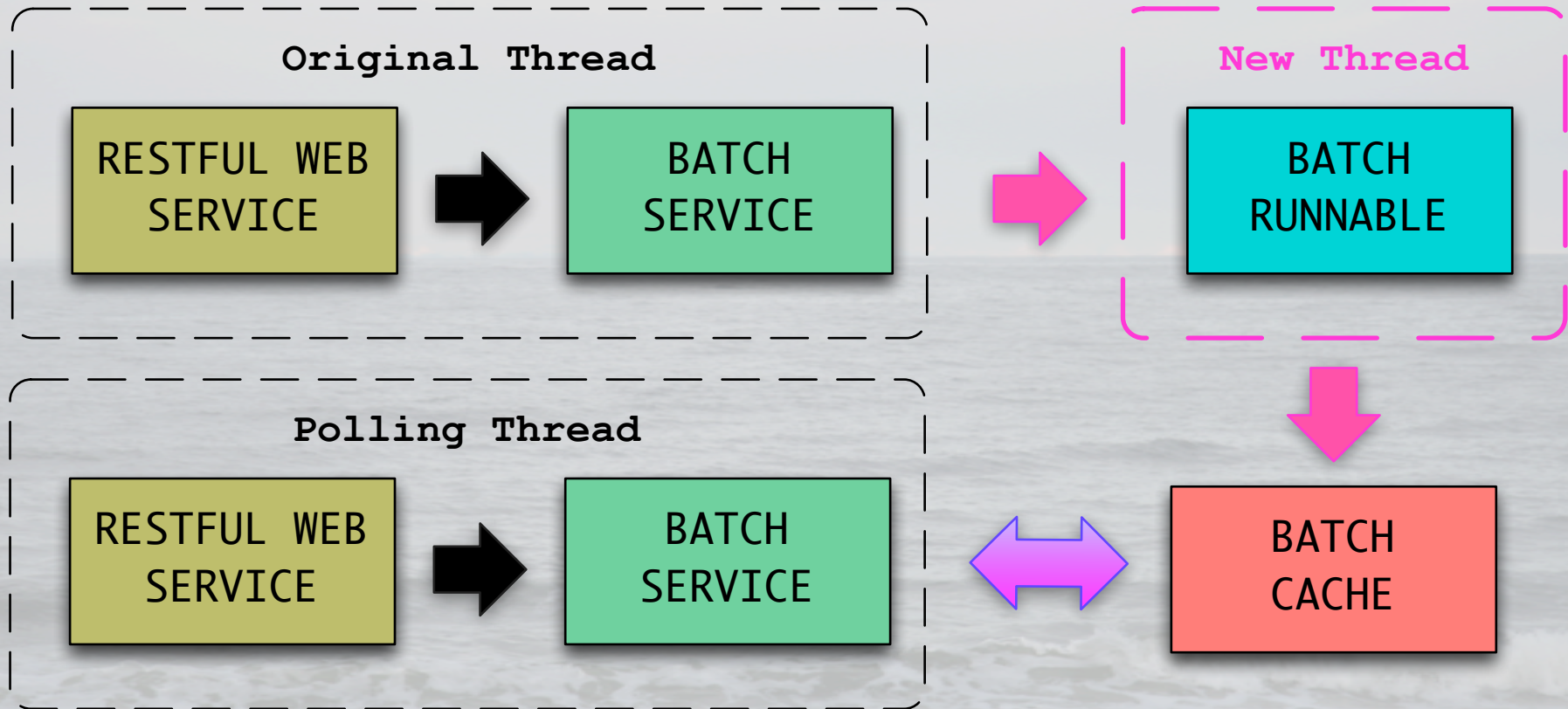

Order Processing – Akka Actors Map-Reduce



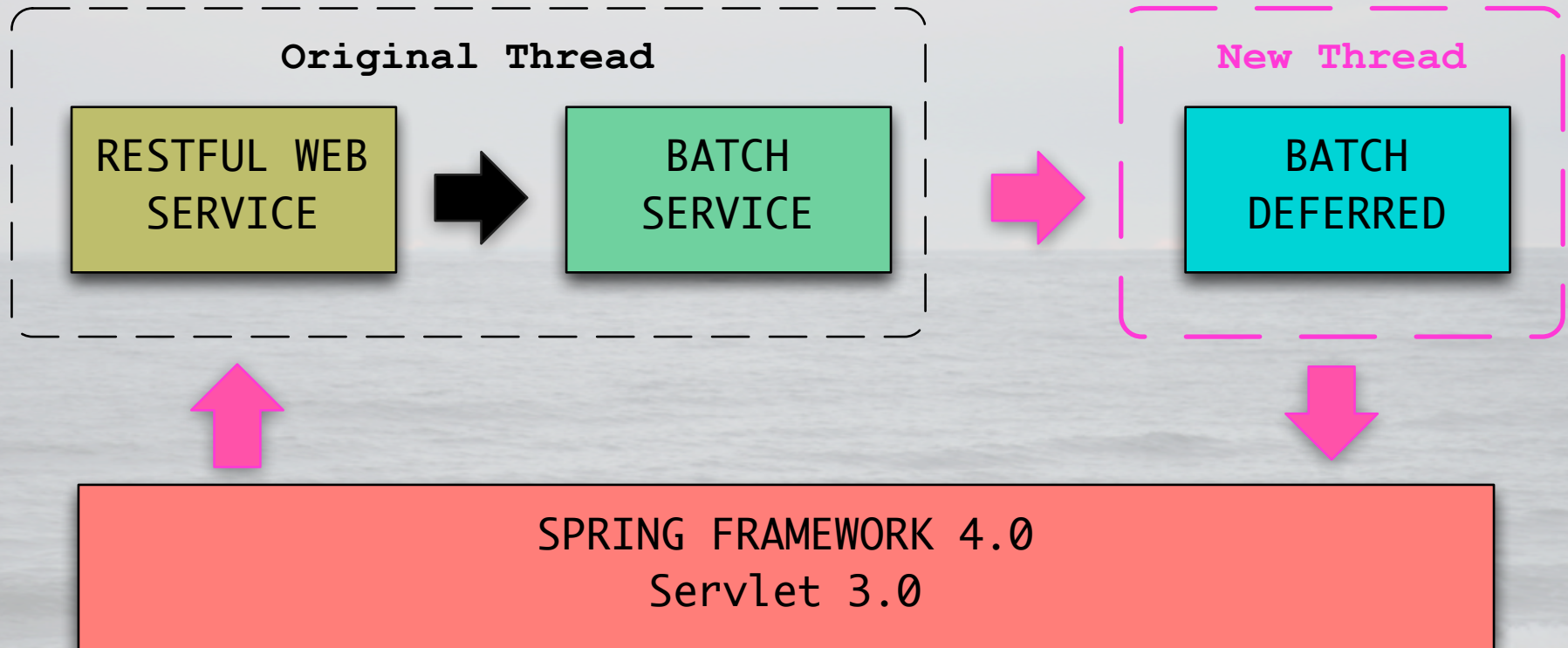
Asynchronous Web Service Magic



Order Processing – Web Service Future



Order Processing – Asynchronous Web Service



Questions & Feedback

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<https://github.com/jtdeane/demo-spring-orders>